Washoe County

REGIONAL HAZARD MITIGATION PLAN

2025

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Introduction

In recent years, Washoe County has endured a variety of hazards-turned disasters. From closed-basin Flooding (including closed-basin flooding) in the North Valleys and other floods along the Truckee River, Red Rock Canyon, and Pyramid Lake, to wildland fires and the ever-present risk of human-caused disasters, the region has experienced firsthand what hazards can do to a community. In response to hazard risks, Washoe County and its regional partners have made a long-term commitment to work together to prepare for and respond to emergencies. The 2024 update of the Washoe County Regional Hazard Mitigation Plan (RHMP) represents a cooperative effort by the regional partners to identify hazards and take action to reduce hazard risks over the long term.

Authority

The Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act)—as amended by the Disaster Mitigation Act of 2000 (DMA 2000), Public Law 106-390, and its implementing Code of Federal Regulations (CFR) provisions, 44 CFR § 201—provides the legal authority for local hazard mitigation planning. DMA 2000 requires state, local, and tribal governments to develop a Hazard Mitigation Plan (HMP) that identifies the jurisdiction's natural hazards, risks, vulnerabilities, and mitigation strategies. The planning process mandated by the Federal Emergency Management Agency (FEMA) (outlined in 44 CFR §201.6) includes the following activities:

- Document the planning process;
- Provide stakeholders with an opportunity to participate;
- Conduct and document public involvement;
- Incorporate existing plans and reports;
- Discuss continued public participation and plan maintenance; and
- Provide a method for monitoring, evaluating, and updating the HMP.

Once complete, the HMP must be submitted to FEMA for approval. This approval is a prerequisite for federal Hazard Mitigation Assistance grant program eligibility (outlined in 42 CFR §5165(a)).

What Is Hazard Mitigation?

Hazard mitigation is any sustained action to reduce or eliminate the long-term risk to human life and property posed by hazards (44 CFR §201.2). Hazard mitigation activities may be implemented before, during, or after an event. However, it has been demonstrated that mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs.

In addition, hazard mitigation planning is one of the five mission areas in the National Preparedness Goal: Mitigation, Preparedness, Response, and Recovery (see Figure 1). The Washoe County RHMP is integral to the region's approach to emergency management and is designed to align and integrate with other existing plans and emergency management activities.

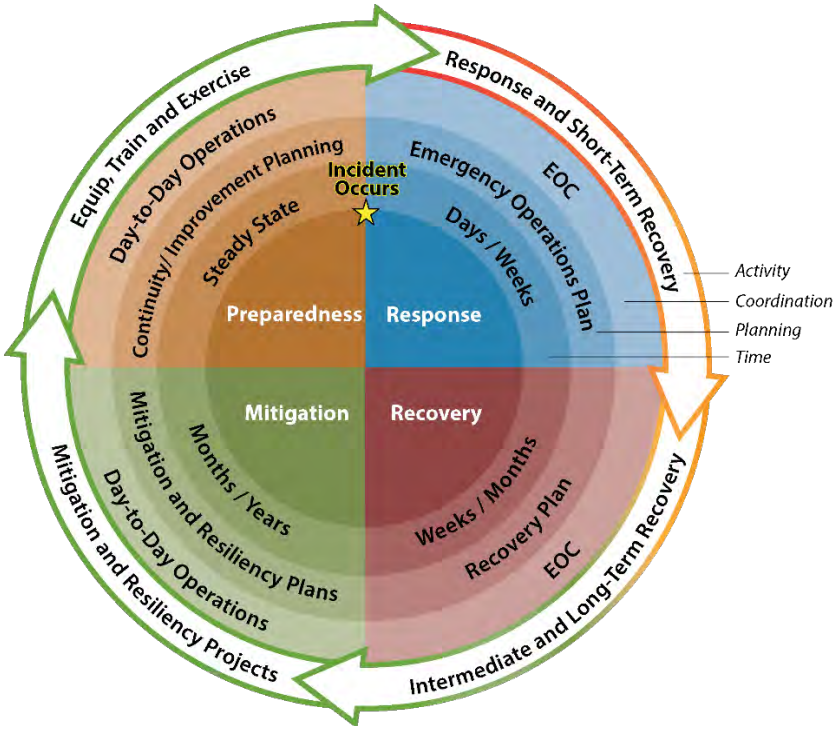


Figure 1: The Emergency Management Cycle

Mitigation planning is important because it not only encourages communities to become more flexible and adapt to change more easily, but it also:

- Guides mitigation activities in a coordinated and efficient manner;
- Promotes partnerships;
- Integrates mitigation into existing plans/programs;
- Considers future growth and development trends;

- Makes a community more disaster-resilient; and
- Ensures eligibility for grant funding.

Purpose and Scope

Purpose

The Washoe County Regional Hazard Mitigation Plan (RHMP) assesses the potential impact of all hazards on community members and property and provides mitigation strategies and actions to reduce such risks. The RHMP prioritizes these strategies and includes an implementation plan to ensure that strategic actions are carried out. The 2024 RHMP is the required update of the County's existing 2020 RHMP. Updating the RHMP ensures that community members have access to the most up-to-date hazard risk information and maintains the County's and participating communities' eligibility to receive federal mitigation funding.

Scope

The Washoe County RHMP is focused on community members, property, and community lifelines, and it includes strategies for broader community risk reduction. The County is a large geographic region with communities throughout. The RHMP attempts to account for all areas of risk and address the needs of each plan participant. It is designed to integrate with other planning efforts and neighboring county mitigation plans, and to be multi-jurisdictional, representing the efforts of each plan participant:

- Washoe County
- City of Reno
- City of Sparks
- North Lake Tahoe Fire Protection District
- Pyramid Lake Paiute Tribe
- Reno-Sparks Indian Colony
- Truckee Meadows Fire Protection District
- Truckee River Flood Management Authority

Besides this RHMP Base Plan, each participating community has a standalone Jurisdictional Annex that identifies unique capabilities, risks, and mitigation strategies that reflect its mitigation program. Refer to those Jurisdictional Annexes for jurisdiction-specific details.

The Washoe County Hazard Mitigation Program

The RHMP is one component of the region's comprehensive approach to hazard mitigation. The County and its partners maintain capabilities to ensure that all elements of the participating communities can support hazard mitigation activities (see the Mitigation Strategy section). The following hazards are the focus of the region's hazard mitigation program:

- Avalanches and landslides
- Criminal acts and terrorism
- Drought
- Wildland fires
- Earthquakes
- Energy emergencies
- Flooding (including closed-basin flooding)
- Hazardous materials incidents
- Infectious diseases
- Radiological waste transport
- Extreme Weather
- Transportation incidents
- Volcanoes

The risks associated with these hazards are prioritized and assessed in the RHMP. See Mitigation Strategy for details on the ongoing implementation of the County's mitigation program.

Organization of the Program

Figure 2 illustrates how the County organizes to ensure an engaged and collaborative approach to mitigation planning and program implementation. This organization is informally referred to in this plan as the County's mitigation program.

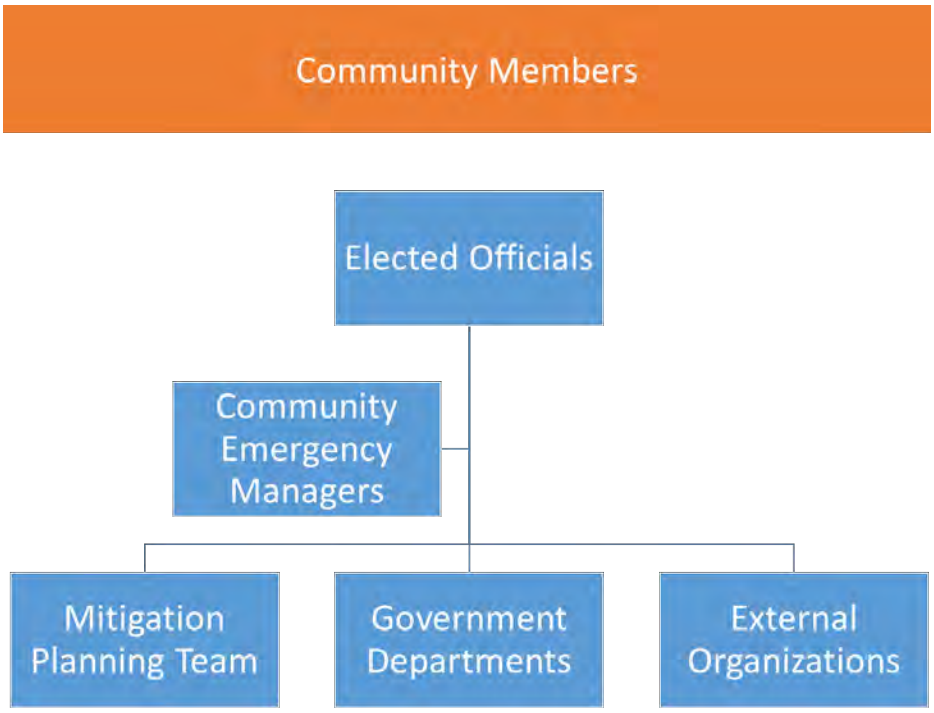


Figure 2: Organization of the Washoe County Multi-Jurisdiction Mitigation Program

Roles and Responsibilities

The RHMP exists as a framing document for the region's overall mitigation program. All community members, governmental entities, and businesses play a role in mitigation, and this section outlines those roles and responsibilities.

COMMUNITY MEMBERS

Prepared and educated community members are a critical aspect of the region's resiliency, and the County and its partners actively encourage their members to participate in efforts to minimize vulnerability to hazards by engaging in the following activities:

- Participate in preparedness programs. More information can be found in newsletters, on Facebook pages, and through direct engagement.
- Engage in personal and family preparedness and mitigation activities at home and at work.

ELECTED OFFICIALS

Elected leaders play a key role in the County's mitigation program. As local decision-makers, those officials are responsible for balancing budgetary requirements with the need to reduce risks. Participating elected officials perform the following activities in support of the County's mitigation program:

- Develop and set policy guidance and direction for the County's hazard mitigation program;
- Pass required ordinances to support the hazard mitigation program;
- Provide resources, funding, and direction for protecting and enhancing the lives of community members and protecting cultural and natural resources;
- Adopt the RHMP; and
- Approve funding and projects outlined in the RHMP.

COMMUNITY EMERGENCY MANAGERS

Each participating community employs an emergency manager or emergency management department. These entities serve as the lead coordinators for the community mitigation program. Emergency managers facilitate mitigation activities, including updates to the RHMP, and provide technical assistance to other departments. Key responsibilities of emergency managers include the following:

- Facilitate the community's hazard mitigation program;
- Provide technical support to departments to integrate hazard mitigation into their activities; and
- Keep elected officials apprised of the status of the County's hazard mitigation program.

MITIGATION PLANNING TEAM

The Mitigation Planning Team (MPT) includes members of various community partner governmental departments. It was developed to ensure that the RHMP is representative of the capabilities, resources, and concerns of the whole region. The MPT will convene regularly to monitor, evaluate, and implement the region's mitigation program. Additional key responsibilities of the MPT include the following:

- Support ongoing implementation of the region's hazard mitigation program;
- Meet quarterly to address progress made on mitigation actions to date; and
- Provide input and technical support for updating and maintaining the RHMP.

Refer to Planning Process for a discussion of the role of the MPT in the 2024 update of the Washoe County RHMP.

GOVERNMENTAL DEPARTMENTS AND AGENCIES

The success of the region's mitigation program depends on making mitigation a shared endeavor across all organizational elements of the governmental departments of each participating community. Departments are strongly encouraged to incorporate hazard mitigation into their plans and programs and be active participants in the County's efforts to enhance resiliency. Key responsibilities of plan participants include the following:

- Implement actions identified in the RHMP;
- Incorporate hazard mitigation into other departmental planning efforts; and
- Assign a representative to serve as a liaison to the MPT.

COMMUNITY PARTNERS AND NEIGHBORING JURISDICTIONS

The County is committed to a collaborative mitigation program that strives to integrate with other community efforts to mitigate the impacts of hazards. While the scope of the RHMP primarily includes participating community departments, the County will continue to look for opportunities to partner with neighboring jurisdictions, private industry, nonprofit organizations, and community- and faith-based organizations in its mitigation program. In particular, the County will coordinate with neighboring counties, the State of Nevada, and FEMA Region 9. The key responsibilities of community partners include the following:

- Incorporate hazard mitigation into organizational and business activities; and
- To the greatest extent possible, coordinate hazard mitigation activities with those of the County and other community partners.

Organization of the 2024 Plan

The 2024 update of the RHMP is organized into the following chapters:

- Chapter 1: Introduction. Identifies the authorities on which the plan is based, describes the plan's purpose and scope, describes how the plan is organized, and identifies changes to the plan since 2015.
- Chapter 2: Planning Process. Describes the process used to update the plan, including data sources and plan integration activities, outreach and engagement strategies, activities of the MPT and other participants, and plan development milestones.
- Chapter 3: Community Profile. Summarizes the profile for the planning area, including geographic, demographic, and economic characteristics that make the area unique.

- Chapter 4: Hazard Profiles and Vulnerability Assessments. Describes the hazards that could impact the community, including a hazard-ranking table.
- Chapter 5: Capability Assessment. Identifies the existing mitigation capabilities of departments and organizations and highlights mitigation accomplishments over the last planning cycle.
- Chapter 6: Mitigation Strategy. Provides updated goals and objectives for the region's mitigation program and identifies a comprehensive set of prioritized mitigation actions that would enhance the region's resilience.
- Chapter 7: Program Implementation. Describes the MPT's plan for monitoring, evaluating, and updating the Washoe County RHMP over the next five years.

In addition to the main document, the RHMP has a series of appendices that document the planning process, expand map sets, and provide additional data for the Vulnerability Assessment. They are in a separate volume.

What's New in the 2024 Update?

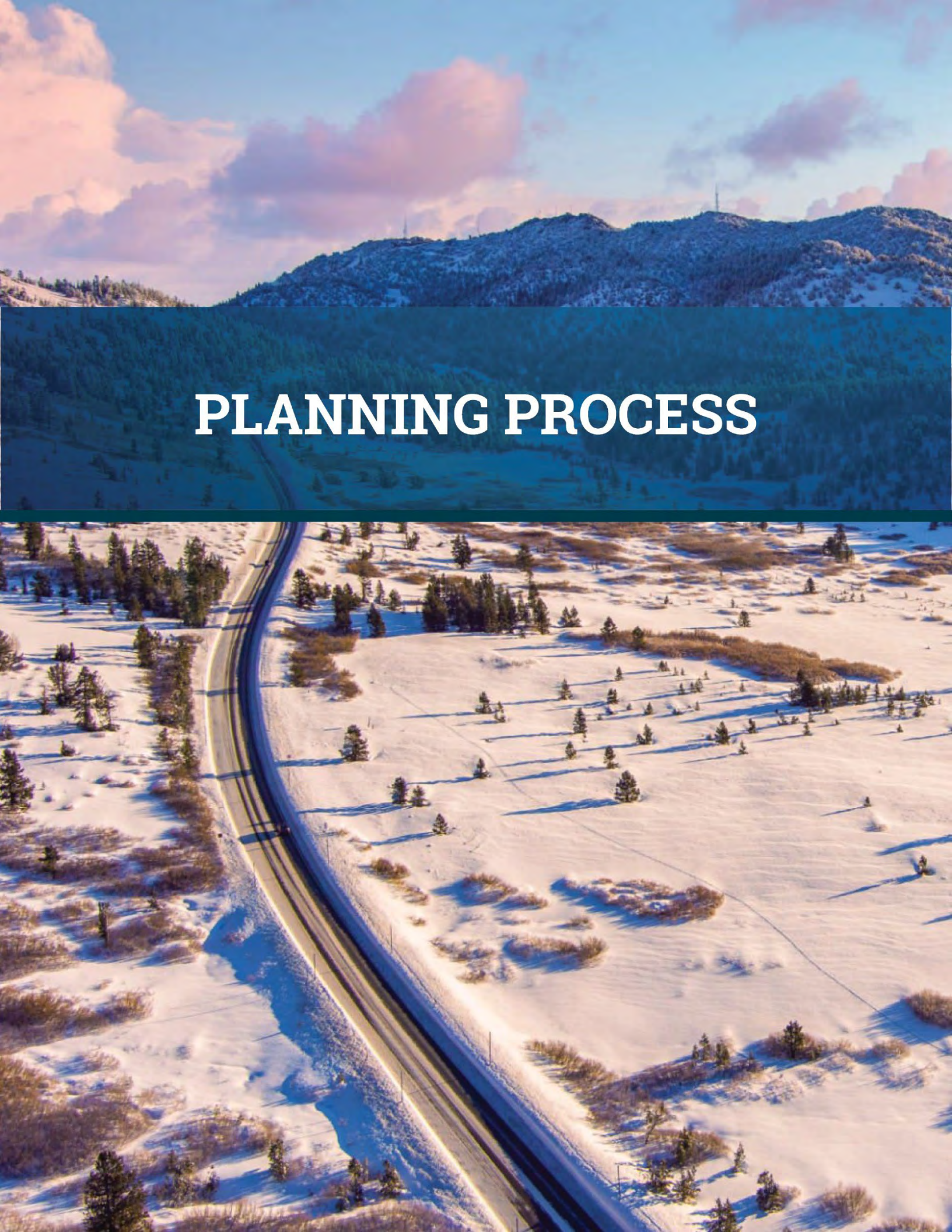
FEMA	**E2.** Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))

The 2019 RHMP was improved upon from the 2015 RHMP. The 2015 RHMP served as a starting point for regional hazard mitigation planning efforts and provided a benchmark against which the community's current risk and hazard vulnerability could be considered. The 2019 HMP was the basis for the 2024 review, which identified progress made in implementing the mitigation strategies proposed in that plan (see Appendix A). The section, Incorporating Existing Planning Mechanisms, been expanded to guide the development of and establish an organizational structure for a regional mitigation program. This program will encourage the integration of mitigation into existing planning mechanisms and continued public involvement in the planning process.

With the 2024 RHMP update, the County and its partners have placed an increased emphasis on incorporating the best available data, particularly on the emerging hazard, urban avalanches, identifying funding sources for mitigation projects, and adding specificity to their mitigation actions.

These changes in planning priorities stem from recent studies and mitigation grant experience. In 2023, the County received the Washoe County Avalanche Analysis Report, which assessed areas of avalanche risk across the County. This study showed that additional analysis was needed. Furthermore, since the last plan update, available mitigation grant funding has increased through grants such as the Building Resilient Infrastructure and Communities (BRIC) program and the Hazard Mitigation Grant Program (HMGP), and the American Rescue Plan Act

(ARPA) which makes funds available because of the COVID-19 pandemic. It is important to the County and its partners to select mitigation actions that are eligible for mitigation grant funding.



PLANNING PROCESS

Planning Process

FEMA	A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1)) A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process? (Requirement 44 CFR § 201.6(b)(2)) A3. Does the Plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1)) A4. Does the Plan describe the review and incorporation of existing plans, studies, reports and technical information? (Requirement 44 CFR § 201.6(b)(3)) E2. Was the Plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3)) HHPD1: Did the Plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?

The RHMP reflects the needs and priorities of Washoe County and the following jurisdictions, tribes, and special districts who intend to adopt the final plan:

- City of Reno
- City of Sparks
- Reno-Sparks Indian Colony
- Pyramid Lake Paiute Tribe
- Truckee Meadows Fire Protection District
- North Lake Tahoe Fire Protection District
- Truckee River Flood Management Authority

The RHMP was also informed by stakeholders and other organizations identified in this section. Together, these jurisdictions, tribes, special districts, and other organizations—hereby referred to as the regional partners—collaborated to develop a local hazard mitigation plan which reflects the unique risks, vulnerabilities, and priorities of their communities and organizations. In particular, the plan was updated with the following changes in priorities in mind:

- Expand the avalanche hazard profile to include new data from a recent study on avalanche risk, particularly urban avalanche risk.
- Expand the specificity of mitigation actions and ensure that there are mitigation actions for each hazard identified.
- Clearly identify potential funding sources for mitigation actions.

Throughout the plan update, the regional partners were responsible for the following:

- Conducting public outreach, including to socially vulnerable populations.
- Attending meetings on the plan update.
- Completing local input forms on existing information, stakeholders' contact information, the risk assessment, capability assessment, and mitigation strategy.
- Refining the goals and objectives of the 2020 RHMP.
- Completing a self-evaluation of their capabilities and opportunities to expand or improve upon them.
- Updating the status of all mitigation actions identified in the 2020 RHMP.
- Approving new mitigation actions for this plan update.
- Determining how the plan will be maintained in the future.
- Committing to adopting the plan once it achieves Approvable-Pending-Adoption status from FEMA.

A consultant, IEM International, Inc. (IEM), was brought on to help facilitate meetings, develop public outreach materials, and draft the plan update. Furthermore, to update the current RHMP, IEM helped develop a planning process based on the various guidance documents and regulations, including the new FEMA Local Mitigation Planning Policy Guide, Emergency Management Accreditation Program (EMAP) standards, and FEMA's Local Mitigation Planning Handbook.

Planning Area

The Washoe County RHMP accounts for all areas in Washoe County, Nevada, hereby known as "the planning area."

Data Collection and Incorporation of Existing Plans

An important objective of the plan update was to gather and incorporate the best available data into the hazard mitigation plan update. The regional partners and stakeholders were asked to provide plans, studies, or other data sources that they considered important to include in the draft plan update. This data was used to develop the maps in the RHMP, update the hazard profiles, describe mitigation success stories, and explain plan participants' capabilities. Sources included items such as:

- The State of Nevada Enhanced Hazard Mitigation Plan (2023)
- Washoe County Avalanche Analysis Report (2023)
- Nevada Drought Status Report (2022, 2023)
- Washoe County Geographic Information System (GIS) data
- 2023 Nevada Governors Status of Energy Report
- 2020 Regional Hazardous Materials Emergency Response Plan
- TRFMA website – plans, project summaries, and proposed map revisions
- National Inventory of Dams

Additional sources are cited in their respective hazard profiles.

Coordination with Other Planning Efforts

Washoe County recognizes that disasters do not stay within jurisdictional boundaries, and as a result has made it a practice to plan at the regional level for all emergency management activities. The RHMP builds on long-standing regional partnerships between the County, the cities of Reno and Sparks, the Pyramid Lake Paiute Tribe, and the Reno-Sparks Indian Colony (RSIC) and on previous regional plans, including the following:

- Washoe County Regional Emergency Operations Plan
- Washoe County Community Wildfire Protection Plan (CWPP)
- Washoe County Regional Family Risk Assessment Protocol (FRAP):

- Truckee River Flood Management Authority Flood Protection Plan
- Washoe County Master Plan

Mitigation Planning Team

The County began preparing for the update of the HMP by completing an application for grant funding and hiring IEM to support the plan update process in 2024. The County's Emergency Management Administrator and Program Coordinator – Mitigation convened the Mitigation Planning Team (MPT) and coordinated with the regional partners, including the plan participants, throughout the plan update process. IEM was responsible for facilitating meetings, conducting data analysis, and drafting the final draft plan.

The MPT was convened at the start of the project to facilitate department and community member input into the HMP update. The MPT aided in the revision of mitigation goals and objectives, determination of risks and vulnerabilities, identification of mitigation strategies, refinement of mitigation review criteria, and prioritization and implementation of mitigation strategies. This planning process focused on improving intergovernmental coordination to ensure that the resulting document met the needs of all participating community departments.

MPT Members

The MPT was led and organized by the County's Emergency Manager. Table 1 lists the members of the MPT, who were invited to participate in the plan update by attending meetings, filling out plan update forms, providing data, and reviewing the draft plan.

Table 1: Participants of Mitigation Planning Team Meetings

Name	Title	Agency/Jurisdiction
Kelly Echeverria	Emergency Management Administrator	Washoe County Emergency Management (WCEM)
Andrew Ancho	Division Chief, City Emergency Manager	RFD
Rob Bidart	Senior Civil Engineer	City of Sparks Planning and Zoning Department
Sabrina Brasuell	Mitigation Program Coordinator	WCEM
Francisco Ceballos	Program Coordinator	WCEM
Eric Crump	Division Director of Operations	Washoe County Community Services Department
Hal Dawson	Associate Engineer, Emergency Manager	Nevada Department of Transportation

Name	Title	Agency/Jurisdiction
Michael Drinkwater	Community Services	City of Sparks
Andrea Esp	Public Health Emergency Response Coordinator	Northern Nevada Public Health
John Flansberg	Regional Infrastructure Administrator	City of Reno
Kayla Garcia	Management Analyst	City of Reno
Chad Giesinger	Planning Manager	Washoe County Planning and Building
Raquel DePuy Grafton	Program Coordinator – Public Health Preparedness Program	Northern Nevada Public Health – Washoe County
Kris Haines	Integration Lead	FEMA/DHS
Danielle Henderson	Natural Resources Manager	Truckee River Flood Management Authority
Trenton Johnson	Detective Sergeant	City of Reno – Reno Police Department
Cameron Kramer	Assistant Emergency Manager	Reno-Sparks Indian Colony
Bear Lewis	Northern Nevada Disaster Program Manager	American Red Cross
Jessica Adams Lopes	Homeland Security Program Coordinator	WCEM
Trina Magoon	Director of Utility Services	City of Reno Utility Services
Jordyn Marchi	Public Health Emergency Response Coordinator	Northern Nevada Public Health NNPH
Scott Means	Division Chief Emergency Management	City of Sparks Fire Department
Craig Petersen	Air Quality Supervisor	Northern Nevada Public Health, Air Quality Management
John Rees	Technology Services Dpt.	Washoe County Regional Communication System (WCRCS)
Aaron Reyes	Emergency Management Coordinator	Truckee Meadows Water Authority
Lt. Joseph Rodriguez	Assistant State Fire Marshall	Nevada State Fire Marshall DPS
Ciera Sampson	Emergency Services Manager	Reno-Sparks Indian Colony (RSIC)

Name	Title	Agency/Jurisdiction
Stephen Shipman	Response Coordinator	Northern Nevada Public Health – Washoe County
Dwayne Smith	Engineering & Capital Projects Division Director	Washoe County Community Services Division
Ryan Sommers	Fire Chief	North Lake Tahoe Fire Protection District
Candace Stowell	Planning & Community Development	Reno-Sparks Indian Colony
Brian Taylor	Emergency Manager	Regional Emergency Medical Services Authority (REMSA)
Daniel Thayer	Hungry Valley fire Chief	Reno-Sparks Indian Colony
Janelle Thomas	Senior Licensed Engineering	Washoe County Community Services Department
Travis Truhill	Director of Maintenance Operations	City of Reno
Walt White	Fire Chief	Sparks Fire Department
Khalil Wilson	Associate Civil Engineer	City of Reno – Public Works
Jeanne Bunting	Hazard Mitigation Specialist – Project Manager	IEM
Casey Garnett	Hazard Mitigation Specialist – Lead Planner	IEM
Myrna Chase	Hazard Mitigation Planner	IEM
Kate Smith	Hazard Mitigation Planner – GIS	IEM
Chris Smith	Director of Individual Assistance and Disaster Housing	IEM

MPT Meetings

The needs of the RHMP were discussed, and key deliverables were reviewed at the MPT's formal meetings. The MPT held a series of three group meetings during the project, where representatives from key departments and other stakeholders could provide knowledge and insights regarding hazard risks and local capabilities, engage with the contractors, and collaboratively work on the plan's content. In addition, representatives of each of the plan participants were invited to participate in weekly status update meetings. These meetings provided the opportunity to discuss questions, timelines, and needs for the plan update.

The MPT meetings served as the primary data-gathering mechanism for the planning process, and the importance of these meetings cannot be overstated. While contract support to develop

the plan was provided by IEM, community members and government employees in the MPT were actively engaged and supported every step of the planning process. This includes data collection, determination of goals and objectives, articulation of specific hazards and risks, and development of a comprehensive mitigation strategy. Table 2 is the schedule of planning team meetings.

Table 2: Mitigation Planning Team Meeting Schedule

MPT Meeting	Date	Description
Kickoff Meeting	3/14/2024	The MPT met to discuss the objective of the hazard mitigation plan update, the hazard mitigation planning process, the public and stakeholder outreach, and changes in priorities. Opportunities for engagement were discussed. The MPT reviewed the hazards included in the last plan and decided to retain them all but not add any hazards. The MPT was introduced to its online SharePoint electronic planning database for this plan update.
Risk Assessment Meeting	4/24/2024	The MPT was presented with a status update, including discussion of the ongoing public and stakeholder outreach. The MPT were presented with information on its hazards, including the updated hazard analysis, and members discussed their experience with the hazard events. The MPT prioritized each hazard for each regional partner.
Mitigation Strategy Meeting	5/15/2024	The MPT were given information on their updated risk assessment and capability assessment and a summary of the ongoing public and stakeholder outreach. The MPT reviewed the hazard mitigation goals from the prior plan and decided to amend the language of a few goals and objectives to emphasize the wider needs and time frame involved. A comprehensive range of mitigation actions were introduced, and the MPT discussed the status of current actions.
Mitigation Prioritization Meeting		The MPT convened to review and prioritize the proposed mitigation actions and to discuss mitigation grant funding available. The MPT also approved the strategy for plan maintenance, evaluation, and update.
Plan Review Meeting		The consultants presented the draft plan to the MPT. The draft plan review process was discussed, and the MPT committed to soliciting feedback on the draft plan.

Table 3 lists the people who attended MPT meetings.

Table 3: Participants of Mitigation Planning Team Meetings

Name	Title	Agency/Jurisdiction
Kelly Echeverria	Emergency Management Administrator	Washoe County Emergency Management (WCEM)
Andrew Ancho	Division Chief, City Emergency Manager	Reno Fire Department
Rob Bidart	Senior Civil Engineer	City of Sparks Planning and Zoning Department
Sabrina Brasuell	Mitigation Program Coordinator	WCEM
Francisco Ceballos	Program Coordinator	WCEM
Eric Crump	Division Director of Operations	Washoe County Community Services Department
Hal Dawson	Associate Engineer, Emergency Manager	Nevada Department of Transportation
Michael Drinkwater	Community Services	City of Sparks
Andrea Esp	Public Health Emergency Response Coordinator	Northern Nevada Public Health
John Flansberg	Regional Infrastructure Administrator	City of Reno
Kayla Garcia	Management Analyst	City of Reno
Chad Giesinger	Planning Manager	Washoe County Planning and Building
Raquel DePuy Grafton	Program Coordinator – Public Health Preparedness Program	Northern Nevada Public Health – Washoe County
Kris Haines	Integration Lead	FEMA/DHS
Danielle Henderson	Natural Resources Manager	Truckee River Flood Management Authority
Trenton Johnson	Detective Sergeant	City of Reno – Reno Police Department
Cameron Kramer	Assistant Emergency Manager	Reno-Sparks Indian Colony
Bear Lewis	Northern Nevada Disaster Program Manager	American Red Cross
Jessica Adams Lopes	Homeland Security Program Coordinator	WCEM
Trina Magoon	Director of Utility Services	City of Reno Utility Services

Name	Title	Agency/Jurisdiction
Jordyn Marchi	Public Health Emergency Response Coordinator	Northern Nevada Public Health (NNPH)
Scott Means	Division Chief Emergency Management	City of Sparks Fire Department
Craig Petersen	Air Quality Supervisor	Northern Nevada Public Health, Air Quality Management
John Rees	Technology Services Dpt.	Washoe County Regional Communication System (WCRCS)
Aaron Reyes	Emergency Management Coordinator	Truckee Meadows Water Authority
Lt. Joseph Rodriguez	Assistant State Fire Marshall	Nevada State Fire Marshall DPS
Ciera Sampson	Emergency Services Manager	Reno-Sparks Indian Colony (RSIC)
Stephen Shipman	Response Coordinator	Northern Nevada Public Health – Washoe County
Dwayne Smith	Engineering & Capital Projects Division Director	Washoe County Community Services Division
Ryan Sommers	Fire Chief	North Lake Tahoe Fire Protection District
Candace Stowell	Planning & Community Development	Reno-Sparks Indian Colony
Brian Taylor	Emergency Manager	Regional Emergency Medical Services Authority (REMSA)
Daniel Thayer	Hungry Valley fire Chief	Reno-Sparks Indian Colony
Janelle Thomas	Senior Licensed Engineering	Washoe County Community Services Department
Travis Truhill	Director of Maintenance Operations	City of Reno
Walt White	Fire Chief	Sparks Fire Department
Khalil Wilson	Associate Civil Engineer	City of Reno – Public Works
Jeanne Bunting	Hazard Mitigation Specialist – Project Manager	IEM
Casey Garnett	Hazard Mitigation Specialist – Lead Planner	IEM
Myrna Chase	Hazard Mitigation Planner	IEM

Name	Title	Agency/Jurisdiction
Kate Smith	Hazard Mitigation Planner – GIS	IEM
Chris Smith	Director of Individual Assistance and Disaster Housing	IEM

As of May 7, 2024, weekly meetings were held with plan participants and continued until the plan's submission. Representatives from the Division of Emergency Management (DEM) attended these sessions, and private meetings were also conducted with the Pyramid Lake Paiute Tribe (PLPT).

Besides the MPT meetings, the MPT was engaged through follow-up emails and requests to provide additional information pertaining to internal capabilities, jurisdiction-specific risks, and mitigation strategy development.

Each plan participant also coordinated its own community or organization to involve subject matter experts in the plan update process. By engaging the people and departments responsible for responding to disaster events and implementing mitigation actions, it is hoped that this mitigation plan reflects the local needs and expectations of the plan participants.

Inclusive Outreach and Engagement

A critical component of the RHMP update effort is a robust stakeholder engagement process that provides "an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval" (44 CFR §201.6). Providing an opportunity for public comment on the draft plan is one way to engage with the public regarding hazard concerns. However, the MPT also wanted to ensure that the public had a meaningful way to participate in the process, as outlined in the following sections.

Stakeholder Engagement

MEETINGS

Table 4 lists the stakeholders who were invited to participate in the MPT, including attending meetings; providing feedback, such as suggestions for data, studies, and other information to incorporate into the plan; and completing the plan review.

Table 4: Stakeholders in the Planning Process

Stakeholder	Type of Stakeholder
Truckee Meadows Water Authority	Local and regional agencies involved in hazard mitigation activities

Stakeholder	Type of Stakeholder
NV Energy	Representatives of businesses, academia, and other private organizations
Reno Tahoe Airport Authority	Representatives of businesses, academia, and other private organizations
State of Nevada – State Fire Marshal	Agencies that have the authority to regulate development
Nevada Dept of Transportation	Local and regional agencies involved in hazard mitigation activities
Northern Nevada Public Health	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
REMSA	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Renown Health	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Northern Nevada Medical System	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Saint Mary's Regional Medical Center	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Reno–Sparks Convention and Visitors Authority (RSCVA)	Representatives of businesses, academia, and other private organizations
FEMA	Local and regional agencies involved in hazard mitigation activities
US Army Corp of Engineers	Local and regional agencies involved in hazard mitigation activities
American Red Cross	Local and regional agencies involved in hazard mitigation activities

Stakeholder	Type of Stakeholder
Liberty Dialysis	Representatives of healthcare organizations, providing comprehensive kidney care services, including in-center hemodialysis, to the Washoe County community.
DaVita – Reno Main	Representatives of healthcare organizations, providing comprehensive kidney care services, including in-center hemodialysis, to the Washoe County community.
DaVita – Sierra Rose & Sparks	Representatives of healthcare organizations, providing comprehensive kidney care services, including in-center hemodialysis, to the Washoe County community.
DaVita – South Meadows	Representatives of healthcare organizations, providing comprehensive kidney care services, including in-center hemodialysis, to the Washoe County community.
Washoe County School District	Local and regional agencies involved in hazard mitigation activities
Truckee River Flood Management Authority	Local and regional agencies involved in hazard mitigation activities
University of Nevada, Reno	Representatives of businesses, academia, and other private organizations
DEM	Local and regional agencies involved in hazard mitigation activities

In addition, the IEM planning team met with the Nevada Department of Transportation on April 29, 2024, to discuss avalanche risk and its avalanche mitigation measures.

Furthermore, multiple stakeholders actively participated in the public outreach process, including hosting a booth at the public meeting and presenting on their areas of subject matter expertise, as in the public engagement section.

The Washoe County Regional Hazard Mitigation Plan details the collaborative efforts between local government, dam owners, and key regulatory agencies to ensure dam safety and risk mitigation. The county actively engages with the Nevada Division of Water Resources (NDWR) and the United States Army Corps of Engineers (USACE) to incorporate dam safety measures into hazard mitigation strategies. Through stakeholder meetings, data-sharing initiatives, and coordinated planning efforts, Washoe County integrates dam-related hazard assessments and risk reduction strategies into the overall mitigation framework.

The plan also incorporates critical information provided by the NDWR and USACE. These contributions ensure that the HMP reflects the most up-to-date data on dam infrastructure, potential flood risks, and emergency response coordination. By leveraging state and federal expertise, Washoe County enhances its capacity to mitigate dam-related hazards and strengthen community resilience.

DIGITAL SURVEY

Besides being invited to participate in the plan update on the MPT, a wide range of stakeholders were invited to complete a digital survey specifically designed for the regional partners. Each regional partner was asked to identify its stakeholders. Stakeholder surveys were shared by email. Table 5 lists those additional stakeholders.

Table 5: Stakeholders in Addition to Those in the Mitigation Planning Team

Stakeholder	Type of Stakeholder
REMSA	Representatives of nonprofit organizations, including community-based organizations
Renown Health	Representatives of nonprofit organizations, including community-based organizations
Saint Mary's Regional Medical Center	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Northern Nevada Medical System	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Northern Nevada Sierra Medical Center	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Veteran's Administration Hospital	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Reno–Sparks Convention and Visitors Authority (RSCVA)	Representatives of businesses, academia, and other private organizations
US Army Corp of Engineers	Local and regional agencies involved in hazard mitigation activities
Fresenius Medical Care	Representatives of nonprofit organizations, including community-based organizations, which work directly

Stakeholder	Type of Stakeholder
	with and/or provide support to underserved communities and socially vulnerable populations
Pyramid Lake Housing Authority	Representatives of nonprofit organizations, including community-based organizations
Pyramid Lake Paiute Tribe Food Distribution Program	Representatives of nonprofit organizations, including community-based organizations
City of Reno Senior Citizen Advisory Committee	Representatives of nonprofit organizations, including community-based organizations
Nevada Division of Public and Behavioral Health	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Northern Nevada State Veterans Home	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Washoe County Human Services Agency Senior Services Division	Representatives of nonprofit organizations, including community-based organizations
Regional Transportation Commission – Paratransit	Local and regional agencies involved in hazard mitigation activities
University of Nevada, Reno – Natural Resources and Environmental Science	Representatives of businesses, academia, and other private organizations
University of Nevada – Global Water Center	Representatives of businesses, academia, and other private organizations
Carson City, NV	Neighboring communities
Storey County, NV	Neighboring communities
Lyon County, NV	Neighboring communities
Churchill County, NV	Neighboring communities
Pershing County, NV	Neighboring communities
Humbolt County, NV	Neighboring communities
Placer County, CA	Neighboring communities
Nevada County, CA	Neighboring communities
Sierra County, CA	Neighboring communities
Lassen County, CA	Neighboring communities
Modoc County, CA	Neighboring communities

Stakeholder	Type of Stakeholder
Nevada Care Connection	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Care Chest	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Reno Housing Authority	Representatives of nonprofit organizations, including community-based organizations
Assistance League Reno–Sparks	Representatives of nonprofit organizations, including community-based organizations
Food Bank of Northern Nevada	Representatives of nonprofit organizations, including community-based organizations
Catholic Charities of Northern Nevada Food Pantry	Representatives of nonprofit organizations, including community-based organizations
Safe Embrace	Representatives of nonprofit organizations, including community-based organizations
Domestic Violence Resource Center	Representatives of nonprofit organizations, including community-based organizations
Peppermill Reno	Representatives of businesses, academia, and other private organizations
Nugget Casino Resort	Representatives of businesses, academia, and other private organizations
Grand Sierra Resort and Casino	Representatives of businesses, academia, and other private organizations
Eldorado Resort Casino	Representatives of businesses, academia, and other private organizations
IGT	Representatives of businesses, academia, and other private organizations
U-Haul Holding Company	Representatives of businesses, academia, and other private organizations
Circus Circus Reno	Representatives of businesses, academia, and other private organizations
Legacy Supply Chain Svc	Representatives of businesses, academia, and other private organizations
VA Sierra Nevada Health Care	Representatives of nonprofit organizations, including community-based organizations, which work directly

Stakeholder	Type of Stakeholder
	with and/or provide support to underserved communities and socially vulnerable populations
Club Cal Neva	Representatives of businesses, academia, and other private organizations
Hamilton Company	Representatives of businesses, academia, and other private organizations
JC Penney Logistics Center	Representatives of businesses, academia, and other private organizations
Incline Village Community Hospital	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Nevada Voluntary Organizations Active in Disaster	Local and regional agencies involved in hazard mitigation activities
Access to Healthcare	Representatives of nonprofit organizations, including community-based organizations
Seniors – City of Reno	Representatives of nonprofit organizations, including community-based organizations
Reno–Sparks Gospel Mission Inc	Representatives of nonprofit organizations, including community-based organizations
Reno Food Systems	Representatives of nonprofit organizations, including community-based organizations
Volunteers of America – Northern California & Northern Nevada Reno Works	Representatives of nonprofit organizations, including community-based organizations
Veterans Guest House	Representatives of nonprofit organizations, including community-based organizations
Nevada Rural Housing	Representatives of nonprofit organizations, including community-based organizations
Rebuilding Together Northern Nevada	Representatives of nonprofit organizations, including community-based organizations
Community Foundation of Northern Nevada	Representatives of nonprofit organizations, including community-based organizations
Seniors in Service Nevada	Representatives of nonprofit organizations, including community-based organizations
I-80 RV Park	Representatives of businesses, academia, and other private organizations

Stakeholder	Type of Stakeholder
Truckee Meadows Community College – Emergency Management	Representatives of businesses, academia, and other private organizations
Truckee Meadows Community College – EPIC (Educational Programs Inspiring the Community)	Representatives of businesses, academia, and other private organizations
AARP Nevada	Representatives of nonprofit organizations, including community-based organizations
Community Services Agency Reno	Representatives of nonprofit organizations, including community-based organizations
The Children's Cabinet	Representatives of nonprofit organizations, including community-based organizations
Central Truckee Meadows Remediation District Program	Representatives of nonprofit organizations, including community-based organizations
Nevada Division of Environmental Protection – Bureau of Safe Drinking Water	Agencies that have the authority to regulate development
Nevada Division of Environmental Protection – Bureau of Air Quality Planning	Agencies that have the authority to regulate development
Nevada Division of Environmental Protection – Bureau of Corrective Actions	Agencies that have the authority to regulate development
Boys and Girls Club of Truckee Meadows	Representatives of nonprofit organizations, including community-based organizations
Child Care Development Fund	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Downtown Reno Partnership	Representatives of businesses, academia, and other private organizations
Friends of Nevada Wilderness	Representatives of nonprofit organizations, including community-based organizations
Inter-Tribal Council of Nevada	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Nevada Small Business Development Center	Representatives of businesses, academia, and other private organizations

Stakeholder	Type of Stakeholder
Reno + Sparks Chamber of Commerce	Representatives of businesses, academia, and other private organizations
Washoe Valley Alliance	Representatives of businesses, academia, and other private organizations
Truckee Meadows Stormwater Permit Coordinating Committee	Agencies that have the authority to regulate development
One Truckee River	Local and regional agencies involved in hazard mitigation activities
Nevada Historical Society	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Historic Reno Preservation Society	Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or provide support to underserved communities and socially vulnerable populations
Nevada State Parks	Local and regional agencies involved in hazard mitigation activities
Washoe Valley Alliance	Representatives of businesses, academia, and other private organizations
Nevada Division of Forestry	Local and regional agencies involved in hazard mitigation activities
Nevada Division of Forestry – Western Region Office	Local and regional agencies involved in hazard mitigation activities
Nevada Department of Transportation	Local and regional agencies involved in hazard mitigation activities
Bureau of Reclamation	Local and regional agencies involved in hazard mitigation activities
US Forest Service	Local and regional agencies involved in hazard mitigation activities
Nevada Division of Water Resources	Local and regional agencies involved in hazard mitigation activities
Desert Research Institute	Representatives of businesses, academia, and other private organizations

PLAN REVIEW

Stakeholders were also invited to participate in the plan by reviewing and providing feedback on the draft plan during the plan update process.

SUMMARY

The stakeholder's feedback was incorporated into the draft plan by integrating it into the risk assessment, including a map based on Nevada Department of Transportation data. In addition, stakeholder feedback was shared at MPT meetings, and the MPT was encouraged to select mitigation actions that reflected the stakeholders' suggestions.

Public Engagement

PUBLIC MEETINGS

Nine in-person public meetings were held during the plan update process. The location and time of the Hazard Mitigation Plan Update – Community Meeting were selected to ensure the greatest accessibility to the public, including vulnerable populations. The meeting was held in Reno, near public transportation, on a Saturday from 10:00am to 12:00pm. The meeting took place in an area designated as disadvantaged by the Climate and Economic Justice Screening Tool (CEJST). The meeting opportunity was publicized broadly through social media, local news outlets, and the County website. Figure 3 presents information about public participation.

The MPT embraced an open-house meeting concept that allowed the public to learn about the different hazards that the planning area faces, and it provided opportunities to complete the survey in English or Spanish. In addition to tables dedicated to each hazard, different stakeholders and community officials also helped present on the hazard mitigation plan and hazards, including the following presentations:

- Hazard Mitigation Planning – IEM Lead Planner Casey Garnett
- Avalanche and Landslide – Sierra Avalanche Center Executive Director David Reichel
- Criminal Acts and Terrorism – Washoe County Sherriff's Office Northern Nevada Regional Intelligence Center Lt. Ransford "Randy" Vawters
- Drought – National Weather Service Meteorologist Chris Johnston
- Earthquake – University of Nevada, Reno Seismology Lab Network Manager William H. Savran

Approximately 20 staff members, four volunteers, and four members of the public attended the meeting. One question from the public concerned whether any consideration had been given to burying power lines that might cause wildfires around the County. NV Energy noted that that

was under consideration, and they were evaluating whether to bury over 321 miles of cables in the state. However, with the cost as high as $4–5 million per mile, it would take significant additional funding to do this for all lines.

While the public turnout was low on the day of the event, the event was subsequently shared on the Washoe County website, where the public was encouraged to watch the recording and provide their feedback on the hazard mitigation plan.

- Energy Emergency – NV Energy Senior Emergency Management Administrator Timothy Hill
- Flooding (including closed-basin flooding) – Truckee River Flood Management Authority Natural Resource Manager Danielle Henderson
- Hazardous Materials Incident – Reno Fire Department Battalion Chief Patocka
- Infectious Disease – Northern Nevada Public Health Epidemiology Program Manager, Heather Kerwin (pre-recorded)
- Radiological Waste Transport – Division of Emergency Management Radiological Equipment Coordinator Brent Harper and Nevada Highway Patrol Lt. Cornmesser
- Extreme weather – National Weather Service Meteorologist Chris Johnston
- Transportation Incident – Washoe County Emergency Management Administrator Kelly Echeverria
- Volcano – USGS California Volcano Observatory Scientist-in-Charge, Dr. Andrew Todd Calvert



Figure 3: Photos from the Public Meeting

- Wildland Fire – Reno Fire Department Fire Marshal John Beck

The plan update process also was discussed, and the public was invited to participate in the plan at Citizen Advisory Board (CAB) meetings in the planning area. These hybrid meetings were held both in person and online through Zoom. The meetings were public and regularly scheduled, with the aim of bringing community members together to discuss the key issues and interests of their neighborhoods. One meeting was held at 6:00pm, at the Gerlach Community Center in a rural community in unincorporated Washoe County with an estimated population of 130, to allow access to residents in a hybrid format. Additional (CAB) meetings were held in:

- Reno Fire Department – Station 11
- North Valleys Regional Park – Community Building
- McKinley Arts and Culture Center – Board Room
- Reno-Sparks Indian Colony – Community Meeting
- Sun Valley – Citizen Advisory Board
- South Truckee Meadows/Washoe Valley – Citizen Advisory Board
- Spanish Springs – Spanish Springs Library
- Incline Village/Crystal Bay – Incline Village Library

Presentations on hazard mitigation were delivered at public RSIC and Pyramid Lake Paiute Tribe Tribal Council meetings, attended by over 50 people. Participants were informed about the plan update, including the hazards, and encouraged to participate by completing the survey, available both digitally and in hard copy at the public meetings.

During the Hazard Mitigation Plan Update Community Meeting, the Wildland Urban Interface Coordinator for the Truckee Meadows Fire Protection District (TMFPD) announced to the attendees the upcoming CAB meeting for Incline Village on June 24, where he would be presenting. The Washoe County Program Coordinator for Mitigation provided dual language survey signs for display and requested that the update and survey be mentioned to encourage participation.

On June 5, 2024, the Program Coordinator for Mitigation at the Office of the County Manager's Emergency Management requested an update on the Hazard Mitigation Plan efforts from the Public Education/Information Officer. The update included social media outreach on May 7 and June 5, 2024, and emails to community partner distribution groups on May 3 and June 5, 2024.

The Program Coordinator for Mitigation at the Office of the County Manager's Emergency Management and her department attended meetings to discuss wildfire preparedness and the extension of the survey period to accommodate Tribal partners.
Dual language survey signs were provided to meeting participants, and hard copies of the survey were presented at the Sun Valley CAB Meeting. The Washoe County Community Outreach Coordinator received two hard copies of the survey feedback from the Sun Valley CAB meeting held on the weekend of June 8, 2024. CAB meeting agendas and minutes for June were available from the meetings at Sun Valley and South Truckee Meadows/Washoe Valley Citizen Advisory Board.
WCEM also participated in a sharing opportunity during the Nevada Wildlife Federation Wildfire Event on June 20, 2024. The Program Coordinator spoke briefly and directed attendees to the Washoe County Hazard Mitigation Plan Survey. The event, which included a Pint Night and Trivia at Craft, was covered by two news channels.

DIGITAL SURVEY

An online survey was developed to learn more about the public's initial concerns prior to plan development. The initial online survey was distributed through social media (e.g., Facebook, Next Door) and in-person flyers and hard copies. Over the course of two months, over 647 individuals responded to the survey and provided feedback. See Appendix A for a summary of the survey results. These results were shared with the MPT at each meeting and over the dedicated SharePoint site for this plan update.

PLAN REVIEW

Community members were provided with the draft RHMP to review for one month, beginning in November and informed about the availability of the plan through a press release and announcements and Monday Minutes Survey on the County's social media accounts, including Twitter and Facebook. Additionally, information on the plan update was available through an online StoryMap for public comment beginning in December. Stakeholders were also invited to review the draft RHMP and provide comments. Comments received during this plan review are summarized in the following sections.

SUMMARY

The public's feedback was incorporated into the draft plan by integrating key takeaways into the risk assessment. Some takeaways, such as concerns about hazards not addressed in this plan update (like traffic accidents and sidewalk repair), were not integrated into this plan. Furthermore, the public outreach results were shared with the plan participants at each meeting. Plan participants were encouraged to select mitigation actions which would address the public's concerns.

Plan Update Methodology

The updated RHMP serves as the written record of the comprehensive hazard mitigation planning process. In addition, the RHMP reflects the region's current needs and hazard concerns. The initial development of the RHMP update occurred over a five-month period from February 2024 through July 2024. The plan was developed through a series of seven steps, as detailed in Table 6, many of which occurred concurrently. Table 6 also illustrates the corresponding FEMA local mitigation planning task for each RHMP development milestone. The requisite state and FEMA review periods occurred during the draft and final RHMP steps.

Table 6: Washoe County RHMP Update Milestones and Timeline

Washoe RHMP Update Development Milestones	Corresponding FEMA Recommended Mitigation Planning Task	Timeline	Updates Made
Organize the Planning Process	Task 1 – Determine the Planning Area and Resources Task 2 – Build the Planning Team Task 3 – Create an Outreach Strategy	March–May 2024	The Planning Process section, along with the Introduction and Community Profile, were updated to reflect current participants, including stakeholder and public outreach.
Hazard Identification and Risk Assessment	Task 5 – Conduct a Risk Assessment	March–May 2024	The risk assessment was updated to accommodate additional information requested in the new FEMA Local Mitigation Planning Policy Guide. A new format was developed, expanding upon prior content. Public input was given a greater emphasis. Additional data was added, particularly to hazards like avalanches.
Capability Assessment	Task 4 – Review Community Capabilities	May 2024	Each participant reviewed and updated their current mitigation capabilities.

Washoe RHMP Update Development Milestones	Corresponding FEMA Recommended Mitigation Planning Task	Timeline	Updates Made
			There was additional emphasis on identifying opportunities to expand and improve upon current capabilities. Additionally, further information on NFIP capabilities was added.
Mitigation Strategy	Task 6 – Develop a Mitigation Strategy	May-June 2024	Goals were evaluated and changes were made. Plan participants reviewed and amended mitigation action statuses and new mitigation actions. Actions were then reprioritized using the STAPLEE* criteria.
Plan Maintenance	Task 7 – Keep the Plan Current	June 2024	The plan maintenance section of the previous plan was reviewed and updated to reflect new positions and capabilities.
Plan Adoption and Approval	Task 8 – Review and Adopt the Plan	Upon FEMA APA	The plan must pass public, state, and FEMA review. All required edits will be addressed during this time. Once the plan reaches the "Approvable-Pending-Adoption" status, each plan participant will adopt it.

*STAPLEE = Social, Technical, Administrative, Political, Legal, Economic, and Environmental

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COMMUNITY PROFILE



Community Profile

Governance

Washoe County was created in 1861 as one of the original nine counties of the Nevada Territory. It was named after the Washoe people who originally inhabited the area. It was consolidated with Roop County in 1864. Washoe City was the first county seat in 1861 and was replaced by Reno in 1871. Washoe County's key officials and departments are listed below.

Washoe County – Key Elected Officials

- County Commissioners (five)
- County Assessor
- County Clerk
- County Recorder
- County Sheriff
- County Treasurer
- District Attorney
- Incline Village Constable
- Public Administrator

Washoe County Departments

- 311 – Informational Call Center
- Adult Services
  - Crossroads
  - Sober 24
- Alternative Sentencing
- Animal Services
- Assessor's Office
- Board of County Commissioners
- Budget Division
- Building
- Children's Services
- Clerk's Office
- Code Enforcement
- Communications and Media
- Community Services Department
- Comptroller's Office
- District Attorney's Office
- District Court
- Emergency Management
- Engineering and Capital Projects

- Finance
- Geographic Information Systems (GIS)
- Northern Nevada Public Health
- Housing and Homeless Services
- Human Resources
- Human Services Agency
- Incline Village Justice Court
- Juvenile Services
- Law Library
- Local Emergency Planning Committee
- Library System
- Medical Examiner
- Office of the County Manager
- Parks and Open Space
- Planning
- Public Administrator's Office
- Public Defender's Office
- Alternate Public Defender's Office
- Public Guardian's Office
- Purchasing Division
- Recorder's Office
- Registrar of Voters
- Reno Justice Court
- Roads Operations
- Senior Services
- Sheriff's Office
- Sparks Justice Court
- Technology Services
- Treasurer's Office
- Utility Services
- Wadsworth Justice Court

Washoe County Districts

Besides the five districts served by County Commissioners, the County also encompasses the following:

- **General Improvement Districts (GIDs):** Gerlach, Grandview, Incline Village, Palomino, Sun Valley, and Verdi TV District. GIDs are structured to provide the County with a tool to finance infrastructure and other projects.
- **Fire Protection Districts:** North Lake Tahoe and Truckee Meadows
- **Townships:** Gerlach-Wadsworth, Incline Village, Reno-Verdi, and Sparks
- **Wards**: Reno and Sparks

- **Northern Nevada Public Health:** The Health District in Washoe County

Incorporated Cities

- **Reno**: Incorporated in 1903, the "Biggest Little City in the World" is the County seat. The growing city measures 103 square miles and is home to 273,448 individuals. The city is in southern Washoe County on the eastern slope of the Sierra Nevada range in the Truckee Meadows basin.

- **Sparks**: Incorporated in 1905, the City of Sparks covers approximately 36 square miles east of the City of Reno and is home to a growing population, currently estimated at 109,226.

Geography

Washoe County is located along the eastern slopes of the Carson Range of the Sierra Nevada mountains in western Nevada. The name "Washoe" originates from the name of the aboriginal tribe that inhabited the strip of land extending along the base of the Sierra.

Population and Demographics

According to the 2020 U.S. Census, Washoe County's population was 486,492. The percentage of population growth from the 2010 Census (421,407) to 2020 was approximately 8.7%, resulting in an estimated population growth of 65,085 residents. The population per square mile increased from 66.9 in 2010 to 77 in 2020.

Most of the population growth occurred in the Reno–Sparks area and the southernmost region of the County, northwest of Carson City. Table 7 lists various characteristics of the population of Washoe County and of Nevada as a whole.[1]

Table 7: Washoe County Population

Populations by Age (2020)	Washoe County	State of Nevada
Persons under 5 years	5.2%	5.5%
Persons under 18 years	20.5%	21.7%
Persons 65 years and older	17.7%	16.9%
Female persons	49.1%	49.5%
White alone	83.4%	72.1%
Black or African American alone	3.0%	10.8%

[1] United States Census Bureau, "QuickFacts Nevada; Washoe County, Nevada." https://www.census.gov/quickfacts/fact/table/washoecountynevada/PST045223

Populations by Age (2020)	Washoe County	State of Nevada
American Indian, Alaskan Native	2.3%	1.7%
Asian alone	6.3%	9.4%
Native Hawaiian, other Pacific Islanders alone	0.8%	0.9%
Hispanic or Latino, any race	26.2%	30.3%

Washoe County and the Nevada State Demographer cooperatively prepare annual population estimates for Washoe County for July 1 of each year. From 2018 to 2022, an estimated 8.0% of Washoe's County population under the age of 65 years was disabled, and 12.0% of the County population under age 65 did not have health insurance. Between 2018 and 2022, approximately 22.2% of persons aged five years or older spoke a language other than English at home. Almost 96% of households own a computer, and 89.4% have a broadband Internet subscription.[2]

The Truckee Meadows Regional Planning Agency (TMRPA) projects that the population in Washoe County will grow from 489,180 in 2022 to 587,479 in 2042. This translates to an average annual growth rate of 0.92%.[3]

Table 8 presents a breakdown of the population growth in Washoe County from the County Consensus Forecast for 2021–2042. As shown in the table, growth in the Cities of Reno and Sparks will outpace that in the unincorporated portions of the County. This growth is anticipated primarily because of in-migration—people who are moving to Washoe County.

Table 8: Washoe County Population Growth[4]

Jurisdiction	2021 Certified Estimates*	2042 Maximum Jurisdiction Forecast	Increase
Reno	264,318	329,330	25%
Sparks	107,489	132,271	23%
Unincorporated	113,306	130,793	15%
County Total	**485,113**	**592,394**	**22%**

[2] Unites States Census, "QuickFacts Washoe County, Nevada." https://www.census.gov/quickfacts/fact/table/washoecountynevada/PST045223

[3] Truckee Meadows Regional Planning Agency (TMRPA), "2024 Washoe County Consensus Forecast." https://www.tmrpa.org/washoe-county-consensus-forecast/

[4] Truckee Meadows Regional Planning Agency (TMRPA), "2022 Washoe County Consensus Forecast." ." https://tmrpa.app.box.com/v/WCCF-2022-Final-TMRPA (login required)

As the population grows over the next two decades, it is anticipated there will also be a shift in demographics because of the aging Baby Boomer population. Residents aged 65 and older will increase by 21%,[5] indicating a need for additional senior-friendly housing and services.

Figure 4 and Figure 5 show population density estimates for daytime and nighttime hours, respectively, based on population estimates from the 2022 American Community Survey conducted by the U. S. Census Bureau. Estimates were modeled at a resolution of 3 arc-seconds (approximately 90 meters) by Oak Ridge National Laboratory and accessed through their LandScan database.[6]

[5] Truckee Meadows Regional Planning Agency (TMRPA), "2022 Washoe County Consensus Forecast." https://tmrpa.app.box.com/v/WCCF-2022-Final-TMRPA (login required)
[6] Oak Ridge National Laboratory LandScan. https://www.ornl.gov/project/landscan

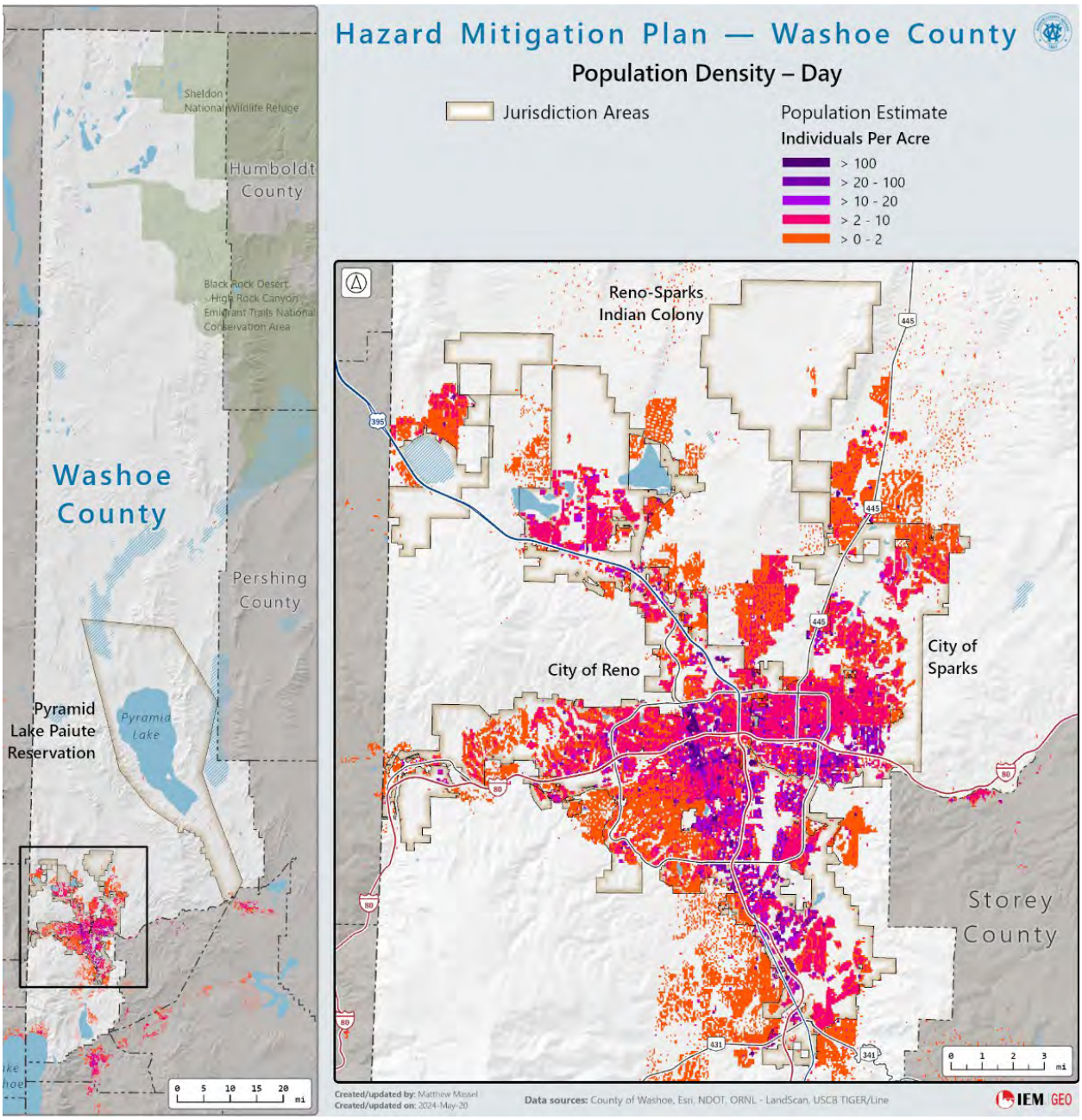


Figure 4: Washoe County Daytime Population Density

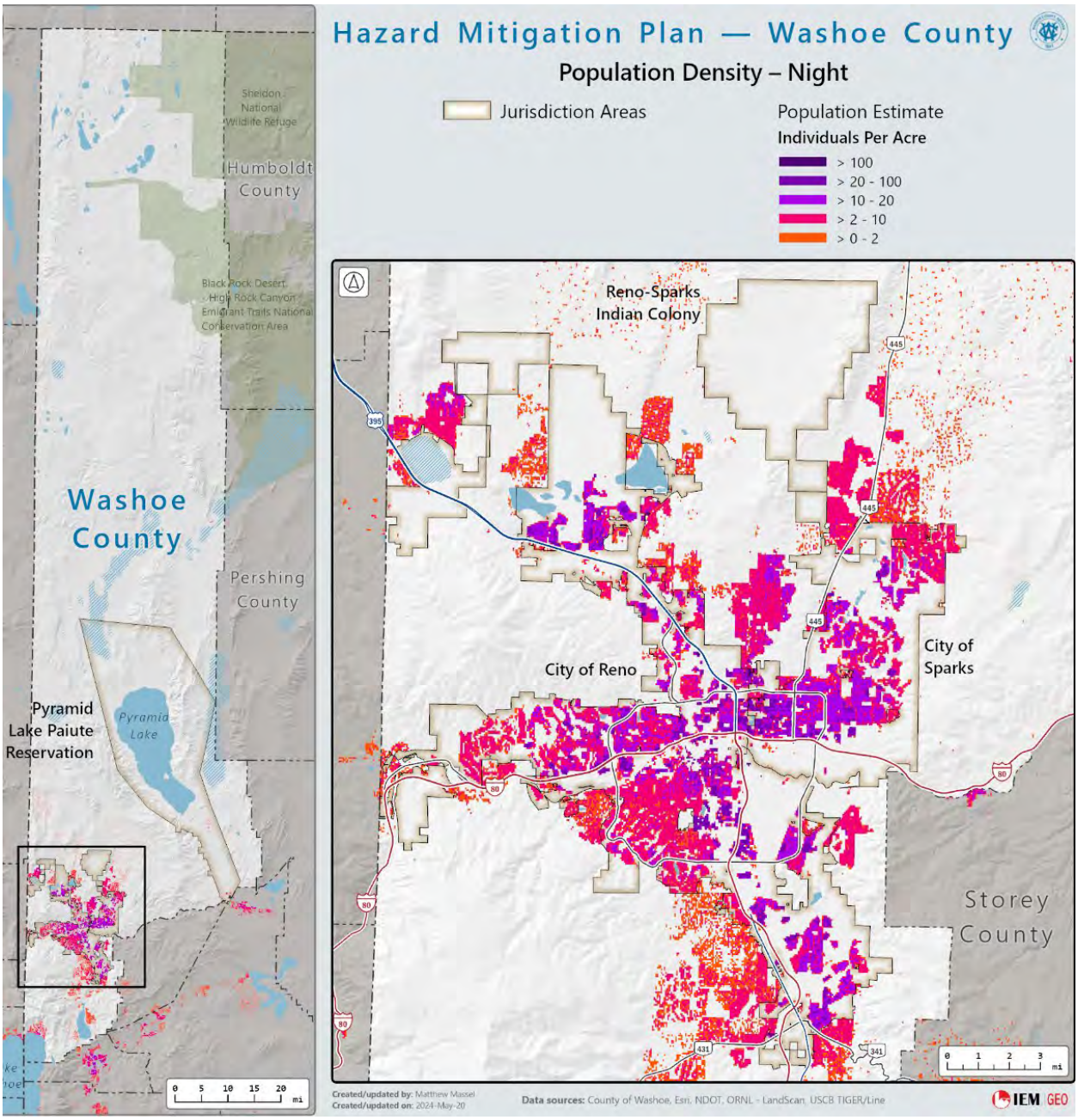


Figure 5: Washoe County Nighttime Population Density Map

Economy

Economic indicators show growth and an income increase from 2018 to 2022. Table 9 compares the economic characteristics of Washoe County in 2018–2022 with those in 2013–2017.[7] Per the U.S. Census, 66.0% of the population aged 16 years and older is in the labor force.

[7] Oak Ridge National Laboratory LandScan. https://www.ornl.gov/project/landscan

Table 9: Washoe County Economic Characteristics

Characteristic	2013–2017	2018–2022
Individuals below the poverty Level	13.3%	10.3%
Median Home Value	$268,100	$460,000
Median Household income	$58,595	$81,531
Per Capita Income	$31,879	$44,448

Education

From 2018 to 2022, 88.5% of people aged 25 or older had a high school diploma or higher, and 32.5% of that age group had a bachelor's degree or higher.

Job Growth

According to the Washoe County Consensus Forecast 2022–2042, employment for Washoe County is forecast to grow at an average of 1.05%, from 312,163 in 2022 to 379,528 in 2042.[8] Table 10 shows the current and projected Employment Composition Totals from 2022 to 2042.

Table 10: Projected Employment Composition Totals 2022–2024[9]

Industry Group	2022 Jobs	2042 Estimated Jobs	Percentage Growth, 2022–2024
Construction	21,115	24,189	15%
Finance, Insurance and Real Estate	39,715	57,125	13%
Government	29,948	34,549	
Manufacturing	15,776	18,755	19%
Natural Resources	1,532	1,854	21%
Retail Trade	29,814	32,893	
Services	143,253	181,859	27%
Transportation, Communication, and Public Utilities	24,622	30,425	24%
Wholesale Trade	11,058	10,960	-0.9%

[8] TMRPA, "2022 Washoe County Consensus Forecast." https://tmrpa.app.box.com/v/WCCF-2022-Final-TMRPA (login required)
[9] TMRPA, "2022 Washoe County Consensus Forecast." https://tmrpa.app.box.com/v/WCCF-2022-Final-TMRPA (login required)

Industry Group	2022 Jobs	2042 Estimated Jobs	Percentage Growth, 2022–2024
Totals	**316,833**	**392,609**	

Industry Outlook

The industries that employed the highest percentages of Washoe County's labor force in 2022 were Services (45.2%); Finance, Insurance, and Real Estate (12.5%); Government (9.5%); and Retail Trade (9.4%). These were followed by Natural Resources (0.5%); Manufacturing (5.0%); Wholesale Trade (3.5%); Transportation, Communications, and Public Utilities (7.8%); and Construction (6.7%). These trends remain largely stable in projections through 2042. The Finance, Insurance, and Real Estate sectors will see the largest increase in employment, with an increase of 2% from 2022 to 2042.[10]

The Services sector is expected to strengthen its dominance over the industry mix in Washoe County, with a forecasted increase of over 38,000 new jobs by the year 2042. Conversely, the Wholesale Trade sector will lose 98 jobs by 2042. All other industry sectors are projected to experience growth, with a substantial increase of 17,410 new jobs expected in the Finance, Insurance, and Real Estate sectors. In addition, the Transportation, Communication, and Public Utilities sectors and the Government sector are expected to show moderate increases ranging from 4,000 to 6,000 new jobs.

According to the National Agricultural Statistics Service, Washoe County had 314 farms[11] (owner, part owner, and tenure), of which 69% were in the small range: 1–49 acres. The value of agricultural production in 2015 was $57.9 million, and value of food manufacturing was $1.1 billion.[12] The highest-grossing agricultural industries were cattle ranching and vegetable/melon farming. The largest agriculture industries were commercial fishing, greenhouse, nursery and floriculture, and beef cattle ranching/farming. The largest food manufacturing industries were spices and extracts, breakfast cereals, and fluid milk.[13]

[10] TMRPA, "2022 Washoe County Consensus Forecast." https://tmrpa.app.box.com/v/WCCF-2022-Final-TMRPA (login required)
[11] National Agriculture Statistics Service, "Quick Stats." https://quickstats.nass.usda.gov/results/F5354E09-9741-3CEA-96C5-1094EB4D61ED
[12] Nevada Department of Agriculture, "Nevada Food & Agriculture Washoe County." https://agri.nv.gov/uploadedFiles/agrinvgov/Content/About/washoe.pdf
[13] Nevada Department of Agriculture, "Nevada Food & Agriculture Washoe County." https://agri.nv.gov/uploadedFiles/agrinvgov/Content/About/washoe.pdf

Economic Development

Washoe County has seen a rise in the construction, transportation and warehousing, and administrative support businesses.[14] According to The Nevada Governor's Office of Economic Development, employment rose by 6.6% from 2018 to 2023, outpacing the national average by 3.0%. Reno and Sparks, in particular, will continue to experience significant growth. This growth may be influenced by Washoe County's accessibility—including major air, rail, and highway transportation routes—and its ranking as fourth in the nation for population growth and second in the nation for people moving to a new area.[15] The proximity to tourist hot spots, including skiing opportunities and Lake Tahoe, also supports economic growth.

The unemployment rate in Washoe County in January 2024 was 4.38%, which increased from 3.41% in 2019. Unemployment is higher in Washoe County than the national average of 4.0%.[16] Over the last decade, there has been a significant shift, with more people commuting out of the County than into the County.

A $40M New Deantronics medical device research, development, and manufacturing facility, seen in Figure 6, is slated to open in the Spanish Springs Business Center in 2020.



Photo credit: Kayla Anderson, Sparks Tribune.

Figure 6: New Deantronics Facility

[14] University of Nevada, Reno, "Economic Characteristics for Washoe County, Nevada." https://naes.agnt.unr.edu/PMS/Pubs/2022-4443.pdf

[15] Washoe County, "Business and Development in Washoe County." https://www.washoecounty.gov/csd/business_development/economic_development.php

[16] Nevada Governor's Office of Economic Development, "Washoe County, NV Economy Overview." Rural Economic & Community Development | Governor's Office of Economic Development

Nevada and Washoe County offer many incentives to businesses and developers that have encouraged economic investment and growth over the past few years. These incentives include the following:[17]

- No personal state income tax
- No unitary tax
- No corporate income tax
- No estate tax
- No franchise tax
- No inheritance tax
- No special intangible tax
- Sales tax deferral
- Personal property tax abatement
- Property tax exemptions
- Nevada hub zone abatements
- Train Employees Now (TEN) Grant
- Procurement Outreach Program
- Sales and use tax abatements
- Payroll tax abatement
- Property tax abatement – recycling
- Renewable and energy storage abatements
- Aviation and data center abatements
- Industrial development bonds
- Made in Nevada marketing

Land Use and Ownership Trends

> Washoe County is a place of diverse and resilient opportunities to build a quality life in a safe and engaging community offering unparalleled access to Washoe County's natural landscape, its arts, culture, and history, and its rich network of community services.
>
> –Envision Washoe 2040 Vision Statement[18]

According to Washoe County's updated master plan, Envision Washoe 2040, approximately 80% of the unincorporated County is federally managed. The Bureau of Land Management (BLM) manages 65% of the land in the unincorporated County. Other state and federal agencies that manage land in Washoe County include the Bureau of Reclamation, U.S. Fish and Wildfire

[17] Washoe County, "Business and Development in Washoe County." https://www.washoecounty.gov/csd/business_development/economic_development.php
[18] Washoe County, "Envision Washoe 2040." washoecounty.gov/csd/planning_and_development/files-planning_and_development/Files-MP_Update/EnvisionWashoe.pdf

Service, U.S. Forest Service, Division of State Parks, Division of Wildfire, and Division of Building and Grounds.

State parks in the County include Lake Tahoe Nevada State Park and Washoe Lake State Park.

Tribal lands in the County include the Pyramid Lake Indian Reservation (covering approximately 306,273 acres in Eastern Washoe County) and the Reno-Sparks Indian Colony, which consists of a 28-acre urban campus in Reno, 15,426 acres in Hungry Valley, and various commercial locations in the region. The land administered by the Bureau of Indian Affairs covers approximately 486,629 acres.[19]

Table 11, updated from the 2020 Master Plan, illustrates the approximate number of acres in Washoe County managed by a federal agency and identifies which agency is responsible.

Table 11: Federal Land Management[20]

Federal Agency	Acres
Bureau of Land Management	2,691,812.762[21]
Bureau of Reclamation	283
Department of Defense	1,732
Fish and Wildlife Service	185,756
Forest Service	94,395

As of 2023, according to the U.S. Census, Washoe County had 223,819 housing units.[22] Of these, 58.6% were owner-occupied. The median value of owner-occupied homes in 2022 was $460,000, and the median rental cost was $1,401. The housing stock has steadily increased in recent years. In 2020, there were 208,481 housing units, 212,084 in 2021, and 218,178 in 2022. An estimated 4,259 building permits were issued in 2023 alone. Continued economic and population growth indicates an ongoing need for additional housing.

[19] Native Land Information, "BIA Land Area Totals for US Native Lands." https://nativeland.info/dashboard/land-area-totals-for-us-native-lands/
[20] Washoe County, "Master Plan Land Use and Transportation Element." https://www.washoecounty.gov/csd/planning_and_development/resources/master-plan-zoning/files/_land_use_and_transportation_element.pdf
[21] University of Nevada, Reno, "Washoe County Land Use 2022." https://naes.agnt.unr.edu/PMS/Pubs/2022-4441.pdf
[22] United States Census Bureau, "Quick Facts Washoe County, Nevada." https://www.census.gov/quickfacts/fact/table/washoecountynevada/BPS030222

Other plans and agencies that are involved in land use decisions in Washoe County include the following:

- **Washoe County's Open Space and Natural Resource Management Plan** – This regional plan covers natural resources and open space strategies in southern Washoe County, including Reno and Sparks.
- **The Tahoe Regional Plan** – This plan for development in the Tahoe Basin focuses on balancing economic and community prosperity and protecting the natural environment. This plan was developed by the Tahoe Regional Planning Agency, the nation's first bistate regional environmental planning agency. The land use component of this plan outlines how land should be used and developed in the Lake Tahoe Basin, including goals on 1) limiting development, 2) public land acquisition, and 3) conserving natural areas.
- **The Truckee Meadows Regional Plan** – This comprehensive strategy for public facilities and natural resources was developed by TMRPA, an organization designed to promote collaboration between the cities of Reno and Sparks and Washoe County. It is being updated in 2024, including updates to the natural resources that should be conserved and strategies to mitigate risks.
- **The One Truckee River Management Plan** – This plan was developed for the Truckee River and all the jurisdictions it intersects. It was developed by the Nevada Land Trust and Keep Truckee Meadows Beautiful. The goals of the plan are: 1) ensure and protect water quality and ecosystem health in the Truckee River; 2) create a safe, accessible river connecting people and places; 3) build an aware and engaged community that protects and cares for the river; and 4) ensure the measurable, sustainable, and collaborative management of the river for today and into the future.

Figure 7 shows where development in the south of the County is constrained.

Population growth will continue to play into land use. Since the last plan update, there have continued to be questions surrounding federal ownership of lands, sustainable growth, economic development, and conservation. These concerns are particularly noted in Reno and Sparks—where most of the County's population resides—as development tends toward the foothills of the mountains and other areas of higher vulnerability to wildland fire.

As noted in the prior hazard mitigation plan, this has led to the development of the Truckee Meadows Public Lands Management Bill (also known as the Washoe County Lands Bill)—designed to open up potential development on federal lands. The bill's supporters suggest this bill will help create affordable housing options, support Tribal communities, increase conservation, protect public lands, and provide proceeds from land sales for priorities like

education and restoration around the Truckee River.[23] As of 2024, this bill is still under consideration.

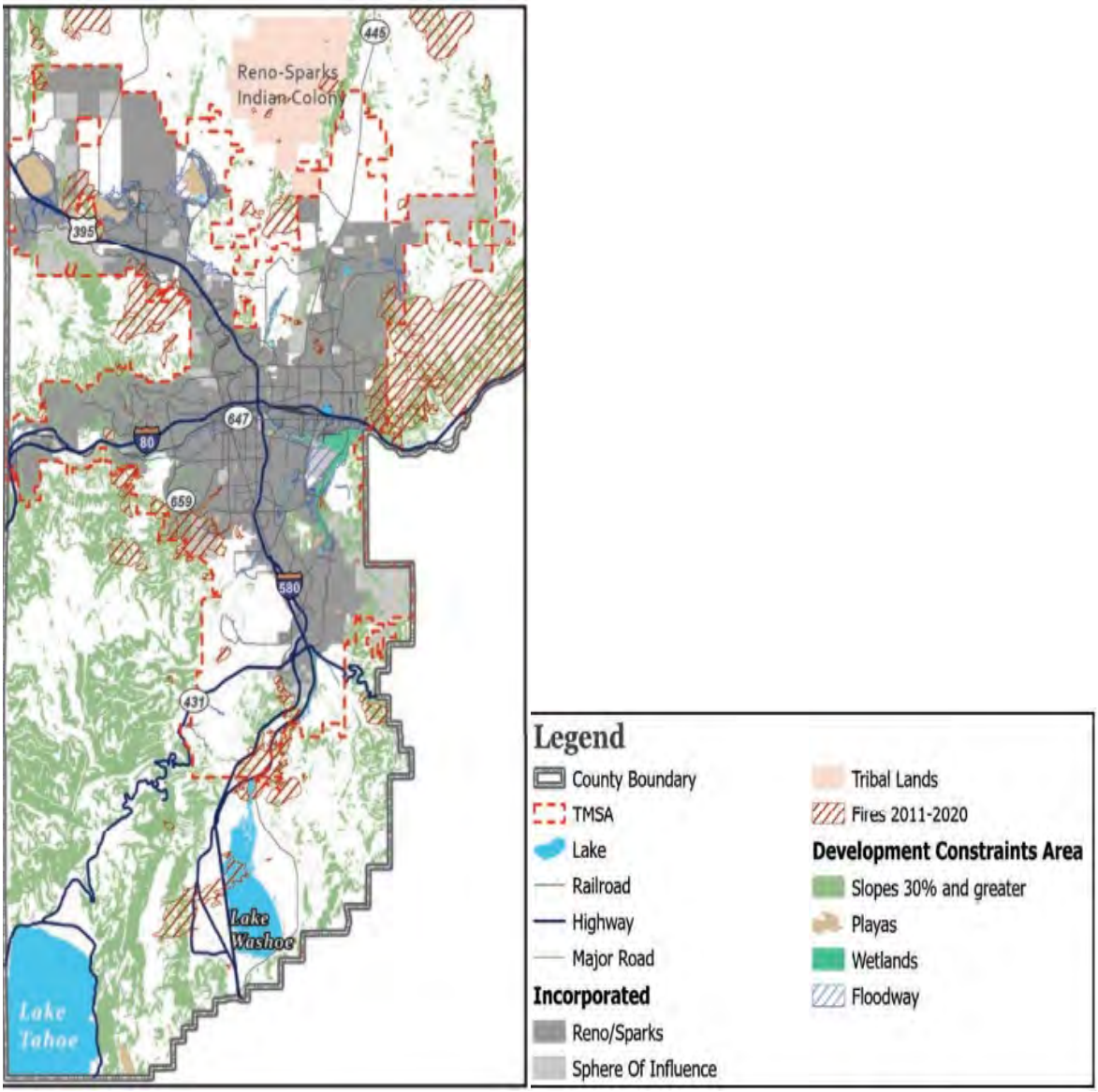


Figure 7: Development Constraints on Washoe County[24]

[23] Jack Rosen, U.S. Senator for Nevada, "Rosen's Washoe County Lands Bill Receives Senate Hearing, Critical Step Toward Passing and Becoming Law." https://www.rosen.senate.gov/2024/06/12/rosens-washoe-county-lands-bill-receives-senate-hearing-critical-step-toward-passing-and-becoming-law/

[24] Washoe County, "Envision Washoe 2040." https://www.washoecounty.gov/csd/planning_and_development/files-planning_and_development/Files-MP_Update/EnvisionWashoe.pdf

Transportation and Commuting Patterns

Washoe County is dissected by two main transportation corridors: Interstate 80 (I-80) (east–west) and US Highway 395/580 (north–south). State routes (SRs) in the County include SR 28 at Lake Tahoe, SR 431 at Mount Rose Highway, SR 341 at Geiger Grade, and SR 445, 446, and 445, which lead north out of the Truckee Meadows. The Nevada Department of Transportation (NDOT) provides a Roadway Functional Classification Map, which highlights interstates, expressways, and major and minor arterials in Washoe County.[25]

The 2050 Regional Transportation Plan, dated 2021 and amended in 2023 and 2024, provides a vision for transportation projects, programs, and services coming to the Washoe County planning area through 2050. It emphasizes annual spot improvements for bicycle, pedestrian, and needs for people with disabilities and investments in traffic signals, intelligent transportation systems, and pavement preservation to reduce long-term expenses. In general, the plan focuses on improving existing routes in the urban core but does not provide opportunities for expanding transit options, including in South Meadows, Incline Village, South Reno, Lake Tahoe, and along the I-80 corridor. It also proposes mobility hubs to support planning initiatives in the midtown district of Reno.

The vast majority of Washoe County's approximately 486,492[26] residents live and work in the southern half of the County. An estimated 250,555 individuals aged 16 and over commute to work, 69.5% of whom commute alone in a private vehicle. Only 1.5% use public transportation. The mean travel time to work is 22.3 minutes.[27]

The Regional Transportation Commission (RTC) offers bus service through RTC Ride[28] in the greater Reno–Sparks area. Lines extend as far north as Lemon Valley and Sun Valley and as far south as South Meadows. Washoe Senior Ride is a subsidized RTC taxi program funded by 0.25% of the Washoe County sales tax allocated for public transportation. Registered County residents 60 years and older and veterans of any age will receive up to $60 worth of taxi fare

[25] Nevada Department of Transportation, "FC_Washoe_County_Urbanized_04_20_16." https://www.dot.nv.gov/home/showdocument?id=6648
[26] United States Census Bureau, "P1|Race." https://data.census.gov/table?g=050XX00US32031
[27] United States Census bureau, "S0801|Commuting Characteristics by Sex." https://data.census.gov/table?q=washoe%20county%20nevada%20commute&g=050XX00US32031
[28] Regional Transportation Commission. Fares & Passes – RTC Washoe

subsidies.[29] Various carpool and vanpool lease incentives also are available through the RTC website.[30]

Table 12 provides NDOT Average Annual Daily Traffic (AADT) data for Washoe County from 2021, accounting for every type of vehicle.

Table 12: Average Vehicle Miles Traveled by Functional Class, Washoe County, 2021[31]

COUNTY	FC	FUNCTIONAL CLASS (FC)	%AVMT	AVMT	MILES
WASHOE	1	Principal Arterial - Interstate - Urban	3.75%	1,037,030,700	38.519
	1	Principal Arterial - Interstate - Rural	1.52%	419,914,068	32.307
	2	Principal Arterial - Other Freeways & Expressways - Urban	1.08%	298,848,568	15.896
	3	Principal Arterial - Other - Urban	2.91%	805,280,283	109.409
	3	Principal Arterial - Other - Rural	0.00%	1,155,882	0.116
	4	Minor Arterial - Other - Urban	2.17%	600,661,867	195.345
	4	Minor Arterial - SU	0.11%	30,362,908	10.854
	4	Minor Arterial - Other - Rural	0.50%	137,001,885	95.190
	5	Major Collector - Rural	0.06%	17,236,026	152.261
	6	Minor Collector - Urban	0.61%	169,467,628	170.719
	6	Minor Collector - SU	0.04%	10,640,933	14.104
	6	Minor Collector - Rural	0.03%	8,862,255	177.439
	7	Local - Urban	1.47%	405,913,368	1,146.486
	7	Local - SU	0.02%	5,400,890	61.654
	7	Local - Rural	0.15%	40,448,205	263.850
		WASHOE TOTAL	**14.42%**	**3,988,225,465**	**2,484.149**

AVMT = Average Vehicle Miles Traveled

Infrastructure projects are underway to improve public transit. In 2019, RTC received $40.4 million from the Federal Transit Administration to advance the Virginia Street Bus RAPID Transit Extension Project in Reno, which includes elements for new sidewalks, lighting, landscaping, improving safety, and the addition of five bus stations and two electric buses to operate on the RAPID Virginia Line. The aim was to create connectivity from Meadowood Mall to Midtown Reno and the University of Nevada, Reno. Figure 8 is a poster about this project.

On April 5, 2024, the City of Reno secured a 34% increase in funding over the previous year to develop subways, light rail, buses, and ferry systems. This substantial funding boost will significantly contribute to expanding, modernizing, maintaining, and operating public

[29] Regional Transportation Commission of Washoe County, Nevada, "Washoe Senior ride Taxi bucks Program." https://rtcwashoe.com/public-transportation/washoe-senior-ride-taxi-bucks-program/

[30] Regional Transportation Commission of Washoe County, Nevada, "Fares & Passes." https://rtcwashoe.com/public-transportation/fares-passes/

[31] Nevada DOT, "Annual Vehicle Miles of Travel." https://www.dot.nv.gov/home/showpublisheddocument/20786/637968713254800000

transportation systems. In addition, it will enhance stations, tracks, and facilities, create new corridors, and increase accessibility for seniors and disabled riders.[32]



Figure 8: RTC Poster on the Virginia Street Bus RAPID Transit Extension Project

Major Disaster Declarations

The County has received 43 major disaster declarations since 1965, including 11 since the previous 2020 RHMP update.

[32] KOLO 8, "FTA Funding for Public Transit Headed to Reno." https://www.kolotv.com/2024/04/05/fta-funding-public-transit-headed-reno/

Table 13 identifies these declarations.

Table 13: FEMA Disasters and Declarations[33]

Disaster Number	Individual Assistance Program	Public Assistance Program	Declaration Date	Title
5448	No	Yes	08/14/2022	Joy Lake Fire
5390	No	Yes	06/09/2021	Nevada Jacks Valley Fire
5382	No	Yes	11/17/2020	Pinehaven Fire
5328	No	Yes	08/15/2020	Loyalton Fire
5326	No	Yes	08/03/2020	North Fire
5322	No	Yes	07/21/2020	Rockfarm Fire
5316	No	Yes	06/27/2020	Poeville Road Fire
4523	Yes	No	04/04/2020	Covid 19 Pandemic
5291	No	Yes	08/24/2019	Long Valley Fire
5283	No	Yes	07/13/2019	Jasper Fire
5190	No	Yes	07/14/2017	Cold Springs Fire
4303	No	Yes	02/17/2017	Severe Winter Storms, Flooding (including closed-basin flooding), and Mudslides
5156	No	Yes	02/17/2017	Severe Winter Storms, Flooding (including closed-basin flooding), and Mudslides
5141	No	Yes	07/31/2016	Nevada Virginia Mountains Fire Complex
5138	No	Yes	07/19/2016	Nevada Rock Fire
2974	No	Yes	01/19/2012	Washoe Fire
2973	No	Yes	11/18/2011	Caughlin Fire

[33] FEMA, "Disasters and Other Declarations." https://www.fema.gov/disaster/declarations?field_dv2_declaration_date_value%5Bmin%5D=1965&field_dv2_declaration_date_value%5Bmax%5D=2024&field_dv2_declaration_type_value=ll&field_dv2_incident_type_target_id_selective=All&field_dv2_state_territory_tribal_value%5B0%5D=NV&page=0

Disaster Number	Individual Assistance Program	Public Assistance Program	Declaration Date	Title
2822	No	Yes	07/17/2009	Red Rock Fire
2713	No	Yes	07/16/2007	Hawken Fire
2709	No	Yes	07/08/2007	Hungry Valley Fire
2704	No	Yes	07/06/2007	Red Rock Fire
2679	No	Yes	11/11/2006	Pinehaven Fire
2664	No	Yes	08/12/2006	Verdi Fire
2649	No	Yes	06/27/2006	Oregon Fire
1629	No	Yes	02/03/2006	Extreme weather and Flooding (including closed-basin flooding)
3243	No	Yes	09/13/2005	Hurricane Katrina Evacuation
3204	No	Yes	02/23/2005	Snow
3202	No	Yes	02/17/2005	Record and/or Near Record Snow
2550	No	Yes	08/25/2004	Andrew Wildfire
2531	No	Yes	007/14/2004	Waterfall Fire
2524	No	Yes	6/30/2004	Verdi Fire Complex
2479	No	Yes	07/15/2003	NV-Robb Wildfire-7-14-2003
2476	No	Yes	007/11/2003	NV-Red Rock Fire 7-11-03
2371	No	Yes	08/09/2001	NV – Antelope Fire – 08/09/2001
2316	No	Yes	08/01/2000	NV – Arrowcreek Fire
2312	No	Yes	06/30/2000	Reno Fire Complex
2265	No	Yes	07/03/1999	Mira Loma Fire
1153	Yes	Yes	01/03/1997	Extreme weather, Flooding (including closed-basin flooding), Mud and Landslides
759	No	Yes	02/28/1986	Extreme weather and Flooding (including closed-basin flooding)

Disaster Number	Individual Assistance Program	Public Assistance Program	Declaration Date	Title
187	Yes	Yes	01/18/1965	Extreme weather, Heavy Rains, and Flooding (including closed-basin flooding)



HAZARD PROFILES AND VULNERABILITY ASSESSMENTS



Hazard Profiles and Vulnerability Assessment

Introduction

Assessing the risks of natural hazards measures their potential impacts on life, property, and the economy. The intent of risk assessment is to identify, as much as practicable, the qualitative and quantitative vulnerabilities of a community, given the data available. A risk assessment provides a better understanding of the impacts of natural hazards on the community. It provides a foundation on which to develop and prioritize mitigation actions. The aim is to reduce damage from natural disasters through increased preparedness and response times and to allocate resources to areas of greatest vulnerability.

This risk assessment followed the methodology described in the FEMA Local Mitigation Planning Handbook 2023, which outlines a five-step process:

1. Identify hazards: This step helps clarify what hazards may occur in the planning area.
2. Describe hazards: This step includes gathering more information about the hazards. It looks at where they can happen, how impactful they have been in the past, and how often and with what intensity they might occur in the future.
3. Identify community assets: This step examines which assets are most vulnerable to loss during a disaster. It must include changes in development that have taken place since the previous plan was created.
4. Analyze impacts: This step describes how each hazard could affect the assets of each community.
5. Summarize vulnerability: This step brings all the analysis together. It uses risk assessment to draw conclusions. From these conclusions, the planning team can develop a strategy to increase the resilience of residents, businesses, the economy, and other vital assets.

Hazard Ranking Methodology

Hazard Identification

According to FEMA guidance, identifying hazards is the first step in developing a risk assessment. The Washoe County MJHMP Planning Team reviewed previous hazard mitigation plans and relevant documents to determine the natural hazards that could affect the county and to consider any possible changes in hazards of concern. Table 14 lists the hazards addressed in this plan.

Table 14: Hazards Addressed in the Plan

Hazard Type	Hazard Name
Natural Hazards	Avalanche and Landslide Drought Earthquake Flood Infectious Disease Extreme Weather Volcano Wildland Fire
Human-Caused Hazards	Criminal Acts and Terrorism
Technological Hazards	Energy Emergency Hazardous Materials Incident Radiological Waste Transport Transportation incidents

Prioritization of Hazards

Table 15 presents the evaluation metrics of the hazard prioritization process, also known as the Calculated Risk Priority Index (CPRI). The hazards identified were ranked according to five attributes:

- **Probability:** Likelihood of the hazard occurring.
- **Magnitude:** Areas potentially impacted and the overall impact.
- **Onset:** The time between the recognition of an approaching hazard and when the hazard begins to affect the community.
- **Duration:** The length of time the hazard remains active, the length of time emergency operations continue after the hazard event, and the length of time that recovery will take.
- **Frequency:** How often a hazard has resulted in an emergency or disaster.

Each participating jurisdiction was responsible for prioritizing the identified hazards on a worksheet based on these criteria, perceived notions of the probability of future occurrences, the spatial extent of the hazard, and historical events. The results of these rankings are found in the individual jurisdictional annexes. This prioritization reflects the fact that vulnerability can differ across jurisdictions. The overall risk ranking for Washoe County is shown in Table 15.

Table 15: Guidelines for Prioritization

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Probability *What is the likelihood of the hazard occurring?*	1	Unlikely	Less than 1% probability of occurrence in the next year or a recurrence interval of greater than every 100 years.	30%
	2	Occasional	1%–10% probability of occurrence in the next year or a recurrence interval of 11 to 100 years.	
	3	Likely	11%–90% probability of occurrence in the next year or a recurrence interval of 1 to 10 years.	
	4	Highly Likely	91%–100% probability of occurrence in the next year or a recurrence interval of less than 1 year.	
Magnitude *What will be the overall impact?*	1	Negligible	Less than 5% of the affected area's critical and non-critical facilities and structures are damaged/destroyed. Only minor property damage and minimal disruption of life. Temporary shutdown of critical facilities.	30%
	2	Limited	Between 5% and 25% of property in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than one day but less than one week.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
	3	Critical	Between 25% and 50% of property in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than a week but less than one month.	
	4	Catastrophic	Over 50% of critical and non-critical facilities and infrastructure in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than one month.	
Onset *How long will be there be between when it is recognized the hazard is approaching and when the hazard will begin to affect the community?*	1	Self-defined	More than 24 hours	10%
	2	Self-defined	12–24 hours.	
	3	Self-defined	6–12 hours.	
	4	Self-defined	Less than 6 hours.	
Duration *What is the length of time the hazard will remain active, including how long emergency operations will need to continue*	1	Brief	Up to 6 hours.	10%
	2	Intermediate	Up to one day.	
	3	Extended	Up to one week.	
	4	Prolonged	More than one week.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
after the hazard event?				
Frequency *How often has this kind of hazard resulted in an emergency or disaster?*	1	Every 10+ years	This hazard is not frequent but may still impact the area.	20%
	2	Every 5–10 years	This hazard is not as frequently occurring, but it could occur in the next 10 years.	
	3	Every 1–5 years	This hazard is likely to occur relatively often. It may have occurred more or less frequently recently, but on average it can be expected every 1–5 years.	
	4	Annually	This hazard is a frequent occurrence which the area actively has to respond to on an approximately annual basis.	

The following equation was used to calculate the total Risk Factor (RF) Value for each jurisdiction:

Risk Factor Equation

RF Value = [(Probability x .30) + (Spatial Extent x .10) + (Severity of Life/Property Impact x .30) + (Warning Time x .10) + (Duration x .10) + (Response Capacity x .10)]

Table 16: Calculated Priority Risk Index for Hazards in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Avalanche and Landslide	2	3	4	3	2	2.6
Criminal Acts and Terrorism	3	2	4	2	3	2.7
Drought	3	1	1	4	2	2.1
Earthquake	4	3	4	3	3	3.4
Energy Emergency	4	2	4	3	3	3.1
Flood	3	2	2	3	4	2.8
Hazardous Materials Incident	3	2	4	2	3	2.7
Infectious Disease	2	2	1	4	2	2.1
Radiological Waste Transport	3	3	4	3	3	3.1
Extreme Weather (Winter Storm, Windstorms, Extreme Heat)	4	2	1	4	3	2.9
Transportation Incident	3	4	4	3	3	3.4

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Volcano	1	3	3	4	1	2.1
Wildland Fire	4	4	4	3	4	3.9

Hazard Considerations

MITIGATION VS. ADAPTATION VS. PREPAREDNESS

Mitigation plans address the need to reduce the risks associated with hazards. However, not all risks can always be reduced. In instances when mitigation actions are too expensive or otherwise unfeasible, other approaches, such as adaptation or preparedness actions, may have to be taken. The terms mitigation, adaptation, and preparedness often are confused, but each term refers to a different method that communities can use to address risks associated with hazards, as defined below.

- **Mitigation** – FEMA defines mitigation as the action to reduce loss of life and property by lessening the impact of disasters.[34] The process of hazard mitigation planning involves community efforts to identify risks and vulnerabilities associated with natural, technological, and human-caused disasters and to develop long-term strategies for risk reduction. The goal of a mitigation program is to reduce or avoid the costs associated with disaster response and recovery.

- **Adaptation** – Changing climate conditions will affect the frequency and magnitude of natural hazards, such as Flooding (including closed-basin flooding) and wildland fires. The concept of climate adaptation encompasses the responses of communities to a changing climate. The Intergovernmental Panel on Climate Change defines climate adaptation as adjustments in human and natural systems in response to actual or expected changes in climate that moderate harm or take advantage of beneficial opportunities.[35]Climate adaptation in many cases includes broader strategies, such as studies and policy changes

[34] FEMA, "Mitigation for Homeowners," https://www.fema.gov/fact-sheet/mitigation-homeowners#:~:text=Mitigation%20is%20an%20action%20to,hurricanes%2C%20from%20having%20catastrophic%20impacts.
[35] UNFCCC, "Adaption and Resilience." https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/introduction#:~:text=Adaptation%20refers%20to%20adjustments%20in,opportunities%20associated%20with%20climate%20change.

aimed at altering how a community develops in the future to take into consideration expected climate conditions.

- **Preparedness** – The Department of Homeland Security and FEMA define preparedness as a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action in an effort to ensure effective coordination during response to a disaster or other incident.[36] Preparedness strategies are actions that increase the capacity of an agency, community, or individual to respond after a disaster occurs to protect lives and property. In instances where the risks of a hazard cannot be mitigated or adapted to, preparedness activities enable communities to respond to disaster.

Future Conditions

The potential impacts of future climate conditions include increased average temperatures, decreased snow accumulation, and increased peak stream flow. The increasing average temperature is expected to be more pronounced during the summer months, and decreased summer precipitation is expected to accompany this shift. The frequency and magnitude of extreme precipitation events are also expected to increase, particularly in the winter. In short, what is currently viewed as a 100-year event may soon be reconsidered as a 50-year event or even a 10-year event. This would place further stress on storm drainage systems and natural stream systems, placing Washoe County communities at an increased risk of Flooding (including closed-basin flooding).

Changing precipitation and average temperatures may impact potable water availability. If snowmelt shifts to earlier in the spring and summers become longer, hotter, and drier, regional needs for water storage may grow. Decreased water availability combined with increased demand may exacerbate water rights conflicts.

Finally, changing climate conditions can impact ecosystems, with complicated feedback that may affect ecosystem services that local communities and tribes rely on for recreation, water quality, and overall well-being.

Changes in development patterns also affect the vulnerability of communities to hazards. As the cities of Reno and Sparks expand, future development is more likely to occur in areas prone to wildland fires, and local governments and developers must take the risk of fire into consideration when planning and constructing new homes, businesses, and infrastructure. Development also increases stormwater runoff and alters drainage patterns. In the North Valley, recent and future development can increase the magnitude of closed-basin Flooding

[36] Homeland Security, “Plan and Prepare for Disasters.” https://www.dhs.gov/archive/plan-and-prepare-disasters#:~:text=Preparedness%20is%20defined%20by%20DHS,Preparedness%20System%20to%20prevent%2C%20respond

(including closed-basin flooding). These, and other jurisdiction-specific considerations, are discussed further in the annexes as well.

Cascading Impacts

Hazards do not occur in a vacuum, and the occurrence of one hazard can cause multiple other hazards and adverse effects. Accordingly, the County and its partners have attempted to take the risk assessment one step further by identifying the potential cascading, or secondary, impacts that may be generated by a hazard. In better understanding these cascading impacts, the region will be better prepared to holistically address risks and vulnerabilities.

CASCADING IMPACT EXAMPLE

An earthquake is a singular hazard presenting specific risks, but an earthquake is also likely to cause secondary hazards for the community such as:

- Landslides
- Utility Failures
- Urban Fires
- Transportation Accidents

Vulnerable Populations

Socioeconomic and demographic characteristics affect how people are impacted by disasters and their ability to access the resources needed to recover. These factors can include age (both children and the elderly), gender, income, disabilities, housing conditions, English-speaking proficiency, racial and ethnic background, and access to transportation. People who exhibit one or more of these vulnerability characteristics often experience more severe effects from a disaster. To better understand the impacts of hazards on different demographic groups in Washoe County, various tools and data were used.

A convenient way to get an overall understanding of vulnerability is to use an index that summarizes a series of variables into a simplified value. The Social Vulnerability Index (SVI) summarizes 16 variables in four themes: Socioeconomic Status, Household Characteristics, Racial and Ethnic Minority Status, and Housing Type/Transportation. These data can be displayed in tabular form or by geographic distribution on a map, as shown in Figure 9 through Figure 14.

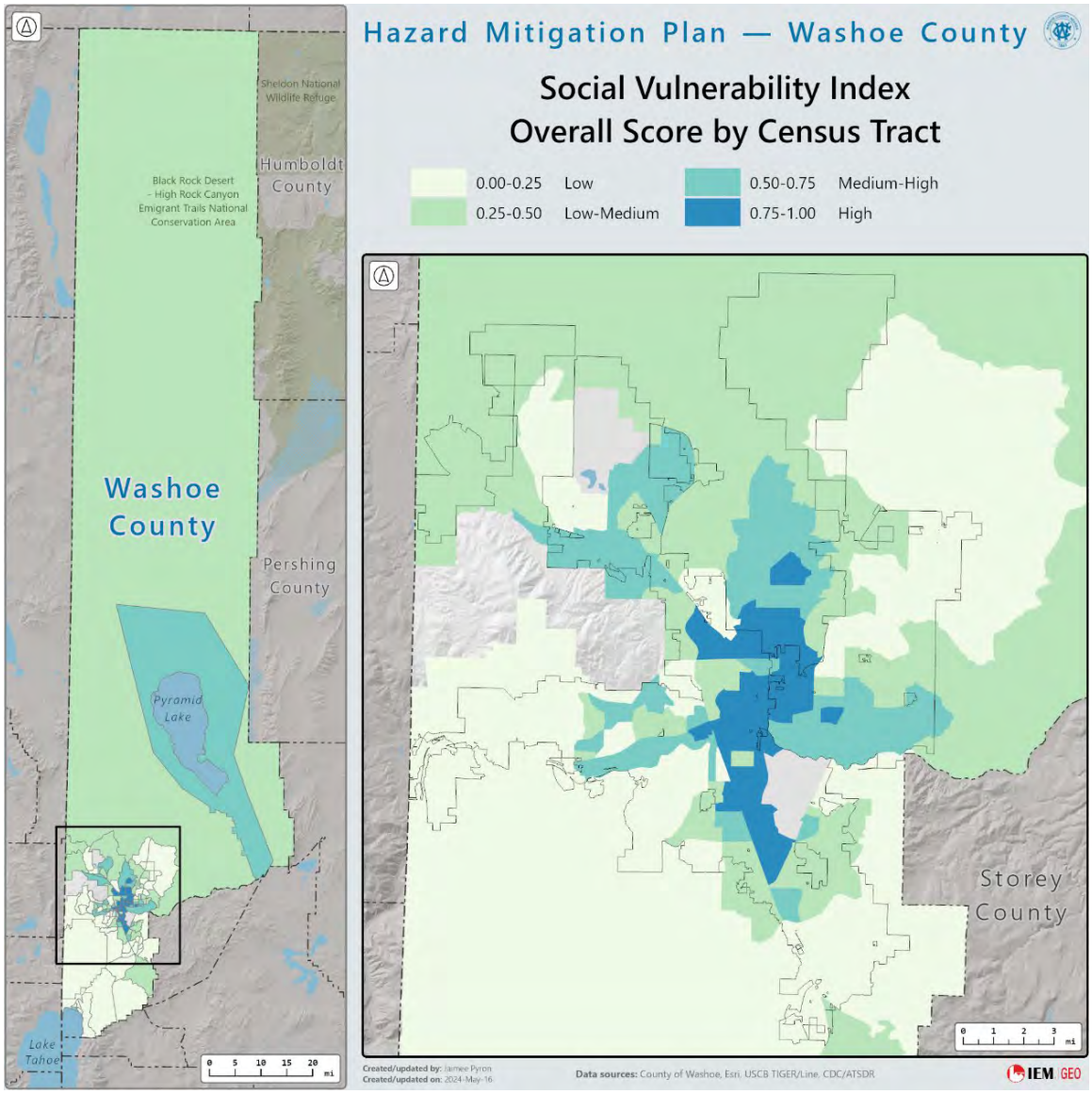


Figure 9: Washoe County Social Vulnerability Index Map

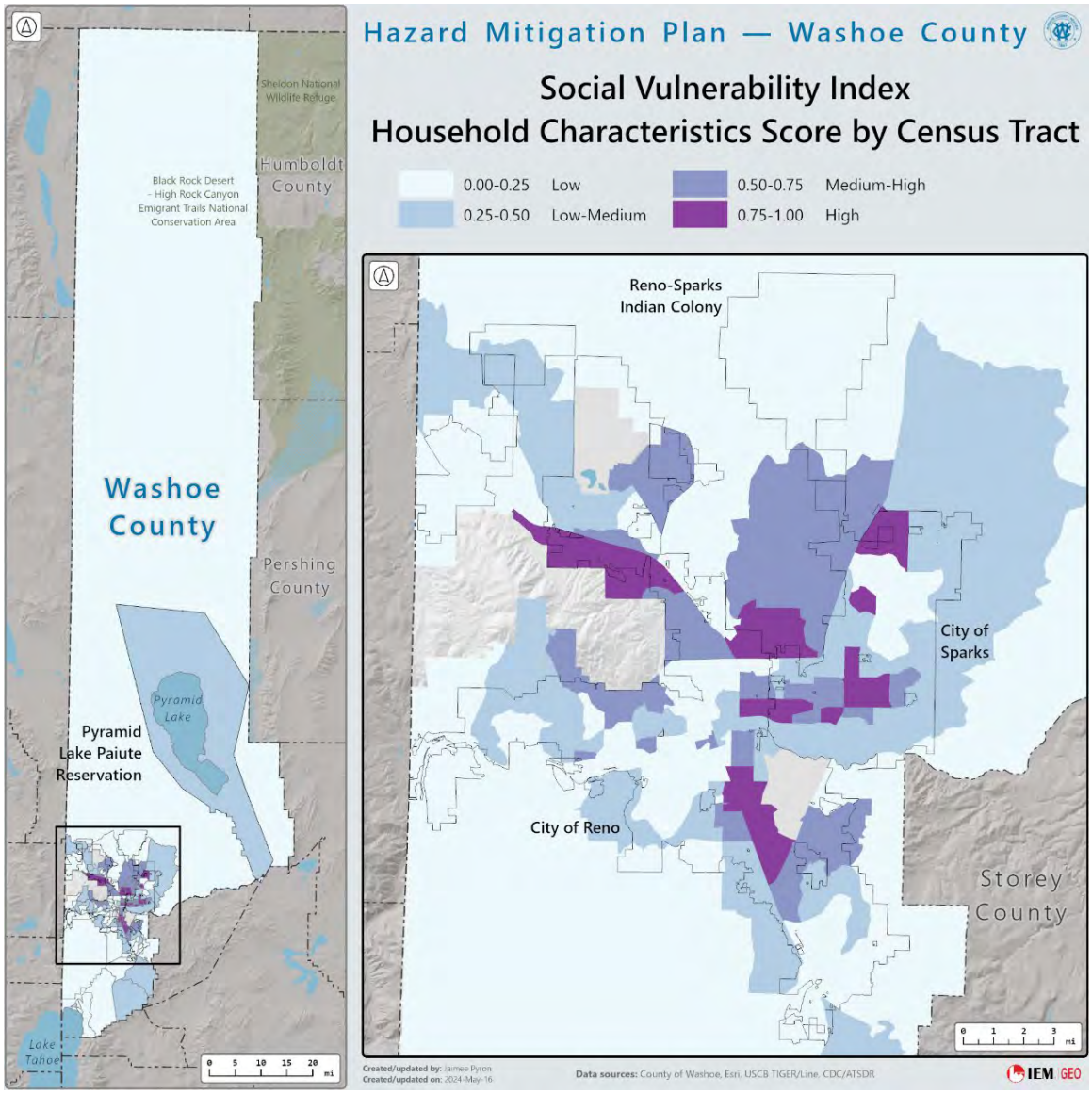


Figure 10: Washoe County Social Vulnerability Index Household Characteristics Score

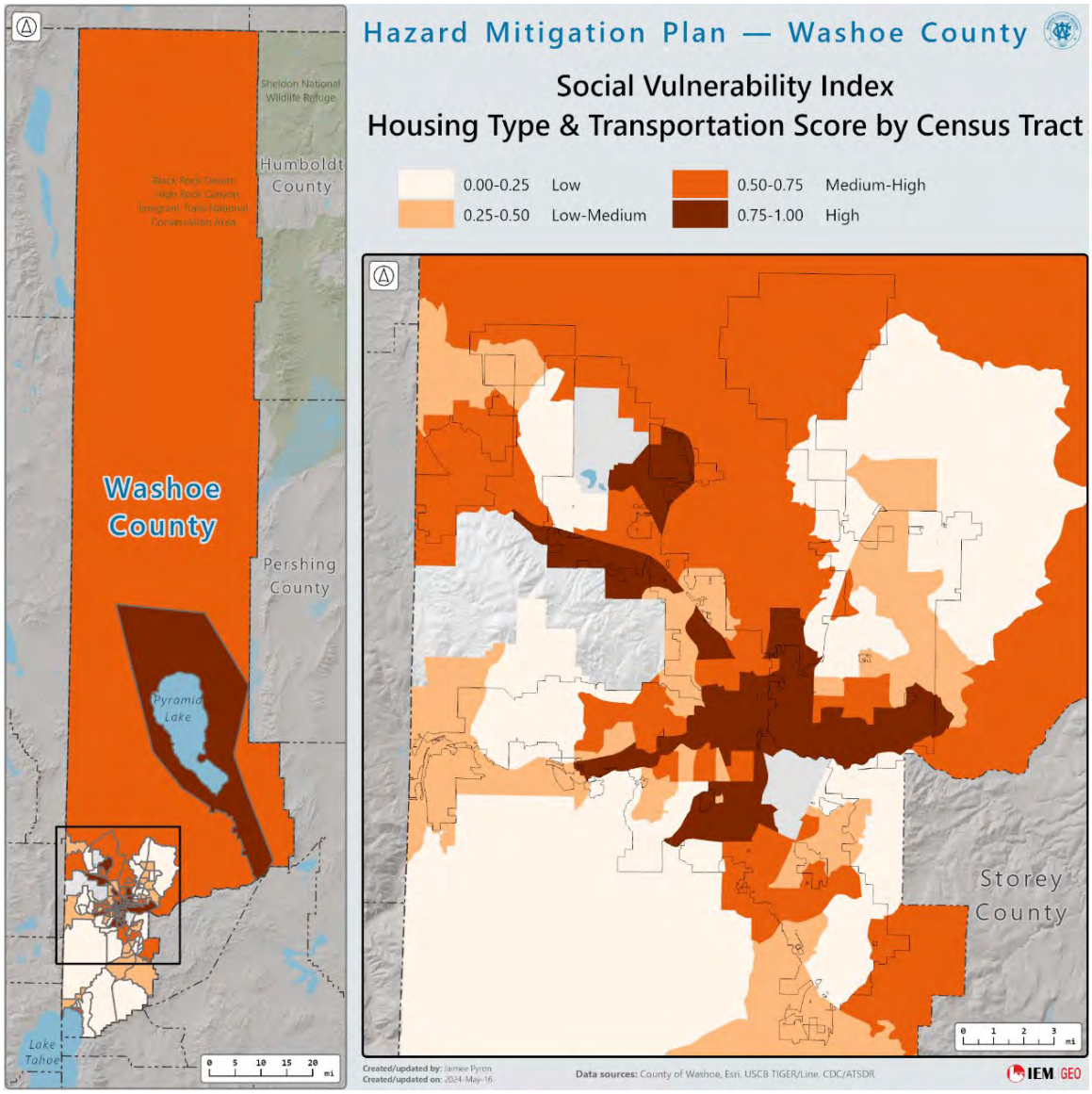


Figure 11: Washoe County Social Vulnerability Index Housing Type & Transportation Score

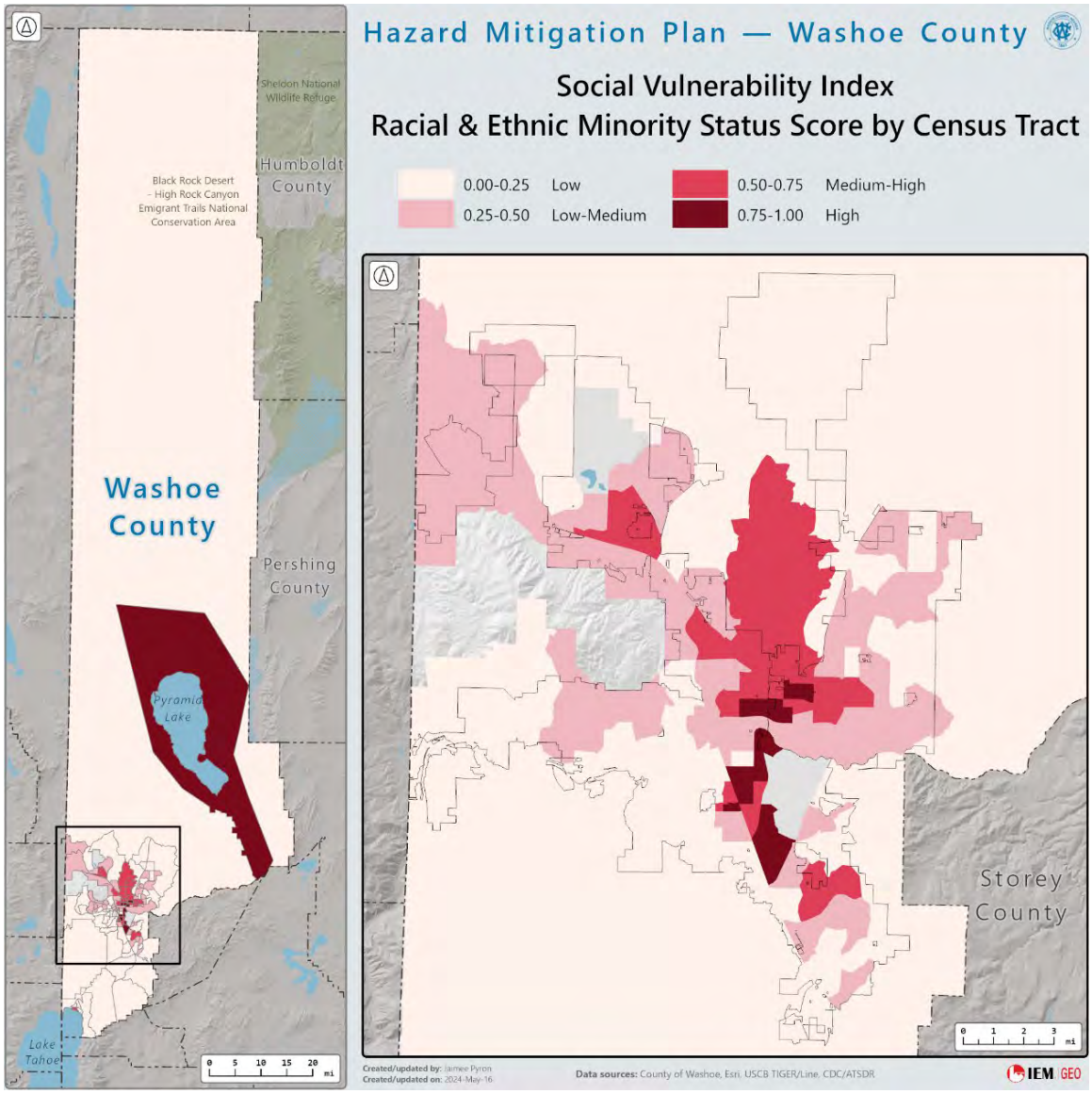


Figure 12: Washoe County Social Vulnerability Index Racial & Ethnic Minority Status Score

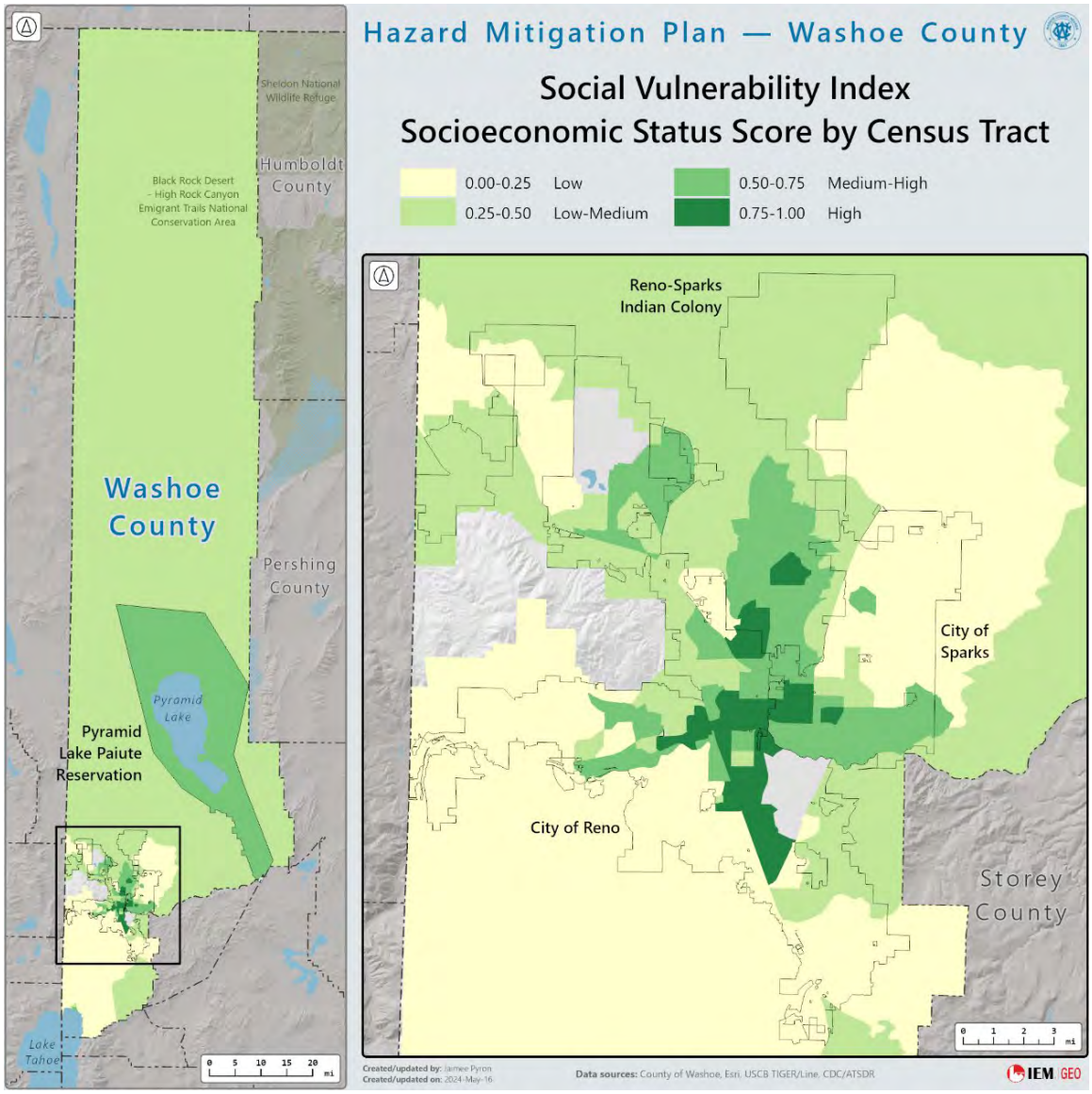


Figure 13: Washoe County Social Vulnerability Index Socioeconomic Status Score

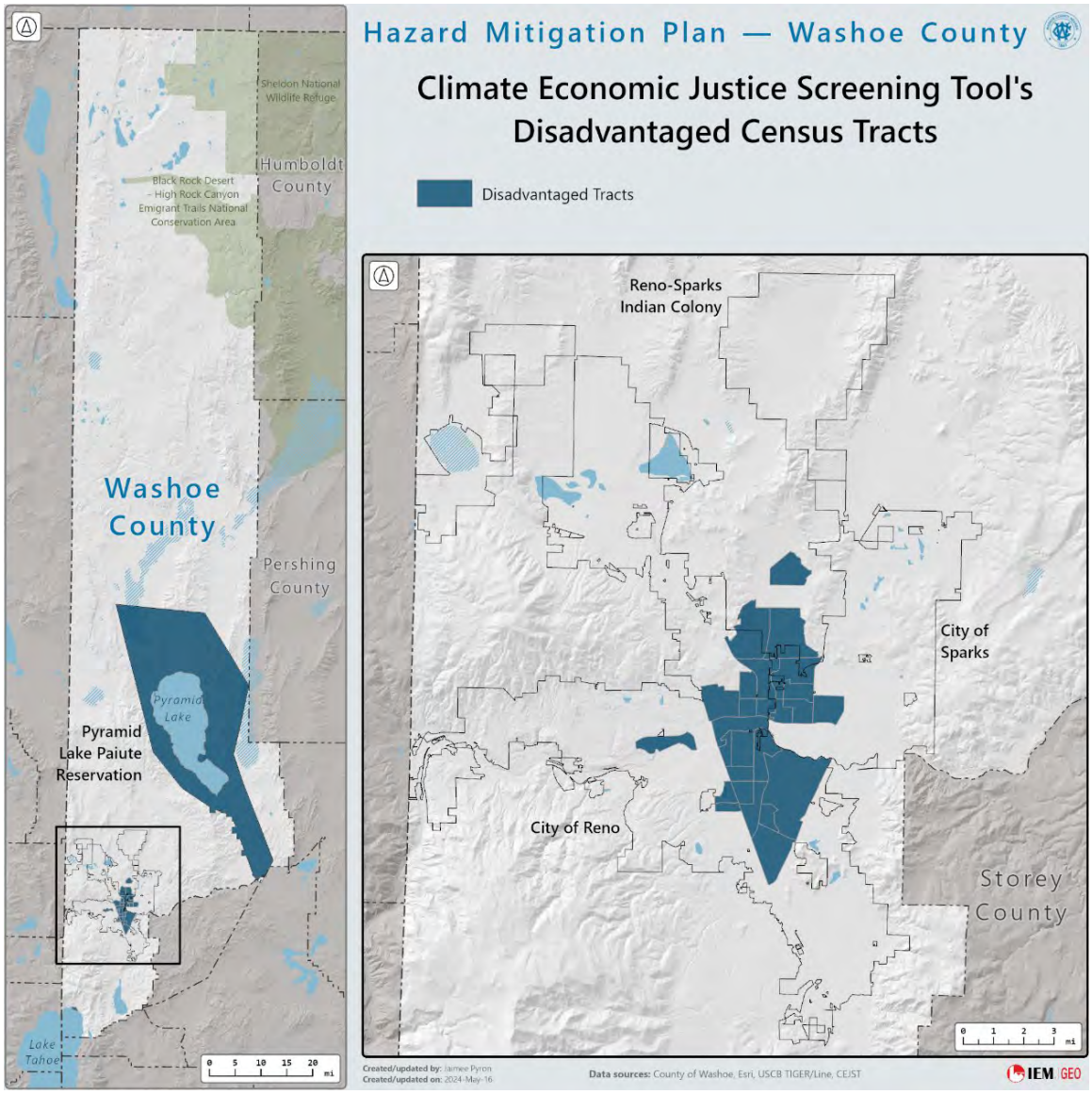


Figure 14: Washoe County CEJST Disadvantaged Census Tracts

Figure 14 highlights disadvantaged census tracts in Washoe County. Communities are considered disadvantaged if they are in a census tract that meets a threshold defined by the Climate Economic Justice Screening Tool (CEJST) for at least 1 of 8 categories of burden. Indicators that contribute to disadvantaged community scores in one or more census tracts in Washoe County include the following:

- Expected Agricultural Loss
- Projected Wildfire Risk
- Expected annual loss to building values from natural hazards
- Expected annual population loss rate from natural hazards

- Percentage of people with asthma
- Low life expectancy
- Rates of people with heart disease
- Wastewater discharge: toxic concentrations in parts of streams within 500 meters
- Underground storage tanks and releases
- Lack of indoor plumbing
- Unemployment rates
- The percentage of people with less than a high school diploma
- Traffic volume and proximity
- Lack of green space
- Proximity to hazardous waste facilities and proximity to risk management plan facilities (airports)
- The lands of the Reno-Sparks Indian Colony cover less than 1% of the census tract where it is located and are considered disadvantaged.
- Low Income, Low Median Income, or percentage at or below the federal poverty level.

Risk-Driven Planning

The vulnerability assessment discussed in this section and the following hazard profiles were developed through a combination of comprehensive geospatial analysis and stakeholder feedback. The combined findings shaped a risk-driven planning process that resulted in mitigation strategies focused on the real risks and vulnerabilities faced by Washoe County and its partners.

Vulnerability Assessment

A vulnerability assessment offers a detailed representation of the losses that a community may incur in the event of a disaster. This is particularly valuable for county and city personnel and other decision-makers who must balance the costs of mitigation with the potential harm to residents and property. The assessment provides a standardized method to measure a community's exposure to natural hazards and helps identify which hazards and regions should be prioritized for disaster resilience efforts. Based on evaluating the assets at risk, hazard

mitigation resources can be allocated where they are most needed, using the information in the hazard profiles.

For an effective vulnerability assessment, hazard mitigation analysts must be given both quantitative and qualitative information for each hazard. Quantitative data are obtained through an exposure analysis that provides the number of assets at risk of a particular hazard. For hazards that lack measurable data, qualitative data help describe how a hazard could impact the region, offering insights beyond the numbers of assets at risk. By combining these types of data, analysts can gain a comprehensive understanding of the risks associated with each hazard and develop appropriate mitigation strategies.

The hazard exposure analysis was developed using the most reliable and up-to-date data available and adhered to the methodology outlined in FEMA Local Mitigation Planning Handbook, May 2023.[37] This guidebook provides a comprehensive framework for identifying and evaluating hazards, estimating potential losses, and developing strategies for mitigating risks. The analysis was conducted with the utmost precision and rigor to ensure its validity and accuracy.

A comprehensive vulnerability assessment was conducted for each hazard. Geospatial data were indispensable in determining the assets exposed to specific hazards. In this regard, geospatial analysis can be conducted by overlaying the natural hazard's spatial footprint on a map of people and assets. Notably, Washoe County's hazards, including flood, wildland fire, and earthquakes, have known geographic extents. Spatial information on these hazards is crucial in determining the areas of exposure and vulnerability of the assets.

To conduct a vulnerability analysis, access to data from several sources is required. This study used asset data from county, state, and federal sources to provide a snapshot of the impacts of natural hazards on the assets. The term "asset data" refers to critical infrastructure in the county and cities, such as utilities, owned facilities, bridges, schools, and other community facilities that are necessary for residents.

Hazus 6.1 was used to estimate potential losses for five hazard scenarios: 100-year flood, 500-year flood, an M 6.8 Freds Mountain fault earthquake, an M 6.9 Mount Rose Fault Zone scenario earthquake, and an M 6.8 Spanish Springs Valley Fault. The models estimate the amount of damage that could be expected for different building occupancies, critical facilities, transportation systems, and utilities from these events.

[37] FEMA, "Local Mitigation Planning Handbook." https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-handbook_052023.pdf

Stakeholder Feedback

In addition to the Calculated Priority Risk Index, stakeholders provided insights into their unique jurisdictional vulnerabilities through risk assessment forms. As part of these forms, participants were asked to review each hazard based on the following attributes:

- **Previous Hazard Events:** Previous occurrences can give an idea of what might happen and what is at risk.
- **Changes in Priority:** What (if any) changes in priority should there be for this plan based on previous occurrences and progress with mitigation since the last plan update.
- **Jurisdictional Vulnerabilities:** A description of specific vulnerabilities for each of the identified hazards, including potential impacts on current and future assets.
- **Changes in Development:** Any changes in development that have occurred in hazard-prone areas must be identified and if it has increased or decreased the vulnerability of each jurisdiction.

Hazard-Specific Profiles and Risk Assessments

The following section profiles each hazard identified in Table 14 and assesses the associated risks. Each risk assessment considers the following attributes:

- **Hazard Description:** A brief introduction to the mechanisms behind the hazard.
- **Location:** An indication of geographic areas that are most likely to experience the hazard.
- **Extent/Probability:** A description of the potential magnitude of the hazard, accompanied by the likelihood of the hazard occurring (or a timeframe of recurrence, if available).
- **Past Occurrences/History:** Similar to Location, a chronological highlight of recent occurrences of the hazard accompanied by an extent or damage cost, if available.
- **Probability of Future Events:** Likelihood of this type of event occurring in Washoe County, based on return intervals or past annual frequency.
- **Potential Impacts from Future Climate Conditions:** A brief overview indicating ways in which the hazard profile may change over time because of a changing climate, if applicable.
- **Cascading Impacts:** A brief overview of secondary hazards often associated with the hazards.

- **Vulnerability:** A description of the potential magnitude of losses associated with the hazard. Vulnerability may be expressed in quantitative or qualitative values, depending on available data.
- **Development Trends:** Economic changes, land use changes, and other changing conditions and how these trends impact on County's vulnerability to each hazard since the 2020 plan development (increased, decreased, unchanged).

Avalanche and Landslide

Hazard Description

AVALANCHE

An avalanche is a natural disaster caused when a mass of snow and ice suddenly slides down a mountainside or slope. Different snow avalanches include slab avalanches, loose snow avalanches, gliding avalanches, powder avalanches, and wet snow avalanches.[38]

A slab avalanche is a type of avalanche that occurs when a cohesive layer of snow breaks loose from the surrounding snowpack and slides downhill. This cohesive layer, known as the slab, can be released suddenly and triggered by various factors such as changes in temperature, snowfall, wind loading, or the weight of a person or object on the snowpack. Triggering requires applying an additional load and a slope angle of at least 30°. Slab avalanches are particularly dangerous and responsible for more than 90% of avalanche deaths because they can involve large volumes of snow and travel at high speeds, posing significant risks to structures and people in their path.

A loose snow avalanche, also known as a sluff or slush avalanche, occurs when a mass of unconsolidated snow slides downhill. It often occurs on steep slopes and is typically triggered by a disturbance such as a skier or snowboarder or an increase in temperature. Loose snow avalanches generally move at slower speeds than slab avalanches and are less destructive. Generally, less than 10% of avalanche fatalities are due to these, but they can still pose a serious risk to backcountry enthusiasts.

A gliding avalanche occurs when a cohesive layer of snow glides over a weaker layer underneath. This movement is often slow and can be likened to a flowing river of snow. Gliding avalanches are typically characterized by a distinct smooth, polished appearance on the snow surface. They are generally slower and less destructive than other types of avalanches. These avalanches occur naturally when friction decreases at the interface with the ground, causing the snow at the base of the snowpack to become moist.

A powder avalanche or powder cloud, also known as a "dry snow avalanche," is primarily caused by slab avalanches. They occur when a layer of snow breaks loose and begins to slide downhill. As the snow slides, it picks up more snow, creating a powder cloud that becomes suspended in the air due to a large difference in altitude. This suspension of snow can lead to the formation of a powerful powder cloud. These avalanches are known for their incredible speed, reaching up to 300 km/h, and can cause extensive damage along their path. They are

[38] WSL Institute for Snow and Avalanche Research, “Avalanche Types.” https://www.slf.ch/en/avalanche-bulletin-and-snow-situation/about-the-avalanche-bulletin/avalanche-types/

most likely to occur when the avalanche danger is rated as high or very high, posing a significant risk to both human life and property.

Wet slide avalanches occur when a layer of snow with a smooth, cohesive upper surface moves downhill over a denser, weaker layer. This type of avalanche is typically triggered by snow melting due to warm temperatures, rain, or intense sunlight. Wet slab avalanches are characterized by slower movement than dry snow avalanches but can still be just as powerful and destructive. The wet snow acts as a lubricant, allowing the slab to slide over the weaker layer, and they often occur in the spring when the snowpack is melting.

Avalanche possibility is determined by the interaction of three key variables:

1. Terrain: The steepness of the slope plays a crucial role in avalanche potential. Steeper slopes are more likely to experience avalanches. Most avalanches occur on slope angles ranging from 35 to 50 degrees.
2. Snowpack: The stability of the snowpack is another critical factor. If the snow is unstable, it is more prone to avalanching.
3. Weather: Weather conditions such as temperature changes, precipitation, and wind can significantly impact snowpack stability. Rapid changes in weather can swiftly alter the stability of the snowpack, increasing the risk of avalanches.

The snowpack varies across the state, with a maritime snow climate, relatively heavy snowfall, and mild temperatures in western and southern Nevada. In contrast, northeastern Nevada (Ruby Mountains) is somewhat transitional between marine and continental climates (Utah and Colorado), characterized by low snowfall and lower temperatures.

Dense trees may anchor the snowpack in the starting zones of avalanche slopes. However, trees or other vegetation further down the slope will not significantly affect the speed or direction of moving avalanche debris. Most avalanches occur during or immediately following winter storms between December and March.

The slopes of the Carson Range in Washoe County contain extensive avalanche terrain. Most of these avalanche areas are visited mostly by backcountry travelers. The slopes above Crystal Bay and the Third Creek drainage avalanche frequently and directly threaten homes and roads. Other slopes in the Lake Tahoe Basin along State Route/SR 431 and 28 have been identified as avalanche areas. Before and during large storms, Washoe County Emergency Management issues avalanche advisories to occupants and road crews in the Crystal Bay and Third Creek areas, depending on the degree of public risk. Avalanche advisories are issued over the Emergency Alert System (EAS) or a public alert system. The Washoe County Avalanche Call Out has devised a three-stage system to alert people in potential avalanche areas of imminent hazards that might require caution or evacuation.

LANDSLIDE

Landslides, also known as mass movements, are complex phenomena that occur due to a combination of geological, climatological, and human factors. They are defined as the downward movement of a mass of rock, debris, or earth along a slope or cliff. Landslides can be triggered by heavy rainfall, snowmelt, earthquakes, volcanic activity, and human activities such as mining or construction. The type of slope, the nature of the soil and rock, and the presence of vegetation all play a role in determining the likelihood of a landslide occurrence. There are five modes of slope movement: falls, topples, slides, spreads, and flows, which are further categorized based on the type of geological material and type of movement: bedrock, debris, or earth.[39] Movements include rotational, translational, block, rockfall, topple, debris flow, debris avalanche, earthflow, and creep.[40] Landslides may be small or very large, and they can move at slow to very high speeds. They can be initiated by storms, earthquakes, fires, volcanic eruptions, and human modifications of the land that lead to slope instability.

The susceptibility of an area to landslides depends on many variables, including the steepness of the slope, the structure and physical properties of slope materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage. Landslides may be caused by one or a combination of the following factors:

- Change in slope gradient or increased weight through development
- Shocks and vibrations
- Changes in water content
- Weathering of rocks
- Removal of vegetation (for example, by wildland fire or through grading) or changes in the types of vegetation covering slopes

Landslides can be caused by various factors, such as shaking from earthquakes, heavy rainfall, and volcanic activity. Human activities can also trigger landslides. Debris flows, which are moving masses of rock fragments, soil, and mud, with more than half of the particles larger than sand size, are considered a type of landslide in this risk assessment. Debris flows can be initiated by flash floods, particularly in areas where wildfires have burned off vegetation that previously stabilized the slope. Additionally, landslides may occur in regions cut by perennial streams, where stream erosion can destabilize the sediment and rocks, causing collapses. Another common type of landslide in Nevada is a rock fall, a fast-moving landslide that happens

[39] USGS, "What is a Landslide and What Causes One?" https://www.usgs.gov/faqs/what-a-landslide-and-what-causes-one
[40] Utah Geological Survey, "Landslide Hazards in Utah." https://ugspub.nr.utah.gov/publications/public_information/pi-98.pdf

when rocks or earth fall, bounce, or roll from a cliff or down a very steep slope. Rockfalls start from high outcrops of hard, erosion-resistant rock that become unstable for various reasons. Rock falls can be triggered by heavy rainfall, earthquakes, and human activities, and they can cause direct harm to people, damage structures, and block transportation routes.

Location

AVALANCHE

Avalanche risk is highest in the steep, mountainous areas of the Carson Range of the Sierra Nevada in southwestern Washoe County. Incline Village and Crystal Bay are under avalanche advisories several times each winter. The Avalanche Hazard Report prepared by Dick Penniman for the County in 1993 identified three high-hazard avalanche areas (areas where an avalanche could damage standard wood-frame structures and/or automobiles). They are described in the following sections. The hazard zones are identified as high, medium, and low potential. The data were provided to IEM by Washoe County.

The Third Creek Drainage, shown in Figure 15, is located on the southern slope below Rose Knob Peak and Mud Lake. During the field study, two large starting zones were identified in this area, each capable of accumulating large amounts of snow and producing large destructive avalanches that can run long distances.

From an elevation of 9,600 feet, the Rose Knob Peak avalanche path falls 2,460 feet to an elevation of 7,140 feet at SR 431. Slope angles range from 35 degrees near the top to 4 degrees above the highway. The average slope angle from the top of the study slope to the highway is 18 degrees. The top 280 feet is a large, open, southwest-facing bowl with an average slope angle of 33 degrees. Its ground surface is primarily loose scree and talus.

From an elevation of 9,140 feet, the Mud Lake avalanche path falls 2,000 feet to an elevation of 7,140 feet at SR 431. Slope angles range from 40 degrees near the top to 4 degrees above the highway. The top 1,140 feet consists of three shallow, open southwest-facing drainages. Ground surfaces are mostly loose scree, which does not anchor the snowpack, even in shallow snow.

The southeast-facing slope at the Third Creek drainage northwest of the end of Jennifer Street is steep enough to produce avalanches and may receive heavy snowfall. While large amounts of snow can accumulate on this slope when storm winds are from a westerly direction, storm winds from a more southerly direction can be expected to scour much of this slope above an elevation of 7,840 feet. From an elevation of 8,280 feet, the studied slope falls 915 feet to an elevation of 7,320 feet at the Third Creek drainage. Slope angles range from 37 degrees near the top to near zero degrees at Jennifer Street. The average slope angle from the top of the study slope to the Third Creek drainage area is 21 degrees.

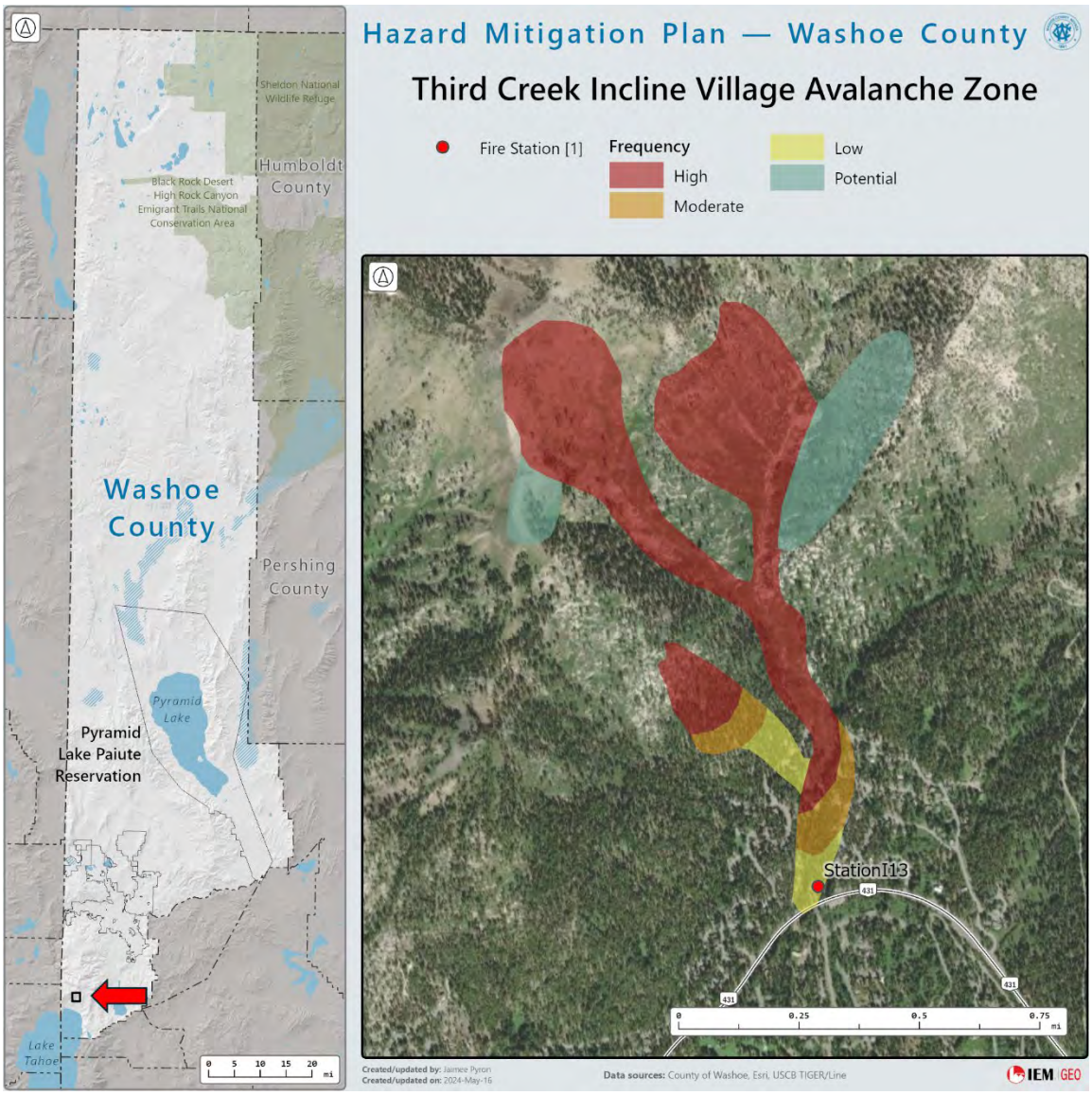


Figure 15: Third Creek Incline Village, Rose Knob Peak, and Mud Lake Avalanche Zone

The west-facing slope east of Sand Harbor, shown in Figure 16, is steep enough to produce avalanches and may receive heavy snowfall. While large amounts of snow can accumulate on this slope when storm winds are from a southerly direction, storm winds from a more westerly direction can be expected to scour much of this slope. From an elevation of 8,160 feet, the study slope falls 1,910 feet to 7,250 feet near the lake. Slope angles range from 37 degrees near the top to nearly zero degrees at the lake. The average slope angle from the top of the study slope to the lake level is 21 degrees. The top 1,170 feet has an average slope of 30 degrees, and its ground surface is mostly loose sand with some low brush and scattered trees.

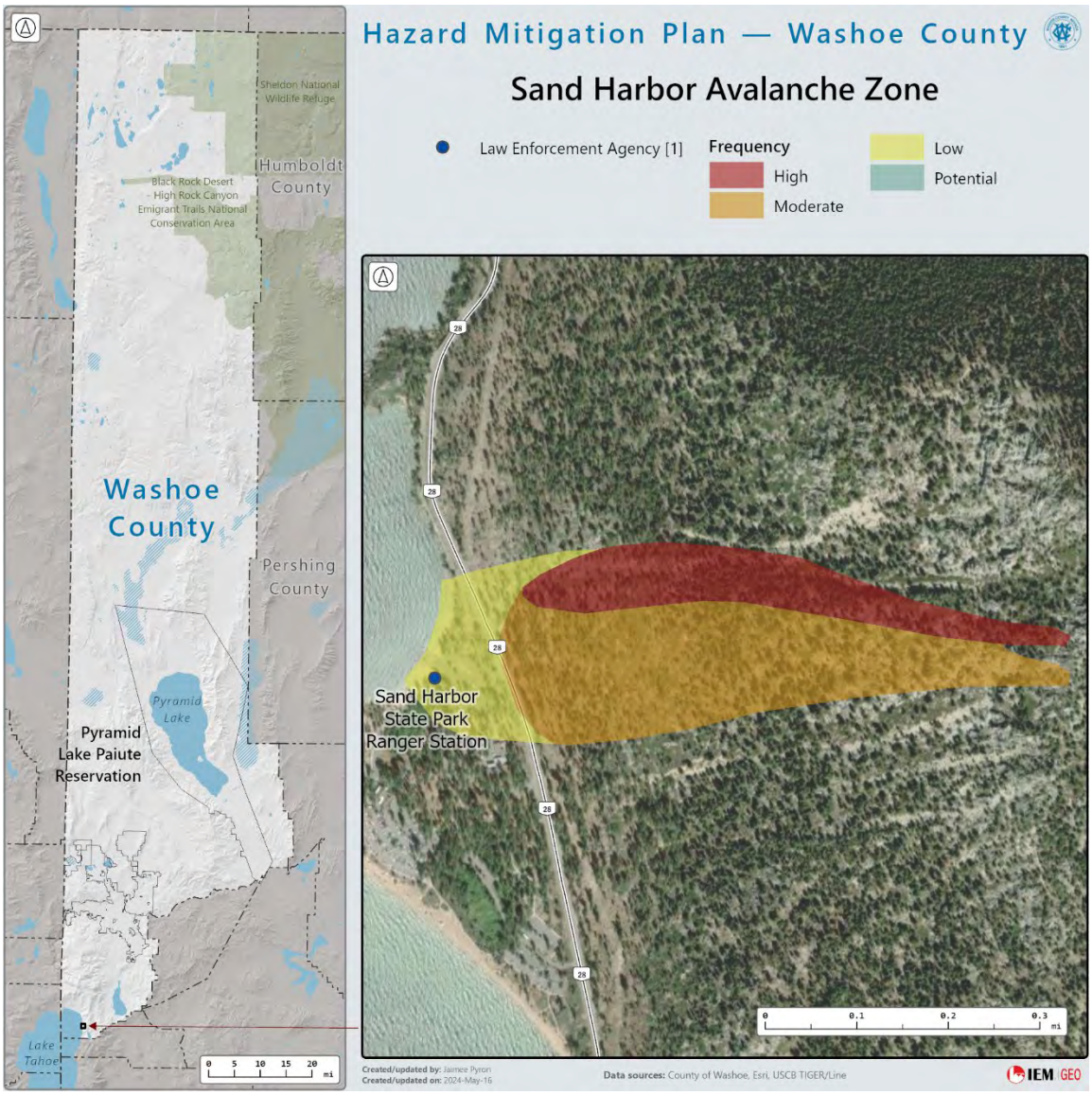


Figure 16: Sand Harbor Avalanche Zone

The Crystal Bay avalanche path, shown in Figure 17, is located on the southeastern slope of Peak 7,350, sometimes referred to as Crystal Bay Hill. The field study identified several small starting zones in this area, which can accumulate large amounts of snow and produce large destructive avalanches that can run long distances. From an elevation of 6,320 feet, the more significant southern portion of the slope drops 1,100 feet to an elevation of 6,220 feet at Lake Tahoe. The average slope angle from the top of the study slope to the edge of the lake is 23 degrees.

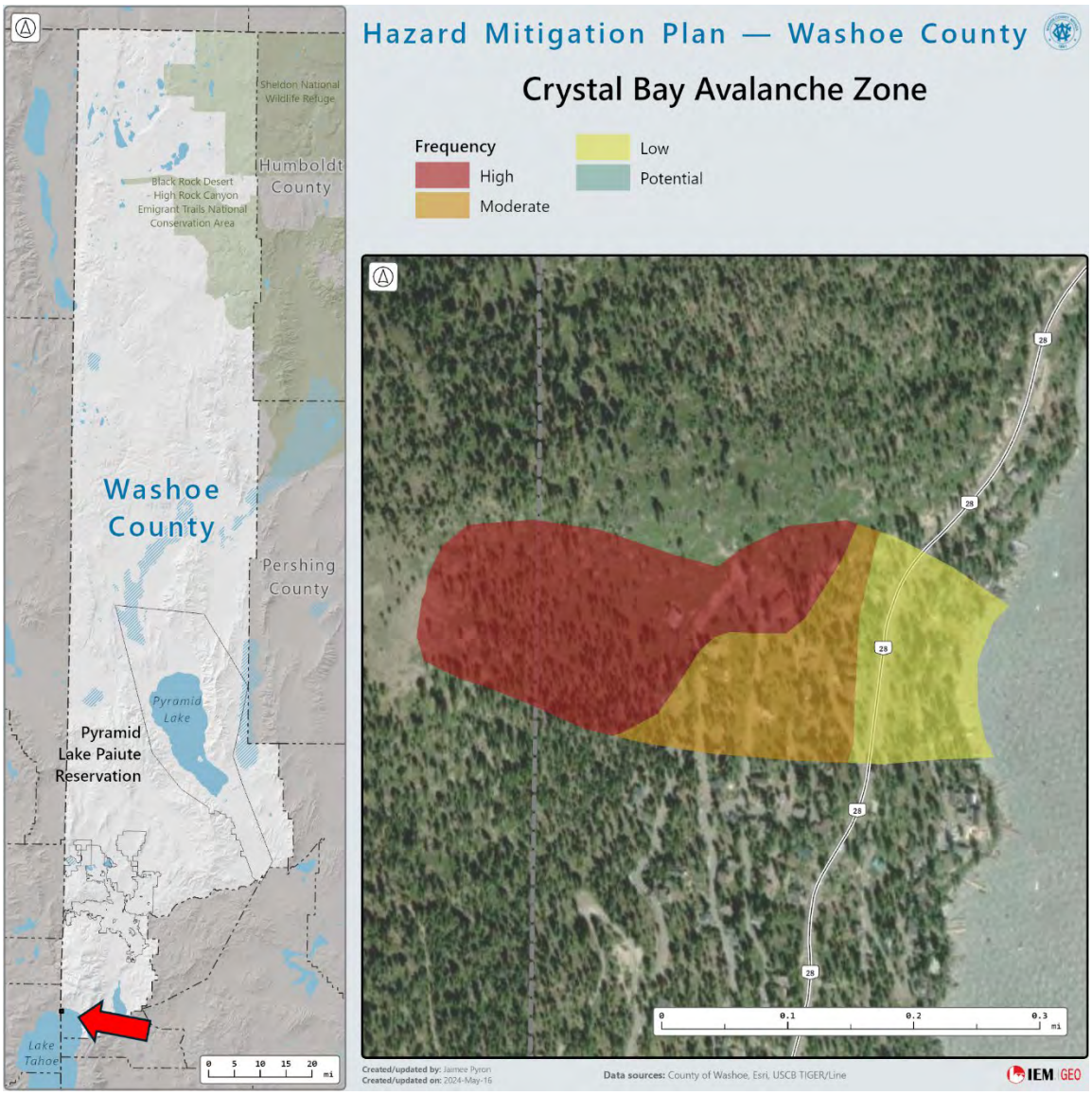


Figure 17: Crystal Bay Avalanche Zone

Figure 18 shows approximate areas identified by NDOT where avalanche control activities commonly take place. These zones were adapted from a hand-drawn map NDOT provided, highlighting avalanche risk areas along SR 431 and 878. Six areas are identified by NDOT, including Hurricane Point and Nightmare. It is important to note that these areas are approximations based on the hand-drawn map and highway mile markers.

The Mount Rose Ski Area, south of SR 431, is located on the eastern slope of the Carson Range of the Sierra Nevada Mountains and contains several slopes prone to avalanches. The Chutes, including the Beehive, consist of 40–55-degree slopes over 1000 feet long on a north-facing slope.

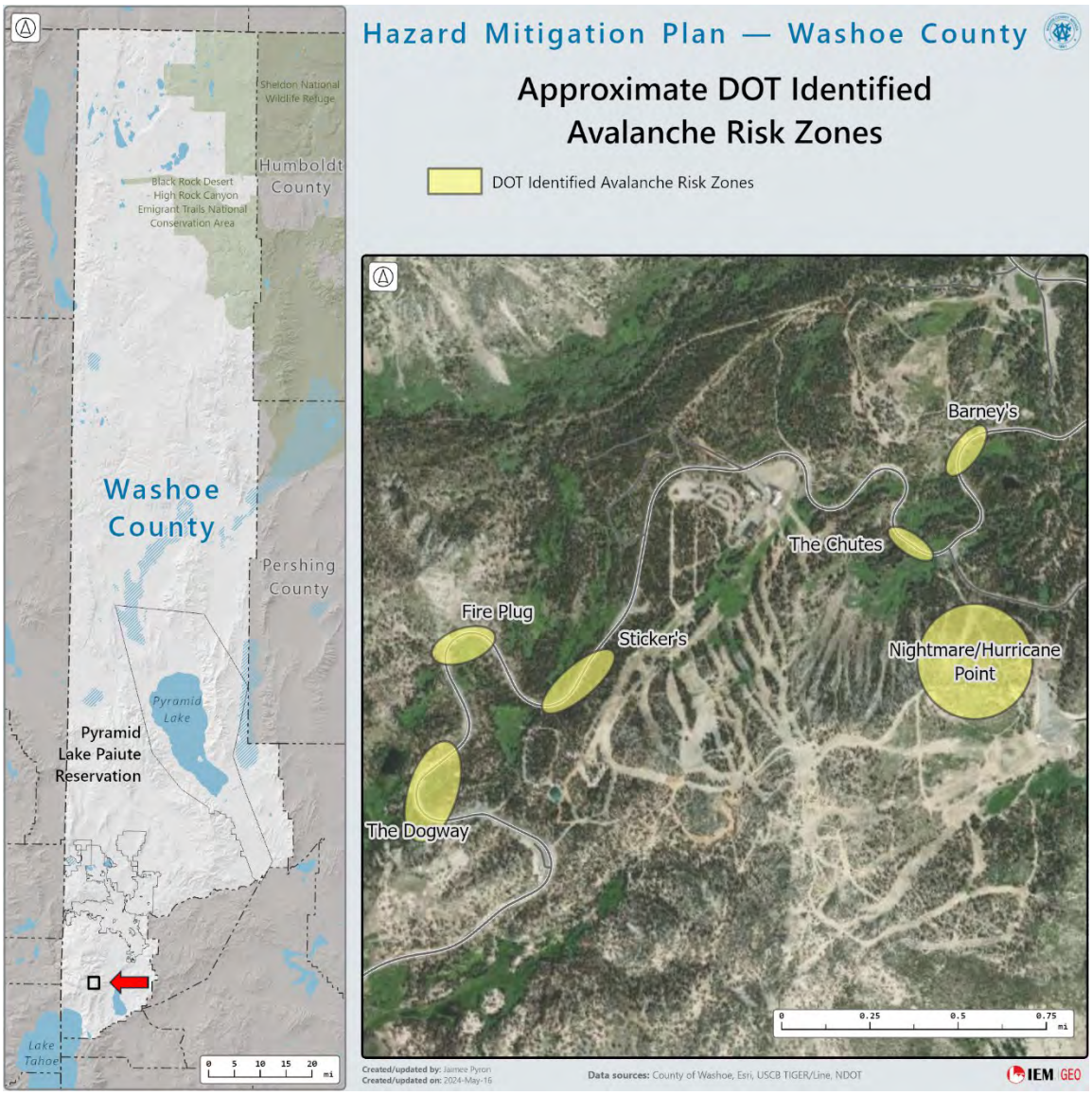


Figure 18: Approximate DOT Avalanche Risk Zones

The geographic extent of potential avalanches is relatively small—less than 10% of the planning area. Secondary impacts, such as blocked roads, can affect larger areas and cause detours. Avalanche risk is highest in the steep, mountainous regions of the Carson Range of the Sierra Nevada in southwestern Washoe County. Incline Village and Crystal Bay are commonly under avalanche advisories during the winter.

A snow fence has been proposed as a mitigation measure to reduce the potential for avalanches. According to the Sierra Avalanche Center, the Mount Rose and Rose Knob Peak areas receive avalanche advisories more often than any other region in the County.

LANDSLIDE

Certain areas are more susceptible to landslides than others. Regions with steep slopes, loose soil or rock, and heavy rainfall are particularly prone to landslides. Additionally, areas previously disturbed by human activities such as construction, mining, or deforestation are at higher risk. Landslides in Nevada are typically confined to specific areas and generally result in less severe economic consequences than hazards that affect larger regions. Landslide hazard areas include foothills and mountain areas with fractured and steep slopes.

These areas in Washoe County include the Sierra Nevada Mountains foothills just southwest of Reno, the Virginia Mountains along the western side of Pyramid Lake, the Pah Rah Range just south of Pyramid Lake, and the Carson Range of the Sierra Nevada in southern Washoe County near Lake Tahoe (see Figure 19).

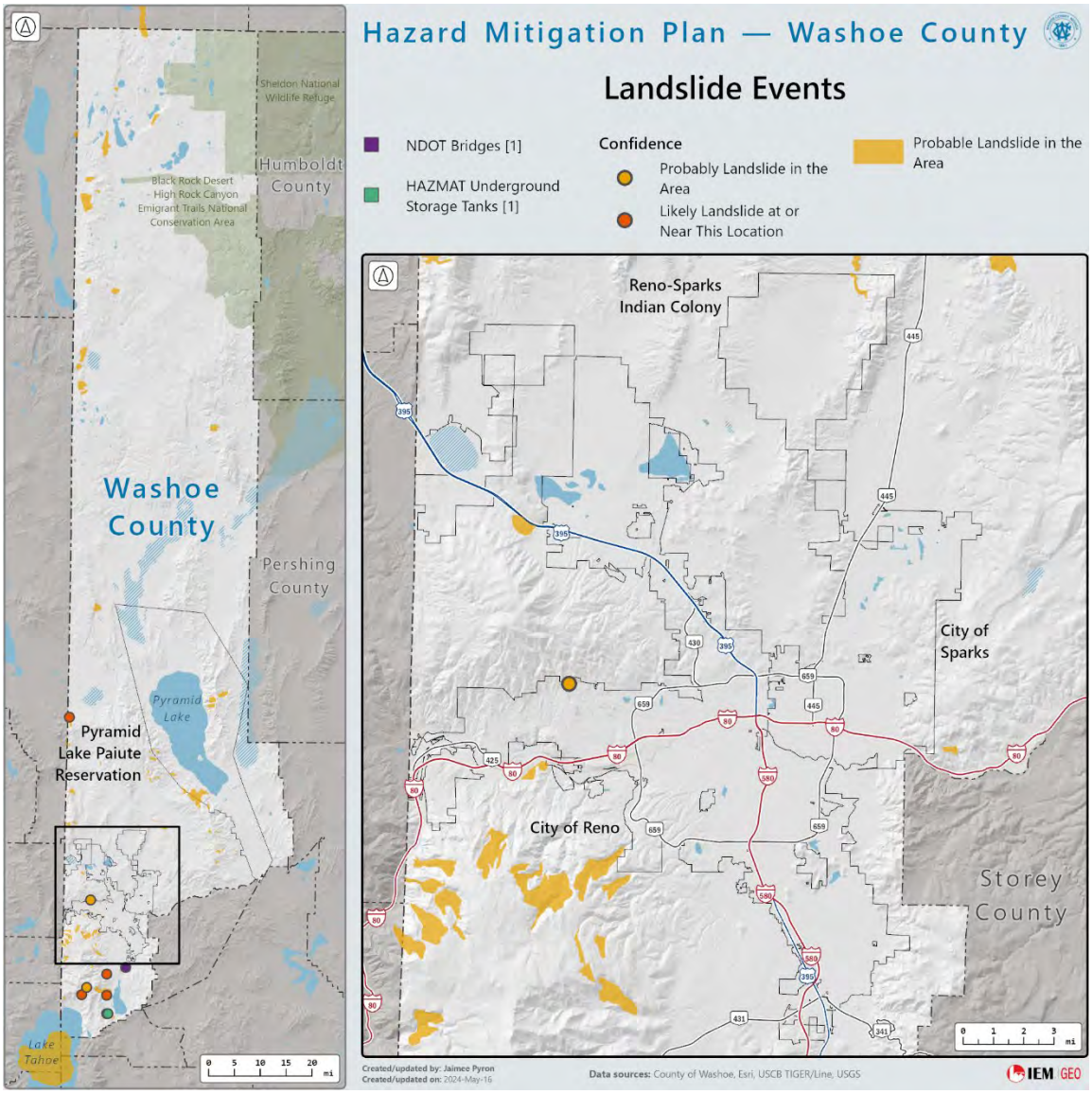


Figure 19: Landslide Hazard Areas in Washoe County

In Washoe County, landslides primarily occur along fractured or steep slopes (greater than 15%) or steep banks of rivers and creeks. Areas with steep slopes are usually not heavily populated, and most are on federal or state land.

Extent

AVALANCHE

In Washoe County, the overall magnitude and severity of the impacts of avalanches are generally classified as Very Low. Secondary impacts, such as blocked roads, can affect larger areas and cause detours. However, places like Incline Village/Crystal Bay and sections along Mount Rose Highway above Galena Park face Moderate avalanche impacts. In response to typical avalanche effects, local resources, including state, county, and local agencies, such as the Incline Village General Improvement District and North Lake Tahoe Fire Protection District, are deployed. Search and rescue efforts are facilitated by local volunteers organized through the County Sheriff's Office, while road-clearing operations are typically managed by state or county resources.

The magnitude of an avalanche is related to frequency in that large destructive avalanches occur less frequently than smaller ones in an avalanche path. The frequency of avalanche events reaching a specific location in an avalanche path declines with the location's distance from the starting zone.

Estimates of magnitude are described in terms of the Avalanche Size–Destructive Force classification, which is based on the destructive potential or consequences of snow avalanches (see Table 17). Scaling parameters of typical mass and path length are also included. The maximum size class (destructive effect) for a given avalanche path relates to the snow supply (depth of avalanches) and terrain (area, length, configuration, and incline of the avalanche path). Size D1 avalanches are relatively harmless. Size D2 avalanches are unlikely to damage or bury a vehicle on a road, but higher frequency Size D2 paths may become a driving hazard for vehicles. Size D3 avalanches could be expected to bury or destroy a pickup truck.[41]

Although avalanche effects are usually brief, lasting less than three days, the economic impact tends to be concentrated in the immediate affected community or regional/local transportation network. In worst-case scenarios, avalanche responses may require coordinated efforts from state, county, and local levels, potentially impacting critical facilities and disrupting services for 4 to 7 days.

[41] Washoe County Avalanche Analysis Report, David Hamre and Associates, LLC, 2023.

Table 17: Avalanche Size – Destructive Force (American Avalanche Association, 2022)

Size	Avalanche Destructive Potential	Typical Mass (t)	Typical Path Length (m)
D1	Relatively harmless to people.	<10	10
D2	Could bury, injure, or kill a person.	102	100
D3	Could bury and destroy a car, damage a truck, destroy a wood-frame house, or break a few trees.	103	1,000
D4	Could destroy a railway car, large truck, several buildings, or substantial amounts of forest.	104	2,000
D5	Could gouge the landscape. Largest snow avalanche known.	105	3,000

To mitigate risks, transportation corridors have been strategically constructed to avoid avalanche hazards and are diligently maintained with state and local resources. Most avalanche events primarily affect roads in the Tahoe basin and those traversing the Sierra Nevada, closely monitored during heavy snowfall to ensure motorist safety. Active avalanche mitigation measures, such as road closures for avalanche control work on SR 431 (Mount Rose Highway) by NDOT, may lead to delays and detours for motorists and truckers.

While avalanche events predominantly occur in unpopulated areas under the ownership of the United States Forest Service (USFS), the risk to human life increases with winter recreation activities in these regions, including snowmobiling, backcountry skiing and snowboarding, climbing, cross-country skiing, and snowshoeing.

LANDSLIDE

Landslide hazard areas in Washoe County include foothill and mountain areas where fractured and steep slopes are present. These areas include the Sierra Nevada Mountains foothills just southwest of Reno, the Virginia Mountains along the western side of Pyramid Lake, the Pah Rah Range just south of Pyramid Lake, the Lake Range east of Pyramid Lake, mountain ranges to the west of Long Valley in the northwestern part of the County, and the Carson Range of the Sierra Nevada in Southern Washoe County near Lake Tahoe. Small slides and slumping may occur along the steep banks of rivers and creeks. Areas where steep slopes are present are not generally heavily populated, and most are located on federal or state land. The overall magnitude and potential severity of impacts from a landslide is considered Medium.

Less severe landslide events could be handled at the state or county level, disrupt services for 4 to 7 days, and have minor economic impacts on a communitywide scale. Considering a worst-case scenario, a landslide event could require state- or county-level support, impact critical facilities, disrupt services for 8 to 14 days, and have countywide economic impacts.

Previous Occurrence/History

AVALANCHE

The avalanche history in Table 18 was gathered from various resources and includes adjacent areas of the northern Sierra Nevada in California that would impact emergency services in northern Nevada. It contains data from the Sierra Avalanche Center's annual reports (SAC). This information is used to create daily avalanche advisories available to the general public. It generally includes only those avalanches that caused injury, death, evacuations, or substantial property damage. Additional data were included from the USFS National Avalanche Center, Colorado Avalanche Information Center, and the American Avalanche Association's (A3) educational website, www.avalanche.org.

The Washoe County Avalanche Analysis Report includes additional descriptions of the 1986 avalanches. In late February 1986, two very large avalanches occurred in a 10-hour period in the upper Third Creek drainage of Mount Rose Wilderness Area and ran into the lower, inhabited drainage of the Third Creek subdivision. These D4-sized avalanches swept across the Jennifer Street Cul-de-sac, uprooted and entrained mature timber, destroyed a water supply bridge, and filled the 75' deep by 200' wide ravine that divides the subdivision. With avalanche debris cutting through the neighborhood, the threat of subsequent avalanches running further than ever suspected was a serious risk. The position of the homes just above the gully was critical to the absence of injuries and property damage. The water tank reservoir near Mercury Court was hit, and debris came within several hundred feet of the North Lake Tahoe Fire Protection District (NLTFPD) Station 13 and Mount Rose Highway. Records from 1995 indicate that debris from a D3 event reached the lower drainage but was confined in the gully.[42]

Table 18: History of Avalanche Occurrences in Nevada and Adjacent Sierra Nevada

Date	Location	Description/Injuries/Damage
11/16/2017	Hourglass Bowl, Tamarack Peak, Mt. Rose Ski Area, Nevada	Three skiers were caught and partially buried; one suffered minor injuries.

[42] Washoe County Avalanche Analysis Report, David Hamre and Associates, LLC, 2023.

Date	Location	Description/Injuries/Damage
2/20/2017	Mt. Rose Ski Area, Nevada	An avalanche buried Mt. Rose highway with about 20 feet of snow. No injuries were reported. Mt. Rose ski area closed the following day because of the avalanche.
1/5/2017	Mt. Rose Ski Area, Nevada	Two backcountry skiers escaped an avalanche unharmed. The avalanche closed Mt. Rose Highway, about 30 miles southwest of Reno, and two vehicles were stuck.
12/10/2016	Mt. Rose Chutes – Closed Area, Nevada	Two skiers hiked/traversed into closed, uncontrolled terrain at Mt. Rose. The first skier triggered a large avalanche and was swept away 600–1000 ft downslope. The skier's body was found the next day.
12/23/2012	Sierra Nevada	Up to 5 feet of snow in the Sierra Nevada caught several skiers and snowboarders, most of whom could dig themselves out and survive. Still, an Alpine Meadows veteran ski patroller was caught and died in a "controlled" avalanche released by a detonated charge. A snowboarder was buried and killed in a separate avalanche event at Donner Ski Ranch a day earlier.
2/12/2007	Mount Rose Ski Area, Nevada	An avalanche severely injured one ski patrol member at Extreme Chutes of Ski Tahoe resort; the skier was not buried.
3/1/2006	Washoe County, Nevada	Avalanche advisories were issued for Crystal Bay Subdivision and Third Creek area.
12/15/2002	Mt. Rose Ski Resort, Nevada	East of Mt. Rose, one snowboarder was caught and killed, and an avalanche in our out-of-bounds area injured two.
12/1/1997	Mount Rose Highway, Nevada	An explosive triggered an avalanche in the Beehive area of the Chutes. The highway was closed, and there were no injuries or deaths.
2/18/1986	Sierra Nevada, Nevada	Avalanches blocked both I-80 and Amtrak train tracks west of Reno. No deaths or injuries directly related.
1/29/1972	Mount Rose Ski Area, Nevada	Seven injuries and two deaths at "The Chutes" ski area. The ski area was closed.
1/2/1969	Slide Mountain at Mount Rose Ski Area, Nevada	One death.

Landslides

Evidence of landslides can be found throughout the County. Such events frequently follow other natural occurrences, such as earthquakes and intense rainstorms.

Previous Occurrence/History

The most severe landslide in Nevada's history occurred on May 30, 1983, when a 30-meter section of rock and soil detached from the southeast face of Slide Mountain, Nevada. This was caused by unusually wet weather in the winter of 1982–1983, with a record snowpack and recent warm weather in late May. The slide resulted in various slope movements, such as rock slumping, rockfall avalanches, and debris avalanches. The area where the rock slumping occurred had large blocks that were 90 meters or more wide. The movement of the rock slump downslope was indicated by the displacement of tree lines, showing that the maximum movement was about 75 meters. The material that entered Upper Price Lake displaced most of the lake water, overflowing and breaking through a low dam, sending water rushing down the Ophir Creek Gorge. When it emerged from the Gorge, the debris flow spread out into the Washoe Valley, causing destruction and damage to houses, resulting in one fatality and covering old U.S. Highway 395.[43]

Table 19: Landslides in Washoe County

Date	Location	Description/Injuries/Damage
4/25/2008	City of Reno	A rockslide set off by earthquake was blamed for causing a 125-foot breach in a wooden flume that carried water to one of Reno's two water treatment plants
5/30/1983	Ophir Creek on the eastern slope of Slide Mountain in Washoe Valley	A landslide-induced flood, rapidly moving flow emerged from a canyon and killed one person, injured several others, damaged 11 homes, and caused the evacuation of 5,000 people. The unusual hydraulics were caused by unseasonably hot weather, which accelerated an abnormally heavy snowpack. Highway 395 and Freeway 395 were both closed.

[43] Events Nevada, "Slide Mountain, Nevada 1983." https://www.eventsnevada.com/SlideMtn1983.html#:~:text=Slide%20Mountain%201983&text=At%20about%20noon%20on%20May,Washoe%20Valley%20to%20the%20east



Figure 20: Photo of the Slide Mountain Landslide, May 30, 1983[44]

Probability of Future Occurrence

AVALANCHE

The 2023 Enhanced SHMP reports that Washoe County is one of the areas in the state that is expected to experience the highest annual losses due to avalanches. Due to the steep mountainous terrain, high elevations, and winter snows common on the eastern slopes of the Sierra Nevada range, minor avalanches with negligible impact occur annually or semiannually in Washoe County. More severe avalanches that cause injuries, damage property, or impact roadways arise less frequently.

The probability of severe avalanche events that impact public safety, property, or infrastructure is considered Medium, with roughly a 14% chance of occurrence each year. This indicates that high-risk avalanches typically occur between once in 10 years and once in 100 years in Washoe County. On a smaller scale, the 2023 Avalanche Analysis Report categorized Third Creek as having a potential for avalanches affecting the lower inhabited draining between every 20–50 years or a 30-year average return period. Avalanche impacts in the Crystal Bay area on the upslope side of Tuscarora Road occur approximately once every 3 years. The Sierra Avalanche Center monitors specific avalanche probability and provides forecast data for the Lake Tahoe-Sierra region on the following website: https://www.sierraavalanchecenter.org/. Figure 21 shows the Sierra Avalanche Center's forecast area.

[44] Nevada Bureau of Mines and Geology, MyNews4, "Photo of Slide Mountain landslide May 30, 1983," https://mynews4.com/news/knowing-nevada/knowing-nevada-the-disaster-at-slide-mountain



Figure 21: Map of Sierra Avalanche Center's Forecast Area[45]

Avalanches are complex phenomena because of the complicated interactions of weather, climate, and snowpack structure. USGS research assessing current and future trends in avalanche activity aims to fill a knowledge gap needed to improve forecasting and public safety, protect resources, and lend insight into the ecological role of avalanches. By coupling these avalanche chronologies with historic climate data, USGS scientists tease apart the topographic and climate factors that contribute to avalanche occurrence at local and regional scales. These techniques assist with the understanding of avalanche cycles in the broader context of atmospheric circulation patterns, such as the Pacific Decadal Oscillation (PDO) or El Niño Southern Oscillation (El Niño and La Niña). Through careful dissection of the connections

[45] 2018 Nevada Enhanced SHMP, Sierra Avalanche Center, "Map of Sierra Avalanche Center Forecast Area." https://www.sierraavalanchecenter.org/

between past climate and avalanche cycles, USGS scientists aim to improve avalanche forecasts to reduce the loss of property and life.[46]

The 2023 Enhanced SHMP states the following regarding climate change:

- Research done by the NWS representative on our NHM Working Group indicates that climate change could have some minor effects on the frequency of avalanches in the future. Snow levels, on average, may be higher in Nevada if climate change trends continue.
- At this time, the NHMWG does not have sufficient data to develop a quantitative assessment of the impact of climate change on avalanches.

LANDSLIDE

Due to the past frequency of landslides in areas of the County with steep slopes and the likelihood of triggering storms, the probability of future occurrence of landslides is Medium. The County may be impacted by an increase in the probability of future landslides, based on potential increases in drought and wildland fires and changes in winter precipitation.

The 2023 Enhanced SHMP states the following regarding landslide and climate change:

- Incline Village areas are noted as being particularly vulnerable.

Vulnerability Analysis – Avalanche

Mountain communities in the Lake Tahoe Basin, including Incline Village and Crystal Bay, are vulnerable to the effects of avalanches. When avalanche conditions are present, risks are highest for recreational users and others in backcountry areas who may trigger avalanches or be injured or killed by an avalanche. In addition to injuries and deaths, avalanches can damage or destroy property and utilities and cover roadways in snow. Transportation disruptions caused by avalanches or area closures because avalanche risks can have economic impacts on ski resorts and other businesses in the Lake Tahoe Basin over a period of days to a week or more.

CRITICAL FACILITIES

Figure 22 shows critical facilities in avalanche hazard zones, which include North Lake Tahoe Fire Protection District Station 13 and the Sand Harbor State Park Ranger station. As noted previously, SR 431 and 28 are crucial transportation routes to Incline Village and other

[46] USGS, Northern Rocky Mountain Science Center, "Examining Snow Avalanche Frequency and Magnitude," 2021. https://www.usgs.gov/centers/norock/science/examining-snow-avalanche-frequency-and-magnitude

communities in the North Tahoe area. Road closures caused by avalanche or during avalanche control efforts can isolate motorists or disrupt delivery services or goods to those communities.

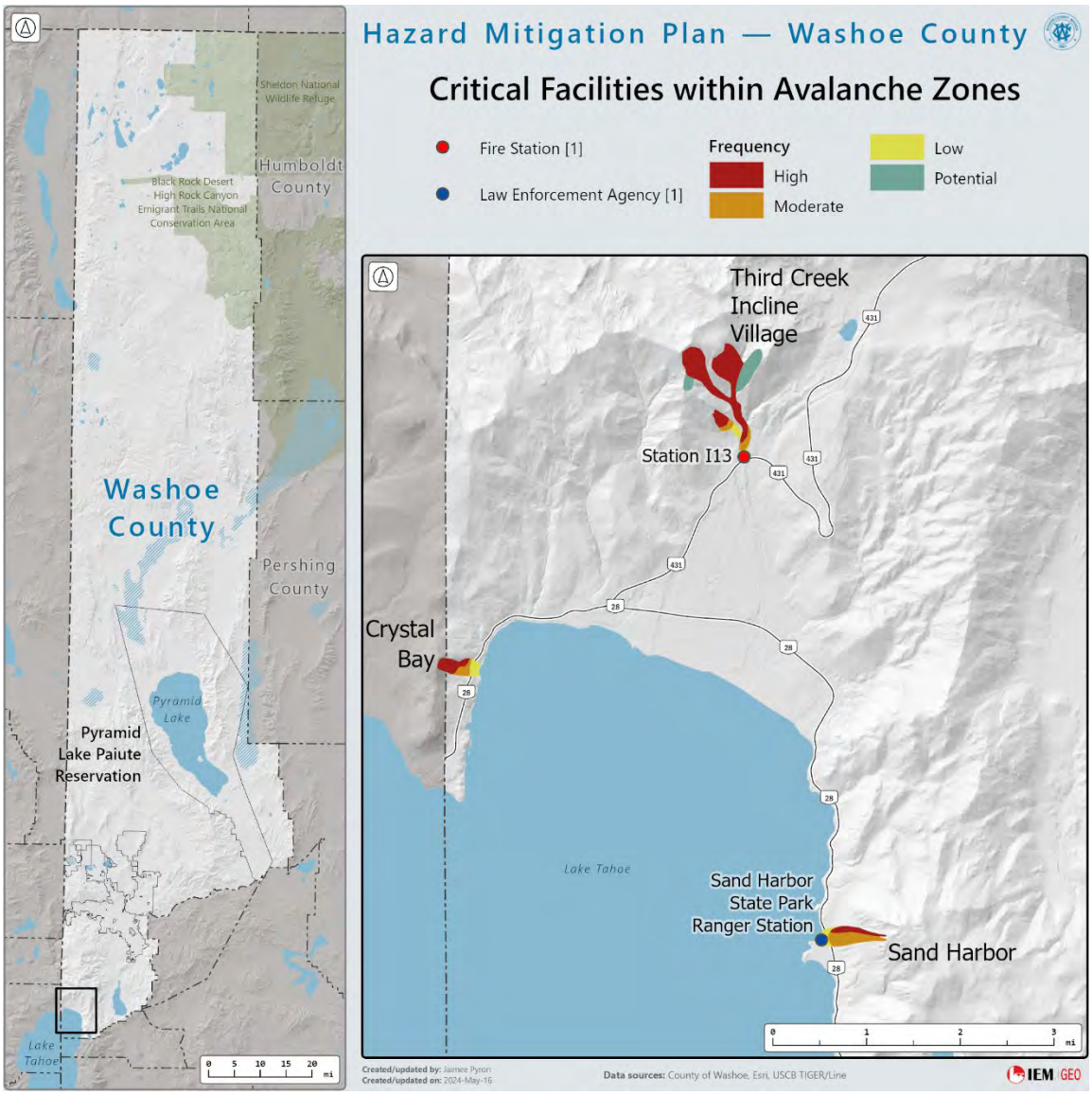


Figure 22: Critical Facilities in Avalanche Zones

ESTIMATED IMPACT AND POTENTIAL LOSSES

When avalanches intersect with humans, there can be substantial costs associated with impacts on commerce, damage to infrastructure, and loss of human life. In the western United States, avalanches are the most frequently occurring lethal form of mass movement and, on an annual basis, cause more fatalities than earthquakes and all other forms of slope failure combined.

They can also impact roads and railways, causing substantial damage and disruption to commerce.[47]

Snow avalanches are a severe natural hazard in the mountainous regions of western North America, destroying property, disrupting transportation networks and recreational facilities, and occasionally causing deaths. Annual numbers of avalanche accidents and fatalities in the United States have increased steadily, with the average national annual fatality rate of around 25 by the late 1990s being more than five times greater than the average rate in the early 1950s. Economic losses from avalanches are difficult to assess, but conservative estimates show that they amount to millions of dollars each year when accounting for property damage, snow removal from highways, and avalanche rescues.[48]

Due to the age of the 1993 avalanche hazard zone data, there is concern as to whether it is appropriate for use in asserting specific qualitative impacts and losses to structures at risk to avalanche in each of those zones. The 2023 Avalanche Analysis Report provides recommendations on the development of updated avalanche risk zone maps and other resources. It also provides the following detailed qualitative description of potential impacts, particularly in the Third Creek and Crystal Bay areas.[49]

In Third Creek, several overlapping avalanche paths funnel into sub-drainages with steep-sided gullies that converge, forming a lower drainage between Jennifer Street and Apollo Way. The ravines confine a lot of avalanche debris and impact forces and can prevent smaller slides from running further distances. As the gullies fill and become less confined and/or in the rare events of a very large avalanche or multiple large starting zones releasing in short succession, debris may affect the lower inhabited drainage area. The houses high in the subdivision and close to the ravine are at the greatest risk. It should also be noted that the ravines can be a dangerous terrain trap for individuals recreating in the area, as small (size D2) avalanches could bury, injure, or kill a person. The report also identified a water tank near Lunar Court, partially protected from runout zones, and a reservoir in lower drainage near Mercury Court, which was previously hit in 1986. Debris from this avalanche came within several hundred feet of the North Lake Tahoe Fire Protection District Station 13, located further downslope in the Third Creek drainage.

The Crystal Bay Avalanche Path has a history of impacting homes and roads. Most impacts have been near the north end of Tuscarora Road after the junction with Lakeview Avenue. Teresa Court also has been impacted, although there were no details in the report. Goshute, Amagosa, and Lower Wassou Roads also can be affected. The terraces created by the roads offer a

[47] USGS, Northern Rocky Mountain Science Center, "Examining Snow Avalanche Frequency and Magnitude," 2021. https://www.usgs.gov/centers/norock/science/examining-snow-avalanche-frequency-and-magnitude

[48] FEMA, Preparedness Community, Avalanche Impact, 2024. https://community.fema.gov/ProtectiveActions/s/article/Avalanche-Impact

[49] Washoe County Avalanche Analysis Report, David Hamre and Associates, LLC, 2023.

catchment that would likely interrupt the debris flow and prevent far-running slides. However, they can also act as dangerous terrain traps for vehicles and pedestrians.

Cascading impacts of avalanches may include utility failure, economic losses from structural damage or impeding transportation routes, fatalities, transportation accidents, floods, debris flows, and diminished water quality.

In Washoe County, the expected annual loss (EAL) value for avalanche is $104K, with a rating of relatively low expected annual losses, and an NRI score of 41.8 (Figure 23).

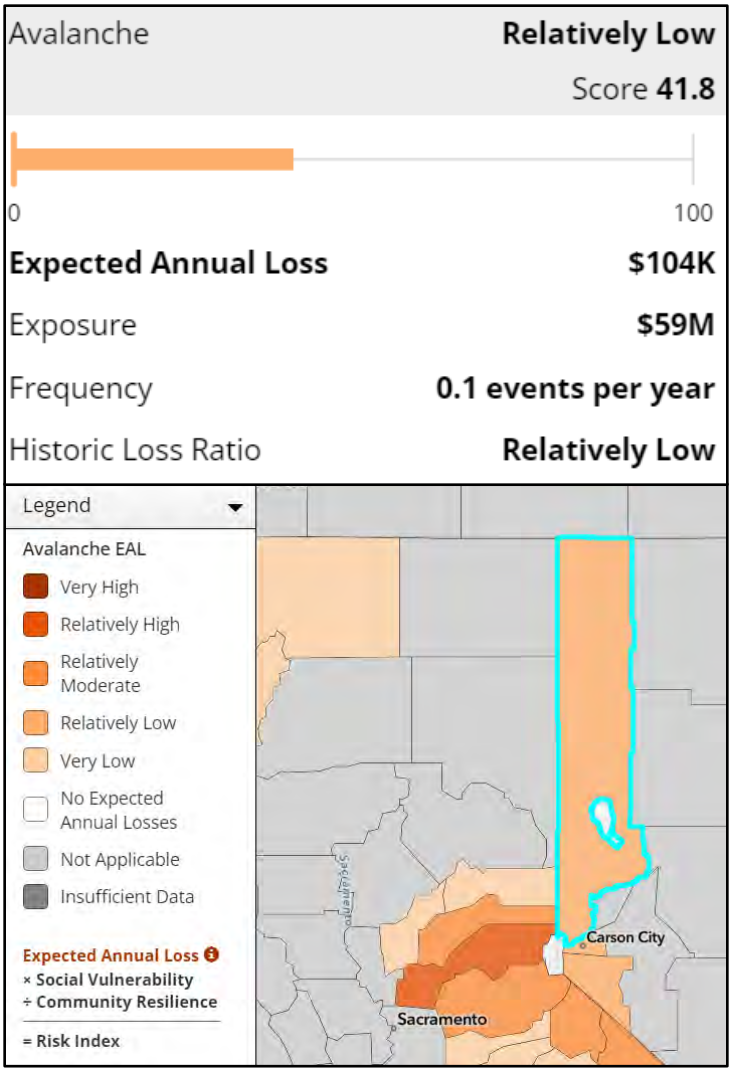


Figure 23: Washoe County Avalanche Expected Annual Loss Score, Map, and Legend[50]

[50] FEMA, National Risk Index, "Washoe County Avalanche Expected Annual Loss Score, Map and Legend." https://hazards.fema.gov/nri/map

VULNERABLE POPULATION

People caught in avalanches can die from suffocation, trauma, or hypothermia. An average of 28 people die in avalanches every winter in the U.S.[51] Most avalanche-related injuries and fatalities will likely continue to be related to recreationalists drawn to the steep snow-covered slopes prone to avalanches, and most developed ski areas have avalanche control measures and rescue teams on site to deal with avalanche-related emergencies. However, an ever-increasing number of outdoor enthusiasts use snowmobiles in undeveloped areas with no avalanche controls or available emergency personnel. In 2009, twice as many snowmobilers died in avalanches in the U.S. as did participants in any other winter sports activities. As the population increases and as more snowmobilers venture into the winter backcountry, avalanches may become an increasing threat in Nevada in the future, but currently, they do not account for a large number of deaths or injuries in this state. As shown in Figure 24, there were only two snowmobiler fatalities in Nevada between 1951 and 2016.[52]

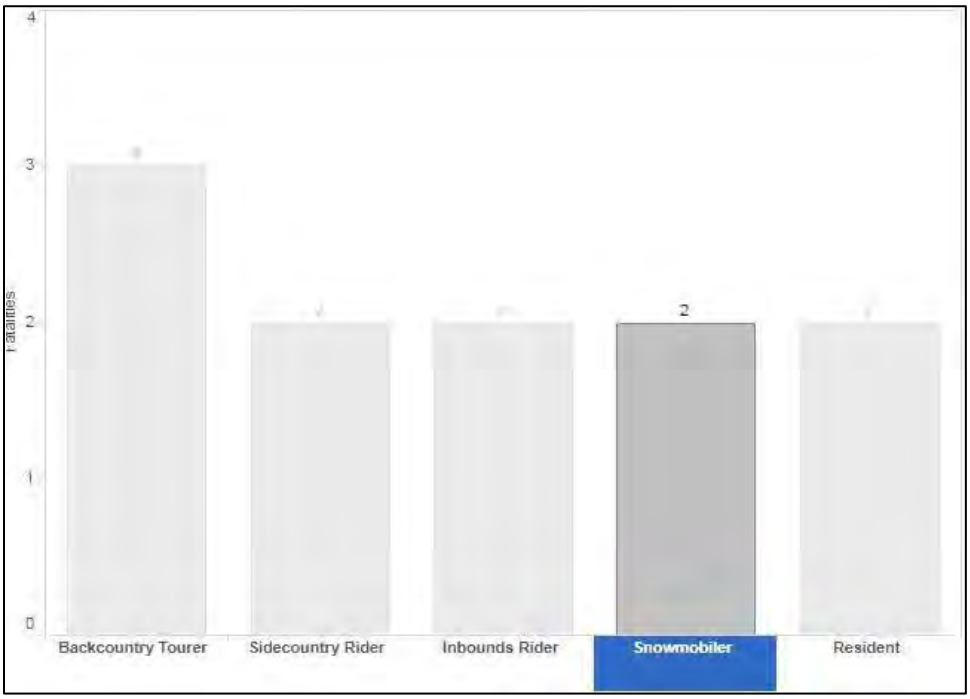


Figure 24: Avalanche Fatalities by Primary Activity in Nevada, 1951–2016

[51] FEMA, Preparedness Community, Avalanche Impact, 2024. https://community.fema.gov/ProtectiveActions/s/article/Avalanche-Impact

[52] 2018 Nevada Enhanced SHMP, Colorado Avalanche Information Center, "Avalanche Fatalities by Activity in Nevada, from 1951–2016." http://avalanche.state.co.us/?s=avalanche+statistics

COMMUNITY LIFELINES



Avalanches present significant risks to safety and security, often striking suddenly. Emergency services must be prepared for rapid search and rescue operations, ensuring they have the resources to respond effectively to protect lives.

Access to food, hydration, and shelter can be severely affected, as blockages from snow and debris hinder supply deliveries. Emergency shelters may be necessary for displaced individuals, making it vital for local authorities to coordinate relief efforts quickly.

Health and medical systems can become overwhelmed due to injuries, requiring rapid deployment of medical personnel and resources to ensure adequate care for those affected.

Energy infrastructure is particularly vulnerable, as avalanches can damage power lines, leading to outages. Restoring energy quickly is crucial for heating, communication, and medical equipment.

Transportation routes may also be blocked, complicating access for emergency services and supply deliveries. Efforts must be made to clear roads to facilitate rescue operations.

Hazardous materials can pose additional risks if stored near avalanche-prone areas, leading to potential spills and contamination. Monitoring these risks is essential during an event.

Communication systems may be compromised, challenging coordination during emergencies. Maintaining effective communication is critical for safety and operational efficiency.

Finally, water systems can be damaged or contaminated, making it vital to ensure access to safe drinking water for affected communities.

EXISTING MITIGATION CASE STUDY

For all development in unincorporated areas of the County in identified avalanche hazard areas, developers must complete a geotechnical study and comply with the study's final recommendations to reduce vulnerability to avalanches.

PROPERTY

North Lake Tahoe Fire Station 13 is in the northern part of Incline Village, in an area susceptible to avalanches.

DEVELOPMENT TRENDS

The County has installed a camera system above Crystal Bay to monitor snow conditions and provide early warning of avalanches. Planned future development in the Incline Village and Crystal Bay communities will occur primarily as an infill. The County reviews development proposals in these communities to identify and mitigate avalanche hazards. Risks in these areas have not changed. Avalanche hazard areas have been mapped near Incline Village and Crystal Bay, and development is directed away from these areas. Backcountry recreational areas and access roads may be more vulnerable to avalanche and landslides. Overall, the risk to these hazards has not changed since the last plan update due to changes in development.

VULNERABILITY SCORE

The NRI includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at the county and census tract levels. Table 20 provides an overview of each category for Washoe County.

Table 20: Risk Factor for Avalanche in Washoe County

	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
Avalanche	Very Low	High	Very Low	$104K	Low

Based on the NRI, Washoe County has a rating of very low for the risk index and a score of 35.1 for avalanche, which is lower than the national percentile (see Figure 25).

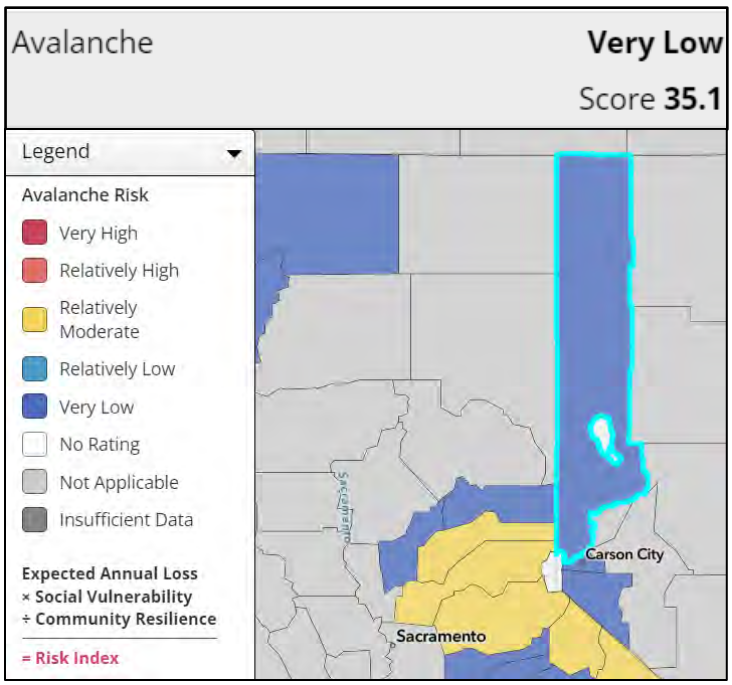


Figure 25: National Risk Index for Washoe County, Avalanche Score, Map, and Legend[53]

Vulnerability Analysis – Landslide

Landslides often occur with little or no warning and pose significant risks to the natural environment, human safety, property, infrastructure, utilities, and transportation, with impacts causing injuries or fatalities. Potential impacts of landslides include environmental disturbance, property and infrastructure damage, and injuries or fatalities. Landslide impacts are typically limited to those areas immediately surrounding the slope failure. The structural integrity of buildings in the affected area can be compromised, or the entire building can be destroyed. Roadways and drainage systems in affected areas also can be damaged or destroyed. Because landslides happen without warning, loss of life and injuries in affected areas are possible. Any damage from a landslide would most likely be localized. It is difficult to estimate the potential losses in a landslide event. It is assumed that while one major event may lead to significant losses, annualizing losses over an extended period is likely to yield a negligible annualized loss estimate for all jurisdictions exposed to this hazard.

Standard loss estimation methodologies are not currently available for estimating landslide damage. Sufficient historical data regarding events and associated losses were not available to quantify here. While damage associated with a single event could be significant at the location of the event, it is estimated that damage is most likely negligible when evaluated on an average annual basis.

[53] FEMA, "National Risk Index Washoe Avalanche Score, Map and Legend." https://hazards.fema.gov/nri/map

In Washoe County, the expected annual loss (EAL) value for landslides is $123K, with a rating of relatively moderate expected annual losses and an NRI score of 87.4 (Figure 26).

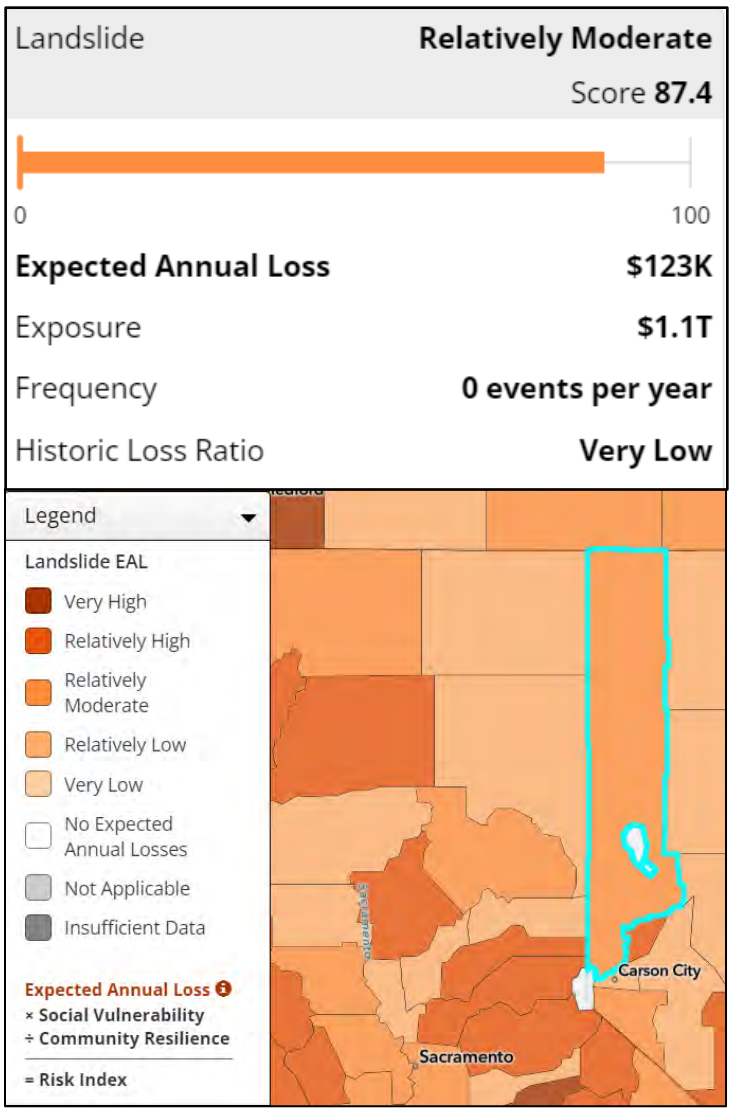


Figure 26: Washoe County Landslide Expected Annual Loss Score, Map, and Legend[54]

VULNERABLE POPULATION

The risk landslide has on people in the affected area can be devastating. Homes affected by landslides may become uninhabitable. If a road or rail line is in the path of destruction, then local transportation may be impacted, potentially complicating efforts to move people to a safe zone and/or to obtain vital supplies, such as food and water.

[54] FEMA, National Risk Index, "Washoe County Landslide Expected Annual Loss Score, Map and Legend." https://hazards.fema.gov/nri/map

Areas where landslides have probably occurred in the past are shown in Figure 19. Most of these are primarily in mountainous areas with little permanent population or development. There are three zones of past probable landslides on the west side of Washoe Valley. Based on Washoe County roof print data, 72 residences are within these boundaries. Based on an average household size of 2.64,[55] an estimated 190 people reside in these areas; 111 other buildings, including garages and sheds, are also in these areas.

COMMUNITY LIFELINES

The community lifelines of safety and security, food, hydration and shelter, health and medical, energy, transportation, hazardous materials, communications, and water systems are identified as at-risk due to avalanches. Transportation routes may disappear, leaving access to medical care, emergency services, and the purchase of necessities intangible until the event has been resolved. Limited communication may be available until powerlines and transformers have been restored. Homes may be damaged or destroyed, and due to power supplies being affected, water stations may be unable to pump water into homes and businesses. Depending upon the location of the avalanche or landslide, underground hazardous material tanks could be disrupted and leak into the surrounding soils and water supplies.



CRITICAL FACILITIES

Two facilities, one bridge, and one hazardous materials (HAZMAT) underground storage tank, were identified in areas of probable landslides. Several primary roads also have sections in these areas, including portions of Hwy 39, 580, and SR 677 in Washoe Valley. Some energy transmission lines also traverse these boundaries and could be disrupted if movement occurs in the future.

Washoe County's diverse spectrum of infrastructure encompasses transportation networks, energy grids, communications systems, water supply, and more. Each component shapes socioeconomic dynamics, provides essential services, and sustains Washoe County's vibrant

[55] U.S. Census Bureau Quick Facts.
https://www.census.gov/quickfacts/fact/table/NV,US/PST045223

culture and economy. Assessing, fortifying, and adapting the County's critical infrastructure is imperative to safeguard residents, preserve economic vitality, and pave the way for a more resilient future.

EXISTING MITIGATION CASE STUDY

The Nevada Department of Transportation (NDOT) and the Mount Rose–Ski Tahoe Mountain resort regularly control avalanche slopes that affect SR 431 to the east of the summit. NDOT uses a Gazex system for avalanche control in several areas along SR 431 between South Reno and Incline Village. Avalanche control includes closing the road and using 3 remotely operated cannons to trigger unstable snow while the roads are clear. This proactive approach is designed to help release snow towards the highway under controlled circumstances with crews ready to clear the snow, reducing the risk an avalanche will occur naturally.

DEVELOPMENT TRENDS

County land use plans and the Washoe County Development Code include policies and regulations for development on parcels with steep slopes and grading activities that may create steep slopes. These policies and regulations will reduce landslide risks associated with future development in the County.

Building in areas at risk of landslides can have several detrimental effects on the environment and communities. Firstly, the increased population density in these areas can lead to more construction and urban development, which in turn can disturb the natural stability of the land and elevate the risk of landslides. Additionally, deforestation and improper land use practices associated with population growth can exacerbate soil erosion, further increasing the susceptibility to landslides. Moreover, a larger population in these areas means that more lives and property are at risk when landslides occur, potentially leading to greater human and economic losses. Finally, the heightened demand for resources and infrastructure in these areas can place additional stress on the environment, exacerbating the risk of landslides and compounding the challenges faced by these communities.

The rapid population growth in Washoe County[56] has sparked concerns about the heightened susceptibility of these areas to natural disasters. The influx of residents into these regions has amplified the potential for human casualties and property damage in the event of landslides or avalanches. A combination of natural phenomena and human activities, including deforestation and inappropriate land use, has exacerbated the fragility of these areas, making them more prone to landslides and avalanches. Consequently, the burgeoning population has significantly increased the vulnerability of both infrastructure and people compared to the previous plan.

[56] USA Facts, "How has the Population Changed in Washoe County?" https://usafacts.org/data/topics/people-society/population-and-demographics/our-changing-population/state/nevada/county/washoe-county/

If development encroaches on areas higher in elevation than the valley floors, alluvial fans, landslides, and debris flows will likely become more significant hazards. Due to the limited geographic extent of this hazard, management and mitigation are best handled at the local level. State agencies provide support and technical assistance to local entities in response to this hazard.

VULNERABILITY SCORE

The NRI includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at the county and census tract levels. Table 21 provides an overview of each category for Washoe County.

Table 21: Risk Factor for Landslide in Washoe County

	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
Landslide	Relatively Moderate	High	Moderate	$104K	Moderate

Based on the NRI, Washoe County has a rating of very low for the risk index and a score of 83.6 for landslide which is higher than the national percentile (see Figure 27).

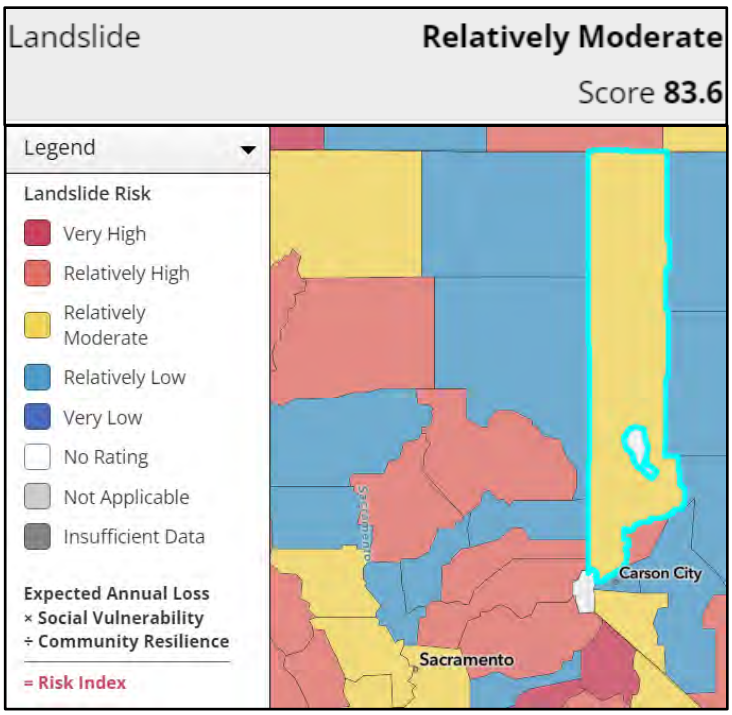


Figure 27: National Risk Index for Washoe County, Landslide Score, Map, and Legend[57]

CONSEQUENCE ANALYSIS

Avalanches and Landslides in Washoe County tend to happen in remote areas. The risk for Avalanches is low, and the risk to Landslides is very low.

The information below provides the Consequence Analysis of the Potential for Detrimental Impacts of Avalanches and Landslides, which was done for accreditation with the Emergency Management Accreditation Program (EMAP).

Subject	Ranking	Impacts/Avalanche and Landslide
Public	Minor to Severe	Avalanche and Landslides are two different geological threats that could impact Washoe County residents. While a low risk in Washoe County, depending on the seasonal activities, Avalanches and Landslides can occur and affect members of the public. Both hazards tend to occur in more remote areas of the county, and transportation corridors have been strategically constructed to protect citizens and tourists on the roads. Of particular concern to Washoe County is the urban Avalanches and Landslides. Because Avalanches and Landslides may happen without warning, they could trap

[57] FEMA, "National Risk Index Washoe Landslide Score, Map and Legend." https://hazards.fema.gov/nri/map

Subject	Ranking	Impacts/Avalanche and Landslide
		people suddenly, leading to injuries and fatalities. They may also damage utility lines and gas mains, putting residents at risk of the cascading effects.
Responders	Minor – Moderate	The hazards faced by personnel will depend on the event they are responding to. The most likely hazards encountered when responding to a geologic event would be sub-surface or sub-strata instability. Roadways may become blocked by landslides and Avalanches, making it difficult for first responders to reach the injured and trapped. Personnel responding to the incident may become injured themselves on any debris found in the area. In addition, any chemicals that may have leaked and/or gas pipes that may have broken can produce toxic fumes and possible explosions.
Continuity of Operations	Minor	Depending on the location of the event, the execution of the COOP would not be affected, and the Continuity of Operations would continue. Cascading events that could affect the COOP would be road blockages, power outages, etc.
Property, Facilities, and Infrastructure	Minor – Moderate	Avalanche and Landslide events may pose a threat to property, facilities, and infrastructure within Washoe County. They could block roadways, cutting off transportation routes. If structures and utility lines are near the event, it could cause severe damage. However, this risk is low for Avalanches and very low for landslides, which tend to happen in areas of lower population.
Environment	Mild – Moderate	Events can result in profound, lasting, and temporary impacts on the environment. Landslides can alter the paths of rivers and streams. This water change could grow in size and pull-down trees and boulders. Ground and land erosion can alter the topography.
Economic Condition	Mild – Moderate	The economic and financial impacts of Avalanche and Landslide events are largely based on the conditions of the impacted area and the magnitude of the event. Avalanches can affect the economy if they affect tourist and winter sports activities, reducing the tax base, whereas Landslides are more apt to destabilize a road, block traffic, and affect power lines.

COMMUNITY INPUT

AVALANCHE

The public ranked avalanche as the hazard they were the second least concerned about impacting the planning area. Member of the public indicated that all roads exiting the Tahoe Basin, the Tahoe area in general, and ski areas would be susceptible to avalanche. Another noted that while Reno itself would not likely be significantly impacted by an avalanche, radio towers, buildings, and other access roads connected to Reno could be impacted. Further, one member of the public was concerned with first responder's awareness of and ability to respond to an avalanche.

The public did not indicate any specific mitigation measures they would support for this hazard, but in general there were many comments received in support of additional public outreach and education which may help reduce risk to this hazard.

LANDSLIDE

The public ranked landslide as the hazard they were the third least concerned about impacting the planning area. Multiple comments were received on the risk to hillside communities, particularly in suburban Reno. Slide Mt. and the Virginia Range slopes were also noted as areas of concern. One person expressed concern with the cyclical nature of Flooding (including closed-basin flooding) and landslides and how first responders are not prepared to respond to this type of event in addition to the potential transportation and economic disruption a landslide could cause.

As far as critical infrastructure, additional comments were also recorded on the potential for landslides to impact transportation supply chain passages through the mountains. Bridges were also indicated to be at risk to this hazard, although none were listed specifically. A big landslide on I-80 could cause grocery stores to run out of food, one person reported.

Additionally, the public noted the Truckee River corridor is subject to landslides and Flooding (including closed-basin flooding) because of combinations of times of heavy precipitation, steep slopes, and urban infrastructure projects. The landslides risk around Mayberry Park was noted as an example. Donner Pass being unpassable was also specifically noted as a concern.

No specific mitigation measures for this hazard were suggested by the public however, in general multiple comments were received on limiting building and providing classes, community training, or additional outreach and publications which could help address this hazard.

Criminal Acts and Terrorism

Hazard Description

An **act of violence** is any situation that presents an immediate and ongoing danger to the safety of the people in the community. In addition to individuals using firearms, other types of weapons and erratic behavior can create active threat situations. An active assailant scenario may include mass casualty incidents and workplace violence.

The U.S. Department of Homeland Security defines terrorism as follows:

Terrorism involves violence or the threat of violence against people or property to further a particular ideology. Terrorism can be:[58]

- International, meaning a foreign terrorist organization influences or directs the attacks.
- Domestic, meaning social or political objectives influence the attacks in the terrorist's home country.
- *Foreign intelligence threats* involve other countries collecting information to disrupt U.S. government functions, influence foreign policy, steal technology and trade secrets, and undertake other activities to harm the United States.

Washoe County cites five general types of terrorism:

- Conventional – Such as bombing or hijacking. Vehicle ramming attacks may be a deep concern in the Truckee Riverwalk area, and other open air festivals and event venues.
- **Chemical** – The use of poisons or chemicals (nerve gas). A chemical manufacturing plant produces semiconductors that can be used in acts of violence.
- **Biological –** The use of bacteria, viruses, or other harmful organisms. Pharmaceutical warehouses in the region could be targeted.
- **Radiological** – The use of nuclear or radiological materials. A major interstate runs through the center of Reno, NV, and hazardous materials and cargo are transported on it.
- **Technological** – The use of the Internet to down local critical infrastructures, such as the regional electrical grid and data centers.

[58] United States Department of Homeland Security, 2024, "Understanding Terrorism and National Security Threats." https://www.dhs.gov/hsi/investigate/terrorism-and-national-security-threats

The State of Nevada has a long and rich history of mining gold, copper, lithium, and other minerals. However, these mines may become a security threat to local economies and communities from domestic terror groups and criminal organizations.

There are data centers in the region that could become targets of domestic terror groups and criminal organizations.

Location

Criminal acts of terrorism can impact any populated area, including shopping structures, hospitals and healthcare facilities, schools, and government offices and buildings, such as the new Nugget Event Center in the City of Sparks. In addition, Washoe County has several annual special events throughout the year that are indoor and outdoor open space/park events that attract large crowds. Providing security for special events often involve other County and local governmental agencies, including the Northern Nevada Public Health, Community Development, Sheriff's Office, Reno Police Department, Nevada Highway Patrol and local fire agencies. Examples of special events may include, though are not limited to, athletic events, music concerts, arts and crafts shows, car shows and cultural performances.

Extent

It is difficult to estimate the extent or probability of criminal activity or a terrorist incident. Nonetheless, these threats could affect all populated areas in Washoe County, and government facilities and schools may be the most likely targets. The magnitude and potential severity of the impacts of criminal activity or a terrorist incident are considered Medium. The scale of attacks could range from isolated, targeted incidents to wide scale terrorism motivated to make a regional, national, or global impact.

Previous Occurrence/History

Criminal acts and violent crime have increased in Washoe County since the last plan, with a 4.33% increase from 2021 through 2022. However, from 2022 to 2023, violent crime declined by 1.08%. Table 22 shows the increase in violent crimes from 2020 to 2023, and Figure 28 shows the statistics for 2023.

Table 22: Washoe County Violent Crime Data, 2020–2024[59]

Year	Violent Crime	Criminal Homicide	Forcible Rape	Robbery Total	Aggravated Assault
2020	2302	23	410	379	1490
2021	2402	27	399	397	1579
2022	2506	26	409	467	1604
2023	2479	29	413	426	1611
2024	702	9	106	95	492

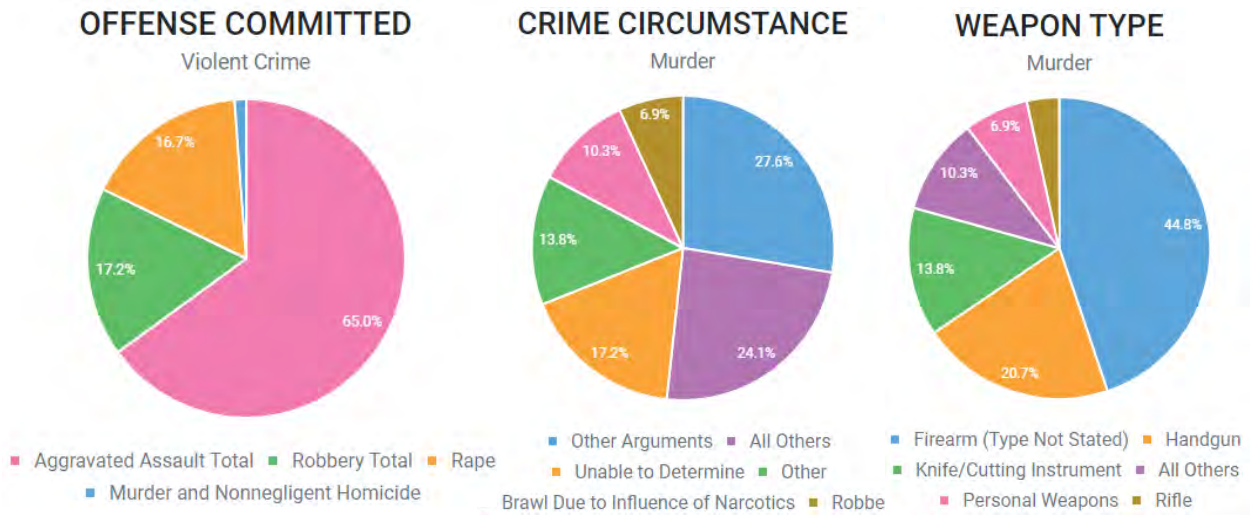


Figure 28: Washoe County Violent Crime Statistics, 2023[60]

Table 23 shows trends in violent crime in Washoe County from 2017 to 2023. In 2023, crimes other than murder and violent crime arrests were down. Table 24 lists four terrorism events in the County since 1995.

[59] State of Nevada, "Nevada Crime Statistics." https://listserv.nv.gov/tops
[60] Ibid.

Table 23: Statistics for Violent Crimes in Washoe County, 2017–2023

Action	2017	2018	2019	2020	2021	2022	2023
Murder	+61.54%	-23.81%	unchanged	+43.75%	+17.39%	-3.70%	+11.54%
Aggravated Assault	+5.95%	-3.31%	-12.97%	+5.13%	+5.61%	+1.52%	-0.06%
Robbery	+7.96%	-23.44%	+1.48%	-7.54%	+4.47%	+17.38%	-8.58%
Rape	+25.93%	+21.85%	+0.69%	+40.41%	-2.68%	+2.51%	-1.96%
Violent Crime Arrests	+0.48%	-1.58%	-10.68%	-68.57%	+0.17%	+16.23%	+3.86%

Table 24: Terrorism Events, Washoe County, Nevada1995–2024[61]

Date	City	Perpetrator	Deaths	Injuries	Target Type	Description
03/09/2015	Reno	Animal Liberation Front	0	0	Business	Assailants threw an incendiary device at a Kentucky Fried Chicken (KFC) in Reno, Nevada, United States. No one was injured in the attack, but a window was damaged. The Animal Liberation Front (ALF) claimed responsibility for the incident.
10/15/2001	Reno	Perpetrator remains unidentified	0	0	Business	Six employees were tested for anthrax exposure after an envelope sent out by Microsoft to Malaysia was returned to the office in Reno, Washoe County, Nevada. Authorities said the envelope was returned in a strange condition and contained anthrax spores. Four of the employees tested negative for types of anthrax poisoning, except those that contracted

[61] University of Maryland National Consortium for the Study of Terrorism and Responses to Terrorism, "Global Terrorism Database." http://apps.start.umd.edu/gtd/

Date	City	Perpetrator	Deaths	Injuries	Target Type	Description
						through the skin. Although no group claimed responsibility for the attack, authorities and sources speculated that al-Qaeda could be behind the anthrax letters due to their recent attacks on the World Trade Center.
12/18/1995	Reno	Perpetrator remains unidentified	0	0	Government	An Internal Revenue Service (IRS) employee discovered a 30-gallon plastic drum packed with 100 pounds of ammonium nitrate and fuel oil. The drum had been placed behind a vehicle in the parking lot of the IRS building in Reno, Nevada. On December 28, 1995, the U.S. District Court in Reno charged Joseph Martin Bailie and Ellis Edward Hurst with planting the bomb at the IRS facility. No further information is available about the status of this case. The two men were accused of trying to detonate the device the previous evening when the building was empty. A three-foot fuse had apparently been ignited but went out prior to reaching the explosive.
08/18/1992	Reno	Anti-abortion extremists	0	0	Abortion Related	Rachelle Shannon firebombed the West End Women's Medical Group in Reno, Nevada, United States. There were no casualties, but the abortion clinic was damaged.

Several active assailant incidents in Washoe County between 2020 and 2024 are noted in the following sections. Due to the number of violent crimes, it is impossible to list each incident. However, no incidents of terrorism have been reported in the county since 2020.

- On March 29, 2024, starting around 1:30 p.m., an incident occurred in Sparks in which two law enforcement officers were shot and later hospitalized with unspecified injuries. Police surrounded a house in the residential Sparks neighborhood, where they said the suspect was barricaded. Police closed nearby streets, evacuated some residences, and told residents in a four-block area to shelter in place.62

- On October 18, 2022, according to authorities, 36-year-old Jason Thorpe entered the public entrance of the City of Sparks police department building around 2:38 a.m. Police said he showed a gun to civilian staff who were working in the records division, on parking lots, and at employee entrances about 18 times over the course of 20 minutes. Security footage showed that around 22 minutes later, the man fired a shot into the air while hiding behind some bushes. Police said the staff was moved to a secure location as officers arrived and used a loudspeaker to negotiate with the suspect for two hours. The incident ended after the suspect fired his gun toward the Sparks Police headquarters, then ran toward officers with the gun still in his hand. The officers fired their weapons. Thorpe died on the scene. [63]

- On May 30 to June 3, 2020, a civil disturbance related to George Floyd murder occurred at Reno City Hall and Reno Police Department after a Black Lives Matter protest that resulted in damage to the police station, city hall, and surrounding businesses and residential areas.

- On the night of August 22, 2020, the Reno Police received reports of shots fired in downtown Reno. Witnesses told Police that the suspect, later identified as Justus Aceves, took the elevator in the Plaza Resort Club at 121 West Street to the ninth floor, there, officers encountered him and instructed him to show his hands, but he disobeyed. Aceves then made a sudden movement toward his waistband and pulled out a 40 caliber Glock pistol. Fearing for their safety, Officer Hannah of the Reno Police Department fired two shots at Aceves.[64]

On October 1, 2017, in Las Vegas, Nevada, a lone gunman committed the deadliest mass shooting by an individual in the United States. He fired from a suite on the 32nd floor of the

[62] AP News, "2 Police Officers Shot in Nevada City. Swat Team Surrounds Home Where Suspect Reportedly Holed Up." https://apnews.com/article/sparks-police-officers-shot-suspect-barricaded-decd09c01ef93897527aae60edaa2871

[63] News Nevada, "Washoe County DA Determines October 2022 Deadly Shooting Justified by Sparks Police." https://www.2news.com/news/washoe-county-da-determines-october-2022-deadly-shooting-justified-by-sparks-police/article_eeed4e40-4ef7-11ed-8c2e-1b9a4c2c341d.html

[64] Washoe County.gov, "Office of the Washoe County District Attorney." https://www.washoecounty.gov/da/files/Report-on-August-22,-2020-OIS.pdf

Mandalay Bay Hotel into crowds attending the Route 91 Harvest music festival. A total of 58 people were killed, and 851 were injured during the shooting and the ensuing panic.

Probability of Future Events

Political and social unrest, economic disparities, ideological extremism, and global geopolitical developments can increase the possibility of terrorism in the United States. Moreover, the global rise of populist movements has fueled anti-immigrant and anti-minority sentiment, which can increase the chance of domestic terrorism. The explosion of advanced technologies and cyber-terrorism potential also are concerning factors. The probability of increased terrorism is difficult to quantify and can be influenced by domestic and international events.

Based on various factors, Washoe County could be considered a potential target for terrorism. It has several critical infrastructure sites, such as airports, major highways, and power plants. The area's significant population centers and notable events could also present attractive targets for individuals or groups seeking to cause harm. Based on the occurrence of previous incidents, the probability of an incident is considered high.

Table 25 shows the Calculated Priority Risk Index for Criminal Acts and Terrorism. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 25: Calculated Priority Risk Index for Criminal Acts and Terrorism in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Criminal Acts and Terrorism	3	2	4	2	3	2.7

Vulnerability

No estimates are available to determine the potential losses associated with criminal acts and terrorism. However, if an active threat were directed at the County, schools, government buildings, other public gathering places and social events would be top targets. Active threats could have an impact on the community in the following ways: loss of human life; damage to buildings and structures; temporary displacement during the threat and/or investigation; stress on medical, emergency response, and security services; declines in economic activity and hospitality business after the event; psychological and emotional trauma; and an increased need for emergency services and funding.

Table 26: Impact on Vulnerable Community Assets

Vulnerable Asset	What makes this group/asset vulnerable during hazards? Have there ever been issues with recovery after an event?
Washoe County Jail	WCSO has plans and procedures for moving inmates in the event we can no longer occupy 911 Parr location, reducing asset vulnerability. No issues with recovery after an event reported.
Washoe County Jan Evans Juvenile Justice Center	Not able to move juvenile inmates to other facilities if building is compromised due to hazard. No issues with recovery after an event reported.

Development Trends

Overall, Washoe County has not seen a significant increase in criminal acts and terrorism. While world events have led to increased protests, they have so far remained peaceful. There appear to be no significant developments that have impacted the overall vulnerability of the planning area to this hazard.

Future development in Washoe County may be vulnerable to criminal acts and terrorism, particularly places of employment, government buildings, and public gathering places. Some types of development may be associated with an increased need for response training.

EXISTING MITIGATION CASE STUDY

Case studies can provide valuable insights into the factors and circumstances that contribute to the risk of terrorism in a particular region. By examining past incidents and their underlying causes, authorities can better understand the root causes of terrorism and the conditions that may lead to such acts. This knowledge can help develop more targeted and effective strategies to mitigate the risk of terrorism. Case studies can also provide valuable lessons and best practices from successful counterterrorism efforts in other regions, which can be adapted and applied to address similar challenges elsewhere. The following are two mitigation case studies for Washoe County:

- To reduce the community's vulnerability to criminal acts and terrorism, the Washoe County Sheriff's Office has developed an Emmy-nominated video and webpage describing how people can respond to an active assailant threat (https://www.washoesheriff.com/general-information/staying-safe/active-assailant-preparedness--what-you-can-do.php).

- In 2018, Northern Nevada Public Health developed a Multi-Casualty Incident Plan to provide guidelines for managing multi-casualty incidents and coordinating between multiple responding agencies[65] and organizations.[66]

CONSEQUENCE ANALYSIS

Criminal Acts and Terrorism can pose a risk for the County of Washoe. The Director of the FBI has recently testified that the United States is a higher risk for an act of terrorism than ever before. Where an incident could happen is unknown, however, Washoe County is not exempt from the threat.

Table 27 shows the Consequence Analysis of the Potential for Detrimental Impacts of Criminal Acts and Terrorism, which was done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 27: EMAP Consequence Analysis for Criminal Acts and Terrorism in Washoe County

Subject	Ranking	Impacts/Criminal Acts and Terrorism
Public	Minimal to Severe	Historical events in Washoe County show that criminal acts and terrorism are a threat. The threat can be anywhere, but normally, criminals and terrorists look for the least risk but the most damage. Targeting tourist venues, event venues, and shopping centers can all be assumed to be at risk. The public's risk is directly related to where they are on any given day, at any given time in relation to the incident area.
Responders	Minimal to Severe	The impact to responders could be severe if not trained and properly equipped. Responders that are properly trained and equipped will have a minimal to moderate impact.
Continuity of Operations	Minimal to Severe	Depending on damage to facilities/personnel in the incident area, re-location and activation of the COOP Plan may be necessary, and lines of succession execution.

[65] Hidalgo, J. (2023, January 26). "Reno-Sparks growth: Forecast pegs housing, education as biggest challenges," Reno Gazette Journal. https://www.rgj.com/story/news/money/business/2023/01/26/reno-sparks-growth-housing-education-are-biggest-challenge/69845214007/

[66] Rowles, L. (2023, December 15). Northern Nevada Adds Over 1,200 Jobs in 2023 with Record Average Wage. EDAWN. https://www.edawn.org/existing-business-update/northern-nevada-adds-over-1200-jobs-in-2023-with-record-average-wage/

Subject	Ranking	Impacts/Criminal Acts and Terrorism
Property, Facilities, and Infrastructure	Minimal to Severe	Impact within the incident area could be severe for explosion and minimal – moderate for HAZMAT.
Environment	Moderate to Severe	Localized impact within the incident area of terrorism could be severe depending on the type of human-caused incident. Criminal Acts could also be severe if, as an example, wildfires are set.
Economic Condition	Minimal to Severe	Economic conditions could be adversely affected and dependent upon time and length of clean up and investigation.
Public Confidence in Governance	Minimal to Severe	Impact will be dependent on whether or not the incident could have been avoided by government or non-government entities, clean-up and investigation times and outcomes, arrests, etc.

COMMUNITY INPUT

The public responses to the All Hazards survey indicated that criminal acts and terrorism are hazards they are concerned about impacting the planning area. Several public members indicated their concern for significant events being susceptible to crime and terrorism. Another noted speeding and racing on Veteran's Parkway. One member stated noticing an increase in burglary and porch pirates.

The public has identified the problem of abandoned homes attracting drug and criminal activity. One member has suggested the importance of community education on home safety, showcasing the community's proactive approach to addressing safety concerns. This active community involvement is a valuable resource that can be harnessed to mitigate this issue. Another member would support private property protection and community police support.

Drought

Hazard Description

Nevada is the driest state in the nation, and the Washoe County has experienced multiple droughts. Drought cycles consisting of successive years of low precipitation are a normal, recurrent phenomenon across the Great Basin. Drought differs from most other natural hazard events due to its slow onset, gradual impact, and duration. With no defined starting period and limited long-range predictability, drought is a "creeping hazard" that may be recognized only after it is well underway. The onset of drought involves many factors, but in Washoe County, it is generally caused by successive years of inadequate winter precipitation, resulting in insufficient natural supplies to meet local demand. It is critical to note that the region depends almost exclusively on winter snowpack and rainfall for its water supply. Rains from summer thunderstorms do little to recharge reservoirs and raise groundwater tables.

Hydrologic conditions that constitute a drought in one location in the Great Basin may not constitute a drought elsewhere or for water users who have a different water supply. Individual water suppliers may use criteria, such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler, to define their water supply conditions. The drought issue is further compounded by water rights specific to a state or region. Water is a commodity possessed under various legal doctrines.

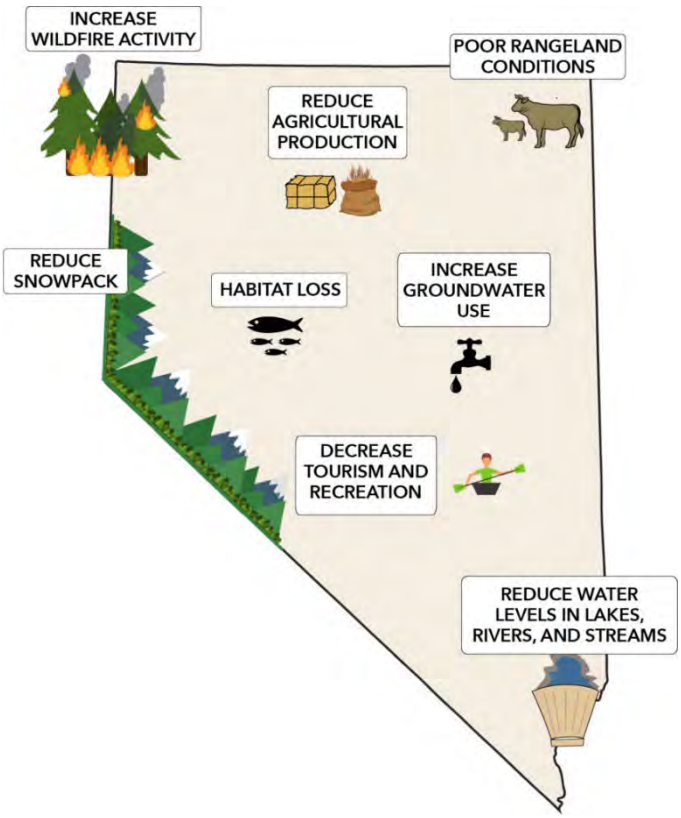


Figure 29: Impacts of Drought on Nevada

A significant number of Washoe County water users—both residential and non-residential—depend on surface water as their primary source of water. The primary source for surface water for the Truckee Meadows area is the Truckee River and its tributaries, while Lake Tahoe provides surface water to the Incline Village/Crystal Bay area. The Truckee River serves as a primary water source for the Truckee Meadows Water Authority (TMWA), which supplies several hydrographic basins adjacent to the Truckee Meadows basins. Drought conditions impact surface water primarily when upstream water storage is diminished and becomes insufficient to provide water supply for users. To meet their water

supply demands during drought conditions, water suppliers, such as TMWA, may be required to depend more on groundwater supplies to supplement diminishing surface water. Other diverters of the Truckee River are impacted by reduced surface water availability, and water users with lower priority may have their surface water supply turned off.

Unlike surface water from reservoirs and rivers, groundwater moves very slowly. Years may pass before a particular year's snowmelt recharges an aquifer and reaches a water well on the valley floor. Consequently, a drought-related decline in the water table may have been caused by a drought many years earlier. The impacts of a drought on the groundwater system are difficult to determine accurately and are even more difficult to predict. However, long-term monitoring of precipitation, stream flow, and water table elevations has shown that drought-related impacts are measurable and significant. For example, in 2003, the State Engineer estimated that in the Mount Rose Fan aquifer, drought conditions resulted in a 10-foot decline of the water table over the prior three years.

There are generally four types of droughts, and they are defined in Table 28.

Table 28: Types of Drought and Their Definitions

Type of Drought	Definition
Meteorological	Occurs when observed precipitation has been significantly lower than average or normal levels over a period of time.
Agricultural	Occurs when precipitation and soil water storage cannot satisfy the demand for water in crops.
Hydrological	Occurs when surface and subsurface water levels are significantly lower than average or normal levels.
Socioeconomic	Occurs when water deficiencies begin to significantly impact human population in an area.

Location

Drought affects broad regions and can include any portion of Washoe County. Historically, the southern section of the County has had less frequent droughts than the central and northern sections because of extensive stored water in reservoirs in the Truckee River basin. However, low snowpack in the Truckee River basin can cause droughts of a greater magnitude in the southern section of the County, as was experienced between 2012 and2016. With the implementation of the Truckee River Operating Agreement, Truckee Meadows Water Authority can store credit water in the Boca Reservoir (Figure 30). The reservoir is currently operated for wintertime flood control based on the 1985 U.S. Army Corps of Engineers' (USACE) Water Control Manual (WCM), which requires minimum specific flood space requirements in the reservoir and prohibits the capture of springtime runoff prior to April. Stakeholders throughout

the Truckee River Basin recognize that the system can be better operated for both flood control and water supply.



Figure 30: Boca Reservoir under Drought Conditions[67]

Extent

The overall magnitude and potential severity of drought are considered relatively moderate in Washoe County. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts from droughts in Washoe County are those related to water-intensive activities, such as agriculture; wildland fire protection; municipal, industrial, and commercial use; tourism; and recreation. Reduced electric power generation in the region and deteriorating water quality also are potential problems. Moreover, drought conditions can cause soil to compact and reduce its ability to absorb water, potentially making an area more susceptible to Flooding (including closed-basin flooding). An ongoing drought can impact the health of existing vegetation, which may also leave an area more prone to beetle kill and create conditions support fuel wildland fires. Drought impacts increase with the length of a drought, as annual carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

Short-term drought indicator blends focus on 1-month to 3-month precipitation. Long-term blends focus on 6 to 60 months. Other indices used, mainly during the growing season, include the USDA/National Agricultural Statics Service Topsoil Moisture, the Keetch–Byram Drought Index, and NOAA/National Environmental Satellite Data, and Information Service satellite Vegetation Health Indices. Indices used primarily during the snow season and in the West

[67] Truckee Meadows Water Authority, 2020. https://tmwa.com/wp-content/uploads/2020/11/TMWA-WRP-2020-Final.pdf

include snow water content, river basin precipitation, and the Surface Water Supply Index. Other indicators include groundwater levels, reservoir storage, and pasture/range conditions.

The U.S. Drought Monitor Intensity Scale (Table 29) is widely used to track weekly drought development, persistence, or improvement across the United States. The U.S. Drought Monitor also releases a map every Thursday, showing parts of the United States that are in drought using five categories to describe the intensity of drought conditions. The U.S. Drought Monitor relies on experts to synthesize the best available data from drought indices and other sources and work with local observers to interpret the information. The U.S. Drought Monitor also incorporates ground truthing and information about drought impacts, via a network of more than 450 observers across the country, including state climatologists, National Weather Service staff, Extension agents, and hydrologists.

Table 29: U.S. Drought Monitor Drought Intensity Scale

Category	Description	Possible Impacts	CPC Soil Moisture Model (%)	USGS Weekly Stream-flow (%)	Objective Short- and Long-term Drought Indicator Blends (%)
DO	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: Some lingering water deficits; pastures or crops not fully recovered.	21–30	21–30	21–30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low; some water shortages developing or imminent; voluntary water-use restrictions requested.	11–20	11–20	11–20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed.	6–10	6–10	6–10
D3	Extreme Drought	Major crop/ pasture losses; widespread water shortages or restrictions.	3–5	3–5	3–5
D4	Exceptional Drought	Exceptional and widespread crop/ pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies.	0–2	0–2	0–2

The Palmer Drought Severity Index (PDSI) (Table 30) is one of the index values used to determine the USDM status indices.[68]

Table 30: Palmer Drought Severity Index Classification and Range

Range	Palmer Classification
4.0 or more	Extremely Wet
3.0 to 3.99	Very Wet
2.0 to 2.99	Moderately Wet
1.0 to 1.99	Slightly Wet
0.5 to 0.99	Incipient Wet Spell
0.49 to -0.49	Near Normal
-0.5 to -0.99	Incipient Dry Spell
-1.0 to -1.99	Mild Drought
-2.0 to -2.99	Moderate Drought
-3.0 to -3.99	Severe Drought
-4.0 or less	Extreme Drought

The Standardized Precipitation Index (SPI) is another metric that can be used to quantify drought and periods of wetness by capturing how observed precipitation deviates from the climatological average. The 12-month Standard Precipitation Index for Nevada (Figure 31) is a visual representation of median precipitation amounts. The positive values in green to purple indicate wet conditions and the negative values in orange to red colors indicate drought conditions. Table 31 lists the numerical values for these conditions.

[68] 2020 Washoe County Hazard Mitigation Plan, Table 4–10, US Drought Monitor Severity Classification, 4–50.

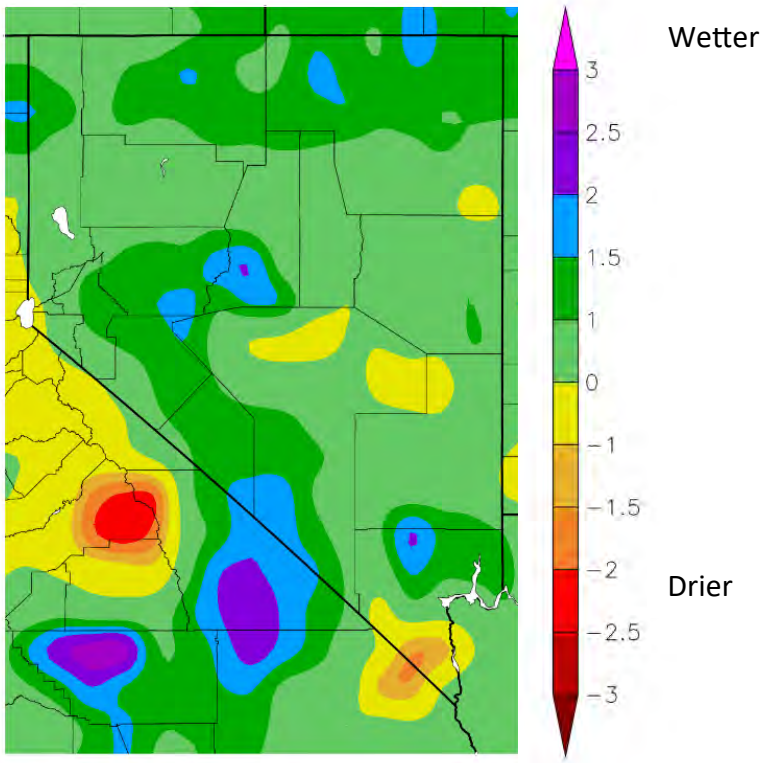


Figure 31: 12-Month Standardized Precipitation Index for Nevada, April 2023–March 2024[69]

Table 31: SPI Category and Value Definitions

SPI Value	Description
-2.0 or less	Extremely Dry
-1.50 to -1.99	Very Dry
-1.0to -1.49	Moderately Dry
+0.99 to 10.99	Near Normal
+1.0 to +1.49	Moderately Wet
+1.5 to +1.9	Very Wet
≥ 2.0	Extremely Wet

Figure 32 applies the precipitation index to the United States. Note that the color coding of the two figures is different.

[69] NOAA regional climate centers. Generated 4/20/2024 at HPRCC using provisional data. https://hprcc.unl.edu/maps.php?map=ACISClimateMaps

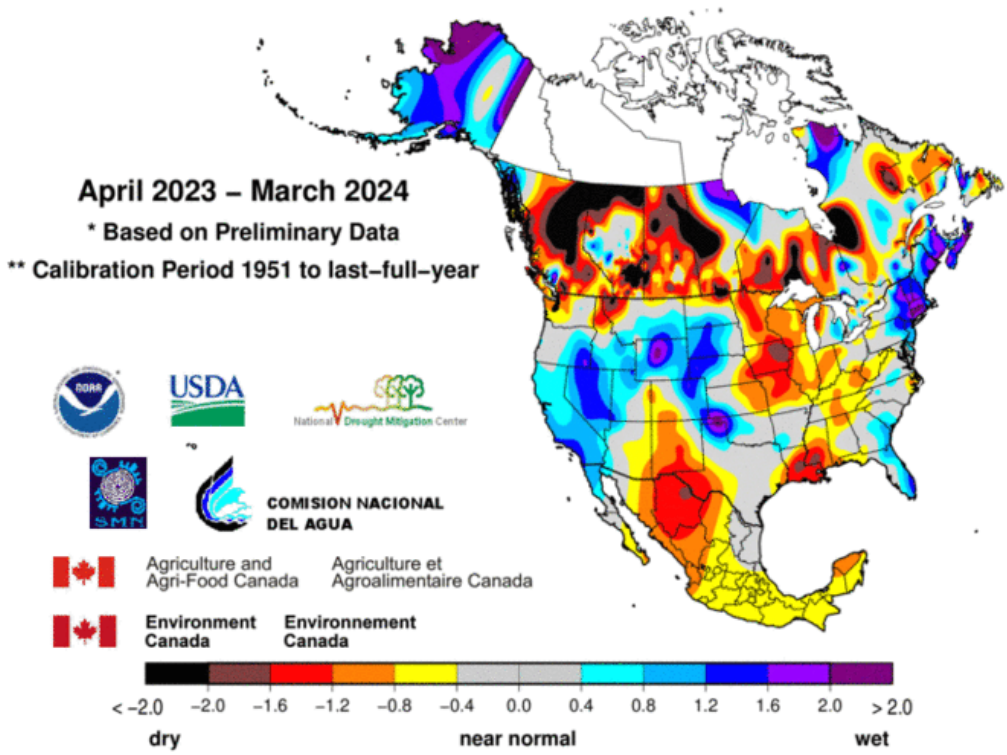


Figure 32: 12-Month Standardized Precipitation Index for the United States, April 2023–March 2024

Typical events are handled at the regional level by all jurisdictions and by both public (e.g., TMWA) and private water suppliers. They can have economic impacts on the County and the state. Disruption of services is highly variable; in urban areas with municipal water systems and reservoir storage, disruption may be quite minimal during a typical few-year drought. In that same drought, however, disruption of water supplies to rural and agricultural communities in Washoe County may be considerable, as those areas depend more on groundwater, which can be depleted quickly in drought conditions.

Considering a worst-case scenario, a decade-long drought can require federal support, impact critical facilities, disrupt water services to both urban and rural populations, and have national economic impacts. The length or nature of disruption is variable, ranging from ceasing all agricultural production to severe water restrictions in urban communities.

Previous Occurrence/History

Washoe County is part of Nevada's Northwestern Climate Division. According to historical drought data from the National Centers for Environmental Information (formerly the National Climatic Data Center), the Northwestern division observed over 253 months from 1900 to 2018, rated as Severe Drought or higher (D2 or higher in Table 29). PDSI readings for the Northwestern Climate Division indicated severe drought or higher in 17.9% of reporting periods

from 1900 to 2018. Most recent data shows between 2018 and 2023 the recurrence interval of severe drought was approximately every two years.[70] .

After a wet winter and, in parts of northern Nevada, an unusually wet spring, much of the state is drought-free. There is still a swath of D0-Abnormally Dry conditions stretching from far northwestern Nevada to southeast Counties. There are relatively few long-term weather stations in northern Washoe County, making the task of tracking drought there challenging. Any observations from the area help to fine-tune whether D0-Abnormally Dry is warranted in the region. A longer view shows significant improvements since 2022, when over 99% of the state was in D2-Severe or deeper drought.[71] While drought is a part of life in Washoe County, the State of Nevada has received no major disaster declaration due to drought since the initial plan was prepared in 2010.

Drought is a normal climate pattern that has occurred in varying degrees of length, severity, and size throughout history. The drought conditions for Nevada are depicted in three historical drought indices. The U.S. Drought Monitor is a weekly map that shows the location and intensity of droughts across the country since 2000. The Standardized Precipitation Index (SPI) Figure 33 is an annual depiction of drought based on precipitation (with data going back to 1900. Paleoclimate data uses tree-ring reconstructions to estimate drought conditions before there were widespread instrumental records, going back to year 0 for some parts of the U.S. View more historical conditions.

Drought results from an imbalance between the water supply and water demand. The SPI measures water supply, specifically precipitation. SPI captures how observed precipitation (rain, hail, snow) deviates from the climatological average over a given period—in this case, over the 9 months leading up to the selected date. Red hues indicate drier conditions, and blue hues indicate wetter conditions. Data from 1895 to the present are available.

While drought conditions are frequently recorded, the TMWA 2020–2040 Water Resource Plan[72] notes drought periods have established historical patterns in the Truckee River Basin, with the most severe drought on record lasting eight years."

[70] NOAA, NCEI, Storm Events Database: Washoe County, Nevada, 2024. https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Drought&beginDate_mm=12&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=12&endDate_dd=31&endDate_yyyy=2023&county=WASHOE%3A31&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=32%2CNEVADA

[71] University of Nevada, Reno, B. Khoh and S. McAfee, June 2023, "Nevada Drought Update, June 2023." https://www.unr.edu/nevada-today/news/2023/june-drought-update-2023

[72] Truckee Meadows Water Authority, 2020. https://tmwa.com/wp-content/uploads/2020/11/TMWA-WRP-2020-Final.pdf

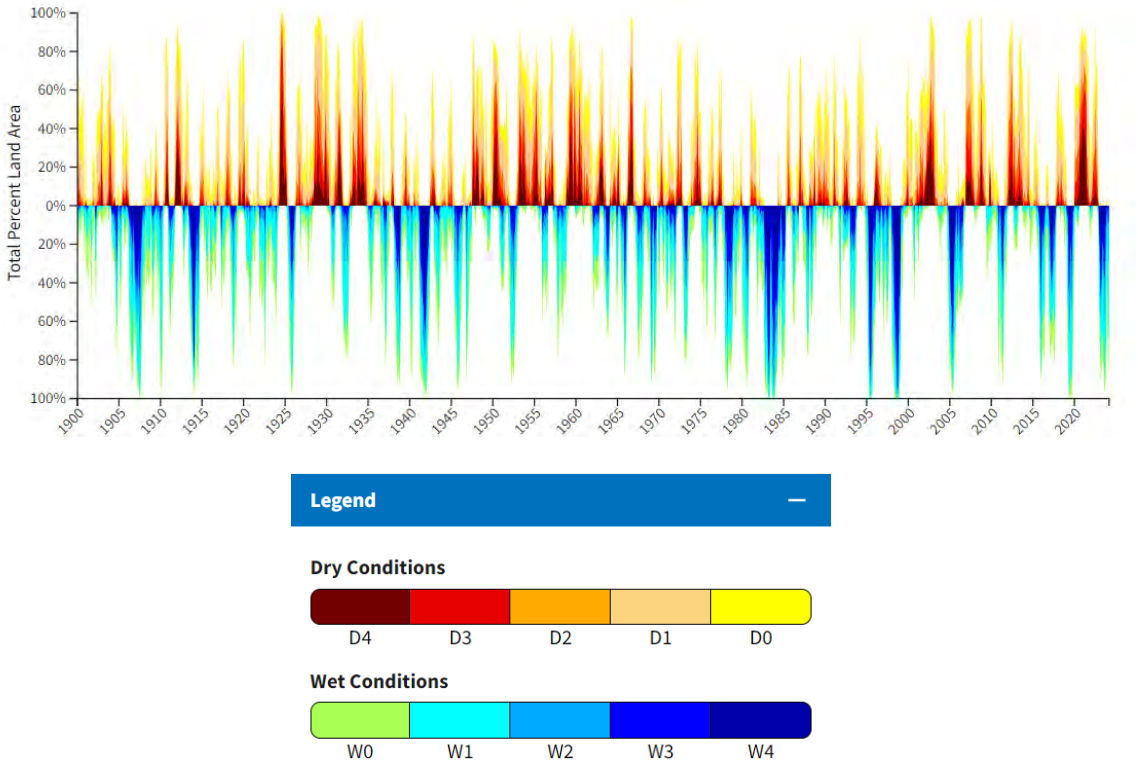


Figure 33: Standardized Precipitation Index for Washoe County 1900–2024[73]

The estimated drought frequencies are as follows:

- 8-year drought – 1 in 230 years
- 9-year drought – 1 in 375 years
- 10-year drought – 1 in 650 years" (TMWA n.d.).

Since 1980, there have been four droughts varying in severity in the Truckee River system: 1987–1994 (eight years), 2001–2004 (four years), 2007–2010 (four years), and 2012–2016 (five years). The 1987–1994 drought was the worst drought in over 115 years and has been the basis for drought planning purposes to date. Although the 2012–2016 drought was unprecedented in terms of its severity (2015 had the lowest recorded snowpack and runoff in history), it was shorter in duration than the eight-year 1987–1994 drought[74].

According to the USDM, Nevada has suffered from several periods of drought since 2000. During these periods, Washoe County also has suffered drought, as seen in Figure 34. Since

[73] National Integrated Drought Information System, NOAA, 2024. https://www.drought.gov/states/Nevada

[74] Truckee Meadows Water Authority, 2020. https://tmwa.com/wp-content/uploads/2020/11/TMWA-WRP-2020-Final.pdf

2000, more often than not, the County has been subject to drought and often severe or worse drought. Three pronounced but relatively brief wet periods are noted: 2005–2006, 2011–2012, and in 2017, 2020, 2023. During these times, the region saw particularly wet/snowy winters, including major floods in December 2005 and February and March 2017. Figure 35 shows the intensity of drought in the western states in 2022.

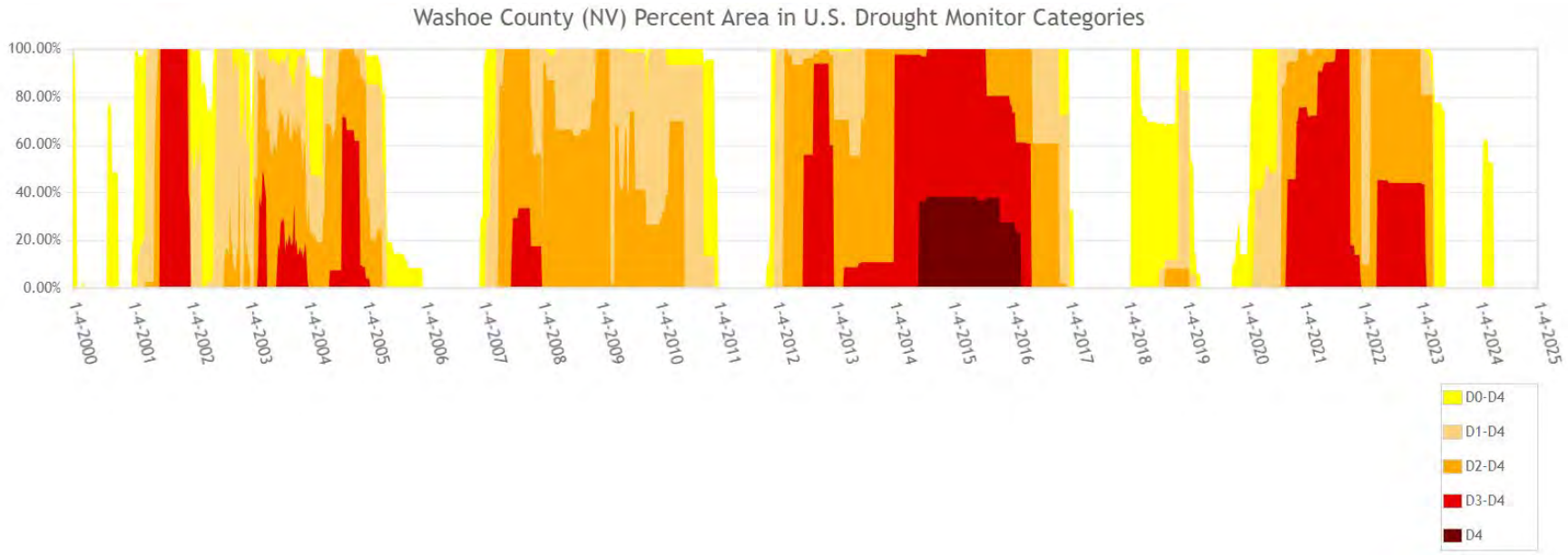


Figure 34: United States Drought Monitor Time Series for Washoe County[75]

[75] Drought Monitor, 2024, "United States Drought Monitor Time Series for Washoe County." http://droughtmonitor.unl.edu/Maps/Animations.aspx

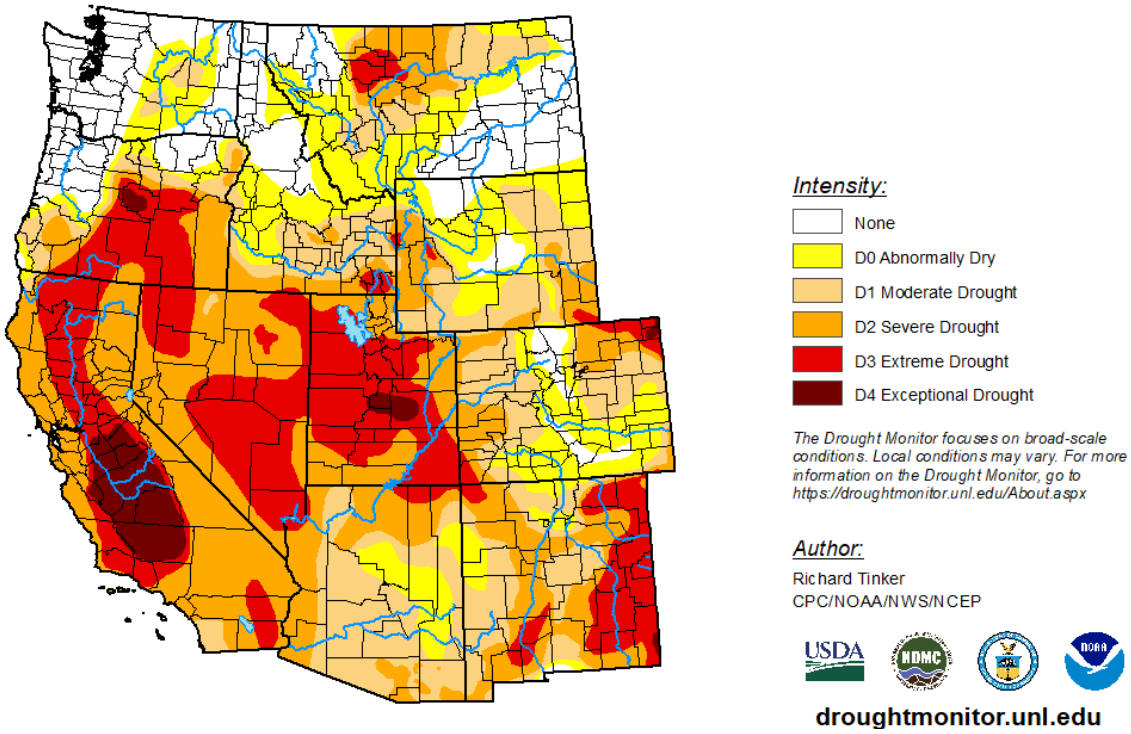


Figure 35: United States Drought Map, Western States, August 16, 2022

Probability of Future Events

The 2023 Enhanced SHMP states precipitation in the State of Nevada has been historically difficult to predict, with different models providing varying results. However, the average of projections shown in the State of Nevada Climate Initiative suggest the potential for slightly more precipitation in northern Nevada. If precipitation does increase, it is not expected to offset the drying effects of higher temperatures. Changes in average temperature and/or precipitation will combine with the occurrence of periodic droughts related to precipitation shortfalls and/or periods of warmer than normal temperature. Climate projections suggest that there is potential for greater year-to-year variability in precipitation. This may further complicate drought planning in the future.

Projections for increasing temperature, irrespective of any changes in precipitation will increase the chance for drought in Nevada over the coming decades because of increased evaporative demand. By the end of this century (2070–2099), average temperatures in Nevada are expected to increase 4–6 °F if greenhouse gas emissions are low and could increase 10–12 °F if emissions are high.[76]

[76] State of Nevada Enhanced Mitigation Plan, 2023, dem.nv.gov/uploadedFiles/demnvgov/content/About/NEHMP_09-22-2023(4).pdf

Table 32 provides the Calculated Priority Risk Index for Drought impact for Washoe County based on the current plan hazard risk assessment results. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 32: Calculated Priority Risk Index for Drought in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Drought	3	1	1	4	2	2.1

Rural Nevada communities typically rely on groundwater resources for municipal and domestic water supply. Although groundwater sources tend to be more resilient to short-term droughts than surface water sources, the intensity and length of droughts may increase under changing climate conditions. Under these conditions, rural water supplies may be more vulnerable to drought conditions.

The 2020 TMWA WRP Water Resource Plan asserts that, during the rest of the century, regional temperatures are expected to warm well beyond 3 ℉, which has already occurred since the 1920s. Increased warming could cause less snow to accumulate and lead to earlier runoff. While there is still uncertainty about expected changes in precipitation, the models suggest that more precipitation will occur in the region each year. The timing, form, and magnitude of precipitation could change significantly by the end of the century. There is consensus among the climate change models that more variability in precipitation will occur as climate change continues. Snowmelt runoff is expected to occur earlier in the season, significantly altering the amount of water that can be captured and stored in upstream reservoirs during the April–July filling period. Overall, annual runoff in the Lake Tahoe and Truckee River Basins is expected to increase over the next 80 years under both Representative Concentration Pathways (RCPs). Therefore, decreases in April–July runoff are projected to be offset by significant increases in runoff outside the historical April–July runoff period. It is projected that there will be a greater frequency of wet years overall on the Truckee River system in terms of the volume of streamflow on an annual basis. Droughts are also predicted to occur more frequently. Precision Water Resources Engineering' (PWRE) modeling shows an increasingly variable future hydrology where the wet years will be wetter and the dry years will be significantly drier.

Common factors in Washoe County that affect future climate conditions related to drought include:

- Decreased snowpack and stream flows
- A shorter snow season and longer, hotter, drier summers

- Increased fuel for wildland fires
- Increased competition for water supplies
- Reduced agricultural yields and potential economic effects

In various parts of the United States, climate normals shift under the influence of climate change. Figure 36 shows projected climate change in Washoe County through 2040, considering a median scenario, neither particularly optimistic nor pessimistic.

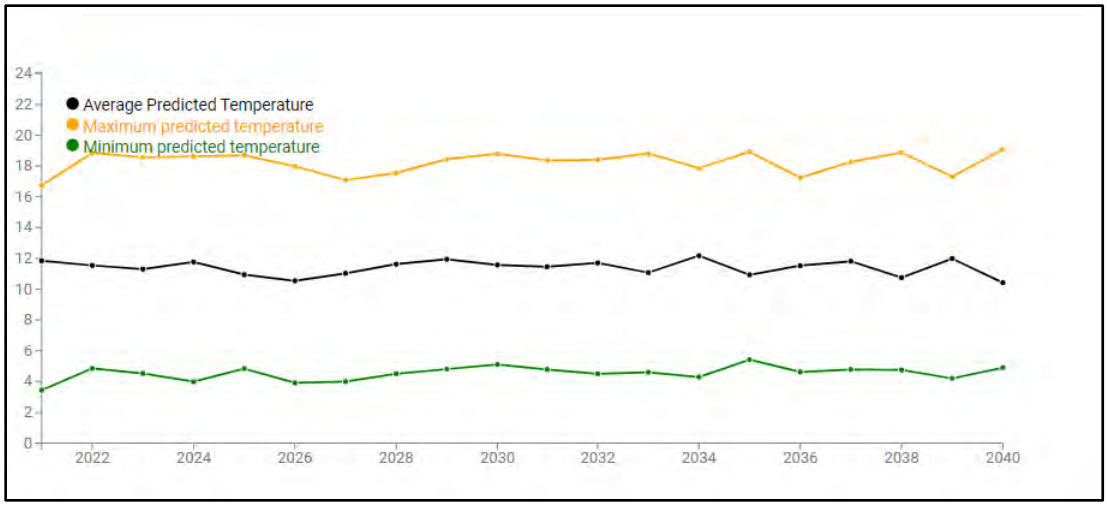


Figure 36: Washoe County Climate Change Forecast to 2040[77]

Based on the assessment in the previous sections, the probability of a future severe drought event is considered medium, with an approximately 50% chance of occurrence in a given year.

The 2023 Enhanced SHMP provides the following highlights expected impact from drought due to climate change (also see Table 33):

- **Public Health** – According to a 2022 white paper by the Office of Management and Budget (OMB), Federal healthcare costs due to climate change for Valley Fever, southwest dust, and wildfires (respiratory injuries) could range between $169M and $353M by the end of the century.
- **Leisure and Hospitality** – Leisure and hospitality is the leading economic sector in Nevada, accounting for 333,900 jobs – 23% of the wages and salary. In 2022, Tourism generated $317.6B and Casino Hotels generated $28.9B of revenue. In addition, Real Estate and Rental and Leasing (including cars, formal wear, equipment, etc.) and tourism related services

[77] Augurisk, Mearns, L.O., et al., 2017: The NA-CORDEX dataset, version 1.0. NCAR Climate Data Gateway, Boulder CO, accessed [November 2020]. Scenario RCP4.5 (median scenario), Model: CanESM2.CanRCM4. "Washoe County Climate Change Forecast." https://www.augurisk.com/risk/state/Nevada/washoe-county/32031

accounted for more than 36% of the State's $159.5B in gross domestic product. Outdoor activities in Nevada include water sports, winter sports, fishing, bird hunting, wildlife watching, hiking, and golfing. Climate change will impact all these activities.

Agriculture, Forestry, Fishing, and Hunting generated $433M in GDP for the State in 2022. During 2022, Nevada agriculture producers saw almost $210M in losses (winter weather, freezing, and irrigation system failures have been excluded). Insurance payments to U.S. farmers due to drought increased 400% in the 25 years from 1995 to 2020. If the same trend were to hold true for the next 25 years, Nevada farmers could see more than $840M (2022 dollars) in losses in a year by mid-century. Even a 50% increase would result in over $315M (2022 dollars) in losses per year.

Table 33: Impacts of Climate Change on Drought[78]

Area	Impact
Public Health	• Potential for mental health impacts • Increased dust due to drying and lowered water levels in desert and terminal lakes
Water Resources	• Increase demand and decrease supply, limiting water availability for all sectors
Environment	• Drought impacts to plant health and growth • Potential for plant mortality
Recreation and Hospitality	• Partial loss of recreational opportunities due to limited snowpack • Dust to negatively impact tourism
Agriculture and Ranching	• Potential decrease on crop yield and production • Decreased forage quantity, range condition • Water hauling needs • Reduction in Federal land • Increased need for feeding hay • Reduction in land available for production

Table 34 provides the 2022 estimates of agricultural loss increase due to climate change for Washoe County. Loss increase can vary because it depends on the mitigation measures that jurisdictions put in place. During 2022, the total crop insurance premiums for agriculture producers in Nevada amounted to $84.4M on $311M in total liabilities. While insurance premiums will also rise, the interplay between such factors as yield decreases and price increases makes estimating the premium increase extremely difficult.

[78] State of Nevada Enhanced Mitigation Plan, 2023, "Climate Strategy." dem.nv.gov/uploadedFiles/demnvgov/content/About/NEHMP_09-22-2023(4).pdf

Table 34: Washoe County Estimated Agricultural Loss Increase Due to Climate Change[79]

County	2022 Loss	2047 Estimate Loss – Low (50% Increase)	2047 Estimate Loss – High (400% Increase)	2047 Loss Due to Climate Change – Low (50% Increase)	2047 Loss Due to Climate Change – High (400% Increase)
Washoe	$10,275,703	$15,413,555	$41,102,812	$2,928,575	$7,809,534

Vulnerability Analysis

The TMWA has sufficient water reserves to meet current and future regional water demands in drought years, up to and including a worst-case scenario equivalent to the 1987–1994 drought period, the worst drought period on record. The 2020–2040 Water Resource Plan looks different from TMWA's previous plans, with more emphasis on future conditions and analysis of TMWA's water resources and its ability to provide a reliable water supply under variable climate conditions and continued population growth.[80] Estimating future demand is largely a function of projected population growth for the Truckee Meadows. TMWA's 20-year water demand projection estimates that water demand will increase 15% from approximately 83,000 acre-feet in 2020 to 96,000 acre-feet in 2040.

The Truckee River Operating Agreement (TROA), implemented in 2015, now allows TMWA to store a portion of its water allocation in reservoirs when it is not needed to meet current demand, providing more flexibility to respond to changes in climatic, hydrologic, and economic conditions. The TROA also grants the TMWA new rights to credit store water in upstream reservoirs and withdraw water from these reservoirs during drought conditions. Domestic and private well owners in East Lemmon Valley, West Pleasant Valley, Washoe Valley, Truckee Canyon, and southwest Truckee Meadows may be more vulnerable to the effects of drought due to long-term declines in groundwater levels and decreased aquifer recharge during meteorological drought conditions. Industrial facilities and utilities that rely on surface water supplies for industrial processes also may experience operational disruptions if surface water levels decrease.

Estimated Impact and Potential Losses

Droughts are slow-onset hazards, but, over time, they can severely affect crops, municipal water supplies, recreational resources, and wildlife. If drought conditions extend over a number of years, the direct and indirect economic impacts can be significant. High temperatures, high winds, and low humidity can worsen drought conditions and make areas more susceptible to

[79] State of Nevada Enhanced Mitigation Plan, 2023, "Climate Strategy." dem.nv.gov/uploadedFiles/demnvgov/content/About/NEHMP_09-22-2023(4).pdf
[80] Truckee Meadows Water Authority, 2020. https://tmwa.com/wp-content/uploads/2020/11/TMWA-WRP-2020-Final.pdf

wildfires. In addition, human actions and demands for water resources can accelerate drought-related impacts. Drought impacts occur over large areas and cross jurisdictional boundaries. All existing and future buildings, facilities, and populations are considered exposed to this hazard and could be impacted. However, drought impacts are mostly experienced in water shortages and crop losses on agricultural lands and have no impact on buildings. The NOAA NCEI storm database reports no historic or recent crop or property losses from drought in Washoe County.[81]

Common direct impacts of drought include diminished crop yields or total crop loss, the depletion of aquifers, livestock mortality, soil erosion, dust storms, wildfires, reduced electricity production from hydroelectric dams, and reduced water quality or availability. The economic impacts of drought can range from crop losses and increased costs incurred by farmers and ranchers who must buy additional water or feed for livestock to economic losses for tourism and hospitality businesses in the Lake Tahoe Basin if there is a low snowpack. The effects of drought can last from one to several years, and the effects of drought are likely to be compounded the longer drought conditions last.

Based on the National Risk Index (NRI), the Expected Annual Loss for Washoe County from drought is $1.3M, with relatively moderate expected annual losses, and a risk score of 96.8 (Figure 37).

[81] NOAA, NCEI, Storm Events Database: Washoe County, Nevada, 2024. https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Drought&beginDate_mm=12&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=12&endDate_dd=31&endDate_yyyy=2023&county=WASHOE%3A31&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=32%2CNEVADA

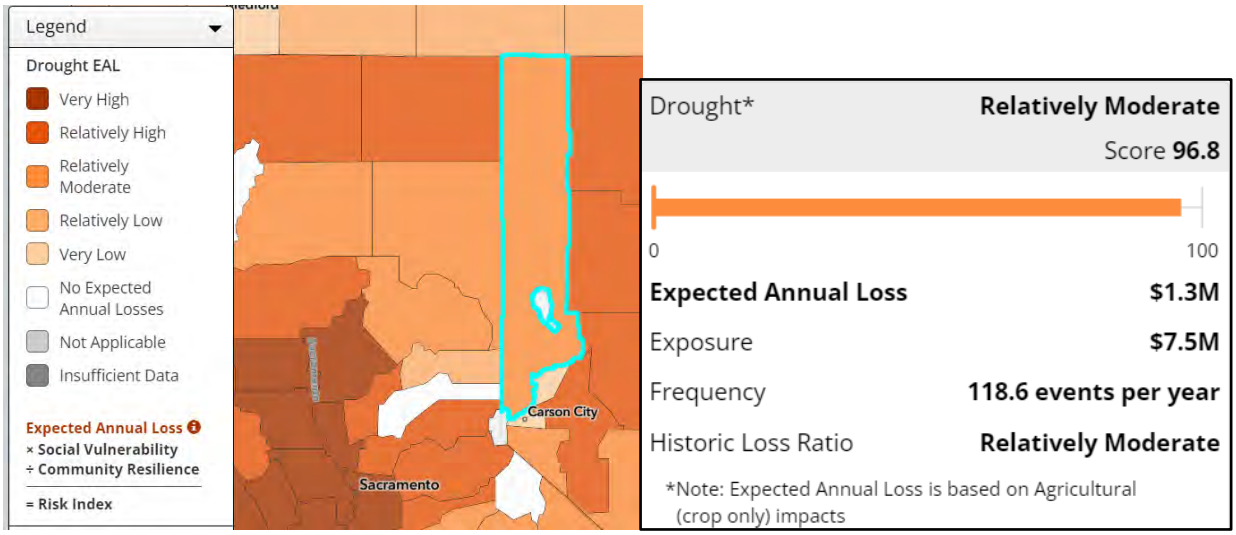


Figure 37: National Risk Index Expected Annual Loss, Map, and Legend for Drought in Washoe County[82]

Vulnerable Populations

Drought can impact both surface water and groundwater availability and can have direct, disastrous effects on human populations. The indirect consequences of drought, such as unemployment, reduced tax revenues, increased food prices, reduced outdoor recreation opportunities, higher energy costs as water levels in reservoirs decrease and consumption increases, and water rationing, are not often fully known. This complex web of impacts can affect people and economies well beyond the area physically experiencing the drought.

Every resident of the region using water for domestic purposes relies to some degree on groundwater supplies. TMWA wells typically supply 15%–20% of annual net water production. These wells provide water to meet summer peak demands. Between June and October during extremely dry years, when Truckee River water is not plentiful, the TMWA relies even more heavily on its wells to meet summer and fall peak demands. In addition to its retail customers, the TMWA provides wholesale water to the Sun Valley General Improvement District, whose only source of water is the TMWA. Other water purveyors in the region rely exclusively on groundwater to meet customer demands. All domestic well owners are solely dependent on groundwater to meet their domestic water needs. The TMWA's surface water treatment and groundwater production facilities are operated as an integrated system that allows for conjunctive use, making it possible for TMWA to reliably meet demands under drought and non-drought conditions. Generally, TMWA diverts as much surface water as possible year-

[82] FEMA, National Risk Index. https://hazards.fema.gov/nri/map

round and begins to bring on groundwater production wells later in the spring when customer demands increase and when needed during drought situations[83].

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States. These lifelines are designed to address the essential needs of a community during and after a disaster. There are eight lifelines, each with its own focus and purpose.[84]

Community Lifelines



Figure 38: FEMA Community Lifelines[85]

During a drought, the essential requirements for food, water, and shelter are crucial for all living organisms, including humans, animals, and crops, to survive and thrive. Without them, they become stressed and eventually die. Drought also affects shelter, as the soil contracts, which leads to structural damage in buildings, bridges, and other construction. To overcome drought, Washoe County must prioritize conservation, creative thinking, and innovation to maintain its current standard of living.

Damage to property from drought is a rarity, although drought can affect the quality and function of water and hydroelectric power infrastructure. In addition, droughts can impact critical infrastructure sectors, such as transportation, energy, and water, which millions of

[83] Truckee Meadows Water Authority, 2020. https://tmwa.com/wp-content/uploads/2020/11/TMWA-WRP-2020-Final.pdf
[84] FEMA, "Community Lifelines Toolkit 2.0." https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf
[85] FEMA, "Community Lifelines Toolkit 2.0." https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf

Americans depend upon. As droughts persist for longer periods and expand into more regions, impacts on various critical infrastructure will increase.[86]

- **Water supply:** During droughts, communities may have limited access to water for household use—including drinking, cooking, cleaning, and watering plants—and for agriculture, transportation, and power generation. Droughts may lead to higher water costs, rationing, or even the decimation of important water sources, such as wells.
- Drought can cause overpulling from aquifers, resulting in subsidence (ground sinking, potholes, large surface cracks), which can damage all parts of the transportation sector, building foundations, supporting infrastructure, and the structural integrity of poles and towers.
- Less surface water availability may reduce the cooling capability of electricity-heavy facilities like datacenters, nuclear plants, and other power plants in the energy sector.
- A threat to water provisions may cause local resource hording or theft to ensure resource security. Theft from key facilities like fire stations, reservoirs, water towers, hospitals and healthcare facilities, and farms/natural sources have been reported in previous longer-term droughts.
- Drought impacts can reduce water provision to defense industrial bases, degrade water quality to healthcare facilities, reduce operations at government facilities, halt critical manufacturing, and impact the chemical sector as water is a key component in many mixtures and dilutions.
- Drought can lead to low-flowing river systems and warmer surface water, making it more conducive to algal blooms, potentially damaging dams and locks, reducing water transportation—with cascading impacts on the supply chain—and reducing hydroelectric capabilities across multiple regions. Electricity generation from fossil fuels can increase by up to 65% during drought conditions because of reduced generation from hydropower.
- Drought can lead to higher costs for feed/hay for livestock, smaller crop yields, and marine loss from overheated waters, leading to higher grocery costs nationally and having a direct impact on the workforce and homelife security.

[86] Cybersecurity and Infrastructure Security Agency, 2024. https://www.cisa.gov/topics/critical-infrastructure-security-and-resilience/extreme-weather-and-climate-change/drought#:~:text=Drought%20can%20lead%20to%20low-flowing%20river%20systems%20and,chain%2C%20and%20reduced%20hydroelectric%20capabilities%20across%20multiple%20regions.

- Increased demand with minimal capabilities to fulfill supply can lead to uneven distribution of wealth across farming communities, and it could lead to financial instability spreading from local to regional and influencing national pricing policy.
- **Transportation Sector:** Drought is often accompanied by extreme heat, which can buckle roadways, render airport runways unsafe, and warp public transit cables. Drought-fueled wildfires also have repercussions for travel by closing roadways and railroads and grounding planes when smoke is thick.
- **Energy Sector:** Droughts can raise concerns about the reliability of electricity production from plants that require cooling water to maintain safe operations. Hydroelectric power may also become unavailable during droughts. When heat waves coincide with droughts, electricity demands can grow, compounding the stress on the grid.

Vulnerability Score

The National Risk Index (NRI) includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at the county and census tract levels. Table 35 provides the NRI data for Drought at the county level.

Table 35: National Risk Index for Drought in Washoe County

	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
Drought	Relatively Moderate	High	Moderate	$1.3M	Moderate

Based on the NRI, Washoe County has a rating of relatively moderate for the risk index and a score of **96.4** for drought which is higher than the national percentile (see Figure 39).

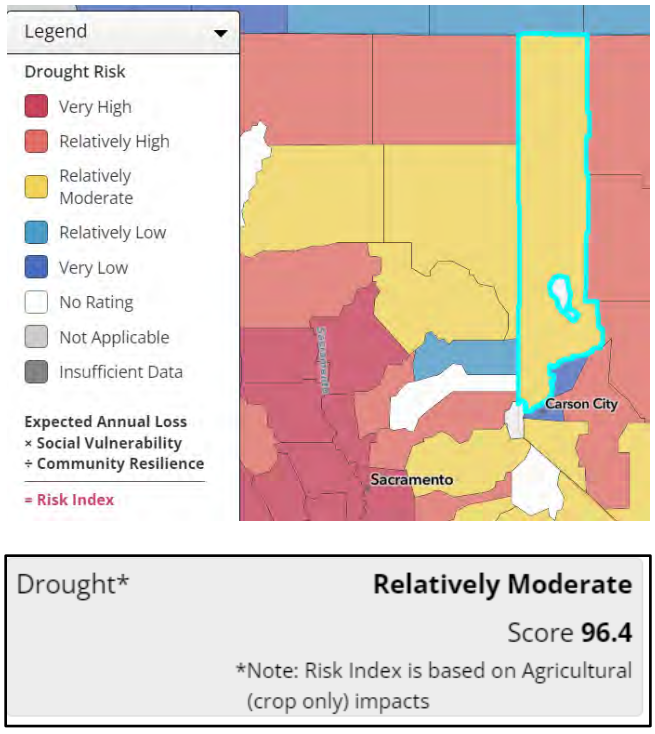


Figure 39: The National Risk Index Drought Score, Map, and Legend for Washoe County[87]

Development Trends

The TROA allows TMWA flexibility in storing and withdrawing water supplies, increasing the agency's ability to respond to hydrologic drought conditions. Economic development across the region has increased demand for water and the region's vulnerability to drought. However, the TMWA has sufficient water supplies and production facilities to meet demand through 2035. Truckee Meadows has been experiencing renewed population growth and increased development since recovering from the economic recession. Economic and population growth has been positive since the completion of TMWA's 2035 WRP in 2016. However, the annual growth rates have not been as fast as those experienced before the start of the Great Recession in 2007. TMWA estimates future population growth and water demand annually to ensure that there are sufficient water resources to meet the increasing demand.[88] While currently it does not appear that the planning area's overall vulnerability to drought has increased due to changes in development, future development may be at an increased risk of drought due to climate change.

[87] FEMA, "National Risk Index Washoe County Drought Score, Map and Legend." https://hazards.fema.gov/nri/map

[88] Truckee Meadows Water Authority, 2020. https://tmwa.com/wp-content/uploads/2020/11/TMWA-WRP-2020-Final.pdf

Type of Hazard	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability (Increased, Decreased, Stayed the Same)
Drought	The region continues to experience high rates of growth. Approximately 9,418 dwelling units were built since 2020. Additionally, a significant amount of commercial and industrial development has occurred. Different types of land uses have differing rates of water consumption, with residential development usually being the most intensive.	Based on dwelling unit growth, population there has been an estimated increase of 18,732 persons.	Due to climate change, extreme drought conditions have become more prevalent in this region. Snowpack is higher and melting faster. The water cycle is changing due to drought conditions and a warming climate.	While drought conditions persist and have become more severe, the region has engaged in complicated water management and planning efforts. These efforts are projected to mitigate the impacts of drought on the water supply of the region. It is currently projected that sufficient water resources exist to serve the projected population over the next 20-years.

Existing Mitigation Case Study

Groundwater is used for drinking water by more than 50% of people in the United States. In Truckee Meadows, groundwater is a vital component of the community's water supply. While much of the local water demand is met using surface water from the Truckee River, during times of low river flows (such as under drought conditions) or during times when Truckee River water is heavy with sediment or otherwise unavailable, the community may be entirely dependent on groundwater. In Truckee Meadows, up to 30% of the drinking water is currently derived from groundwater in a given year. Groundwater wells must be protected or abandoned in accordance with State regulations to keep them from becoming conduits for groundwater

contamination. Northern Nevada Public Health (NNPH) also regulates activities to protect the environment from contamination.[89]

Consequence Analysis

Droughts in Washoe County are a normal occurrence however, the risk of drought is directly related to the length and magnitude of the event.

Table 36 provides the Consequence Analysis of the Potential for Detrimental Impacts of Drought, which was done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 36: EMAP Consequence Analysis for Drought in Washoe County

Subject	Ranking	Impacts/Drought
Public	Moderate	Drought affects broad regions, and all of Washoe County is susceptible. The health and safety of persons affected by drought and severe temperatures will vary depending on the severity of the drought. Drought occurs over a period of days or even months and are normally a prolonged event. Depending on the length of the drought, exposure could have a host of health and safety concerns. Some of these concerns are water supply shortages leading to dehydration. Vulnerable and disadvantaged populations could be hit the hardest.
Responders	Minimal	The threat of drought to first responders should be relatively minor, when properly equipped and trained. Responders are trained to the level necessary to respond in a safe and efficient manner with safety being the number one priority. The most likely effect will be dehydration and other related illnesses.
Continuity of Operations	Minimal to Moderate	Critical infrastructure, essential functions and other areas necessary to the county to function could be compromised due to cascading effects, such as wildfire, power outages, and water shortages which may accompany drought.
Property, Facilities, and Infrastructure	Moderate to Severe	Drought can destabilize the foundation of property, facilities, and infrastructure. Water supplies can run low and pipes can crack when water pressure is restored. Transportation routes may be impassable due to fracture. Shelters, hospitals, and

[89] WashoeCounty.gov, 2024. https://washoecounty.gov/csd/engineering_capitalprojects/environmental/ctmrd/groundwater.php

Subject	Ranking	Impacts/Drought
		healthcare facilities could see an influx of individuals due to drought related health issues.
Environment	High	A drought event could hamper plants and animals as water availability decreases. This is true of fish and marine life also as oxygen levels are affected in ponds, lakes, and rivers. Food scarcity for wildlife could exacerbate human-wildlife encounters. A drought can increase the chance of wildfire and diminish soil quality. Insect infestation can also increase with drought conditions. In addition, poor air quality due to an increase in dust particles and pollutants.
Economic Condition	Moderate	The economic conditions and financial impacts are directly related to the length and severity of the drought. Crops are at great risk when there is a water shortage, resulting in increased prices for the buyer and decreased revenue for the sellers. Livestock can be affected. When a portion of a county's revenue is dependent upon tourism, the reduction of tourists could greatly impact the economy.
Public Confidence in Governance	Moderate	Droughts can lead to a loss of public confidence in the Government if services are limited for a length of time. Frustration levels for the public and business could be escalated.

COMMUNITY INPUT

The public considered drought a hazard and was concerned about its impact on the planning area. One member indicated that new developments are threatening the water sources by planting grass in areas not used. Another noted the effects drought and dry conditions could have on increasing fire risks. Further, a few members were concerned that mild winters would decrease water supply and increase drought.

Public members indicated they would support adopting and enforcing mitigation measures that apply to large corporations and developers. They would also support a slowdown of the building to fund studies to understand the risk and develop mitigation recommendations. Public members also supported additional public outreach and education, which may help reduce the risk of this hazard.

Earthquake

Hazard Description

An earthquake is a sudden motion or trembling of the ground caused by shifting tectonic plates. Earthquakes are potentially catastrophic and can cause multiple fatalities, and major structural and infrastructure damage, including the disruption of utilities, communications, and transportation systems. Secondary effects can include landslides, seiches, liquefaction, fires, and dam failure, among others. Seiches, or standing waves in a closed body of water, can cause inundation impacts similar to a tsunami.

Fault zones in the Earth's crust result from sheer motion between tectonic plates, and they are the causal locations of most earthquakes.

Earthquakes occur abruptly, with little or no warning time. In certain cases, seismic monitoring and alert systems (i.e., ShakeAlert) can issue advance warning of incoming shaking by detecting earthquakes early and alerting people farther away from the source. The duration of earthquakes ranges from a few seconds to a few minutes. Aftershocks can recur over hours, weeks, or months, usually with diminishing frequency and intensity.

Location

According to the U.S. Geological Survey (USGS) earthquakes can happen anywhere in the United States, but they occur in some places more than others. Figure 40 is USGS's National Seismic Hazard Model, which shows the likelihood of damaging shaking in 100 years.

The State of Nevada is the third most seismically active state in the United States, and Washoe County is located in one of the most seismically active areas in Nevada. The likelihood of damaging shaking is 75–95%, so any area of the County is susceptible to noticeable effects of earthquakes. The most hazardous fault zones in Washoe County are the Mount Rose fault zone, the West Tahoe fault, and the Pyramid Lake fault. Moreover, dozens of smaller faults are located in developed areas throughout the County.

Areas near Lake Tahoe and Pyramid Lake may be affected by seiches following an earthquake. The potential inundation zone surrounding Lake Tahoe includes shoreline areas below an elevation of 6,260 feet.

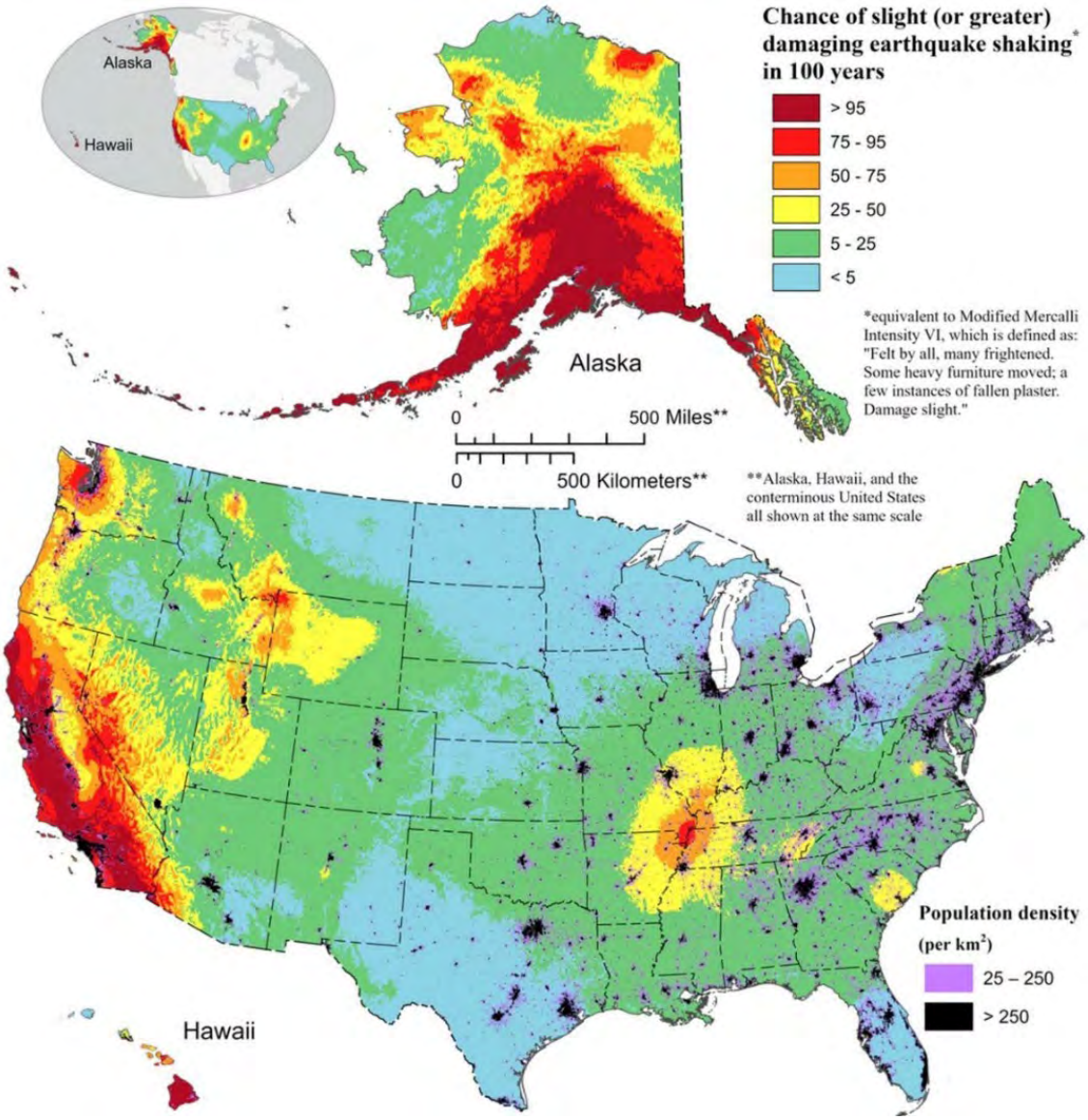


Figure 40: National Seismic Hazard Model[90]

Figure 41 shows the locations of seismic activity in the State of Nevada from the 1840s through 2015. Southern Washoe County, which includes areas near Reno, Sparks, and north of Lake Tahoe, has a higher likelihood of experiencing earthquakes. The region's elevated population density can also exacerbate the potential impacts of such events.

Outside of Southern Washoe County, the earthquake risk varies depending on the region. The regions further away from tectonic plate boundaries are typically less susceptible to strong seismic activity. However, there are still potential risks due to the geological features present in

[90] USGS, 2023, "National Seismic Hazard Model." https://www.usgs.gov/media/images/national-seismic-hazard-model-2023-chance-damaging-earthquake-shaking

the area. For instance, the northern parts of Washoe County can experience some seismic activity due to the geological characteristics associated with the Basin and Range Province, though it may not reach the same level of intensity as in Southern Washoe County.

A total of 77 earthquakes with a magnitude (M) between 4 and 6.5 have been centered in Washoe County: 58 between 4.0 and 5.0, 12 between 5.0 and 6.0, and 7 over 6.0.

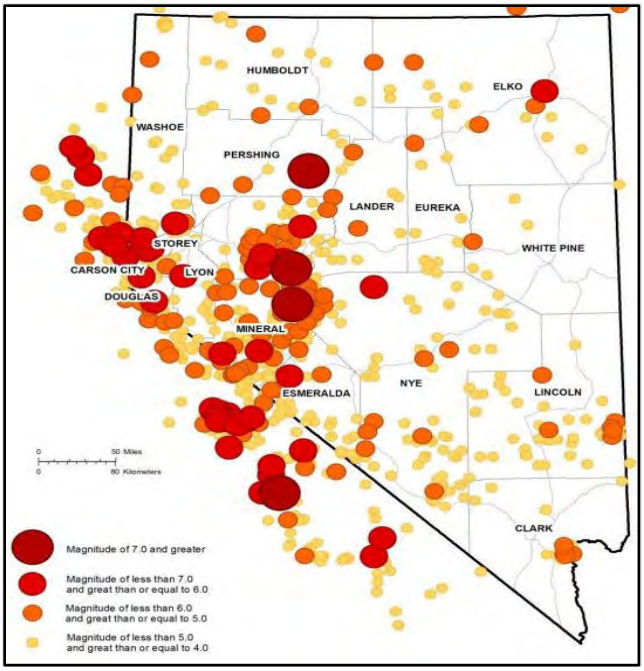


Figure 41: Earthquakes at or above Magnitude 4.0 in and near Nevada, 1840s–2015[91]

Extent

There are many ways to measure the power of an earthquake. The Richter Scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the sizes of earthquakes. The Richter scale has no lower limit and no maximum. It's a logarithmic scale, which means that each one-point increase on the scale represents a 10-fold increase in the size of the quake, expressed in whole numbers and decimals. For example, an M 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated M 6.3 (See Figure 42). For large earthquakes, the moment magnitude scale describes the size of the earthquake in terms of its energy release. This is the most used way to describe the size of large earthquakes.

[91] 2018 Nevada Enhanced SHMP, Nevada Seismological Lab, Nevada Bureau of Mines and Geology, "Earthquakes in Nevada Magnitude 4.0 or Greater, 1840–2015."



Figure 42: The Richter Magnitude Scale[92]

There are other ways to measure the magnitude of an earthquake. Velocity, acceleration, and amplitude (displacement) are examples of aspects of ground motion that can be directly measured. In addition, the amount of energy released during an earthquake is commonly expressed on the moment magnitude scale. It is a measure of energy released from the fault or epicenter, as recorded on seismographs. The moment magnitude scale has largely replaced the Richter scale, as it was developed specific to California earthquakes and crust and does not provide accurate estimates for large magnitude earthquakes.[93]

Another measure of earthquake magnitude is intensity. Intensity is an expression of the amount of shaking at a given location on the surface as felt by humans and is defined by the Modified Mercalli Intensity (MMI) Scale. It is typically the greatest cause of losses to structures

[92] CBC News, 2012, The Associated Press, "Richter Magnitude Scale Explained." https://www.cbc.ca/news/world/richter-magnitude-scale-explained-1.1130841
[93] Michigan Tech, 2024, "Earthquake Intensity." https://www.mtu.edu/geo/community/seismology/learn/earthquake-measure/magnitude/

during earthquakes and is determined by many factors, including the distance from the epicenter and soil types.

The MMI value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects actually experienced at that place.

The lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. Structural engineers usually contribute information for assigning intensity values of VIII or above.[94]

[94] Unites States Geological Survey, 2024, "Modified Mercalli Intensity Scale." https://www.usgs.gov/media/images/modified-mercalli-intensity-scale

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Figure 43: Modified Mercalli Intensity Scale[95]

[95] Unites States Geological Survey, 2024, "Modified Mercalli Intensity Scale." https://www.usgs.gov/media/images/modified-mercalli-intensity-scale

According to USGS, damage from an earthquake begins at a level of ground shaking (peak ground acceleration or PGA) of approximately 10% of the force of gravity (0.1 g, or 10% g). PGA is the maximum acceleration of the ground or the intensity of an earthquake at a given site. Below this level, damage is typically very slight, except in unusually vulnerable facilities, such as buildings constructed prior to enforcement of seismic design building codes.

Peak Ground Acceleration Range %	Damage level	Types of Structure Damage
10–20%	Minor to moderate	Only poorly design structures subject to collapse from ground shaking
20–50%	Significant	Some Modern buildings (built after early 1960s to the mid-1970s) subject to severe levels of damage, including collapse in buildings constructed in noncompliance of seismic building codes standards,
Over 50%	Maximum	May cause higher levels of damage in many buildings, even those designed to resist seismic forces.

Earthquakes can cause significant, widespread structural damage throughout the region. Most critical facilities in Washoe County are located in areas that may experience relatively high seismic ground motion hazards. These facilities may experience PGA with a 2% probability of exceedance in 50 years of greater than 48% gravity, which would be experienced as severe shaking, likely to cause moderate or heavy damage to structures. The impact of an earthquake can deform the earth's gravity. As the rock slabs shift in the earth's interior abruptly, a change in the earth's mass distribution occurs. The stronger the earthquake, the increase in meters of gravity displacement. Gravity displacement can be measured locally in percentages and depends on mass distribution in the vicinity of the measuring point, registering a small but immediate change in gravity.[96]

For most critical facilities in the County, smaller earthquakes (resulting in PGA with a 10% probability of exceedance in 50 years) could produce ground motion ranging from 16% to 64% gravity. These levels of PGA would be experienced as strong to severe shaking and could cause light to heavy damage to structures.

Previous Occurrence/History

The Nevada Seismological Laboratory and the United States Geological Survey online archives contains a database of previous occurrences of earthquake events in Washoe County. Magnitudes <5 on the MMI Scale are likely to be felt by many people but are not likely to

[96] Phys.org, February 21, 2020, "How Earthquakes Deform Gravity." https://phys.org/news/2020-02-earthquakes-deform-gravity.html

damage property. At M 5 or greater on the MMI Scale, earthquakes are felt by most people, and some unstable objects may be broken or overturned. The following earthquakes of M 5 or greater occurred in Washoe County between 1852 and 2023:

- May 30, 1868: M 6.0
- December 27, 1869: M 6.7
- July 10, 1877: M 5.0
- June 3, 1887: M 5.5
- November 18, 1894: M 5.5
- February 18, 1914: M 6.0
- April 24, 1914: M 6.4
- April 27, 1914: M 5.0
- May 25, 1937: M 5.0
- June 18, 1937: M 5.3
- May 9, 1942: M 5.1
- December 3, 1942: M 5.9
- December 29, 1948: M 6.0
- May 9, 1952: M 5.1
- September 26, 1953: M 5.5
- September 26, 1959: M 5.3
- April 25, 2008: M 5.0

Figure 44 shows earthquakes in and near Reno Nevada ≥M 5 between 2018 and March 2024.

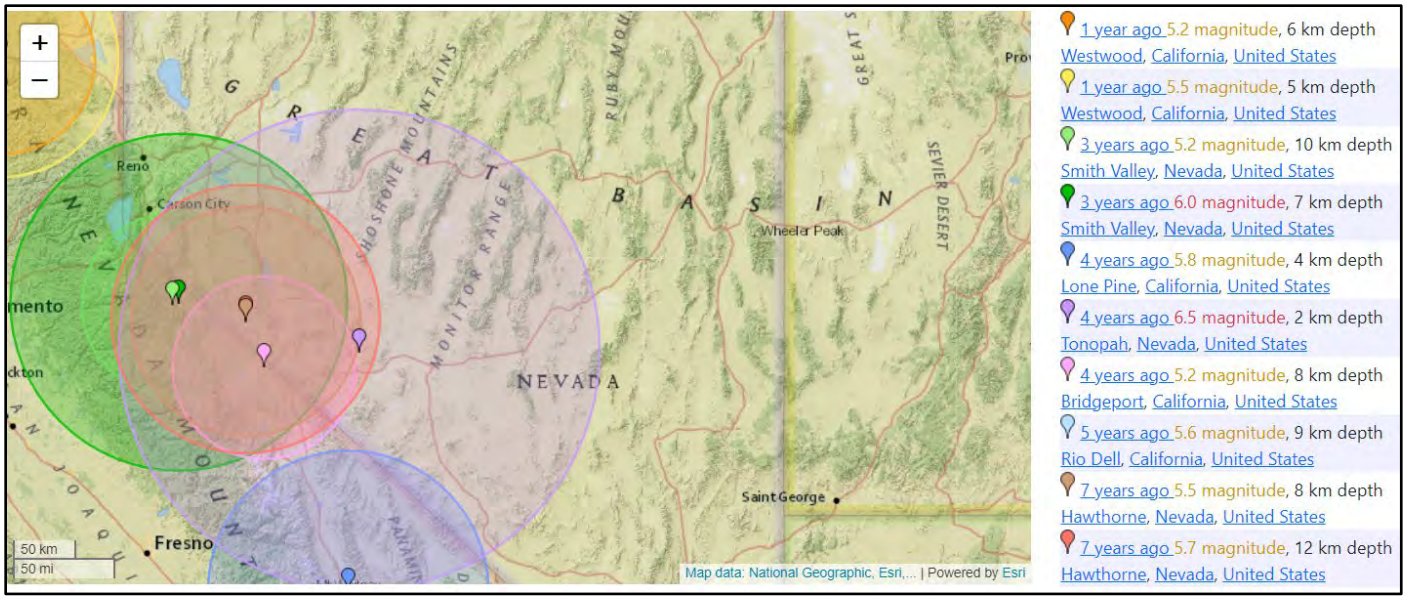


Figure 44: Earthquakes Tracked in Reno Nevada Area at ≥M 5, 2018–2024[97]

- **Mogul-Somersett Earthquake, April 25, 2008** – The largest earthquake in the past 50 years in Washoe County occurred on April 25, 2008. Small earthquakes began in the western Reno, Nevada, region in February 2008 and grew in size and frequency until mid-April. On April 15, 2008, seismic activity greatly increased, producing four events ≥M 3. The earthquake swarm increased again on April 24, 2008, with two M 4 events. The main shock of M 5 occurred on April 25, 2008, and caused violent shaking at Mogul and Somersett. A vigorous aftershock sequence followed into the summer of 2008. While buildings overall survived the shock well, reports indicated that the violent rocking of buildings led to some structural damage, such as cracked paint and plaster along drywall seams, wall and ceiling corners, and doors and entryways. There were some instances of cracked stucco on outside walls and dislodged roof tiles. These types of repairs to a home can cost a couple thousand dollars. In fewer cases, garage walls were displaced from the foundation. More complicated repairs, such as this, are estimated to cost between $5,000, and $10,000. Additionally, there was significant nonstructural damage due to the earthquake, such as damage to household items and business merchandise resulting in financial losses. One utility, a water canal used as a source for local water treatment, withstood damage from the earthquake (Figure 45).

[97] Earthquaketrack.com, "Recent Earthquakes Near Reno, Nevada," 2024. https://earthquaketrack.com/us-nv-reno/recent?mag_filter=5



Figure 45: Water Flume Damaged by the Mogul–Somersett Earthquake, 2008[98]

Probability of Future Events

A 2019 research study conducted by the University of Nevada Reno states that the earthquake hazard in the Reno–Carson City urban area is greater than the hazard in most parts of California—except near the San Andreas fault.[99] Figure 46 maps the potential intensity of earthquakes in Nevada at a common level of PGA. The map shows the intensity of PGA that has a 2% probability of exceedance in 50 years. The recurrence interval for an event with this probability is 2,500 years. The region of Washoe County with the highest predicted peak acceleration is centered in the Reno/Carson City metropolitan area. The PGA range at this probability for the City of Reno is 80–120% percent gravity.

[98] 2020 Regional HMP, "2008 Mogul–Somersett Earthquake Damage Rock Fall Damage to Water Flume" (Nevada Bureau of Mines and Geology, University of Nevada, Reno; dePolo 2008)
[99] Seismology Research Letters, Volume 90, Number 4, July/August 2019, University of Nevada Reno, "A Seismic Hazards Overview of Urban Regions of Nevada: Recent Advancements and Research Directions," http://neotectonics.seismo.unr.edu/CNS_pdfs/2019-AndersonHazardsPaper.pdf

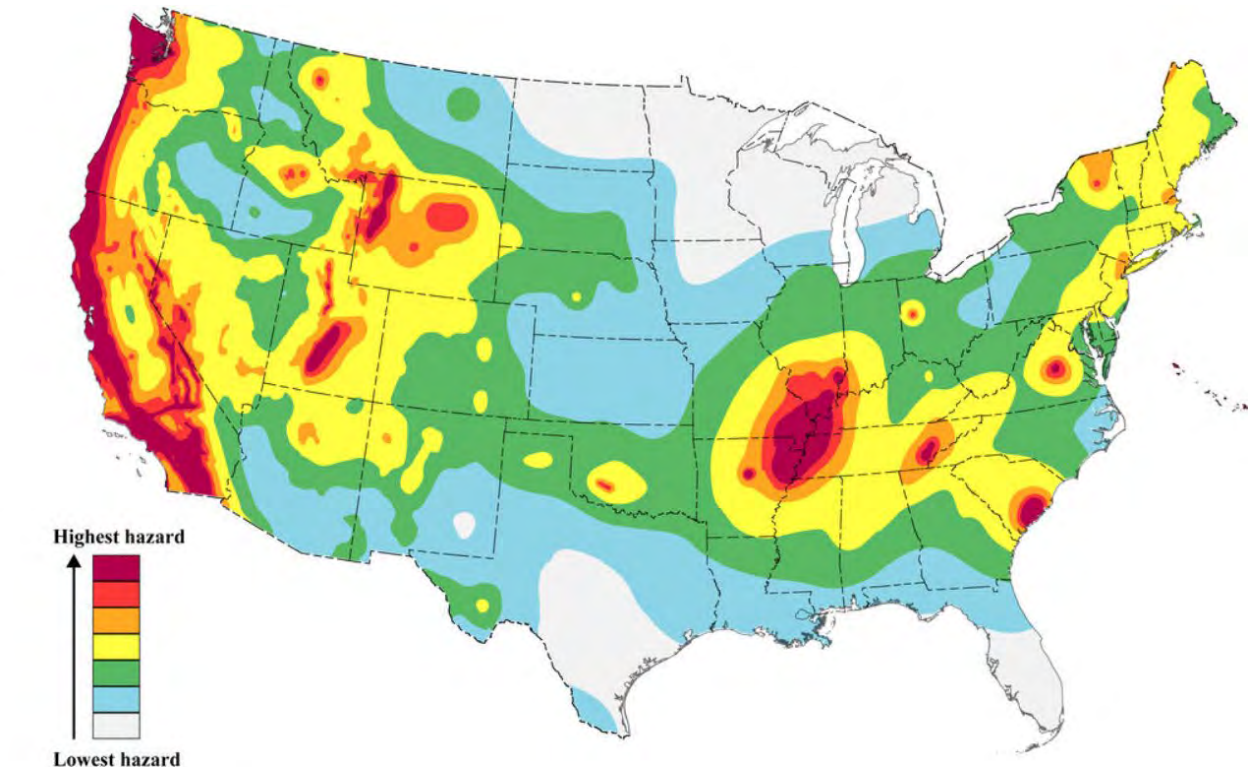


Figure 46: Peak Ground Acceleration (% g) with 2% Probability of Exceedance in 50 Years[100]

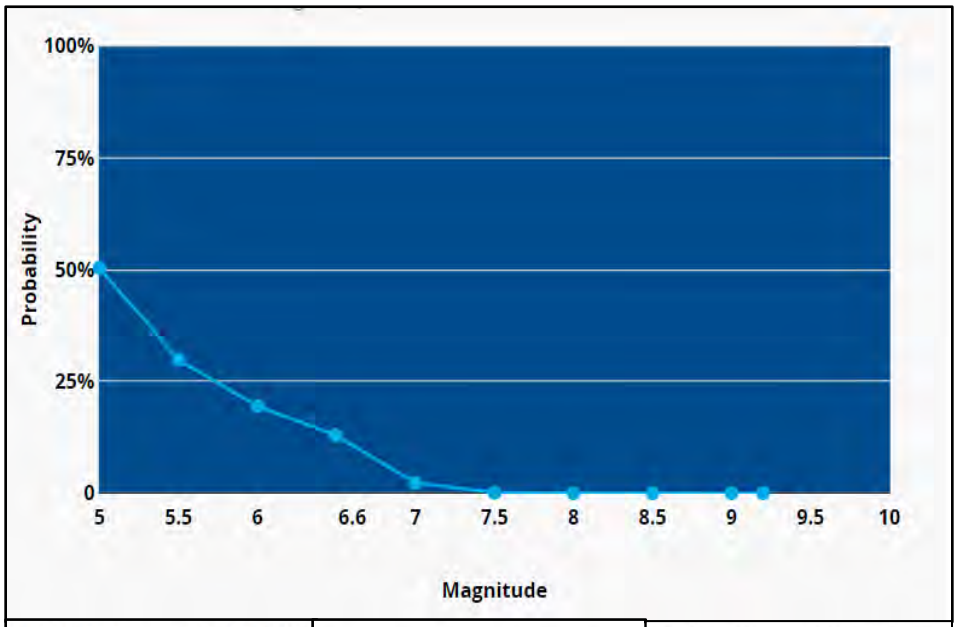
According to the previous lists of earthquake occurrences in Washoe County, 17 earthquakes of >M 5 have occurred in the last 150 years. The probability of future occurrence can be estimated at 10%; this means that there is roughly a 10% chance of an earthquake of >5M occurring every year. The overall probability of future occurrence of an earthquake of ≥5M is considered Medium, with an estimated 1%–10% chance of occurrence in a given year.

Table 37 provides the Calculated Priority Risk Index for Earthquake. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

[100] 2020 Regional HMP, USGS 2014, "Peak Ground Acceleration (%g) with 2% Probability of Exceedance in 50 Years."

Table 37: Calculated Priority Risk Index for Earthquake in Washoe County

Type of Hazard	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Earthquake	4	3	4	3	3	3.4



MAGNITUDE	PROBABILITY	MAGNITUDE	PROBABILITY	MAGNITUDE	PROBABILITY
5.0	50.33%	6.0	19.44%	7.1	1.37%
5.1	45.29%	6.1	18.02%	7.2	0.82%
5.2	45.29%	6.2	16.78%	7.3	0.43%
5.2	40.71%	6.3	15.57%	7.4	0.22%
5.3	36.61%	6.4	14.30%	7.5	0.09%
5.4	32.98%	6.5	12.87%	7.6	0.01%
5.5	29.81%	6.6	9.70%	7.7	0.00%
5.6	27.05%	6.7	7.41%	7.8	0.00%
5.7	24.68%	6.8	5.57%	7.9	0.00%
5.8	22.65%	6.9	3.80%	8.0	0.00%
5.9	20.91%	7.0	2.25%	8.1	0.00%

Figure 47: Probability and Magnitude of Earthquakes in Washoe County in the Next 50 Years[101]

IMPACT OF CLIMATE CHANGE AND VARIATIONS

Recent geological studies have shown that climate change, specifically rising rainfall rates and glacial melting, could exacerbate seismic activity, such as earthquakes. Geologists have identified the correlation between the frequency of earthquakes and annual rainfall cycles. Changing climate conditions , such as a warmer atmosphere, can retain more water vapor, leading to higher levels of precipitation. As rainfall increases, the earth's crust is compressed, both vertically and horizontally, stabilizing it. When this water disappears in the winter, the effective "rebound" destabilizes the region and increases the number of earthquakes that occur.[102]

Vulnerability Analysis

The 2023 Enhanced SHMP states that earthquakes are responsible for the formation of the Nevada mountain ranges, which are still developing. Seismicity, earthquake faults, and geodetically measured deformation (Geodetic measurements of deformation are used to measure the movement of the Earth's surface and strain in the upper few hundred meters of the Earth's crust.) all indicate that future large earthquakes can occur anywhere in the state. In the short term, personal preparedness, emergency response planning, and community recovery planning are critical. In the long term, constructing seismically resilient buildings, planning future development around earthquake faults, and installing earthquake early warning systems will help reduce injuries and damage from future earthquakes.

Earthquakes usually occur without warning and can impact areas a great distance from their point of origin. The damage depends on the extent and duration of the shaking, population density, and the construction of buildings and infrastructure in the area shaken by the quake. Some areas may be more vulnerable than others based on soil type, the age of the buildings, and the building codes in place. Building codes adopted by Washoe County require all development to meet building standards based on seismic zones. The currently adopted codes are the 2018 International Building Code and the 2018 International Residential Code, with the Northern Nevada Amendment package.

Housing types vulnerable to damage from earthquakes include the following:[103]

- **Wood Frame Multi-Family Buildings | Soft-Story Problems** – Some of the buildings most at risk of damage from shaking are soft-story apartments and condominiums. A soft-story

[101] Homefacts, 2024,"Washoe County Earthquake Probability and Magnitude." https://www.homefacts.com/earthquakes/Nevada/Washoe-County.html
[102] Inverse, February 20, 2024, Matthew Blackett, "Scientist Find a Possible Connection Between Climate Change and Earthquake Risk." https://www.inverse.com/science/climate-change-volcano-earthquake-connection
[103] Quake Busters, "Housing Vulnerable to Damage in Earthquakes." https://qbusters.com/housing-vulnerable-to-damage-in-earthquakes/

residential building has large openings on the first floor for garage doors and windows to accommodate parking or commercial space, with housing on upper floors. Most were built before certain building codes were established. In an earthquake, ground shaking can cause these structures to sway and sometimes collapse.

- **Single-Family Homes | Cripple Wall Problems –** Before World War II, older houses were often not secured to their foundations and had insufficient bracing for the walls around the crawl space. From the early 1960s to the mid-1970s, houses were often inadequately secured with small bolts or with too much space between bolts. Common earthquake damage to these structures includes the wood frame coming off its foundation, the walls around the crawl space being displaced, cracks in the foundation, and chimneys breaking at the roof line.

- **Mobile Homes –** A mobile home is a factory-built dwelling made entirely of lightweight metal or with a frame of wood and a steel chassis. The exterior is typically protected with wood, aluminum, or fiberglass siding. Mobile homes are often structurally linked together to form a double-wide coach. The units can be pulled on wheels to a site, leveled, and supported in various ways.

- **Unreinforced masonry (URM) buildings** – These structures do not have steel reinforcing the masonry walls. URM buildings have bearing walls of unreinforced masonry, and the floors, roofs, and internal partitions are usually made of wood. Earthquake damage to URM structures can be severe and hazardous due to a lack of reinforcement, poor mortar, and inadequate roof-to-wall ties. These buildings were constructed in an era when reinforcing was generally not used. Anchorage to floor and roof was generally missing and the use of low-strength lime mortar was common.

SEISMIC DESIGN

Washoe County has established the following requirements for structures:[104]

- **International Building Code (IBC), Chapter 16, Section 1613, amended:** The seismic design for structures in Washoe County shall be based on the response parameters and equations of Chapter 16. See ASCE 7-16 as referenced in the IBC.

- International Residential Code (IRC), 2018 International Residential Code, Chapter 3 Building Planning: Use Seismic Design Category "D2."[105]

[104] Washoe County, Nevada, 2024, Seismic Design. https://www.washoecounty.gov/building/ConstructionDesign%20Requirements.php
[105] International Residential Code, 2018, "Seismic Design Category, Chapter 3 Building Planning." https://codes.iccsafe.org/content/IRC2018/chapter-3-building-planning

Most earthquake-related property damage and deaths are caused by the failure and collapse of structures due to ground shaking. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (in mountain regions and along hillsides), and liquefaction.

IMPACT ON COUNTY ASSETS

Earthquakes can cause various impacts, such as structural damage to buildings, fires, damage to bridges and highways, initiation of slope failures, and liquefaction. The types of impacts depend on factors such as the earthquake's location, the area's level of development, and the infrastructure's ability to withstand shaking. This all depends on the magnitude of the earthquake, the depth of the focus, the distance from the epicenter, the population density, and the mitigation actions taken to disrupt the impacts of the earthquake.

The overall magnitude and potential severity of earthquake impacts are considered relatively high in Washoe County. The economic impacts affect a city or community. In a worst-case scenario, earthquakes can require federal support, impact critical facilities, disrupt services for more than 20 days, and have national economic impacts.

CASCADING IMPACTS

Cascading impacts of earthquakes of high magnitude, potentially resulting in the need for additional mitigation actions, including for landslides, utility failures, infrastructure failures, conflagration, shortages of food, hydration water, and medical supplies, and economic disruption.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Figure 48 presents the National Risk Index (NRI) rating and the Expected Annual Loss for Washoe County at $166M from earthquakes, with a rating of Relatively High expected annual losses and a risk score of 99.5 percentile compared to the rest of the United States.

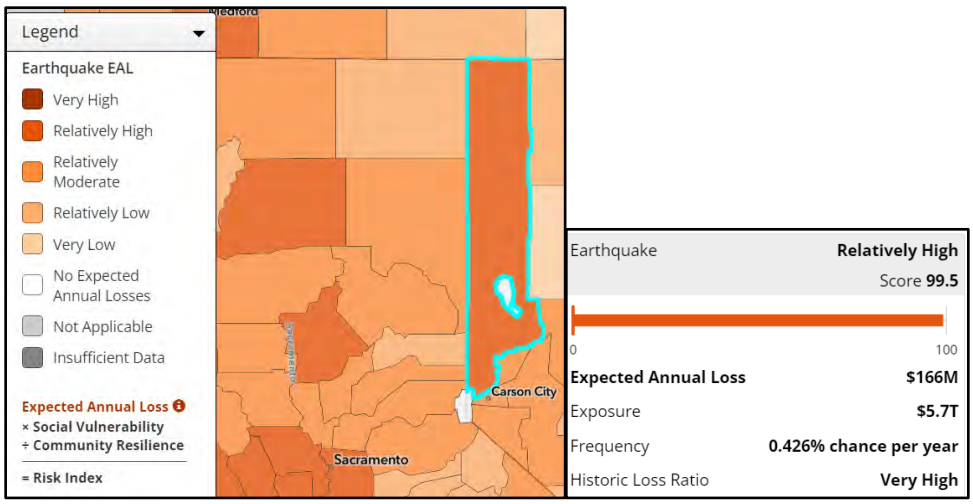


Figure 48: Washoe County Earthquake Expected Annual Loss Score, Map, and Legend[106]

HAZUS SCENARIOS

Three earthquake scenarios were generated to demonstrate potential impacts from different types of events that could affect the planning area. These are based on USGS ShakeMap scenarios, which represent a potential earthquake by assuming a particular magnitude, location, soil amplification, fault-rupture geometry, estimated ground motion, and shaking intensity. Soil amplification is the phenomenon in which seismic waves increase in amplitude as they pass through soft soil layers near the surface of the earth. This is a major factor in determining the extent of damage to structures during an earthquake. Fault rupture geometry refers to the shape and orientation of a fault plane along which an earthquake rupture occurs, including its dip angle, strike direction, and any bends or complexities in its surface. All of these significantly influence how an earthquake ruptures and propagates along the fault, impacting the severity of ground shaking and potential damage. Estimated ground motion is the prediction of the level of ground shaking and its uncertainty at a given location. Shaking intensity is a measure of how severe ground shaking is at a particular location, and it varies from place to place. It is based on how the shaking affects people, buildings, and the landscape. Shaking intensity is measured using a scale, such as the Modified Mercalli Intensity (MMI) scale.

The ShakeMap Scenario catalog comprises credible events developed in consultation with the scientific community, including the USGS Earthquake Hazards Program, regional seismic networks, and additional localized data. The Hazus interface identifies ShakeMap scenarios that could impact a user-defined planning study region. Three events were selected to provide plausible scenarios and associated impacts on the Washoe County planning area as shown in Figure 49 through Figure 51.

[106] FEMA, National Risk Index, "Washoe County Winter Storm Expected Annual Loss Score, Map, and Legend." https://hazards.fema.gov/nri/map

- M 6.8 – Freds Mountain fault
- M 6.9 – Mount Rose fault zone
- M 6.0 – Spanish Springs Peak fault

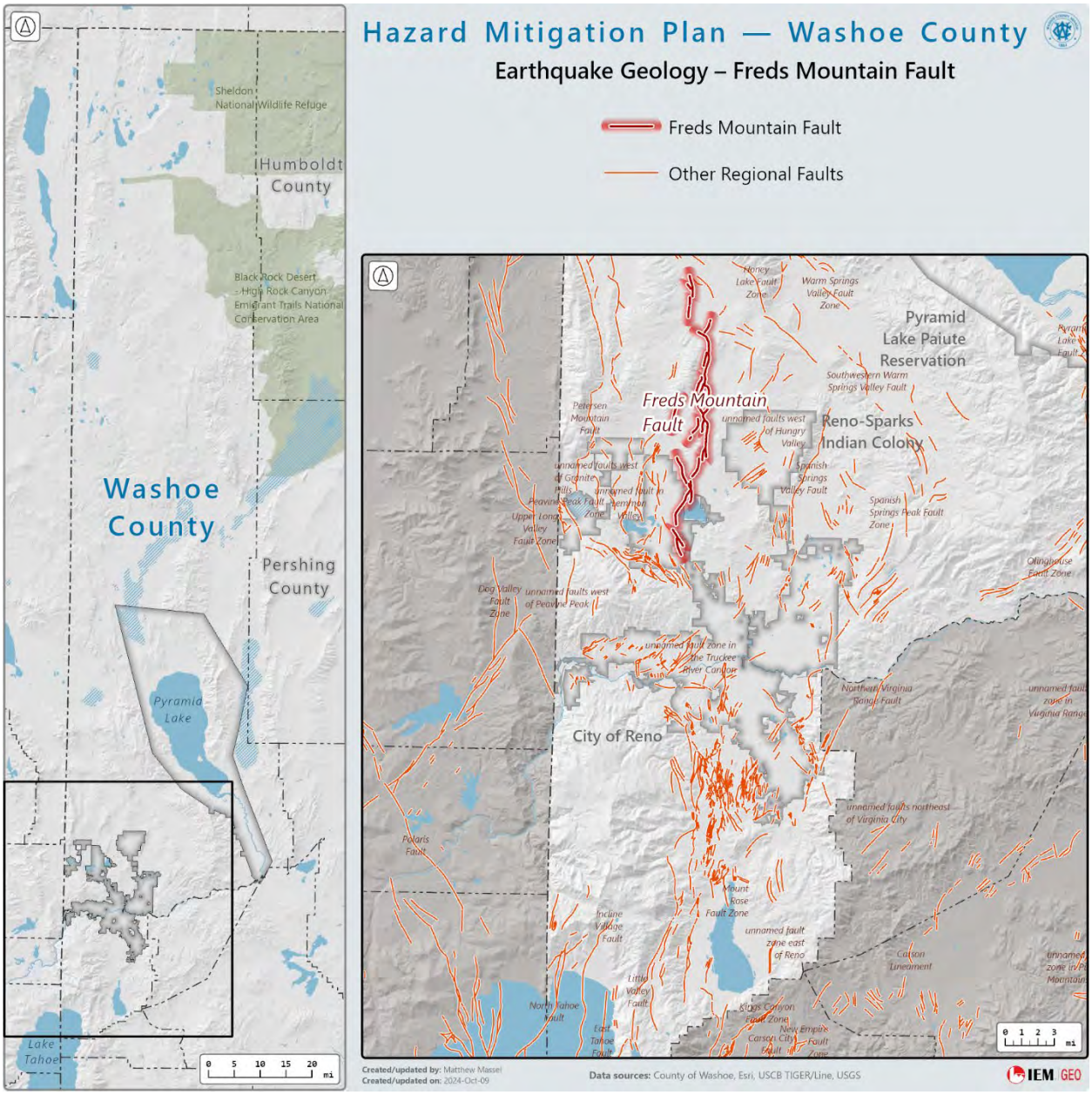


Figure 49: Freds Mountain Fault Zone

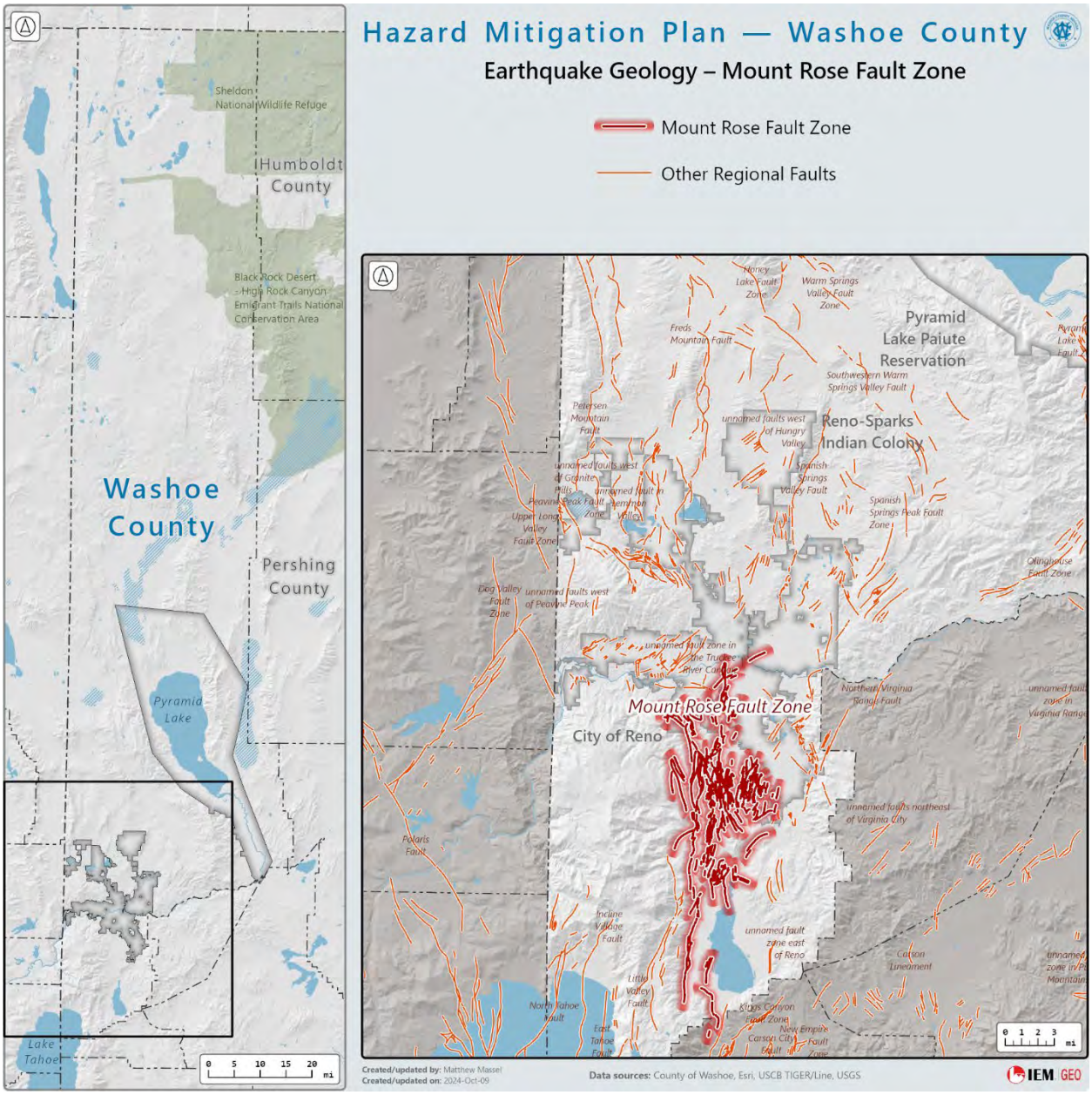


Figure 50: Mount Rose Fault Zone

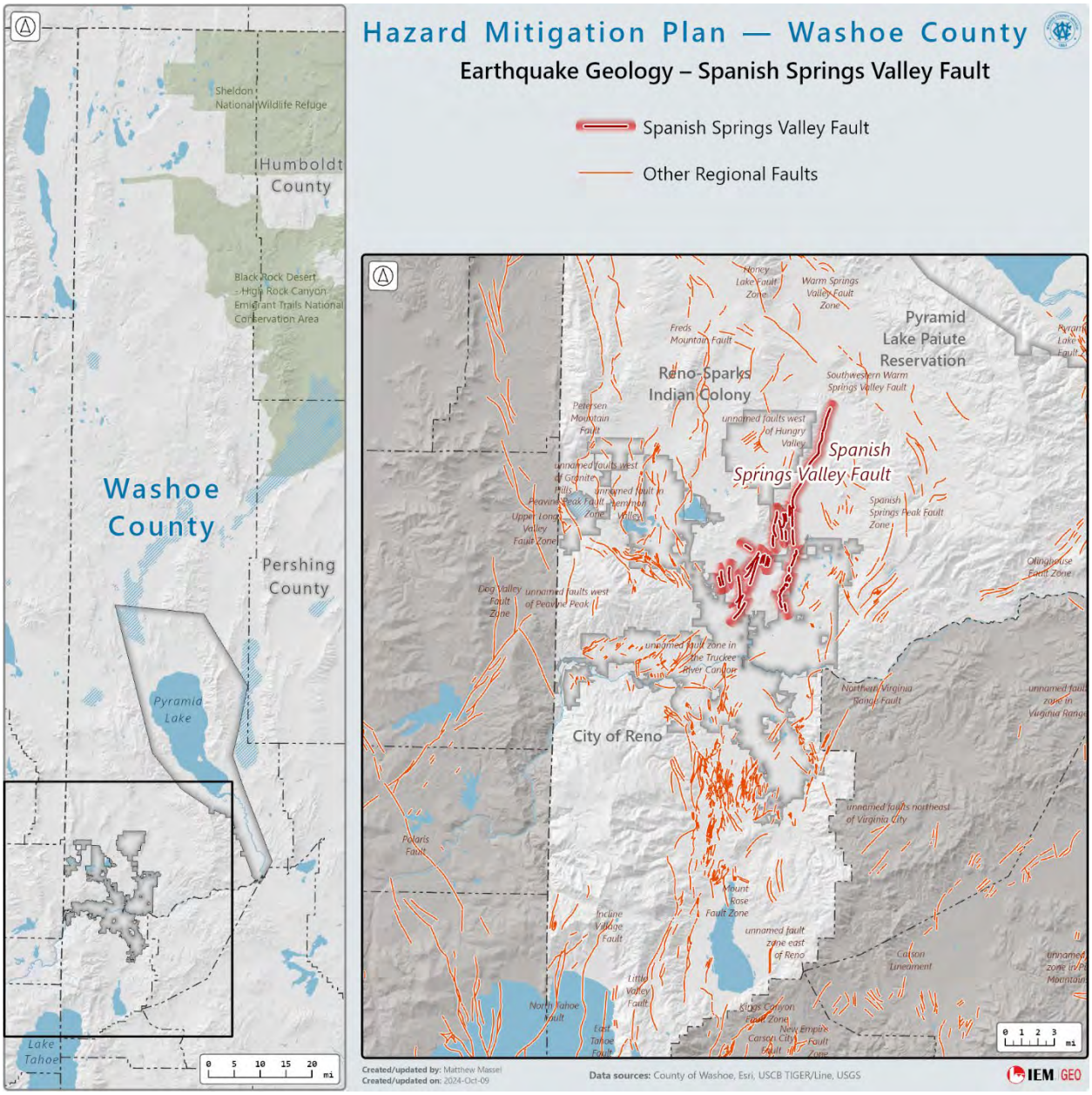


Figure 51: Spanish Springs Fault Zone

Hazus generates loss estimates to describe the potential damage and disruption that may result from the modeled earthquake event. These will be summarized separately for each scenario. Damage is described by five damage states: None, Slight, Moderate, Extensive, and Complete. The impacts of different damage states may vary for different types of construction. Descriptions of structural damage for 16 common building types are available in the Hazus Earthquake Model Technical Manual. Table 38 presents descriptions of structural damage to light wood frame construction.

Table 38: HAZUS Descriptions of Damage from Earthquakes

Damage State	Description
Slight	Small plaster or gypsum-board cracks at corners of door and window openings and wall-ceiling intersections; small cracks in masonry chimneys and masonry veneer.
Moderate	Large plaster or gypsum-board cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys
Extensive	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations; partial collapse of "room-over-garage" or other "soft-story" configurations; small foundation cracks
Complete	Structure may have large permanent lateral displacement, may collapse, or be in imminent danger of collapse due to cripple wall failure or the failure of the lateral load resisting system; some structures may slip and fall off their foundations; large foundation cracks.

Hazus estimates 176,000 buildings are in Washoe County with a total replacement value of $88,108,000 (excluding contents). Of these buildings, 91% of the structures and 65% of total building value are associated with residential housing. According to Hazus demographic data, based on the 2020 Census, the region contains 191,000 households and has a population of 486,492 people.

The standard inventory general building stock data for the region was used, but critical facility information was updated with local data for a Level 2 analysis. There are 50 fire stations, 18 police stations, 41 hospitals and healthcare facilities, 10 Emergency Operations Centers (EOCs) including alternates, and 127 schools in the area.

FREDS MOUNTAIN FAULT ZONE SCENARIO

This scenario is based on a 6.8M earthquake associated with the Freds Mountain fault, with an epicenter near the north boundary of the Reno-Sparks Indian Colony.[107] About 17,508 buildings will be at least moderately damaged in this scenario, and 549 are estimated to be damaged beyond repair. The expected damage by building occupancy type is summarized in Table 39.

[107] M 6.8 Scenario Earthquake – Freds Mountain Fault. https://earthquake.usgs.gov/scenarios/eventpage/bssc20141657_m6p78_se/executive

Table 39: Expected Damage by Building Occupancy Type from the Freds Mountain Fault Zone Scenario

Jurisdiction	Structural Damage	Non-Structural Damage	Building Damage	Contents Damage	Inventory Damage	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
City of Reno	$362,361,000	$1,182,715,000	$1,545,076,000	$562,825,000	$72,290,000	$197,905,000	$169,961,000	$140,942,000	$226,927,000	$2,915,926,000
City of Sparks	$141,803,000	$471,470,000	$613,274,000	$198,529,000	$24,045,000	$71,424,000	$49,337,000	$40,294,000	$55,732,000	$1,052,634,000
Pyramid Lake Paiute Reservation	$26,000	$199,000	$225,000	$107,000	$10,000	$9,000	$4,000	$5,000	$4,000	$364,000
Reno-Sparks Indian Colony	$3,790,000	$8,113,000	$11,902,000	$2,837,000	$387,000	$3,425,000	$3,864,000	$1,238,000	$3,781,000	$27,433,000
Unincorporated Washoe County	$71,474,000	$321,367,000	$392,841,000	$132,455,000	$14,047,000	$38,098,000	$7,295,000	$11,872,000	$8,827,000	$605,434,000
Grand Total	$579,455,000	$1,983,863,000	$2,563,318,000	$896,753,000	$110,778,000	$310,861,000	$230,461,000	$194,351,000	$295,269,000	$4,601,791,000

Building-related losses include direct damage to buildings and contents and indirect losses caused by the inability to operate businesses due to damage caused by the earthquake. The indirect losses include temporary living expenses for displaced individuals. A total of $4.6 billion in building-related losses was generated in this scenario—78% of which are direct losses and 22% of which are business interruption losses.

Losses of $50.5 million are anticipated related to transportation systems, which are valued at $9.5 billion in the region. Bridges and airport facilities account for $19 million and $25.8 million in damage, respectively. Losses related to utility systems total $202 million of the $2.9 billion replacement value of utility system inventory. Four wastewater facilities are anticipated to experience at least moderate damage and be out of service on Day 1, but at least 50% will be functional by Day 7. Eleven communications facilities, including radio and tv transmitters, are expected to have at least moderate damage, but only one will be out of service after Day 1.

Hazus estimates that 2,463 households will be displaced because of this earthquake scenario, and 1,312 people out of the population of 486,492 will seek public shelter. Out of 191,885 households, 36,719 are expected to be without electric power on Day 1; 9.145 without power on Day 7; and 50 are still without power on Day 90.

Table 40: Expected Building Damage by General Occupancy Type for the Freds Mountain Fault Zone Scenario

Building Occupancy Type	None	Slight	Moderate	Extensive	Complete	Total
Single Family Residential	90,293	41,990	4,468	184	20	136,956
Other Residential	8,918	5,664	6,161	3,012	379	24,134
Commercial	6,061	2,765	1,681	571	68	11,146
Government	143	60	48	18	2	271
Education	177	55	36	14	2	283
Agriculture	136	66	31	12	2	247
Religion/ Nonprofit	185	92	72	28	2	379

Building Occupancy Type	None	Slight	Moderate	Extensive	Complete	Total
Industrial	1,369	628	443	181	74	2,696
Total	107,283	51,320	12,940	4,020	549	176,112

The Washoe County Hazus region contains 3,108 URM homes, and it is estimated that 1,860 will have at least moderate damage. An estimated 980,000 tons of debris could be generated in this scenario, requiring an estimated 39,200 truckloads at 25 tons/truck to remove.

Figure 52 through Figure 56 show the locations of the critical facilities in the planning area, categorized by functionality.

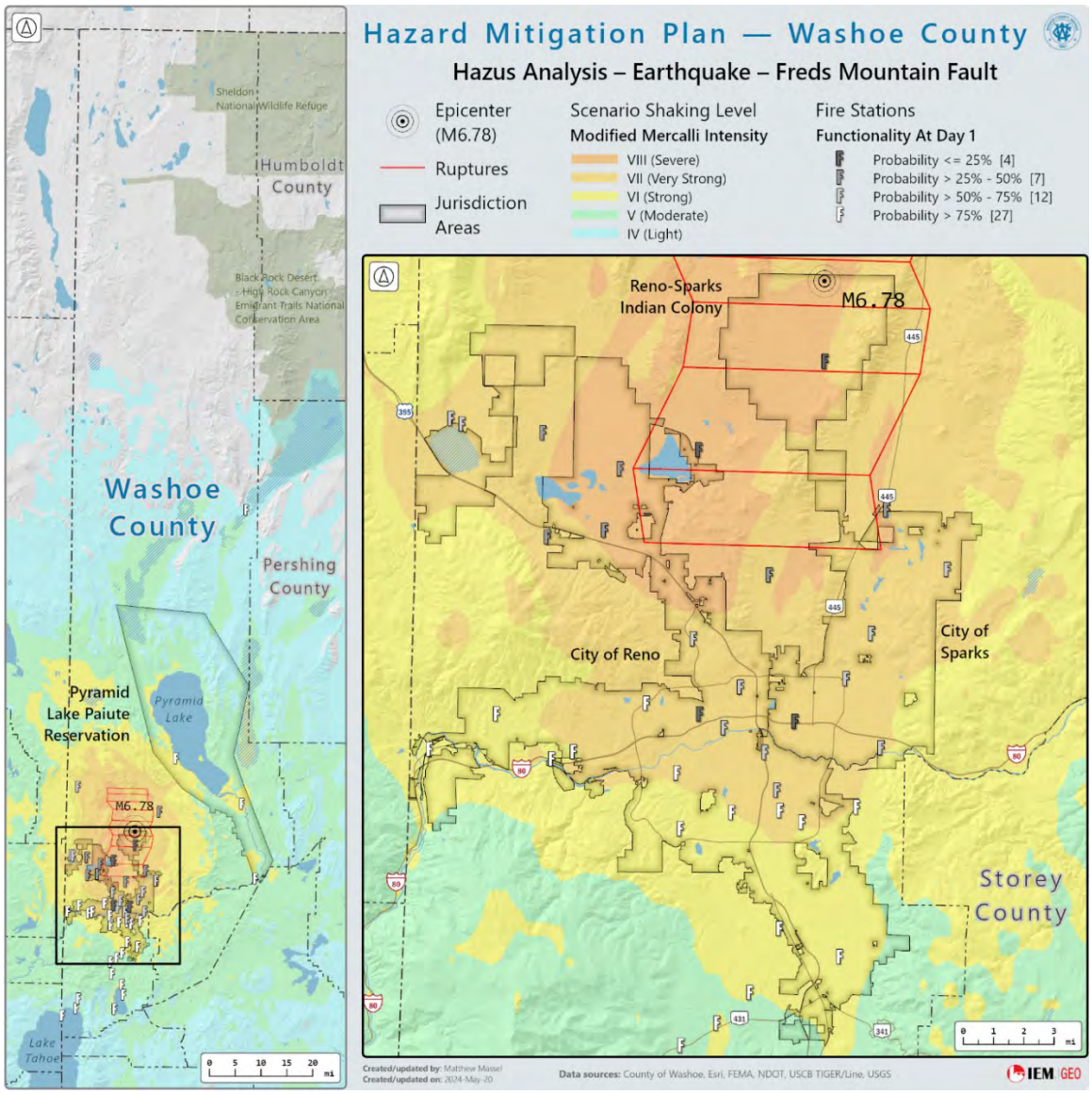


Figure 52: Freds Mountain Fault Hazus Scenario Fire Station Functionality

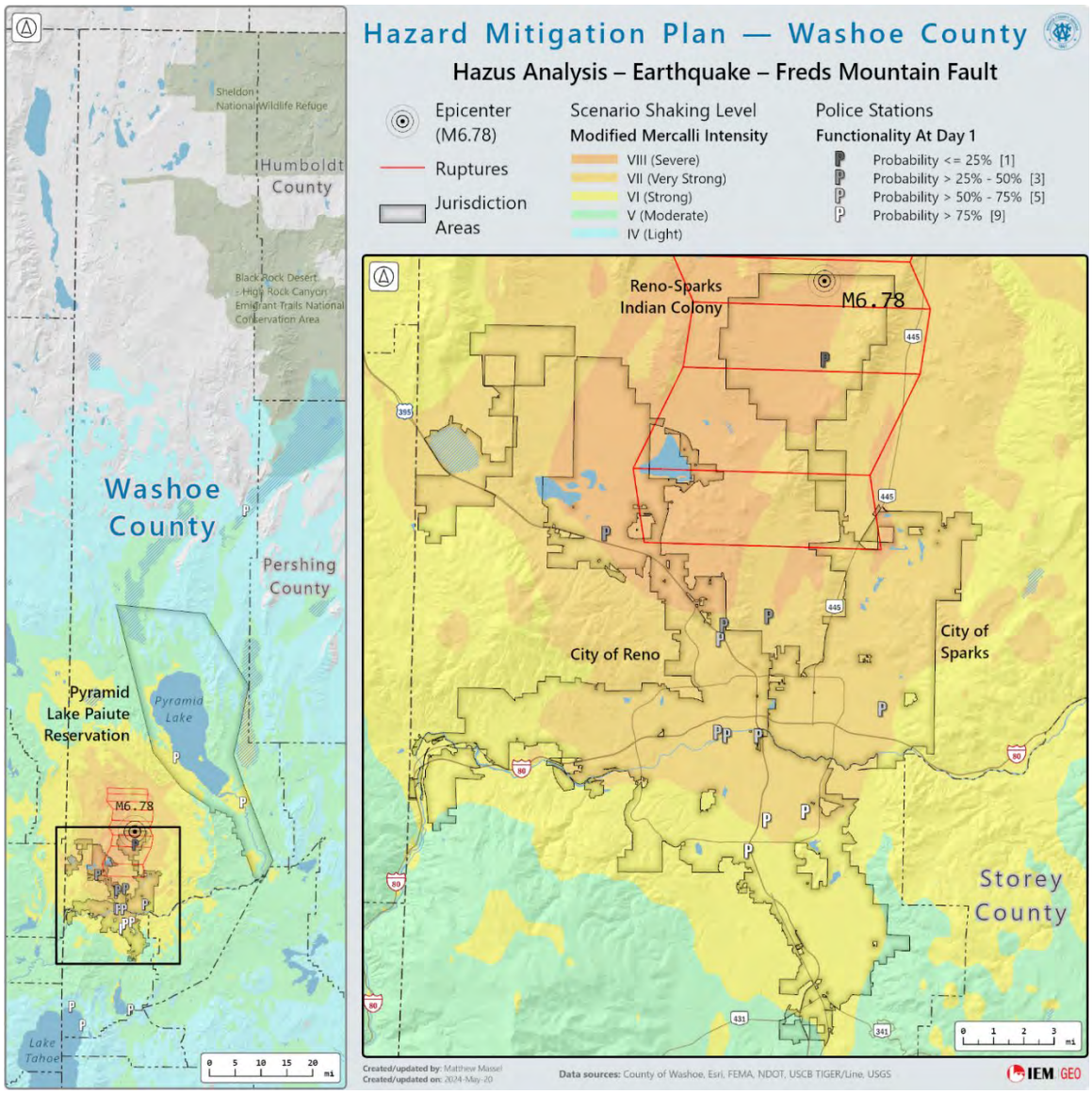


Figure 53: Freds Mountain Fault Scenario Police Station Functionality

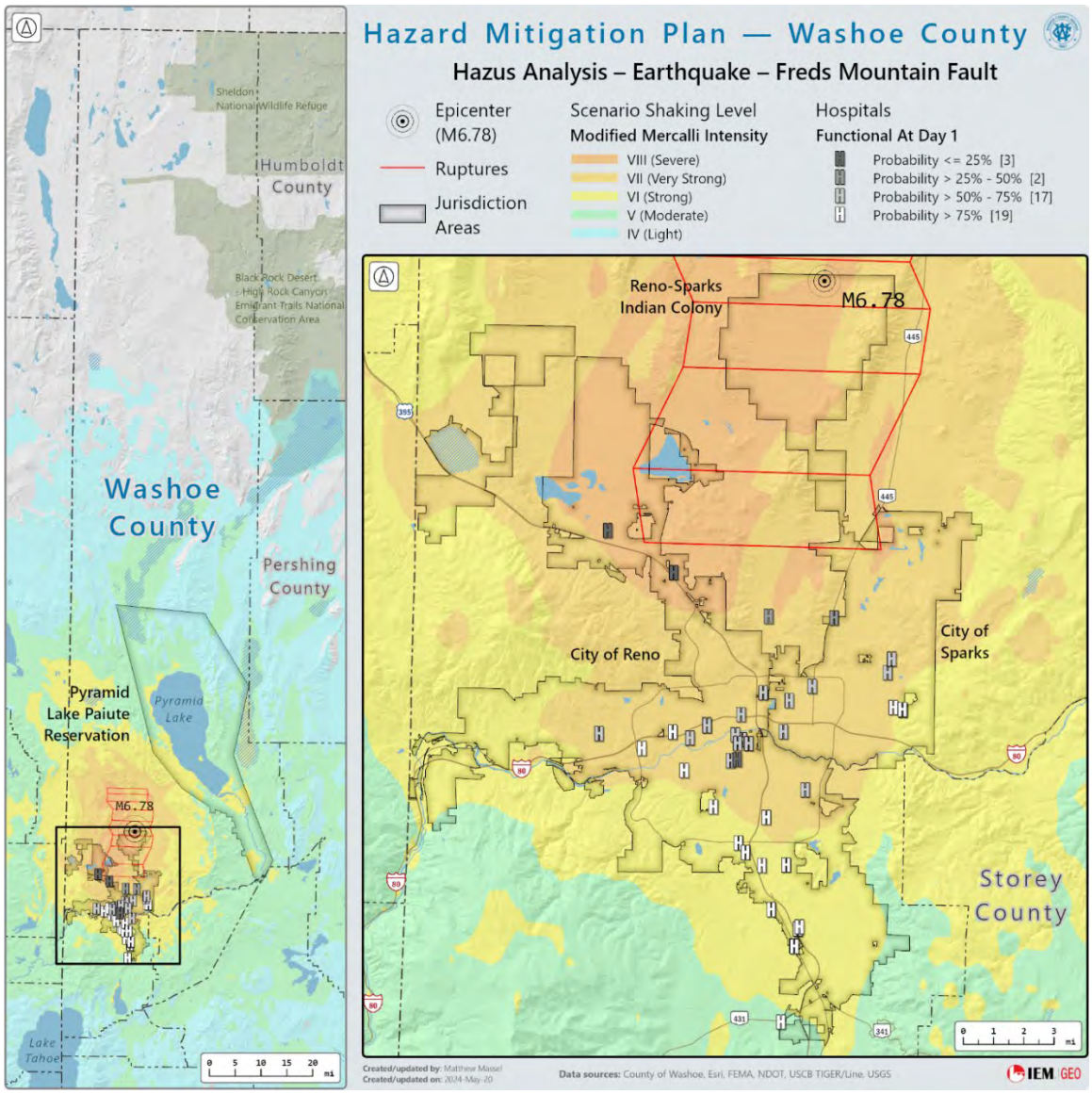


Figure 54: Freds Mountain Fault Hazus Scenario Hospital Functionality

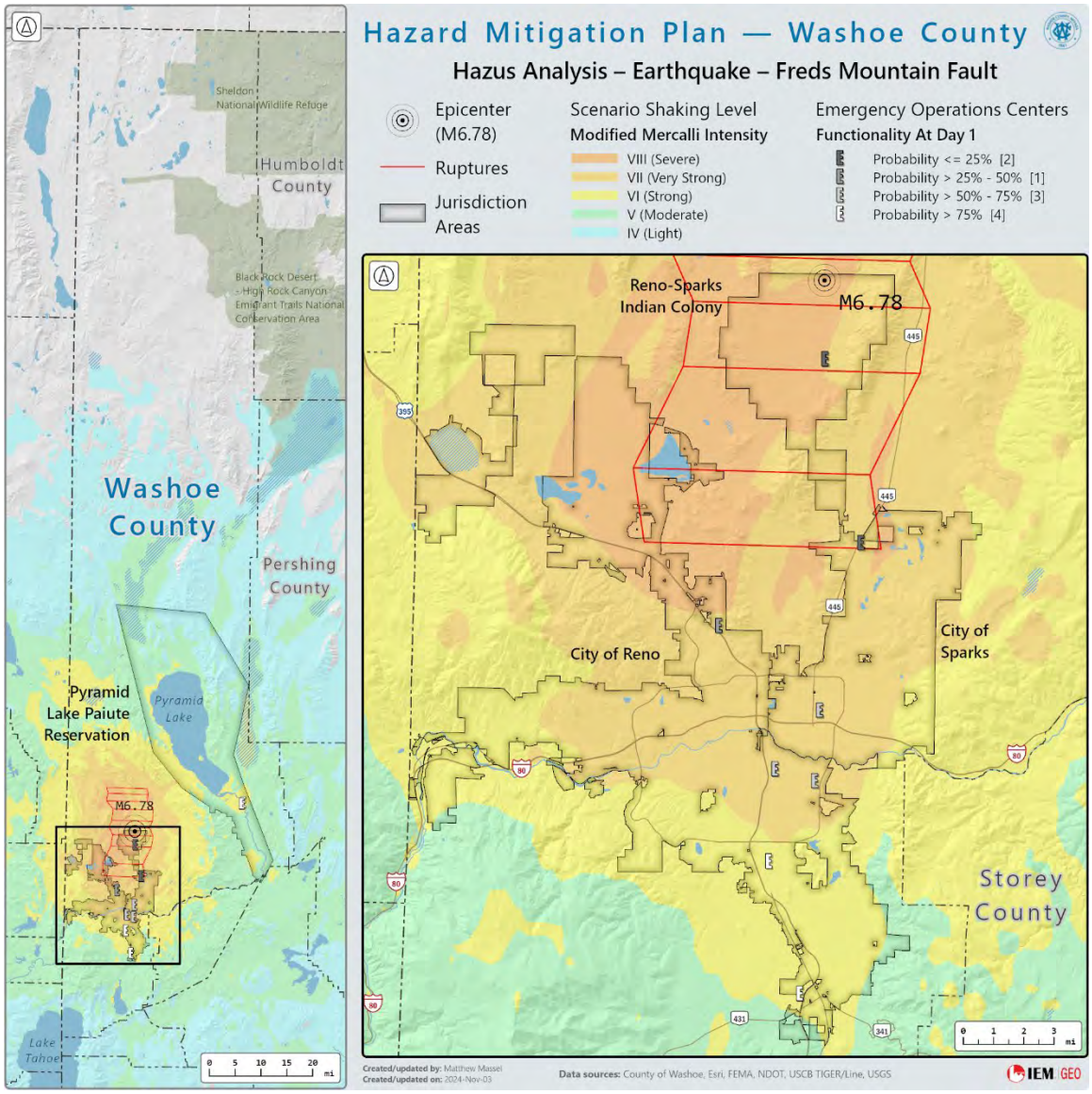


Figure 55: Freds Mountain Fault Hazus Scenario EOC Functionality

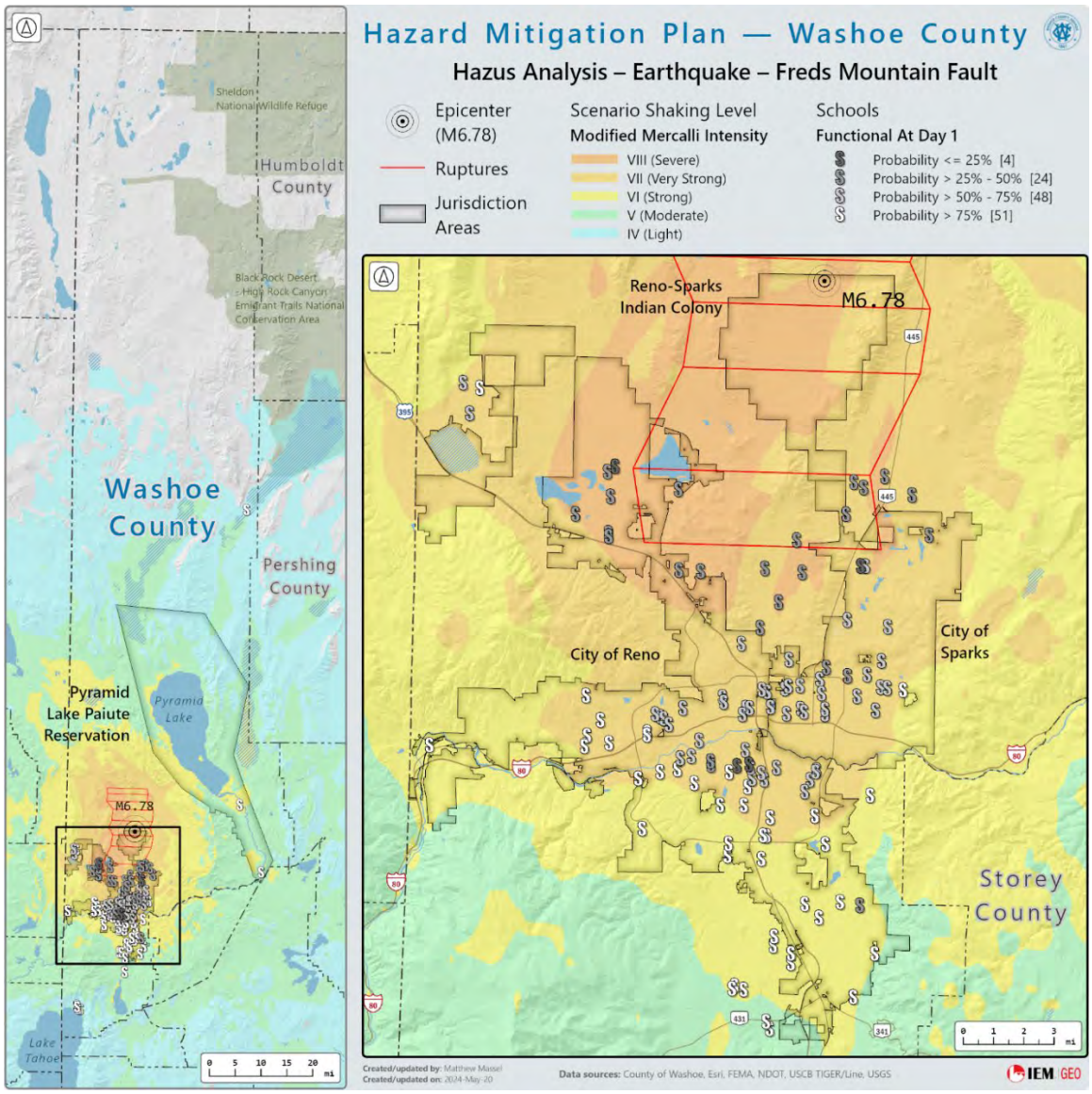


Figure 56: Freds Mountain Fault Hazus Scenario School Functionality

MOUNT ROSE FAULT ZONE SCENARIO

This scenario is based on a 6.89M earthquake associated with the Mount Rose fault zone with an epicenter approximately 3 miles south of the City of Reno.[108] About 25,777 buildings will be at least moderately damaged in this scenario, and 2,317 are estimated to be damaged beyond repair. The expected damage by building occupancy type is summarized in Table 41.

[108] M 6.9 Scenario Earthquake – Mount Rose fault. https://earthquake.usgs.gov/scenarios/eventpage/bssc20141647_m6p89_se/executive

Table 41: Expected Damage by Building Occupancy Type from the Mount Rose Fault Zone Scenario

Jurisdiction	Structural Damage	Non-Structural Damage	Building Damage	Contents Damage	Inventory Damage	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
City of Reno	$969,717,000	$3,689,787,000	$4,659,503,000	$1,433,003,000	$156,551,000	$508,807,000	$533,046,000	$447,429,000	$740,121,000	$8,478,460,000
City of Sparks	$280,427,000	$811,897,000	$1,092,325,000	$348,438,000	$58,499,000	$129,168,000	$100,345,000	$78,254,000	$112,032,000	$1,919,059,000
Pyramid Lake Paiute Reservation	$2,000	$15,000	$17,000	$8,000	$1,000	$0	$0	$0	$0	$27,000
Reno-Sparks Indian Colony	$12,354,000	$46,699,000	$59,052,000	$19,264,000	$2,355,000	$8,776,000	$9,995,000	$3,321,000	$10,167,000	$112,930,000
Unincorporated Washoe County	$98,499,000	$446,319,000	$544,819,000	$182,676,000	$11,878,000	$47,575,000	$18,057,000	$19,739,000	$22,082,000	$846,826,000
Grand Total	$1,360,998,000	$4,994,717,000	$6,355,715,000	$1,983,389,000	$229,283,000	$694,326,000	$661,444,000	$548,743,000	$884,401,000	$11,357,302,000

Building-related losses include direct damage to buildings and contents and indirect losses caused by the inability to operate businesses due to damage caused by the earthquake. These indirect losses include temporary living expenses for displaced individuals. A total of $11,357,300,000 in total building-related losses were generated in this scenario, 75% of which are direct losses and 25% of which are business interruption losses.

Losses of $164.6 million are anticipated related to transportation systems, which are valued at $9.5 billion in the region. Bridges and airport facilities account for $104 million and $53 million in damage, respectively. Losses to utility systems total $473.9 million out of $2.9 billion replacement value. Three potable water facilities are anticipated to experience at least moderate damage and be out of service on Day 1, but they will be at least 50% functional by Day 7. Seven electric facilities are expected to have at least moderate damage and will not be functional before Day 7. In addition, twenty-nine communications facilities will experience at least moderate damage, with twenty-eight facilities 50% functional on Day 1 and all expected to be at least 50% functional by Day 7.

Hazus estimated that 8,645 households would be displaced because of this earthquake, and 4,426 people out of the population of 486,492 will seek public shelter. Out of 191,885 households, 84,168 will be without power on Day 1 and 22,561 on Day 7. The Washoe County Hazus region contains 3,108 URM homes. It is estimated that 2,944 of them will have at least moderate damage.

Table 42: Expected Damage by Building Occupancy for the Mount Rose Scenario

Building Occupancy Type	None	Slight	Moderate	Extensive	Complete	Total
Single Family Residential	68,680	57,263	10,088	555	370	136,956
Other Residential	7,037	8,493	5,796	1,936	871	24,134
Commercial	3,006	3,584	2,342	1,384	829	11,146
Government	87	69	57	34	24	271
Education	114	78	40	31	20	283
Agriculture	93	77	40	22	14	247

Building Occupancy Type	None	Slight	Moderate	Extensive	Complete	Total
Religion/ Nonprofit	95	108	83	61	32	379
Industrial	786	765	654	334	156	2,696
Total	79,898	70,436	19,101	4,359	2,318	176,112

An estimated 2,346,000 tons of debris will be generated in this scenario, requiring an estimated 93,840 truckloads at 25 tons/truck to remove.

Figure 57 through Figure 61 show the locations of the critical facilities in the planning area, categorized by functionality. In addition, 15 hospitals, 21 schools, 3 EOCs, 1 police station, and 8 fire stations were projected to experience at least moderate damage greater than 50%.

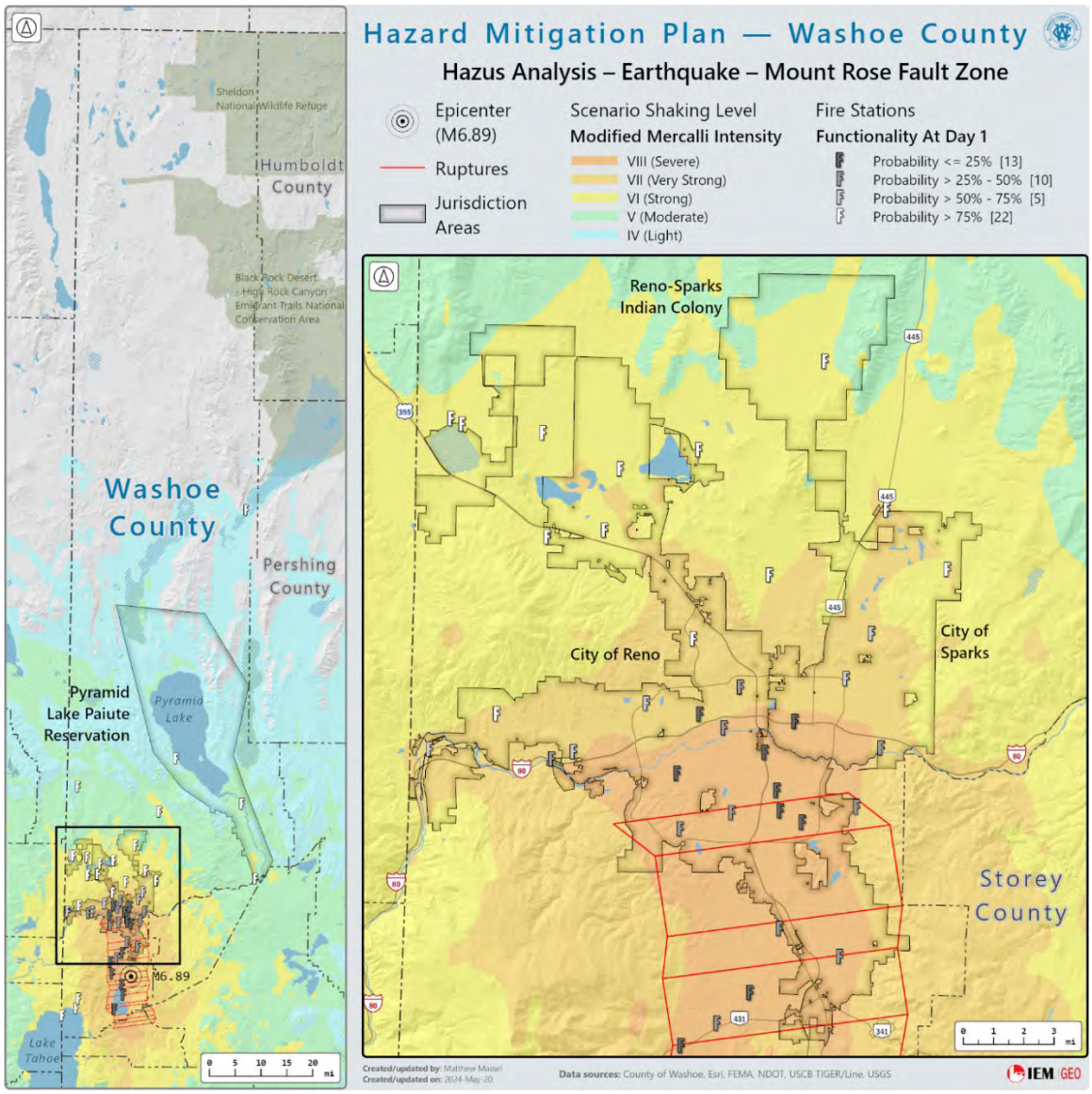


Figure 57: Mount Rose Fault Hazus Scenario Fire Station Functionality

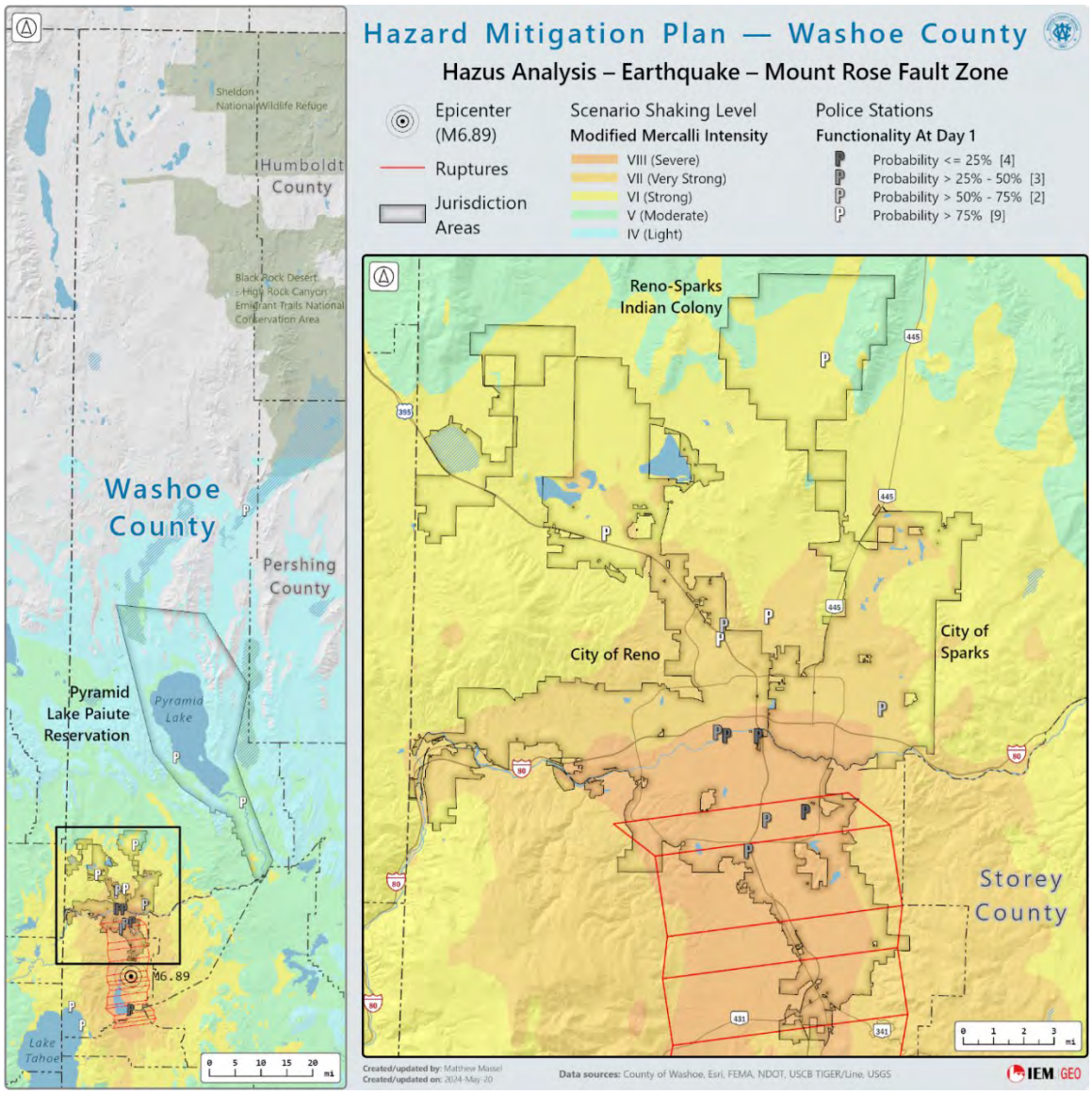


Figure 58: Mount Rose Fault Hazus Scenario Police Station Functionality

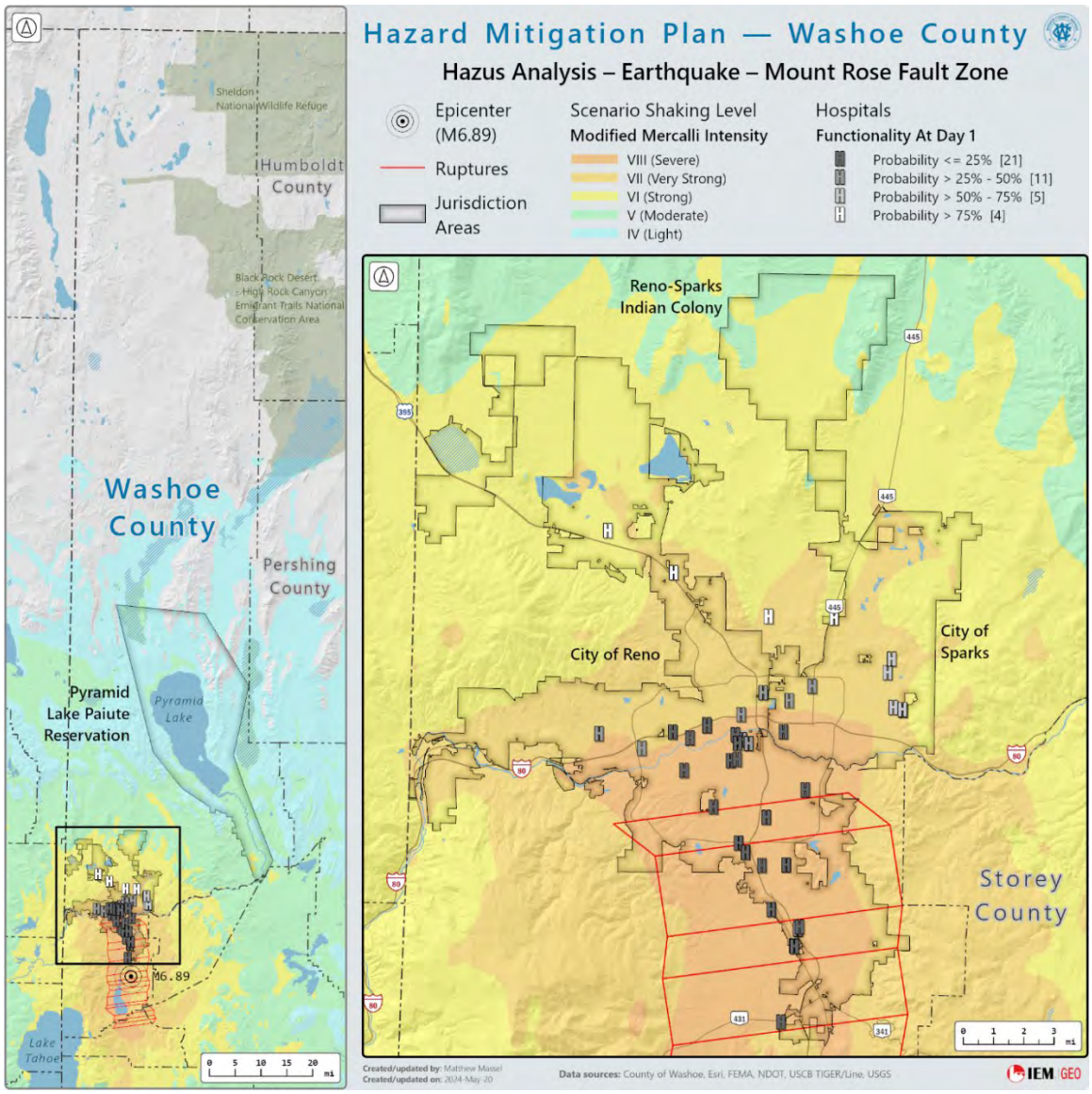


Figure 59: Mount Rose Fault Hazus Scenario Hospital Functionality

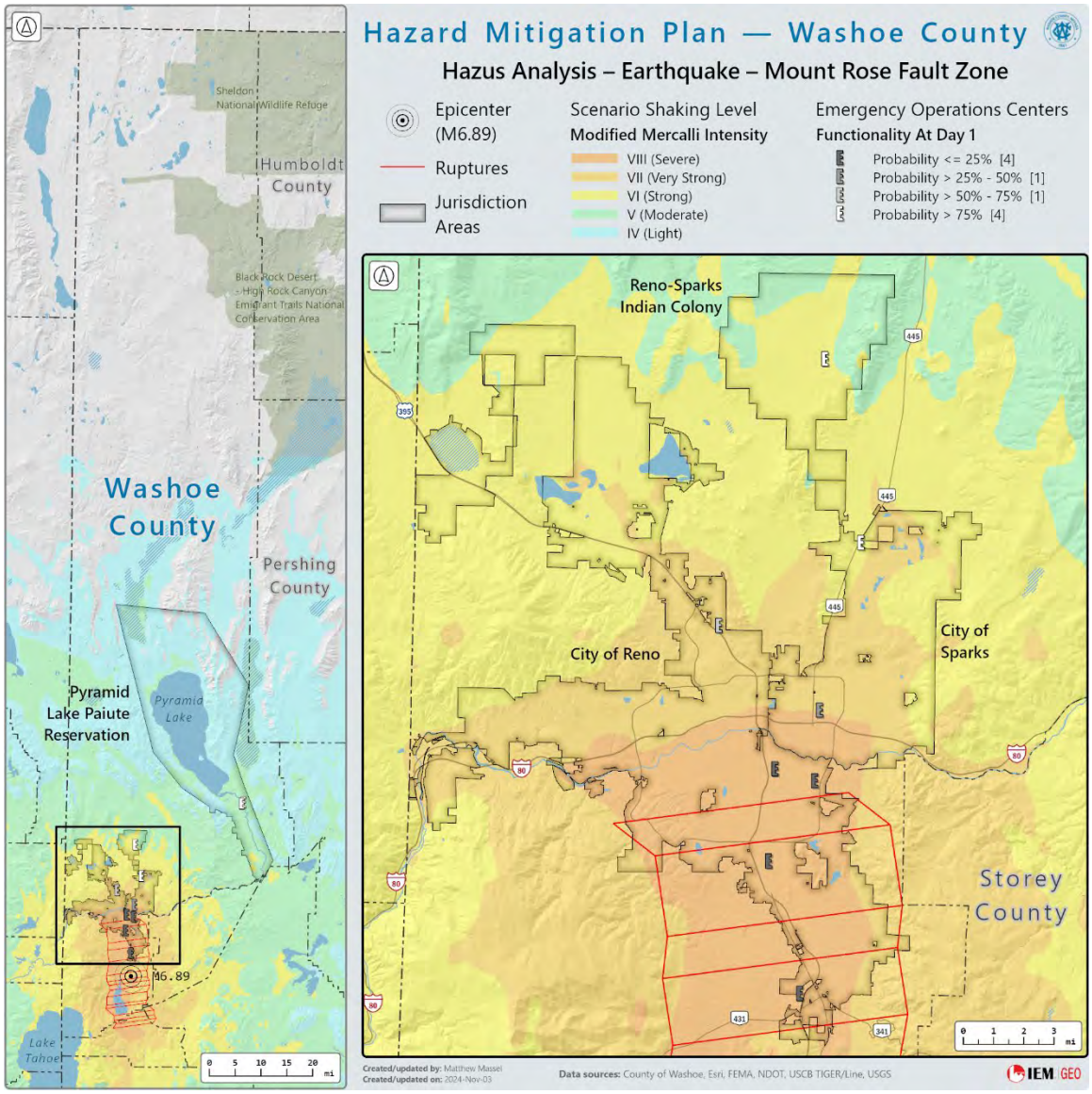


Figure 60: Mount Rose Fault Hazus Scenario EOC Functionality

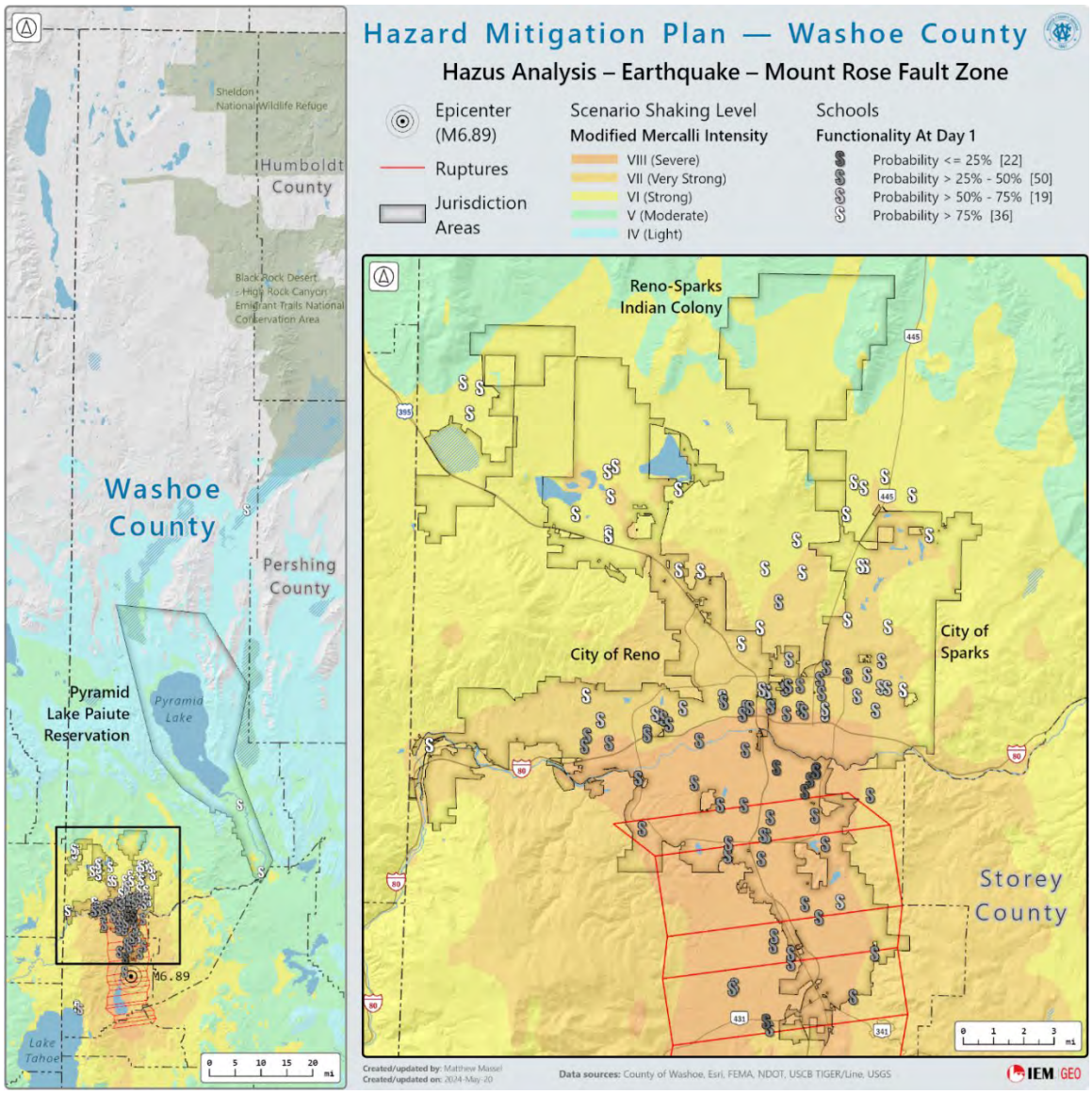


Figure 61: Mount Rose Fault Scenario School Functionality

SPANISH SPRINGS VALLEY FAULT SCENARIO

This scenario is based on a 6.62 earthquake associated with the Spanish Springs Valley fault with an epicenter near the northeast boundary of the City of Sparks.[109]

About 19,301 buildings will be at least moderately damaged in this scenario, and 650 are estimated to be damaged beyond repair. The expected damage by building occupancy type is summarized in Table 43.

[109] M 6.0 Scenario Earthquake – Spanish Springs Valley fault. https://earthquake.usgs.gov/scenarios/eventpage/bssc20141656_m6p62_se/executive

Table 43: Expected Damage by Building Occupancy Type from the Spanish Springs Valley Fault Scenario

Jurisdiction	Structural Damage	Non-Structural Damage	Building Damage	Contents Damage	Inventory Damage	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
City of Reno	$360,200,000	$1,052,446,000	$1,412,646,000	$439,802,000	$49,709,000	$211,242,000	$213,574,000	$170,581,000	$289,472,000	$2,787,027,000
City of Sparks	$326,383,000	$1,095,692,000	$1,422,075,000	$459,491,000	$61,936,000	$158,302,000	$110,134,000	$88,506,000	$123,911,000	$2,424,355,000
Pyramid Lake Paiute Reservation	$13,000	$107,000	$120,000	$59,000	$6,000	$4,000	$2,000	$3,000	$2,000	$195,000
Reno-Sparks Indian Colony	$6,501,000	$16,607,000	$23,108,000	$5,879,000	$813,000	$5,299,000	$5,810,000	$1,940,000	$5,852,000	$48,700,000
Unincorporated Washoe County	$62,841,000	$281,240,000	$344,080,000	$114,466,000	$11,700,000	$32,559,000	$7,001,000	$10,204,000	$8,070,000	$ 528,080,000
Grand Total	$755,937,000	$2,446,093,000	$3,202,030,000	$1,019,697,000	$124,163,000	$407,406,000	$336,520,000	$271,233,000	$427,308,000	$5,788,357,000

Building-related losses include direct damage to buildings and contents and indirect losses caused by the inability to operate businesses because of damage caused by the earthquake. These indirect losses include temporary living expenses for displaced individuals. A total of $5,788,350,000 in total building related losses were generated in this scenario, 75% of which are direct losses and 25% of which are business interruption losses.

Over $70 million in losses are anticipated related to transportation systems, which are valued at $9.5 billion in the region. Bridges and airport facilities account for $31.4 million and $32.6 million in damage, respectively. Losses to utility systems total $141.22 million out of $2.9 billion replacement value. One wastewater facility is anticipated to experience at least moderate damage but will be at least 50% functional by Day 7. Thirteen communications facilities are expected to have at least moderate damage, but they will still have more than 50% functionality.

Hazus estimates that 3,361 households will be displaced because of this earthquake, and 1,827 people out of the population of 486,492 will seek public shelter. Out of 191,885 households, 49,251 are expected to be without electric power on Day 1, 13,402 without power on Day 7, and 65 still without power on Day 90.

Table 44: Expected Building Damage by Occupancy Type for the Spanish Springs Valley Fault Scenario

Building Occupancy Type	None	Slight	Moderate	Extensive	Complete	Total
Single Family Residential	88,003	42,549	6,058	282	65	136,956
Other Residential	9,238	6,106	5,929	2,569	291	24,134
Commercial	5,321	2,873	1,855	887	211	11,146
Government	128	62	50	26	5	271
Education	162	60	38	19	4	283
Agriculture	130	66	32	16	4	247
Religion/ Nonprofit	167	93	72	39	8	379

Building Occupancy Type	None	Slight	Moderate	Extensive	Complete	Total
Industrial	1,218	635	502	278	63	2,696
Total	104,367	52,444	14,536	4,115	651	176,112

The Washoe County Hazus region contains 3,108 URM homes, and it is estimated that 2,281 will have at least moderate damage. An estimated 1,219,000 tons of debris will be generated in this scenario, requiring an estimated 48,760 truckloads at 25 tons/truck to remove.

Figure 62 through Figure 66 show the locations of the critical facilities in the planning area, categorized by functionality. In addition, four hospitals, six schools, one EOC, and one fire station are expected to have at least moderate damage greater than 50%.

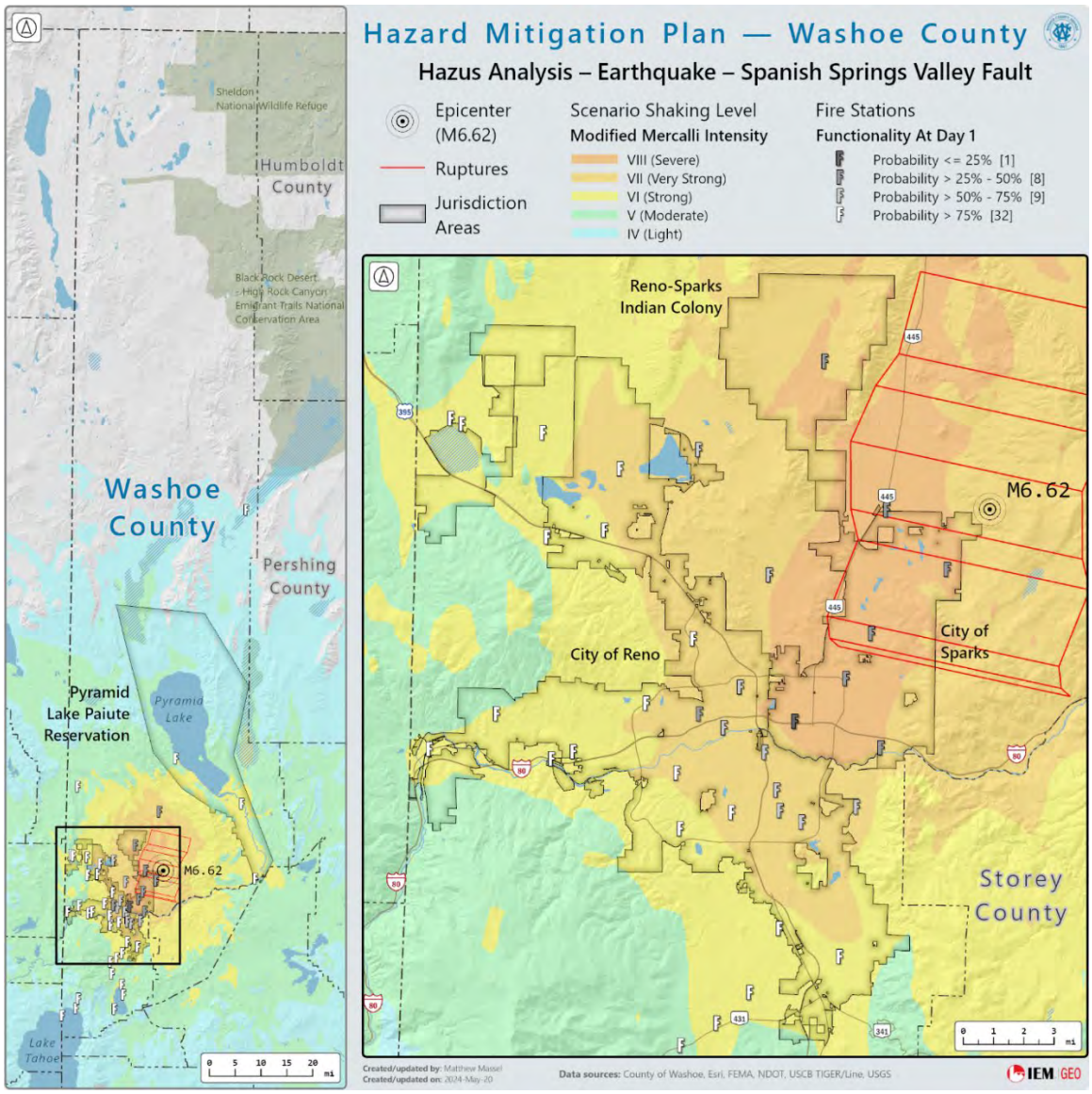


Figure 62: Spanish Springs Valley Hazus Scenario Fire Station Functionality

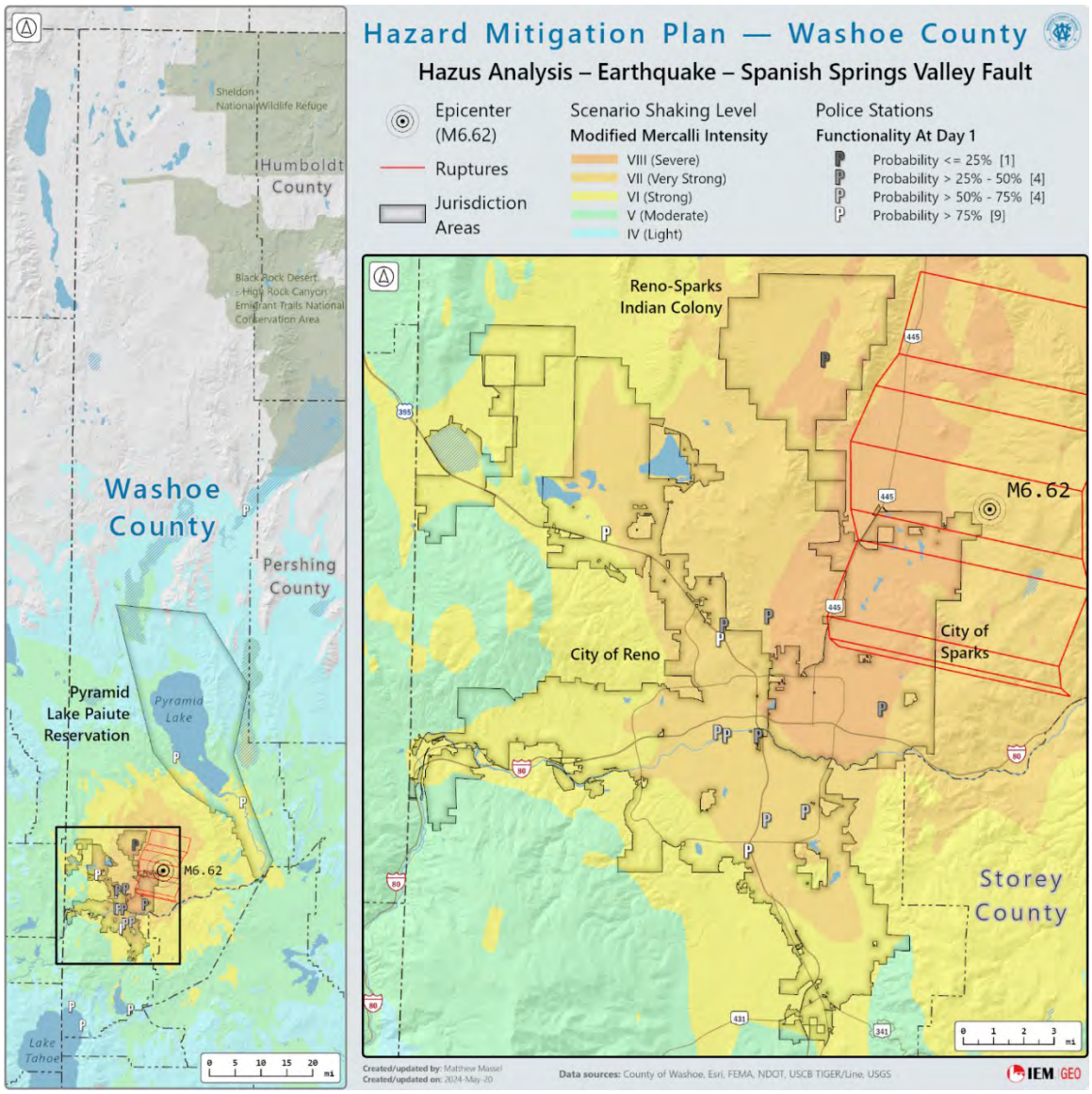


Figure 63: Spanish Springs Valley Hazus Scenario Police Station Functionality

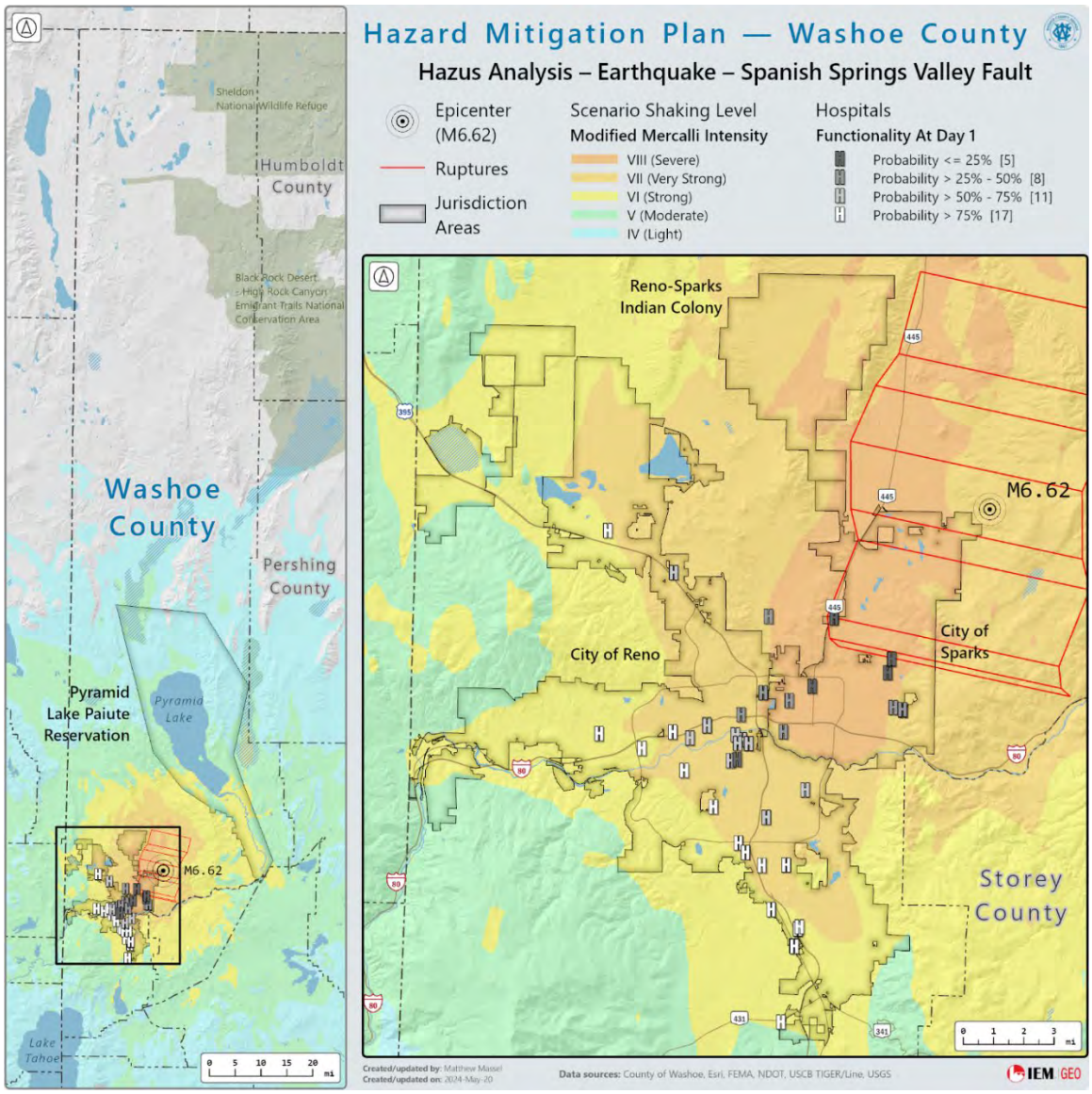


Figure 64: Spanish Springs Valley Hazus Scenario Hospital Functionality

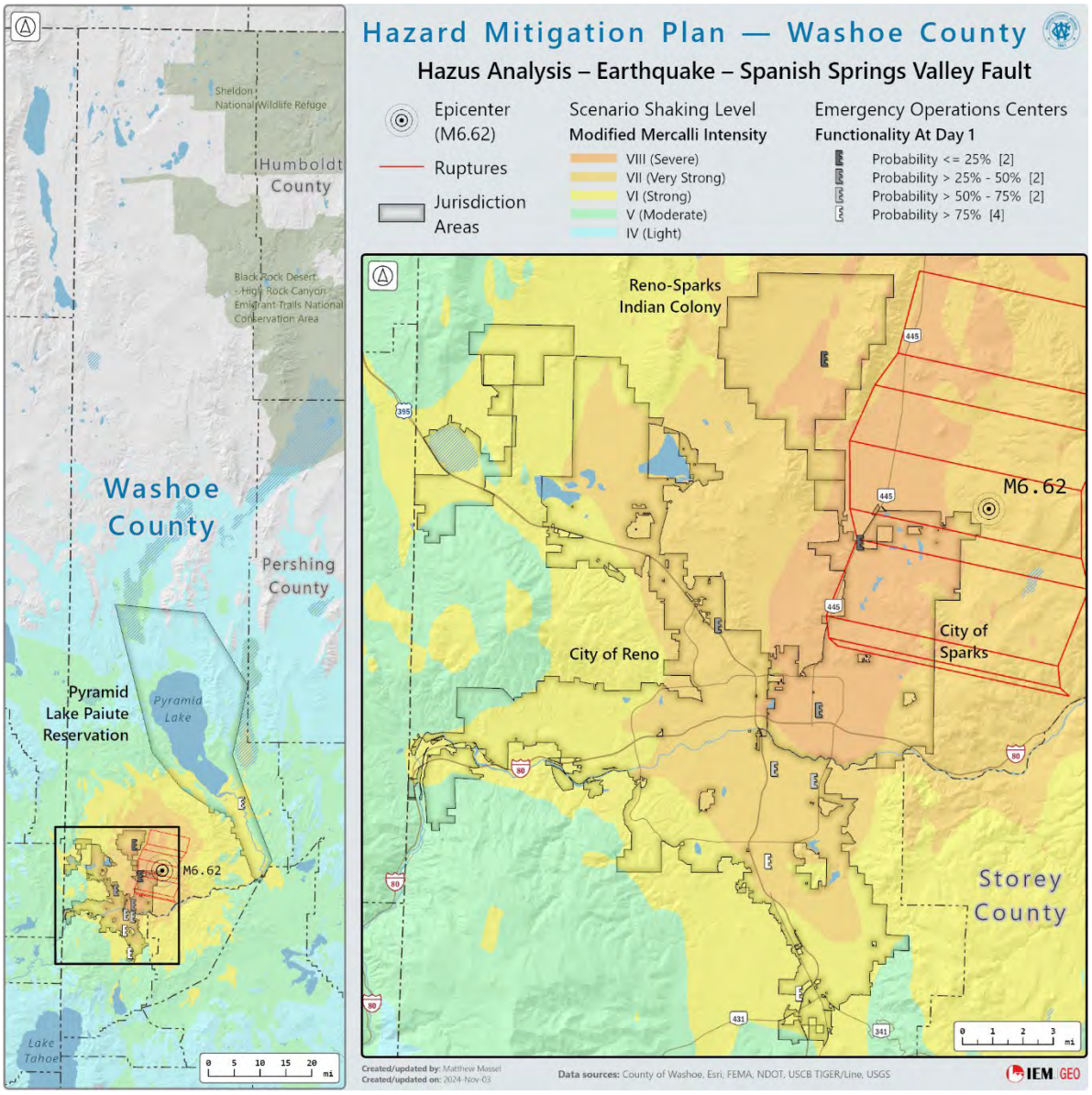


Figure 65: Spanish Springs Valley Hazus Scenario EOC Functionality

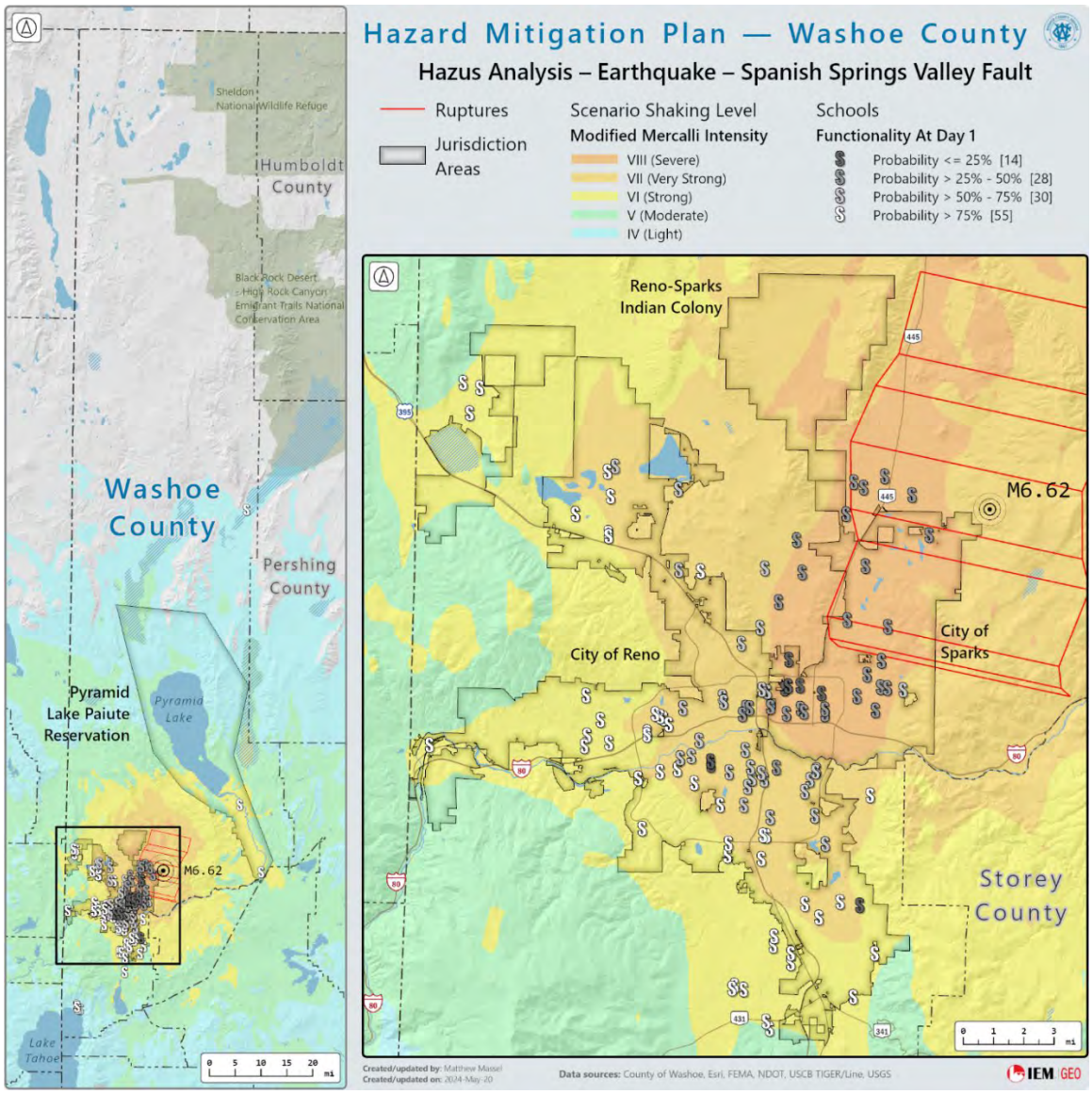


Figure 66: Spanish Springs Valley Hazus Scenario School Functionality

VULNERABLE POPULATIONS

When an earthquake damages buildings and infrastructure, the people in and around them are in danger. Individuals and families can suffer injury and death during, and following, an earthquake. Debris and damage can trap people in buildings, creating unknown survival conditions depending on the extent of building damage and the resources available. When buildings collapse, roads crack, or bridges are damaged, injuries to those nearby can range from minor to severe, potentially leading to permanent disability or death. Following a severe earthquake with extensive damage, entire communities can become homeless and emergency services can be stressed beyond capacity. This type of devastation can have lasting effects on people's physical, emotional, and mental well-being.

Earthquakes can have immediate and long-term impacts on health. The immediate impacts include trauma-related deaths and injuries from building collapse or secondary effects, such as burns from fires. Long-term health effects from earthquakes can include such conditions as posttraumatic stress disorder (PTSD), depression, and severe anxiety. Earthquakes strike with no warning, putting those in impacted areas in danger. Due to their unpredictable nature, it is common for people to experience emotional distress following an earthquake. Feelings such as overwhelming anxiety, trouble sleeping, and other depression-like symptoms are typical responses to such disasters.

Long-term impacts on the community from an earthquake may include displacement, disruption of government services, economic impacts, and health risks. Health risks include increased airborne particulate matter or contamination of water or soils from hazardous materials spills or releases of sewage. The severity and duration of these impacts depend on the earthquake's intensity and the extent of damage to infrastructure and buildings throughout the region. People relocating outside the region after an earthquake could cause an extended loss of revenue for local governments and have economic impacts because of a reduced workforce.

The Climate and Economic Justice Screening tool can be used to identify census tracts that are reported as overburdened and underserved. The area highlighted in gray in Figure 67, Figure 68, and Figure 69 are the census tracts in the Pyramid Lake Paiute Reservation, the Reno-Sparks Indian Colony, and the central Reno–Sparks urban area that are so designated. This tool ranks most of the burdens using percentiles and shows how much burden each census tract experiences when compared to other tracts. Communities are considered disadvantaged if there are census tracts that meet the thresholds for at least one of the tool’s categories of burden: Climate Change, Energy, Health, Housing, Legacy Pollution, Transportation, Water and Wastewater, and Workforce Development.

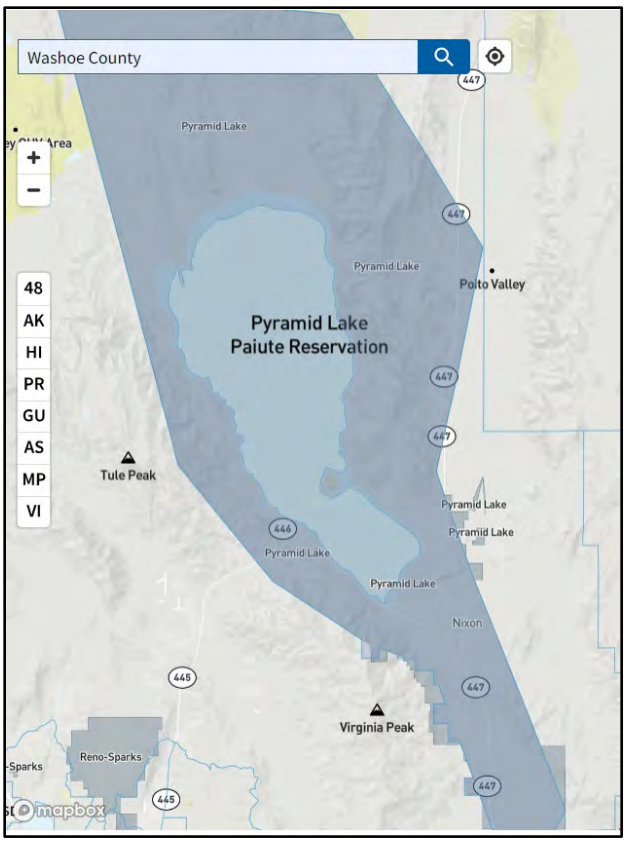


Figure 67: Census Tracts on the Pyramid Lake Paiute Reservation Identified as Disadvantaged[110]

[110] Climate and Economic Justice Screening Tool, "Pyramid Lake Paiute Indian Reservation by Census Tract." https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5

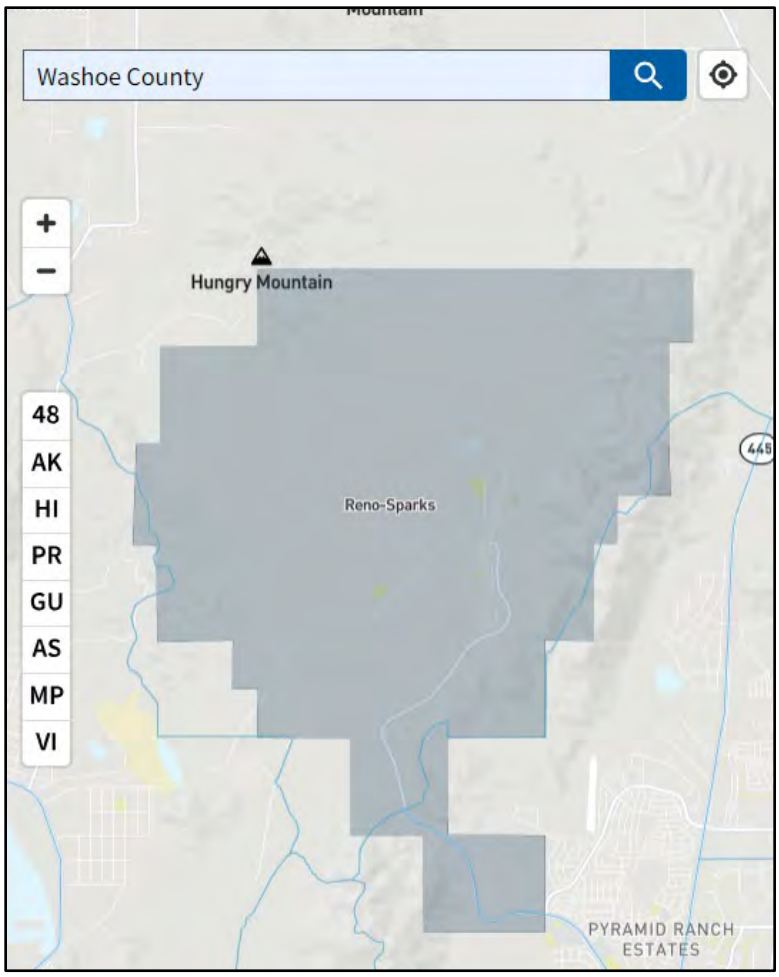


Figure 68: Census Tracts on the Reno–Sparks Reservation Designated as Disadvantaged[111]

[111] Climate and Economic Justice Screening Tool, "Reno-Sparks Indian Colony by Census Tract." https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5

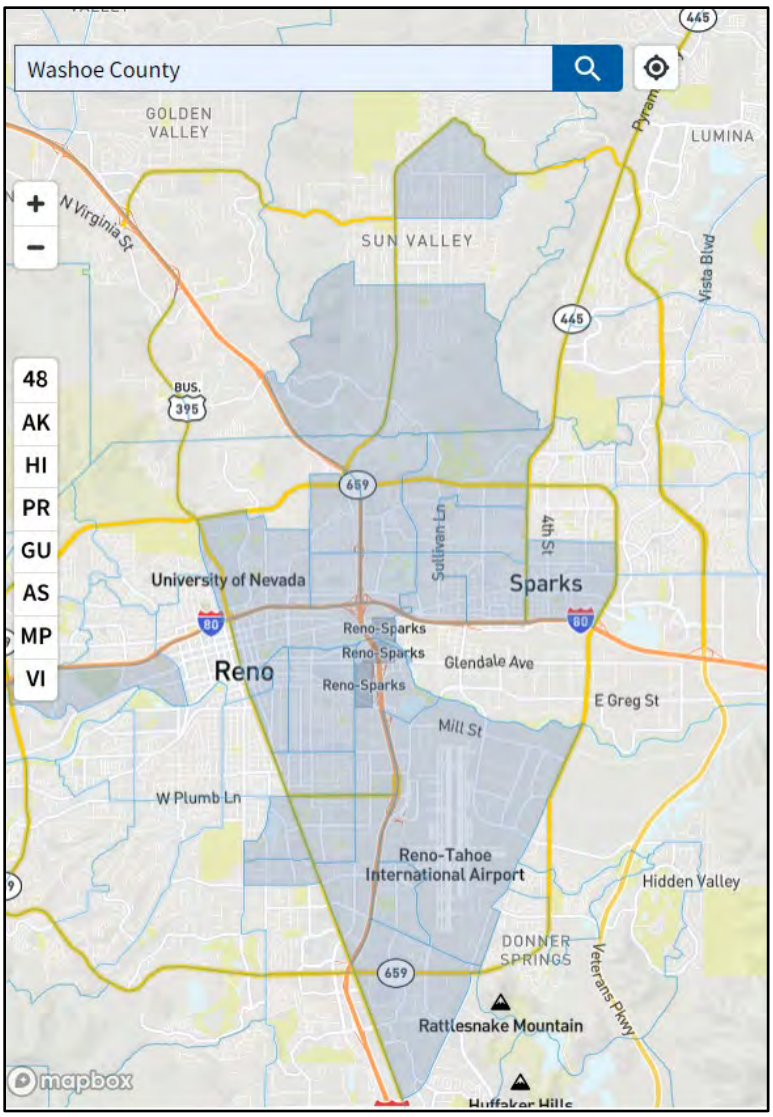


Figure 69: Census Tracts in the City of Reno and City of Sparks Designated as Disadvantaged[112]

Many of these areas have high percentages of low-income households. These individuals may be disproportionately impacted by disruptions to the economy and loss of income, and they may have more difficulty obtaining temporary housing. Lower-income households may reside in older housing that is more vulnerable to damage from ground shaking, potentially exposing them to greater rates of home damage and an increased risk of injury as a result.

COMMUNITY LIFELINES

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines are essential for the well-being of any

[112] Climate and Economic Justice Screening Tool, "City of Reno and City of Sparks by Census Tract." https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5

community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States. These lifelines are designed to address the essential needs of a community during and after a disaster. There are eight lifelines, each with its own focus and purpose (Figure 70).[113]



Figure 70: FEMA Community Lifelines

In the event of an earthquake event, all community lifelines are likely to be impacted. Electrical power lines on the National Power Grid are likely to be damaged and cause extended power outages and potential fires. Downed telecommunications towers would disrupt communications systems throughout the County. Road debris (i.e., downed trees and powerlines and other structural debris) and cracks in roads could limit, or prohibit, access of emergency responders.

Development Trends

- **Economic**: Although the county has implemented current seismic codes to decrease risks for new development, recent regional economic development has elevated the potential monetary value of damage that a catastrophic earthquake could cause. This indicates an increased vulnerability to seismic events and underscores the pressing need for continued efforts to mitigate these risks.

- **Land Use**: The land use plan now includes constructing new buildings using higher standards and materials that can withstand the potential impacts of earthquakes. This approach has significantly reduced the vulnerability of buildings to seismic activities, making the urban landscape more resilient to natural disasters.

[113] FEMA, "Community Lifelines Toolkit 2.0." https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf

Building codes adopted by Washoe County require all development to meet building standards based on seismic zones. The currently adopted codes are the 2018 International Building Code and the 2018 International Residential Code, with the Northern Nevada Amendment package. Future development in Washoe County will be required to comply with current seismic codes, which will reduce vulnerability to earthquakes.

VULNERABILITY SCORE

The NRI includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at a county and Census tract level. Table 45 provides an overview of each category for Washoe County.

Table 45: National Risk Index for Earthquake in Washoe County

Earthquake	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Relatively Moderate	High	High	$166 M	High

Based on the NRI, Washoe County has a rating of Relatively High for the risk index and a score of 99.4 for earthquake—which is higher than the national percentile. Figure 71 illustrates the USGS probability risk score of 50.33% and a high-risk level for Washoe County.

Figure 72 illustrates USGS probability risk score of 50.33% and a high-risk level for Washoe County. The County has a high earthquake risk, with 211 earthquakes since 1931. The USGS database shows that there is a 50.33% chance of a major earthquake within 50km of Washoe County in the next 50 years. The largest earthquake within 30 miles of Washoe County, NV was M 4.8 in 1993.

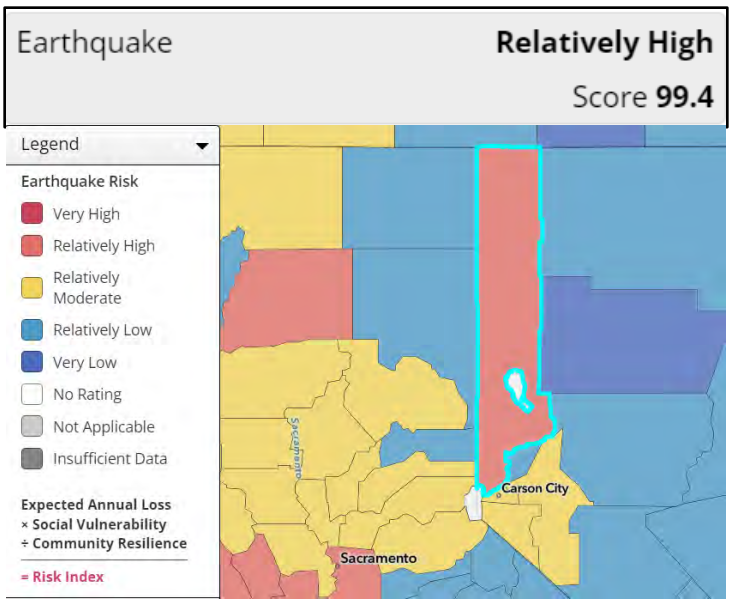


Figure 71: National Risk Index Washoe County Earthquake Score, Map, and Legend[114]

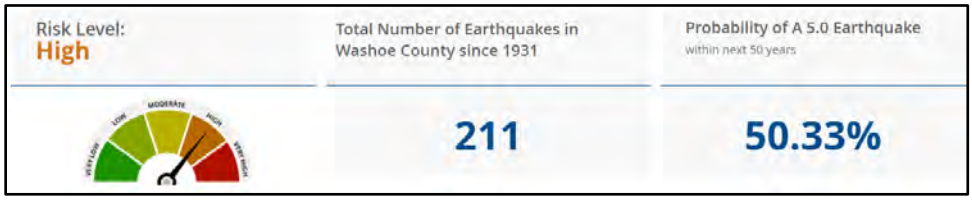


Figure 72: USGS Probability Risk Score for Washoe County[115]

EXISTING MITIGATION CASE STUDY

The City of Reno completed a city hall seismic retrofit in 2024. This was completed to reduce earthquake risk. As a part of this retrofit project, the City placed dampeners and strengthened welds in the upper stories of City Hall to mitigate swaying during a seismic event. This project was funded by a $4,000,000 FEMA grant. The total project cost was $10,000,000.

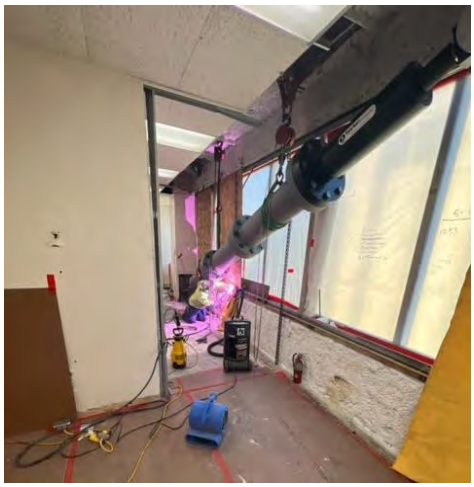


Figure 31: Seismic Retrofitting in the City of Reno City Hall

[114] FEMA, NRI, "National Risk Index Washoe County Earthquake Score, Map and Legend." https://hazards.fema.gov/nri/map

[115] Homefacts, 2024, "USGS Probability Risk score for Washoe County." https://www.homefacts.com/earthquakes/Nevada/Washoe-County.html

CONSEQUENCE ANALYSIS

Washoe County is in a seismically active area, with Nevada being the 3rd most active state for seismic activity, after California and Alaska. Earthquakes are a high priority in Washoe County.

Table 46 presents the Consequence Analysis of the Potential for Detrimental Impacts of Earthquake, which was done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 46: EMAP Consequence Analysis for Earthquakes in Washoe County

Subject	Ranking	Impacts/Earthquake
Public	High	Earthquakes can be a great risk to the health and safety of persons living in Washoe County. While there may be some early warning, oftentimes, it can come too late. Public Safety is at risk of structural collapse or damage, road damage, and utility damage. Services can be cut off for days or weeks, putting people at risk for lack of access to hospitals and healthcare facilities, water, or food and shelter.
Responders	Moderate	Earthquakes can affect first responders, not only at the site of the response and recovery but also on a personal level if their homes or lives are disrupted by an earthquake and its aftershocks.
Continuity of Operations	High	Critical infrastructure, essential functions, and other areas necessary for the county to function could be compromised by the Earthquake and the cascading effects of structural stability and power outages.
Property, Facilities, and Infrastructure	High	While buildings are increasingly being seismically built and retrofitted, the damage can still be extensive. Cracked foundations, walls, roads, and waterways can all be affected and create huge costs for the public and government entities to fix.
Environment	Minimal – Moderate	Earthquakes can create environmental concerns such as contaminated water, landslides, affected waterways, wildlife, and plant life. The extent of the environmental impact would depend on the severity of the earthquake.
Economic Condition	High	Economic conditions and financial impacts can be affected. When a portion of a county's revenue is dependent upon tourism, a reduction in tourists could greatly impact the economy. Businesses could be shuttered and inaccessible, affecting incomes and revenue for both private and public entities.

Subject	Ranking	Impacts/Earthquake
Public Confidence in Governance	High	The longer it takes to fix damaged roads and buildings, the greater the public's confidence will decline. Access issues to food, water, power, medical, etc., can cause widespread panic, with confidence slipping further.

COMMUNITY INPUT

The public expressed concern that Earthquakes are a hazard in the planning area. One member noted that all of Reno is on a fault line. One member expressed concern that community responders are underprepared for an earthquake, especially for backup communication systems for radio and the internet. Another member is concerned that buildings are not up to seismic standards.

The public did not suggest specific mitigation measures for this hazard. However, comments were received on increasing building standards and providing classes, community training, or additional outreach and publications that could help address this hazard.

Energy Emergency

Hazard Description

An energy emergency is defined as an abrupt interruption in the availability of utility services. A utility failure represents any occurrence in which vital utilities or services are rendered inoperable. A utility failure may be caused by electrical blackouts, equipment malfunctions or damage, or an unexpected surge in demand.

A utility failure may impact any of the following services:

- Power to homes and businesses
- Drinking water
- Wastewater or stormwater
- Telecom and information technology

Moreover, interruptions in energy services may also be planned for system repairs or maintenance. In 2019, NV Energy and Pacific Gas and Electric Company (PG&E) began implementing extensive public safety outage management programs in areas with extreme fire risks. The planning area includes parts of the Lake Tahoe basin in Washoe County. To prevent downed power lines and damaged equipment from causing fires, these electricity providers may de-energize parts of the electrical grid during weather conditions conducive to wildland fires (e.g., high temperatures, low humidity, high winds, lightning storms) or based on field observations or information from first responders.[116] Planned outages can affect fuel availability for Washoe County. Outages affecting PG&E's system would cut power to the equipment that controls the operation of the fuel pipeline serving the region.

Location

Energy emergencies can affect any portion of the planning area. Rural and populated areas alike are known to experience power outages during winter and windstorms that can last from several hours to several weeks. The overall effects of a widespread energy emergency would be concentrated in population centers, but the condition is likely to be present throughout the planning area. The electric utility provider for the planning area is NV Energy (formerly Sierra Pacific Power Company). NV Energy owns and operates no facilities that are rated Critical per the Department of Homeland Security criteria for National Critical Facilities.

[116] NV Energy, "Power Safe NV." https://www.nvenergy.com/safety/wildfire

Extent

The overall magnitude and potential severity of impacts of energy emergencies is considered Low in Washoe County. Typical energy emergency events are handled at the regional level, and economic impacts could affect the entire County. In a worst-case scenario, an energy emergency could require federal support, impact critical facilities, disrupt services for several days, and have national economic impacts. According to the Nevada Office of Energy, multiple alternative energy sources are in place, which may reduce the extent of an energy emergency by providing other options in the event of a failure.

ALTERNATIVE ENERGY SOURCES

Thanks to Hoover Dam, Nevada is famous for hydroelectricity, and the state is experiencing a new chapter for this technology as an energy storage solution. Surplus renewable electricity is used to pump water uphill into a hydroelectric dam, where it is effectively stored for later use. *rPlus Hydro* is planning to build a 1,000 megawatt (MW) pumped hydro energy storage project in White Pine County. *rPlus* estimates that this energy storage facility could provide 13 percent of Nevada's electricity needs for eight hours at a time.

Solar technology currently provides 23 percent of the state's electricity, and that number continues to rise. Nevada's wealth of solar resources and favorable business environment consistently attract development. For example, Project Gemini's 690 MW solar facility is anticipated to produce sufficient electricity for 260,000 homes. Notably, it will also incorporate energy storage capabilities, so surplus daytime energy can be used during the night. A partnership between NV Energy and Energy Vault resulted in the 380-MW battery connected to the Project Gemini solar installation, and an additional 220-MW battery project will be developed.[117]

Previous Occurrence/History

Utility disruptions have historically been caused by both natural and human-caused events, including earthquakes, wildland fires, floods, and human activities. Most energy emergencies can be traced back to weather events. Outages can affect fewer than 20 customers in rural areas or more than 50,000 in Reno and Sparks.

Figure 73 displays the stability of the power grid in Washoe County over a 15-day period.

[117] Nevada Governor's Office of Energy Status of Energy Report 2023. https://energy.nv.gov/uploadedFiles/energynvgov/content/Home/Features/2023_Status_of_Energy_Report.pdf

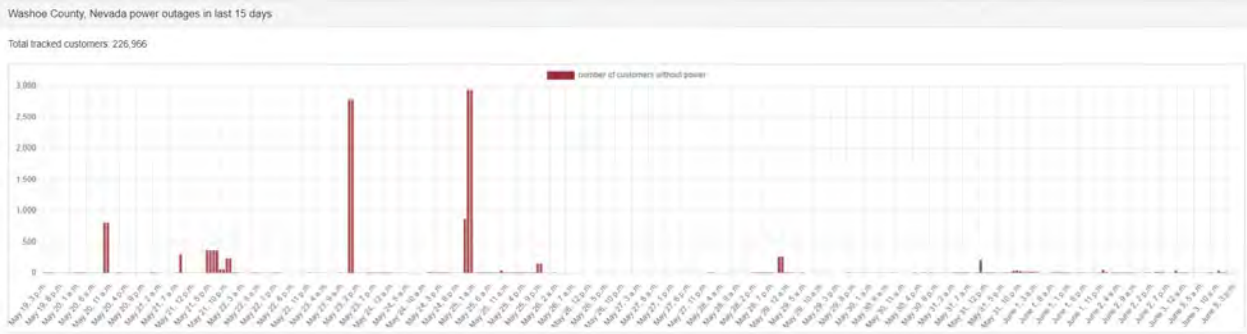


Figure 73: Washoe County Power Outages, May 19–June 3, 2024[118]

Developing a comprehensive process to track and document power failure events by year, location, or individual power provider is challenging. While some online systems maintain current status updates, documentation of previous events is typically not maintained. The most recent information from NV Energy about outages in its system is derived from the 2020 HMP update. (Table 47). Washoe County customers experience an average of 0.93 power outages annually, lasting roughly 100.68 minutes.[119]

Table 47: Power Outages in Washoe County, 2014–2018

Year	Number of Outages	Average Duration of Outages (minutes)
2014	934	201
2015	1,323	412
2016	962	219
2017	1,134	223
2018	1,042	192
Grand Total	**5,395**	**259**

The 2018 Nevada Enhanced SHMP references a major power outage in Washoe County because of a weather-related event. From November 9 to 10, 2015, a severe winter storm resulted in many broken tree branches because of heavy wet snow. Over 35,000 customers were without power in Washoe County due to downed power lines.

[118] The Gardner News, "Off the Grid: Washoe County, Nevada Power Outage Tracker." https://data.thegardnernews.com/national-power-outage-map-tracker/area/washoe-county-nevada/32031/

[119] Find Energy, "Washoe County, Nevada Electricity Rates & Statistics." https://findenergy.com/nv/washoe-county-electricity/

- In January 2019, another winter storm caused 4,000 homes in Washoe County to lose power, requiring 10 specialized NV Energy trouble crews and 50 power line technicians to work for over 12 hours to address the issue.[120]

- During Winter 2020, approximately 90,000 customers were affected by power outage for four days due to Sierra Mountains "cement" snowstorm downing power lines.



Figure 74: Utility Pole with Power Lines and Transformers[121]

- On April 11, 2022, more than 4,400 customers were without power across Northern Nevada. NV Energy reported that the biggest outages were in Washoe and Humboldt Counties and Carson City. The biggest outage in Washoe County was in Sparks and affected more than 700 customers. More than 1,200 customers in Carson City were affected.[122]

- On January 21, 2024, NV Energy reported that over 2,100 NV Energy customers were without power in parts of Northern Nevada. Around 6 a.m., 6,000 NV Energy customers in the region did not have power, but that number dwindled to about 1,100 by 7:30 p.m., according to NV Energy's website. NV Energy's outage map showed that most of the

[120] 2 News Nevada, "Northern Nevada's Power Outages: Causes and Cures." https://www.2news.com/townnews/electricity/northern-nevadas-power-outages-causes-and-cures/article_715b0b56-6289-56bf-8cdf-6f80b7e17a56.html

[121] Reno Gazette Journal, 2015, Jupiter Images. www.jupiterimages.com

[122] 2News Nevada, "Power Restored to 600+ NV Energy Customers Across Northern Nevada," 2022. https://www.2news.com/news/power-restored-to-600-nv-energy-customers-across-northern-nevada/article_f2cb5036-b9e5-11ec-a4cf-b3896e39fa68.html

outages were concentrated in and around Reno and Carson City, with the largest single outage in Reno impacting 845 people.[123]

- On March 2, 2024, NV Energy reported that over 9,524 customers across Northern Nevada and 8,068 in Washoe County experienced power outages caused by severe wind and significant snow.[124] NV Energy stated that poor visibility and road conditions increased restoration times.[125]

Probability of Future Events

Due to the sporadic history of occurrences, the broad range of potential causes, the unpredictability of these causes, and the improvements in energy supply systems after previous failures, the probability of future occurrence of this hazard is difficult to measure. The overall probability of future energy emergency events is considered high.

Table 48 provides the Calculated Priority Risk Index for Energy Emergencies in Washoe County. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 48: Calculated Priority Risk Index for Energy Emergency in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Energy Emergency	4	2	4	3	3	3.1

The probability of energy emergencies may increase because of climate change. NV Energy states that "changes in the climate and environment are contributing to an increased risk of wildfires and other natural disasters. We are responding to these changes in many ways to protect our customers, community, and equipment from extreme weather. This includes public safety outages and other measures."

One way that climate change could affect the odds of an energy emergency is increased demand. As temperatures rise and extreme heat events become more frequent, there is

[123] Las Vegas Review Journal, Taylor Lane, "Thousands go without power in Nevada after high winds down power lines," January 14, 2024. https://www.reviewjournal.com/local/local-nevada/thousands-go-without-power-in-nevada-after-high-winds-down-power-lines-2981606/
[124] KOLO News Now, "Almost All Power Restored in Western Nevada." https://www.kolotv.com/2024/03/02/widspread-power-outages-western-nevada/
[125] 2News Nevada, "NV Energy Reports Numerous Outages Across Northern Nevada, Sierra," 2024. https://www.2news.com/news/nv-energy-reports-numerous-outages-across-northern-nevada-sierra/article_81fa8778-d86a-11ee-9b8d-2f235ac728ad.html

increased demand for power to keep cool, which could cause widespread power outages. Extreme weather events due to climate conditions could further increase the risk of weather-related equipment damage as well.

NV Energy implemented the Public Safety Outage Management program to plan power outages to more areas in Northern Nevada with elevated fire risk, recognizing safety as a priority. The goal of the program is to protect customers and the community from the risk of wildfires in areas where the risk of fires is extreme or elevated. It would shut off power in one or more zones of extreme or elevated fire risk when certain environmental conditions are met, and an evaluation of risk is done with guidance from local emergency management teams and other stakeholders. This helps prevent power lines, things that are blown into power lines, and other equipment from causing wildfires. Residents in Carson City, Washoe, would be affected by the scheduled power outages. NV Energy monitors weather patterns 7 to 10 days ahead for any concerning weather patterns. By the 72-hour mark, NV Energy begins to communicate with local emergency management officials and discuss where they see risks.

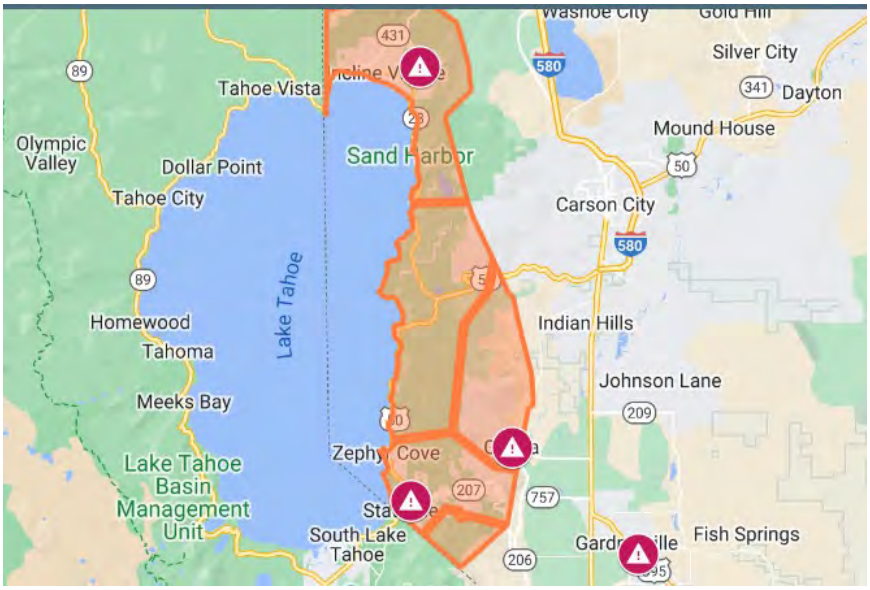


Figure 75: Northern Nevada Public Safety Outage Management Zone

Vulnerability Analysis

Prolonged power outages can cause health emergencies and increased demand for emergency medical services, especially in Nevada, where vulnerable people may be exposed to extreme summer or winter weather conditions. Power outages also can disrupt utilities or damage infrastructure, such as frozen pipes, with economic impacts because of the loss of perishable food and other items. Depending on the cause, a power outage or other energy emergency can cause cascading impacts—most significantly, wildland fires—if an outage was caused by a downed line or other physical damage.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The Nevada Governor's Office of Energy Status of Energy Report 2023 states that Nevada's economy relies on safe and affordable energy production. This provides essential services to Nevadans and serves as a magnet for new businesses, new industries, and new jobs. For this reason, in 2023, Governor Joe Lombardo outlined a comprehensive and balanced energy policy for Nevada that embraces a wide range of fuels, technologies, and supporting infrastructure. The policy goal is to develop and maintain a robust and diverse energy portfolio that will ensure that Nevada's energy needs are met, making significant progress toward this objective on multiple fronts.[126]

VULNERABLE POPULATIONS

In Washoe County, several populations are particularly vulnerable to energy emergencies, which can significantly impact their health and well-being. One of the most affected groups includes low-income households. These families often face financial constraints that limit their ability to invest in alternative energy sources or upgrade to energy-efficient systems. As a result, they are more susceptible to power outages, which can disrupt their daily lives and exacerbate existing financial struggles.

Another vulnerable population consists of elderly residents. Many older adults depend on reliable energy supplies for critical medical devices, heating, or cooling systems. During an energy emergency, these individuals may encounter serious health risks, especially if temperatures rise or fall drastically. Additionally, individuals with disabilities are at heightened risk, as they may rely on electric equipment for mobility and daily activities, making consistent energy access essential for their independence and safety.

Children and families also represent a particularly vulnerable group during energy emergencies. Young children are sensitive to environmental changes, and disruptions in energy supply can increase the risks of heat-related illnesses or exposure to cold. Furthermore, those living in rural areas may face additional challenges, as they often have less access to backup power sources and emergency services, leaving them more isolated during energy crises.

Lastly, the homeless population, who often lack stable shelter and access to basic resources, can face severe hardships during energy emergencies, making targeted support for these groups essential for effective emergency management.

Development Trends

The County's upward trend in development increases the overall demand for utilities. Furthermore, increased wildfire conditions due to climate change increase the need to

[126] Nevada Governor's Office of Energy Status of Energy Report 2023. https://energy.nv.gov/uploadedFiles/energynvgov/content/Home/Features/2023_Status_of_Energy_Report.pdf

intentionally shut off electricity to protect public safety. In general, the risk of an energy emergency is rising in the planning area because of these factors. NV Energy has been working to expand its energy generation facilities to incorporate more renewable energy facilities and replace aging equipment regularly. Nevada leads the nation in solar power potential, and it has already made significant strides in growing its solar energy capacity. Since 2016, the state's solar energy generation has nearly tripled. As of 2022, solar energy generation accounts for 23 percent of the state's total electricity. Currently, 37 percent of Nevada's electricity comes from renewable sources, helping meet the growing demands of the state, and ensuring that homes and businesses can rely on a robust and secure energy supply.[127]

Future development will create increased demand for utility services. In general, utility providers plan for and complete capital improvements to meet future demands. Factors such as budget constraints or the need to build new utility plants, such as wastewater treatment plants or power generation facilities, may affect utility providers' ability to serve many new customers.

COMMUNITY LIFELINES

Ensuring the safety and security of residents is crucial during energy emergencies, which can have significant effects on several FEMA community lifelines. The Energy lifeline itself is the most directly affected, as disruptions in energy supply can lead to power outages, affecting critical infrastructure and essential services. Impacts can be felt across other lifelines, such as Transportation, Communication, Hydration, Hazardous Waste, and Water and Wastewater. For example, transportation systems rely on energy for fueling and operations, and communication networks and water supply facilities also depend on energy to function. Access to necessities, such as food, hydration, healthcare, and medical services, may be affected as stores and healthcare facilities are without power or experience reduced energy, and the use of generators is necessary. In addition, hazardous waste stored in temperature-controlled environments may be at risk of instability. Energy emergencies may lead to the spread of diseases and illnesses, and even death if prolonged.

[127] Nevada Governor's Office of Energy Status of Energy Report 2023. https://energy.nv.gov/uploadedFiles/energynvgov/content/Home/Features/2023_Status_of_Energy_Report.pdf



Figure 76: FEMA Community Lifelines[128]

Mitigation efforts play a critical role in reducing vulnerabilities in energy infrastructure and making it more resilient to disasters. Mitigation focuses on identifying and addressing risks and weaknesses before disasters occur, aiming to minimize their impact on energy systems. Strategies include various measures, such as infrastructure hardening, redundancy, and diversification of energy sources.[129]

VULNERABILITY SCORE

Potential energy emergencies can cause significant disruptions to daily life and economic activities. According to the plan update, Washoe County is at moderate risk of being impacted by such events. However, the vulnerability score has not yet been calculated, as NRI (National Risk Index) data are available only for natural hazards. This hazard is considered a cascading hazard. The vulnerability score will be determined once more data has been collected.

EXISTING MITIGATION CASE STUDY

Recognizing the potential for hazards like wildland fires and severe weather to cause power outages, NV Energy is partnering with Washoe County to make the electric system more resilient. NV Energy is implementing strategies, such as replacing wooden power poles with steel poles designed to withstand snow loading and wildland fires and integrating renewable energy generation facilities into their system.[130]

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[128] FEMA, "Community Lifelines Toolkit 2.0." https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf

[129] LinkedIn, Robert Gerlach, June 3, 2023, "FEMA Community Lifelines, Focus on Energy." https://www.linkedin.com/pulse/fema-community-lifelines-focus-energy-robert-gerlach-mpa-mep/

[130] Washoe County Government, Emergency Management and Homeland Security, 2024, "Energy Emergency-Mitigation." https://www.washoecounty.gov/em/Hazards/Energy%20Emergency.php

CONSEQUENCE ANALYSIS

In the event of an energy emergency, Washoe County could face several risks. These may include power outages, disruption of essential services such as hospitals and healthcare facilities and emergency response systems, economic impacts due to the halt of commercial activities, and potential strain on resources for heating and cooling during extreme weather conditions. Additionally, there may be challenges in maintaining communication systems and ensuring the availability of fuel for transportation.

The information below provides the Consequence Analysis of the Potential for Detrimental Impacts of Energy Emergencies, which was done for accreditation with EMAP.

Table 49: EMAP Consequence Analysis for Energy Emergencies in Washoe County

Subject	Ranking	Impacts/Criminal Acts and Terrorism
Public	Minimal to Severe	This public risk revolves around power outages, particularly during extreme weather events like heat waves or winter storms. These outages can impact essential services like hospitals and healthcare facilities, emergency services, and residential areas. In addition to inconvenience, power outages can pose risks to public health and safety, especially for vulnerable populations.
Responders	Minimal to Severe	First responders in Washoe County face several risks in the event of an energy emergency. These may include potential exposure to hazardous materials and electrical hazards and the risk of injury or illness due to the emergency response work. Additionally, there may be challenges related to communication and coordination with other response agencies and the need to manage public safety and maintain critical infrastructure.
Continuity of Operations	Minimal to Severe	The impact of an energy emergency in Washoe County could be substantial on the continuity of operations. Inadequate handling of the emergency, communication failures, and a lack of effective response could interrupt essential services and operations. This could lead to disruptions in public services, potentially affecting critical functions such as emergency response, healthcare, and transportation. Additionally, businesses, schools, and other vital institutions may struggle to operate effectively, further exacerbating the impact on the community.
Property, Facilities, and	Minimal to Severe	The risk to property, facilities, and infrastructure in Washoe County due to energy emergencies could include potential

Subject	Ranking	Impacts/Criminal Acts and Terrorism
Infra-structure		damage from fires, explosions, or other hazardous incidents. These emergencies may also disrupt essential services and utilities, further harming infrastructure and buildings. Additionally, power outages and other energy-related issues could impact the functionality of critical facilities and infrastructure, posing a risk to their stability and operation.
Environment	Moderate to Severe	The impact on the environment can be significant during energy emergencies in Washoe County. Power outages and energy shortages can increase air pollution if backup generators or older, less efficient power sources are used to meet electricity demands. Additionally, the increased use of generators during emergencies can contribute to noise and air pollution. Furthermore, during energy emergencies, there may be an increased risk of wildfire in the region due to the potential failure of electrical infrastructure and the use of alternative power sources. This can damage local ecosystems and wildlife habitats. It is also important to consider the potential strain on water resources during energy emergencies, as water is often used in cooling systems for power generation. A lack of energy supply can also impact water treatment facilities, potentially leading to water quality issues.
Economic Condition	Minimal to Severe	The economic impact of energy emergencies in Washoe County can be significant. Power outages and energy shortages can disrupt businesses, leading to financial losses due to halted operations and productivity. Additionally, the increased use of backup generators during emergencies can result in higher fuel costs for businesses and households. Moreover, if energy emergencies lead to water supply issues, businesses that rely on water, such as agriculture and manufacturing, may face production challenges and increased costs.
Public Confidence in Governance	Minimal to Severe	An energy emergency in Washoe County could significantly impact public confidence in governance. Inadequate handling of the emergency, communication failures, and a lack of effective response could lead to frustration and mistrust among the public. If government agencies are perceived as unprepared or unable to manage the crisis, it could erode confidence in their ability to protect and serve the community.

Subject	Ranking	Impacts/Criminal Acts and Terrorism
		Additionally, a prolonged energy emergency could raise questions about the overall stability and resilience of the local governance, potentially leading to decreased public trust and support.

COMMUNITY INPUT

The public expressed concern about the Energy Emergency being a hazard in the planning area. One member expressed concern that an extended energy emergency would bring everyday life to a standstill and potentially increase violence in the area. The public was concerned that seniors lacked proper heating and cooling due to an energy emergency. Another member was concerned with storing medicine in the refrigerator needed for a chronic illness if power is not available. Another member was concerned about trees and limbs near or touching powerlines.

Increased population density increases the region's resource needs, and energy disruptions can impact food, transportation, and shelter. Complete dependence on electronic systems to control logistics and communication and maintenance of all existing infrastructure systems increases the potential magnitude of disruptions based on G5 solar flares, cyber warfare, and technological failures.

Several members support ensuring foliage is not in the immediate region of powerlines and upgrading powerlines to withstand hazards. The public supports community training or additional outreach and publications that could help address this hazard.

Extreme Weather

Hazard Description

WINTER STORM

Winter storms can bring heavy rain or snow, high winds, extreme cold, and ice storms. In Nevada, winter storms begin with cyclonic weather systems in the North Pacific Ocean or the Aleutian Islands, which can cause massive low-pressure storm systems to sweep across the western states. Winter storms plunge southward from arctic regions and drop heavy amounts of snow and ice. The severity of winter storms is generally minor. However, a heavy accumulation of ice can create hazardous conditions. A large winter storm event or an atmospheric river event can also cause exceptionally high rainfall that persists for days, resulting in heavy Flooding (including closed-basin flooding). Lake-effect snow is possible near large water bodies, such as Lake Tahoe and Pyramid Lake. This is produced when a cold air mass moves across warmer lake water, which can produce narrow but intense bands of heavy snowfall.

Three basic ingredients are necessary to make a winter storm:

- **Cold air**: Below-freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- **Lift**: Something to raise moist air to the clouds and cause precipitation. An example of lift is warm air colliding with cold air and being forced to rise over the cold dome. The boundary between the warm and cold air masses is called a front. Another example of lift is air flowing up a mountainside.
- **Moisture**: To form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean, is an excellent source of moisture.

Table 50 shows the types of winter storms.

Table 50: Types of Winter Storms[131]

Type	Definition
Blizzard	A storm which contains large amounts of snow OR blowing snow, with winds in excess of 35 mph and visibilities of less than 1/4 mile for an extended period (at least 3 hours). The wind factor is what distinguishes a blizzard from a snowstorm.

[131] National Weather Service, Winter Weather Warnings, Watches and Advisories. https://www.weather.gov/safety/winter-ww

Type	Definition
Snowstorm	A storm which is generally considered less severe than a blizzard due to the lack of high winds and low visibility, but they can still be dangerous, especially when driving or walking on slick surfaces
Ice Storm	A storm which results in the accumulation of at least 0.25" of ice on exposed surfaces. They create hazardous driving and walking conditions. Tree branches and powerlines can easily snap under the weight of the ice.

WINTER WEATHER WARNINGS AND ADVISORIES

The National Weather Service issues the following winter weather warnings and advisories[132]:

WINDSTORM

A **windstorm** is a severe weather condition that is sometimes indicated by high winds with little or no rain. High winds can also accompany thunderstorms and can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Winds greater than 40–60 miles per hour (mph) are considered high. Winds that exceed 100 mph can overturn mobile homes, tear roofs off houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, and debris blocking streets. Windstorms can cause dust storms and can often increase the risk of wildland fires. See the Wildland Fire section for a description of red flag warnings associated with high winds.

EXTREME HEAT

An emerging hazard for Washoe County is extreme heat. Extreme heat occurs when summertime temperatures are much hotter and/or more humid than average. Historically, the seasonal maximum heat index is 90.17 degrees, but it is expected to increase to over 96 degrees by mid-century[133]. Extreme heat conditions are determined by comparing temperature and humidity to average conditions for the affected location at that time of year.[134] Extreme heat can have negative health impacts, particularly on populations with underlying health risks. Extreme heat can also increase the negative impacts of drought and the probability of wildfire.

[132] National Weather Service, 2024, https://www.weather.gov/safety/winter-ww
[133] ClimRR Climate Projection Report, Washoe County. https://climrr.anl.gov/climateprojections
[134] Center for Disease Control and Prevention, 2024. https://www.cdc.gov/heat-health/about/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fextreme-heat%2Fabout%2Findex.html

Location

WINTER STORM

High elevations in the western portion of Washoe County experience the effects of winter storms, often snowstorms, with greater frequency than the rest of the County. Locations that are often affected by snowstorms include Mt. Rose Highway, Incline Village, Mt. Peavine, and I-80 near the County's border with California. [135] The National Gridded Snowfall Analysis estimates snowfall through several remote observation networks. Figure 77 shows the seasonal snow accumulation as of March 28, 2023, a boom year for snow in the Sierra Nevada.

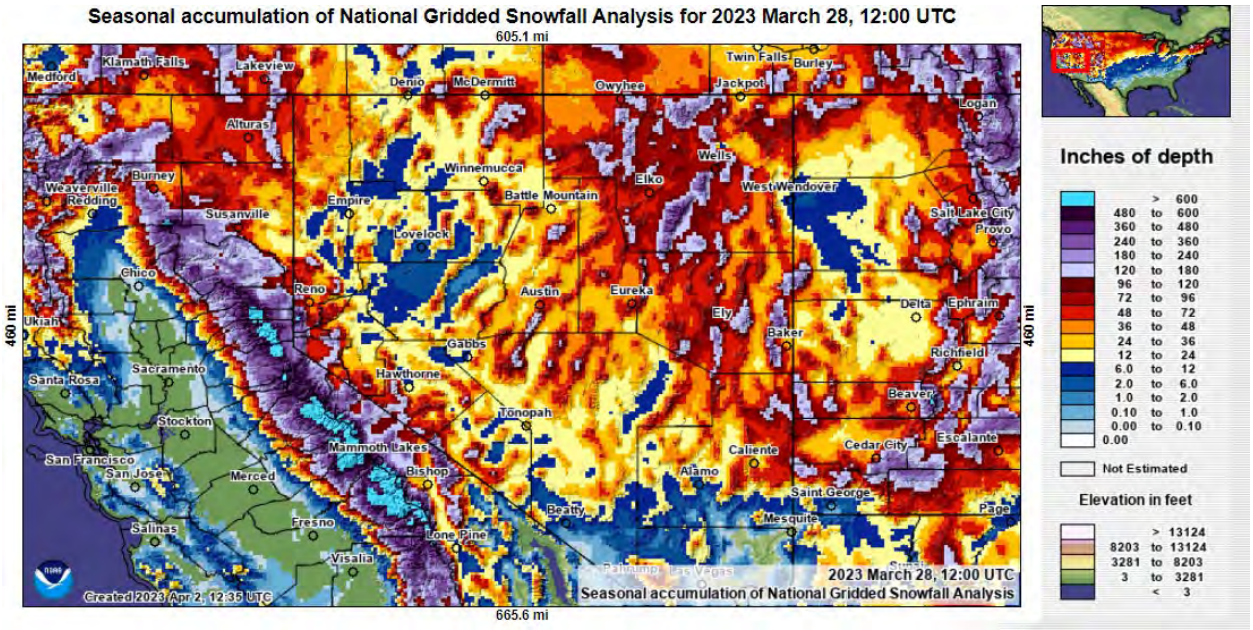

Figure 77: Seasonal National Gridded Snowfall Analysis, March 28, 2023

WINDSTORM

Extreme wind events are experienced in every region of the United States. A useful tool for determining the location of the extreme wind hazard area in a jurisdiction is depicted in Figure

[135] National Operational Hydrologic Remote Sensing Center. "Seasonal accumulation of National Gridded Snowfall Analysis for 2023 March 28." https://www.nohrsc.noaa.gov/interactive/html/map.html?ql=station&zoom=&loc=42.55+N%2C+122.94+W&var=snowfall_season_d&dy=2023&dm=3&dd=28&dh=12&snap=1&o11=1&o9=1&o13=1&lbl=m&mode=pan&extents=us&min_x=-123.21666666667&min_y=35.916666666663&max_x=-111.34166666667&max_y=42.591666666662&coord_x=-117.27916666667&coord_y=39.2541666666625&zbox_n=&zbox_s=&zbox_e=&zbox_w=&metric=0&bgvar=dem&shdvar=shading&title=1&width=800&height=450&nw=800&nh=450&h_o=0&font=0&js=1&uc=0

78. This map of design windspeeds was developed by the American Society of Civil Engineers. It divides the United States into four wind zones, geographically representing the frequency and magnitude of potential extreme wind events. The figure shows that Washoe County and its jurisdictions are within Zone I, with a design windspeed for shelters of 130 miles per hour. Windstorms may occur anywhere in Washoe County. Properties with aboveground infrastructure, utilities, and tree stands may be more damaged during windstorms.

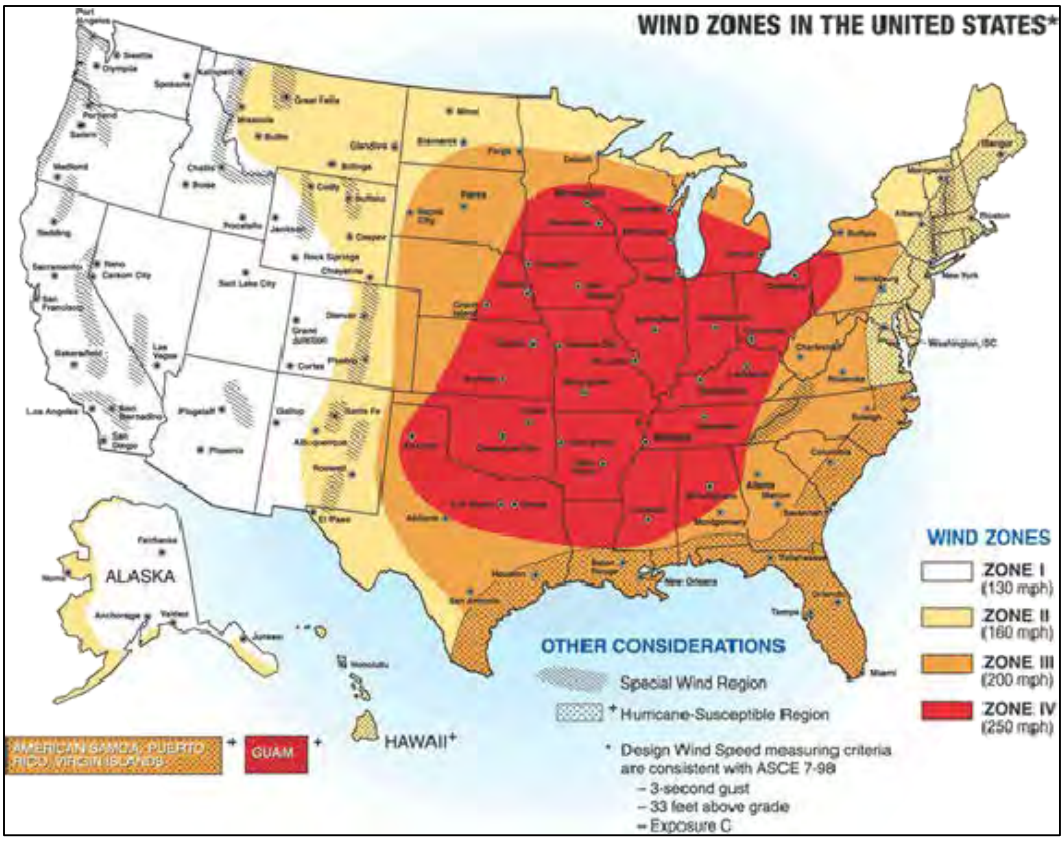

Figure 78: Wind Zones in the United States[136]

EXTREME HEAT

Extreme heat also may occur anywhere in Washoe County. However, urban areas are more likely to experience extreme heat conditions because of the heat island effect, in which the impervious surfaces concentrated in cities increase the surrounding area's temperature higher than temperatures in more rural areas.[137] shows areas of urban heat island effects in Washoe in 2020, according to heat severity data provided by the Trust for Public Land. The data use

[136] Resilient Action Fund, FEMA, 2022, "Wind Zones in the United States." https://www.buildingresilient.com/resources/us-wind-zones-map/

[137] United States Environmental Protection Agency, "Heat Island Effect." https://www.epa.gov/heatislands#:~:text=Heat%20islands%20are%20urbanized%20areas,as%20forests%20and%20water%20bodies

Landsat 8 imagery ground-level thermal sensors to show where certain areas of cities are hotter than the average temperature for that same city as a whole.

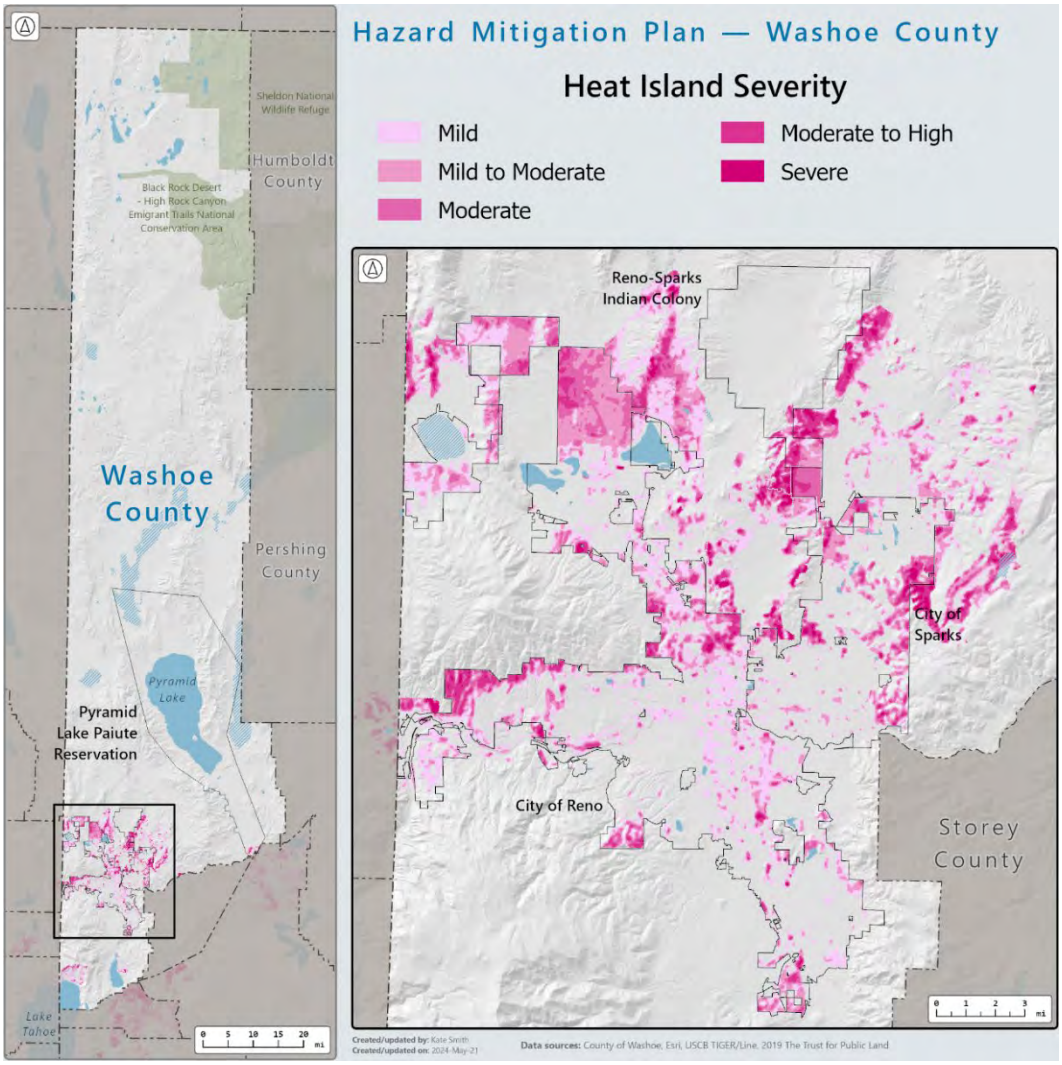

Figure 79: Heat Severity in Washoe County

Extent

The magnitude and potential severity of impacts of Extreme weather is considered Low. Typical Extreme weather events are handled at the city or county level, can disrupt local government and business services for a period of days to weeks, and can have economic impacts on a statewide scale. Considering a worst-case scenario, an extreme weather event could require federal-level support, could impact critical facilities, and disrupt services for more than 20 days, and could have nationwide economic impacts.

SNOWSTORM

The severity of the effects of snowstorms increases as the amount and rate of precipitation increase. In addition, storms with a low forward velocity are in an area for longer and become more severe in their effects. Storms in full force during morning or evening rush hours tend to have their effects magnified because more people are out on the roadways and directly exposed. Snowfall accumulation and related hazardous conditions tend to increase at higher elevations, including Incline Village and other mountainous areas. Major transportation routes, such as Interstate 80 west of Reno, State Route 431, and State Route 28, are more likely to be affected by winter storms. Heavy snowfall generally refers to snowfall accumulating to 4" or more in depth in 12 hours or less or 6" or more in-depth in 24 hours or less.

One tool to indicate the potential severity of a winter storm is the Winter Storm Severity Index (Figure 80). Based on the official forecast, the National Weather Service forecasters use this tool to maintain situational awareness of the possible significance of weather-related impacts. It can be used to communicate societal impacts on the public.

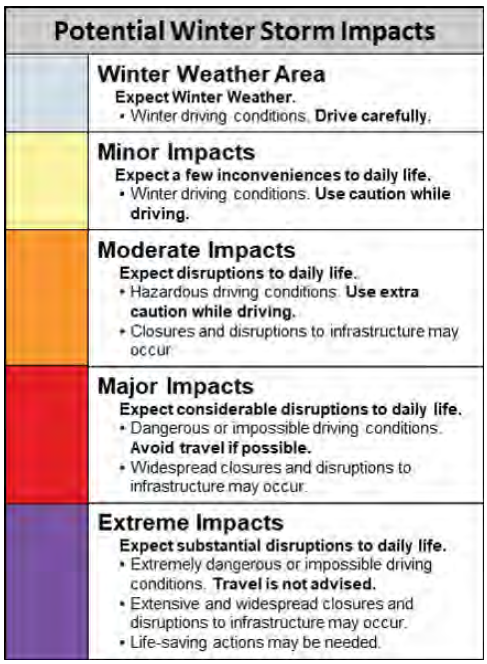

Figure 80: Winter Storm Severity Index[138]

WINDSTORM

Extreme wind can occur alone, such as during straight-line wind events and derechos, or it can accompany other natural hazards, including snowstorms, blizzards, and severe thunderstorms. Severe wind threatens lives, property, and vital utilities, mainly due to flying debris or downed

[138] National Weather Service, Winter Storm Severity Index. https://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php

trees and power lines. Severe wind will typically cause the greatest damage to structures of light construction, particularly manufactured homes. The table below is the Beaufort Scale of severe wind hazard and represents one measure of the magnitude or severity of the wind hazard (Table 51).

Table 51: Beaufort Scale of Severe Wind Hazard[139]

Beaufort Number	Wind Speed (miles per hour)	Description	Wind Effects on Land
0	<1	Calm	Calm, smoke rises vertically.
1	1–3	Light Air	Wind motion visible in smoke.
2	4–7	Light Breeze	Wind felt on exposed skin. Leaves rustle.
3	8–12	Gentle Breeze	Leaves and smaller twigs in constant motion.
4	13–18	Moderate Breeze	Dust and loose paper are raised. Small branches begin to move.
5	19–24	Fresh Breeze	Small trees begin to sway.
6	25–31	Strong Breeze	Large branches are in motion. Whistling is heard on the overhead wires. Umbrella use is difficult.
7	32–38	Near Gale	Whole trees in motion. Some difficulty experienced walking into the wind.
8	39–46	Gale	Twigs and small branches break from trees. Cars veer on the road.
9	47–54	Strong Gale	Larger branches break from trees. Light structural damage.
10	55–63	Storm	Trees broken and uprooted. Considerable structural damage.
11	64–72	Violent Storm	Widespread damage to structures and vegetation.
12	>73	Hurricane	Considerable and widespread damage to structures and vegetation. Violence.

EXTREME HEAT

The heat index is what the temperature feels like to the human body when relative humidity is combined with air temperature. There is a direct relationship between air temperature and relative humidity and the heat index. As air temperature and relative humidity increase, the

[139] NOAA, 2024, "Beaufort Scale of Severe Wind Hazard." https://www.weather.gov/mfl/beaufort

heat index increases.[140] When the heat index is high, the body has more difficulty cooling itself through evaporation of perspiration to maintain a comfortable temperature. The potential for negative health consequences increases with higher heat index values.

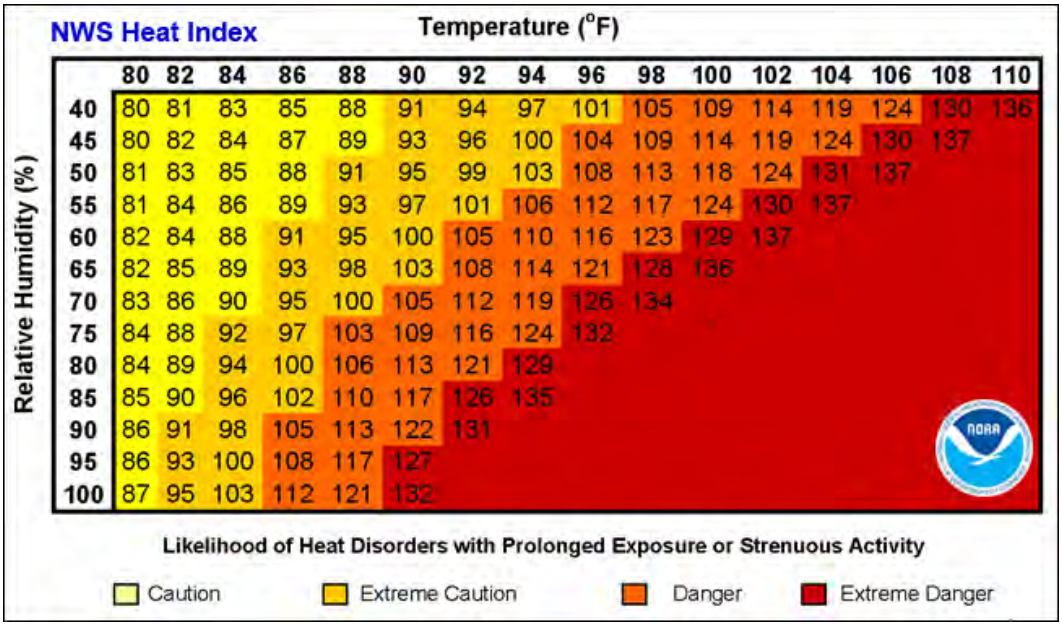

Figure 81: National Weather Service Heat Index[141]

Previous Occurrence/History

WINTER STORM

NOAA's NCEI Storm Events Database records 142 Winter Weather, Winter Storms, and Heavy Snow events in Washoe County between 2019 and 2023. No deaths, three injuries, $8M in property damage, and no crop damage were identified in the database.

The FEMA website shows that FEMA made two major disaster declarations due to Extreme weather in the State of Nevada since the initial plan was prepared in 2010 (See Table 52, Figure 82, and Figure 83).[142]

[140] National Weather Service, "What is the Heat Index?" https://www.weather.gov/ama/heatindex
[141] National Weather Service, "What is the Heat Index?" https://www.weather.gov/ama/heatindex
[142] FEMA, "Disaster Declarations for States and Counties." https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

Table 52: FEMA Extreme weather Declarations, 2010–2023[143]

Disaster/ Emergency #	Declaration Type	Event	Incident Period	Eligible Assistance for Washoe County
DR-4307	Major Disaster Declaration	Severe Winter Storms, Flooding (including closed-basin flooding) (including closed-basin flooding), Mudslides	February 5–22, 2017	Public Assistance
DR-4303	Major Disaster Declaration	Severe Winter Storms, Flooding (including closed-basin flooding), Mudslides	January 5–14, 2017	Public Assistance

[143] Ibid.

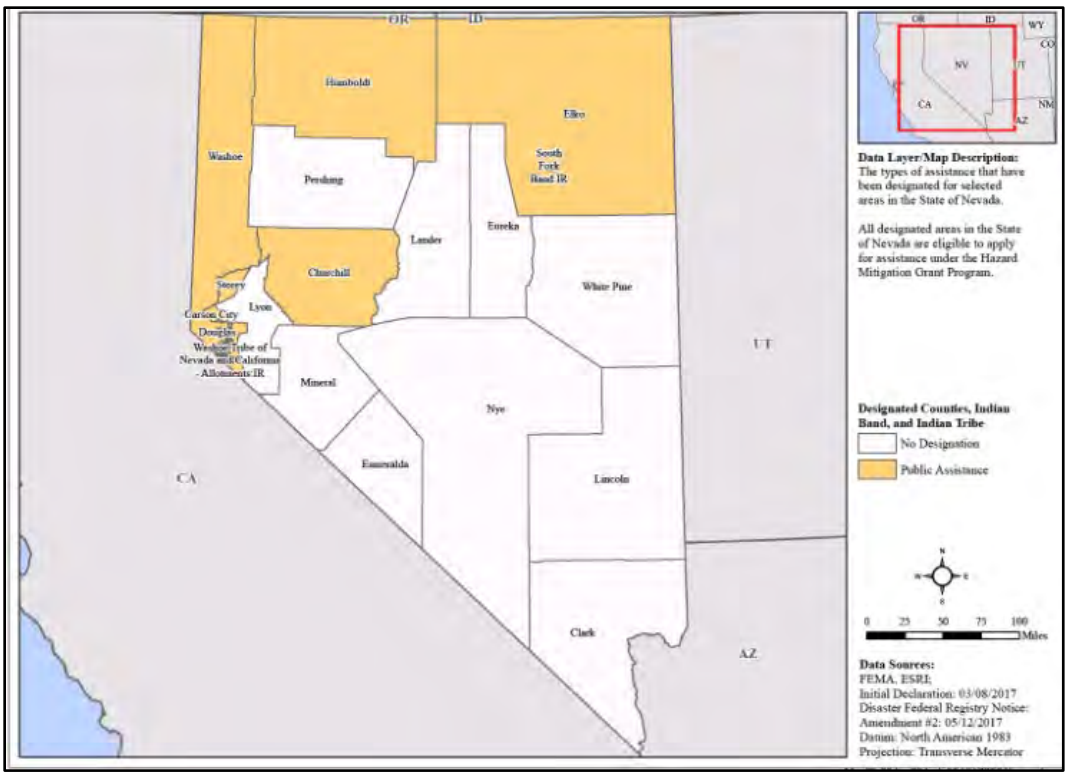

Figure 82: FEMA 4307-DR, Nevada Disaster Declaration as of 5/12/2017[144]

[144] FEMA, 2024, "FEMA 4307, Nevada Disaster Declaration as of 5/12/2017." https://www.fema.gov/disaster/4307/designated-areas

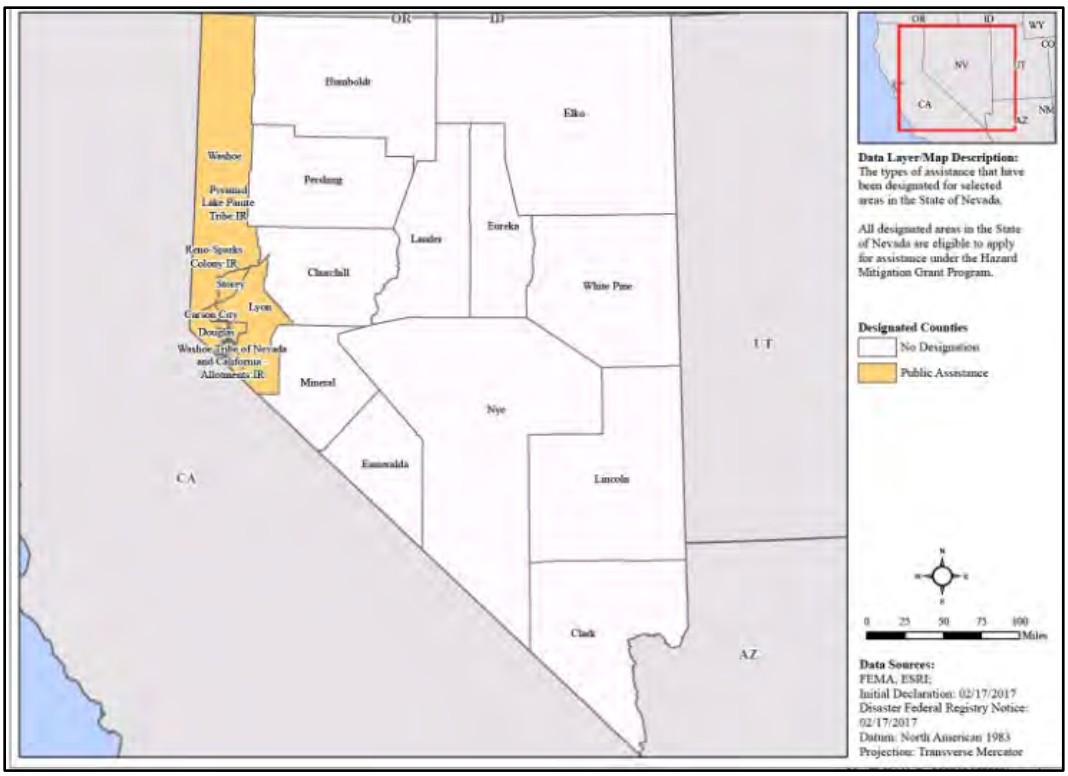

Figure 83: FEMA 4303-DR, Nevada Disaster Declaration as of 2/17/2017[145]

Historical snowfall data in Washoe County were extracted from the National Oceanic and Atmospheric Administration's (NOAA's) online climate database covering the years 2015–2023. During this period, the average daily snowfall in the winter months ranged from 0.16 to 0.28 inches, with the highest snowfall generally occurring in February.

The 2018 Nevada Enhanced SHMP lists the following severe winter storms occurring in Washoe County over the past 15 years:

- **December 29, 2004–January 10, 2005**: Severe winter storm in Northern Nevada, prompting FEMA to designate 16 counties for federal funding to alleviate the cost of emergency protective measures.
- **February 25, 2011**: Winter storm with up 18 inches of snow and 50 mph winds, causing multiple auto accidents, two injuries, and roughly $250,000 in damage.
- **January 13–14, 2013**: Prolonged winter temperatures led to Governor Sandoval declaring a state of emergency, and subzero temperatures were responsible for deaths across the state, including in Reno.

[145] FEMA, 2024, "FEMA 4303, Nevada Disaster Declaration as of 2/17/2017." https://www.fema.gov/disaster/4303/designated-areas

- **November 9–10, 2015**: A severe winter storm downed power lines because of heavy, wet snow, and over 35,000 customers were without power in Washoe County.
- **January 30–31, 2016**: Snow totals of 4 to 8 inches around Reno-Sparks area, and areas in and near the foothills west of Reno received 8 to 10 inches of snow. Whiteout conditions occurred because of heavy lake-effect snow off Pyramid Lake.

MOST RECENT WINTER STORM EVENTS

- **February 22, 2022:** Another inside slider tracked through the region with more snow and wind. This inside slider-type system moved into the region late Sunday through Tuesday. It brought periods of snow showers, increased wind, travel difficulties, and much lower temperatures to the region through Wednesday night. Snow Monday and into Tuesday morning overperformed in some areas, with several inches of new snow falling in bands over parts of the eastern Sierra, and western NV. A vehicle crash occurred the morning of Tuesday, February 22, around 6:00 am PST involving two vehicles and three passengers who were injured. A slider-type weather system moved over the region late Sunday, February 20, into the morning of Tuesday, February 22, producing a couple rounds of snowfall.
- **December 10, 2022:** A stronger winter storm brought another round of heavy snow, strong winds, and travel impacts on Sierra passes December 9–11. Peak snowfall totals occurred through the period of December 10–11 with 2–4 feet of snow widely reported in Sierra locations and northeast CA. Storm total snowfall amounts even exceeded 5 feet over parts of the Sierra crest. Several inches of new snow also fell over some western Nevada valleys, with a foot plus falling across some eastern Sierra foothill areas as well. Strong winds having gusts of 65–75 mph in far western Nevada resulted in reports of $8M in damage across parts of Sparks during the early morning of December 10.
- **December 31, 2022:** Heavy snow prompted a winter storm warning for Washoe County and neighboring counties. Heavy wet snow accumulation was expected to be from 4 to 8 inches, or 12 to 18 inches above 5,000 feet. A number of downed powerlines caused power outages to thousands of customers throughout the region. Heavy rain in previous days had prompted a flood watch for main stem rivers, creeks, streams, and low-lying areas due to excessive runoff.

The 2018 Nevada Enhanced SHMP reports that, to qualify as an “extreme” event, a snowfall must be above the 15th percentile of overall snowfall for a particular county. The state complied with weather- related incidents and reported deaths or damage from 1995 through 2016 using data from the National Weather Service. Over this period, Washoe County experienced one extreme cold event, 25 incidents of hail, 279 heavy snowfall events, four ice storms, and 22 winter storms. Reported damage included $128,000 due to heavy snowfall, $30,000 due to ice storms, and $600,000 due to winter storms. Winter storms also led to the deaths of three people during this period in Washoe County.

WINDSTORM

Windspeeds in Washoe County can reach high levels. In 2016, Reno was ranked as the second windiest city in the United States, and Reno has reported record high wind gusts exceeding 80 mph.[146] Daily wind speeds were obtained from NOAA's online climate database for Washoe County from 2015 through 2018.[147] The data suggests that the windiest months in Washoe County are April through June. Average daily wind- speeds from 2015 to 2018 for the months of April through June ranged from 6.09 to 7.50 mph.

NOAA's NCEI Storm Events Database records 170 events of high wind, strong wind, and thunderstorm wind in Washoe County between 2019 and 2023. No deaths, no injuries, $5K in property damage, and $250 in crop damage were identified in the database.

The 2018 Nevada Enhanced SHMP complied weather-related incidents and reported deaths or damage from 1995 to 2016 using data from the National Weather Service. During this period, there were over 500 incidents of high wind that accompanied winter storms, resulting in two deaths and over $7 million in damage. Additionally, there were 25 reported incidents of dust storms and an associated hazard of windstorms, which led to 19 injuries and $240,000 in damage. Figure 84 shows how damaging high winds can be.

[146] Reno Gazette Journal, "Reno Second-Windiest City in the U.S. in 2016." https://www.rgj.com/story/news/2017/01/17/reno-second-windiest-city-us-2016/96675108/
[147] Washoe County, "Regional-HMP-2020.pdf." https://www.washoecounty.gov/em/files/Regional-HMP-2020.pdf



Figure 84: NWS Reno Radar Damage from Wind, December 2008[148]

HUMAN EFFECTS OF DISASTER: 2002 WASHOE COAUNTY WINDSTORM

In December 2002, a windstorm caused major property damage, flight cancellations, and power outages in Reno, Nevada.

"It's the strongest winds we've ever recorded in Reno. What we saw today were hurricane-force winds."
– Tom Cylke, weather service forecaster.[149]

[148] Washoe County, NV, "Regional-HMP-2020.pdf." https://www.washoecounty.gov/em/files/Regional-HMP-2020.pdf
[149] Desert News, "High Winds Set Record in Reno; Wild Surf, Tornado Hit California." https://www.deseret.com/2002/12/15/19694045/high-winds-set-record-in-reno-wild-surf-tornado-hit-california/

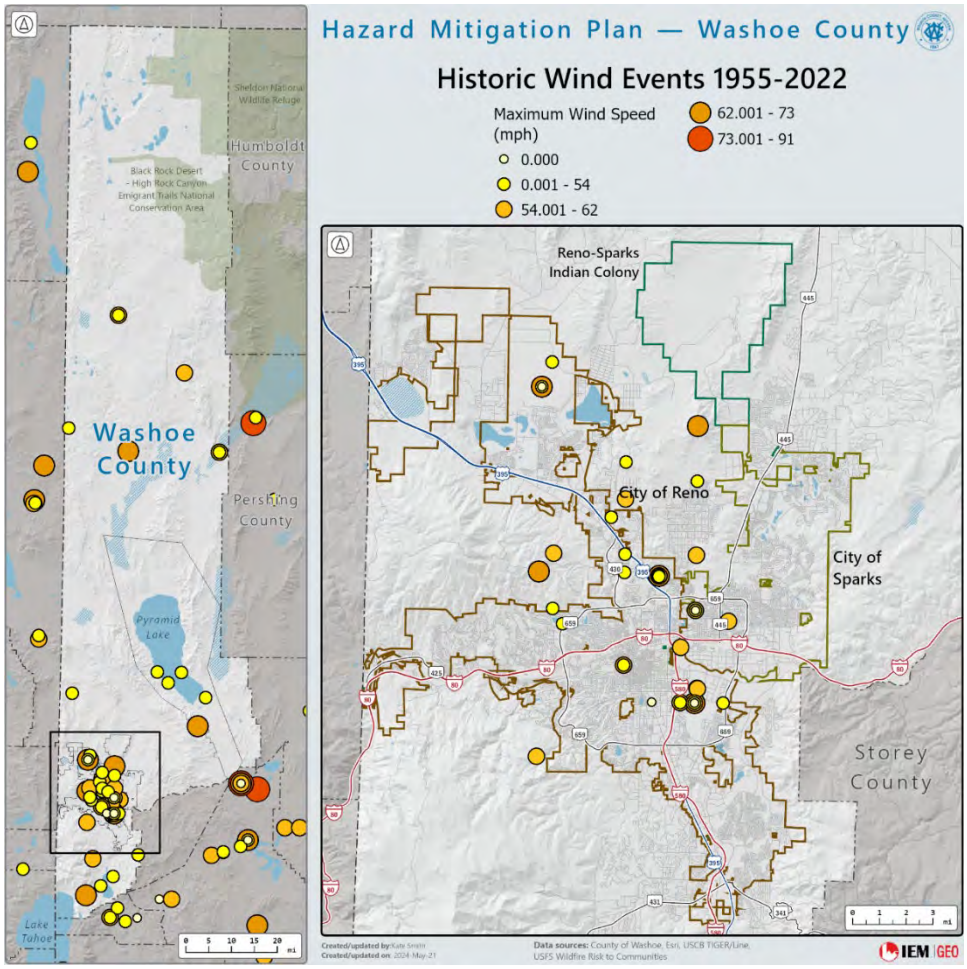

Figure 85: Historic Wind Events in Washoe County, 1955–2022[150]

EXTREME HEAT

No excessive heat events have been recorded for Washoe County in the NCEI Storm Events Database. However, excessive heat watches and warnings have occurred in recent years, including in 2021[151] and 2023.[152] These warnings included information to help individuals avoid heat-related illness and the locations of cooling centers.

[150] National Weather Service Storm Prediction Center Severe Weather Database. https://www.spc.noaa.gov/gis/svrgis/

[151] Reno Gazette Journal, "Excessive heat warning issued for Reno area beginning Sunday," https://www.rgj.com/story/news/2021/06/26/excessive-heat-warning-reno-area-beginning-sunday/5357958001/

[152] Reno Gazette Journal, "Reno expecting 102-degree temps this weekend; excessive heat watch into next week." https://www.rgj.com/story/news/2023/07/10/reno-expecting-102-degree-temps-this-weekend-heat-watch-through-monday-july-17-evening/70398343007/

Figure 86 shows a maximum temperature of red days at 27 per year (minimum temperature days 5), maximum temperature orange days at 34 per year (minimum temperature days 16), and maximum temperature yellow days at 97 per year (minimum temperature days 55), maximum temperature green days at 120 per year (minimum temperature days 202). All temperature readings were recorded at the Reno Airport. The top right of the graph shows the dates in 2024 when heat warnings, advisories and conditions were issued, between June 11 and August 7.

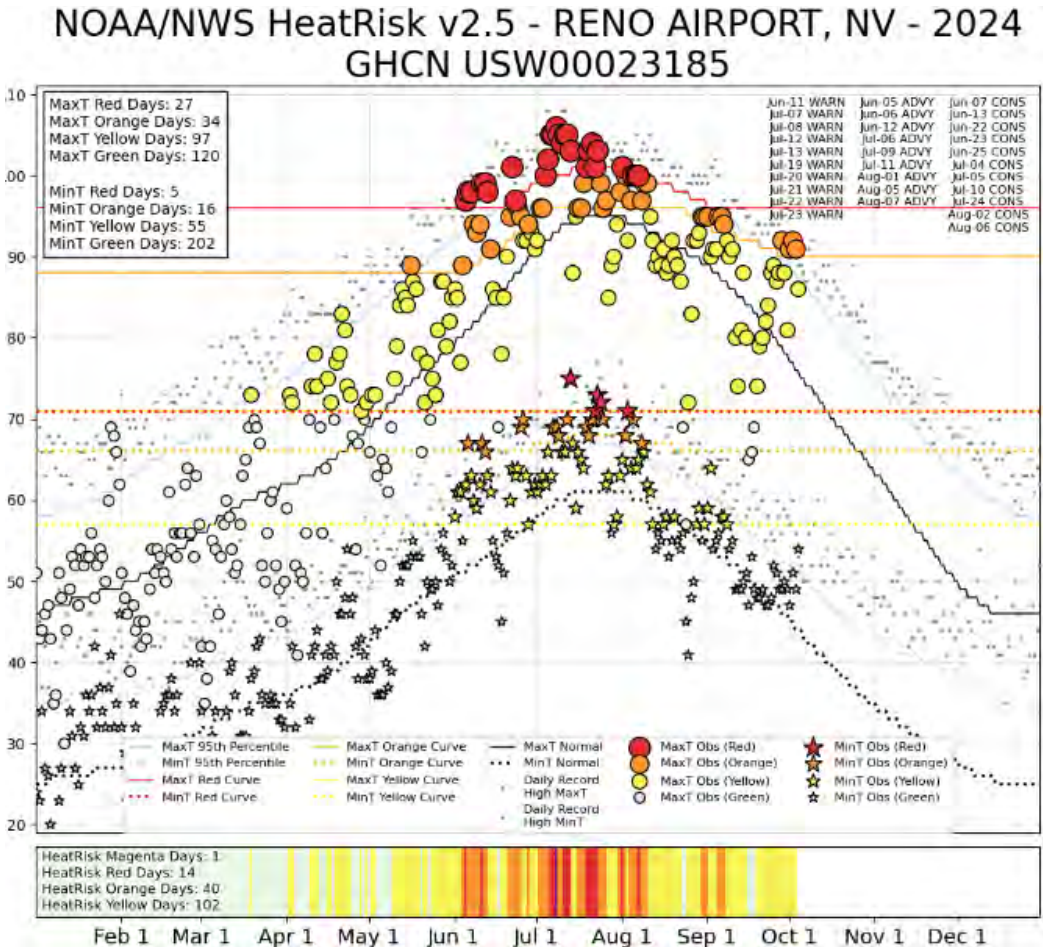

Figure 86: NOAA/NWS Heat Risk Graph, 2024 Reno Airport[153]

Probability of Future Events

The probability of a winter storm in Washoe County is High, based on an average frequency of three events per year according to the NRI. The probability of windstorms is also High, based on the number of occurrences recorded in NCEI. The probability of future extreme heat events is considered Medium. There have not been a significant number of historic events, but

[153] National Oceanic and Atmospheric Administration, National Weather Service, "HeatRisk Information, Reno Airport," https://www.wpc.ncep.noaa.gov/heatrisk/historical/

occurrences are expected to increase in the future. The overall probability of an Extreme weather event is High, and the potential impact of future climate conditions could increase the risk of Extreme weather events. However, since Extreme weather occur every year in Washoe County, local and state jurisdictions and emergency response personnel are experienced in responding to such scenarios.

The following table provides the Calculated Priority Risk Index of each jurisdiction as per the current plan hazard risk assessment results. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 53: Calculated Priority Risk Index for Extreme weathers in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Extreme weathers (Winter Storm, Windstorms, Extreme Heat)	4	2	1	4	3	2.9

IMPACTS OF CLIMATE TRENDS AND VARIATIONS

The 2018 Nevada Enhanced SHMP provided the following statement related to future climate conditions: There are some aspects to Nevada Extreme weather for which we have better confidence in anticipating the impacts of climate change, while for many other aspects much is unknown. Recent observations and simulations suggest a continued rise in rain–snow elevation. This will cause a larger portion of winter precipitation to fall as rain instead of snow. This scenario could lessen the frequency of lower elevation heavy snow events but increase the risk of winter floods. This scenario also means less snowpack from which to rely on for the summer water supply.

Simulations are mixed in terms of winter precipitation in the coming decades, with some showing a decreasing trend for the Sierra and Great Basin and others showing an increasing trend. Most projections show more of the precipitation coming in fewer but larger atmospheric river type storms. This scenario would increase the risk of severe weather impacts—heavy snow and floods. However, there is no reliable data on whether Nevada windstorms will increase or decrease in frequency and intensity in the coming decades due to climate change.

Based on the most recent long-range simulations, climate change can be expected to lead to more episodes of extreme heat in Nevada, especially in southern Nevada. The number of 105°+ days will likely increase, making the duration and severity of heat waves more extreme. Perhaps of more importance—based on the scientific consensus and what has already been

observed—average overnight low temperatures are projected to increase, perhaps considerably, in the coming decades. This will remove the mitigating effect of cooling off at night, which has helped northern Nevada minimize health impacts from recent heatwaves.

Recent studies conducted by the Desert Research Institute conclude that climate change and an intense urban heat island have made Reno the fastest warming city in the U.S. The warming temperatures pose risks to Reno's communities, as heat is the number one weather-related cause of death in the U.S.



Figure 87: NOAA Mapping of Heat Islands, Including Reno–Sparks, Nevada[154]

The following represent the potential impacts on future climate conditions of extreme weather:

- Potential for a larger portion of winter precipitation falling as rain instead of snow
- Potential for less frequency of heavy snow but increased risk of winter floods
- Potential for less snowpack on which to rely for summer water supply
- Potential for increased risk of severe weather events, such as heavy snow
- Potential risk of increased windstorms
- Continuing increase in average temperatures across the region, along with increases in extreme heat events.

[154] Desert Research Institute, "Reno/Sparks selected to be part of Urban Heat Mapping Campaign," 2024. https://www.dri.edu/reno-sparks-selected-to-be-part-of-urban-heat-mapping-campaign/

Vulnerability Analysis

WINTER STORM

The County's primary vulnerability from extreme weather is from power outages and impairment of transportation. Because nearly all social and economic activities are dependent on transportation, snow can have a serious impact. Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of ice or snow, downed trees, or debris, or from increases in demand beyond the capacity of the electrical system. Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe weather events. Buildings and roofs can be damaged if large amounts of heavy snow accumulate. If prolonged cold temperatures accompany a winter storm, pipes can freeze and burst.

Winter storms can lead to health concerns for unhoused populations who do not have insulated clothing or dry living conditions and are at increased risk of hypothermia. Populations who may not have sufficient heating or who lose heat due to a power outage may seek alternative heating sources. Carbon monoxide poisoning can occur if proper ventilation is not used. Home fires also occur more frequently in the winter because of inadequate safety precautions from using alternative heat sources. Exhaustion and heart attacks brought on by overexertion are two other common causes of death related to winter storms. Shoveling snow, pushing a vehicle, or even walking in heavy snow can lead to heart attack, particularly in older individuals or those not used to high levels of physical activity. Slick or icy conditions following heavy snow may lead to injuries from falls.

Winter storms are dangerous. They can bring cold temperatures, power failures, loss of communication services, and icy roads. This can make being outside dangerous, and for this reason, the Center for Disease Control and Prevention[155] recommends limiting time outside, staying indoors as much as possible to reduce the risk of car crashes and falling on the ice, although there are hazards inside the home as well, such as improper heating sources due to power outages, such as the kitchen stove. Members of the community who are isolated or have disabilities may be more vulnerable, especially those who may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Power losses during winter storms have resulted in deaths from carbon monoxide poisoning if people attempt to keep warm by lighting charcoal fires or operating backup generators indoors.

[155] Center for Disease Control and Prevention, "Safety Guidelines: During & After a Winter Storm," 2024. https://www.cdc.gov/winter-weather/safety/stay-safe-during-after-a-winter-storm-safety.html?CDC_AAref_Val=https://www.cdc.gov/disasters/winter/duringstorm/indoorsafety.html

WINDSTORMS

Most vulnerabilities to windstorms occur in the built environment. Buildings, utilities, and transportation systems are vulnerable to wind damage. Old or poorly constructed buildings or insufficiently anchored manufactured homes are more vulnerable to strong winds and can be heavily damaged. Uprooted and fallen trees can damage above-ground power and other utility lines and can block roads, railways, or other transportation networks. Windstorms can also generate storm-related debris that can be costly and time-consuming to clear. Building damage and service interruptions also cause economic losses from business interruptions.

Falling trees or blowing debris can lead to injuries or loss of life. Power outages and transportation disruptions can also negatively impact populations.

EXTREME HEAT

Extreme heat is associated with more fatalities than any other severe weather event in the United States. During extreme heat events, a person's body temperature may rise faster than it can cool itself, which can lead to heat-related illnesses, such as heat exhaustion or heat stroke. Older adults, young children, pregnant women, and individuals with chronic diseases, such as cardiovascular or respiratory conditions, are at the highest risk. Outdoor workers and unhoused populations also are particularly vulnerable. People who live in social isolation, including linguistic isolation or those living alone with few social relationships, also are at higher risk. Social factors, including race and ethnicity, income, and educational attainment, are correlated with many health outcomes, including heat-related illness. Lower-income individuals may not live in housing with air conditioning and are at risk. Those living and working near urban heat islands may be more vulnerable.

Extreme heat events can also have negative impacts on worker productivity, such as time lost on the job when people need to take more frequent or longer breaks to avoid overheating or when it is too hot to work at all. Extreme heat can also affect the agricultural sector, such as livestock health and crop yields.

Heat waves can damage transportation infrastructure and pose challenges for maintenance and construction. Higher temperatures can put stress on bridge infrastructure through thermal expansion of bridge joints and paved surfaces, and deterioration of steel, asphalt, protective cladding, coats, and sealants. When the roadway surface expands at a crack or joint, heat can cause the pavement to buckle and warp, sometimes requiring closure for urgent repairs. Extreme heat can accelerate the deterioration or threaten the integrity of some types of asphalt pavement through the softening, rutting, and migration of liquid asphalt.

Extreme heat is also related to wildfire risk. High temperatures contribute to drying out of vegetation, which may burn more rapidly once ignited. These conditions are exacerbated if they occur during times of drought.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Snowstorms also slow the local economy, but there is a debate about whether these slowdowns cause permanent revenue losses. Productivity and sales may decline but often accelerate after a storm. Some permanent effects may occur if some areas in the region are accessible, and others are not. For example, visitors traveling to the Lake Tahoe Basin may choose to cancel their trips if roads through the mountains are impassable. For workers, snow can be a hardship, especially for those who lack benefits and vacation time. For local governments, responding to snowstorms can be a major unbudgeted expense. Some have even had to issue emergency bonds to cover snowstorm recovery costs.

Cascading impacts of extreme weather (winter storms and windstorms) include the following:

- Human health risks (e.g., hypothermia, heat-related illnesses, or respiratory illness in the case of dust storms)
- Vehicular accidents
- Fires caused by damaged power lines
- Fuel loading for fires
- Landslides from downed trees
- Utility failures
- Property/structural damage
- Economic losses

Figure 88 shows the NRI rating Expected Annual Loss from Winter Weather for Washoe County at $45K, with a rating of relatively low expected annual losses, and a risk score of 49.0.

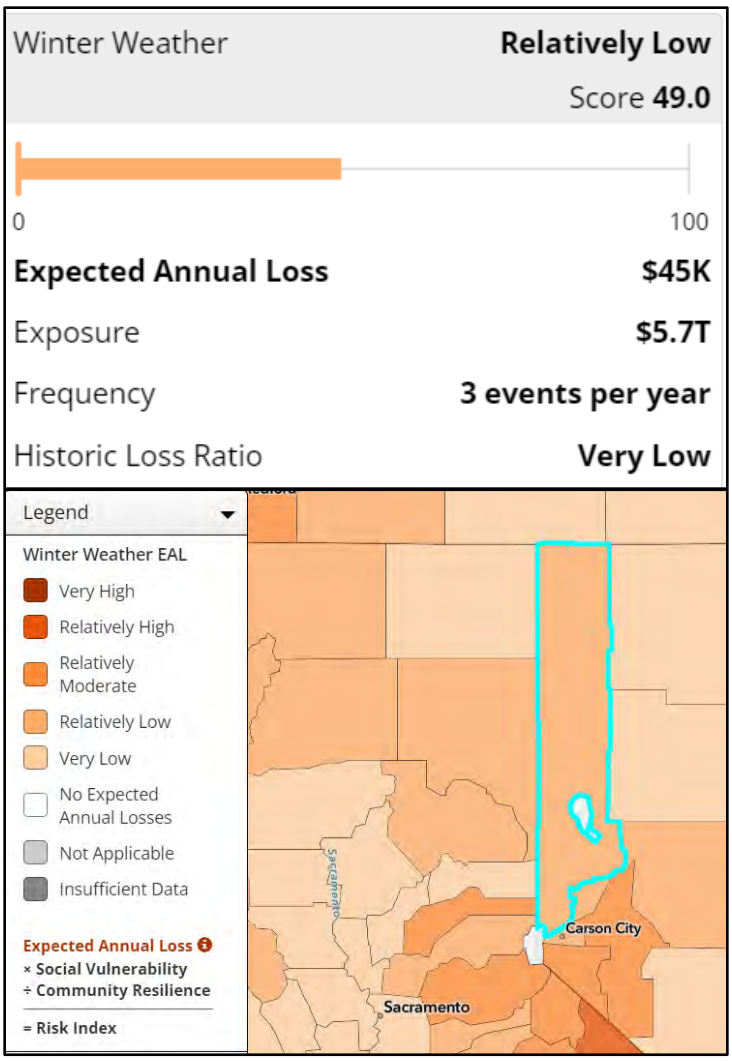

Figure 88: Washoe County Winter Weather Expected Annual Loss Score, Map, and Legend[156]

Figure 89 shows NRI Expected Annual Loss from Windstorm for Washoe County at $67K from drought, with a rating of relatively low expected annual losses, and a risk score of 18.3.

[156] FEMA, National Risk Index, "Washoe County Winter Storm Expected Annual Loss Score, Map, and Legend." https://hazards.fema.gov/nri/map

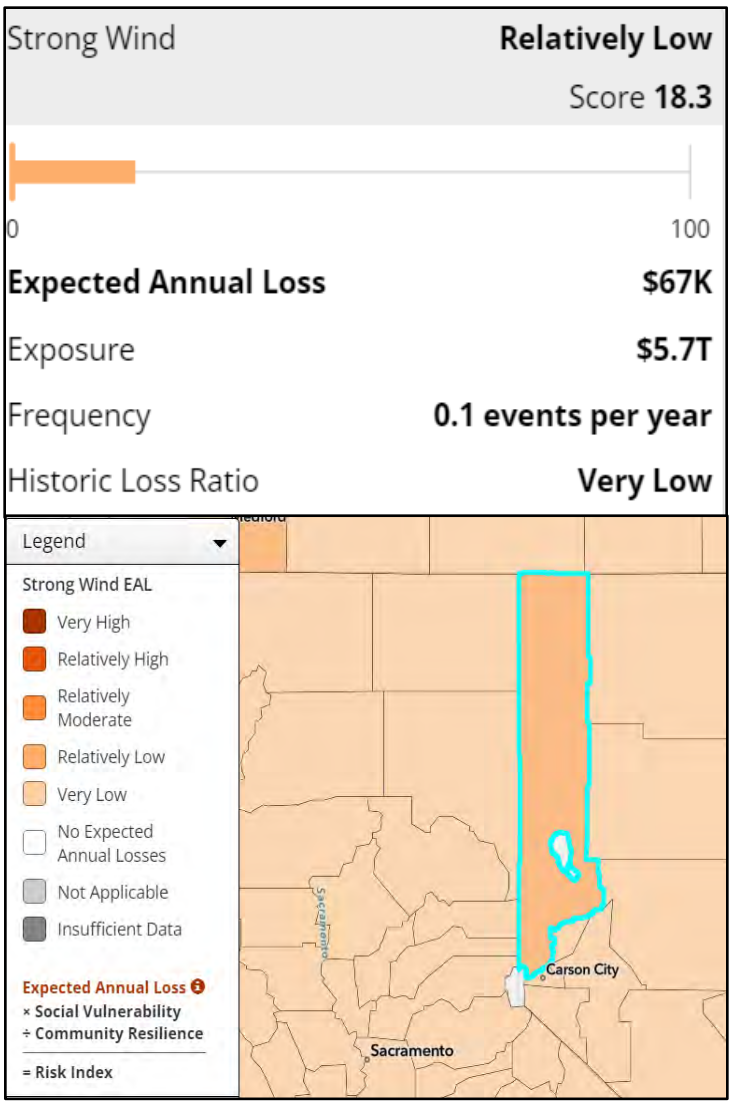

Figure 89: Washoe County Windstorm Expected Annual Loss Score, Map, and Legend[157]

Figure 90 shows NRI Expected Annual Loss from Heatwaves for Washoe County at $133K, with a rating of very low expected annual losses, and a risk score of 62.0.

[157] FEMA, "National Risk Index Washoe County Heat Wave Score, Map, and Legend." https://hazards.fema.gov/nri/map

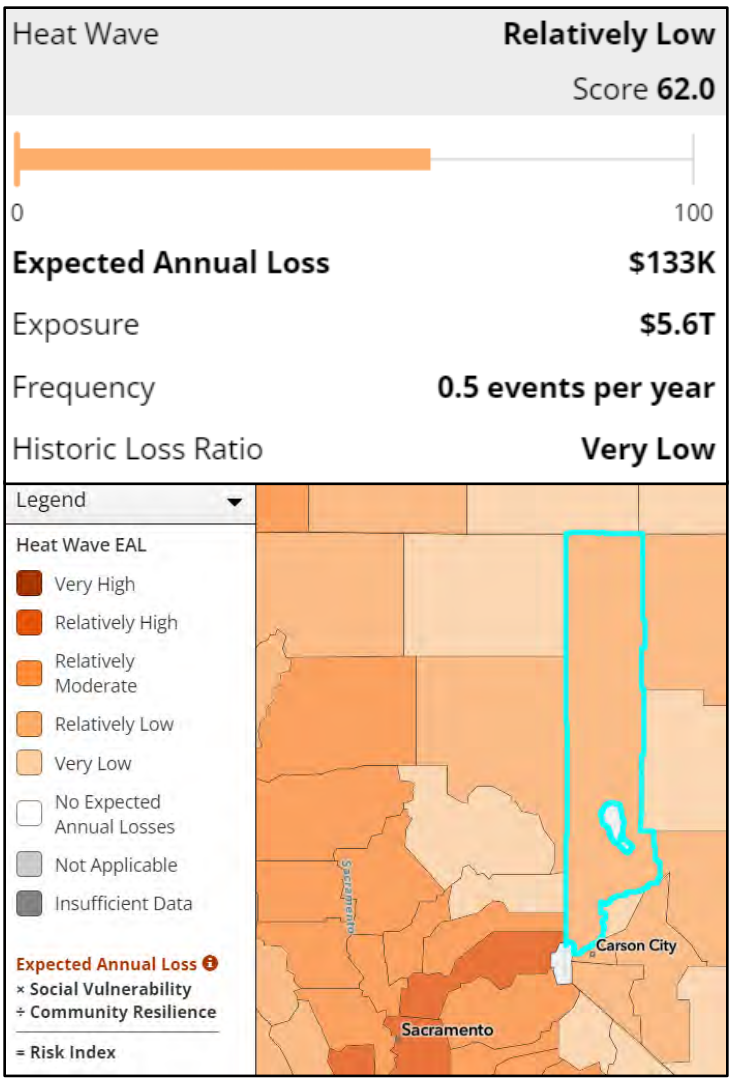

Figure 90: Washoe County Windstorm Expected Annual Loss Score, Map, and Legend[158]

VULNERABLE POPULATIONS

In Washoe County, certain populations are particularly vulnerable to the impacts of winter storms, windstorms, and extreme heat. One of the most affected groups is the elderly. Older adults often face challenges related to mobility and health, making it difficult for them to adequately prepare for or respond to severe weather conditions. Their increased susceptibility to cold and heat can put them at greater risk during extreme events.

Children also represent a vulnerable population during such weather occurrences. Young kids may require supervision and assistance, especially in harsh winter conditions or during

[158] FEMA, "National Risk Index Washoe County Heat Wave Score, Map, and Legend." https://hazards.fema.gov/nri/map

heatwaves. This group relies on caregivers to ensure their safety, which can be especially challenging during times of inclement weather.

Low-income families are another critical demographic at risk. Economic constraints often limit their access to proper shelter, heating, and cooling resources, making them more susceptible to the adverse effects of extreme temperatures. This vulnerability can be dangerous during winter storms or heatwaves, where access to safe and insulated housing is crucial.

Additionally, the homeless population faces significant challenges during severe weather events. Without stable housing, individuals experiencing homelessness are left without adequate protection from the elements, putting them at heightened risk for health issues during extreme weather.

Individuals with disabilities are also disproportionately affected. Those with physical or cognitive impairments may experience difficulties evacuating or accessing necessary resources during storms. This can exacerbate their vulnerability when timely action is needed.

Medical patients who rely on electrically powered devices, such as oxygen concentrators, may face life-threatening situations during winter storms or extreme heat, especially if power outages occur.

Outdoor workers, including construction and agricultural laborers, are particularly affected by extreme heat or wind. Their exposure to harsh weather conditions without proper protection can lead to severe health risks.

Lastly, individuals with limited English proficiency may struggle to understand weather warnings or safety protocols. This language barrier can impede their ability to seek help or take necessary precautions during extreme weather events.

Development Trends

Recent Development Trends:

- **Economic:** Increased regional economic development continues to increase the potential for disruptions during and after severe weather events. (Increased Vulnerability)
- **Land Use:** The County's upward trend in development increases the overall strain on responding to winter storm impacts at various locations. (Increased Vulnerability)
- **Future Land Use:** Future development in more remote areas of the County may increase the cost of responding to snowstorms and increase the risk to residents, particularly the elderly or those with medical conditions.

EXISTING MITIGATION CASE STUDY – EXTREME HEAT

Several municipal, county, and tribal governments and community groups based in the Reno-Sparks area are teaming up to map the hottest parts of Reno, Sparks, and adjacent portions of Washoe County. The National Oceanographic and Atmospheric Administration (NOAA) is partnering with the U.S. Departments of Health and Human Services and Housing and Urban Development to map urban heat islands.[159]

The City of Reno has been awarded a $500,000 grant from the United States Department of Agriculture (USDA) and the US Forest Service as part of the federal government's effort to plant and maintain trees, combat extreme heat, and improve access to nature in cities nationwide.[160]

COMMUNITY LIFELINES

Extreme weather events are considered to be "Medium/Significant Risk" hazards. They occur frequently and can cause significant damage to structures that have not been built to meet current building codes. Because the transportation infrastructure in the state is rather robust, weather-related events generally do not have much long-lasting effect on the transportation network. Severe weather events may cause temporary closures but generally do not cause damage. The exception is severe Flooding (including closed-basin flooding), which can be caused when storms bring large amounts of rain or warm rain on top of already heavy snowpacks. These floods can cause significant damage to roads, railways, and airports.

Power infrastructure is at risk of high wind events. However, to this point, widespread prolonged outages have not been observed. Outages during high wind events have been localized to city or county levels. Because winter snow, rain, and windstorms occur each year in northern and central Nevada, most local and state jurisdictions can manage these events. Only when the storms are severe and repeated is there a possibility of these hazards causing damage and prolonged disruption.

VULNERABILITY SCORES

The National Risk Index (NRI) includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at the county and census tract levels. The following tables and figures provide overviews of each category at the county level.

Table 54: National Risk Index for Winter Weather in Washoe County

[159] Desert Research Institute, "Reno/Sparks selected to be part of Urban Heat Mapping Campaign," 2024. https://www.dri.edu/reno-sparks-selected-to-be-part-of-urban-heat-mapping-campaign/

[160] MyNews4, Alyssa Beck, September 21, 2023. https://mynews4.com/news/local/reno-named-fastest-warming-city-in-the-united-states-from-climate-center-plant-trees-airport-usda-forest-service-nature

Winter Weather	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Low	High	Low	$45K	Low

Based on the NRI, Washoe County has a rating of relatively low for the risk index and a score of 45.9 for winter weather which is lower than the national percentile.

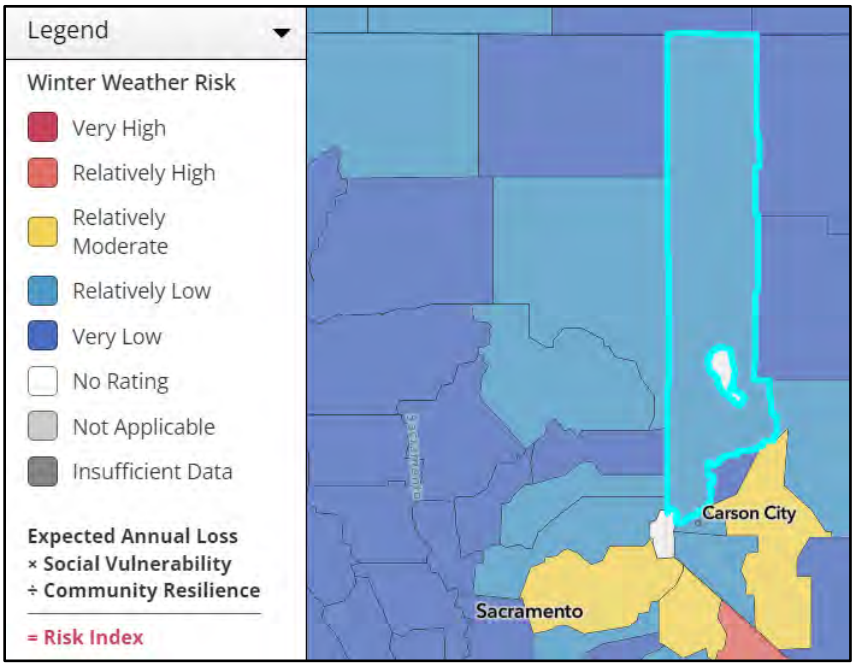

Figure 91: National Risk Index Washoe County Winter Weather Score, Map, and Legend[161]

Table 55: National Risk Index for Windstorm in Washoe County

Windstorm	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Low	High	Very Low	$67K	Low

Based on the National Risk Index (NRI), Washoe County has a rating of very low for the risk index and a score of 15.7 for strong wind which is lower than the national percentile.

[161] FEMA, "National Risk Index Washoe County Heat Wave Score, Map, and Legend." https://hazards.fema.gov/nri/map

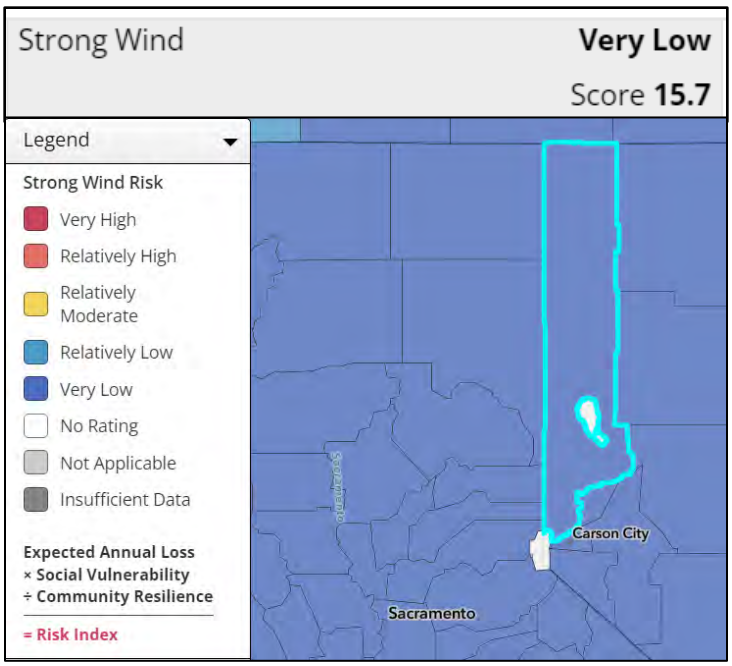

Figure 92: National Risk Index Washoe County Strong Wind Score, Map, and Legend[162]

Table 56: National Risk Index for Heat Wave in Washoe County

Heat Wave	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Low	High	Low	$133K	Low

Based on the National Risk Index (NRI), Washoe County has a rating of relatively low for the risk index and a score of 60.3 for heat wave which is lower than the national percentile.

[162] FEMA, "National Risk Index Washoe County Heat Wave Score, Map, and Legend." https://hazards.fema.gov/nri/map

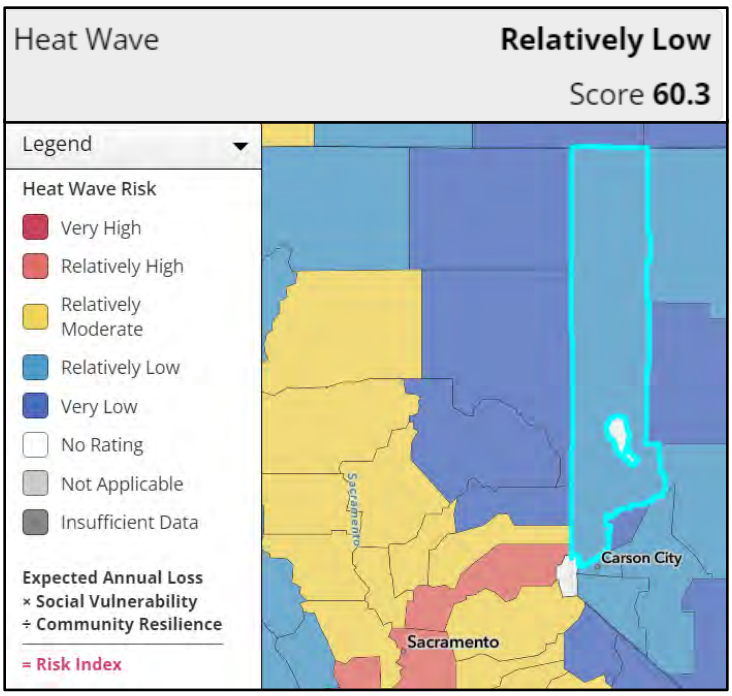

Figure 93: National Risk Index Washoe County Heat Wave Score, Map, and Legend[163]

CONSEQUENCE ANALYSIS

Extreme weather can pose a risk for the County of Washoe. Whether a Winter Storm or a Windstorm, the impacts can be mild to severe.

The information below provides the Consequence Analysis of the Potential for Detrimental Impacts of Extreme Weather (Winter Storm, Windstorm, and Extreme Heat), which was done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 57: EMAP Consequence Analysis for Extreme Weather (Winter Storm, Windstorm, and Extreme Heat) in Washoe County

Subject	Ranking	Impacts/Extreme weather (Winter Storm, Windstorm, and Extreme Heat)
Public	Minimal to Severe	Extreme weather can affect the public and, depending on the magnitude of the storms, can be devastating. Historical data suggests that extreme weather have the potential to cause injuries and even death. Heavy snow accumulations, ice storms, and heavy windstorms like Derechos can impact all transportation routes, communications, energy sources, and more. The risk for carbon monoxide poisoning, electric shock,

[163] FEMA, "National Risk Index Washoe County Heat Wave Score, Map, and Legend," https://hazards.fema.gov/nri/map

Subject	Ranking	Impacts/Extreme weather (Winter Storm, Windstorm, and Extreme Heat)
		fires, and contaminated water can all affect the safety and health of the public. Extreme heat can have a catastrophic impact on the public, especially those that are disadvantaged or underserved and do not have access to cooling shelters.
Responders	Moderate	Responding personnel are normally trained for extreme weather, cautious, and dress appropriately. However, physical hazards such as debris-covered areas, streets, and roadways can cause incidents. Responders can be shocked by downed power lines. With an extreme weather, transportation routes can be greatly reduced, making it more difficult to reach victims. Extreme temperatures can also cause stress to responders unless given ample breaks, ways to cool off, and plenty of hydration.
Continuity of Operations	Moderate to Severe	Critical infrastructure, essential functions, and other areas necessary for the county to function could be compromised. Public services can be greatly impacted, and cascading events such as power outages, gas leaks, and water shortages can put added stress on the county. Infrastructure, service delivery, and access to medical care can all be impacted. Extreme heat can add pressure to services for the public, especially when overwhelmed.
Property, Facilities, and Infrastructure	High	Transportation routes can become impassable due to debris, heavy precipitation, etc. Windstorms can blow down utility poles, creating power outages. Building roofs can collapse from heavy snowfall and ice.
Environment	Moderate to Severe	Plant life can be affected by extreme weather; however, nature is resilient. High winds can bring down trees and affect wooded areas. Wildlife is also resilient and will recover from extreme weather and windstorms, even if through a culling impact. Extreme temperatures can affect the environment, especially if accompanied by a drought.
Economic Condition	Moderate	The economy could suffer due to the impacts of an extreme weather or windstorm. Impassable roadways, power outages, etc., can all cut off the public's access to businesses, resulting in a loss of revenue. The tourist industry could take a hit if the storms are damaging enough. Extreme heat could potentially keep the public at home or in cooling shelters, affecting the revenue to businesses and tax base for the county.

Subject	Ranking	Impacts/Extreme weather (Winter Storm, Windstorm, and Extreme Heat)
Public Confidence in Governance	High	Public Confidence can shift to the negative if they do not feel that the government is responding as quickly as it should in the response and recovery arena.

COMMUNITY INPUT

EXTREME WEATHER – WINTER STORM

The public indicated that extreme weather is a hazard they are concerned about impacting the planning area. One member stated the need for tree trimming and removal in high-wind-vulnerable areas near power lines. Another noted that buildings need to be up to standard for roofs to sustain windstorms or snow loads. Further, one member expressed concern that the city does not respond adequately to storm events. Several members expressed concern about the elderly population without proper heating and cooling during extreme weather events.

The public indicated they would support modernizing building codes to be standard with hazard events related to the area. Many comments promoted preparedness during an emergency. Another member noted developing more self-sustaining food projects in case of prolonged emergencies.

EXTREME WEATHER – WINDSTORM

The public expressed significant concern about the impact of severe weather and windstorms on their community. One member highlighted that their entire neighborhood is subject to extreme winds and snowstorms, and that the nearby foothills and wilderness are vulnerable to wildfires. This statement underscores the clear and present danger posed by these hazards.

Another member noted the interconnectedness of various hazards, stating that storms (wind and winter) go hand in hand with Flooding (including closed-basin flooding), avalanches, landslides, energy outages, and wildfires. This comprehensive view of the hazards underscores the complexity of the challenges faced by the community. The need for effective planning was also highlighted, with one member noting the impact of severe weather on transportation and the importance of planned local road closures for winter storms.

EXTREME WEATHER – EXTREME HEAT

The public also expressed concern about the impact of severe heat on their community. One member provided a detailed account of the potential impacts of severe heat and related hazards, noting that woodland fires can cause loss of life to people and animals, destroy property, and alter the landscape for a long time. They also highlighted that drought could affect well levels and the ability to remain in homes/on property, as well as affecting property

value. Another member provided a personal perspective on the potential impacts of severe heat and related hazards, emphasizing the importance of being prepared, especially for those who are caregivers. They noted that their immediate neighborhood includes many essential services within walking distance, and that any disruption to these services would pose a great hardship. Finally, one member emphasized the wide-ranging impacts of severe heat and related events on the community, noting that the Reno area is most prone to seasonal events like snowstorms, Flooding (including closed-basin flooding), and increasing heat.

The public indicated they would support modernizing building codes to be standard with hazard events related to the area. Many comments promoted preparedness during an emergency. Another member noted developing more self-sustaining food projects in case of prolonged emergencies.

Flood

Hazard Description

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. They can cause substantial damage to structures, landscapes, and utilities and jeopardize life safety. Specific health hazards also are expected in Flooding (including closed-basin flooding) events. Standing water and wet materials in structures can become breeding grounds for microorganisms, such as bacteria, mold, and viruses. When Flooding (including closed-basin flooding) occurs in populated areas, warnings and evacuation can reduce impacts to life and safety.

Dam failure occurs when a dam, a barrier built across a river or stream to hold back water, breaks or collapses, leading to the uncontrolled release of water. This can happen for various reasons, such as heavy rainfall, inadequate maintenance, and structural failure.

The effects of dam failure on communities can be devastating. The sudden release of a large volume of water can lead to flash floods, causing widespread destruction of property, infrastructure, and agriculture. It can also cause loss of life and the displacement of communities. The environmental impact can be severe, as the sudden surge of water can lead to soil erosion, habitat destruction, and contamination of water bodies. Rebuilding and recovery efforts can take years, and the social and economic impacts can be long-lasting.

Flash Flooding (including closed-basin flooding) is associated with floods of significant volume and short duration. Flash floods often fall short of a 100- or 500-year Flooding (including closed-basin flooding) event and generally create impacts associated with stormwater runoff. In contrast to riverine Flooding (including closed-basin flooding), this type usually results from heavy rainfall on a relatively small drainage area and usually occurs in the spring and summer from thunderstorms. It is important to note that even in drought, scattered summer thunderstorms can bring excessive rainfall and flash Flooding (including closed-basin flooding), particularly near wildland fire burn scars that enhance water runoff. Flash floods produce debris flows and significant water runoff laden with burn debris and mud. Urbanization increases runoff by two to six times compared with undeveloped terrain because of the relative impermeability of surfaces in urban areas.

Closed-basin Flooding (including closed-basin flooding) occurs when a lake has no outlet or a relatively small outlet that limits the lake's ability to drain during storm events. Floodwater in closed-basin lakes accumulates over long periods and these lakes are susceptible to dramatic fluctuations in water levels that may remain for weeks, months, or years.

Riverine Flooding (including closed-basin flooding) – Flooding (including closed-basin flooding) that occurs along a channel (where a "channel" is defined as a feature on the ground that carries water through and out of a watershed, whether natural channels, such as rivers and

streams, or human-made channels, such as drainage ditches). Riverine Flooding (including closed-basin flooding) occurs when excessive rainfall or snowmelt over an extended period causes a river to exceed its capacity.

Overbank Flooding (including closed-basin flooding) occurs when excess water overflows the channel banks. Overbank Flooding (including closed-basin flooding) occurs when downstream channels receive more rain or snowmelt from their watersheds than normal.

Urban drainage Flooding (including closed-basin flooding) occurs when the capacity of an urban drainage system is exceeded. An urban drainage system comprises ditches, storm sewers, retention ponds, and other facilities constructed to store runoff or carry it to a receiving stream, lake, or ocean. Urban drainage Flooding (including closed-basin flooding) can also occur in areas protected by levees, as water collects on the protected side of the levee when pump capacities are exceeded during extreme weather. Storm water is a natural part of the Washoe County landscape, but too much creates public hazards and causes damage to both private and public property. Heavy snow melts and ice jams can contribute to storm water drainage problems.

The National Weather Service (NWS) publishes public alert statements, watches, warnings, and advisories. Table 58 provides descriptions of these categories.

Table 58: Watches, Warnings, and Advisories Issued by the National Weather Service

Category	Action	Interpretation
Flash Flood Warning	Take Action	A Flash Flood Warning is issued when a flash flood is imminent or occurring. Flash flood warning tags include base, considerable, and catastrophic.
Flood Warning	Take Action	A Flood Warning is issued when a hazardous weather event is imminent or already happening. A Flood Warning is issued when Flooding (including closed-basin flooding) is imminent or occurring.
Flood Advisory	Be Aware	A Flood Advisory is issued when specific weather forecasts indicate that Flooding (including closed-basin flooding) may become a nuisance. Although Flooding (including closed-basin flooding) is not expected to be bad enough to issue a warning, it may cause significant inconvenience, and if caution is not exercised, it could lead to situations that threaten life and/or property.
Flood Watch	Be Prepared	A Flood Watch is issued when conditions are favorable for a specific hazardous weather event to occur. A Flood Watch is issued when conditions are favorable for Flooding (including closed-basin flooding). This does not mean Flooding (including closed-basin flooding) will occur, but it is possible.

The National Weather Service (NWS) categorizes the extent (magnitude or severity) of riverine and flash Flooding (including closed-basin flooding) in which a river has reached the flood stage as minor, moderate, and major. The categories are based on property damage and threat to the public and are as follows:

- **Minor Flooding (including closed-basin flooding)** – Minimal or no property damage but possibly some public threat or inconvenience.
- **Moderate Flooding (including closed-basin flooding)**– Some inundation of structures and roads near streams; some evacuations of people and/or transfer of property to higher elevations.
- **Major Flooding (including closed-basin flooding)**– Extensive inundation of structures and roads; significant evacuations of people and/or transfer of property to higher elevations.

100-year and 500-year floods have a 1 in 100 chance or 1 in 500 chance (i.e., 0.1% or 0.2% chance) of being exceeded in a year. Major Flooding (including closed-basin flooding) at this scale occurs in Washoe County because of two types of storm events: 1) heavy, prolonged rainfall on top of a deep snowpack in the Sierra Nevada, and 2) heavy, prolonged rainfall that spills over into the normally rain-shadowed Reno–Sparks area. A hybrid of both scenarios can lead to these levels of Flooding (including closed-basin flooding). Floods of this magnitude occur in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. Truckee River Flooding has been of primary concern to the Reno–Sparks metropolitan area. Intense storms can overwhelm local waterways and the integrity of Flooding (including closed-basin flooding) control structures.

Location

The geographic location of Flooding (including closed-basin flooding) is concentrated in the floodway and floodplain of the Truckee River and its tributaries, including Steamboat Creek and Dry Creek in eastern Reno and southern Sparks. The Truckee River headwaters comprise the Lake Tahoe Basin. The river drains part of the high Sierra Nevada and empties into Pyramid Lake, the sole outlet of Lake Tahoe.

Flash Flooding (including closed-basin flooding) is usually associated with development, urbanization, and inadequate storm drainage systems. Most of Washoe County's population and urbanization sits in the County's southern portion, Reno, and Sparks, along the I-80 and US Highway 395 corridors. The results of the concentrated development were heavily felt during the 2005 flash Flooding (including closed-basin flooding) events.

Areas affected by alluvial fan Flooding (including closed-basin flooding) and flash Flooding include Hidden Valley, Jumbo Grade, Stormy Canyon, Virginia Foothills, Whites Creek, Galena Creek, and Sun Valley. Some of the most valuable properties in southern Washoe County are in

the potential path of alluvial fan Flooding (including closed-basin flooding), and structures have been built to protect them.

The primary closed-basin Flooding (including closed-basin flooding) hazards are associated with three playas located north and west of the downtown Reno area: White Lake, Silver Lake, and Swan Lake (also called Lemmon Lake), collectively called the North Valleys. White Lake is in the western portion of the valley, north of US Highway 395 near the Nevada–California border.

Silver Lake is in the central part of the valley, northwest of the Sierra Sage Golf Course. Swan Lake is in the eastern portion of the valley, east of Reno-Stead Airport. Closed-basin Flooding (including closed-basin flooding) is also a potential emerging hazard in Boneyard Flats.

Pyramid Lake is also a large, closed basin located northeast of Reno. However, Flooding (including closed-basin flooding) impacts around the lake have been caused by riverine floods and not rising lake levels.

A total of 156 dams are located in Washoe County, including 50 High-Hazard and 25 Significant-Hazard dams (see Figure 94). Washoe County owns and is responsible for five dams that are Significant or High Hazard. Inundation boundaries showing potential Flooding (including closed-basin flooding) downstream of these dams are not currently available to the public.

High hazard potential (HHP) dams in Washoe County present significant risks due to their potential failure which could lead to substantial loss of life, property, and environmental degradation. Dam failures can result from various factors, including structural deficiencies, inadequate maintenance, seismic activity, extreme weather events, and operational errors. The consequences of such failures are profound, encompassing rapid flooding, destruction of infrastructure, loss of life, and long-term economic and environmental impacts. In Washoe County, the presence of multiple dams necessitates a comprehensive evaluation of each structure's condition, maintenance practices, and emergency preparedness measures.

Communities situated downstream of HHP dams are particularly vulnerable to the effects of dam failures. In Washoe County, urban centers such as Reno and Sparks, as well as smaller communities along river corridors, are at risk. Major population centers are built along rivers with histories of flooding notably the Truckee River. This proximity underscores the necessity for targeted mitigation strategies to protect these communities. Currently, inundation zones are not made publicly available or are not available. Washoe County will continue to work with dam owners to develop inundation zones for all high hazard dams.

The following figures and tables outline the dams, specifically HHPD’s, located within the county.

Table 59: High Hazard Potential Dams Located in Washoe County.

Location	NID	State Regulated	Federal Regulated	Purpose	Hazard Potential	EAP Prepared	Owner	Capacity (Acre Ft)	Inspection Date
Damonte Ranch Dam Detention Pond #4	NV10595	Yes	No	Flood Risk Reduction	High	Yes	Private	68.4	4/16/2020
Damonte Ranch Flood Control Diversion Dam	NV10592	Yes	No	Flood Risk Reduction	High	Yes	Private	15	4/16/2020
Damonte Ranch Flood Detention Basin Dam	NV10593	Yes	No	Flood Risk Reduction	High	Yes	Private	365	4/16/2020
Damonte Ranch Wetlands Detention Basin Dam	NV10594	Yes	No	Flood Risk Reduction	High	Yes	Private	304	4/16/2020
D'Andrea Detention Basin #1 Dam	NV10818	Yes	No	Flood Risk Reduction	High	Yes	Private	71	1/24/2019
D'Andrea Detention Basin #3 Dam	NV10819	Yes	No	Flood Risk Reduction	High	Yes	Private	79	1/24/2019
D'Andrea Ranch Hole #6 Pond Dam	NV10541	Yes	No	Flood Risk Reduction	High	Yes	Private	67	1/23/2019
Dant Blvd Detention Dam	NV10367	Yes	No	Flood Risk Reduction	High	Yes	Local Government	80	6/1/2018
East Logan Ridge Trail Dam	NV10587	Yes	No	Flood Risk Reduction	High	Yes	Local Government	51	6/1/2018
East Wash Diversion Dam	NV00079	Yes	No	Flood Risk Reduction	High	Yes	Local Government	91.2	6/1/2018
Herman Dam	NV10371	Yes	No	Recreation	High	Yes	Local Government	16	10/25/2018
Highland Reservoir Dam	NV00067	Yes	No	Other	High	Yes	Public Utility	61.4	6/26/2020
Home Ranch Canyon Dam	NV10480	Yes	No	Irrigation	High	Yes	Private	100	3/19/2019

Location	NID	State Regulated	Federal Regulated	Purpose	Hazard Potential	EAP Prepared	Owner	Capacity (Acre Ft)	Inspection Date
Huffaker Effluent Storage Reservoir Dam	NV10384	Yes	No	Other	High	Yes	Local Government	4192.2	10/25/2018
Hunter Creek Reservoir Dam	NV00201	Yes	No	Other	High	Yes	Public Utility	93.4	6/26/2020
Marlette Lake Dam	NV00069	Yes	No	Water Supply	High	Yes	State	12700	10/12/2017
Mill Creek Dam No 2	NV00076	Yes	No	Flood Risk Reduction	High	Yes	Local Government	65	8/24/2021
Mill Creek No 1 Dam	NV10376	Yes	No	Flood Risk Reduction	High	Yes	Local Government	2.4	8/24/2021
North Spanish Springs Flood Detention Facility Dam	NV10654	Yes	No	Flood Risk Reduction	High	Yes	Local Government	412	10/25/2018
North Spanish Springs Flood Sediment Basin Dam	NV10653	Yes	No	Debris Control	High	Yes	Local Government	114	10/25/2018
North Virginia Detention Dam	NV10377	Yes	No	Flood Risk Reduction	High	Yes	Local Government	61	6/1/2018
Northgate Golf Course Dam	NV00232	Yes	No	Recreation	High	Yes	Local Government	24	6/1/2018
Pagni Dam	NV10442	Yes	No	Irrigation	High	Yes	Private	20	3/30/2018
Peavine Creek Lower Dam	NV00081	Yes	No	Flood Risk Reduction	High	Yes	Local Government	190	6/1/2018
Peavine Creek Upper Dam	NV00080	Yes	No	Flood Risk Reduction	High	Yes	Local Government	380	6/1/2018
Sierra Sage Ponds	NV10551	Yes	No	Recreation	High	Yes	Local Government	24	4/1/2019
Spanish Springs Stormwater Detention Facility Dam	NV00245	Yes	No	Flood Risk Reduction	High	Yes	Local Government	1285	6/26/2019

Location	NID	State Regulated	Federal Regulated	Purpose	Hazard Potential	EAP Prepared	Owner	Capacity (Acre Ft)	Inspection Date
Sun Valley Detention Dam	NV00238	Yes	No	Flood Risk Reduction	High	Yes	Local Government	290	4/1/2020
Verdi Meadows Wastewater Disposal Dam	NV10632	Yes	No	Other	High	Yes	Public Utility	42	8/28/2019
Virginia Lake Dam	NV10596	Yes	No	Irrigation	High	Yes	Local Government	25	6/1/2018
Washoe Lake Dam	NV10472	Yes	No	Irrigation	High	Yes	Private	400	3/1/2005
West Logan Ridge Trail Dam	NV10586	Yes	No	Flood Risk Reduction	High	Yes	Local Government	6.61	6/1/2018
West Wash Dam	NV00078	Yes	No	Flood Risk Reduction	High	Yes	Local Government	293	6/1/2018
Wheeler Reservoir Dam	NV00072	Yes	No	Recreation	High	Yes	Private	390	12/1/2017
Wilcox Canyon #1 Dam	NV10481	Yes	No	Irrigation	High	Yes	Private	350	1/1/2014

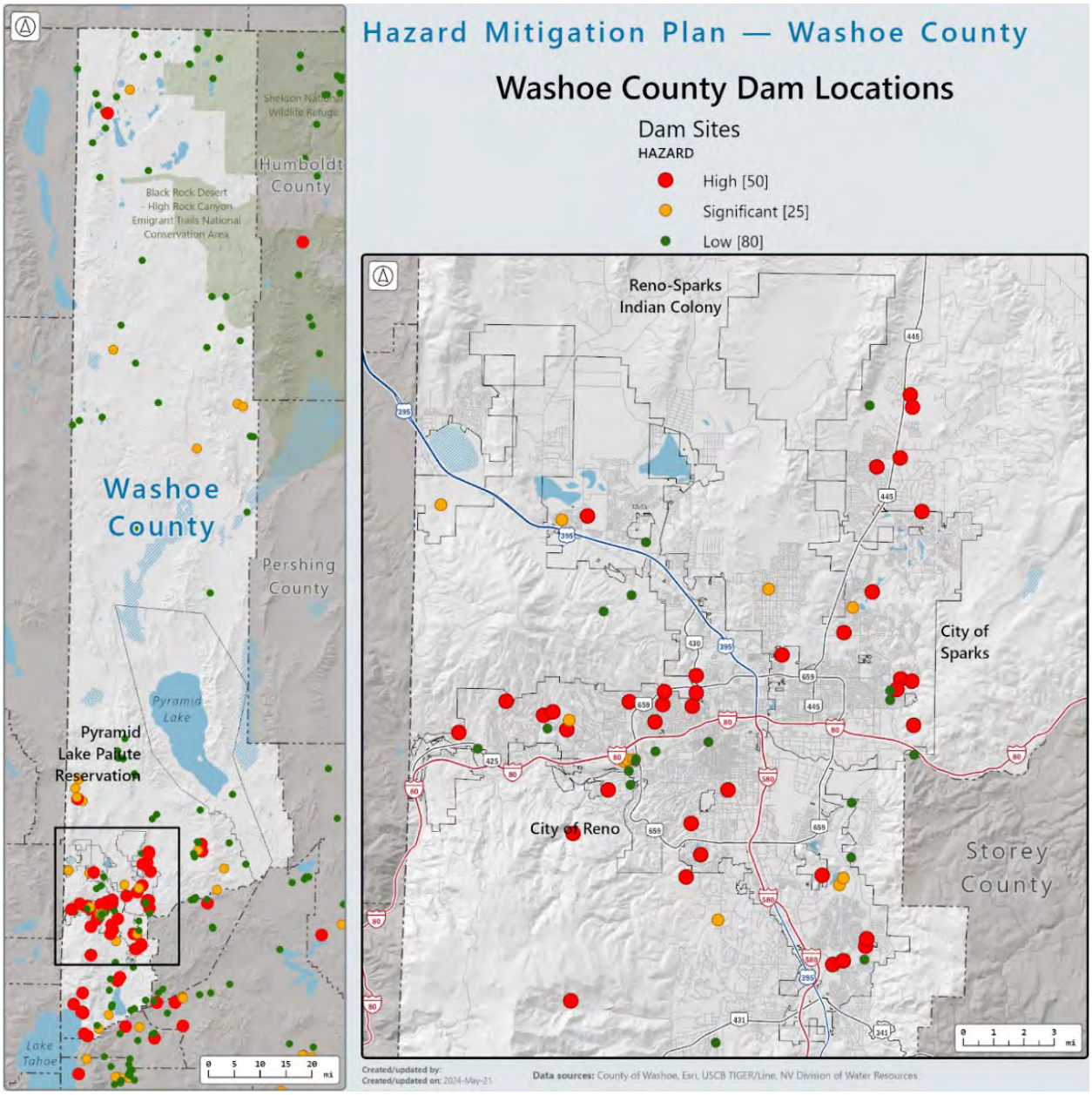

Figure 94: Dam Locations in Washoe County

Extent

The magnitude and potential severity of impacts of Flooding (including closed-basin flooding) is considered High in Washoe County. Severe floods may cause serious injuries and deaths and damage public facilities and private property. The river's height can determine the extent of Flooding (including closed-basin flooding) flows compared with Flooding (including closed-basin flooding) stages determined by USGS (United States Geological Survey) stream gauges throughout the area. It can also be measured by comparing water elevations to past Flooding (including closed-basin flooding) damage. Major floods may disrupt services for weeks, and

response requires state and, potentially, federal support. In closed basins, Flooding (including closed-basin flooding) conditions may be present over an extended period, ranging from months to years, because of the lack of natural drainage.

Areas of the County with poor drainage may experience limited, localized Flooding (including closed-basin flooding) annually. Major floods on the Truckee River have occurred approximately once a decade. Since 1986, closed basins in the North Valleys have flooded roughly once a decade. The highest lake elevations were measured following winter storms in March 2017.[164]

Figure 95 is a schematic of 100-year floodplain and its Special Flood Hazard Area (SFHA). It is the land area covered by the floodwaters of the base flood (red line in the figure), extending to the end of the floodway fringe.[165] A base flood has, on average, a 1% chance of occurring in a given year.[166] The SFHA requires NFIP floodplain management enforcement, and mandatory flood insurance applies for federally backed mortgages.

100-year and 500-year floods have a 1-in-100 chance or a 1-in-500 chance (i.e., 0.1% or 0.2% chance) of being exceeded in a year. Major Flooding (including closed-basin flooding) at this scale occurs in Washoe County because of two types of storm events: 1) heavy, prolonged rainfall on top of a deep snowpack in the Sierra Nevada, and 2) heavy, prolonged rainfall that spills over into the normally rain-shadowed Reno–Sparks area. A hybrid of both scenarios can lead to these levels of Flooding (including closed-basin flooding). Floods of this magnitude occur in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. Truckee River Flooding (including closed-basin flooding) has been of primary concern to the Reno–Sparks metropolitan area. Intense storms can overwhelm local waterways and the integrity of Flooding (including closed-basin flooding) control structures.

[164] Truckee Meadow Water Authority Water Resource Plan. https://tmwa.com/wrp2020/
[165] Nebraska Department of Natural Resources, Microsoft Word - 2001 Newsletter-DRAFT5a.doc
[166] Douglas County Nevada, "Flood Protection Information." https://www.douglascountynv.gov/government/departments/community_development/stormwater_and_flood_management/flood_protection_information#:~:text=The%201%25%20annual%20chance%20flood,)%2C%20AH%2C%20and%20AE

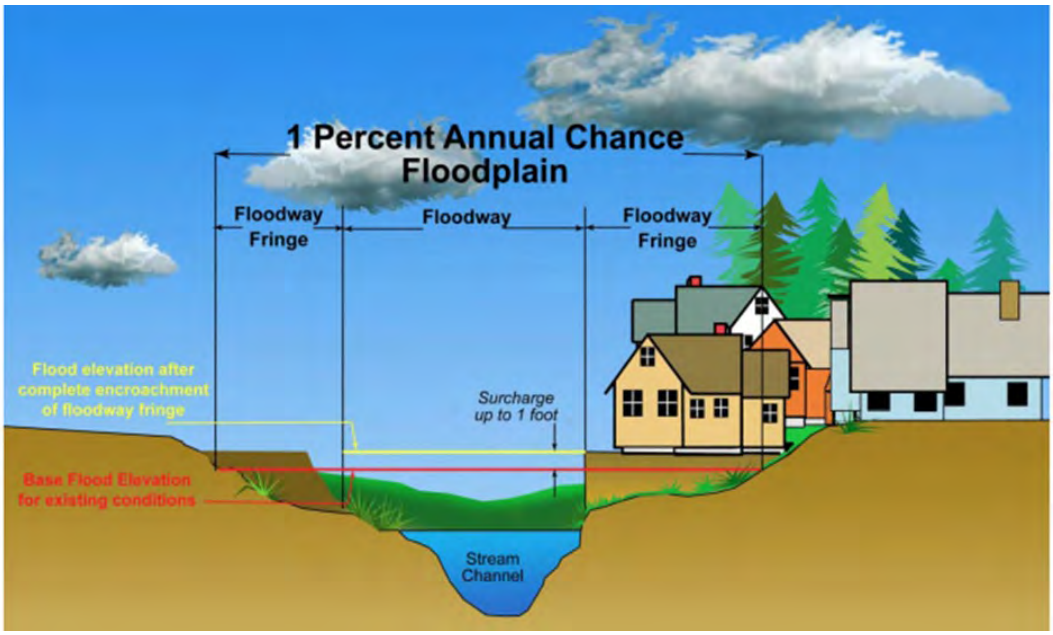

Figure 95: Schematic of 100-year Floodplain.

A map series of potential flood extents is available from the Truckee River Flood Management Authority.[167] This was developed using a two-dimensional HEC-RAS hydraulic model of the Truckee River and its major tributaries with flow rate data from USGS stream gauges. Inundation boundaries were developed for various flow rates to model flood depths for 10-, 20-, 50-, 75-, 100-, 117-, 150-, 200-, and 500-year return periods. Figure 96 shows the 100-year scenario.

[167] Truckee River Flood Map Series. https://trfma.org/resources/flood-map-series/

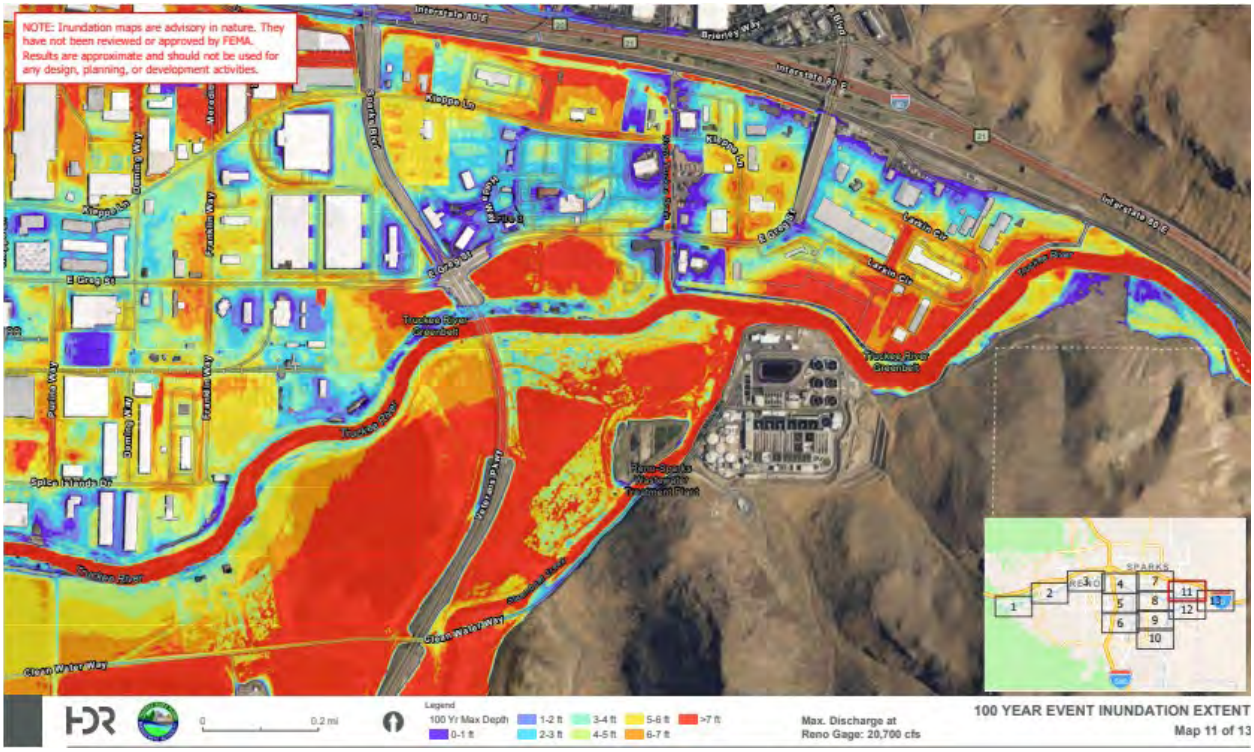

Figure 96: Map of the TRFMA 100-Year Flood Scenario

Previous Occurrence/History

Between 2018 and 2024, NOAA's NCEI Storm Events Database recorded 15 Flooding (including closed-basin flooding) episodes in Washoe County, which includes the Greater Lake Tahoe Area, Greater Reno-Carson City-Minden Area, Western Nevada Basin, and Range including Pyramid Lake, and Northern Washoe County. These Flooding (including closed-basin flooding) episodes included flash floods, debris flows, and lakeshore Flooding (including closed-basin flooding).

It is important to note that there were no recorded deaths, injuries, property damage, or crop damage during these events, so such details have been omitted from Table 60.

Table 60: Flooding (including closed-basin flooding) Events, Washoe County, 2018–2024[168]

Location	Date	Type
Steamboat	05/21/2023	Debris Flow
Steamboat	03/09/2023	Flood
Steamboat	03/09/2023	Flood

[168] National Centers for Environmental Information, "Storm Events Database." https://www.ncdc.noaa.gov/stormevents/

Location	Date	Type
Huffaker Hills	08/05/2022	Flash Flood
Harold's Trapshoot SP	12/23/2021	Flood
Sparks	12/23/2021	Flood
Washoe City	07/01/2021	Flood
Sparks	06/30/2021	Flood
Sparks	06/03/2021	Flood
Reno Stead Airport	07/25/2019	Flash Flood
Washoe City	07/21/2018	Debris Flow
Vista	07/21/2018	Flash Flood
Steamboat	07/21/2018	Debris Flow
Vista	07/21/2018	Debris Flow
Black Springs	03/22/2018	Flood

In addition, two flood declarations have been declared for Washoe County since 1965. They are shown in Table 61.

Table 61: FEMA Flood Declarations[169]

Date	Disaster Number
02/28/1986	759
01/18/1965	187

Numerous major Flooding (including closed-basin flooding) events have impacted the County. The most significant events include the following:

- **Closed Hydrobasin Flood**- 2023- A continuation of high-water levels in the East Lemmon Valley Hydrobasin (Swan Lake) because of record setting precipitation events in 2023 required additional flood barrier construction and flood water pumping operations to protect area residents and public infrastructure.

- **Timberline Drive Flash Flood-** 2023- Flash flood along Whites Creek along Timberline Drive resulted in overtopping and out-of-bank flows that damaged Washoe County roadway and roadside ditches and subsequently damaged private property before reentering the creek environment.

[169] FEMA, "Disaster Declarations for States and Counties." https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

- **Steamboat Irrigation Ditch Overtopping**– March 9–10, 2023- Winter precipitation in the Verdi, Nevada area resulted in the formation of ice dams along the Steamboat Irrigation canal and when later precipitation (rain on snow event) resulted in overtopping of flood flows that resulted in flood to private properties and Washoe County roadways. Additional Areas where the ditch was overwhelmed causing flood damage to private properties including Towne Drive, Mick Circle, Kivett Lane, Oddie Ct., Fairview Road, and South Hills Drive. No reported damage to residential structures but water flowing across property and landscaped areas resulting in erosion damage.

- **Private property damage/WC Right-of-Way damage**-2023- Flash Flooding (including closed-basin flooding) has damaged both private property and Washoe County right-of-way on several occasions over the last 5 to 10 years. Water has entered residential garages, erosional damage to driveways and clogged driveway culverts.

- **Andrew Lane Flood Damage**- 2023-Flash Flooding (including closed-basin flooding) has impacted private property and Washoe County right-of-way with debris flows and depositions.

- **Joy Lake Road Flood Damage-** 2023-Sinkhole and erosion to both private property and Washoe County right-of-way due to failed storm drainpipes.

- **Leadville Road Flood damage- 2023**- Flash Flooding (including closed-basin flooding) damaged 3 roadway crossing associated with Washoe County right-of-way.

- **Companion Court Flood Damage-2023**- Retention Pond overflow due to flash flood resulted in private property flood and damage and a sinkhole/erosion within Washoe County right-of-way.

- **Variety of private property and Washoe County infrastructure**-December 2022 Area Flood Impacts- Primarily impacts to drainage systems (culvert pipes, swales, ditches, etc.)

- Huffaker Hills – August 5, 2022

- **Bailey Creek/Toll Road/Geiger Grade Road Flooding (including closed-basin flooding) –** 2022- Flash flood occurred along Bailey Creek, crossing Toll Road immediately south of the intersection with Geiger Grade. Flood water impacted the roadway, a private garden nursey, and flooded a Washoe County School District building before damaging landscape at a neighboring apartment complex.

- **Warrior Lane**-2021- Flash flood impact to private residence – Damage to property and water within crawlspace.

- Sparks – December 23, 2021

- Harold's Trapshoot State Park – December 23, 2021

- Washoe City – July 1, 2021
- Sparks – June 30, 2021
- Reno Stead Airport, July 25, 2019
- Main Street – July 23, 2019-Unknown damages, minor impacts to houses and commercial buildings along Main St., loss of function of EOC (Emergency Operations Center), and economic losses due to businesses closing. Flash Flooding (including closed-basin flooding) occurred along Main St. late in the evening on the 23rd. Multiple basements were flooded, and multiple community assets were inaccessible the following day, including the EOC and local grocery store. School openings were delayed.
- Closed-basin Flooding (including closed-basin flooding) in Lemmon Valley/Swan Lake – January and February 2017
- Truckee River and tributary Flooding (including closed-basin flooding)
  - December 24, 2005–January 3, 2006
  - December 16, 1996–January 6, 1997 (Flood of record (estimated at 117-yr event))February 11–20, 1986

There was considerable Flooding (including closed-basin flooding) of Swan Lake in December 2017. Figure 97 shows efforts by Washoe County to control the Flooding (including closed-basin flooding), while Figure 98 is an aerial photograph of the Flooding (including closed-basin flooding).



Figure 97: Flood Barriers Being Set Up on the Edge of Swan Lake by Washoe County[170]



Figure 98: Aerial Photograph of Swan Lake Flooding (including closed-basin flooding), March 23, 2017[171]

[170] Reno Gazette Journal, March 5, 2018, photo credit Jason Bean. https://www.rgj.com/story/news/2018/03/02/photos-flooding-issues-still-remain-lemmon-valley/390684002/

[171] Reno Gazette Journal, March 5, 2018, photo credit Tech Sgt. Emerson Marcus/Nevada National Guard. https://www.rgj.com/story/news/2018/03/05/rgj-investigates-reno-knew-lemmon-valley-would-flood-but-allowed-development-anyway/317123002/

REPETITIVE FLOOD LOSSES

The NFIP tracks Repetitive Loss (RL) properties, which are NFIP-insured properties that, since 1978 and regardless of any changes in ownership during that period, have experienced any of the following:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 in any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property

According to FEMA, there are the following RL loss properties in the planning area:

- City of Sparks – 27 RL
- City of Reno – 12 RL
- Unincorporated Washoe County – 18 RL

SEVERE REPETITIVE FLOOD LOSSES

The NFIP also tracks Severe Repetitive Loss (SRL) properties, which are NFIP-insured properties that, since 1978 and regardless of any changes in ownership during that period, have experienced any of the following:

- Four or more separate claim payments have been made under a standard flood insurance policy issued pursuant to this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or
- at least two separate claims payments have been made under a standard flood insurance policy, with the cumulative amount of such claim payments exceeding the fair market value of the insured building on the day before each loss.

According to FEMA, the following RL loss properties are in the planning area:

- City of Sparks – 0 SRL
- City of Reno – 2 SRL
- Unincorporated Washoe County – 1 SRL

Probability of Future Events

The probability of Flooding (including closed-basin flooding) in the planning area is High. Given a potential increase in high-intensity precipitation events, particularly in the winter months, and

increasing development resulting in additional impervious surface, the County may be impacted by the rise in the probability of future floods and closed-basin Flooding (including closed-basin flooding).

Table 62 provides the Calculated Priority Risk Index for Flood in Washoe County. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 62: Calculated Priority Risk Index for Flooding (including closed-basin flooding) in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Flood	3	2	2	3	4	2.8

IMPACTS OF CLIMATE TRENDS AND VARIATIONS

It is widely known that Nevada is the driest state in the nation. Nevertheless, it has experienced many catastrophic floods. Because a warmer atmosphere can carry more water, the most extreme storms are expected to become even more extreme. For example, projected near-term and long-term changes in peak annual runoff rates (the maximum daily runoff rate occurring during the average year) are projected to increase more than 25% to 50% above historical peak rates across much of the state, especially in and around many mountain ranges.[172] Flooding (including closed-basin flooding) impacts related to climate change include increased high-intensity precipitation events in the winter months, increased intensity of winter storms, and changing Flooding (including closed-basin flooding)regimes and return patterns.

Vulnerability Analysis

The magnitude and potential severity of impacts of Flooding (including closed-basin flooding) is considered High in Washoe County. Severe floods may cause serious injuries and deaths and damage public facilities and private property. The river's height can determine the extent of Flooding (including closed-basin flooding) flows compared with Flooding (including closed-basin flooding) stages determined by USGS stream gauges throughout the area. It can also be measured by comparing water elevations to past Flooding (including closed-basin flooding) damage. Major floods may disrupt services for weeks, and response requires state and, potentially, federal support. In closed basins, Flooding (including closed-basin flooding)

[172] University of Nevada, College of Agriculture Extension Program, "Climate Change Impacts in Nevada," 2024. https://extension.unr.edu/publication.aspx?PubID=3957

conditions may be present over an extended period, ranging from months to years, because of the lack of natural drainage.

ESTIMATED IMPACT AND POTENTIAL LOSSES

All types of Flooding (including closed-basin flooding) can cause widespread damage throughout rural and urban areas, including but not limited to: water-related damage to the interior and exterior of buildings; destruction of electrical and other expensive and difficult-to-replace equipment; injury and loss of life; proliferation of disease vectors; disruption of utilities, including water, sewer, electricity, communications networks and facilities; loss of agricultural crops and livestock; placement of stress on emergency response and healthcare facilities and personnel; loss of productivity; and displacement of persons from homes and places of employment. Any type of agricultural, commercial, residential, and recreational development and natural communities (e.g., wetlands, marshes) located in a floodplain (inland or coastal) are vulnerable to Flooding (including closed-basin flooding). Increased urbanization, and thus an increase in paved surfaces, enhances the threat of Flooding (including closed-basin flooding) where drainage systems cannot cope with the increased input of stormwater runoff and decrease in natural water infiltration into the soil (increasing runoff). In rural areas, property damage caused by Flooding (including closed-basin flooding) can be devastating to farmers. When Flooding (including closed-basin flooding) occurs during the growing season, farmers can suffer widespread crop loss. Livestock farmers may lose livestock if they cannot find safe ground during rising floodwaters. This threat to agricultural areas is primarily associated with riverine Flooding (including closed-basin flooding), including overbank and flash floods.

The risk index score is Very High, and the expected annual loss from riverine Flooding (including closed-basin flooding) is $64,862,161 according to the National Risk Index (NRI).

Flooding (including closed-basin flooding) can also threaten industrial, residential, and commercial properties. Industrial facilities of all types typically handle and store various quantities of hazardous materials for their operations. These materials can encounter flood waters and be released into the environment, impacting local water sources and natural resources, and threatening public health. Buildings can experience significant water-related damage, sometimes beyond repair, because of Flooding (including closed-basin flooding). Household furnishings and business inventories can be lost if there is not enough time to remove items to safe locations. In addition to being at risk because of floodwater, people face the threat of explosions and fires caused by leaking gas lines and the possibility of being electrocuted.

Wild animals, forced out of their homes and brought into contact with humans by floodwaters, can be a threat. Post-flood concerns could include mold growth on structures, creating an increased health concern. Severe Flooding (including closed-basin flooding) can cause extensive damage to public utilities and disrupt the delivery of services. Loss of power and communications can be expected. Drinking water and wastewater treatment facilities may be temporarily out of operation. The impact of Flooding (including closed-basin flooding) on

transportation is particularly noteworthy. Flooded streets and roadblocks make it difficult for emergency vehicles to respond to calls for service. Floodwater can wash out sections of roadways and bridges. Most importantly, most fatalities that occur in floods result from people trying to drive on roads covered by floodwater.

HAZUS

Hazus 6.1 was used to estimate potential impacts from 100-year and 500-year return period floods. Hazus uses a digital elevation model to generate flood depth grids and then uses these depth grids, general building stock data, and damage functions to estimate the level of damage to structures and other social and economic impacts on the region.

Hazus estimates that the region has 175,354 buildings with a total replacement value of $88 billion (excluding contents). Most of these buildings are residential and provide housing for over 191,000 households. Hazus 6.1 references Census 2020 data, which indicates that 486,492 people reside in Washoe County.

Critical facilities in the region include 41 hospitals with 1,845 beds, 50 fire stations, 17 police stations, 10 Emergency Operations Centers, and 127 schools. Local data was provided by Washoe County GIS (Geographic Information System) and was used to supplement the default Hazus data for a Level 2 analysis to ensure that the facility data was current and accurate.

Critical infrastructure in the region includes Transportation and Utility Lifelines, such as highways, railways, bus facilities, and airports. The total value of the transportation lifeline is $10.7 billion (see Table 63)

Table 63: Value of Components of the Transportation Lifeline

Highway	Railway	Bus Facility	Airport	Total
$8,284,508,000	$2,190,290,000	$3,706,000	$257,151,000	$10,735,655,000

Utility lifelines include potable water, wastewater, natural gas pipelines, oil pipelines, electric power facilities, and communications facilities, and are valued at $3.19 billion (see Table 64).

Table 64: Value of Components of the Utility Lifeline

Potable Water	Wastewater	Natural Gas	Electric Power	Communications	Total
$108,891,000	$727,546,000	$1,578,401,000	$770,818,000	$4,033,000	$3,189,689,000

100-YEAR RETURN PERIOD SCENARIO

A 100-year return period flood scenario would cause moderate damage to 4,237 buildings, and 105 would be destroyed. 100 residences are expected to have at least moderate damage, with

an estimated impact on 249 individuals based on an average household size of 2.49 according to the US Census Bureau ACS 5-year estimate 2018–2022. In this scenario, 13,016 households (39,049 individuals) are anticipated to be displaced, and 4,716 are expected to seek public shelter.

Hazus estimates damage to critical facilities and infrastructure. Table 65 provides a summary of the expected damage to each of these facility types for the 100-year scenario. Figure 99 through Figure 103 show the locations of each of these facilities and indicate whether they will be functional on Day 1.

Table 65: Expected Damage to Critical Facilities from the 100-Year Flood Scenario

Facility Type	Total Count	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Center	10	0	0	0
Fire Station	50	1	0	1
Hospital	41	6	0	3
Police Station	18	1	0	1
School	127	5	0	4
Total	246	13	0	9

Economic losses for this scenario total $5.28 billion, including $2.4 billion (45%) as direct losses from structures, contents, and inventory. Business interruption losses, such as relocation costs, income losses, rental income losses, and wage losses, account for $2.89 billion or 54% of the losses. These are summarized for individual jurisdictions in Table 66.

Table 66: Economic Losses for 100-Year Flood Scenario by Jurisdiction

Jurisdiction	Building Damage	Contents Damage	Inventory Damage	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
City of Reno	$359,473,000	$527,586,000	$45,849,000	$192,257,000	$409,613,000	$125,491,000	$657,389,000	$2,317,631,000
City of Sparks	$410,916,000	$762,833,000	$162,432,000	$217,522,000	$429,331,000	$145,237,000	$592,531,000	$2,720,802,000
Pyramid Lake Paiute Reservation	$996,000	$591,000	$18,000	$302,000	$72,000	$92,000	$69,000	$2,140,000
Reno-Sparks Indian Colony	$6,871,000	$19,011,000	$6,677,000	$5,353,000	$6,343,000	$3,659,000	$25,227,000	$73,141,000
Unincorporated Washoe County	$46,350,000	$40,493,000	$3,083,000	$23,187,000	$17,225,000	$7,689,000	$31,471,000	$169,344,000
Grand Total	$824,606,000	$1,350,514,000	$218,059,000	$438,621,000	$862,584,000	$282,168,000	$1,306,687,000	$5,283,058,000

Table 67: Count of Buildings in 100-Year Flood Area by Occupancy Type

	Agricultural	Commercial	Education	Government	Industrial	Religion	Residential	Total
Total Buildings	1	363	1	3	71	0	7,892	8,331
Buildings with Substantial Damage	0	2	0	0	3	0	100	105

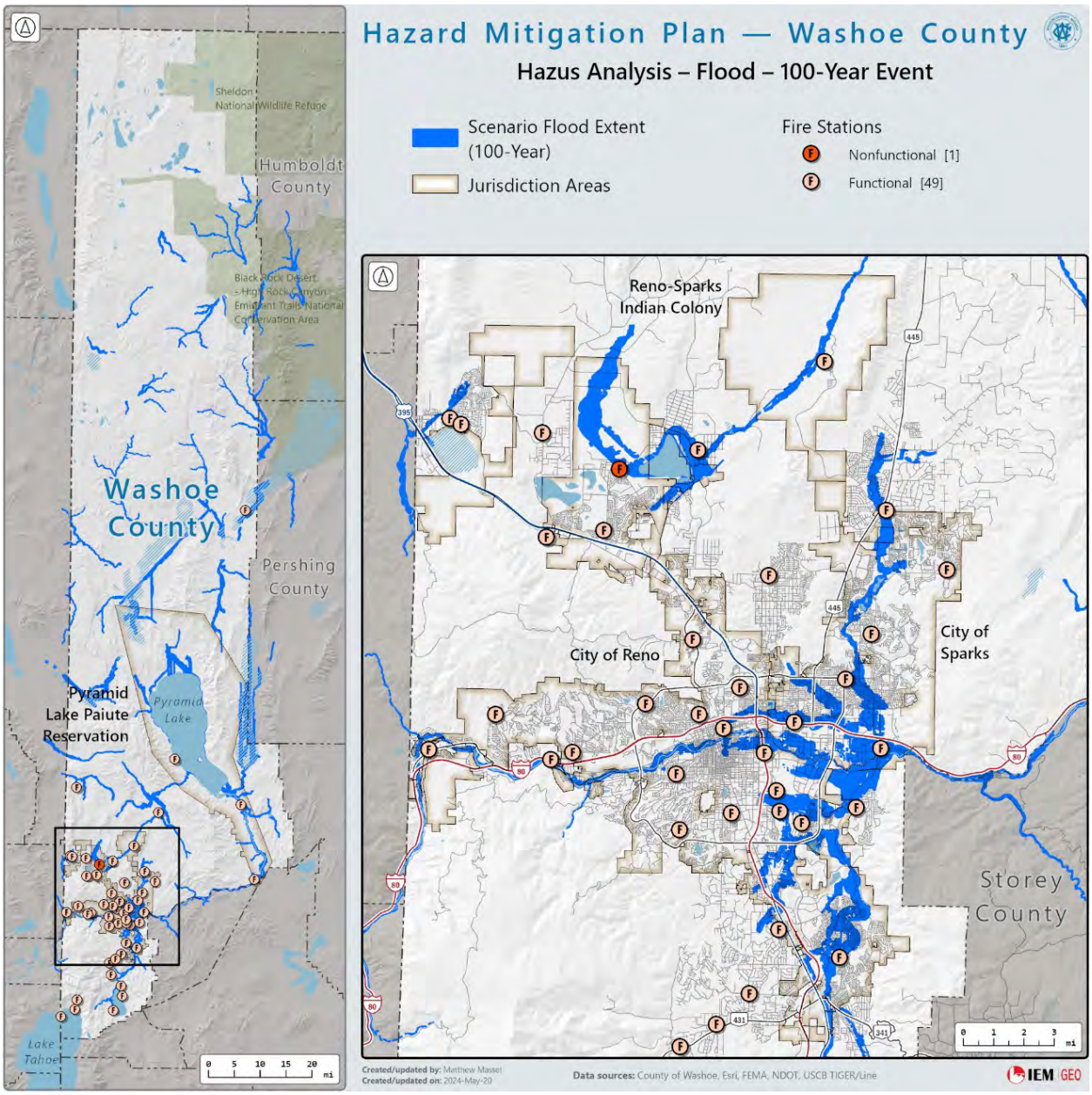

Figure 99: Washoe County Hazus 100-Year Flood Scenario, Fire Station Functionality

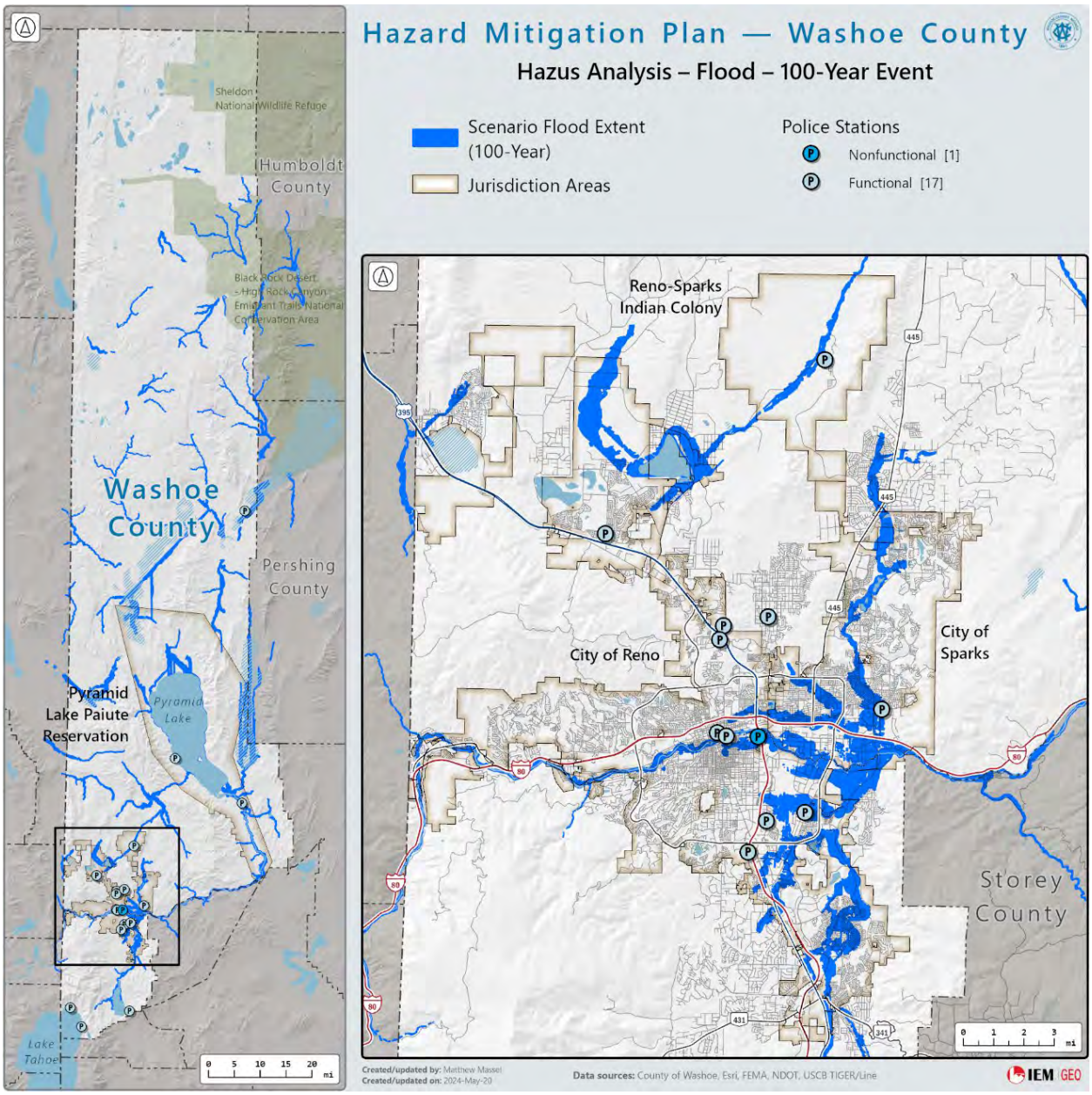

Figure 100: Washoe County Hazus 100-Year Flood Scenario, Police Station Functionality

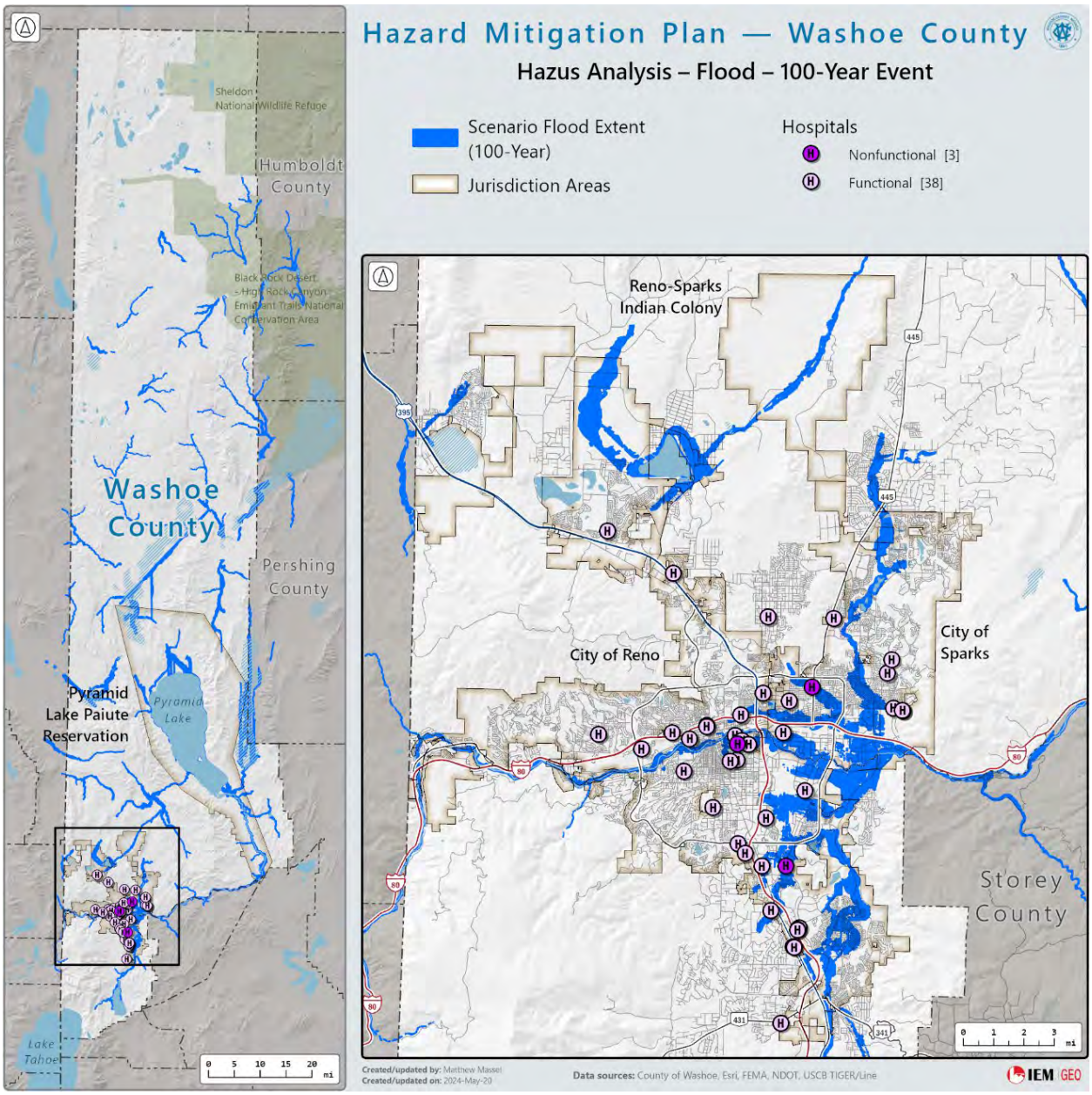

Figure 101: Washoe County Hazus 100-Year Flood Scenario, Hospital Functionality

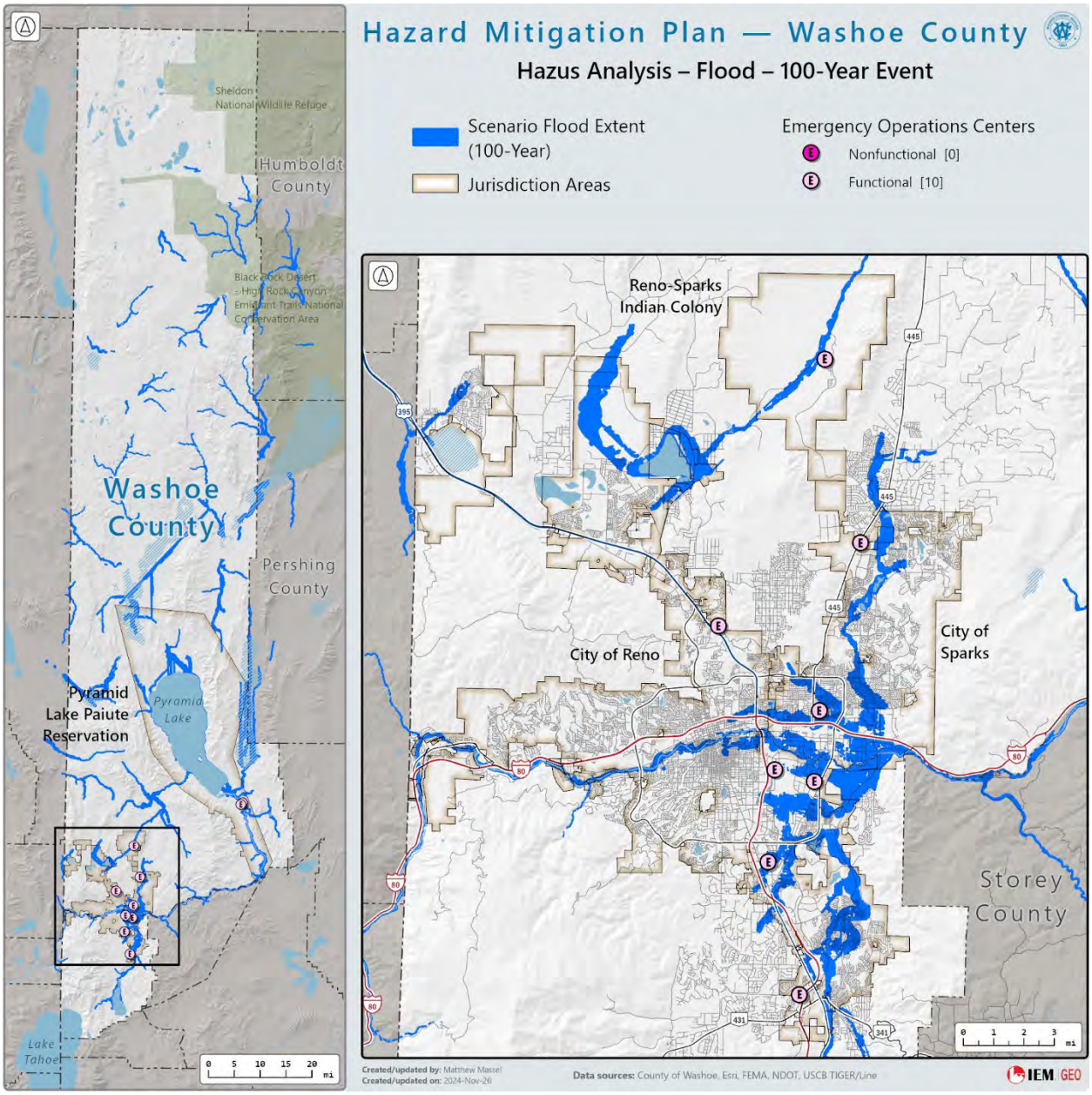

Figure 102: Washoe County Hazus 100-Year Flood Scenario, EOC Functionality

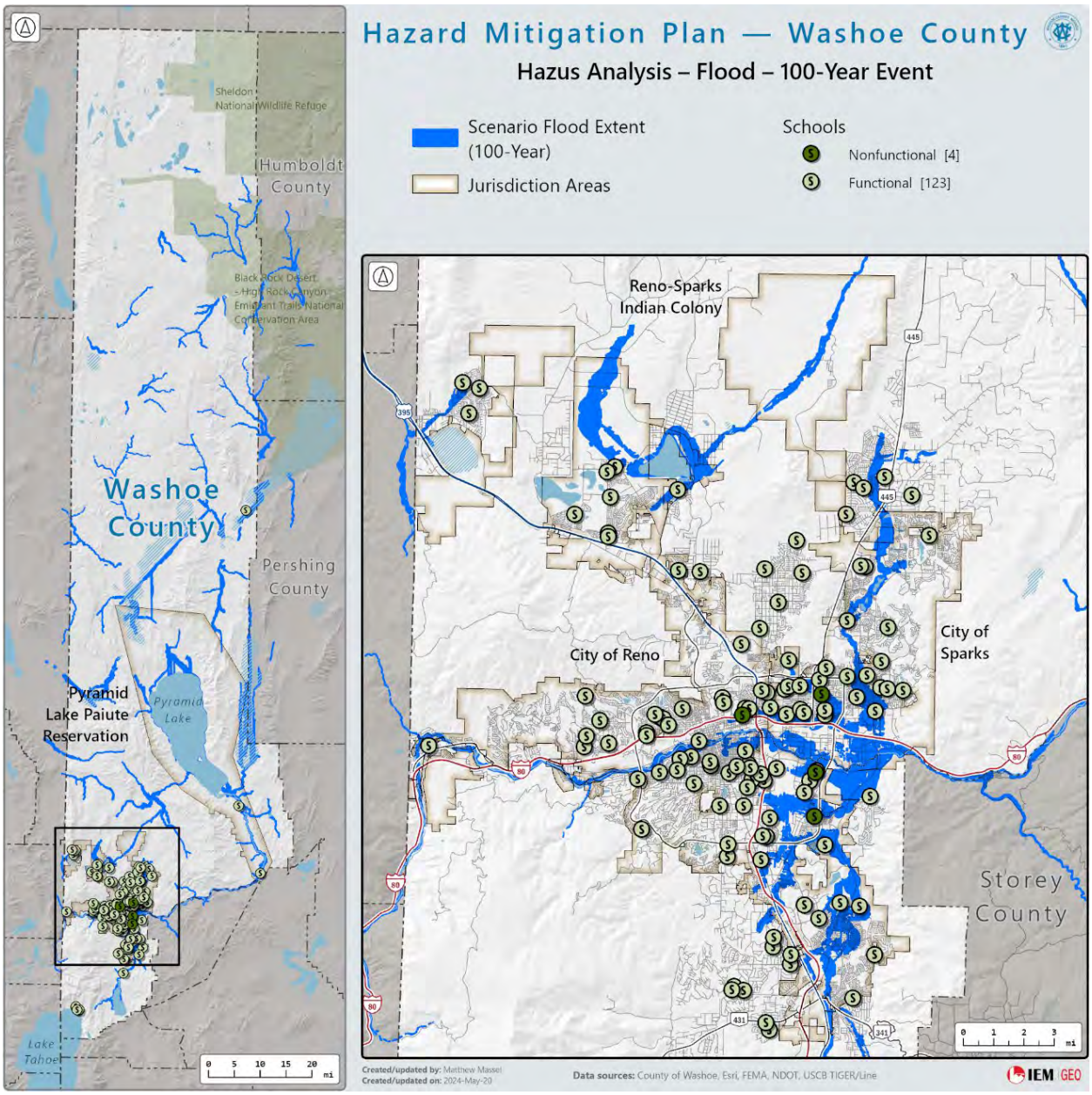

Figure 103: Washoe County Hazus 100-Year Flood Scenario, School Functionality

500-YEAR RETURN PERIOD SCENARIO

A 500-year return period flood scenario would cause moderate damage to 9,728 buildings, and 1,155 would be destroyed. 1,147 residences are expected to have substantial damage, with an estimated impact on 2,856 individuals based on an average household size of 2.49 according to the US Census Bureau ACS 2018-2022 5-year estimate. In this scenario, 21,682 households (65,046 individuals) are anticipated to be displaced, and 6,017 are expected to seek public shelter.

A summary of the expected damage to each of the critical facility types for the 500-year scenario is shown in Table 68. Economic losses by jurisdiction in a 500-year scenario are shown in Table 69.

Figure 104 through Figure 108 show the locations of each of these facilities and indicate those that will or will not be functional on Day 1 of a 500-year flood event.

Table 68: Expected Damage to Critical Facilities for a 500-Year Flood Scenario

Facility Type	Total Count	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Center	10	2	0	2
Fire Station	50	3	0	1
Hospital	41	8	0	5
Police Station	18	3	0	2
School	127	15	0	14
TOTAL	**246**	**31**	**0**	**24**

Table 69: Economic Losses for 500-Year Flood Scenario by Jurisdiction

Jurisdiction	Building Damage	Contents Damage	Inventory Damage	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
City of Reno	$803,281,000	$1,031,101,000	$97,977,000	$319,746,000	$598,273,000	$207,630,000	$1,165,090,000	$4,223,031,000
City of Sparks	$1,012,203,000	$1,710,789,000	$306,880,000	$400,793,000	$763,907,000	$251,673,000	$1,129,282,000	$5,575,527,000
Pyramid Lake Paiute Reservation	$3,103,000	$1,616,000	$0	$776,000	$0	$228,000	$0	$5,721,000
Reno-Sparks Indian Colony	$10,958,000	$29,674,000	$11,461,000	$6,707,000	$9,819,000	$4,608,000	$31,717,000	$104,944,000
Unincorporated Washoe County	$112,839,000	$91,829,000	$5,983,000	$45,180,000	$30,436,000	$14,567,000	$60,965,000	$361,790,000
Grand Total	$1,942,384,000	$2,865,009,000	$422,301,000	$773,202,000	$1,402,435,000	$478,706,000	$2,387,054,000	$10,271,013,000

Table 70: Count of Buildings in 500-Year Flood Area by Occupancy Type

	Agricultural	Commercial	Education	Government	Industrial	Religion	Residential	Total
Total Buildings	0	688	0	4	140	0	13,460	14,292
Buildings with Substantial Damage	0	3	0	0	5	0	1,147	1,155

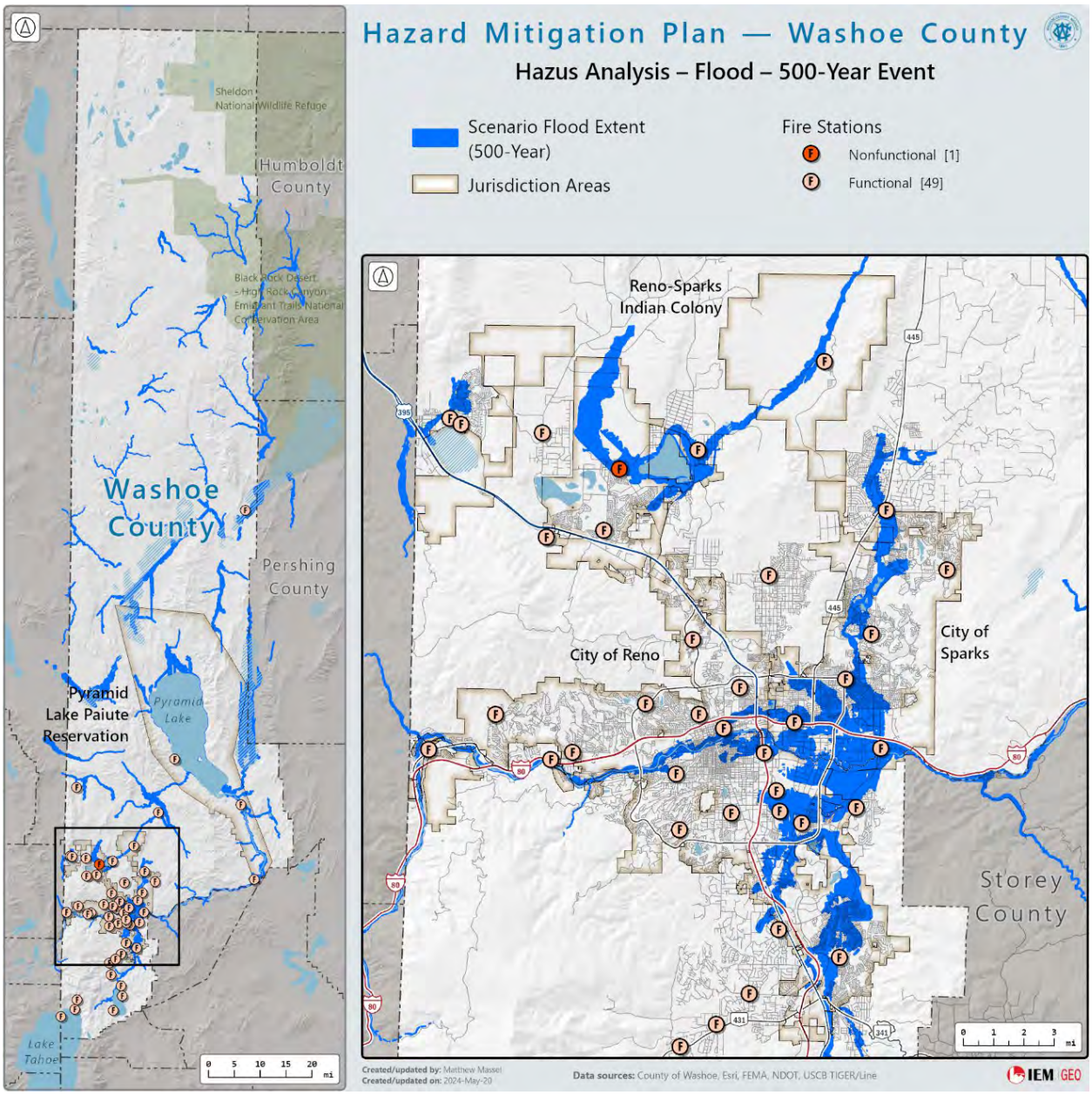

Figure 104: Washoe County 500-Year Flood Hazus Scenario, Fire Station Functionality

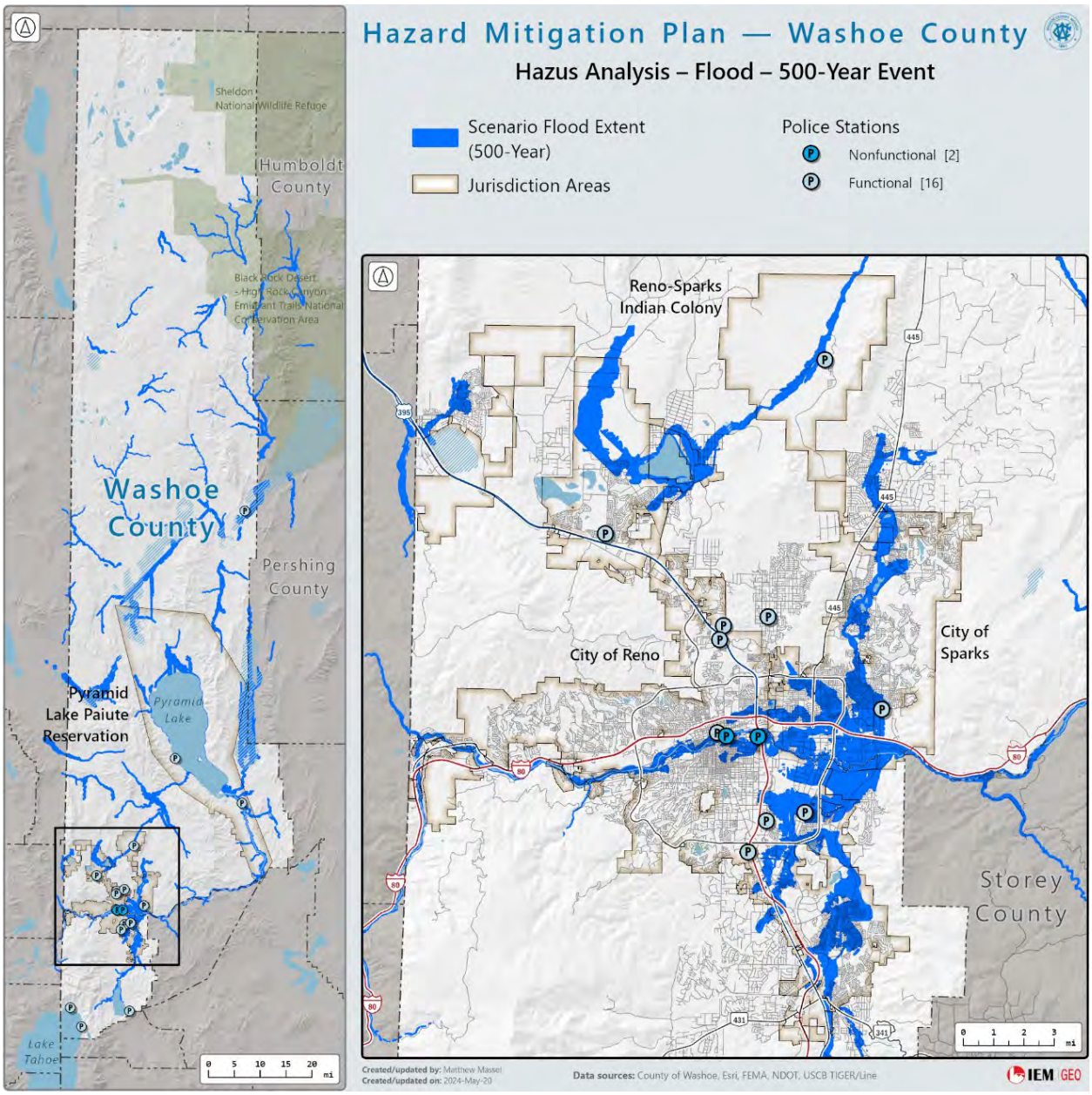

Figure 105: Washoe County 500-Year Flood Hazus Scenario, Police Station Functionality

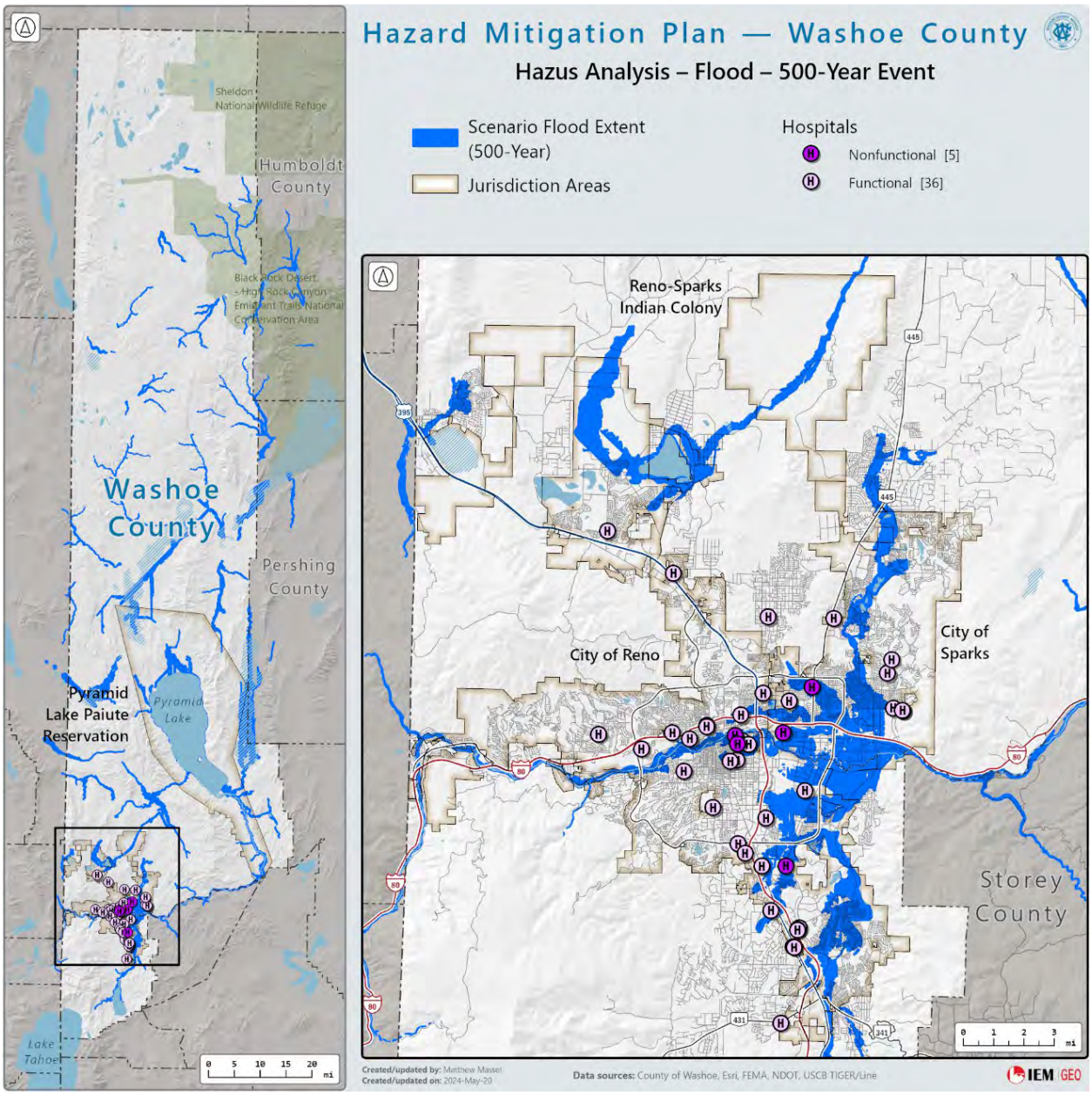

Figure 106: Washoe County 500-Year Flood Hazus Scenario, Hospital Functionality

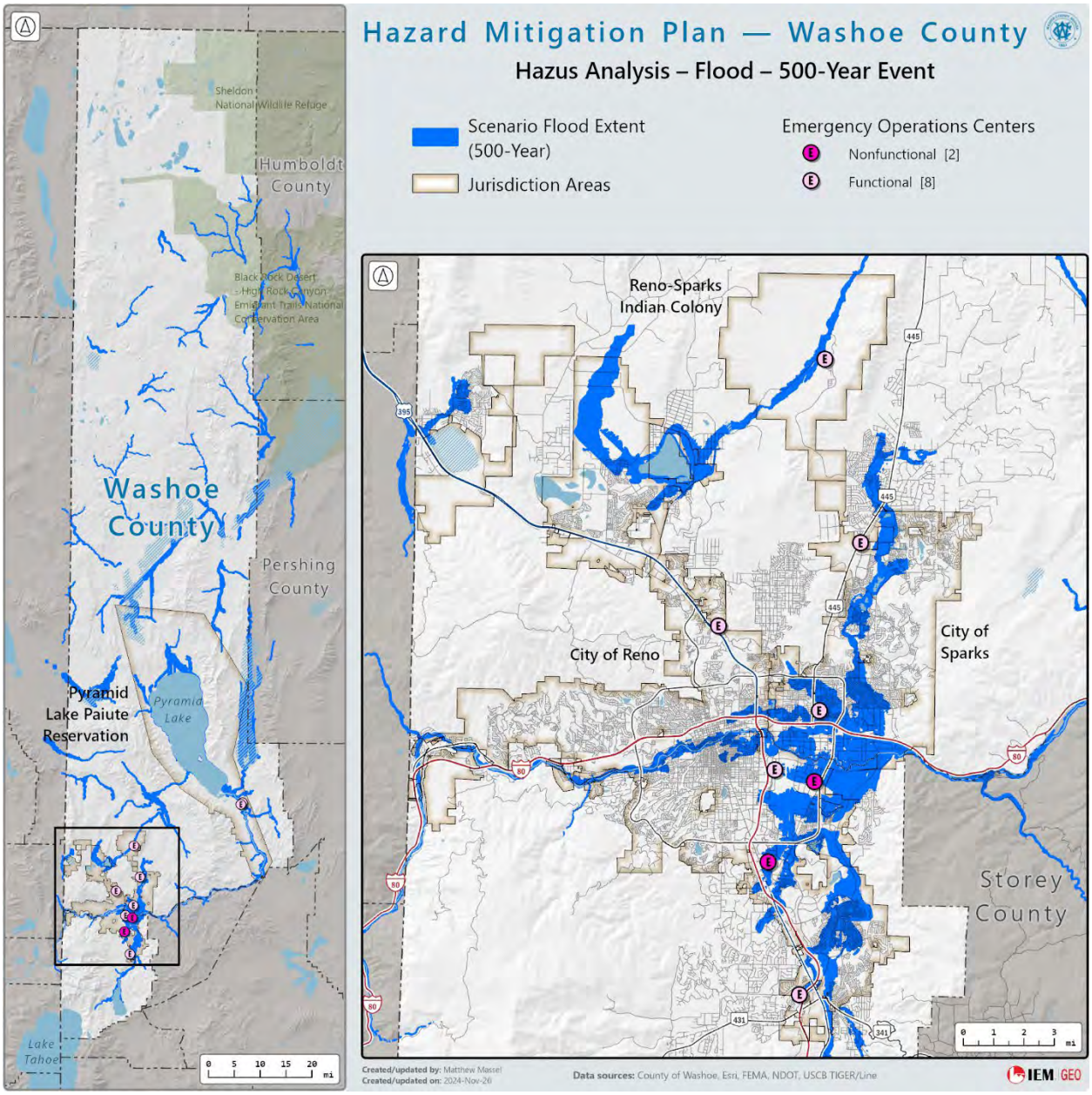

Figure 107: Washoe County 500-Year Flood Hazus Scenario, EOC Functionality

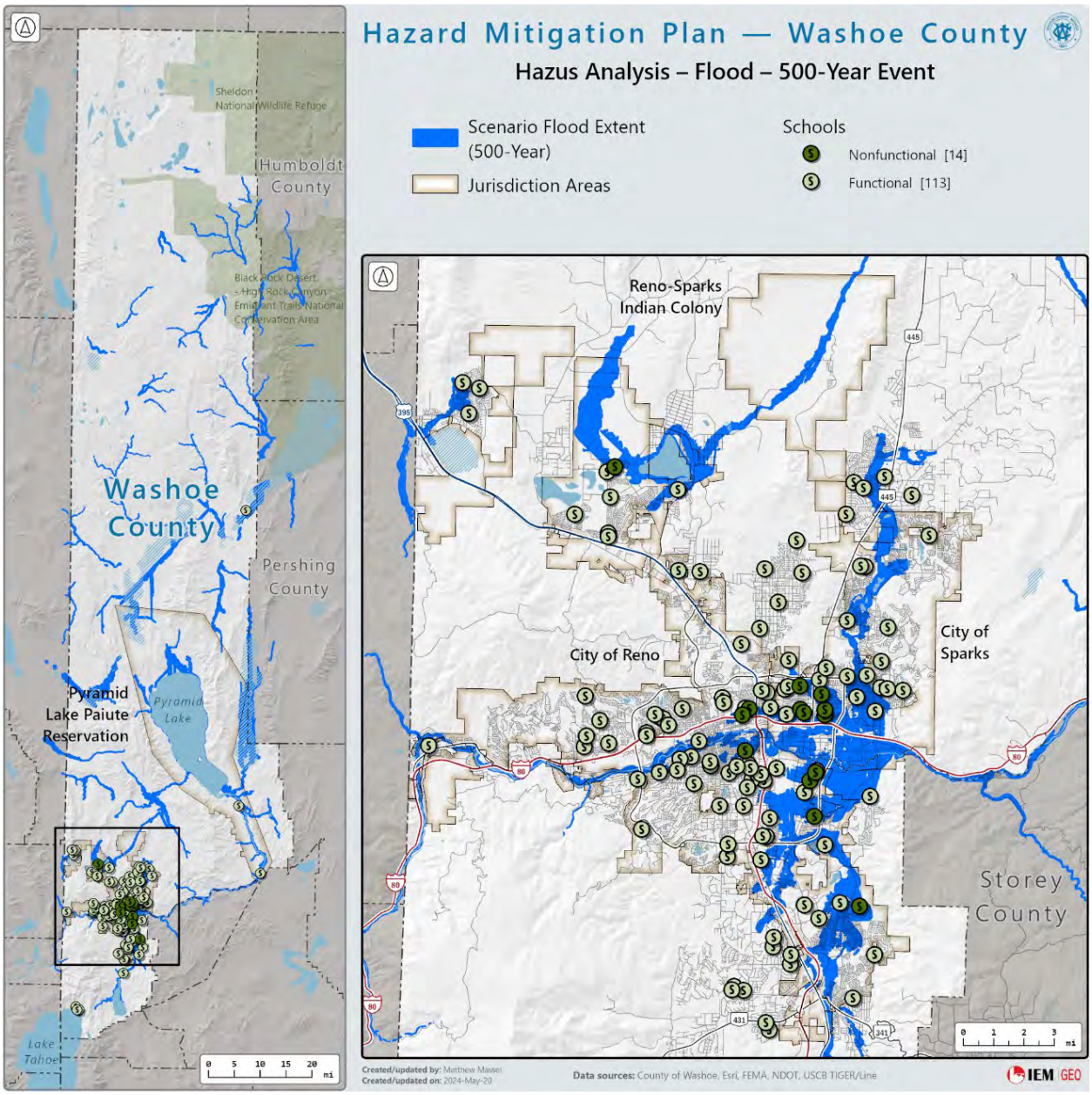

Figure 108: Washoe County 500-Year Flood Hazus Scenario, School Functionality

Figure 109 illustrates the NRI rating the Expected Annual Loss for Washoe County at $65M from riverine Flooding (including closed-basin flooding), with a rating of Very High expected annual losses and a risk score of 99.7.

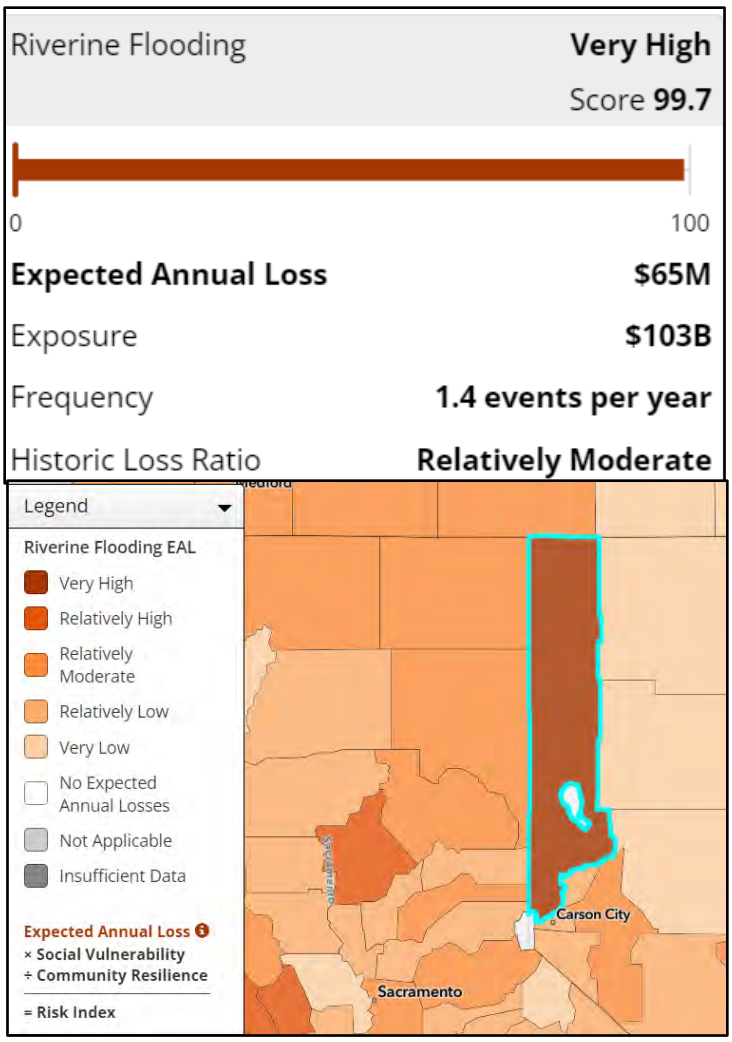

Figure 109: National Risk Index Washoe County Riverine Flooding (including closed-basin flooding) Expected Annual Loss Score, Map, and Legend[173]

Impact on Community Assets

Riverine or flash Flooding (including closed-basin flooding) in the County often results in the washout or Flooding (including closed-basin flooding)of roadways and infrastructure in waterways, such as bridges or culverts. Due to the concentration of urban development along the Truckee River, many critical facilities in the County are in the 100-year or 500-year mapped floodplains and are vulnerable to riverine Flooding (including closed-basin flooding). Flash Flooding can affect smaller creeks and streams and areas near burn scars, and critical facilities outside mapped floodplains may be affected.

[173] FEMA, National Risk Index, "Washoe County Riverine Flooding Expected Annual Loss Score, Map and Legend." https://hazards.fema.gov/nri/map

Closed-basin Flooding (including closed-basin flooding) in Washoe County occurs in and around playas, which may become shallow lakes during periods of increased precipitation. Development on a playa or in adjacent low-lying areas is most vulnerable to the impacts of closed-basin Flooding (including closed-basin flooding). Vulnerable areas in Washoe County include established residential neighborhoods on the shorelines of Swan Lake and commercial and residential areas near Silver Lake and White Lake. Closed-basin Flooding (including closed-basin flooding) of these lakes also affects public facilities and infrastructure, including US Highway 395, Village Parkway, Lemmon Drive, Lemmon Valley Elementary School, and the Reno-Stead Water Reclamation Facility. See Appendix B for additional material on closed-basin Flooding hazards in Washoe County.

Major floods can impact the community by displacing residents and business owners; damaging and disrupting infrastructure, including roads and bridges, water treatment facilities, and wastewater treatment facilities; and causing health risks because of contaminated public water supplies and private wells. Areas like Chance Lane and Rhodes Road Bridges -A residential area in the South Truckee Meadows would be isolated from access and emergency services if the Steamboat Creek were to flood and damage/destroy the two bridges (Andrew Land and Rhodes Road) that are the only way into and out of the area.

VULNERABLE POPULATIONS

In Washoe County, certain populations are particularly vulnerable to flooding due to a combination of geographical, economic, and social factors. Areas along the Truckee River and its tributaries are at the highest risk, especially neighborhoods in low-lying regions that are prone to overflow during heavy rainfall or rapid snowmelt. Communities such as Sparks and parts of Reno, particularly near the river corridors, often experience significant flooding during severe weather events. Residents in these areas may lack adequate flood defenses and infrastructure, making them more susceptible to the impacts of flooding.

Additionally, populations with limited resources are more vulnerable to flooding. Low-income families and individuals living in affordable housing developments or mobile home parks often have fewer financial means to prepare for or recover from flood disasters. This economic vulnerability can be exacerbated by lack of access to information about flood risks, inadequate insurance coverage, and limited access to emergency services. The elderly and those with disabilities also represent at-risk populations, as they may have mobility issues that hinder their ability to evacuate quickly during flood events.

Finally, transient populations, including the homeless, face significant challenges during flooding. They often lack stable housing and may be unaware of available resources for emergency shelter or assistance. In times of flooding, their vulnerability increases as they may lack access to timely alerts and have fewer means to protect themselves against the elements. As Washoe County continues to face climate-related challenges, addressing the needs of these vulnerable populations will be crucial in improving overall community resilience to flooding.

Development Trends

- **Economic:** The Truckee River Flood Management Authority, a joint powers authority created under an Interlocal Cooperative Agreement among Washoe County, the City of Reno, and the City of Sparks, is continuing to implement the Truckee River Flood Management Project (Flood Project) by constructing, maintaining, and operating infrastructure designed to reduce Flooding (including closed-basin flooding) risks. The Flood Project has evolved over decades of study, consideration, and community involvement. The current plan represents the outcomes of countless meetings, community input, and local and federal planning. The Flood Project extends approximately 33 miles along the Truckee River, from downtown Reno (near Jones Street) to the town of Wadsworth, Nevada (near Pyramid Lake)[174]. Once completed, the Flood Project will reduce flood damage from a 100-year event throughout Truckee Meadows. Its economic benefits have been estimated at $2 billion (Decreased Vulnerability).

- **Land Use:** Areas targeted for new development are generally outside mapped floodplains. The County requires the potential impacts of new development in floodplains to be mitigated to avoid downstream Flooding (including closed-basin flooding) impacts. Residential and commercial development has resulted in the creation of additional impervious surfaces in the closed basins of the North Valleys (Increased vulnerability).

Future Land Use: Washoe County has adopted Article 416, Flood Hazards, of the Washoe County Development Code to reduce the County's vulnerability to Flooding (including closed-basin flooding). Article 416 establishes development guidelines and requirements for properties in unincorporated parts of the County that are in Flooding (including closed-basin flooding) hazard areas. For developments in flood-prone areas of the County to be approved, mitigation measures, such as Letter of Map Revisions to FEMA Flood Insurance Rate Maps, on-site detention/retention basins, elevation/fills for building pads, and drainage improvements must be implemented. Through its land use planning and zoning authority, the County has attempted to zone flood-prone areas for less intense development or no development at all[175] (Decrease vulnerability).

[174] Truckee River Flood Management Authority, 2024, "The Flood Project." https://trfma.org/our-work/our-projects/
[175] Washoe County.gov, Emergency Management and Homeland Security, 2024. https://www.washoecounty.gov/em/Hazards/Flooding.php

Table 70: Changes from Floods

Type of Hazard	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability (Increased, Decreased, Stayed the Same)
Flood	In the unincorporated county, there are 3,239 units built on parcels that intersect a FEMA flood hazard. Of these units, 254 have been built since 2020 representing a 7.8% increase since the last plan update.	Based on countywide persons per household and occupancy data from the US Census Bureau, an additional 254 residential units represents a population increase of approx. 571 persons since 2020.	Extreme weather events have become more common, resulting in more severe Flooding (including closed-basin flooding) events when they occur. Closed basin Flooding continues to be problematic and difficult to manage. New development has increased impervious surfaces in the region; however, plans and regulations are in place to mitigate such increases by using adequate detention basins and rapid infiltration techniques.	On-going flood control efforts, such as adequate sizing of detention basins, review of drainage alterations during project review, and certified flood plain management, have mitigated vulnerability to potential flood damage. Efforts are underway to purchase old development built in the flood plain prior to current regulations, which will decrease vulnerability in those areas. Wherever development occurred in flood prone areas prior to current mitigating regulations remain vulnerable. Sun Valley is one such area as there are open ditches and a lack of adequate storm drain facilities. For the same reasons, and due to closed basins, Lemmon Valley is another area that continues to be flood prone.

COMMUNITY LIFELINES

All lifelines are assigned to Flooding (including closed-basin flooding) because of the high impact of loss of life and property during these incidents. Law Enforcement Officers, Emergency Medical Services, and rescue attempts may be delayed or impossible because of road Flooding (including closed-basin flooding) and blockage from debris. Due to these same problems, businesses and stores will be closed, causing food insecurities and access to daily necessities. Because of power outages, communication may be impossible, and some people will not be able to call for help. Hazardous materials may leak into the water and the ground, causing current and future problems for people, crops, and livestock. There are eight lifelines, each with its own focus and purpose (Figure 110).



Figure 110: Community Lifelines

VULNERABILITY SCORE

The NRI includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at the county and census tract levels. Table 71 provides an overview of each category at the county level.

Table 71: National Risk Index for Flood in Washoe County

Flood	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Very High	High	High	$65M	High

Based on the NRI, Washoe County has a rating of very high for the risk index and a score of 99.7 for flood which is higher than the national percentile (see Figure 111).

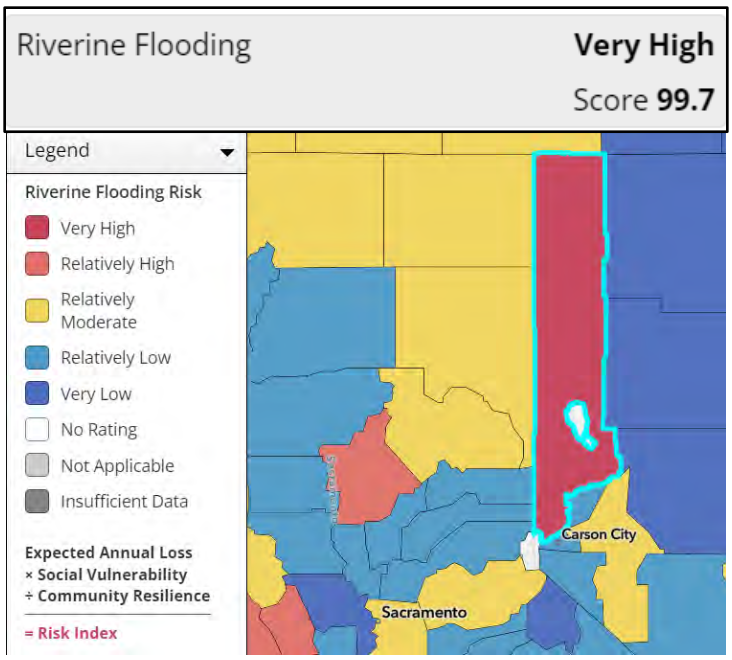

Figure 111: National Risk Index Washoe County Flood Score, Map, and Legend[176]

EXISTING MITIGATION CASE STUDY A

Lemmon Valley and Swan Lake Flood Prevention Measures

Lemmon Valley, with a population of about 5000, is one of several basins north of the City of Reno that has no natural outlet for water. With nowhere else to go, stormwater collects at the valley floor–filling Swan Lake–until it infiltrates into the ground or evaporates. If there is too much water, Flooding (including closed-basin flooding) occurs.[177] In 2019, three Lemmon Valley property owners were awarded $1.2M in damages, interest and costs after their homes were damaged. A court decision held the City of Reno liable for the Flooding (including closed-basin flooding) at Swan Lake in 2017, based on its decision to develop properties nearby, which caused more runoff to reach Swan Lake.[178] Since 2017, Washoe County has developed a proactive flood management plan, and it monitors the lake levels and surrounding snowpack, and implements certain responses dictated by the conditions and lake levels. Washoe County has prepared for rising Swan Lake water levels by constructing protective berms in certain areas

[176] FEMA, "National Risk Index Washoe County Flood Score, Map, and Legend." https://hazards.fema.gov/nri/map

[177] The Nevada Independent, Daniel Rothberg, "Indy Environment: Past decisions loom over Reno, Washoe County votes on Lemmon Valley flooding," 2019. https://thenevadaindependent.com/article/indy-environment-past-decisions-loom-over-reno-washoe-county-votes-on-lemmon-valley-flooding

[178] 2News Nevada, "City Of Reno Reaches Global Settlement For Swan Lake Flooding Damages," April 28, 2023. https://www.2news.com/city-of-reno-reaches-global-settlement-for-swan-lake-flooding-damages/article_aa9e2c7e-a017-58b7-a7f8-c899da0f9820.html

around the lake and installing high-flow pumps to manage water that flows down from the surrounding areas.[179] Washoe County Engineering monitors lake elevations and takes regular measurements, reviews weather forecasts and precipitation patterns, performs field inspections of the stormwater infrastructure (drainage channels, cross pipes, roadside ditches, etc.), and is prepared to respond should rapidly rising lake levels and Flooding (including closed-basin flooding) occur. The linked Swan Lake Elevations data are used by the Washoe County team to assess necessary operation changes to protect public safety. [180]

EXISTING MITIGATION CASE STUDY B

Truckee River Flood Management Authority (TRFMA)

The TRFMA is a joint effort among Reno and Sparks, Washoe County, and many other stakeholders to reduce the devastating impacts of Flooding (including closed-basin flooding) along the Truckee River in Washoe County, Nevada. TRFMA is building infrastructure and managing the floodplain to reduce flood damages, safeguard public health, and create a more resilient community.

Vista Narrows Floodplain Terracing Project

The Vista Narrows Floodplain Terracing Project will restore a degraded and incised reach of the Truckee River by reconnecting the river to its floodplain, creating 13 acres of wetlands, and improving habitat for native fish and wildlife. Three floodplain terraces will be excavated to allow frequent inundation, improve connectivity to groundwater, and support native plant species. This mitigation project is currently in the design & permitting phase, with construction anticipated to start in the next few years.

CONSEQUENCE ANALYSIS

Floods are the number two priority in Washoe County. The risk of Flooding (including closed-basin flooding) in the planning area is considered high, and can take different forms, such as , alluvial fan Flooding, and riverine Flooding.

Table 72 shows the Consequence Analysis of the Detrimental Impacts of Flooding (including closed-basin flooding), which was done for accreditation with the Emergency Management Accreditation Program (EMAP).

[179] WashoeLife, Bethany Dryesdale, “Lemmon Valley and Swan Lake flood prevention measures,” 2023. https://washoelife.washoecounty.gov/washoe-county/lemmon-valley-and-swan-lake-flood-prevention-measures/

[180] Washoe County, NV, Swan and Silver Lake Water Monitoring, 2024. https://www.washoecounty.gov/csd/engineering_capitalprojects/drainage_and_flooding/monitoring_response/swan_silver_lake.php

Table 72: EMAP Consequence Analysis for Flood in Washoe County

Subject	Ranking	Impacts/Flood
Public	High	Flooding (including closed-basin flooding) is considered a major area of concern to the county. Overall, any portion of the planning area is susceptible to Flooding (including closed-basin flooding), with low-lying and urban areas having the potential to be severely impacted. Flash floods come without warning, leaving little time to react. Individuals in vehicles face extreme hazards, who may lose control, become trapped, and be washed away. A lack of visibility can cause drivers to become stranded or trapped when the roadbed is impaired. The potential for electrical fires and sewage back up, along with water contamination, pose a threat to the public.
Responders	Moderate	Responding personnel can be affected and will be event specific. Flash floods can sweep responders and emergency vehicles away. Weakened levies can burst and compromise rescue missions. Another source that can hinder response is damaged foundations, resulting in collapsed buildings.
Continuity of Operations	Moderate to Severe	Critical infrastructure, essential functions, and other areas necessary for the county to function could be compromised. Cascading events, such as sewage leaks and water contamination, may accompany floods, adding additional pressure to County Operations. Public services can be disrupted because of impassable roadways, which could cause the temporary halt of transportation services, including public and emergency transportation. Power outages can make it difficult to access important documents and vital records. Communications can be impacted, making it difficult for emergency personnel to contact needed resources.
Property, Facilities, and Infrastructure	High	Flooding (including closed-basin flooding) of any etiology can pose severe damage to property, facilities, and infrastructure. Drainage systems can become clogged, and natural drainage can be disrupted. Building and facility foundations can become unsteady and compromised. Water can become undrinkable if it comes into contact with hazardous waste, sewage, or other hazardous liquids.
Environment	Moderate–Severe	Floods can affect the environment marginally or have catastrophic impacts. Flooding (including closed-basin flooding) can cause miles of property contamination that precludes habitability. Standing water as floods recede can exacerbate the mosquito population, which can carry diseases. Flooding

Subject	Ranking	Impacts/Flood
		(including closed-basin flooding) can crest creeks and rivers, destroy habitat, and snakes and other animals may seek to escape the waters by seeking refuge in homes and buildings. Trees and plants can die because they are choked out by oversoaked soil. Flooding (including closed-basin flooding) can also cause bank erosion, bed scour, and sediment deposition.
Economic Condition	Moderate	Depending on the type and severity of the Flooding (including closed-basin flooding), there could be significant financial and economic impacts, especially for tourist areas. Farmland crops can be decimated, resulting in less revenue. Flooded roads or Flooding (including closed-basin flooding) impact on roads and can cut off businesses from clientele.
Public Confidence in Governance	High	Depending on the level and timeliness of response, public confidence can be affected. Oftentimes recovery also takes time, and this can lead to a loss of confidence. If the public believes not enough planning and preventative measures were taken, the loss of public confidence in governance will be at its greatest.

COMMUNITY INPUT

The public expressed deep concern about the recent building in flood-prone areas, a matter of utmost urgency. Members of the public were particularly worried about Veterans Parkway, as retention basins are holding water when they are not supposed to, thereby eliminating the ability for the basins to store water in case of a flood event. Another noted concern was the continued construction of drainage conduits into the Lemmon Valley basin, which needs to reduce the risk of renewed Flooding (including closed-basin flooding). One resident residing in Mogul, a designated flood zone, stated that the ditches and streams are rarely maintained. Another member expressed concern about the Flooding (including closed-basin flooding) in several areas of South Reno, from S. Virginia Street to Damonte Ranch Road and Geiger Grade near Toll.

The public did indicate support for improving drainage to mitigate Flooding (including closed-basin flooding) and return water to reservoirs. One member commented on the prohibition on building in flood-prone areas. Another member mentioned flood walls along the river. The public supported education, awareness outreach, and flood assessments and mapping.

Various agencies and entities (TRFMA, NWS, NOAA, Washoe County, Reno, Sparks, and others) conduct separate ongoing public outreach efforts and receive additional community input on flood concerns and proposed mitigation actions. All community input was used to inform the planning team's decision on how to prioritize mitigation projects in the mitigation strategy.

Hazardous Materials Incident

Hazard Description

A hazardous material is any item or agent (biological, chemical, or physical) which can cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials can be present in the form of gas, solid, or liquid. Environmental or atmospheric conditions can influence hazardous materials if they are uncontained.[181]

The release or spill of bulk hazardous materials could cause a fire, explosion, toxic cloud, or direct contamination of people or property. The effects may involve a local site or many square miles. Health problems may be immediate, such as corrosive effects on skin and lungs, or gradual, such as the development of cancer from a carcinogen. Damage to property could range from immediate destruction by explosion to permanent contamination by persistent hazardous material.

Accidents involving the transportation of hazardous materials could be just as catastrophic, if not more so, than accidents involving stored chemicals, because the lack of a fixed location leads to increased unpredictability. The U.S. Department of Transportation divides hazardous materials into nine major hazard classes[182]. A hazard class is a group of materials that share a common major hazardous property. These hazard classes are as follows:

- Class 1 – Explosives
- Class 2 – Gases
- Class 3 – Flammable Liquids and Combustible Liquids
- Class 4 – Flammable Solids; Spontaneously Combustible, Dangerous When Wet
- Class 5 – Oxidizing and Organic Peroxides
- Class 6 – Poison (Toxic) and Poison Inhalation Hazard
- Class 7 – Radioactive
- Class 8 – Corrosives

[181] Institute of Hazardous Materials Management, 2012, "What are Hazardous Materials?" https://www.leg.mn.gov/docs/2015/other/150681/PFEISref_1/IHMM%202012.pdf

[182] United States Department of Transportation, Pipeline and Hazardous Materials Safety Administration, 2020, "DOT Chart 16 Hazardous Materials Markings, Labeling, and Placarding Guide." https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2020-07/USDOT%20Chart%2016%20PHH50%200162%201117%20WEB.pdf

- Class 9 – Miscellaneous

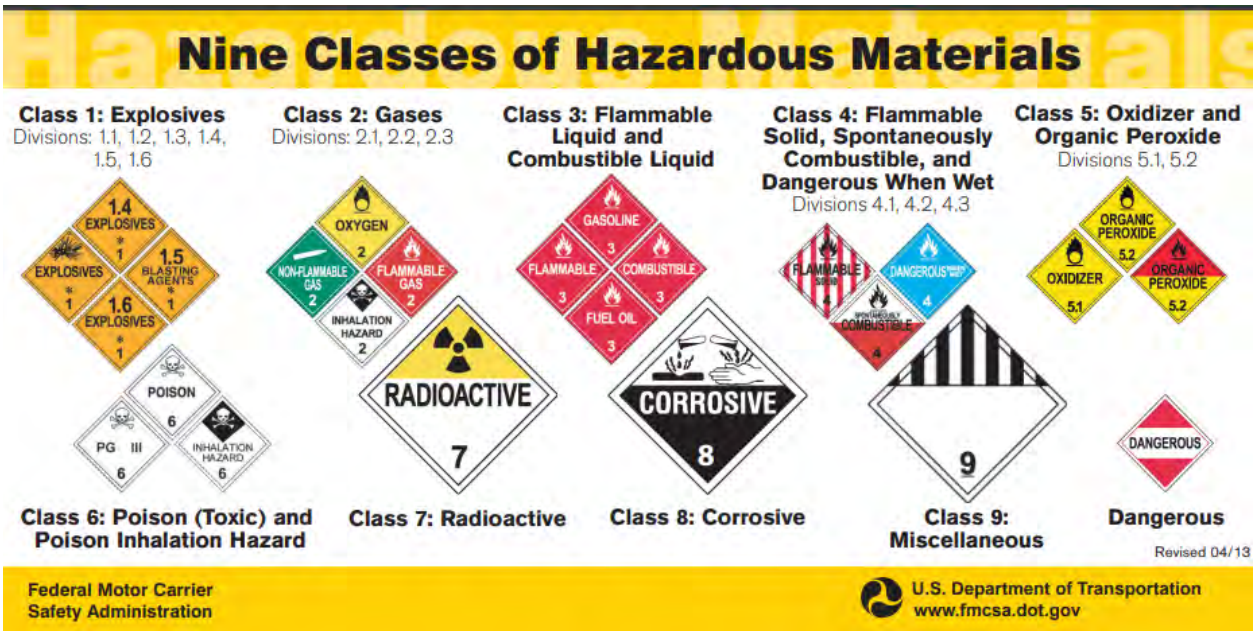

Figure 112: Federal Motor Carrier Safety Administration Nine Classes of Hazardous Materials[183]

Chemical Identity

- **Hazardous Material** – A substance (solid, liquid, or gas) capable of posing an unreasonable risk to health, safety, the environment, or property.

- **Extremely Hazardous Substances (EHS)** – The EPA uses this term for chemicals that must be responsible pursuant to the Superfund Amendments and Reauthorization Act (SARA, Title III). The list of these substances and the threshold planning quantities are identified in 40 Code of Federal Regulations (CFR 355).[184] Releases of EHS must be reported to the National Response Center.

- **Highly Hazardous Substance** – Hazardous substance, as used by the Nevada State Emergency Response Commission, encompasses every chemical regulated by both the U.S.

[183] United States Department of Transportation, Federal Motor Carrier Safety Administration, 2024, "Nine Classes of Hazardous Materials." https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/docs/Nine_Classes_of_Hazardous_Materials-4-2013_508CLN.pdf

[184] Code of Federal Regulations 355. https://www.ecfr.gov/current/title-40/chapter-I/subchapter-J/part-355

Department of Transportation (hazardous materials) and the Environmental Protection Agency (hazardous waste), including emergency response.

- **Level of Concern (LOC)** – The concentration of EHS in the air above which there may be serious irreversible health effects or death as a result of a single exposure for a relatively short period. The Local Emergency Planning Committee (LEPC) can declare the LOC for any EHS product, and LEPC can declare any site or product eligible for planning.

Location

Potential for contact with hazardous materials is present throughout all areas of Washoe County because of four main factors:

- The widespread distribution of hazardous materials storage locations (fixed facility)
- The transport of hazardous materials via motor transportation and rail (transportation)
- River and water ditches
- The transport of hazardous materials by pipeline (pipeline)

The following descriptions indicate defines the diversity of the hazardous products that move through the Reno, Sparks, and Washoe County areas.[185]

1. **Transportation Routes** – Highways, railways, and commercial and military aviation routes constitute a major threat because of the multitude of chemicals and hazardous substances transported along them. Interstate 80, Highway 395, and other main thoroughfares are areas of concern, as are the Union Pacific railroad tracks.
2. **Pipeline** – Several pipelines transect the Washoe County region, carrying a wide variety of products for industrial, commercial, and residential use. The Kinder Morgan Pipeline Company, one of the largest pipelines, services Washoe County and the Fallon Naval Air Station with petroleum products. The Paiute Pipeline and Tuscarora Pipeline supply high pressure natural gas for service to the communities and businesses.
3. **Business and Industry** – The manufacturing and light industrial firms in the Washoe County region offer the potential for hazardous materials incidents. These facilities use and/or store products that may be harmful to the population living and working in the area and to the sensitive ecosystems of the region.
4. **Agriculture** – Accidental releases of pesticides, fertilizers, and other agricultural chemicals may be harmful to human health and the environment. Most of the agricultural industry consists of ranching and farming operations located throughout the Washoe County region.

[185] Washoe County LEPC Hazardous Materials Emergency Plan, 2020. https://www.washoecounty.gov/lepc/hazardous_materials_emergency_plan.php

5. **Illegitimate Business** – Illegitimate businesses, such as drug laboratories, are a significant threat to human health, property, and the environment. In many instances, the residue is dumped in remote areas of the county or along the side of the road, posing a serious health threat to the unsuspecting person who stumbles across it.
6. **Hazardous Waste** – Hazardous waste (e.g., used motor oil, solvents, or paint) is occasionally dumped in remote areas of the county or along roadways. Like drug lab residue, illegally dumped hazardous waste poses a threat to human health, property, and the environment.
7. **Radioactive Materials** – Interstate 80, Highway 395, other main thoroughfares, and railroads are authorized routes for the shipment of radioactive materials.
8. **Acts of Terrorism** – Terrorist acts are becoming more common today and much more sophisticated. Events in recent years have prompted a move toward terrorist preparedness.

FIXED FACILITY

Under Nevada State law (Nevada Administrative Code 477.323), entities may not store hazardous materials in quantities above a designated limit unless permitted annually through the Department of Public Safety, State Fire Marshal's Division.

Title III of the Federal Superfund Amendments and Reauthorization Act is a freestanding statute titled the Emergency Planning and Community Right-To-Know Act (EPCRA). Under EPCRA, certain businesses are required to export information annually about hazardous substances used and stored at their facilities. These reports, known as Tier II reports, are submitted to County Local Emergency Planning Committees (LEPCs), State Emergency Response Commissions (SERCs), and local fire departments.

EPCRA includes planning requirements for facilities that store or use any of the 355 chemicals known as Extremely Hazardous Substances (EHSs). Facilities that contain quantities of one or more EHSs above an amount that could pose a threat are considered emergency planning facilities and must notify SERCs and LEPCs of the chemicals' presence and assist with local emergency planning efforts, as requested. Approximately one-third of the chemicals on the EHS list are also included in the list of materials designated as hazardous substances by the Comprehensive Environmental Response, Compensation, and Liability Act, which includes hundreds of other chemicals.

In the event of a release of a chemical above its reportable quantity (as designated by the Occupational Safety and Health Administration), responsible parties are required to notify the community emergency management coordinator for the LEPC and local emergency response agency of any areas likely to be affected by the release. The SERC must also be notified.

HIGHWAY TRANSPORTATION

There have been several studies regarding hazardous materials commodity shipments through these corridors. NDOT contracted Cambridge Systematic, Inc. to update the Hazardous

Materials flow study through the Washoe County region from October 2018 through February 2019. These reports vary based on the time of year, time of day, and other variables. They do, however, give an indication of commodity travel through the Reno, Sparks, and Washoe County area.

The focus of these studies was on the major transportation corridors. The I-80 corridor is the one corridor that has the most truck movement on a month-by-month basis. The weigh station operated by the California Highway Patrol in Truckee, California, reports an average of 50,000 (2019 updated number) trucks a month that pass through that facility. Approximately 7% (from Department of Transportation 2017) of the trucks, or 3,500 trucks per month, display hazardous materials placards, as in Figure 113. Assuming that each vehicle had an average load weight of 35,000 pounds, that would convert to approximately 61,250 tons of placarded material a month moving through the I-80 corridor.[186]



Figure 113: Hazard Materials Placard[187]

NEVADA DEPARTMENT OF TRANSPORTATION (NDOT) STUDY

The information in Table 73 was taken from the Nevada Hazardous Commodity Flow Study published in October 2018 through February 2019, prepared by Cambridge Systematics, Inc. for

[186] Washoe County LEPC Hazardous Materials Emergency Plan, 2020. https://www.washoecounty.gov/lepc/hazardous_materials_emergency_plan.php

[187] 2018 Nevada Enhanced SHMP, Environmental Safety Services 2019, "Hazard Materials Placard."

the Nevada Department of Transportation. (This study was five months long; therefore, the table represents this five- month study). The study team conducted four roadside surveys in the Reno/Washoe County area. The study team positioned survey technicians at overpasses to observe trucks transporting HAZMAT in both directions. Surveyors counted HAZMAT trucks during two-hour survey times during daylight hours on weekdays. At each location, surveyors documented the placard color, UN number, and direction of each truck displaying a HAZMAT placard. When UN numbers could not be identified, the color of the placard was notated. The survey focused on the top three HAZMAT placards, which included gasoline, diesel, and propane. This represented 63% of all HAZMAT trucks observed. Other placards observed included hexanes and heptanes, representing 37% of the total.

Table 73: HAZMAT Trucks Identified at Four Survey Locations in Washoe County[188]

Location	Diesel	Gasoline	Propane	Other Flammable Gas/Liquid	All Other	Total
I-80 Reno	5	14	1	5	6	31
I-80 downtown Reno	3	6	2	7	3	21
I-80 west of Reno	2	2	1	0	2	7
I-80/Route 427	2	0	1		1	5
I-80 Reno	5	14	1	5	6	31
I-80 downtown Reno	3	6	2	7	3	21
Totals	12	22	6	13	12	65

Note: 5-month study, 2 hours per day, 5 days a week – the top three HAZMATs.

Extending the numbers in Table 73 for an entire year, the total HAZMAT trucks moving through Washoe County are approximately 156 trucks for a given 24-hour period, or 4,745 trucks per month, and 56,940 trucks per year through all Washoe County corridors.

Table 74 indicates that the greatest HAZMAT transported is gasoline and other flammable gas or liquids over the most heavily traveled routes.

[188] Washoe County LEPC Hazardous Materials Emergency Plan, Cambridge Systematics, Silver State Survey, 2019– 2020, "HazMAT Trucks Identified at Four Survey Locations in Washoe County." https://www.washoecounty.gov/lepc/hazardous_materials_emergency_plan.php

Table 74: Hazard Class Percentages[189]

Location	Diesel	Gasoline	Propane	Other Flammable Gas/Liquid	All Other	Total
I-80 downtown Reno	16.1%	45.2%	3.2%	16.1%	19.4%	100%
I-80 west of Reno	14.3%	28.6%	9.5%	33.3%	14.3%	100%
I-80/Route 427	28.6%	28.6%	14.3%	0%	28.6%	100%
I-80 Reno	40.0%	0%	20%	20%	20%	100%

By identifying top HAZMAT volumes, routes, and frequencies, transportation officials have more information on which portions of the existing infrastructure and facilities are used to transport high volumes of HAZMATs. This helps in prioritizing transportation infrastructure investments for highway, rail, and pipeline facilities; helps first responders train for chemicals and fuels likely to be transported in their counties; and helps emergency managers place HAZMAT response assets and resources in appropriate locations. At the local level, LEPC uses this information to conduct training and exercise programs that match up with the likely hazards in the jurisdiction.

RAIL TRANSPORT

Nevada is served by the Union Pacific Railroad, which maintains a main line track that travels east and west along the Truckee River Corridor, starting at Truckee, California, and continuing east to Fernley, Nevada. The railroad route is within 100 yards of the Truckee River at many locations and crosses waterways at several additional locations. Hazardous material loads can and will be mixed with other freight being transported by the train on a given day. The amount of hazardous materials being transported depends on product demand and can vary based on the season.

Union Pacific reported that 43,401 carloads and intermodal loads of hazardous materials passed through the County in 2019–2021 (see Table 75). This report is for a two-year period. The total number of loads is both westbound and eastbound freight. The loads in Table 75 are for *all* hazardous materials passing through Washoe County.

Table 75: Union Pacific Railroad Hazardous Materials Commodity Flow Report[190]

2019–2020	Westbound and Eastbound
Carloads	38,212

[189] Washoe County LEPC Hazardous Materials Emergency Plan, 2020. https://www.washoecounty.gov/lepc/hazardous_materials_emergency_plan.php
[190] Washoe County LEPC Hazardous Materials Emergency Plan, 2020. https://www.washoecounty.gov/lepc/files/HazMAT-Annex-D-12-17-2020.pdf

2019–2020	Westbound and Eastbound
Intermodal loads	5,189
Total: All hazardous materials	43,401

These loads can and will be mixed with other freight being moved by the train on a given day. The amount of hazardous materials transported is dictated by product demand and can vary based on the season. Union Pacific is acutely aware and proactive in preparing for any incident that may occur and is well prepared to respond in the event of a train-related incident.[191]

AIR

Hazardous materials may be transported through Washoe County via air carriers, including UPS, Federal Express Corporation, and others that use Reno-Tahoe International Airport. The highest risk of a hazardous materials incident during transport by air is during the loading and unloading processes at airports or airfields. Generally, the quantities of hazardous materials shipped by air are much smaller than other transportation modes. The transport of hazardous materials by air is regulated by the Federal Aviation Administration's Office of Hazardous Materials Safety and by the International Air Transport Association and the International Civil Aviation Organization. The FAA ensures and promotes the safe transportation of dangerous goods in air commerce through activities that include regulatory oversight of dangerous goods carried by the flying public or transported on aircraft.[192]

PIPELINE

Several major pipeline systems transport hazardous materials across the County. The Paiute Transmission System, which carries liquefied natural gas, runs through the southern edge of Washoe County to the northeast into Churchill and Pershing Counties. The Tuscarora Gas Transmission system connects to the Paiute Pipeline outside Sun Valley and runs to the northwest (connecting with several smaller liquefied natural gas (LNG) pipelines, including the Spanish Springs Lateral). The Tuscarora Pipeline connects with the Empire LNG Pipeline at the Pyramid Lake Paiute Reservation. From this point, the Empire Pipeline runs to the northeast and terminates in Empire. The Ruby Pipeline runs through the northern third of Washoe County. The Kinder Morgan SFPP North pipeline parallels I-80 through the Reno/Sparks metropolitan area and carries petroleum products (gasoline, diesel, and jet fuel).

[191] Union Pacific, 2024. https://www.up.com/aboutup/community/safety/hmm/preparedness/index.htm

[192] Federal Aviation Administration, Office of Hazardous Materials Safety, 2024. https://www.faa.gov/about/office_org/headquarters_offices/ash/ash_offices#Office%20of%20Hazardous%20Materials%20Safety

KINDER MORGAN OVERVIEW[193]

Kinder Morgan operates an underground pipeline that transports approximately 13 million barrels of petroleum products (gasoline, diesel, and jet fuel) from the pump station in Rocklin, California, to the Sparks, Nevada terminal. Jet fuel is then pumped from the Sparks terminal to the Fallon Naval Air Station. Kinder Morgan also shares a storage facility in Sparks.

Fuel enters the pipeline in Rocklin, California, and traverses the western slope of the Sierra with booster pumps at Colfax and Cisco Grove. Once the fuel reaches Donner Summit, gravity forces the fuel the rest of the way to Sparks. The pipeline varies in size from six-to-I0-inches diameter and was constructed in the 1950's of high-grade steel pipe. Valves have been installed at the most critical locations along the pipe (see Table 76). These valves are a combination of automated motor-driven block valves and manual block valves located along the full length of the pipeline. The motor-driven block valves can be operated remotely from the terminal. All the valves can be operated manually onsite.

Table 76: Location of Pipeline Isolation Valves[194]

Area	Valve Type	Location
Donner Lake	Automatic	West end of Donner Lake
Truckee	Manual	West River Road, Truckee
Prosser Creek Incoming	Manual	Southwest bank of Prosser Reservoir
Prosser Creek Outgoing	Manual	East bank or Prosser Reservoir
Woodchopper Springs	Manual	1.1 mi. East of Prosser Reservoir
Hoke Valley	Manual	2.2 mi. East of Prosser Reservoir
California/Nevada	Automatic	Stateline in Verdi
Northridge	Manual	Northridge Golf Club
West Reno	Automatic	Dickerson Road, Reno
Coney Island	Manual	Coney Island Drive, Reno
Reno Incoming	Manual	KMEP Terminal, Sparks
Reno Outgoing	Manual	KMEP Terminal, Sparks
East Vista	Manual	3.5 mi. East of Terminal, near R.R.
West Lockwood	Manual	Lockwood Exit, near R.R.
East Lockwood	Manual	Mustang Exit, near R.R.

[193] Washoe County LEPC Hazardous Materials Emergency Plan, 2020, "Kinder Morgan Pipeline Overview." https://www.washoecounty.gov/lepc/hazardous_materials_emergency_plan.php
[194] Washoe County LEPC Hazardous Materials Emergency Plan, 2020, "Location of Pipeline Isolation Valves."
https://www.washoecounty.gov/lepc/hazardous_materials_emergency_plan.php

Area	Valve Type	Location
Clark	Manual	Eagle Pitcher Mine
Fernley	Manual	Fernley, Nevada
Donner Lake	Automatic	West end of Donner Lake
Truckee	Manual	West River Road, Truckee

The Trans-Sierra pipeline parallels Highway 80 and rail corridors on the Truckee River from Donner Summit to Truckee. East of Truckee, the pipeline heads north, roughly following the power transmission line into Reno. The portion of the pipeline following the power transmission lines is primarily located in areas of low population. Near the Mountain View Cemetery in Reno, the pipeline rejoins the Union Pacific Railroad right-of-way and follows the rail through Reno and Sparks, joining Highway 80 east of McCarran Road.

The Fallon Naval Air Station portion of the pipeline follows Highway 80 and the railroad right-of-way for about 16 miles to the Tracy Power Plant. East of the Tracy power plant, near the Eagle Pitcher Mine, the pipeline veers to the south, leaving the Truckee River and railroad corridor for about 11 miles. The pipeline rejoins the railroad corridor following the Truckee Canal southwest of Wadsworth and heads east along the railroad right of way through Fallon until it reaches its final destination at the Fallon Naval Airforce Station.

Extent

The overall magnitude and potential severity of hazardous materials incidents are considered **Low** in Washoe County but vary, based on type of facility. The vulnerability to hazardous materials disasters at fixed facilities includes the potential for either an explosive release or insidious leaking of materials into the ground or groundwater. The impact of an accident or spill during roadway or rail transport depends largely on the spill location relative to population centers and waterways. Figure 114 illustrates hazardous materials incident statistics from 2014 to 2023 in the United States by transportation mode by the United States Department of Transportation Pipeline and Hazardous Materials Safety Administration Office of Hazardous Materials Safety.

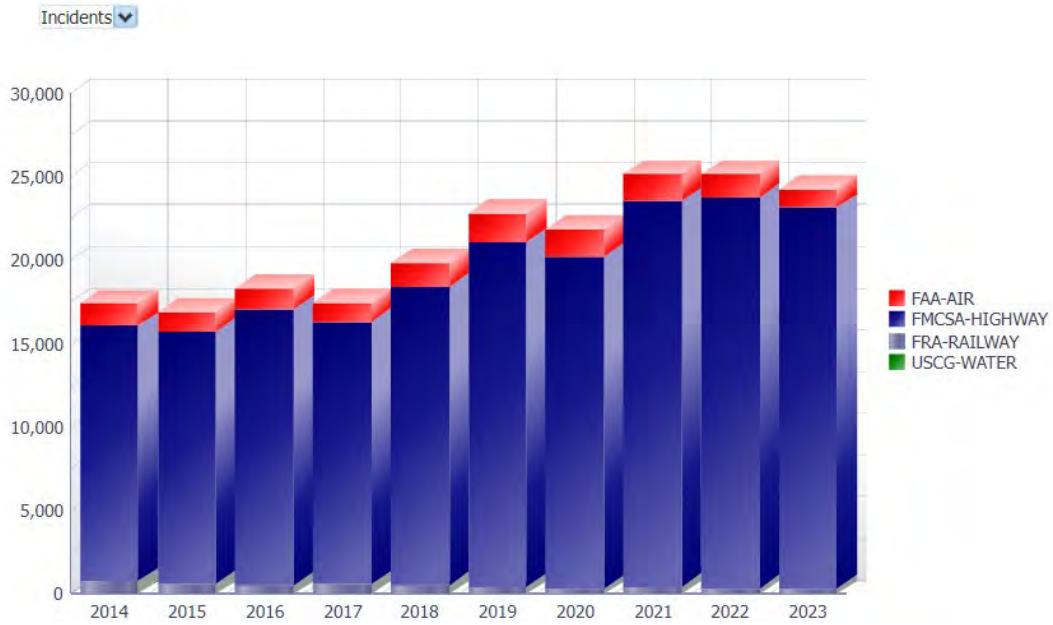

Figure 114: US DOT Pipeline and Hazardous Materials Safety Administration Statistics, 2014–2023[195]

While the potential for a leak would appear to be minimal, cause for concern should be taken seriously. A leak could cause problems anywhere along the corridor, particularly upstream from Chalk Bluff water treatment plant and downstream from Sparks on the spur to Fallon where the pipeline crosses the river six times. A seepage of fuel would be the most difficult to detect and may be the most probable type of leak to impact the Truckee River watershed. Any release or potential for release in the Truckee River watershed area should lead to a review the Truckee River Geographic Response Plan (TRGRP).[196]

Any release from the pipeline could have severe consequences for the population and the environment. The proximity of an existing pipeline to the Truckee River and its inlets and outlets signifies a potential threat to the water system. The communities located along the Truckee River draw their water supply from the river or from wells that are directly affected by

[195] U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration, 2024. https://portal.phmsa.dot.gov/phmsapub/faces/PHMSAHome;PHMSAPUB_SESSIONID=YXOtEF-EcE02b8RvKabrZl93XvE3syA9qt58ZdGKPP_NRZtmBjL1!1352215114?req=-5004889885205992985&attempt=0

[196] U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration, 2024. https://portal.phmsa.dot.gov/phmsapub/faces/PHMSAHome;PHMSAPUB_SESSIONID=YXOtEF-EcE02b8RvKabrZl93XvE3syA9qt58ZdGKPP_NRZtmBjL1!1352215114?req=-5004889885205992985&attempt=0

any product released from the pipeline. Further effects of a pipeline accident, such as the potential for causing wildland fires, are an additional concern.

There are several locations along the pipeline where leak detection can occur; the threshold of detection is about one-tenth of one percent over a period of about 15 minutes. In a catastrophic break, the pipeline can be shut down in about 30 seconds using automatic shutoff valves. Isolation of manual valves is dependent on weather conditions and could require 30 minutes to an hour to close. Once the pipeline is isolated, the product remaining in the pipe can be estimated based on the distance of the block valve from the point of release. If this break is caused by a single isolated event, such as a landslide or rockslide, the damage could be detected, contained, and repaired relatively quickly, assuming fair weather conditions and transportation routes are clear.

In a widespread event, a major earthquake, or flood, fuel distribution would be hampered by power outages, road closures, and perhaps pipeline shut down. Emergency services would be limited to the fuel supplies on hand. Even access to this fuel might be limited by the availability of mobile generators to power pumps. Additional emergency crews would more than likely have to be brought in to repair ruptures along the pipeline, since available personnel would be occupied at the terminal and urban core areas during a major catastrophic event.

More typical hazardous materials accidents are handled at the city or county level, disrupt services for up to two weeks, and have countywide economic impacts. Considering a worst-case scenario, a hazardous materials release could require federal support, could impact critical facilities and disrupt services for more than 20 days, and could have national economic impacts.

Previous Occurrence/History

According to the Federal Pipeline and Hazardous Materials Safety Administration (PHMSA), which releases annual hazardous materials incident reports, there were 1,806 reported incidents throughout the entire state of Nevada from 2015 to 2023, resulting in 14 injuries, two of which required hospitalization. There were no fatalities during this time. Total damage over this time totaled approximately $2,377,408.[197]

Of these incidents, 1,589 occurred on state highways and resulted in damage of approximately $1,852,621 and one hospitalization. A total of 117 incidents occurred on railways, resulting in no injuries and approximately $502,647 in damage. The remaining 100 incidents were associated with airports. No damage was reported beyond five injuries that did not require hospitalization.

[197] Pipeline Hazardous Materials Safety Administration, “Incident Statistics.” https://portal.phmsa.dot.gov/analytics/saw.dll?Portalpages&PortalPath=%2Fshared%2FPublic%20Website%20Pages%2F_portal%2FHazmat%20Incident%20Report%20Search

According to the PHMSA, Washoe County had one reported pipeline spill: along the Kinder Morgan North pipeline in October 2007, caused by equipment failure. The incident released 851 barrels (35,742 gallons).

Since the 1950s, only one major incident has been reported. That spill was caused by damage to the pipeline by a construction crew working above it. Over the past 50 years, the pipeline has been subjected to extensive stream erosion, landslides, and tectonic activity. The fact that the pipeline has survived relatively undamaged over the years is a testament to the quality of the original construction and the ongoing efforts to maintain the pipeline.

Probability of Future Events

The probability of future hazardous materials events varies based on the type of accident considered High. Based on the frequency of past incidents, particularly during transportation of hazardous materials, the overall probability of hazardous materials incidents is considered Medium. As the volume of hazardous materials transport, handling, or production increases, the expected frequency of accidents involving uncontained release increases correspondingly.

It is important to note, however, that an increase in hazardous materials regulation is likely to decrease the potential for hazardous materials releases. The probability of a hazardous materials release on a roadway, rail line, or fixed facility is marginally higher than that of pipeline accidents, due to increased potential for human error or mechanical failure.

Table 77 provides the Calculated Priority Risk Index for Hazardous Materials Incidents in Washoe County. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 77: Calculated Priority Risk Index for Hazardous Materials Incidents in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Hazardous Materials Incident	3	2	4	2	3	2.7

Vulnerability Analysis

Hazardous materials incidents can be caused by a number of factors, including technological failures, natural hazards, such as earthquakes or floods, and human factors. The County and local governments maintain records of hazardous materials storage sites in the Regional Hazardous Materials Response Plan and maintain communications with Nevada Highway Patrol regarding shipments of hazardous materials on all transportation routes throughout the

County. Hazardous materials incidents can be caused by a number of factors. The region's most pressing vulnerability is presented by a transportation incident occurring on the I-80 and/or I-580 highway. Many of the critical facilities and valuable assets are near I-80 and I-580, particularly in the Reno/Sparks corridor. Hazardous materials may be transported through the Reno-Tahoe International Airport. In addition, power plants, water and wastewater treatment plants, hospitals and healthcare facilities, fire stations, and other critical facilities in Washoe County may store hazardous materials on site.

PIPELINE

Any release from the pipeline may have severe consequences for the population and the environment. The proximity of the pipeline to the Truckee River and its inlets and outlets signifies a potential threat to the water system. All the communities located along the Truckee River draw their water supply from the river or from wells that are directly affected by any product release from the pipeline. Environmental damage, including the potential for wildland fire, is an additional consideration.

DEVELOPMENT TRENDS

- **Economic:** Increased transportation of hazardous materials in the corridor increases the probability of a release or spill of bulk hazardous materials to cause fire, explosion, toxic cloud, or direct contamination of people or property. Damage to property could range from immediate destruction by explosion to permanent contamination by a persistent hazardous material (Increased Vulnerability).

- **Land Use:** Kinder Morgan operates an underground pipeline that transports approximately 13 million barrels of petroleum products (gasoline, diesel, and jet fuel) from the pump station in Rocklin, California, to the Sparks, Nevada terminal. Jet fuel is then pumped from the Sparks terminal to the Fallon Naval Air Station. Kinder Morgan also shares a storage facility in Sparks[198] (Increased Vulnerability).

- **Future Land Use**: Excavation is the most likely cause of damage to the pipeline. The potential for rupture because of nearby excavation is greatest in areas where the pipeline corridor intersects highways and railroad right of ways and areas of new construction. As the area in the pipeline corridor continues to grow and expand, the potential for damage will also continue to grow[199] (Increased Vulnerability).

[198] Washoe County Emergency Management and Homeland Security Program, 2020, "Regional Washoe County Hazardous Materials Emergency Response Plan." https://www.washoecounty.gov/lepc/files/HAZMAT-Annex-D-12-17-2020.pdf

[199] Washoe County Emergency Management and Homeland Security Program, 2020, "Regional Washoe County Hazardous Materials Emergency Response Plan." https://www.washoecounty.gov/lepc/files/HAZMAT-Annex-D-12-17-2020.pdf

EXISTING MITIGATION CASE STUDY

KINDER MORGAN PIPELINE MITIGATION ACTIONS

There are several locations along the pipeline where leak detection can occur; the threshold of detection is about one-tenth of one percent over a period of about 15 minutes. In a catastrophic break, the pipeline can be shut down in about 30 seconds using automatic shutoff valves. Isolation of manual valves is dependent on weather conditions and could require 30 minutes to an hour to close. If this break is caused by a single isolated event, such as a landslide or rockslide, the damage could be detected, contained, and repaired relatively quickly, assuming fair weather conditions and transportation routes are clear.[200]

VULNERABILITY SCORE

A vulnerability score has not been calculated for this hazard, as the NRI only profiles natural hazards.

COMMUNITY INPUT

Public members expressed concern for hazardous materials within the Truckee River, Sparks Industrial area, and Hwy 80 and 395. One member expressed concern about storing hazardous materials along the Truckee River and about older businesses storing various materials along the river route. Another member was concerned about hazardous materials being stored in buildings and along highways.

The public did not suggest any specific mitigation measures for this hazard. However, multiple comments were received on educating about the hazardous incident mitigation plan, practicing the plan, and evaluating the plan for improvements. One member commented on ensuring a hazardous waste team was prepared before a hazardous material event occurred.

[200] Washoe County Emergency Management and Homeland Security Program, 2020, "Regional Washoe County Hazardous Materials Emergency Response Plan." https://www.washoecounty.gov/lepc/files/HAZMAT-Annex-D-12-17-2020.pdf

Infectious Disease

Hazard Description

While chronic disease has placed a lasting strain on the nation's healthcare system, acute infectious disease poses a greater immediate and severe threat to its capacity. These diseases, caused by pathogenic bacteria, viruses, fungi, or parasites, are often marked by debilitating symptoms, such as fever, diarrhea, fatigue, muscle aches, coughing, respiratory issues, and rashes.[201] An outbreak of infectious diseases can bring socioeconomic activity and critical government functions to a standstill.

Diseases can spread in a number of ways—direct and indirect contact, inhalation, and vectors. Diseases that spread easily through respiratory transmission and human-to-human contact can pose significant risks to communities due to their difficulty to isolate and control, often leading to rapid and widespread outbreaks.

Some diseases, such as Salmonella and E. coli infections, can spread quickly through food and water sources. Though these diseases are treatable, they can lead to severe symptoms or death if not addressed quickly. Containing the spread of these diseases requires identifying and addressing the source of contamination of the food or water supply and communicating risks and safety measures to the public.

Some diseases, transmitted through animal vectors, are a constant concern as they evolve and adapt. What was once a disease exclusive to animals may have gained the ability to infect humans. A prime example is the West Nile virus, which has impacted communities nationwide. This virus, transmitted through mosquito bites, can affect birds, horses, and humans, often leading to severe symptoms or death.

It is not just human health that is at stake. Diseases that affect livestock, such as the West Nile virus or the recent outbreaks in dairy cattle and poultry from Highly Pathogenic Avian Influenza H5, can wreak havoc on our economy. These diseases can spread rapidly through livestock flocks or herds, sometimes necessitating the culling of entire populations, and causing significant financial hardship.

Table 78: Levels of Disease[202]

Term	Definition
Sporadic	Refers to a disease that occurs infrequently and irregularly.

[201] Mayo Clinic, "Infectious Diseases." https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/syc-20351173

[202] CDC Archive, "Introduction to Epidemiology." https://archive.cdc.gov/www_cdc_gov/csels/dsepd/ss1978/lesson1/section11.html

Term	Definition
Endemic	Refers to the constant presence and/or usual prevalence of a disease or infectious agent in a population in a geographic area.
Hyperendemic	Refers to persistent, high levels of disease occurrence.
Epidemic	Refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area.
Outbreak	Carries the same definition of epidemic but is often used for a more limited geographic area.
Cluster	Refers to an aggregation of cases grouped in place and time that are suspected to be greater than the number expected, even though the expected number may not be known.
Pandemic	Refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

The recent COVID-19 pandemic is a good example of how disease outbreaks can rapidly evolve into much larger-scale incidents that have wide-ranging effects on the health of the population, the economy, and the supply chain of many different services and materials. Several primary diseases of concern in Washoe County have been identified, along with the potential impact of climate change, and other risk factors for communicable diseases. For a full list of reportable diseases, see the Northern Nevada Public Health (NNPH) website: https://www.nnph.org/files/Nevada-List-of-Reportable-Communicable-Diseases-03-2024.pdf.

The World Health Organization monitors infectious disease conditions and their migration on a global level. In the United States, the Centers for Disease Control and Prevention (CDC) handles the monitoring of infectious diseases. Statewide, the Nevada Division of Public and Behavioral Health is the lead agency for monitoring infectious diseases. Northern Nevada Public Health (NNPH) is the lead local agency responsible for the prevention, control, and treatment of infectious disease in the planning area. Due to the large number of tourists and travelers passing through Washoe County, highly contagious diseases can easily spread to and from nearby communities. NNPH's Communicable Disease Team works in conjunction with the following prevention and control programs: tuberculosis, foodborne illness, sexually transmitted disease, Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS), vaccine-preventable diseases, and vector-borne diseases, and it conducts disease surveillance in an effort to:

- Protect the health of the public;
- Determine the extent of morbidity in the community;
- Evaluate the risk of transmission; and
- Intervene rapidly when appropriate.

Nevada Administrative Code, Chapter 441A1, identifies diseases of public health significance that must be reported to the WCHD. Persons required to report include healthcare providers and directors of hospitals and healthcare facilities, diagnostic laboratories, schools, childcare facilities, correctional facilities, and permitted food establishments. Each report is investigated to characterize the illness, collect demographic information about the case, identify sources of the infection, and take steps to minimize the risk of further disease transmission. Data is collected, maintained, and analyzed at the program level.

Location

Infectious diseases spread by humans, and vector-borne infectious diseases can occur in both urban and non-urban areas throughout the County. Areas in the county that are more susceptible to infectious diseases are typically those with higher population density, such as Reno and Sparks, and areas with poor sanitation and limited access to healthcare services. On the other hand, areas more susceptible to vector-borne diseases are often those with standing water or extensive vegetation, providing suitable habitats for disease-carrying vectors, such as mosquitoes and ticks. These are more prevalent in non-urban areas.[203]

Extent

The overall magnitude and potential severity of infectious disease outbreak impacts are considered Medium in Washoe County. Typical disease outbreaks are handled at the city or county level. Severe outbreaks may disrupt services for weeks, and economic impacts may be felt at the county level.

The Northern Nevada Public 2023 Annual Communicable Disease Summary reports that communicable diseases are a continuing threat to everyone, regardless of age, gender, lifestyle, ethnic background, or socioeconomic status.[204] They cause illness, suffering, and death and place an enormous financial burden on society. Currently, over 90 diseases or conditions are reportable in Nevada. In 2023, over 17,400 cases were reported to Northern Nevada Public Health. The numbers dramatically decreased from the 2022 report due to COVID-19 not being as prevalent (see Figure 115).[205]

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[203] Northern Nevada Public Health, 2023, "Total Reportable Cases of Selected Communicable Diseases by Year, Washoe County, 2019–2023." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

[204] 2023 NNPH Annual Report data at this link: https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

[205] 2023 NNPH Annual Report data at this link: https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

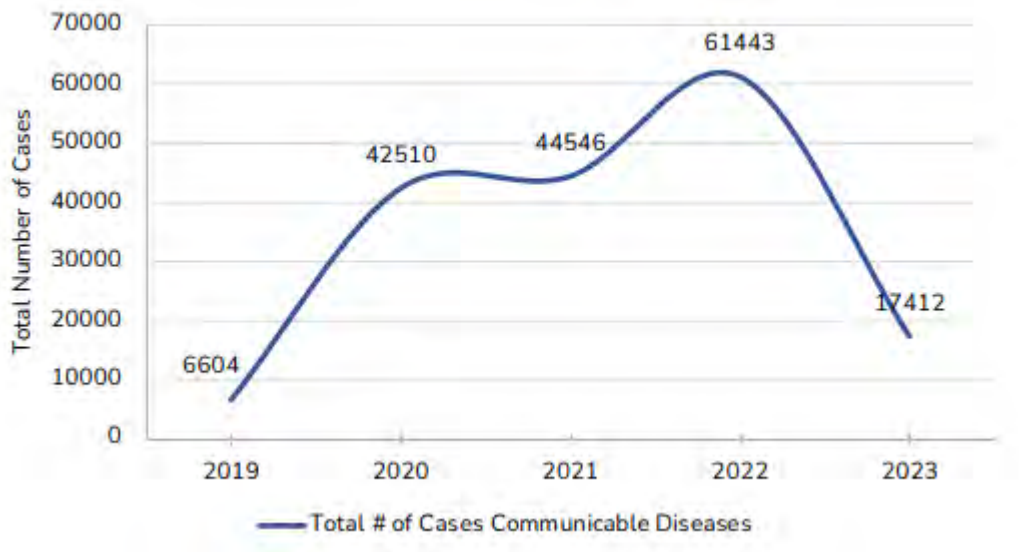


Figure 115: Northern Nevada Annual Communicable Disease Total, 2019–2023[206]

VACCINE-PREVENTABLE DISEASE

Coronavirus disease 2019, commonly known as COVID-19, is a respiratory disease caused by the SARS-CoV-2 virus. Like many other respiratory viruses, it is spread by people encountering respiratory droplets from infectious individuals.

The symptomology of COVID-19 is broad, ranging from mild symptoms to severe illness. The more common symptoms include fever, chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, loss of taste or smell, congestion, sore throat, nausea or vomiting, and diarrhea. These symptoms may worsen, and emergency medical attention may be needed if signs such as trouble breathing, persistent pain or pressure in the chest, new confusion, inability to wake or stay awake, or a pale gray or blue coloration in the skin, lips, or nail beds. Risk factors for higher susceptibility to severe illness include individuals with underlying health conditions, immunocompromised individuals or those with a weakened immune system, and older adults.

COVID-19 infection or severe illness can be prevented by staying up to date with COVID-19 vaccines, washing hands and using alcohol-based sanitizer, wearing a mask if infected or exposed, improving ventilation, and conducting group activities outdoors.

[206] Northern Nevada Public Health, 2023, "Total Reportable Cases of Selected Communicable Diseases by Year, Washoe County, 2019–2023." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

COVID-19 was a global pandemic with cases and deaths occurring around the world. In Nevada, all counties reported cases of COVID-19. While the public health emergency declaration ended in the United States in May 2023, COVID cases still occur regularly in Nevada. It is unknown if the virus will become more seasonal in nature, like influenza. However, COVID-19 is considered more of an endemic virus as of summer 2023, meaning that it regularly occurs and has a consistent prevalence in the population. Future outbreaks may occur because of travel and mass gatherings in congregate settings or in settings with high population density.

Influenza "**flu**" is caused by two main types of influenza viruses: types A and B. Influenza is a respiratory illness that routinely spreads in humans, causing seasonal epidemics each year. Influenza can cause mild to severe illness, sometimes leading to death. Symptoms are usually sudden and include fever/feeling feverish, chills, cough, sore throat, runny/stuffy nose, muscle/body aches, headaches, fatigue, and sometimes vomiting and diarrhea.

Influenza typically spreads from person to person, through respiratory droplets released when people with the flu cough, sneeze, or talk. These droplets land in the mouths or noses of those nearby or are inhaled into the lungs. Less commonly, a person might get the flu by touching a surface or object with the flu virus on it, then touching their own mouth, nose, or eyes.

Antiviral drugs are a treatment option but work best if started within two days after symptoms begin. People at higher risk of flu complications include young children, adults 65 years of age and older, pregnant women, and people with certain medical conditions, such as asthma, diabetes, and heart disease.

VECTOR-BORNE DISEASES

Lyme disease, the most common vector-borne disease in the United States, is caused by two species of bacteria: *Borrelia burgdorferi* and *Borrelia mayonii*. Blacklegged ticks (*Ixodes scapularis* and *Ixodes pacificus*) are the primary vectors for Lyme disease transmission. Though they can attach to any part of the body, they are often found in hard-to-see areas and must be attached for 36–48 hours for the Lyme disease bacterium to be transmitted. Typical signs and symptoms of Lyme disease, including fever, chills, headache, fatigue, myalgia, erythema migrans rash, or swollen lymph nodes, occur 3–30 days after a tick bite. If left untreated, the infection can spread to the joints, heart, and nervous system. The four major manifestations of Lyme disease are erythema migrans, neurologic Lyme disease, Lyme carditis, and Lyme arthritis. Timely tick removal and testing are essential to prevention and early diagnosis. Antibiotic treatment based on the manifestation of Lyme disease is important and can help prevent chronic Lyme disease. Other methods of prevention include the use of insect repellent, applying pesticides, and reducing tick habitat.

SEXUALLY TRANSMITTED INFECTIONS (STI)

Human Immunodeficiency Virus (**HIV)** attacks the body's immune system and, if left untreated, can progress to Stage 3 HIV, formerly known as AIDS. There is no cure for HIV. However, with

effective treatment, the disease can be managed and people with HIV can live a long time. HIV is most often transmitted through vaginal or anal sex or by sharing needles or syringes. Usually, the only symptoms associated with HIV are experienced within the first 2-4 weeks after infection, and mirror flu-like illness. Once HIV progresses to Stage 3, which may be decades later, the immune system is damaged, and people are more likely to become ill from infections not typically experienced by immune-typical persons. These are known as opportunistic infections. CD4 cell lymphocyte count and percentage and the presence of opportunistic infections indicate the stage of infection. Stage 3 indicates that HIV disease has progressed in a person, over a prolonged period. This term has replaced Acquired Immunodeficiency Syndrome (AIDS) as a disease surveillance definition.

ENTERIC

Campylobacteriosis is caused by the bacterium *Campylobacter* in humans and, according to CDC estimates, is the number one cause of bacterial diarrheal illness in the United States.

People with Campylobacteriosis may experience bloody diarrhea, fever, stomach cramps, nausea, and vomiting. *Campylobacter* is carried in the intestines of animals and is most often acquired through the slaughter of animals or cross-contamination of fruits, vegetables, or milk that has been left untreated, contaminated water, or soil that contains feces. People preparing food may inadvertently contaminate food through cutting or preparing on surfaces that had been used with raw or undercooked poultry. Antibiotics can lessen the duration of symptoms. However, most recover without antibiotic treatment while focusing on rehydrating. Figure 116 shows the status in the County as of April 2024.

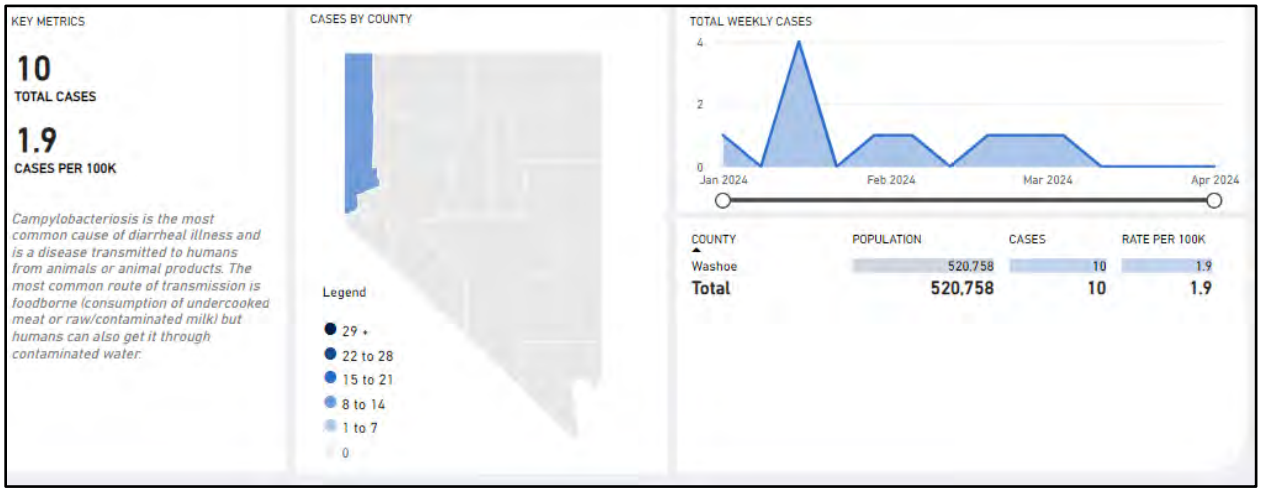


Figure 116: Status of Campylobacteriosis Cases, Washoe County, April 5, 2024[207]

[207] Nevada Department of Health and Human Services, Office of Analytics, 2024, "Infectious Disease Data Portal."

Cryptosporidiosis is caused by a parasite, *Cryptosporidium*, which is most often spread through drinking water or recreational water contaminated by fecal matter; it is the leading cause of waterborne illness in the United States. Symptoms include watery diarrhea, stomach cramps, dehydration, nausea, vomiting, fever, and weight loss. Most people with healthy immune systems recover without treatment. However, those in poor health or with weakened immune systems are at risk of a more severe and longer duration of illness and may benefit from treatment.

Infection can be prevented by hand washing with soap and water; alcohol-based sanitizers are ineffective against *Cryptosporidium*. It can be avoided by not swallowing untreated water or unpasteurized milk products.

BLOODBORNE

Hepatitis B is a vaccine-preventable liver infection caused by the hepatitis B virus (HBV). Hepatitis B can become long-term or chronic and can lead to serious, even life-threatening, health issues, such as cirrhosis or liver cancer. Most people with chronic HBV are asymptomatic and have no evidence of liver disease or injury. However, some develop cirrhosis or hepatocellular carcinoma (i.e., primary liver cancer). Approximately 25% of those infected during childhood and 15% who become chronically infected after childhood die prematurely from cirrhosis, and most remain asymptomatic until the onset of end-stage liver disease. HBV can be transmitted through sexual contact with an infected partner, contact with infectious body fluids, or sharing items with a person with HBV infection that can break the skin, such as razors, toothbrushes, and needles, or exposure to needle sticks. HBV infection can be prevented by being vaccinated.

Hepatitis C (HCV) can range from a mild illness lasting a few weeks to a serious, long-term, or chronic illness. More than half of those with HCV develop a chronic infection. Chronic HCV can cause serious, even life-threatening health problems like cirrhosis and liver cancer. Most people with chronic HCV do not have any symptoms or have only general symptoms, such as chronic fatigue and depression. HCV transmission can occur through contact with blood from an infected person. This can include sharing drug-injection equipment, sexual contact, healthcare exposure, giving birth, and sharing items that can break the skin, such as razors and toothbrushes. Currently, there is no vaccine to prevent HCV. Treatment usually involves 8–12 weeks of oral therapy (pills) and cures over 90% of cases, with few side effects.

OTHER

Mpox (**previously known as monkeypox)** is caused by an orthopoxvirus, which is in the same family as smallpox. Before 2022, almost all cases of Mpox outside Africa were found to be

https://app.powerbigov.us/view?r=eyJrIjoiNTNjYWU0M2ItMWI5My00NGRjLTg2ZWQtMmU5NmY1ZGQxNDVhIiwidCI6ImU0YTM0MGU2LWI4OWUtNGU2OC04ZWFhLTE1NDRkMjcwMzk4MCJ9

related to international travel. Transmission occurs through person-to-person contact, either through direct contact with the rash and scabs of an infected person or through intimate contact. While less likely, transmission can also occur by touching objects, fabrics, and surfaces that have been used by a person with Mpox and not disinfected. Once exposed to the virus, the incubation period is 3–17 days. The virus can spread once symptoms start and continue until the rash is fully healed and a new layer of skin has formed. The rash goes through several stages, including scabbing, before healing. It initially looks like a pimple or blister and can be painful or itchy. Other symptoms include fever, chills, swollen lymph nodes, exhaustion, muscle aches, backaches, and respiratory symptoms (e.g., sore throat, congestion, or cough). The current Mpox outbreak has mostly occurred in gay, bisexual, or other men who have sex with men. Vaccination (JYNNEOS) is the best way to prevent Mpox if exposed or are at a higher risk of being exposed. Other preventive measures include reducing risks during sexual activity and social gatherings until vaccinations are complete. Close, skin-to-skin contact with those who have a rash that looks like Mpox should be avoided, as should contact objects or materials that a person with Mpox has used. Hands should be washed with soap and water or alcohol-based hand sanitizers. Figure 117 shows the status in the County as of April 2024.

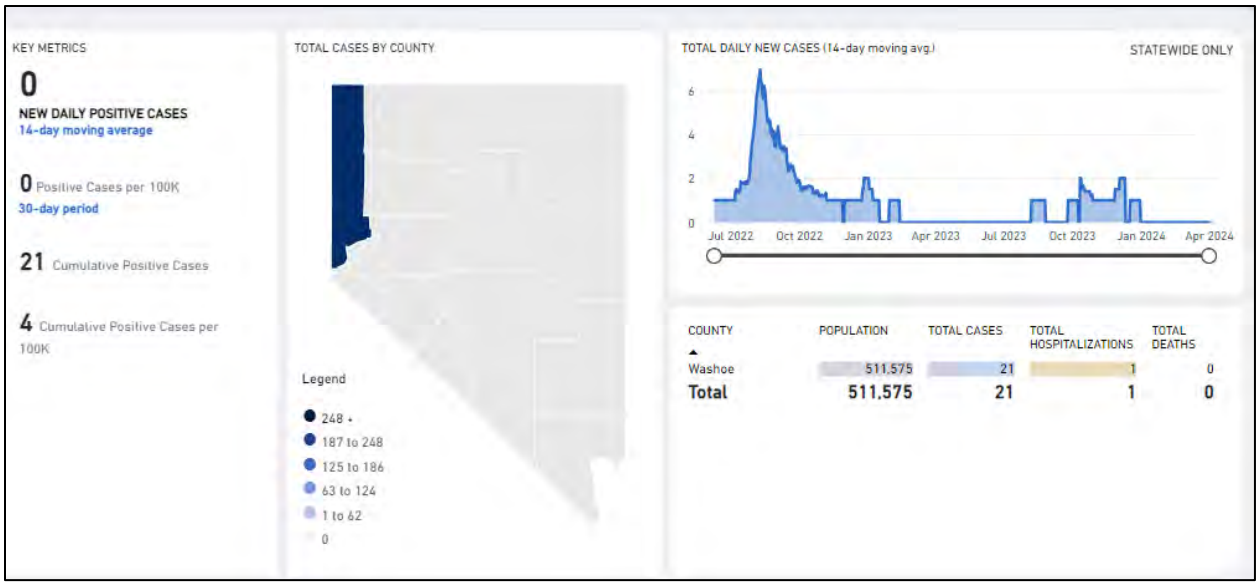


Figure 117: Status of Mpox (formerly Monkey Pox) Cases, Washoe County, April 5, 2024[208]

[208] Nevada Department of Health and Human Services, Office of Analytics, 2024, "Infectious Disease Data Portal." https://app.powerbigov.us/view?r=eyJrIjoiNTNjYWU0M2ItMWI5My00NGRjLTg2ZWQtMmU5NmY1ZGQxNDVhIiwidCI6ImU0YTM0MGU2LWI4OWUtNGU2OC04ZWFhLTE1NDRkMjcwMzk4MCJ9

Previous Occurrence/History

Selected occurrences of infectious diseases as human health hazards in Washoe County from 2015 to 2024 are discussed in the following sections.

- **2024**—Shigellosis is an infectious disease caused by bacteria of the genus Shigella. It primarily spreads through the fecal-oral route, often via contaminated food or water, and can lead to symptoms such as diarrhea (which may be bloody), fever, and stomach cramps. Shigellosis is highly contagious, and good hygiene practices, such as handwashing, are essential for prevention. In 2024, 27 cases of Shigellosis were reported in Washoe County.[209]

- **2020 – COVID-19:** COVID-19, or coronavirus disease 2019, is caused by the SARS-Co-V-2 virus. It is considered a respiratory illness, but it can affect areas of the body besides the respiratory system. Respiratory symptoms range from mild to severe. COVID-19 was declared a public health emergency of international concern (PHEIC) on January 30, 2020, and a global pandemic by the World Health Organization on March 11, 2020. The United States declared COVID-19 a national emergency from March 13, 2020, to May 11, 2023. The state of Nevada declared COVID-19 a public health emergency on March 12, 2020. Additional guidance and recommendations on gatherings and closure were issued in the weeks following and are detailed in the COVID-19 timeline of the Nevada Department of Health and Human Services Division of Public and Behavioral Health. Figure 118 shows the status in the County as of April 2024.

[209] Northern Nevada Public Health, "Vol 44 No 35 12-24-2024 Epi News Shigellosis Outbreak." https://www.nnph.org/files/ephp/epi-news/2024/Vol%2044%20No%2035%2012-24-2024%20Epi%20News_Shigellosis%20Outbreak.pdf

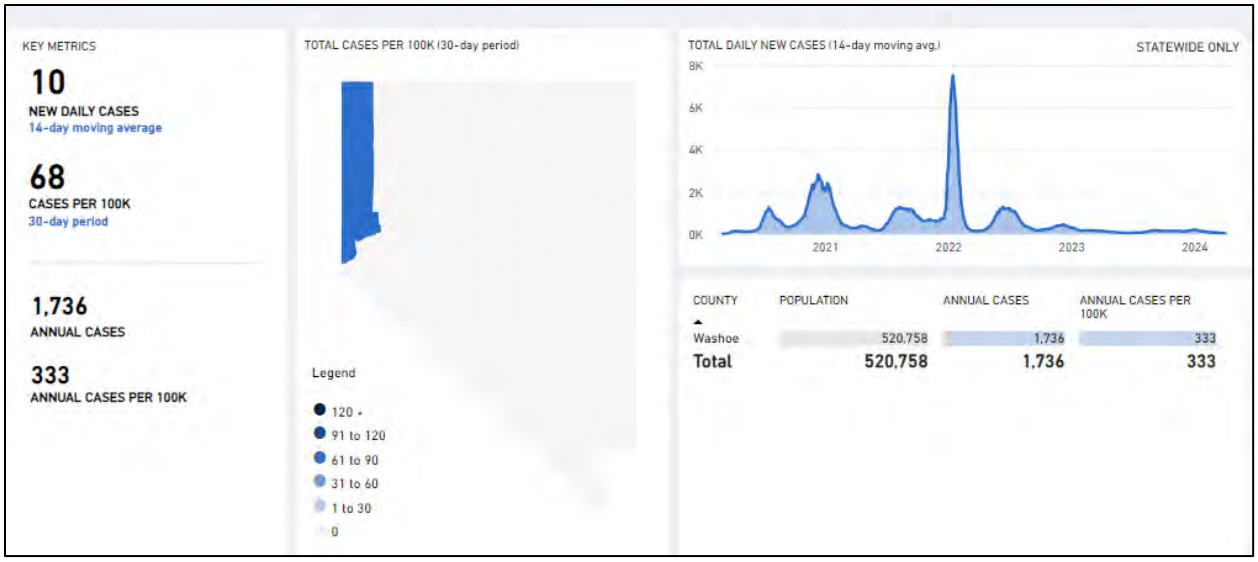


Figure 118: Status of COVID-19 Cases, Washoe County, April 5, 2024[210]

- **2018 – Measles:** One lab-confirmed case of measles was reported in the County in 2018. NNPH, activated its Incident Command System and proactively treated, quarantined, isolated, or monitored people who had had contact with the infected person.

- **2018 – *Escherichia coli* (*E. coli*):** NNPH identified six cases of infected people with a superbug called *Klebsiella pneumoniae carbapenemase* (KPC)-producing *E. coli* in a state-licensed group home. The WCHD's response to this outbreak contributed to the CDC re-evaluating its recommendations for preventing the spread of similar bacteria in group home settings.[211]

- **2017 – Zika:** NNPH coordinated Zika testing for 53 individuals.[212]

- **2017 – Carbapenemase-producing organisms (CPO):** NNPH investigated six cases of CPO (WCHD, n.d. [b]). CPO are bacteria, such as *Klebsiella, E. coli, Acinetobacter*, and *Pseudomonas*, found in normal human intestines that have acquired genes that make them resistant to broad-spectrum antibiotics. CPO can spread outside the intestines and cause serious conditions, such as urinary tract infections, bloodstream or wound infections, and pneumonia, which are difficult to treat because of the antibiotic resistance developed by

[210] Nevada Department of Health and Human Services, Office of Analytics, 2024, "Infectious Disease Data Portal." https://app.powerbigov.us/view?r=eyJrIjoiNTNjYWU0M2ItMWI5My00NGRjLTg2ZWQtMmU5NmY1ZGQxNDVhIiwidCI6ImU0YTM0MGU2LWI4OWUtNGU2OC04ZWFhLTE1NDRkMjcwMzk4MCJ9

[211] Northern Nevada Public Health, "Vol 39 No 05 03-06-2019 Q4 2019 and 2018 State.pdf." https://www.nnph.org/files/ephp/epi-news/2019/Vol%2039%20No%2005%2003-06-2019%20Q4%202018%20and%202018%20Stats.pdf

[212] Ibid.

the bacteria (British Columbia Centre for Disease Control et al. 2014). In 2017, one resident of the County died from an infection of *New Delhi Metalo-Beta-Lactamase-Producing Klebsiella pneumoniae* that was resistant to all antibiotics available for treatment.[213] **2015–2016 –** Ebola: While no Ebola cases have been confirmed in Washoe County, the WCHD and partner agencies have increased infectious disease preparedness efforts in response to the international Ebola outbreak. In 2015, NNPH monitored individuals returning from countries with Ebola outbreaks, provided training and exercises for hospitals and healthcare providers, and developed a website for Point of Dispensing training (WCHD n.d. [c]). NNPH provides personal protective equipment for first responders during Ebola and other highly infectious disease responses. NNPH, regional hospitals and healthcare facilities, and REMSA designed a full-scale Ebola exercise that tested responses to both a walk-in Emergency Room patient and a patient identified at a satellite healthcare facility.[214]

- **2015 – Norovirus:** In 2015, NNPH investigated a large outbreak of Norovirus affecting public and private schools and daycare facilities. More than 2,000 cases were identified during this outbreak.[215]

- **2015 – E. coli:** An outbreak of 28 cases of *E. coli* resulted in hospitalization of 13 people. Five individuals developed a serious complication known as Hemolytic Uremic Syndrome.[216]

Figure 119 displays information regarding infectious disease cases in Washoe County in 2022.

[213] Ibid.
[214] Ibid.
[215] Ibid.
[216] Ibid.

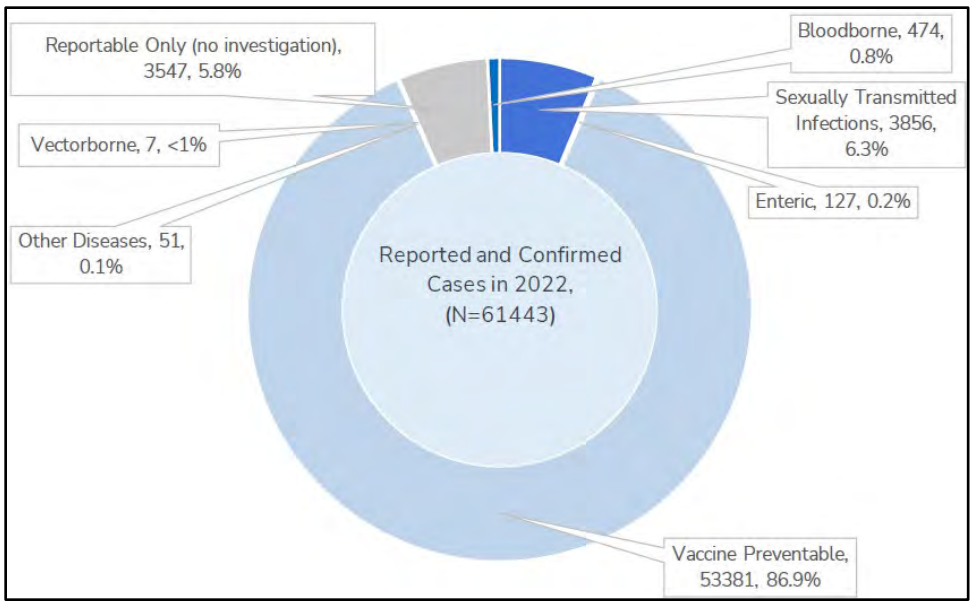


Figure 119: Cases Reported by Type, Washoe County, 2022[217]

Table 79 lists the numbers of communicable diseases, by type, reported in Washoe County from 2018 to 2023.

Table 79: Reportable Cases of Selected Communicable Diseases by Year, Washoe County, 2018–2023[218]

Type	2018	2019	2020	2021	2022	2023
Campylobacteriosis	46	48	28	92	61	54
Chlamydia	2729	2682	2526	2451	2448	2300
Coccidioidomycosis	8	8	15	9	8	11
COVID			36,324	7,552	2,767	10,048
Cryptosporidium	18	18	5	5	12	10
Escherichia coli/ Shiga toxin-producing Escherichia coli (EHEC/STEC)	12	4	5	7	8	12

[217] Northern Nevada Public Health, 2024, Annual Summary Report, "Cases Reported by Type, Washoe County, 2022." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2022_Updated.pdf

[218] Northern Nevada Public Health, 2024, "Total Reportable Cases of Selected Communicable Diseases by Year, Washoe County, 2019–2023." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

Type	2018	2019	2020	2021	2022	2023
Giardiasis	20	10	20	17	15	16
Gonorrhea	918	864	1131	1054	824	607
Group A Strep, Invasive	5	2	10	5	5	NR
Hepatitis B (Chronic)	62	65	60	48	56	79
Hepatitis C (past or present)	648	680	476	332	466	232
Human Immunodeficiency Virus (HIV)	27	37	31	24	27	38
Hospitalized with Influenza	542	266	11	148	348	210
Lyme	4	1	1	5	5	8
Pertussis	13	27	13	5	10	5
Invasive Pneumococcal Disease	70	100	67	53	79	57
Rotavirus	12	9	7	1	9	12
RSV	480	720	622	959	2141	1638
Salmonellosis	36	30	25	31	20	30
Stage 3 HIV Infection (AIDS)	14	12	11	14	16	14
Syphilis (primary and secondary)	111	160	133	159	153	146
Tuberculosis	9	8	4	7	6	9

*Count more than 5 in recent year.

Table 80 lists cases, by type, reported in Washoe County in 2023.

Table 80: Numbers of Cases, by Type, in Washoe County, 2023

STI		Enteric		VPD		Bloodborne		Vectorborne		Other		Reportable Only (investigation if outbreak)	
Chlamydia	2300	Campylobacteriosis	54	COVID	10048	Hepatitis C, Acute	6	Dengue Fever	2	Candida auris	3	Animal Bites	1246
Gonorrhea	607	Cryptosporidiosis	10	Hepatitis B, Acute	7	Hepatitis C, Chronic	232	Ehrlichiosis	1	Coccidioidomycosis	11	EBLL*	60
HIV	38	EHEC/STEC*	12	Hepatitis B, Chronic	79			Hantavirus	2	CPO*	5	Invasive H. flu , not type b	18
Stage 3 HIV Infection (AIDS)	14	Giardiasis	16	Influenza**	210			Lyme	8	Legionellosis	4	RSV*	1638
Stage 3 HIV Infection-Progressed to Stage 3	7	Listeriosis	1	Invasive Pneu. Disease	57			West Nile Neuroinvasive	1	Streptococcal Toxic Shock Syndrome	2		
Syphilis	424	Salmonellosis	30	Meningococcal	1					Tuberculosis	9		
		Shigellosis	5	Pertussis	5								
		Vibriosis	4	Rotavirus	12								
		Yersiniosis	3	Varicella	10								
Total	3390	Total	135	Total	10429	Total	238	Total	14	Total	34	Total	2962

EHEC/STEC - *Escherichia coli*/ Shiga toxin-producing *Escherichia coli*

CPO - Carbapenemase producing organisms

RSV - Respiratory Syncytial Virus

EBLL – Elevated Blood Lead Level

**Influenza count includes only hospitalized cases

Probability of Future Events

Climate change can have significant impacts on the spread of infectious diseases. As temperatures and precipitation patterns shift, the geographic range of disease-carrying vectors, such as mosquitoes and ticks, can expand, bringing diseases like malaria, dengue fever, and Lyme disease into new areas. Warmer temperatures can also speed up the reproduction and development of these vectors, allowing them to spread diseases more quickly. Additionally, changes in precipitation can create new breeding grounds for disease-carrying organisms. Overall, climate change can create more favorable conditions for the transmission and spread of infectious diseases, posing a threat to global public health.

Cases of infectious disease occur annually in Washoe County, and the probability of future events is estimated at Medium. Based on potentially changing climate patterns, an increase in the likelihood of emerging infectious diseases may impact Washoe County.

Figure 120 through Figure 124 show the rates of reported cases for five illnesses in recent periods.

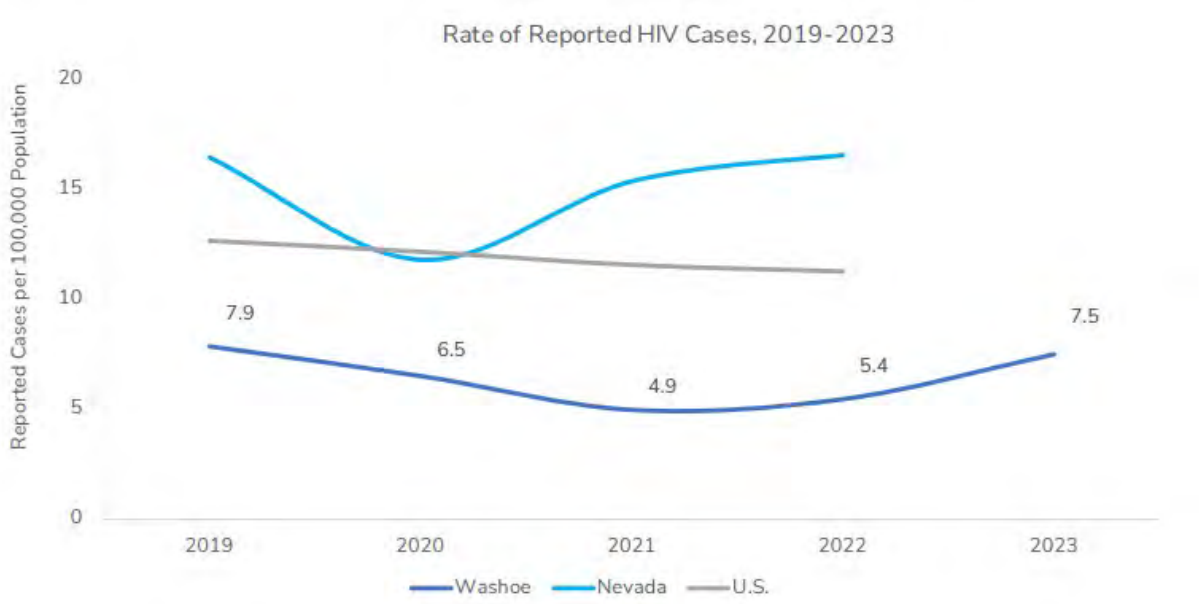


Figure 120: Rate of Reported HIV Cases, 2019–2023[219]

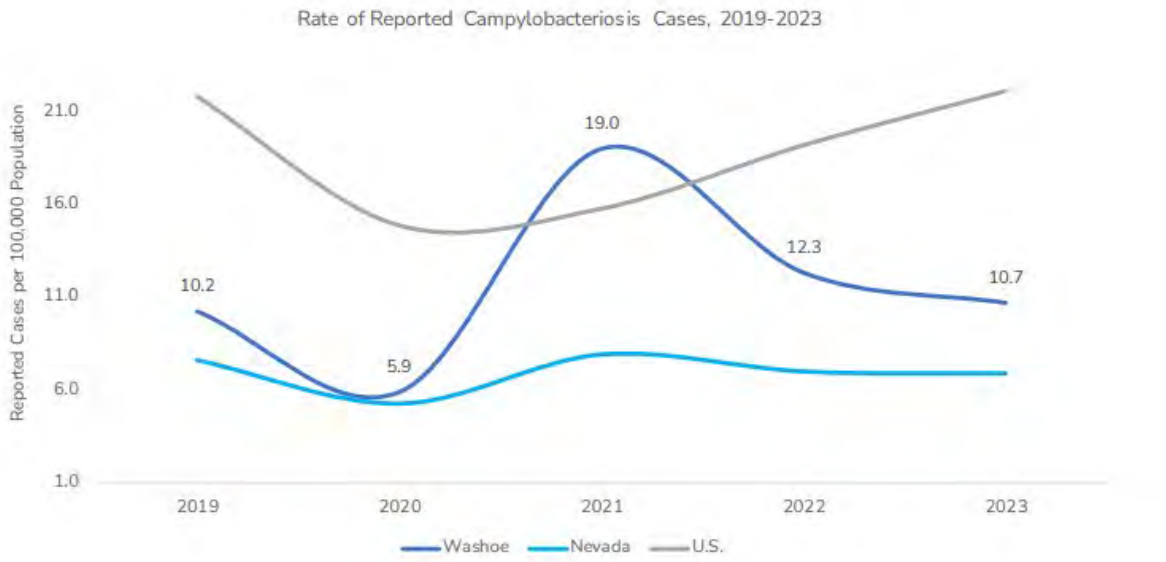


Figure 121: Rate of Reported Campylobacteriosis Cases, 2019–2023[220]

[219] Northern Nevada Public Health, 2023 Annual Communicable Disease Summary, "Rate of Reported HIV Cases, 2019–2023." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

[220] Northern Nevada Public Health, 2023 Annual Communicable Disease Summary, "Rate of Reported Campylobacteriosis Cases." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

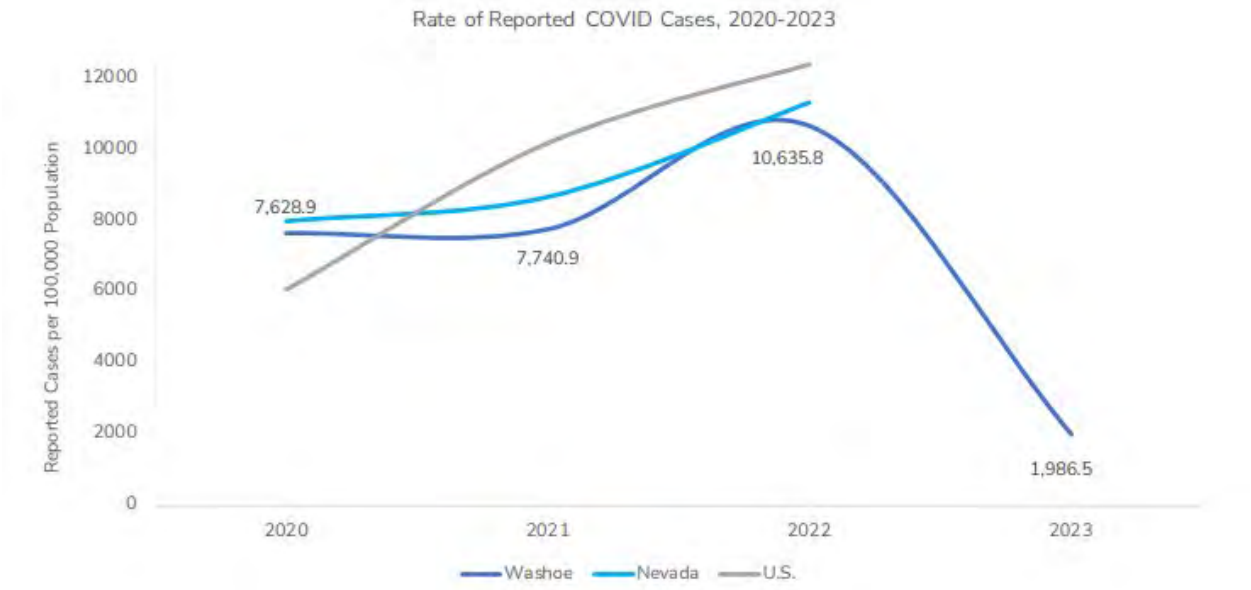


Figure 122: Rate of Reported COVID-19 Cases, 2020–2023[221]

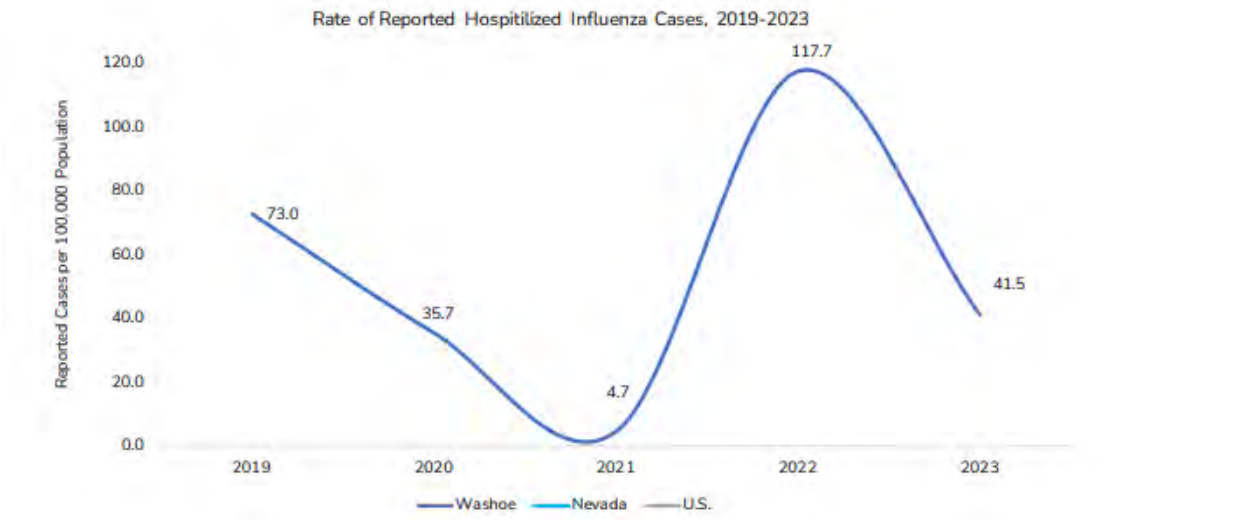


Figure 123: Rate of Reported Hospitalized Influenza Cases, 2019–2023[222]

[221] Northern Nevada Public Health, 2023 Annual Communicable Disease Summary, "Rate of Reported Covid Cases, 2020–2023." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

[222] Northern Nevada Public Health, 2023 Annual Communicable Disease Summary, "Rate of Reported Hospitalized Influenza Cases, 2019–2023."

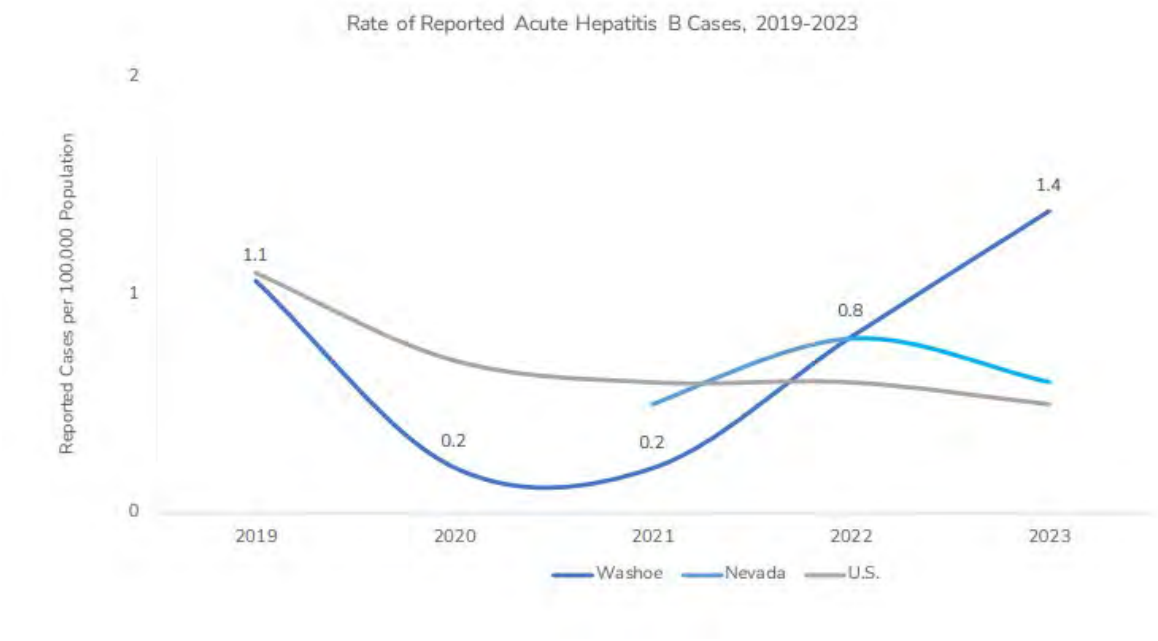


Figure 124: Rate of Reported Acute Hepatitis C Cases, 2019–2023[223]

Scientific researchers emphasize the need for a comprehensive approach to outbreak forecasting that encompasses various modeling techniques. While certain aspects of outbreaks are predictable, it is still uncertain whether there are inherent limits to outbreak prediction. The scientific community has gained substantial insights into how factors, such as social contact networks, healthcare infrastructure variability, and prior immunity distribution, contribute to the complex dynamics of disease transmission. Studies have shown that data-driven, dynamic, and agent-based models can generate practical forecasts. Furthermore, research has proven the feasibility of predicting different outbreak components, such as the expected number of cases, pace of treatment, demand for protective equipment, and importation probability. Despite these advancements, the scientific community is engaged in an ongoing discussion regarding the need for and our ability to effectively forecast outbreaks.

Table 81 provides the Calculated Priority Risk Index for Infectious Disease in Washoe County. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

[223] Northern Nevada Public Health, 2023 Annual Communicable Disease Summary, "Rate of Reported Acute Hepatitis C Cases, 2019–2023." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

Table 81: Calculated Priority Risk Index for Infectious Disease in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Infectious Disease	2	2	1	4	2	2.1

POTENTIAL IMPACTS FROM FUTURE CLIMATE CONDITIONS

The 2018 Nevada Enhanced SHMP reports that it is unknown how climate change will affect the frequency or occurrences of epidemics in Nevada.

- Changing climatic conditions will influence the distribution and occurrence of vector-borne diseases.
- Infectious diseases, ground-level ozone pollution, dust storms, and changes in allergens may combine with extreme temperatures and precipitation to generate multiple disease burdens.
- Episodes of drought and extreme precipitation, coupled with rising temperatures, promote the growth, and spread of pathogens.

Vulnerability Analysis

EXPOSURE

Infectious diseases have been known to spread quickly through communities. Many spread through close contact, meaning that highly populated areas like Reno and Sparks are more prone to widespread outbreaks. Public gathering places where people may be together in close quarters, such as schools and childcare facilities, offices, and transportation terminals, provide more opportunities for diseases to pass from one person to another.

Land use changes can have a major impact on infectious disease numbers. This is done by changing the rate of contact between individuals and disease hosts, whether animal, insect, or fungal. Along with this change in contact rate, land use changes can also alter the composition of local species, potentially allowing vector species to become the dominant species.

Outbreaks of infectious diseases most often affect pockets of vulnerable populations. However, a worst-case scenario could overwhelm local hospitals and healthcare facilities and require a surge response.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Vaccine hesitancy has been a public health issue for many years, and it increased during the COVID-19 pandemic. Many infectious diseases are entirely vaccine preventable (e.g., Hepatitis A) or have reduced transmission, extent, and severity (e.g., influenza, COVID-19). Vaccines are a powerful public health tool to prevent and mitigate disease and reduce the potential for outbreaks. Increases in vaccine hesitancy are of concern, as herd immunity is necessary to help reduce the likelihood of outbreaks.

VULNERABLE POPULATIONS

Population growth could increase the risk of infectious disease outbreaks and their impact on hazard mitigation for Nevada. The estimated population of Washoe County in 2024 is 499,064, with a growth rate of 0.21% in the past year, according to the most recent United States census data. Washoe County is the second largest county in Nevada. The 2010 population was 421,969, and it has grown 18.27% since that time. An increase in the population can impact infectious disease risk. For example, areas with higher population densities saw earlier outbreaks of COVID-19. Population density has been found to be a risk factor for the spread of infectious diseases, particularly for those that spread from person to person and through food and water. Furthermore, vector-borne illnesses can also increase or change patterns with increasing population density.

Various populations are vulnerable to communicable diseases, and understanding these groups is crucial for effective public health interventions. One vulnerable population consists of infants and young children whose immune systems are still developing, making them more susceptible to infection. Their proximity to daycare centers and schools increases the risk of disease transmission.

Another vulnerable group is the elderly, particularly those with preexisting health conditions or weakened immune systems. Age-related declines in immune function can make them more susceptible to infectious diseases and increase the severity of illness. Long-term care facilities and nursing homes often house a significant proportion of elderly individuals, further amplifying the risk of disease outbreaks.

Individuals with compromised immune systems—such as those with HIV/AIDS—cancer, organ transplants, or autoimmune diseases, are highly vulnerable. These conditions weaken their ability to fight infections, leaving them more susceptible to communicable diseases. Strict infection control measures and targeted prevention strategies are essential for protecting this group.

Unhoused populations also face increased vulnerability to communicable diseases due to factors, such as crowded living conditions, limited access to healthcare, poor nutrition, and higher rates of substance abuse. These circumstances can contribute to the spread of infections like tuberculosis, hepatitis, and respiratory illnesses in unhoused communities.

Lastly, marginalized and socioeconomically disadvantaged populations may be at higher risk. Factors such as limited access to healthcare, overcrowded living conditions, inadequate sanitation, and lack of education, can contribute to increased vulnerability to communicable diseases.

Figure 125 and Figure 126 present demographics in the County for vaccine-preventable diseases and sexually transmitted infections, respectively, while Table 82 and Table 83 present data for cases in the County of HIV and COVID-19.

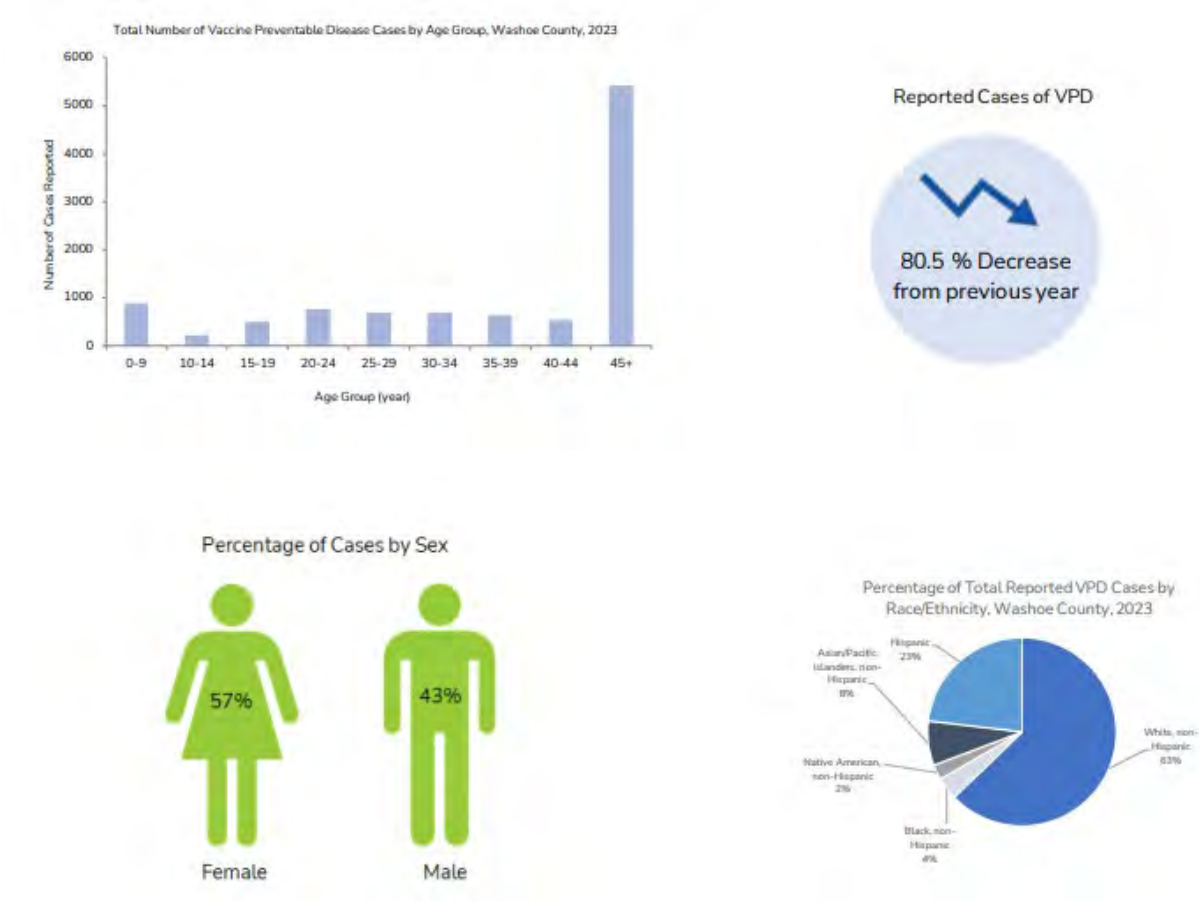


Figure 125: Demographics of Vaccine-Preventable Disease Cases, Washoe County, 2023[224]

[224] Northern Nevada Public Health, 2023 Annual Communicable Disease Summary, "Washoe County Vaccine Preventable Disease Cases Demographics, 2023." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

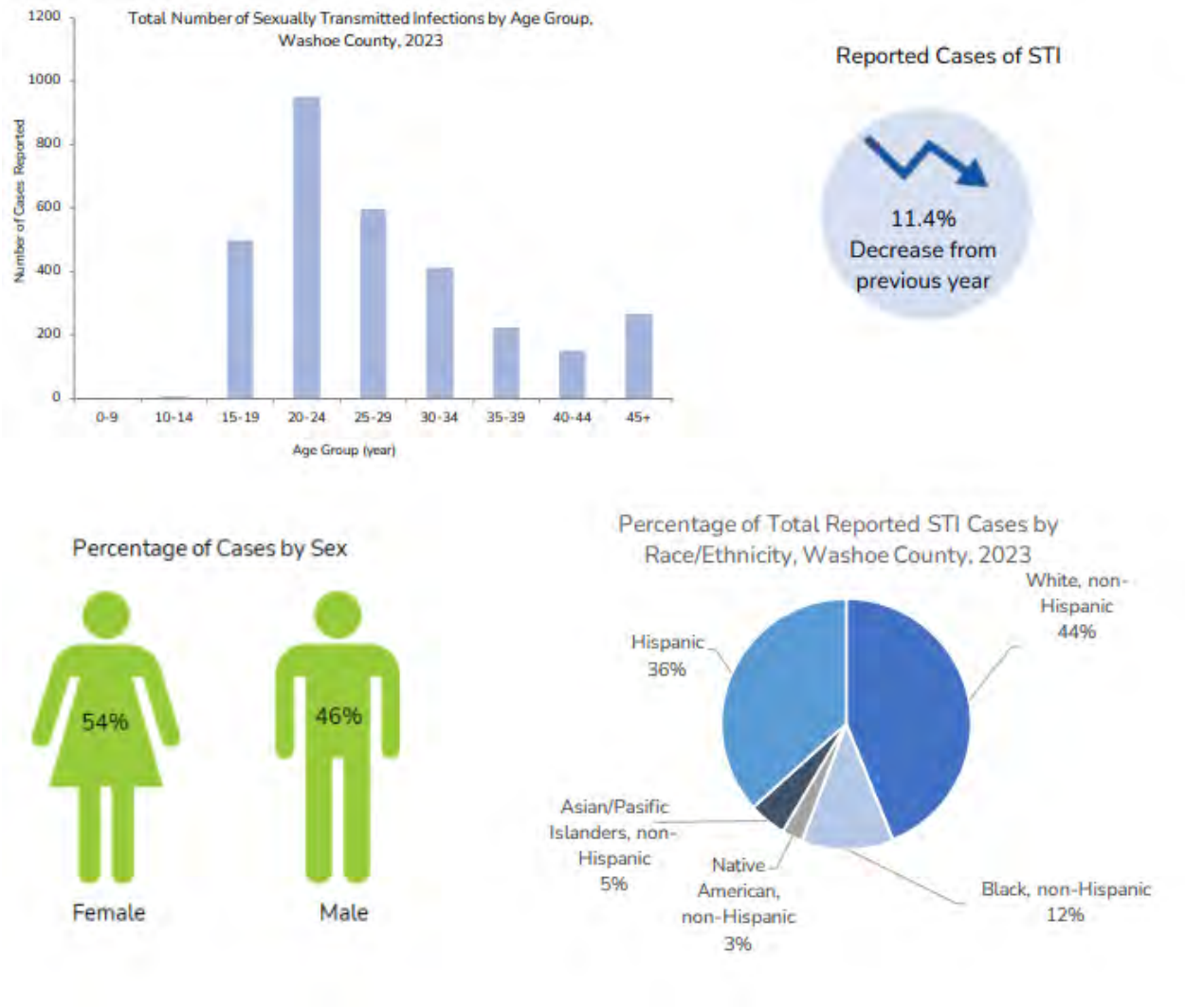


Figure 126: Demographics of Sexually Transmitted Infections, Washoe County, 2023[225]

[225] Northern Nevada Public Health, 2023 Annual Communicable Disease Summary, "Washoe County Sexually Transmitted Infections Demographics, 2023." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

Table 82: HIV Cases by Selected Characteristics, Washoe County, 2023[226]

Total Number of Human Immunodeficiency Virus Cases by Selected Characteristics, Washoe County, 2023

Characteristics	Count	Incidence Rate per 100K Population
Sex		
Male	32	12.6
Female	5	2.0
Transgender	1	NA
Age Groups		
0-9	0	0.0
10-14	0	0.0
15-19	1	2.7
20-24	5	12.6
25-29	7	19.3
30-34	9	26.7
35-39	3	8.6
40-44	6	18.9
45+	7	3.4
Race/Ethnicity		
White, non-Hispanic	13	4.2
Black, non-Hispanic	7	50.4
Native Amercian, non-Hispanic	0	0.0
Asian/Pasific Islanders, non-Hispanic	1	2.6
Hispanic	16	11.5
Unknown	1	NA
Total	38	7.5

[226] Northern Nevada Public Health, 2023 Annual Communicable Disease Summary, "HIV Cases by Selected Characteristics, Washoe County 2023." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

Table 83: COVID-19 Cases by Selected Characteristics, Washoe County 2023[227]

Characteristics	Count	Incidence Rate per 100K Population
Sex		
Male	4286	1689.9
Female	5762	2284.7
Age Groups		
0-9	861	1477.3
10-14	232	763.8
15-19	500	1374.7
20-24	768	1930.4
25-29	683	1881.9
30-34	682	2021.9
35-39	630	1810.2
40-44	522	1643.2
45+	5170	2529.2
Race/Ethnicity		
White, non-Hispanic	6034	1961.7
Black, non-Hispanic	365	2626.0
Native American, non-Hispanic	253	3592.1
Asian/Pacific Islanders, non-Hispanic	717	1859.9
Hispanic	2262	1630.4
Unknown	417	NA
Total	10048	1986.5

Development Trends

Infectious, communicable, and vector-borne diseases can significantly impact development trends in many ways. They can strain healthcare systems, lead to workforce absenteeism, and cause economic disruptions. In addition, investment in infrastructure and public services may be diverted to disease control efforts, affecting overall development. Furthermore, the fear of contracting these diseases can affect consumer behavior, tourism, and foreign investment, influencing economic growth and development. The burden of infectious diseases can hamper

[227] Northern Nevada Public Health, 2023 Annual Communicable Disease Summary, "COVID-19 Cases by Selected Characteristics, Washoe County 2023." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2023_final_v_published.pdf

the social, economic, and environmental aspects of development, and emerging infectious diseases can pose vulnerabilities to economic and land use trends in several ways.

RECENT DEVELOPMENT TRENDS

- **Economic:** These diseases can increase healthcare expenditures and reduce productivity due to illness or workforce absenteeism. This can strain healthcare systems and have direct economic impacts on businesses and industries.

- **Land Use:** Emerging infectious diseases can also influence land use patterns. For instance, areas affected by outbreaks may experience changes in land development plans, shifting the focus toward healthcare infrastructure and away from other projects. Moreover, the occurrence of infectious diseases can lead to changes in travel patterns, affecting tourism and trade, which can further impact land use and economic trends.

- **Future Land Use:** Infectious diseases can affect future land use by impacting population distribution and density. An increased population can lead to more urbanization, which may lead to converting agricultural land into residential and commercial uses. In addition, the spread of infectious diseases can lead to changes in land use patterns, such as the creation of quarantine zones or restricted areas to control the spread of the diseases. This can impact how land is used for agriculture, housing, and other purposes.

COMMUNITY LIFELINES

The spread of communicable diseases poses a significant threat to various community lifelines, including Safety and Security, and access to necessities like food, hydration, shelter, healthcare, energy, communication, and transportation. Outbreaks of such diseases can strain law enforcement and emergency services, as personnel may be quarantined, pass away, or leave due to fear or disagreement with mandatory immunizations. Fear of contracting diseases in public spaces, staff shortages, mandatory lockdowns, and business closures can lead to food insecurity. Shortages of medical personnel overworked medical staff, and the need for personal protective equipment (PPE), medical supplies, and medication can increase the risk of healthcare mistakes and put more lives in danger. Communication centers and transportation hubs may be short staffed, leading to delays in crucial services. Furthermore, hazardous materials may not be disposed of promptly during such times, leading to additional exposure.

During the COVID-19 pandemic, hospitals and other care facilities in Washoe County struggled to cope with the high number of people seeking treatment for COVID-19 symptoms. By December 2020, there had been 50 coronavirus-related deaths, and 328 people had died in Washoe County since the beginning of the pandemic. The test positivity rate had reached a record high of 21.5%, and there were 12,245 active COVID-19 cases. The impact on the healthcare system was severe, with hospitals and healthcare facilities, skilled nursing, and long-term care facilities all experiencing significant strain due to the high number of cases and staffing limitations. Local hospitals and healthcare facilities also were struggling to cope with

the increasing number of cases. By December 2020, Washoe County had the highest case rate (5,990 per 100,000 people) of any county in Nevada.



Figure 127: FEMA Community Lifelines

VULNERABILITY SCORE

A county with a high expected annual loss to hazards, high social vulnerability, and moderate community resilience would be at significant risk of an infectious disease outbreak. The combination of high expected loss and social vulnerability means that the County's population is likely to be impacted by disease outbreaks, and the moderate community resilience suggests that it may struggle to recover from such events. This combination calls for comprehensive risk reduction and resilience-building efforts to protect the population and infrastructure.

CONSEQUENCE ANALYSIS

Infectious diseases pose a significant threat to Washoe County for several reasons. First, the region is a popular tourist destination with a steady influx of visitors, increasing the risk of disease transmission. Additionally, densely populated urban areas within the county can facilitate the spread of infectious diseases. Furthermore, the county's proximity to international travel hubs like Reno-Tahoe International Airport also heightens the risk of imported infectious diseases. Finally, factors such as climate change and globalization can contribute to the emergence and spread of infectious diseases in the region.

The information below provides the Consequence Analysis of the Potential for Detrimental Impacts of Infectious Disease, which was done for accreditation with EMAP.

Table 84: EMAP Consequence Analysis for Infectious Disease in Washoe County

Subject	Ranking	Impacts/Infectious disease
Public	Minimal to Severe	In Washoe County, a worst-case scenario due to infectious disease outbreaks would involve a widespread and rapid increase in the number of cases, overwhelming local healthcare facilities and resources. This could lead to a shortage of hospital beds, ventilators, and medical supplies, making it challenging to provide adequate patient care. Additionally, there could be significant disruptions to daily life, including widespread illness, school closures, business shutdowns, and public event cancellations. Ultimately, the worst-case scenario would be a significant loss of life and severe strain on the community's healthcare and emergency response systems.
Responders	Minimal to Severe	First responders would face significant challenges and risks during an infectious disease outbreak in Washoe County. They would be on the front lines of providing emergency medical care and assistance to affected individuals, potentially exposing themselves to the contagious disease. There could be an increased demand for their services, overwhelming their capacity to respond to all emergencies promptly. Additionally, there would be a heightened risk of first responders themselves becoming ill, which could further strain the emergency response system.
Continuity of Operations	Minimal to Severe	In the event of an infectious disease outbreak in Washoe County, the continuity of operations would be significantly impacted. First responders would face challenges and risks, potentially being exposed to the contagious disease while providing emergency medical care and assistance. The increased demand for their services could overwhelm their capacity to respond to all emergencies promptly, affecting the overall continuity of operations. Additionally, there would be a heightened risk of first responders themselves becoming ill, further straining the emergency response system, and impacting its ability to maintain continuity of operations.
Property, Facilities, and Infrastructure	Minimal to Severe	Severe impacts on property, facilities, and infrastructure in Washoe County due to an infectious disease outbreak could include the temporary or permanent closure of businesses, public facilities, and infrastructure to prevent the spread of the disease. This could lead to reduced property values and financial strain on property owners and businesses. Additionally, increased demand for healthcare facilities and services could lead to strain on the local healthcare infrastructure. Disruptions in supply chains and transportation could also affect the availability of goods and services in the area.

Subject	Ranking	Impacts/Infectious disease
Environment	Moderate to Severe	The most severe impacts on the environment in the event of an infectious disease outbreak in Washoe County could include increased medical waste, such as used personal protective equipment and contaminated materials, which could lead to water pollution and soil pollution if not handled properly. In addition, an outbreak could lead to an increase in the use of disinfectants and chemicals, which could negatively impact local ecosystems and wildlife if not managed carefully. Moreover, disrupting normal activities and increasing resource demand during an outbreak could strain local infrastructures and lead to additional environmental stress.
Economic Condition	Minimal to Severe	The most severe economic impacts on Washoe County from an infectious disease outbreak could include a significant reduction in tourism and travel, leading to financial losses for hotels, restaurants, and other related businesses. Additionally, widespread illness could result in increased healthcare expenses and a strain on local healthcare facilities. Job loss, decreased consumer spending, and supply chain disruptions could also significantly impact the local economy.
Public Confidence in Governance	Minimal to Severe	A severe infectious disease outbreak could significantly affect public confidence in governance in Washoe County in several ways. First, if the outbreak is not effectively managed, the public may lose confidence in the government's ability to handle crises and protect public health. This could lead to increased scrutiny of government actions and decisions and decreased trust in public health officials and agencies. Additionally, the public may question the government's ability to support and protect the local economy if the outbreak leads to widespread economic impacts, such as job losses and business closures. This could create further mistrust and dissatisfaction with the governance and leadership in Washoe County. Furthermore, perceived communication, coordination, and transparency gaps during the outbreak response could erode public trust in the government's ability to communicate and provide accurate information during emergencies effectively.

COMMUNITY INPUT

Respondents to the hazard mitigation plan update public survey expressed concern that infectious diseases were a hazard in the planning area. Several members expressed concern over large gatherings and events spreading infectious diseases. One member requested that unhoused persons' camps near residential areas be removed to prevent the spread of infectious diseases.

The public supports community training or additional outreach and publications that could help address this hazard. One member supported education to avoid future epidemics and outbreaks.

Radiological Waste Transport

Hazard Description

The transportation of radiological waste and other types of radiological materials is a common practice in Washoe County. Washoe County roadways, railways, and airways ship different forms of radiological materials daily. The transportation of radioactive materials through Nevada must follow the hazardous materials regulations of the U.S. Department of Transportation. Most shipments do not require prior notification and do not follow restricted routes. If the type or quantity of radiation exceeds a "Quantity of Concern," the shipper must notify the state of the planned time and route. Shipments of Radioactive Material in Quantities of Concern are not restricted and are not required to wait for approval. A more restricted category is Highway Route Controlled Quantity (HRCQ), which requires prior notification, and pursuant to a Governor's directive, the shipment and transportation vehicle are inspected and then escorted by the Nevada Highway Patrol. These shipments occur about once every three years through Washoe County.

The U.S. Department of Energy (DOE) ships large quantities of low-level radioactive waste to Nevada for disposal at the Nevada National Security Site. Other states and laboratories also send radioactive waste through Washoe County to other locations around the country. Figure 128 shows the routes they might use.



Figure 128: Routes Generally Used to Transport Waste Shipments to the Nevada National Security Site in Southern Nevada.

In particular, the federal government initiative to establish a radiological waste storage facility at Yucca Mountain in Southern Nevada assumes that radiological waste and radioactive materials would be transported through Washoe County and that an accident involving releasing radioactive materials could occur.

The largest risk from transporting radioactive waste through a county is the potential for accidents or incidents that could release radioactive material. This could contaminate the environment and pose serious health risks to the public. There is also the risk of theft or sabotage during transportation, which could lead to the use of radioactive materials for harmful purposes.

The DOE regulates the transportation of these materials and provides training, planning, and permitting to help manage and mitigate the risks and hazards associated with this activity.

Location

Radiological waste could be transported along rail systems, major airports, and highway corridors in Washoe County. The zones of potential impact would extend beyond these transportation facilities. The sizes and shapes of those zones are affected by the material released and atmospheric and environmental effects, such as wind speed and water flow.

Figure 129 displays the locations of nuclear facilities in the United States. It is important to note the presence of Yucca Mountain in Nevada, located southeast of Washoe County, and the Lawrence Livermore National Laboratory near San Francisco. Both locations require large amounts of waste to be transported through the state, and this is expected to continue.



Figure 129: Nuclear Power Reactors in the United States[228]

[228] United States Nuclear Regulatory Commission, "Operating Nuclear Power Reactors (By Location or Name)." https://www.nrc.gov/info-finder/reactors/index.html

Extent

The potential magnitude and severity of impacts from a radiological waste transport incident in Washoe County are categorized as Very High. Incidents involving the release of radioactive materials can necessitate federal support for response efforts, impact critical facilities, cause disruptions in services for weeks, and have widespread economic repercussions across the nation.

Previous Occurrence/History

As of now, only one radiological incident has been reported in Washoe County, while six incidents have been reported throughout Nevada. Table 85 lists these incidents.

Table 85: Radiological Incidents, 2013–2020[229]

Date	City	Entry Code#	Description
04/30/2014	Reno	2012213	An IR192 source was rerouted to a hospital in Nevada. The source was then delivered by the Radiation Safety Officer to the correct address. Once delivered, it was estimated that a dose of 2 mrem was received for 10 minutes of contact.
09/26/2019	Stateline	2019124	A moisture density gauge was stolen from the open bed of a truck. The gauge was locked to the bed, and several valuables were stolen from the cabin. An investigation is underway, and corrective actions will be determined.
11/12/2013	Las Vegas	2013075	A portable gauge fell off the back of a truck because it was unsecured. An anonymous man returned the device, which appeared to be in normal working condition.
08/11/2016	Las Vegas	2016665	Desert Soils Geotechnical reported that two gauges containing AM241 and CS137 were stolen from a storage location. The Radiation Safety Officer had taken the gauges out of storage for routine maintenance. The gauges were in a lab unattended for three hours.

[229] CNS Global Incidents and Trafficking Database, "Nuclear Trafficking 2020." https://www.nti.org/analysis/articles/2019-archive-of-the-cns-global-incidents-and-trafficking-database/

Date	City	Entry Code#	Description
09/14/2018	Las Vegas	2018158	An employee of Aztech Inspection & Testing, LLC, RM secured a moisture density gauge to the steering wheel of his car at home.
11/07/2017	Las Vegas	2017165	The University of Nevada, Las Vegas lost 1.4 grams of 90% enriched U235. The source was left next to a trash can under a desk of a professor who intended to use it for research. The professor forgot about the source and believed the custodial staff accidentally threw it away.

Probability of Future Events

Medical, construction, and traditional radiological materials, including waste, are commonly transported on major transportation routes through Washoe County. As traffic on these routes increases, the potential for radiological waste transport incidents increases. However, given the safety measures in place to prevent these incidents and the fact that no incidents have been reported in Washoe County, the probability of future events is estimated to be Very Low.

Table 86 provides the Calculated Priority Risk Index for an incident involving the transport of radiological waste in Washoe County. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 86: Calculated Priority Risk Index for Radiological Waste Transport in Washoe County.

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Radiological Waste Transport	3	3	4	3	3	3.1

Potential Impacts of Future Climate Conditions

Climate change can significantly impact the transportation of radiological waste. As extreme weather events become more frequent and intense, the risks associated with transporting radiological materials also increase. For example, extreme weather events, such as heavy storms, Flooding (including closed-basin flooding), and hurricanes, can disrupt transportation routes and infrastructure, potentially leading to accidents or incidents involving radiological waste.

Furthermore, rising global temperatures can affect the stability and safety of transportation routes, increasing the likelihood of road and infrastructure damage. This, in turn, can pose significant challenges to the safe transport of radiological waste and increase the risk of incidents such as spills or releases of radioactive materials.

Vulnerability

The MPT determined that hazards from transporting radiological waste have a low probability of occurring. However, the vulnerability of the public, continuity of operations, and infrastructure to radiological waste transport are assessed below. A radiological incident on a transportation corridor could cause a fire or explosion, dispersing radiological particles that contaminate people and property. Depending on several factors, communities in the immediate vicinity of the event would be the most vulnerable. Moreover, if the radioactive materials are not effectively contained, they can spread through the air, soil, and/or water. In the immediate aftermath of a radiological incident on a roadway, the materials pose a substantial risk to first responders and other emergency personnel. Due to the infrequent occurrence of these accidents, emergency personnel may not be sufficiently trained in appropriate response protocols. Radiological materials incidents on transportation corridors require extensive administrative and operational support from impacted jurisdictions. Remote communities may not have the capacity to direct a response to a radiological incident.

Radiological materials would impact jurisdictions' continuity of operations, particularly if a major transportation corridor were affected. Radiological incidents could require the mobilization of resources to evacuate and/or shelter in place. Remote communities with few resources may be limited in their ability to mobilize these resources, and larger communities would have to expend more resources to protect population centers from the impacts of a radiological incident. Infrastructure and facilities near the radiological incident could be temporarily or permanently contaminated or physically impacted by a radiological incident.

Development Trends

Category 1 transport shipments of radiological waste coming from Lawrence Livermore are heavily protected and reinforced and pose a higher risk if the cask becomes detached and striking another object, although a breach of the cask itself is extremely rare. Nevada Highway Patrol has acquired a mobile source awareness training trailer to educate local and state stakeholders on the common transportation of items such as soil density meters. These smaller, unregulated radiological sources pose a higher risk of theft and damage. Nevada Highway Patrol has offered to partner with Washoe County to use the mobile source awareness training trailer for any emergency management tabletop exercises, in an effort to decrease vulnerability of radiological waste transport.

Existing Mitigation Case Study

The Operations Command Center (OCC) and Emergency Operations Center (EOC) of the Nevada National Security Site (NNSS) has dedicated time and resources to establishing essential planning partnerships with stakeholder organizations at the local, state, and national levels. By following FEMA's updated National Response Framework for collaboration between government and private sector organizations, this guidance allows emergency management officials to create integrated planning strategies and common operating objectives.[230]

CONSEQUENCE ANALYSIS

In Washoe County, there is a minimal to moderate risk of a radiological waste event, which could occur due to several factors such as accidents during transportation, mishandling of radioactive materials, or improper disposal of nuclear waste. In a radiological waste event, there could be risks of radiation exposure, environmental contamination, and potential health hazards to the public.

The information below provides the Consequence Analysis of the Potential for Detrimental Impacts of Radiological Waste, which was done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 87: EMAP Consequence Analysis: Radiological Waste

Subject	Ranking	Impacts/Radiological waste
Public	Minimal to Moderate	The public in Washoe County could face significant impacts in the event of radiological waste exposure. These risks could include radiation exposure, environmental contamination, and potential health hazards. Health issues may arise, including radiation sickness, increased cancer risk, genetic mutations, and organ damage. Symptoms of exposure could involve nausea, weakness, hair loss, and skin burns. Authorities must communicate with the public, providing guidance promptly and accurately on minimizing exposure and seeking necessary medical attention.
Responders	Minimal to Severe	In a radiological waste incident in Washoe County, the most severe impacts to first responders could include radiation exposure, potential environmental contamination, and potential health hazards. These risks could lead to immediate health concerns for the first responders and the need for

[230] Nevada National Security Sites, "NNSS readiness featured at 2024 Nevada Emergency Preparedness Association summit," 2024. https://nnss.gov/news/article/nnss-readiness-featured-at-2024-nevada-emergency-preparedness-association-summit/

Subject	Ranking	Impacts/Radiological waste
		specialized training, equipment, and protocols to ensure their safety while carrying out their duties. Additionally, there could be potential long-term health consequences for the first responders if proper precautions are not taken.
Continuity of Operations	Minimal to Severe	In a radiological waste incident in Washoe County, the continuity of care could be impacted. The incident could lead to disruption in medical services, potential contamination of hospitals and healthcare facilities, and challenges in providing ongoing care to individuals affected by the incident. Furthermore, specialized decontamination procedures and protocols could be needed to ensure the safety of both patients and healthcare providers. The long-term health effects of radiation exposure could also necessitate continuous monitoring and specialized treatment for individuals in need of care.
Property, Facilities, and Infrastructure	Minimal to Severe	In the event of a radiological waste incident, there would be significant impacts on property, facilities, and infrastructure. The incident could lead to the contamination of buildings, structures, and surrounding areas, requiring extensive decontamination efforts to ensure safety. Critical infrastructure such as water and power supply lines, roads, and transportation systems could also be affected, potentially leading to disruptions in essential services. Additionally, the incident may necessitate the temporary closure of hospitals and healthcare facilities and other buildings, further impacting the community and local economy. The cleanup and restoration of affected areas would require significant resources and coordination to mitigate the long-term impacts on property, facilities, and infrastructure.
Environment	Moderate to Severe	In the event of a radiological waste incident in Washoe County, there would likely be severe impacts on the environment. The incident could contaminate buildings, structures, and surrounding areas, requiring extensive decontamination efforts to ensure safety. This contamination could affect the local ecosystem, potentially leading to long-term soil, water, and vegetation damage. The incident may also pose risks to wildlife and could impact natural habitats in the area. The cleanup and restoration of affected areas would require significant resources and coordination to mitigate the long-term environmental impacts.
Economic Condition	Minimal to Severe	The economic impacts of a radiological waste incident would be significant. Such an incident could disrupt local businesses,

Subject	Ranking	Impacts/Radiological waste
		agriculture, and tourism. The cleanup and decontamination efforts would require substantial financial resources. The long-term environmental damage could also result in reduced property values and increased insurance costs for residents and businesses in the affected areas. Moreover, the potential health risks associated with the incident could lead to higher healthcare and public safety spending. Overall, the economic impacts of a radiological waste incident in Washoe County could be far-reaching and long-lasting.
Public Confidence in Governance	Minimal to Severe	The impacts on public confidence in governance from a radiological waste incident in Washoe County could be substantial. Such an incident will raise concerns about the government's ability to regulate and manage hazardous materials effectively. It may lead to a loss of trust in local authorities and government agencies responsible for overseeing waste management and environmental safety. Additionally, if the incident is perceived as a regulatory failure or inadequate oversight, it could erode public confidence in the overall governance of the region. This could lead to calls for greater transparency, accountability, and stronger regulatory measures to prevent similar incidents in the future.

COMMUNITY INPUT

The public expressed their worry about radiological waste transport being a significant hazard in the planning area. A public member voiced their concern over transporting hazardous waste and the readiness of the community to deal with a radiological waste event. Several members highlighted the danger of dangerous materials transport on the UP-rail line that passes through the town. RSIC, located near the surrounding freeways and significant roadways, is a potential route for semi-trailers transporting flammable materials, among other materials.

One member supported inspecting and retrofitting transportation corridors. Multiple comments were received regarding community training or additional outreach and publications that could help address this hazard.

Transportation Incident

Hazard Description

A transportation incident is any accident or incident that occurs during any type of transportation, including those occurring during road transport, rail transport, marine transport and air transport. Almost 95% of people who die using our Nation's transportation networks are killed on our streets, roads, and highways, and this threat to our safety is getting worse.[231]

An aircraft crash may occur for many reasons, including mechanical failure, poor weather conditions, or criminal activity. Aircraft of varying sizes are subject to this hazard, from small single-engine aircraft and gliders to helicopters and commercial airliners. The damage from an aircraft crash depends on the location of the accident (densely versus sparsely populated area) and the potential for releasing hazardous materials.

The Federal Railroad Administration defines a rail accident/incident as a list of reportable events, to include collisions, derailments, and other events involving the operation of on-track equipment and causing reportable damage above an established threshold; impacts between railroad on-track equipment and highway users at crossings; and all other incidents or exposures that cause a fatality or injury to any person, or an occupational illness to a railroad employee.[232]

Location

ROAD TRANSPORT

More than 370,000 people died in Transportation incidents over the last decade (2011-2020) in the United States. More than 350,000 of them died on our roads. The major highways that travel through the region are Interstate Highway 80, Interstate Highway 580/US 395, State Route 431, State Route 341, State route 445, and Business Road I-80 (see Figure 130).

[231] United States Department of Transportation, 2024, "The Road Safety Problem." https://www.transportation.gov/NRSS/SafetyProblem

[232] Federal Railroad Administration, 2024, "Accident/Incident Definitions." https://railroads.dot.gov/forms-guides-publications/guides/accidentincident-definitions



Figure 130: Highways in the Washoe County Region[233]

AIR TRANSPORT

Washoe County has three publicly operated airports: the Reno–Tahoe International Airport (RNO), the Reno–Stead Airport (RTS), and the Empire Airport (1A8) in Empire. There are also several privately operated airports in the County that serve commercial, non-commercial, private commuter, and recreational aircraft. The greatest volume of commercial aircraft service passes through Reno–Tahoe International Airport. Federal agencies, such as the Bureau of Land Management, also operate and lease airports in Nevada.

RAIL TRANSPORT

The primary transporters of freight by rail in Nevada are BNSF and Union Pacific Railroad.

Union Pacific is a subsidiary of Union Pacific Corporation. It covers 23 states in the western two-thirds of the United States. Union Pacific railroad is the nation's largest Class 1 railroad and one of the largest intermodal carriers – the transport of truck trailers and marine containers. The railroad helps link production and consumption points in the U.S., and across the world, with a network to deliver the energy, food, raw materials, durable and consumer goods to support the nation's growth.

[233] Washoe County Regional Mapping System, 2024. https://gis.washoecounty.us/wrms/

BNSF Railway is the product of nearly 400 different railroad lines that merged or were acquired over the course of 160 years. It operates one of the largest railroad networks in North America, covering the western two-thirds of the U.S. and hauling the products consumers use every day and the raw materials manufacturers need to make those products.



Figure 131: Railroad Lines in the Washoe County Region[234]

Extent

ROADWAY TRANSPORT INCIDENTS

Preliminary data from the Federal Highway Administration show that vehicle miles traveled (VMT) in the first half of 2021 increased by about 173.1 billion miles, or about 13%. The fatality

[234] Washoe County, 2024, Washoe County Open Data and Transparency Portal. https://opendata.washoecounty.gov/datasets/washoe::railroads/explore

rate for the first half of 2021 increased to 1.34 fatalities per 100 million VMT, up from the projected rate of 1.28 fatalities per 100 million VMT in the first half of 2020.[235]

The U.S. Department of Transportation statistics show freight transportation activity has increased in recent years as has the total number of freight transportation-related fatalities, reaching 5,582 in 2020—a 30.1 percent increase over the 2010 total. Trucks accounted for 88.9 percent of all freight transportation fatalities and 12.8 percent of all highway fatalities in 2020. The vast majority of fatalities involve passenger travel on highways.[236]

The US Department of Transportation compiles annual statistics on the incidents by transportation type (see Figure 132). These annual statistics show that roadway transportation has the highest percentage of all Transportation incidents at 94.2%.

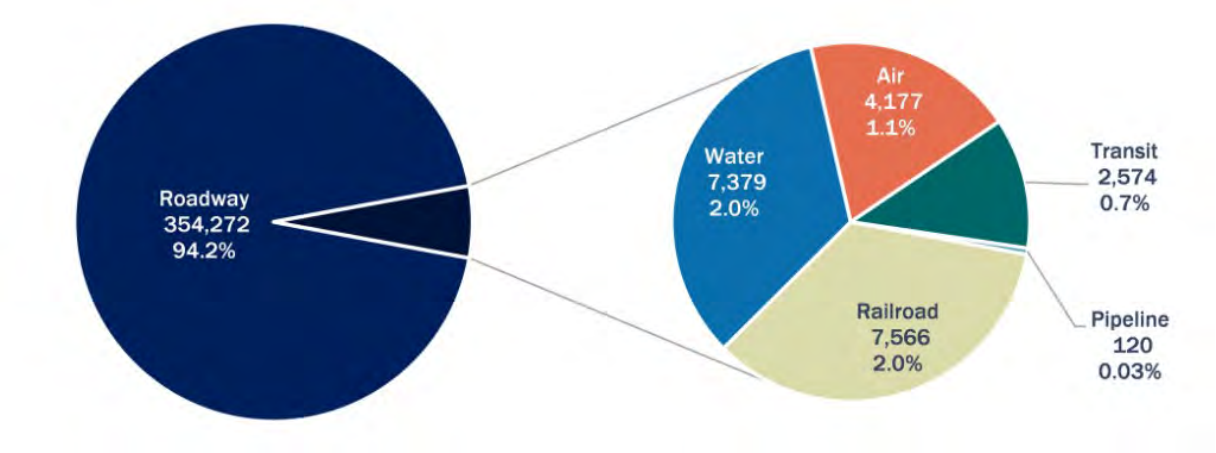


Figure 132: Bureau of Transportation Incident Statistics (Annual Percentages per Transportation Type)[237]

AIRCRAFT TRANSPORT INCIDENT

It is difficult to estimate the extent or probability of the occurrence of an aircraft accident. This type of incident is most likely to occur during takeoff or landing. Aircraft crashes often cause injuries or death to people in the aircraft and on the ground. Crashes can also damage or destroy structures or cause secondary hazards, such as fires or the release of hazardous materials. Aircraft crashes are typically handled at the local level and can disrupt transportation and business services nearby. The magnitude and potential severity of the impact of an aircraft

[235] United States Department of Transportation, 2021, "USDOT Releases New Data Showing That Road Fatalities Spiked in First Half of 2021," https://www.transportation.gov/briefing-room/usdot-releases-new-data-showing-road-fatalities-spiked-first-half-2021
[236] United States Department of Transportation, Bureau of Transportation Statistics 2024. https://data.bts.gov/stories/s/Freight-Transportation-Safety/vu39-vtqh
[237] United States Department of Transportation, 2024, "The Road Safety Problem." https://www.transportation.gov/NRSS/SafetyProblem

crash is considered Medium in Washoe County. Such events are not likely to have significant regional impacts.

RAIL TRANSPORT INCIDENTS

In 2023, the United States registered 995 rail fatalities and around 6,700 non-fatal injuries on the railroads. Injury and fatality numbers had fallen during the COVID-19 pandemic in 2020 and 2021, but 2022 saw a resurgence of accidents above pre-pandemic levels.[238]

Previous Occurrence/History

MAJOR ROAD TRANSPORT INCIDENTS

- **August 25, 2024** –RTC and the Reno Police Department reported a crash between a bus and truck at RTC's Fourth Street Station. The truck ran through the red light, striking the RTC bus. The Reno Police Department and Reno Fire Department responded to the incident. Two people were treated at the scene, with both drivers needing hospitalization.

- **February 26, 2023** – Dozens of cars were involved in accidents, spinouts and slide offs in a matter of a few minutes in Washoe Valley. The Nevada Department of Transportation closed Interstate 580 in both directions through Washoe Valley. Truckee Meadows Fire & Rescue reported 36 vehicles total were involved. It blamed blowing snow and poor visibility for the incidents.

- **December 26, 2021** – Up to 20 cars were involved in a crash in northwestern Nevada, with drivers reporting whiteout conditions, according to the Washoe County Sheriff's Office. I-580 through Washoe Valley was shut down according to Nevada State Police, Highway Patrol division due to a 9-vehicle pileup on northbound I-580, north of the Carson onramp near Eastlake and Duck Hill Road, according to dispatch. Blowing snow created icy road conditions causing multiple spinouts throughout the day as well as reports of fallen trees and branches bringing down utility lines. Both directions of I-580 remain closed from Bowers area to Eastlake Boulevard in Washoe Valley following multiple vehicle crashes and spin outs.

AIRCRAFT INCIDENTS

Most aircraft crashes in Washoe County are associated with small aircraft. Recent crashes that have impacted local communities are as follows:

[238] Statistica, Research Department, "Number of rail accidents and incidents in the United States from 2013 to 2023." https://www.statista.com/statistics/204569/rail-accidents-in-the-us/#:~:text=In%202023%2C%20the%20United%20States%20registered%20995%20rail,saw%20a%20resurgence%20of%20accidents%20above%20pre-pandemic%20levels.

- **September 17, 2023 –** A T-6G and an AT-6B collided in the traffic pattern at the Reno Air Races, killing both pilots.
- **May 1, 2018** – An American Air Racing Thunder Mustang crash landed at Reno after the pilot declared Mayday and landed beyond the midpoint of the 9,000-ft runway at a higher rate of speed than usual. The plane overran the runway, entered a gravel area, and overturned.
- **August 30, 2016 –** A single-engine Beechcraft A36 crashed into the River's Edge RV Park in Sparks. The pilot and one passenger were killed. The plane did not hit any RVs. However, a fire from the crash spread to surrounding RVs and vehicles. Residents were evacuated but could return home once the conditions were safe.
- **September 16, 2011** – The Galloping Ghost, a highly modified North American P-51D Mustang racing aircraft, crashed into spectators while competing at the Reno Air Races, killing the pilot and 10 people on the ground. An additional 69 people on the ground were injured. This was the third-deadliest airshow disaster in United States history, following accidents in 1972 in Sacramento, California, and 1951 in Flagler, Colorado.
- **January 21, 1985 –** Galaxy Airlines Flight 203. Shortly after takeoff from Reno–Cannon International Airport (now Reno–Tahoe International Airport), the Lockheed L-188 Electra four-engine turboprop crashed about 1.5 miles from the end of the runway. It burst into flames, killing all but one of the 71 passengers on board. Figure 133 shows the memorial of this incident.



Figure 133: Memorial for Galaxy Airlines Flight 203 Victims, Located at Rancho San Rafael Regional Park in Reno[239]

RAIL TRANSPORT INCIDENTS

- **March 14, 2023** – A train hit and killed a man near Larkin Circle and Greg St., east of Vista on the morning of March 14, 2023. The train tracks run parallel to Interstate 80. The Washoe County Sheriff's Office (WCSO) stated the victim was an adult man. Union Pacific was on scene, but a spokesperson said the train involved was with BNSF.

- **February 19, 2021** – Washoe County sheriff's deputies investigated the death of a pedestrian who was struck by a train on the east edge of Sparks. The sheriff's deputies stated the train hit and killed the person who was sitting on the tracks just south of Interstate 80 near Vista Boulevard. Earlier the same week, a 60-year-old man suffered life-threatening injuries when he was struck by a train while walking on the railroad tracks in Reno near Barnett Way and Galletti Way. Union Pacific Railroad Police handled that investigation.

- **March 1, 2017** – Washoe County sheriff's deputies investigated a collision between a freight train and a car that injured one person west of Reno. The sheriff's office stated the crash near Mogul involved one person inside of a vehicle sustaining minor injuries. Officials for the Union Pacific railroad assisted in an investigation into the cause of the crash.

[239] Reno Gazette Journal, "New Memorial for Galaxy Airlines Crash Victims." https://www.rgj.com/story/news/2015/01/21/new-memorial-galaxy-airlines-crash-victims/22120481/

Probability of Future Events

ROADWAY INCIDENTS

Table 88 illustrates Nevada Highway Safety Performance Measures from 2014 to 2022 indicating the number of fatalities, serious injuries, fatality and serious injury rates per highway measured vehicle miles traveled, and the number of non-motorized serious injuries reported each year. The date in Table 88 and Figure 134 indicate an increasing trend of fatalities and serious injuries as a result of roadway accidents for the state of Nevada.

Table 88: Nevada Highway Safety Performance Measures, 2014–2022[240]

Performance Measure	2014	2015	2016	2017	2018	2019	2020	2021	2022
Fatalities	291	326	329	311	328	304	333	385	417
Serious Injuries	1,144	1,097	1,232	1,094	1,039	982	964	1,097	1,130
Fatality rate (per HMVMT)	1.144	1.300	1.166	1.162	1.192	1.086	1.359	1.392	1.510
Serious injury rate (per HMVMT)	4.328	4.972	4.306	4.088	3.777	3.508	3.934	3.966	4.091
Non-motorized fatalities	80	83	86	108	88	76	93	94	103
Non-motorized serious injuries	199	181	206	229	203	178	144	222	234

[240] Federal Highway Administration, 2023, "Nevada Highway Safety Improvement Program 2023 Annual Report." https://highways.dot.gov/sites/fhwa.dot.gov/files/2024-04/HSIP%28Nevada%29%202023%20Report.pdf

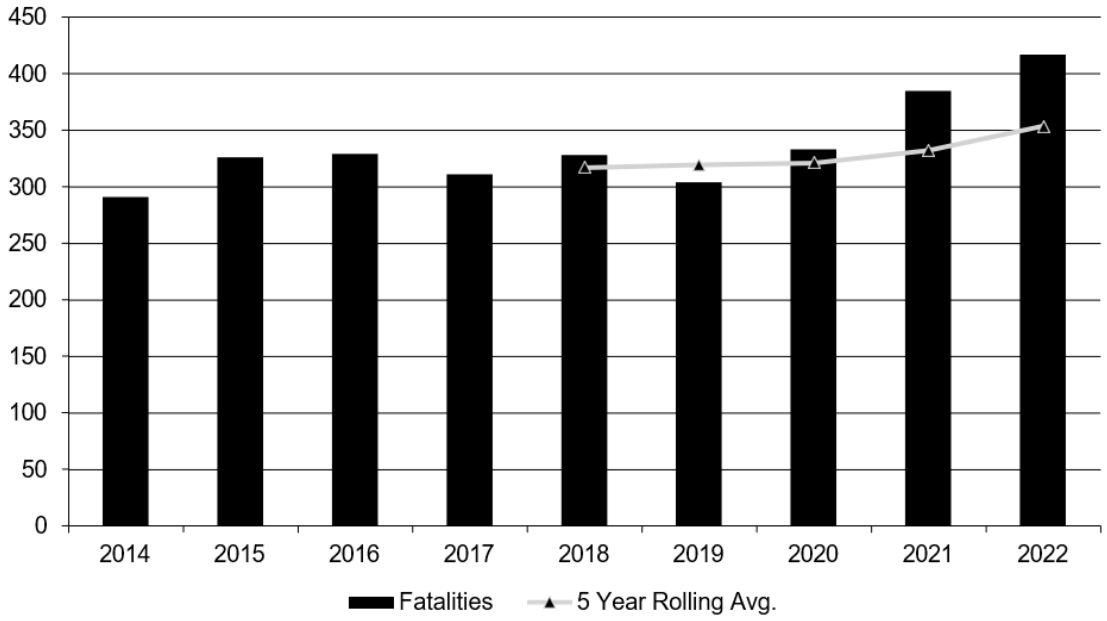


Figure 134: Annual Vehicle Highway Fatalities in Nevada, 2014–2022[241]

AIRCRAFT INCIDENTS

Statistics on airplane crashes include the following:[242]

- The chance of a large, commercial airplane carrier crashing is 0.000001%.
- The odds of being involved in a commercial airplane accident are 1 in 260,256.
- The odds of you dying in a plane crash are 1 in 816,545,929.
- On-demand air taxis (e.g., private jets) had 225 accidents, of which 47 resulted in at least 1 fatality.
- Between 2015 and 2019, general aviation (e.g., recreational pilots) averaged 0.88 fatalities per 100,000 flight hours. On-demand air-taxis averaged just 0.23, and commuter airplanes averaged 0.21.

[241] Federal Highway Administration, 2023, "Nevada Highway Safety Improvement Program 2023 Annual Report." https://highways.dot.gov/sites/fhwa.dot.gov/files/2024-04/HSIP%28Nevada%29%202023%20Report.pdf

[242] Flyfright.com, "Flying High: The Real Odds of Experiencing a Plane Crash," https://flyfright.com/plane-crash-statistics/

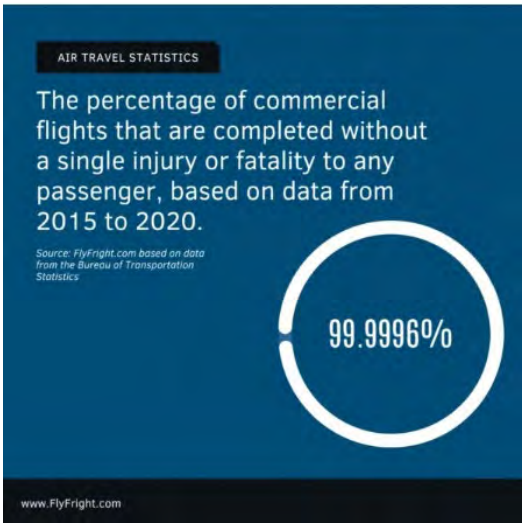


Figure 135: Air Travel Statistics, 2015–2020[243]

Weather conditions are associated with up to 70% of aircraft incidents[244]. Climate change is likely to impact the occurrence, extent, or probability of aircraft crashes in Washoe County. Further, increased development and urbanization can increase the number of people on the ground who may be affected by an aircraft crash. The probability of an aircraft crash with severe consequences on the ground is considered Medium.

[243] Flyfright.com, "Flying High: The Real Odds of Experiencing a Plane Crash," https://flyfright.com/plane-crash-statistics/

[244] Department of Transportation, "Weather and Aviation: How Does Weather Affect the Safety and Operations of Airports and Aviation, and How Does FAA Work to Manage Weather-Related Effects?" https://www.transportation.gov/sites/dot.gov/files/docs/kulesa_Weather_Aviation.pdf

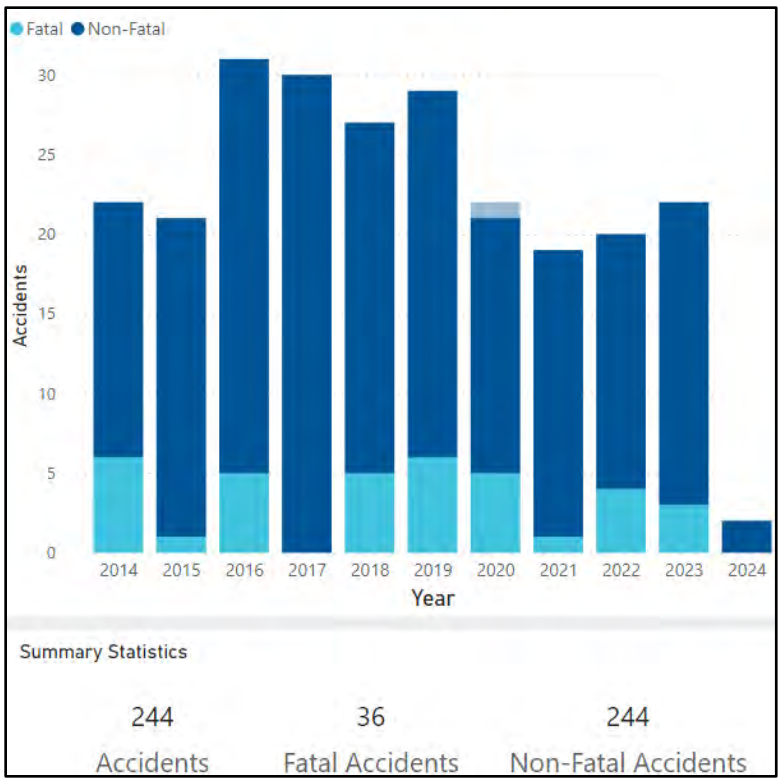


Figure 136: Aviation Accidents by Calendar Year in Nevada, 2014–2024[245]

[245] National Transportation Safety Board, "Monthly Aviation Dashboard-Aviation Accidents by Calendar Year-Nevada." https://www.ntsb.gov/safety/data/Pages/monthly-dashboard.aspx

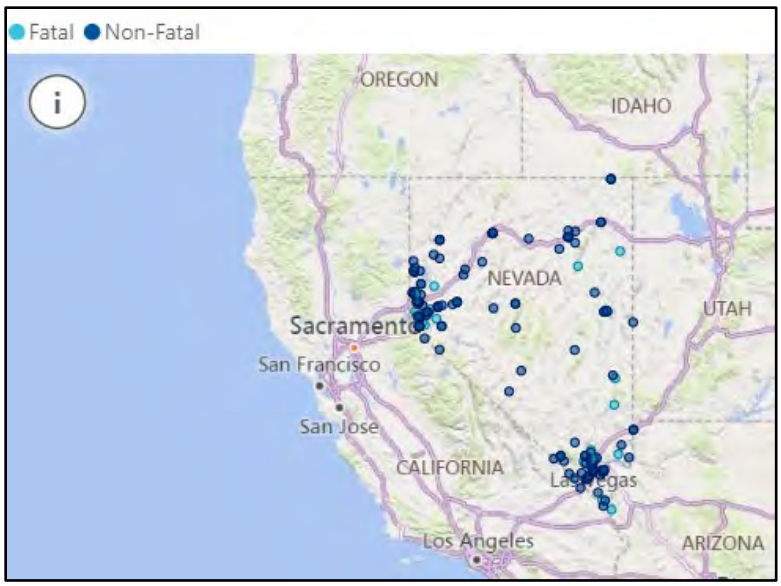


Figure 137: Locations of Aviation Accidents in Nevada, 2014–2024[246]

Table 89 provides the Calculated Priority Risk Index for Transportation incidents in Washoe County. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 89: Calculated Priority Risk Index for Transportation incidents in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Transportation Incident	3	4	4	3	3	3.4

Vulnerability Analysis

Public airports that have accepted federal assistance, including the Reno–Tahoe International Airport, must designate runway protection zones (RPZs) at each end of their runways to protect people and property on the ground if an aircraft lands or crashes beyond the runway. Reno–Tahoe International Airport owns most of the land in its RPZs in Reno.[247] Mixed commercial,

[246] National Transportation Safety Board, "Monthly Aviation Dashboard-Aviation Accidents by Calendar Year-Nevada." https://www.ntsb.gov/safety/data/Pages/monthly-dashboard.aspx
[247] Reno-Tahoe Regional Airport, "RNO.C3_Facility Requirements_Final.docx." https://www.renoairport.com/wp-content/uploads/2022/08/RNO-MP-2018_Facility-Requirements.pdf

residential, and commercial–industrial development in the RPZs is where aircraft crashes are more likely.

Reno–Stead Airport has designated airport-critical areas at the ends of its runways. These trapezoidal areas help ensure that land use is compatible with airport operations to reduce risks to people and property on the ground. The airport critical areas at either end of Runway 8/26 or the south end of Runway 14/32 extend beyond airport property. Residential areas in the County and industrial and recreational areas in Reno near the airport are critical areas where aircraft crashes are more likely to occur.

Development Trends

AIR TRANSPORTATION

According to the Reno–Tahoe Airport Authority's Strategic Plan for FY 2024–2028, there is a call for an increase in commercial air service and cargo activities at the Reno–Tahoe International Airport. This increase in air traffic and cargo operations could potentially elevate the risk of aircraft crashes, thereby increasing vulnerability.

Land Use: Runway protection zones have been strategically mapped at the Reno–Tahoe International Airport. Additionally, critical areas at the Reno–Stead Airport have also been identified and mapped. To decrease vulnerability, development is consciously directed away from these designated areas.

REGIONAL HIGHWAY TRANSPORTATION

The Mt. Rose Corridor is a critical regional link between Lake Tahoe and south Reno for locals and tourists alike. In recent years, the corridor has faced increased pressure from new development, increasing speeds, and rising safety concerns. The Nevada Department of Transportation (NDOT), in collaboration with the City of Reno, Washoe County, the Regional Transportation Commission (RTC) of Washoe County, Nevada Highway Patrol (NHP), and the Truckee Meadows Regional Planning Agency (TMRPA), is embarking on a planning effort that will address needs and plans to allow the Mt. Rose Highway to continue to provide a safe and effective route for all users in the future.

The Nevada Department of Transportation's (NDOT) Mt. Rose Corridor Study is centered on Mt. Rose Highway, State Route 431, from Douglas Fir Drive to Alternate U.S. 395 and Geiger Grade from Alternate U.S. 395 to the Veterans Parkway roundabout. The study will be complete and final report provided on the website in Spring 2022.[248]

[248] Nevada Department of Transportation, 2024, "Mt. Rose Highway Corridor Study," https://www.dot.nv.gov/projects-programs/programs-studies/mt-rose-highway-corridor-study

VULNERABILITY SCORE

Based on data from the Bureau of Transportation Statistics and NTSB, between 2015 and 2020, the odds of a plane crashing are .000001%, and there is one chance in 816,545,929 of death in a plane crash.[249]

CONSEQUENCE ANALYSIS

Aircraft incidents pose significant risks to Washoe County, Nevada. With the presence of Reno-Tahoe International Airport and several smaller airports in the area, the county faces potential risks associated with aviation accidents. These incidents could result in injuries, fatalities, and property damage, impacting public safety in the region.

The information below provides the Consequence Analysis of the Potential for Detrimental Impacts of Transportation incidents specific to aircraft incidents which was done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 90: EMAP Consequence Analysis for Transportation Incidents (Aircraft Crashes) in Washoe County

Subject	Ranking	Impacts/Transportation incidents (Aircraft)
Public	Minimal to Severe	Aircraft incidents can lead to various health risks and illnesses for the public. These may include physical injuries such as burns, fractures, and lacerations resulting from the incident's immediate impact. Additionally, exposure to smoke, fumes, and potentially hazardous materials released during an aircraft incident can result in respiratory issues and other acute health problems. Furthermore, the psychological impact on individuals who witness or are involved in such incidents can lead to mental health challenges such as anxiety, post-traumatic stress disorder (PTSD), and other stress-related conditions.
Responders	Minimal to Severe	First responders can be impacted by aircraft incidents in several ways. They may face physical risks due to the immediate dangers present at the incident site, including burns, fractures, and lacerations. Additionally, exposure to smoke, fumes, and hazardous materials can lead to respiratory issues and other acute health problems. Furthermore, the psychological toll of witnessing or being involved in such incidents can result in mental health challenges such as anxiety, post-traumatic stress disorder (PTSD), and other stress-related conditions.

[249] Nevada Department of Transportation, 2024, "Mt. Rose Highway Corridor Study," https://www.dot.nv.gov/projects-programs/programs-studies/mt-rose-highway-corridor-study

Subject	Ranking	Impacts/Transportation incidents (Aircraft)
Continuity of Operations	Minimal to Severe	An aircraft incident can significantly impact the continuity of operations. First and foremost, the incident can lead to the disruption of crucial infrastructure and services, especially if it occurs near a vital transportation hub. This disruption can affect the transportation of goods and people, leading to delays and potential economic losses. Furthermore, depending on the severity of the incident, it may necessitate the closure of airspace and airports, affecting the travel plans of countless individuals and disrupting the operations of airlines and related businesses. Additionally, suppose the incident occurs near critical facilities or industrial areas. In that case, there is a risk of damage to infrastructure, such as power lines, communication networks, and other essential services, further impacting the continuity of operations. The aftermath of an aircraft incident can also lead to heightened security measures and investigations, potentially causing delays in regular operations and allocating resources to manage the aftermath. Overall, an aircraft incident can profoundly affect the continuity of operations, necessitating comprehensive planning and coordinate efforts to mitigate the impact and facilitate recovery.
Property, Facilities, and Infrastructure	Minimal to Severe	An aircraft incident can impact property, facilities, and infrastructure in several ways. First, the aircraft's physical impact and any resulting fire or explosion can cause direct damage to buildings, roads, power lines, and other essential infrastructure near the incident. Also, depending on the incident's location, critical facilities such as power plants, communication networks, and industrial areas may be damaged. This can lead to disruptions in essential services, including electricity, water supply, and communication systems, further impacting the operations and safety of the surrounding area. Moreover, the aftermath of an aircraft incident may necessitate security measures and investigations, potentially leading to the closure of airspace and airports. This can disrupt travel plans, affect businesses relying on air transportation, and lead to economic losses.
Environment	Moderate to Severe	Aircraft incidents can have several environmental impacts. They can result in increased noise pollution, disrupting local

Subject	Ranking	Impacts/Transportation incidents (Aircraft)
		ecosystems and wildlife. Depending on the severity of the incident, aircraft accidents can release pollutants into the atmosphere, including fuel, hydraulic fluid, and other hazardous materials. Fuel and other hazardous materials spilled from an aircraft incident can contaminate soil and water sources, threatening local ecosystems and human health. Aerial incidents, particularly fires or explosions, can lead to habitat destruction in a crash. Aircraft incidents can also directly impact local wildlife, causing injuries or fatalities to animals near the accident.
Economic Condition	Minimal to Severe	In the event of an aircraft incident, Washoe County, Nevada, could experience various economic impacts. If the incident occurs near popular tourist destinations or resorts, tourism may decrease, leading to a potential loss of revenue for local businesses. Areas near the incident site may experience a decrease in property values, impacting homeowners and the local real estate market. Local businesses, particularly those near the incident, may experience disruptions in operations, leading to financial losses. The county may incur significant costs for emergency response efforts, including fire and rescue services, which will impact the local budget. Legal and insurance costs may be associated with the incident, impacting local government budgets, and potentially leading to increased insurance premiums for businesses and residents in the area.
Public Confidence in Governance	Minimal to Severe	Aircraft incidents can have a significant impact on public confidence in governance. When such incidents occur, the public may question the effectiveness of government regulation and aviation industry oversight. They may also question the transparency of government investigations into the causes of the incidents and the measures taken to prevent future occurrences. Additionally, incidents involving aircraft can lead to concerns about national security and the government's ability to ensure its citizens' safety. Overall, aircraft incidents can erode public trust in the government's ability to manage and ensure the safety of the aviation sector.

COMMUNITY INPUT

The public expressed some concern about aircraft crashes. One member highlighted that the entire Washoe County could be at risk of an aircraft crash, given the airport's location in the

center of the city. Another member, representing the Tribal community, expressed their worry about the frequent low-hanging aircraft flying through the community and the high volume of air traffic from Fallon Naval Airspace.

The public expressed concern for improving evacuation routes in certain areas where there are single access roads.

The public did not indicate any specific mitigation measures they would support for this hazard, but many comments were received in support of additional public outreach and education that may help reduce risk from this hazard.

Volcano

Hazard Description

A volcano is an opening or rupture of the earth's surface that allows ash, gases, and/or molten rock under tremendous pressure to emerge from below the surface. Volcanic activity over long periods can either form mountains as molten rock is gradually extruded or rapidly obliterate mountains during explosive eruptions.

Depending on the type of volcano, an eruption can be among the more spectacular of natural hazard events, ejecting materials thousands of feet into the air, darkening skies, and blanketing surrounding areas with fine powdery ash or rivers of molten lava. Because of advanced geologic and seismic monitoring techniques, warning times for major eruptions are usually measured in weeks or months, and the duration of volcanic activity typically ranges from a few weeks to a few years.

Volcanic hazards can be described in terms of the distance from the volcano in which they may occur. Proximal hazards like lava flows, pyroclastic flows, and lahars are considered to have an impact within a 30-mile radius. Distal hazards, such as eruption clouds and ashfalls, may impact areas further than 30 miles from the volcano.

Location

No active volcanoes are in Washoe County. The closest potentially active volcanoes are in California. Table 91 indicates the approximate distances of these volcanoes from Reno. Figure 138 is a map of these volcano locations by threat rank from USGS.[250]

Table 91: Potentially Active Volcanos Near Washoe County

Volcano	Latitude	Longitude	Approximate Distance from Reno	Last Eruption
Mono-Inyo Craters (in Long Valley Volcanic Region)	37° 53' N	119° 00' W	120 miles south-southeast	350 to 700 years ago
Long Valley Caldera	37° 35' N	119° 05' W	135 miles south-southeast	8,500 years ago

[250] USGS. "California's Exposure to Volcanic Hazards: A geo-narrative by USGS." https://geonarrative.usgs.gov/calvo_exposure/

Volcano	Latitude	Longitude	Approximate Distance from Reno	Last Eruption
Lassen Peak	40° 43’ N	121° 44’ W	115 miles northwest	107 years ago
Mount Shasta	41° 36’ N	121° 19’ W	180 miles north-northwest	3,200 years ago
Medicine Lake	41˚36’ N	121˚33’ W	170 miles north-northwest	950 years ago
Clear Lake	38˚58’ N	122˚46’ W	160 west-southwest	8,500-13,500 years ago

The 2023 Enhanced SHMP also notes that there is some evidence of deep magma injection beneath Lake Tahoe, but that this area does not appear to be likely to erupt. Ash fall would cause the biggest challenges for the state including impacts to airplanes, air quality, and highway driving in Nevada, particularly in near-downwind areas of Esmeralda, Mineral, and Nye Counties. In the event of an eruption in this region, planes flying between Reno and Las Vegas would have to be rerouted west of the Sierra Nevada. Similarly, there is some potential for ash from Cascade volcanoes in northern California (Lassen Peak and Mount Shasta areas) and Oregon to affect airplanes, air quality, and highway driving in northern Nevada, particularly in Washoe, Humboldt, Pershing, and Elko Counties. Air travel between Reno and Portland and Reno and Seattle would be rerouted in the event of an eruption in this area.

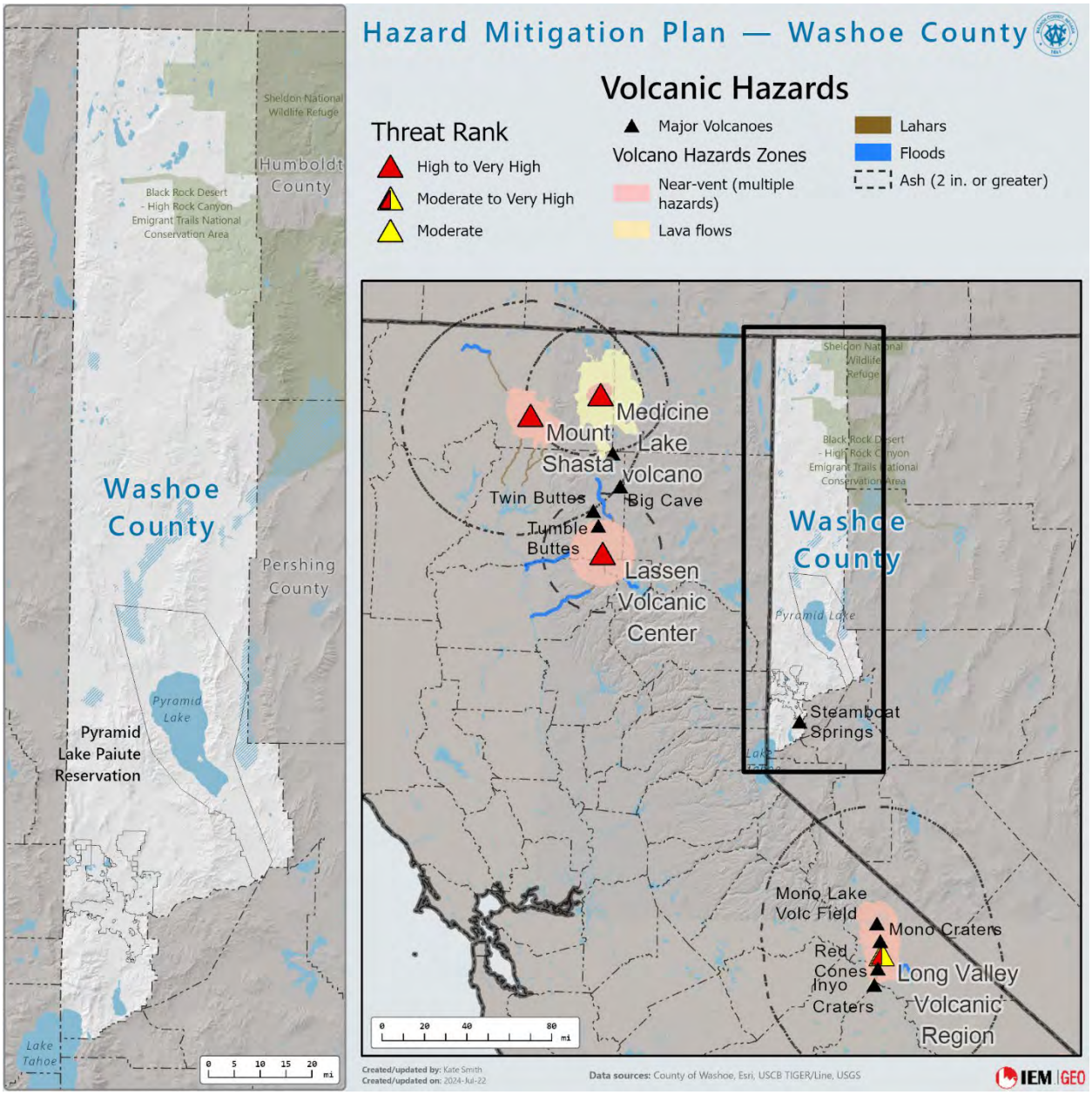


Figure 138: Volcanic Hazards near Washoe County

Extent

Geologic evidence of eruptions from these volcanoes, recognized as ash deposits of particular ages and distinct chemical compositions, is abundant in Nevada. Volcanic gases associated with phreatic eruptions could pose a localized threat of asphyxiation to humans in poorly ventilated spaces in the immediate vicinity of these vents. At Mammoth Mountain, several deaths related to carbon dioxide (CO_2) occurred when a skier and rescuers became trapped in a snow pocket that was filled with CO_2. The emission of CO_2 in this area is associated with volcanic unrest between more dramatic eruption cycles. Elevated CO_2 levels in the soil were first reported by

the USGS in 1989 after a swarm of small earthquakes occurred beneath Mammoth Mountain. It is noted that the ski resorts in that region are located on and near volcanoes.

A volcanic eruption may also trigger a "volcanic blast" or an atmospheric shock wave that creates a pressurized burst of air that travels away from the eruption center. Shock waves from eruptions may flatten trees (e.g., Mount Saint Helens) and break windows in buildings. The effects of these shock waves are more destructive near the eruption center.

It is likely that seismic instruments will detect any imminent eruption in time to warn people to avoid the hazard. The ability to monitor small tremors associated with magma at depth is limited by the small number of seismographs operated in Nevada. The Nevada Seismological Laboratory and the USGS have joint responsibilities for earthquake monitoring and warnings.

Figure 139 shows the region that could be affected by tephra accumulations on the ground following an eruption in the Long Valley–Mono Lake area. The thickness and distribution of tephra depends on wind speed and direction during the eruption. Prevailing westerly winds would likely carry Long Valley–Mono Lake ash away from Reno and northern Washoe County. An ash-rich eruption from Lassen, Shasta, or Medicine Lake would likely affect Washoe County.

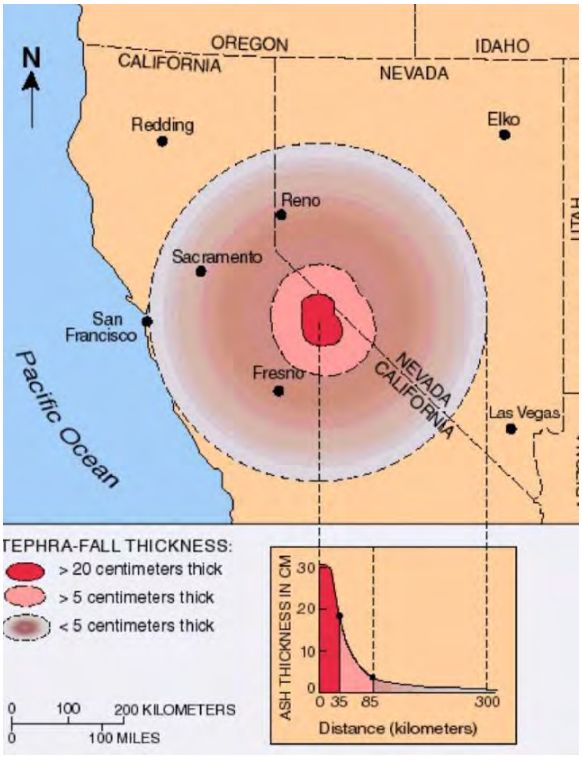


Figure 139: Tephra-Fall Thickness Map of the Long Valley-Mono Lake Area, California[251]

[251] 2018 Nevada Enhanced SHMP, USGS Volcano Hazards Program: "Potential Tephra Fall Hazards for Small to Moderate-Sized Eruptions in the Long Valley–Mono Lake Area, California."

Although geothermal power plants in many parts of the world are associated with active volcanoes, the 15 geothermal power plants in northern Nevada do not appear to be associated with magma. With the possible exception of the Steamboat geothermal system at the south end of Reno, the geothermal areas in Nevada appear to derive their heat from the deep circulation of groundwater rather than direct connections with magma or cooling igneous rock. A recognized hazard in the Steamboat area is the violent eruption of steam, mud, and rock from geysers. As indicated on the geologic map of the Mt. Rose NE Quadrangle,[252] such eruptions occurred during the Quaternary Period near the Mount Rose Highway (Nevada State Highway 431), west of the intersection with U.S. Highway 395, and they could occur there or in other parts of the Steamboat area. The hazard from such eruptions is a local feature that is not likely to require federal assistance.

The magnitude and potential severity of impacts of a volcanic eruption is considered Low to Medium for Washoe County. The County is outside the 50 km distance expected to be impacted by 2 inches of ash from Long Valley Caldera. The County could also be impacted by trace amounts of ash to ashfalls of up to approximately ½ inch from an eruption of one of the Cascades volcanoes, based on the distance ash was carried from the Mount St. Helens eruption by prevailing winds. Prevailing winds would have a direct influence on the amount of ashfall the County receives following an eruption. Ashfall could significantly affect airplanes, air quality, and highway driving, and it could cause combustion engines to fail and damage crops. State-level support may be needed to respond to volcanic eruptions, and eruptions may disrupt services and critical facilities for a period of days to a week. Eruptions could cause local economic impacts, particularly in the agricultural and transportation and distribution sectors.

Previous Occurrence/History

The 2023 Enhanced SHMP noted that Nevada has had a long history of volcanism and, “Small eruptions from the Mono Craters area near Lee Vining and Mono Lake in eastern California have sent ash into Nevada as recently as about 350 years ago; an eruption from these volcanoes presents the most likely current volcanic hazard for Nevada. Other volcanoes that have erupted in recent history and could deposit ash in Nevada include Lassen Peak, Mount

[252] National Operational Hydrologic Remote Sensing Center, “NOHRSC Interactive Snow Information.” https://www.nohrsc.noaa.gov/interactive/html/map.html?ql=station&zoom=&loc=42.55+N%2C+122.94+W&var=snowfall_season_d&dy=2023&dm=3&dd=28&dh=12&snap=1&o11=1&o9=1&o13=1&lbl=m&mode=pan&extents=us&min_x=-123.21666666667&min_y=35.916666666663&max_x=-111.34166666667&max_y=42.591666666662&coord_x=-117.27916666667&coord_y=39.2541666666625&zbox_n=&zbox_s=&zbox_e=&zbox_w=&metric=0&bgvar=dem&shdvar=shading&title=1&width=800&height=450&nw=800&nh=450&h_o=0&font=0&js=1&uc=0

Shasta, the Long Valley Caldera in California, and volcanoes in the Cascade Mountains in Oregon."[253]

Volcanic activity from surrounding states, particularly California and Oregon, has created ash clouds that have drifted over Nevada, as evidenced by many young ash beds in western Nevada. An eruption from these volcanoes presents the most likely current volcanic hazard for Nevada. Other volcanoes that have erupted in recent history and could deposit ash in Nevada include Lassen Peak, Mount Shasta, the Long Valley Caldera in California, and volcanoes in the Cascade Mountains in Oregon. Ash from the 1915 eruption of Lassen Peak traveled at least 200 miles northeast to Winnemucca. The eruption of Mount St. Helens in 1980 deposited up to several centimeters of ash several hundred miles away from the volcano. The biggest threat to Nevada from eruptions in California and Oregon is damage to flying aircraft.

A massive eruption from the Long Valley Caldera near Mammoth Lakes, California, about 760,000 years ago devastated a considerable area in Owens Valley when thick, hot flows of ash were deposited as far south as Bishop. Air-fall ash from these eruptions did collect as thick piles of ash in parts of Nevada, and some of the ash may have been hot enough or thick enough to devastate the local landscape. Scientists would expect strong indications from seismographs before another eruption of this magnitude. The USGS continues to monitor the area around Mammoth Lakes and will issue warnings prior to any subsurface changes that could precede a major eruption.

Seismic and geodetic data at the north end of Lake Tahoe have been interpreted by researchers at UNR (K.D. Smith and others, 2004, Evidence for deep magma injection beneath Lake Tahoe, Nevada–California: Science, v. 305, p. 1277–1280). These data indicate active magma at a depth of approximately 19 miles (30 kilometers). There does not appear to be a near-term threat of volcanic eruptions from this area, in part because the last documented eruption in the area was approximately one million years ago.

The eruption of Lassen Peak in 1915 caused localized debris flows and a pyroclastic cloud that caused damage and deforestation in a 3-square-mile area and Flooding (including closed-basin flooding) and debris flows up to 10 miles from the volcano in Hat Creek. Ash from the eruption traveled at least 200 miles northeast to Winnemucca, Nevada.

Probability of Future Events

The 2023 Enhanced SHMP notes that the most likely volcanic hazard for Nevada is an eruption from the Mono-Inyo Craters. Active volcanoes within approximately 200 miles of Reno have erupted twice in the past 350years. This indicates a 0.6% chance of these volcanoes erupting in

[253] State of Nevada, "The State of Nevada Enhanced Hazard Mitigation Plan 2023, Draft." https://dem.nv.gov/uploadedFiles/demnvgov/content/About/NEHMP_09-22-2023(4).pdf

a given year. The probability of future occurrence with direct consequences for the planning area is therefore considered Very Low.

Table 92 provides the Calculated Priority Risk Index for Volcanoes in Washoe County. Hazards identified as having as risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 92: Washoe County Calculated Priority Risk Index

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Volcano	1	3	3	4	1	2.1

Volcanic risk is low but could be increased if and when a volcano becomes active. The probability is low, but the consequences could have a severe local impact. Mitigation actions are limited to public awareness and evacuation procedures at the local level. There are no significant impacts expected of the volcanic hazard in Nevada resulting from climate change.

There are no direct connections between future climate conditions and volcanic activity.

Vulnerability Analysis

Volcanic hazards, particularly ashfall, have a very low probability of occurring. However, the vulnerability of the public, continuity of operations, infrastructure, and the environment to volcanic hazards are assessed below.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Infrastructure is vulnerable to ash accumulation because its load-bearing capacity may be exceeded by the increased weight of the ash. In addition, ash can collapse roads, destroy engines, clog air and water filtration systems, and impact electrical systems. The proximity to the volcanic eruption and meteorological conditions at the time of the explosion would influence what the impacts of an eruption would be.

Cascading Impacts from volcanoes include the following:

- Disruption of transportation
- Degraded water quality
- Degraded air quality
- Economic impacts (e.g., agriculture, distribution)

- Impacts to normal operations (e.g., schools, tourism)

The environment is highly vulnerable to the effects of volcanic eruptions, particularly ashfall. Rivers and streams are vulnerable to damage, especially since ashfall can be carried through the county by means of the Truckee River, Incline Creek, and Ophir Creek. The sulfuric acid contained in volcanic ash can damage area vegetation, waters, wildlife, and air quality. Ash thickness can affect the survival of agricultural crops. Fauna consuming ash-covered food can suffer and die from gastrointestinal blockages.

VULNERABLE POPULATIONS

Ash falling during a volcanic eruption can pose a substantial risk to members of the public. A one-inch layer of ash weighs between five and ten pounds per square foot and will become much heavier during a rain event because water will saturate the ash. The deposition of ash poses a risk to individuals inside buildings if the load-bearing capacity of those buildings is compromised. Falling ash also poses a health risk to community members due to inhalation hazards. Individuals with pre-existing respiratory health conditions are especially vulnerable to this hazard. Lastly, accumulating ash can impair roadway traction, increasing the likelihood of traffic accidents.

COMMUNITY LIFELINES

Continuity of operations for county agencies and jurisdictions would be more vulnerable to larger ash explosions, which lead to more widespread ashfall. Depending on the amount and spatial distribution of material deposited in a jurisdiction, there could be more damage to communications equipment and transportation infrastructure, which could limit the ability of a jurisdiction or agency to maintain day-to-day operations.

VULNERABILITY SCORE

The NRI includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at the county and census tract levels. Table 93 provides an overview of each category at the county level.

Table 93: National Risk Index for Volcano in Washoe County

Volcano	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Low	Medium	Low	$0	Low

Based on the NRI, Washoe County has no available rating for the risk index and no available score for volcano which is higher than the national percentile (see Figure 140).

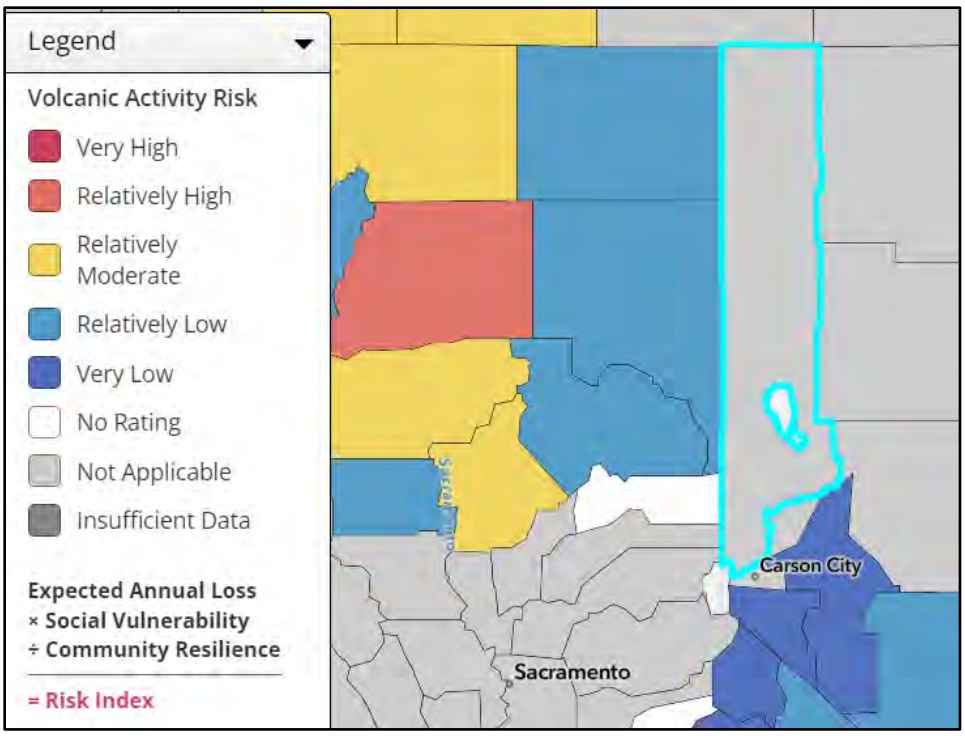


Figure 140: National Risk Index Washoe County Volcanic Activity Score, Map, and Legend[254]

CONSEQUENCE ANALYSIS

Volcanoes can pose a minimal or severe risk to the County of Washoe, depending on the location and severity of the nearby eruption. The biggest risk to Washoe County regarding volcanoes would likely come from nearby active volcanic areas in neighboring states.

The information below provides the Consequence Analysis of the Potential for Detrimental Impacts of Volcano, which was done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 94: EMAP Consequence Analysis for Volcano in Washoe County

Subject	Ranking	Impacts/Volcano
Public	Minimal	The risk of volcanic activity to the public in Washoe County is generally low. Most of the area's volcanoes are considered extinct or dormant. Nevada does have some volcanic activity, but the risk to the public is minimal.

[254] FEMA, "National Risk Index Washoe County Volcanic Activity Score, Map and Legend." https://hazards.fema.gov/nri/map

Subject	Ranking	Impacts/Volcano
Responders	Minimal to Severe	The risks to first responders during a volcano explosion are considerable. These risks include exposure to toxic gases such as sulfur dioxide, ashfall causing breathing problems and reduced visibility, flying debris, and the potential for further eruptions or other volcanic activity. First responders may also face the danger of fast-moving lava flows and the risk of landslides and lahars (mudflows) triggered by the eruption. Additionally, there is the possibility of earthquakes and tsunamis associated with volcanic activity.
Continuity of Operations	Minimal to Severe	Potential impacts on the continuity of operations in Washoe County, due to volcanoes could include disruptions to transportation routes, such as highways and roads, as well as potential damage to infrastructure, buildings, and utilities. Ashfall from a volcanic eruption could also impact air quality and pose health risks to residents. Emergency management and response systems must also be prepared for potential evacuations and support affected communities.
Property, Facilities, and Infrastructure	Minimal to Severe	The impacts and risks to critical infrastructure due to a volcano eruption in Washoe County could be minimal to significant, depending on the distance from the explosion. Some potential impacts and risks may include damage to roads and bridges from ash deposition, interruption of utilities such as power and water supply, and potential damage to buildings and structures from ash fall or volcanic gases. Additionally, there may be risks to communication systems and transportation networks, which could hamper emergency response efforts.
Environment	Moderate to Severe	A nearby volcanic eruption in Washoe County, Nevada, would likely severely impact the environment. Volcanic eruptions can lead to widespread destruction of ecosystems and air and water pollution and can also have long-term effects on the local environment.
Economic Condition	Minimal to Severe	Depending on the location and severity of the eruption, a volcanic eruption near Washoe County could have significant economic impacts. It could close transportation routes, disrupt supply chains, damage infrastructure, and decrease revenue from tourism and hospitality. Additionally, it could strain the county's budget and resources.
Public Confidence in Governance	Minimal to Severe	A volcanic eruption near Washoe County could significantly impact public confidence in governance. Responding to such a natural disaster would be a significant test for local and regional

Subject	Ranking	Impacts/Volcano
		authorities. Delays or inadequacies in the response efforts could decrease public confidence in the government's ability to handle emergencies effectively. In contrast, a well-coordinated and efficient response could help maintain or enhance public confidence in governance.

COMMUNITY INPUT

This hazard was identified as the hazard of least concern to the public according to the digital survey. Three public comments were received on the Volcano hazard. One discussed the super volcano in Yellowstone, or a volcano eruption from Mono County, CA, another agreed that volcano eruptions are cyclic events and will continue to occur, and one contended that volcano eruptions would not impact Reno/Sparks. The public ranked volcanos as the hazard they were least concerned about impacting the planning area. No public questions or suggestions for volcano mitigation actions were received during the plan update. Figure 141 is a picture from the public meeting.

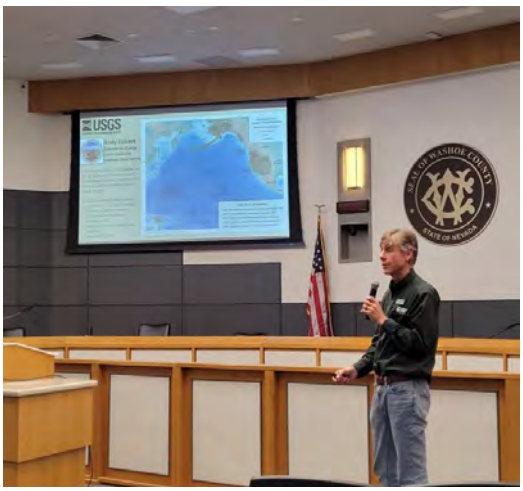


Figure 141: USGS Presentation on Volcanoes at the Public Meeting

No stakeholder comments were received from the stakeholder survey on this hazard.

The plan participants noted that this hazard has a higher priority now that there is a relationship between WCEM and USGS Moffett Field. There is increased need for studying this hazard, in particular ash level predictions, what the cleanup entails, how long the region would be impacted. Additionally, the planning area would benefit from more time with USGS SMEs to dig deeper into this hazard.

Wildland Fire

Hazard Description

A wildland fire is a fire that starts in or moves into areas where there is primarily vegetation and brush and limited structures. Wildland fires can result from natural causes or human activities. The main natural cause of wildland fires is lightning. Human activities that may cause fires include campfires, the use of machinery near dry vegetation, improper disposal of ashes, and arson.

Wildland fires are not confined to forested areas; they can burn wherever vegetation is prevalent, including park areas. The term Wildland–Urban Interface (WUI) is used to describe areas where human development meets or intermixes with vegetation that can fuel fires. Fires in the WUI can cause major losses of property and structures and human casualties.

Wildland fire spreads primarily by the consumption of vegetation, and the rate, area, and extent of consumption depends on three main factors: fuel, topography, and weather. These factors can sustain a wildland fire and predict a given area's fire potential and the associated damage that can occur, affecting the land, infrastructure, and people.

FUEL

Fuel is any material that can burn. Fuels are the source of energy that drives a fire and are a significant factor in wildland fire behavior. Fire behavior depends on fuel type, loading, availability, arrangement, and fuel moisture content. The amount of fuel in an area depends on the availability of water, elevation, and slope aspect Fire behavior is based on 13 distinct Fuel Models (FMs), of which 7 apply to the Washoe County planning area: FM1 Short Grass, FM2 Timber (grass and understory), FM5 Brush, FM6 Dormant Brush and Hardwood Slash, FM8 Closed Timber Litter, FM10 Timber (litter and understory), FM11 Light Logging Slash.

Areas of Washoe County planning area can be divided by fuel type to include: (1) low-elevations of high desert savannah, characteristic of seasonal forbs and grasses; (2) various species of brush, dominated by Big Sagebrush (Artemesia tridentata); (3) mid-elevations transitioning from brush to Mountain Mahogany (*Cercocarpus ledifolia*), a tall, dense brush-like cover type; (4) yellow pine-mixed conifer forests on the eastern aspects of the Carson Mountain Range; and (5) Pinyon-Juniper woodlands dominating lower-elevation mountain ranges in the Northern and Eastern extents of the county.

Located in the western portion of the Washoe County planning area, the upper elevations of the Carson Mountain Range are an alpine ecosystem dominated by yellow pine-mixed conifer species with a brush understory. The northern and eastern parts of the Washoe County planning area are characterized by the transition from savannah grass to brush (both low and decadent stands) to pinyon–juniper forests.

In addition, extensive invasive plant species exist in the planning area, such as cheat grass, Russian thistle, Russian knapweed, and common white top. These species threaten to overtake the native vegetation, smothering riparian areas and intensifying the wildland threat.

Fuel characteristics influence wildland fire spread and intensity. Fuel characteristics include:

- **Loading:** The amount of fuel that is present, expressed in tons per acre.
- **Availability:** The total mass of fuel that may be consumed by a fire. Fuel moisture affects the rate of fire spread. The drier the fuels, the faster the fire spreads because the fuels are preheated and devoid of moisture so the fire can move more quickly. This contrasts with fuels with more moisture, which impedes the progress of a wildland fire because it takes longer for it to dry out and reach its ignition temperature.
- **Arrangement:** The manner in which fuels are spread over an identified area. Horizontal arrangement affects fire spread, patchy fuels could limit fire spread, and vertical arrangement allows a fire to move from a ground fire to a fire in the canopy of trees in a forested area.

TOPOGRAPHY

The slope and aspect of an area affect its susceptibility to wildland fire spread. Both fire intensity and rate of spread increase as the slope increases because heat from a fire rises by convection. A fire burns faster uphill than downhill. A fire will typically burn uphill in the daytime, influenced by upslope winds, and downhill at night, influenced by a shift in the temperature and winds that blow downhill.

The arrangement of vegetation on a hillside also can contribute to increased fire activity on slopes. The aspect of an area can affect fire spread and vegetation growth. South and southwest slopes are exposed to the sun for longer periods and have lighter, sparser vegetation with lower fuel moisture and higher temperatures due to exposure. North- and northwest-facing slopes tend to have heavier fuels with higher fuel moisture and lower temperatures due to less sun exposure. A north or northwest aspect will experience less fire activity than a south-facing slope.

The Washoe County planning area is located on the Lee side of the Carson Range of the Sierra, at elevations that range from 4,600 feet at the Valley Floor to over 10,000 feet above sea level at the Mount Rose Summit. The higher elevations are characterized by deep topographical drainages that are oriented west to east, descending from subalpine timber-covered slopes.

WEATHER

Weather is the most variable and unpredictable element of the fire environment. Weather conditions impact fire behavior and must be constantly monitored by fire suppression crews to ensure safety and make effective firefighting decisions. Weather components, such as

temperature, relative humidity, wind, and lightning, affect the potential for wildland fire. High temperatures and low relative humidity dry out the fuels that feed the wildland fire, creating a situation in which fuel will ignite more readily and burn more intensely. Wind is the most hazardous weather factor affecting fires. The greater the wind, the faster a fire may spread and the more intense it may be. Lightning may ignite wildland fires, which are often in terrain that is difficult for firefighters to reach. Drought conditions contribute to wildland fire vulnerability. During periods of drought, the threat of wildland fire increases. Figure 142 shows the potential for significant wildfires during the summer months.

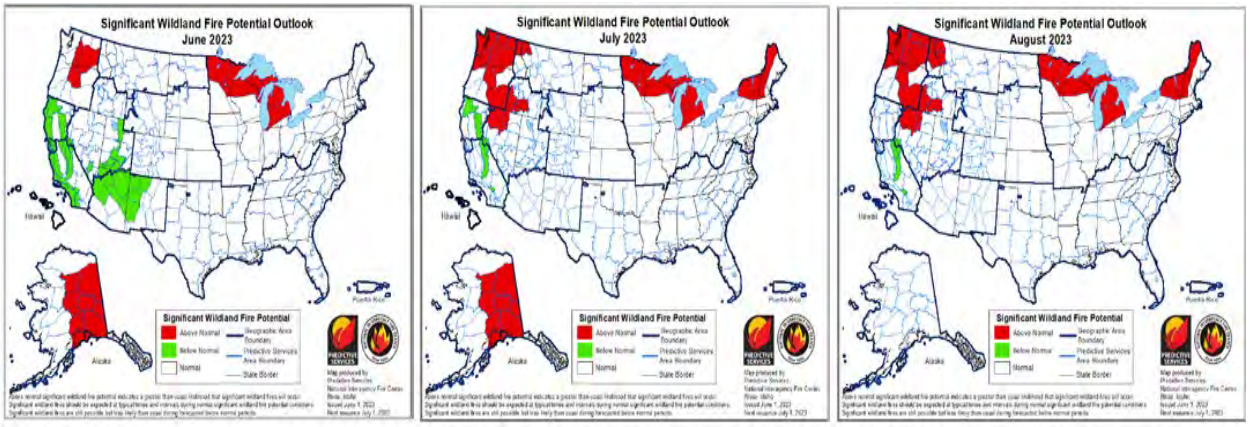


Figure 142: Significant Wildfire Potential in June (left), July (middle), and August (right)[255]

Intense wildland fires can create their own weather systems, which can help fires spread "by lofting embers and causing spot fires."[256] Wildland fires modify winds in their vicinity, causing updrafts that influence how high smoke plumes and embers rise. Intense fires can cause turbulent winds and pyro-cumulus clouds, which can sometimes produce lightning.[257]

Winds can be significant at times in the Washoe County planning area during both the summer and winter fire seasons. Besides wind speed, wind can shift suddenly because of temperature changes or the interaction of wind with topographical features, such as slopes or steep hillsides. The Carson Range of the Sierra Nevada mountains and its steepness on the eastern side of Washoe County create three particularly dangerous situations. The Sierra Nevada Mountain wave is a disrupted linear flow of fast-moving air perpendicular to the range from the west or southwest that creates rapid down-slope winds that intensify in the afternoon and evening. The Washoe zephyrs are afternoon and evening breezes that flow downhill on the east-facing slopes after the sun passes and the cool air starts sinking and flowing down slope. This creates

[255] Nevada State Climate Office, University of Nevada Reno, 2023. https://www.unr.edu/nevada-today/news/2023/june-drought-update-2023. From the https://www.nifc.gov/nicc.
[256] U.S. National Science Foundation, "Researchers Discover how Wildfires Create Their Own Weather." https://www.nsf.gov/news/researchers-discover-how-wildfires-create-their
[257] The Weather Channel, "New Study Reveals How Wildfires Create Their Own Weather." https://weather.com/news/weather/news/how-wildfires-create-own-weather-2017-study

down-slope winds that can be contrary to the normal diurnal winds and can combine with the Sierra Nevada Mountain wave to scour drainages and canyons that are lined with residences in the County and its cities. The third influence is orographic lifting, which facilitates the formation of thunderstorms. These thunderstorms can create winds in excess of 50–60 miles per hour and tremendous short-term downpours or dry lightning with little or no precipitation. Based on historic wildfire data from Nevada Division of Forestry, about 54% of fires are from natural causes, 35% are human-caused, and 11 percent are from other causes or undetermined.

Location

While wildland fire risk is predominantly associated with WUI areas in Washoe County, significant wildland fires can also occur in heavily populated areas. Wildland fires affect grass, forest, brushlands and any structures in them. Where there is human access to wildland areas, such as the Carson Range of the Sierra Nevada and the foothills of the Virginia Range, the risk of fire increases because of a greater chance of human carelessness.

Wildfires can vary in terms of size, location, intensity, and duration. They are not confined to any specific geographic location, but they are most likely to occur in open grasslands. The threat to people and property from a wildfire event is greater in the fringe areas where developed areas meet open grass lands.

Figure 143 Shows wildland fire hazard potential areas in Washoe County using data from Wildfire Risk to Communities, a tool from the USDA Forest Service to understand wildfire risk[258]. Wildfire Hazard Potential is an index that quantifies the relative potential for high-intensity wildfire that may be difficult to manage. It integrates data on wildfire likelihood and intensity to help prioritize where fuel treatments may be needed. Wildfire likelihood, or probability, is based on models of thousands of simulations of weather, topography, and ignitions. Wildfire intensity is a measure of the energy expected from a wildfire, a condition of topography and vegetative fuel available to burn.

In general, the risk of wildland fire is greatest in the mountain ranges in the middle of the County, north of Pyramid Lake, including the Lake Range, Fox Range, and Buffalo Hills; in the Carson Range northeast of Lake Tahoe; and in the WUI outside the cities of Reno and Sparks, including the Pah Rah Range.

Burn scars, the charred, burned area left behind after a wildfire, can contribute to cascading hazards, including increased Flooding (including closed-basin flooding) and landslides.

[258] USDA Forest Service, Wildfire Risk to Communities. https://wildfirerisk.org/

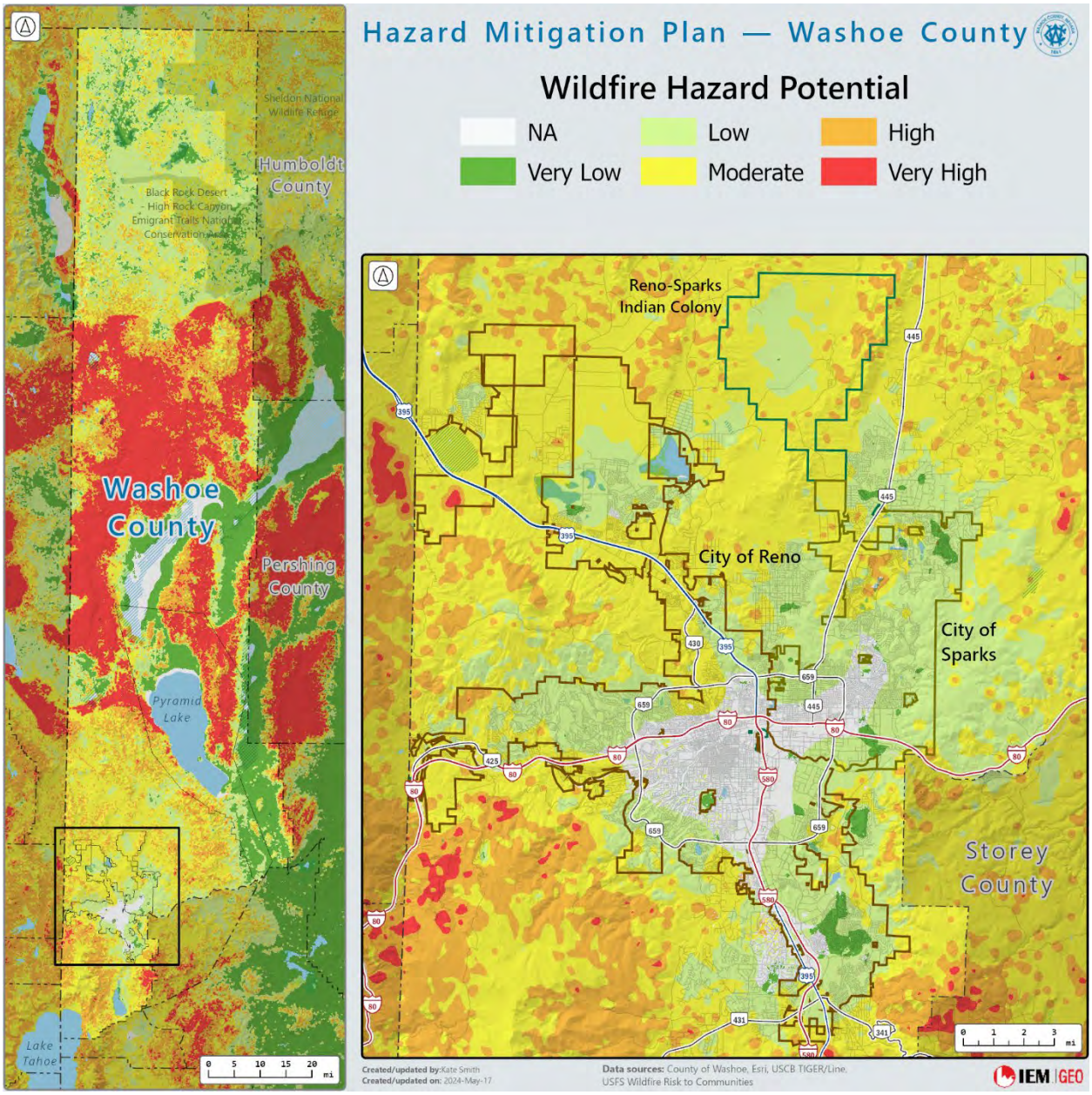


Figure 143: Wildfire Hazard Potential for Washoe County

Extent

The magnitude and potential severity of impacts of wildland fire are considered High in Washoe County. Potential losses from wildland fire include human life; structures and other property improvements; natural and cultural resources; the quality and quantity of the water supply; assets, such as timber, range, and crop land; recreational opportunities; and economic losses. Smoke and air pollution from wildland fires can be severe health hazards. Catastrophic wildland fires can also have secondary impacts or losses, such as future Flooding (including closed-basin flooding), landslides, and erosion during heavy rains.

The fire season extends from May through October—the hot, dry months. Most fires are controlled and contained early, with limited damage to residences and buildings. For ignitions that are not readily contained and become wildland fires, damage can be extensive and can quickly require state and federal assistance.



The risk of a wildfire event is measured in terms of magnitude and intensity using the Keetch–Byram Drought Index (KBDI), a mathematical system for relating current and recent weather conditions to potential or expected fire behavior. The KBDI derives forest fire potential by balancing a drought factor with precipitation and soil moisture (assumed to have a maximum storage capacity of eight inches), and it is expressed in hundredths of an inch of soil moisture depletion.

Each color in Figure 144 represents the drought index at that location. The drought index ranges from 0 to 800. A drought index of 0 represents no moisture depletion, and a drought index of 800 represents absolutely dry conditions.

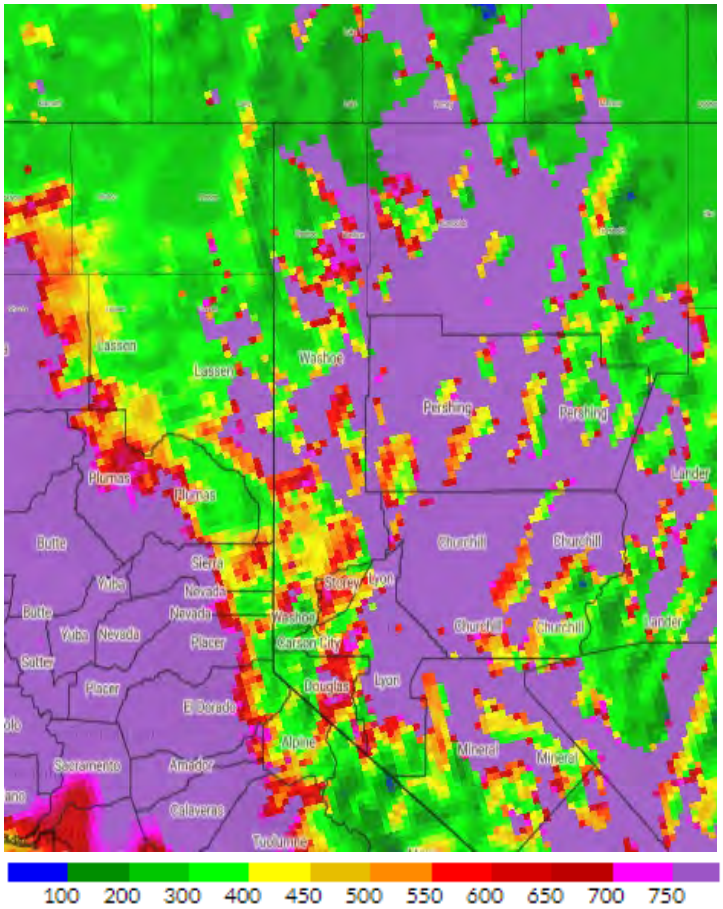


Figure 144: Keetch–Byrum Drought Index Map of Washoe County

Fire behavior can be categorized at four distinct levels on the KBDI:

- **0–200:** Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in spots and patches.
- **200–400**: Fires burn more readily and will carry across an area with no gaps. Heavier fuels will not readily ignite and burn. Expect smoldering and the resulting smoke to carry into and through the night.
- **400–600:** Fire intensity begins to significantly increase. Fires will readily burn in all directions, exposing mineral soils in some locations. Larger fuels may burn or smolder for several days, creating possible smoke and control problems.
- **600–800:** Fires will burn to mineral soil. Stumps will burn to the end of underground roots, and spotting will be a major problem. Fires will burn through the night, and heavier fuels will actively burn and contribute to fire intensity.

Figure 144 shows values in the 400–650 range in the southern portion of Washoe County, where much of the population is concentrated. Scattered areas of high index values are found in other parts of the county where there is less development. This could contribute to an increase in the risk of wildfire. The KBDI is a good measure of the readiness of fuels for a wildfire event. It should be noted that the area experiences changes in precipitation and soil moisture, and caution should be exercised in dryer, hotter conditions.

Previous Occurrence/History

NOAA's NCEI Storm Events Database recorded three wildland fires in Washoe County between 2019 and 2023. No deaths, three injuries, $100K in property damage, and no crop damage was identified in the database. The FEMA web site documents that Washoe County has received 9 major disaster declaration due to wildland fire since the prior plan prepared in 2017. Table 95 identifies the declarations since 2017 that affected Washoe County.

Table 95: Major Disaster Declarations in Washoe County Since 2017[259]

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard M Program Declared	Declaration Date	Title
FM-5190	No	Yes	Yes	7/14/2017	Nevada Cold Springs Fire
FM-5283	No	Yes	Yes	7/13/2019	Nevada Jasper Fire
FM-5291	No	Yes	Yes	8/24/2019	Nevada Long Valley Fire
FM-5316	No	Yes	Yes	6/27/2020	Nevada Poeville Road Fire
FM-5322	No	Yes	Yes	7/21/2020	Nevada Rockfarm Fire
FM-5326	No	Yes	Yes	8/3/2020	Nevada North Fire
FM-5328	No	Yes	Yes	8/15/2020	Nevada Loyalton Fire
FM-5382	No	Yes	Yes	11/17/2020	Nevada Pinehaven Fire
FM-5448	No	Yes	Yes	8/14/2022	Nevada Joy Lake Fire

Data on Wildfires from Nevada Division of Forestry indicates 380 fires affected Washoe County from 2000 to 2023. Of those, 148 were human caused, 128 were from natural causes, 1 was caused by an electrical incident, and 103 were either unavailable or undetermined. 1,240,187.6 acres were burned: the smallest was less than an acre and the largest burned 307,083 acres during the Rush Fire of 2012. Most of the area burned in this fire was in Lassen County, California.

129 fires have affected Washoe County since the last plan update. Between 2020-2023, 124.511.3 acres have burned. The largest of these, the W-5 Cold Springs Fire in 2020, burned 84,817 acres between Washoe County and Lassen County and Modoc County California. 31 of

[259] FEMA, 2024, "Major Disaster Declarations in Washoe County Since 2017." https://www.fema.gov/disaster/declarations?field_dv2_declaration_date_value%5Bmin%5D=2016&field_dv2_declaration_date_value%5Bmax%5D=2024&field_dv2_declaration_type_value=All&field_dv2_incident_type_target_id_selective=All&field_dv2_state_territory_tribal_value%5B%5D=NV

these fires were human caused, 28 were naturally caused, 1 electrical, and the remainder unknown or unavailable.

Table 96 presents information on wildland fires occurring between 2020 and 2023 that were greater than 10 acres in size. Information on historical wildland fires between 2000 and 2019 is available in the 2019 Washoe County Regional Hazard Mitigation Plan.

Table 96: Wildland Fires in Washoe County, 2020–2023

Year	Fire Name	Total Acres Burned	Cause
2023	Culpepper	12.8	Undetermined
2023	S Hill	78	Human
2022	Wadsworth	27	Undetermined
2022	Kinney	17	Undetermined
2022	North Springs	223.7	Natural
2022	Mosquito	119	Undetermined
2022	S-2 Board	38.1	Undetermined
2021	Vista	15.3	Undetermined
2021	Woodsprings	26.3	Undetermined
2021	Petrilla	528.1	Undetermined
2021	S-3	49	Natural
2021	Garson	67.2	Undetermined
2021	Brady	15	Undetermined
2021	Green River	282	Undetermined
2020	S-4 Sheldon	1801.7	Undetermined
2020	Cowhead	59.8	Undetermined
2020	Cole	17.9	Human
2020	Cielo	73.2	Undetermined
2020	Peavine	22.0	Natural
2020	Antelope	29.3	Human
2020	Poeville Road	2972.75	Undetermined
2020	Poodle	13600.9	Natural
2020	North	6882.3	Undetermined
2020	Smoke Shop	96.4	Human
2020	Hardscrabble 1	63.0	Human
2020	Rowdy	11.9	Human

Year	Fire Name	Total Acres Burned	Cause
2020	Poeville	68.8	Human
2020	Scrabble	764.2	Natural
2020	Golden Eagle 1	59.4	Human
2020	Eagle 2	29.2	Natural
2020	Rock Farm	124.3	Human
2020	R-9	26.7	Undetermined
2020	W-5 Cold Springs	84817.27	Undetermined
2020	Baccarat	10519.99	Undetermined
2020	White Lake	234.67	Undetermined
2020	Derby Lake	20.7	Undetermined
2020	Pinehaven	512.14	Undetermined
2020	Red Rock	47.9	Electrical

Several major fires that occurred in the County between 2015 and 2023 are described in the following sections.

- **October 24, 2023, Hill Fire near Verdi** – A fire broke out at 11:00 pm, and homes were evacuated on both the Nevada and California sides of the state line near Dog Valley Road. Truckee Meadows Fire and Protection crews worked to stop the brush fire in the Verdi area, which burned 47 acres of land due to erratic winds and threatened to encroach on an estimated 40–60 homes on Hill Road from Bridge Street to Dog Valley Road neighborhoods.

- **August 23, 2021** – **California Dixie and Caldor Fires** – Dense smoke from massive wildfires burning in neighboring California created hazardous air quality in the Reno–Tahoe area, canceling flights and forcing the closure of schools, parks, and popular summer beaches. Government air monitors recorded some of the region's most hazardous conditions in recent years. The National Weather Service issued an air quality alert for parts of northeast Nevada's Elko County, more than 300 miles (482 kilometers) east of the closest California fires. Smoke blowing from the Dixie and Caldor fires in California blanketed northern Nevada on and off for weeks, leaving particulate matter in the air and raining ash on cars in some areas.

- **November 17, 2020** – **Greater Reno/Carson City** – A powerful Pacific jet stream, rain shadowing, and mountain waves yielded some of the highest winds the region has seen in a few years. Dry vegetation and high winds contributed to several major wildfires near Reno, NV, and Walker, CA. A brief period of spillover rain and snow occurred that night into the morning of November 18.

- **November 17, 2020** – **Pinehaven Fire** in the Caughlin Ranch area of Southwest Reno had wind gusts of 72–77 MPH. On Tuesday, November 17, at approximately 1 pm, a fire started on the hillside just south of Pinehaven Road and Sierra Pine Drive. Five homes were destroyed, three homes were heavily damaged, and 21 homes suffered minor damage from the fire.

- **October 4, 2020** – **The Baccarat Fire** started near Red Rock Road north of Reno on the 4th before being contained on the 8th. The fire burned 10,500 acres, with no structures destroyed. However, the fire threatened 75–100 homes. Mandatory evacuations were ordered for some residents in the path of the fire. Firefighting costs were approximately $2.4M, according to the Carson City District Office, Nevada Bureau of Land Management. October was dry and warm, with much of the area reporting no measurable precipitation during the month.

- **August 24, 2019** – **The Long Valley Fire** started near the Red Rock exit along US Highway 395 and spread across the California–Nevada border into northwestern Nevada on the 24th before being contained on the 27th. The fire burned 2,438 acres, and one structure was destroyed. FEMA stated that the fire threatened 250–300 homes in and around Rancho Haven, Nevada. The fire also threatened five buildings, infrastructure, utilities, equipment, farms, ranches, and a watershed in the area. Mandatory evacuations were ordered for approximately 800 people before containment was reached. Firefighting costs were approximately $600K, according to the Nevada Bureau of Land Management. The fire was caused by warm temperatures, along with dry conditions, and occurred from the 23rd through the end of the month. Breezy conditions occurred on the 24th and 25th, but the combined effects of winds and humidity did not reach critical fire weather criteria.

- **July 13, 2019** – **The Jasper Fire** in northern Sun Valley burned 1,165 acres from July 13 to July 16. The Sierra Front Dispatch Center stated that one home and two outbuildings were destroyed. At one point, more than 100 homes were threatened, and the Washoe County Sheriff's Office was going door to door, urging people to evacuate. Firefighting costs were approximately $769K, according to the Nevada Bureau of Land Management. The fire was caused by a longwave trough that moved across the northwestern US and brought breezy conditions each afternoon to western Nevada and eastern California.

- **July 28, 2018 –The Perry Fire** burned 51,386 acres in the Grass Valley Road area. Residents there were ordered to evacuate, and the fire threatened cultural sites in the Pyramid Lake area. Highway 446 was closed during the incident.

- **The Winnemucca Ranch Fire** (**7/5/2017)** burned 4,800 acres in the Palomino Valley. Residents were under a voluntary evacuation order during the incident, and five structures were destroyed.

- **The Cold Springs Fire** (**7/14/2017)** burned 1,523 acres south of Silver Lake. The fire was spread by high winds and aided by abundant fuel with few natural breaks. The fire damaged

or destroyed power lines in multiple locations and threatened about 100 residences, although there were no casualties.

- **The Tule Fire** (**7/28/2016),** part of the Virginia Mountains Complex of fires in 2017, burned 36,142 acres near Pyramid Lake, which resulted in the closure of the lake for recreational use until the fire was 100% contained. The fire destroyed four residences in Sutcliffe.
- **The Little Valley Fire on October 14, 2016,** burned 2,291 acres north of Carson City. It destroyed 23 homes and threatened an additional 480 acres, and residents in the affected area were under a mandatory evacuation order. Franktown Road was closed to all except residents during the response. Figure 145 shows one aspect of this fire.



Figure 145: Picture of the Little Valley Fire, October 2016 (Photo by CBS News)

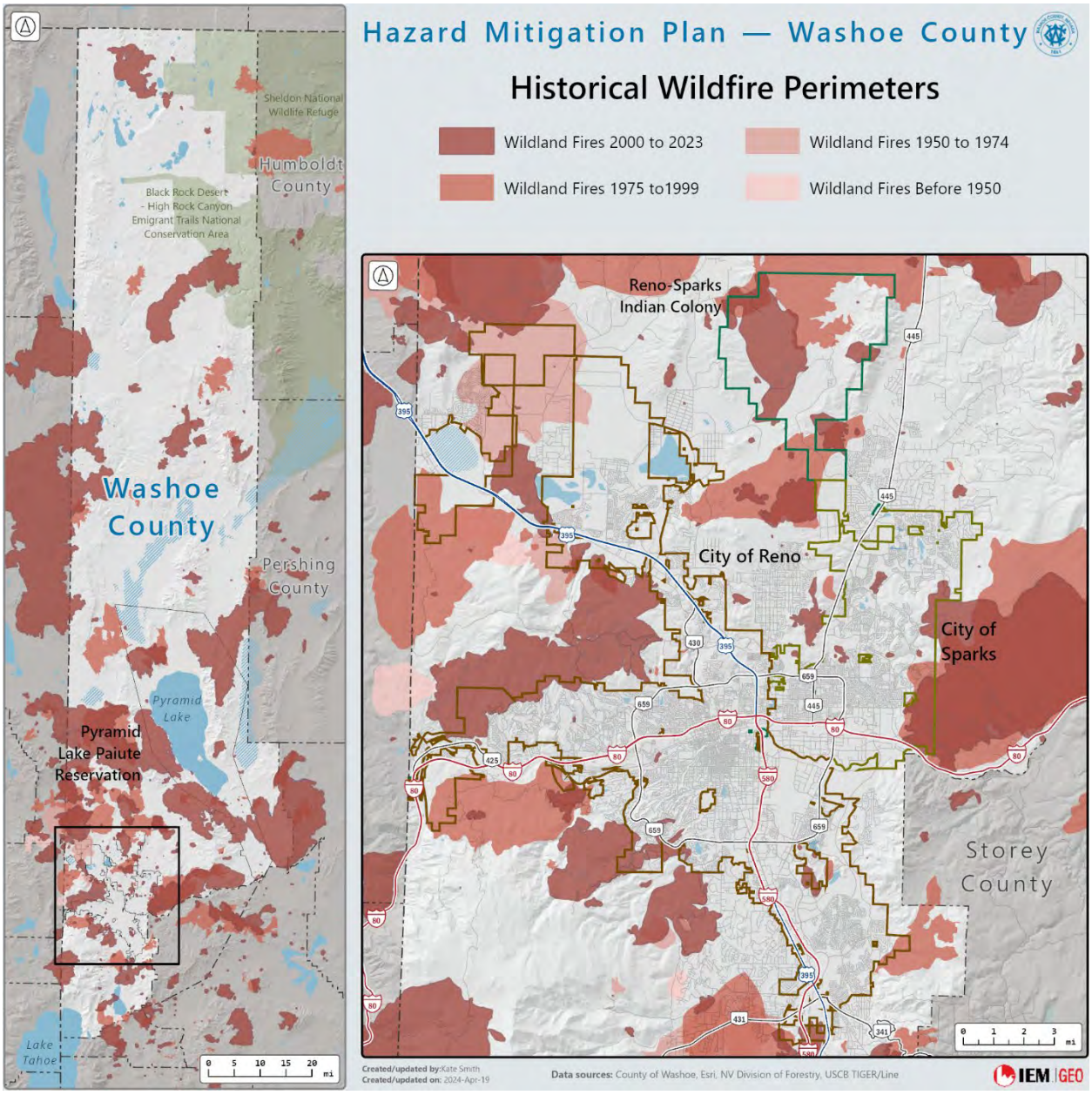


Figure 146: Historical Wildfire Perimeters in Washoe County

Probability of Future Events

A wildfire event poses a potentially significant risk to public health and safety, particularly when conditions such as low humidity, ample fuel loads, and strong winds are present. The impacts associated with a wildfire are not limited to direct damage. While wildfires are often a natural phenomenon and part of the normal cycle of the natural environment, they can cause significant deforestation, wildlife death, and water and air pollution. Environmental damage caused by a wildfire event may take decades or longer to become fully restored.

The 2023 SHMP asserts that nearly the entire State of Nevada is at risk of wildfires due to fuel loading, ignition risk, weather, and topography. No specific area, other than playas, lakes, and parking lots, are immune to this risk. Based on reported locations, wildfires are clustered largely near human population centers, although that is also where the best detection methods and suppression resources are. This phenomenon results in increased reported starts and increased successful suppression. Human-related starts increase in these areas, which include recreation areas, highways, and power line rights-of-way. As populations continue to grow in the state, so will the number of fires in these and other areas.

Based on historical data and current trends (including climate change), the scale, severity, and probability of large wildfires are increasing in all parts of the state. For example, during early July 2016, the Hot Pot fire was burning at a rate of roughly 3 acres every second, 166 acres every minute, and 10,000 acres every hour—for a total of 56,000 acres in one continuous run. This kind of fire behavior is becoming normal for many fuel types and regions in Nevada.

Table 97 provides the Calculated Priority Risk Index for Wildland Fire in Washoe County. Hazards with a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 97: Calculated Priority Risk Index for Wildland Fire

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Wildland Fire	4	4	4	3	4	3.9

Climatic conditions, such as severe freezes and drought, can significantly increase the intensity of wildfires since these conditions kill vegetation, creating a prime fuel source for wildfires. The intensity and rate at which wildfires spread are directly related to wind speed, temperature, and relative humidity. Future climate conditions that increase the potential for wildfires in Washoe County include reduced snowpack and earlier snowmelt, aridification, and more frequent and prolonged drought and heat. Moreover, shifts in the ranges of plant and species, stressed, and weakened forest ecology, increased tree death due to temperature increases, decreased moisture, bark beetle infestations, and drier vegetation or lower water content in vegetation leading to faster and hotter burning fires can all increase the potential for wildfires.

Wildland fire is an annual occurrence in Washoe County; therefore, the probability of future fires is High. Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, the County may experience an increase in the probability of wildland fire in the future.

The Washoe County Fire Plan[260] identified 41 communities in the risk/hazard assessment for Washoe County. Nearly half of these areas have high and extreme fuel hazard conditions within one mile of the community boundary. In some cases, there are hazardous fuel conditions in the community. Many areas classified as moderate fuel hazards have a large component of cheatgrass. During years with above-normal precipitation and abundant growth of cheatgrass, perennial grass, and annual forbs, these areas can escalate into high fuel hazard conditions. Table 98 lists five primary factors that affect the potential fire hazard assessed to arrive at the community hazard assessment score: community design, construction materials, defensible space, availability of fire suppression resources, and physical conditions such as the vegetative fuel load and topography.[261]

Table 98: Results of the Community Risk and Hazard Assessment

Community	Interface Condition	Interface Fuel Hazard Condition	Ignition Risk Rating	Community Hazard Rating
High and Extreme Hazard Communities				
Antelope Valley	Intermix	Low to High	High	High
Mount Rose Corridor	Intermix	Moderate to Extreme	High	High
Rancho Haven	Intermix	Moderate to Extreme	High	High
Red Rock	Intermix	Low to High	High	High
Warm Springs Valley	Intermix	Low to High	High	High
Washoe Valley – West	Intermix	Low to Extreme	High	High
Moderate Hazard Communities				
Anderson Acres	Intermix	Moderate	High	Moderate
Cold Springs	Classic	Moderate	High	Moderate
Galena	Intermix	High to Extreme	High	Moderate
Gerlach	Intermix	Low to Moderate	Moderate	Moderate
Golden Valley	Intermix	Moderate	High	Moderate
Lemmon Valley	Intermix	Moderate	High	Moderate

[260] Washoe County Fire Plan, 2005, "Washoe County Fire Plan: Executive Summary." https://www.rci-nv.com/reports/washoe/summary.html

[261] Nevada Division of Forestry Historical Wildfire GIS Data

Community	Interface Condition	Interface Fuel Hazard Condition	Ignition Risk Rating	Community Hazard Rating
Mogul (I-80 Corridor West)	Classic	Moderate	High	Moderate
Nixon	Intermix	Low to High	High	Moderate
Palomino Valley	Intermix	Low to High	High	Moderate
Pleasant Valley	Classic	Moderate to High	High	Moderate
Reno-Northwest	Classic	Moderate to High	High	Moderate
Reno-Southeast	Intermix	Moderate to High	High	Moderate
Silver Knolls	Intermix	Moderate	High	Moderate
Spanish Springs	Intermix	Moderate to High	Moderate	Moderate
Steamboat	Intermix	Low to High	High	Moderate
Sun Valley	Intermix	Low to Extreme	Moderate	Moderate
Sutcliffe	Classic	High	High	Moderate (High)
Verdi	Intermix	Moderate to Extreme	High	Moderate
Washoe City	Classic and Intermix	High	High	Moderate
Washoe Valley – East	Intermix	Moderate to High	High	Moderate
Low-Hazard Communities				
Empire	Intermix	Low to Moderate	Moderate	Low
Reno-Southwest	Classic	Low to High	High	Low
Sparks	Classic	Low to Moderate	Low	Low
Stead	Classic	Moderate	Moderate	Low
Wadsworth	Classic	Low to Moderate	Moderate	Low

Vulnerability Analysis

Fire is a risk to all development in Washoe County because of the high desert climate and vegetation. The most at-risk type of development for wildland fires is residential subdivisions in or near the WUI, particularly in the more forested areas of the County, such as the Tahoe Basin. Based on economic trends, private land zoned for residential subdivisions in the WUI will continue to be developed, and mitigation, such as creating defensible space and managing fuels, will be required to reduce the risk as much as possible.

According to Wildfire Risk to Communities, Washoe County has very high risk to wildfire; higher than 97% of counties in the United States. Wildfire Housing Unit Risk, as shown in Figure 147, integrates wildfire likelihood, intensity, susceptibility, and exposure along with housing density. This serves as an index of locations where homes and wildfire risk conditions are both present.[262] This figure shows many areas of concern near the City of Reno, City of Sparks, Reno-Sparks Indian Colony, Washoe Valley, and the areas in and near Incline Village.

[262] USDA Forest Service, Wildfire Risk to Communities. https://wildfirerisk.org/

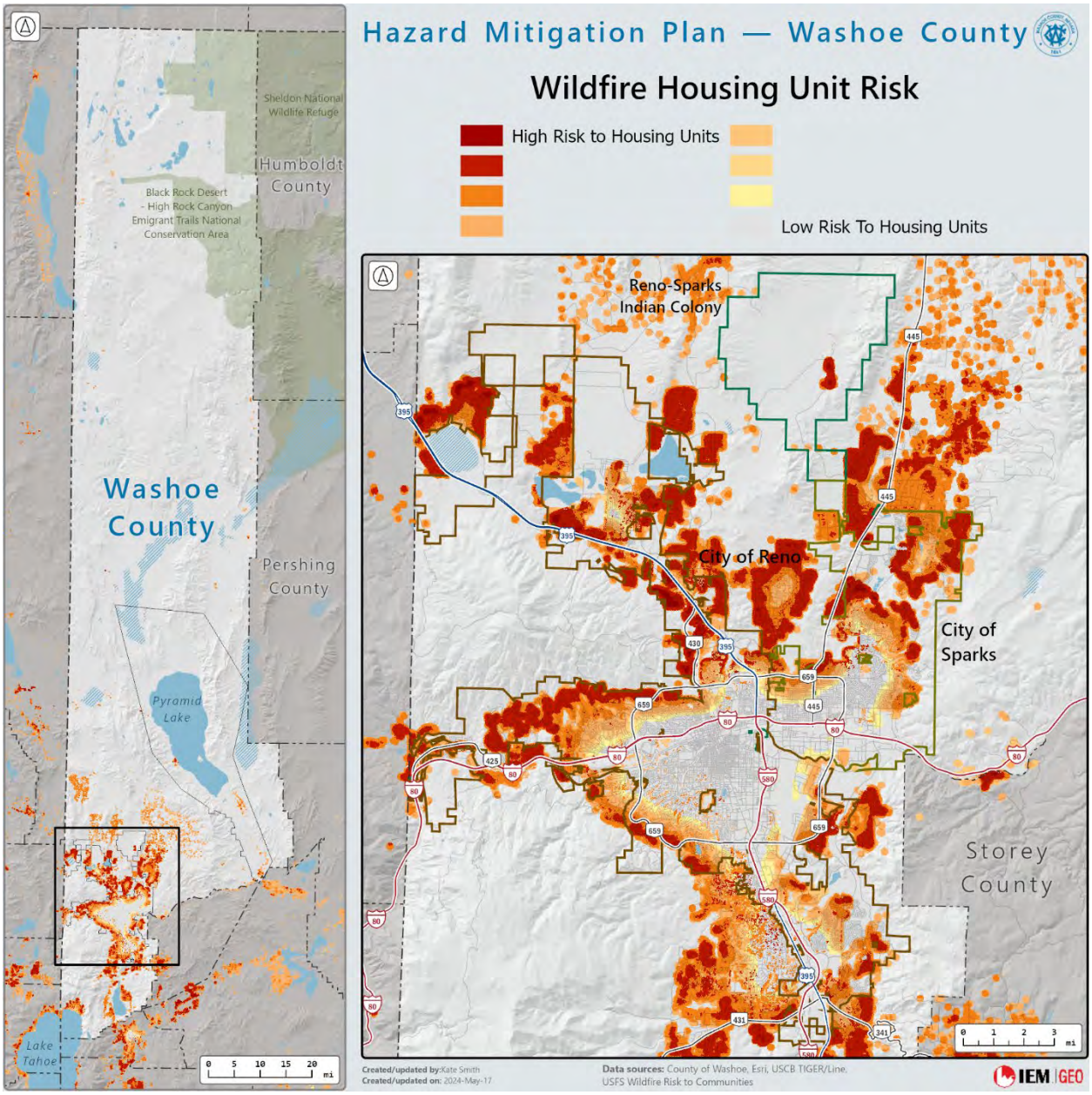


Figure 147: Wildfire Housing Unit Risk for Washoe County

ESTIMATED IMPACT AND POTENTIAL LOSSES

The impacts from major wildfire events can be very severe. Such events can cause multiple deaths, shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage. Severity of impact is gauged by acreage burned, homes and structures lost, and the numbers of injuries and fatalities. The cascading impacts of wildland fires also include Flooding (including closed-basin flooding), landslides, washouts, erosion, potential re-burns, degraded water quality, damage to fisheries, the spread of invasive plant species, power outages, and communications disruptions. Most recently,

studies in the City of Reno in 2021 substantiated the role of air pollution and showed that wildfire smoke in 2020 increased the number of COVID-19 cases.[263]

A wildfire event poses a potentially significant risk to public health and safety, particularly if the wildfire is initially unnoticed and spreads quickly. The impacts associated with a wildfire are not limited to direct damage. Potential impacts on the planning area include the following:

- Persons in the area at the time of the fire are at risk of injury or death from burns and/or smoke inhalation.
- First responders are at greater risk of physical injury since they are near the hazard while extinguishing flames, protecting property, or evacuating residents in the area.
- First responders can experience heart disease, respiratory problems, and other long-term illnesses from prolonged exposure to smoke, chemicals, and heat.
- Emergency services may be disrupted during a wildfire if facilities are impacted, roadways are inaccessible, or personnel are unable to report for duty.
- Critical city and/or county departments may not be able to function and provide necessary services, depending on the location of the fire and the structures or personnel impacted.
- Noncritical businesses may be directly damaged, suffer loss of utility services, or be otherwise inaccessible, delaying normal operations and slowing the recovery process.
- Displaced residents might not be able to return to work immediately, further slowing economic recovery.
- Roadways could be damaged or closed due to smoke and limited visibility.
- Older homes are generally exempt from modern building code requirements, which may include fire suppression equipment.
- Some high-density neighborhoods feature small lots with structures close together, increasing the potential for fire to spread rapidly.
- Air pollution from smoke may exacerbate the respiratory problems of vulnerable residents.
- Charred ground after a wildfire cannot easily absorb rainwater, thus increasing the risk of Flooding (including closed-basin flooding) and potential mudflows.

[263] Harvard.edu, The Harvard Gazette, 2021, “Link between wildfires and COVID cases established.” https://news.harvard.edu/gazette/story/2021/08/wildfire-smoke-linked-to-increase-in-covid-19-cases-and-deaths/

- Wildfires can cause erosion and degrade stream water quality.
- Wildlife may be displaced or destroyed.
- Historical or cultural resources may be damaged or destroyed.
- Tourism can be significantly disrupted, further delaying economic recovery in the area.
- Vegetated dunes can be stripped, significantly damaging the function of the dunes to protect inland areas from the destructive forces of wind and waves.
- Economic disruption negatively impacts the programs and services provided by the community due to short- and long-term loss in revenue.
- Fire suppression costs can be substantial, exhausting the financial resources of the community.
- Residential structures lost in a wildfire may not be rebuilt for years, thus reducing the tax base for the community.
- Recreation and tourism areas can be unappealing for years following a large wildfire, devastating directly related businesses.
- Direct impacts on the municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground delivery lines, and soil erosion or debris deposits into waterways after the fire.

The economic and financial impacts of a wildfire event on local government depend on the scale of the event, what is damaged, costs of repairs or replacement, lost business days in impacted areas, and how quickly critical components of the economy can be repaired. The level of preparedness and pre-event planning by the government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a wildfire event.

The 2018 SHMP points out that besides affecting people, wildfires may severely affect wildlife, livestock, and pets. Such events may require emergency watering/feeding, evacuation, and shelter. Evacuating animals can complicate the general evacuation procedures, logistics, and compliance of the public, due to financial and emotional connections with their animals. This can put responders and the public at an increased risk of injury and death. It is common for the Nevada Department of Wildlife (NDOW) to extend hunting seasons and tags for animal harvest following large wildfires in key habitats to mitigate large starvation-related die-offs of wildlife in fire-affected areas.

In Washoe County, the expected annual loss (EAL) value for Wildfire is $10M, with a rating of Relatively High expected annual losses, and a National Risk Index score of 98 (Figure 148).

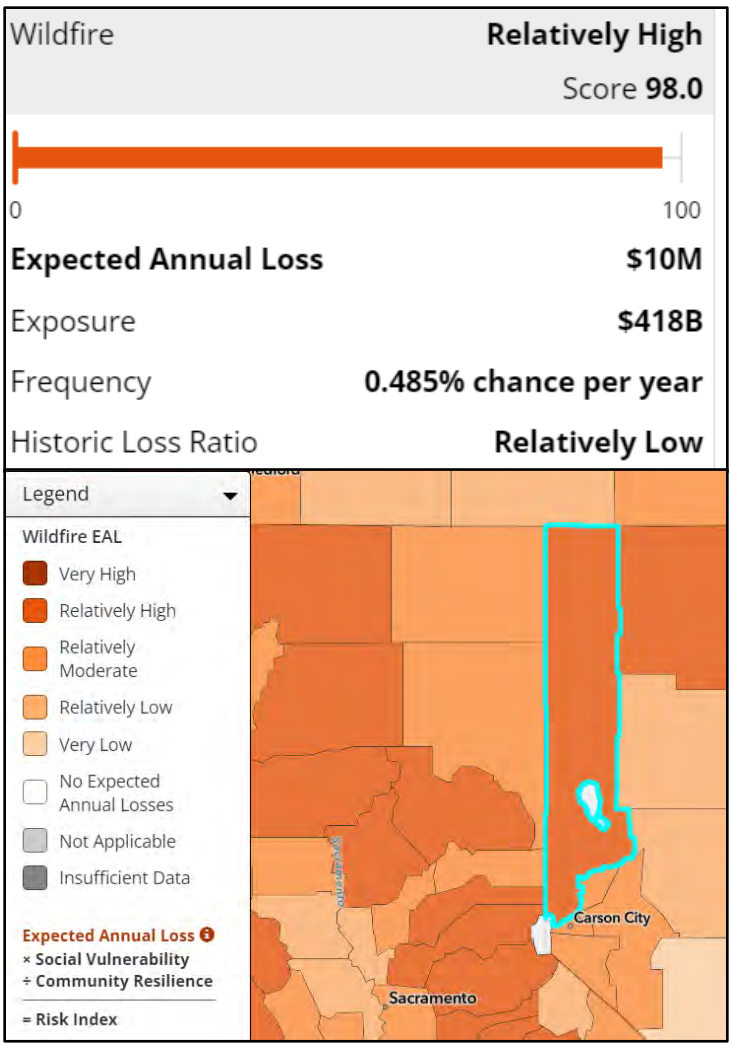


Figure 148: Washoe County Wildfire Expected Annual Loss Score, Map, and Legend[264]

IMPACT ON COUNTY ASSETS

Most critical facilities in the County are in areas of very low to low wildland fire potential. Several critical facilities and community assets are within areas of high or very high wildland fire potential, including Truckee Meadows Fire Station 39, Forest Service Station 381, Sutcliffe Ranger Station, Pyramid Lake Fisheries, David Dunne Hatchery, Koch Cui-Ui Hatchery, 6 flood control structures, 6 HAZMAT storage sites, and Gelena Creek Camp Wechme Lodge and Rock Building.

[264] FEMA, National Risk Index, "Washoe County Wildfire Expected Annual Loss Score, Map and Legend." https://hazards.fema.gov/nri/map

VULNERABLE POPULATIONS

Social and economic factors can make it more difficult for some people to prepare for, respond to, and recover from wildfires. Vulnerable populations may lack access to resources, experience cultural and institutional barriers, have limited mobility, or have medical conditions exacerbated by stress or smoke. For example, people over the age of 65 and people who are disabled are more susceptible to air pollution and particulates associated with wildfire smoke. Language barriers can make it difficult to follow directions during an evacuation or to access support after a disaster. Race and ethnicity are strongly correlated with disparities in health and access to aid and resources. Wildfires disproportionately impact people with low incomes because of factors such as inadequate housing and a diminished ability to evacuate or relocate.

Diminished air quality is an environmental impact of wildfire events, and it poses a potential health risk. Smoke plumes from wildfires can contain inhalable carcinogenic matter. Fine particles of invisible soot and ash that are too small for the respiratory system to filter can cause immediate and long-term health effects. The elderly and those with compromised respiratory systems may be more vulnerable to the effects of diminished air quality after a wildfire event.

2020 SARS-CoV2 studies conducted in Reno Nevada indicated that wildfire smoke may have increased the number of COVID-19 cases in Reno. The results substantiated the role of air pollution in exacerbating the pandemic and can help guide the development of public preparedness policies in areas affected by wildfire smoke, as wildfires were likely to have coincided with the COVID-19 pandemic in 2021.[265]

The Climate and Economic Justice Screening Tool from the U.S. Climate Resilience Toolkit was used to determine which vulnerabilities impacted Washoe County. According to this tool, which uses 2020 U.S. Census data, Washoe County is identified as having 27 disadvantaged populations identified by census tract, depending on the portion of the County, because it meets the threshold for more than one of the following categories: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. According to the Climate and Economic Justice Screening Tool, the portion of Washoe County considered disadvantaged is represented in Table 99 (showing climate change demographics), Figure 149 (Washoe County map with disadvantaged census tracts shaded in gray), Table 100 (listing 27 census tracts with relevant climate change data), and Figure 150 (showing census tracts designated as disadvantaged).

[265] Kiser, D., Elhanan, G., Metcalf, W.J. *et al.* "SARS-CoV-2 test positivity rate in Reno, Nevada: association with PM2.5 during the 2020 wildfire smoke events in the western United States." *J Expo Sci Environ Epidemiol* 31, 797–803 (2021). https://doi.org/10.1038/s41370-021-00366-w

Table 99: Washoe County Demographics by Vulnerability to Wildfire[266]

Vulnerable populations
All areas in Washoe County

Indicator	Number	Percent
Families in poverty	7,502 ±713	6.5% ±0.6%
People with disabilities	55,580 ±1,934	12% ±0.5%
People over 65 years	75,922 ±2,000	16.4% ±0.5%
People under 5 years	27,388 ±1,529	5.9% ±0.3%
People of color	175,379 ±8,826	37.8% ±2%
Black	11,195 ±1,246	2.4% ±0.3%
Native American	7,196 ±819	1.6% ±0.2%
Hispanic	114,756 ±4,610	24.7% ±1.1%
Difficulty with English	14,576 ±1,325	3.3% ±0.3%
Households with no car	12,159 ±832	6.5% ±0.5%
Mobile homes	10,104 ±731	5.4% ±0.6%

[266] Wildfire Risk to Communities, 2024. "Washoe County Population Demographics by Vulnerability to Wildfire." https://wildfirerisk.org/explore/vulnerable-populations/48/48409/

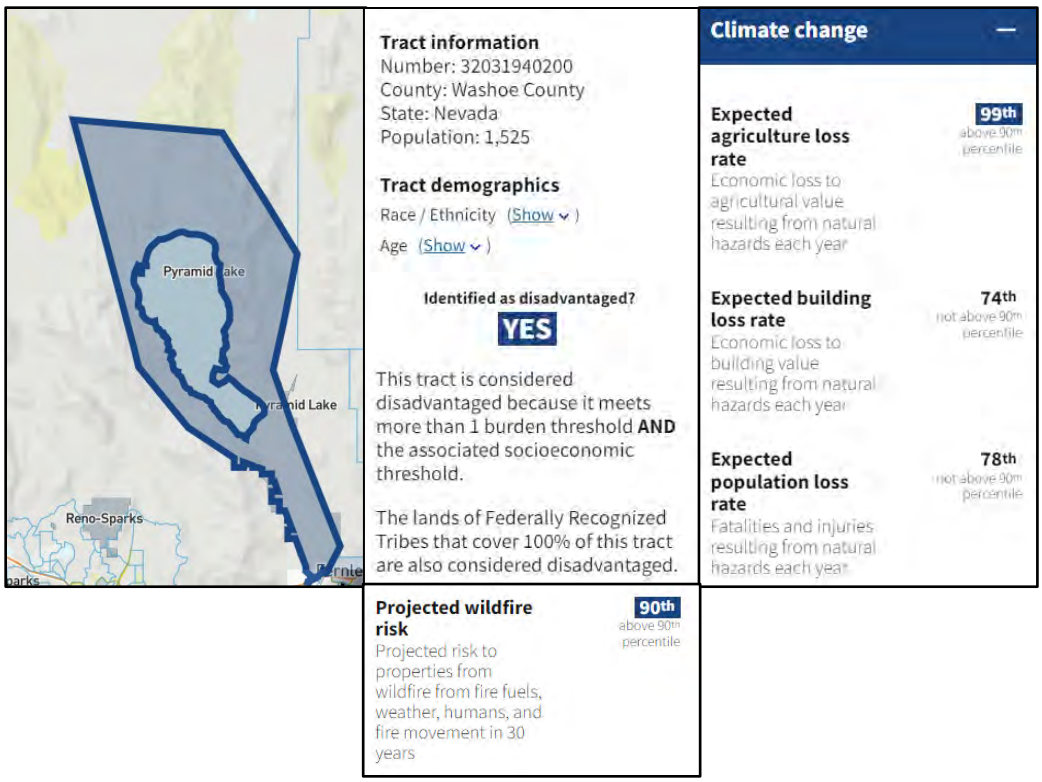


Figure 149: Washoe County–Pyramid Lake Tract Demographics[267]

[267] Climate & Economic Justice Screening Tool, 2024, "Washoe County–Pyramid Lake Tract Demographics." https://screeningtool.geoplatform.gov/en/#13.45/39.6082/-119.76789

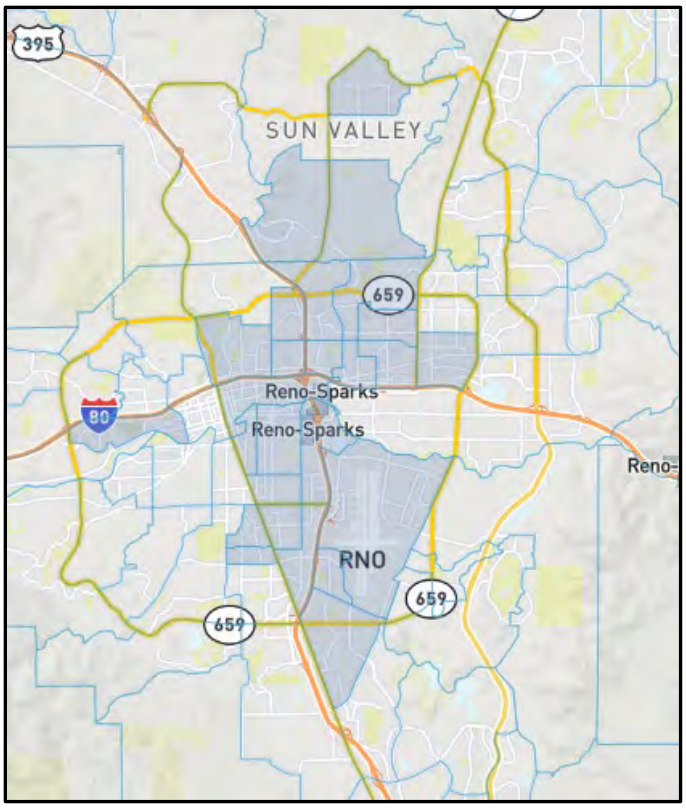


Figure 150: Washoe County 27 Census tracts designated as disadvantaged in gray[268]

Table 100: Washoe County Census Tracts Designated as Disadvantaged[269]

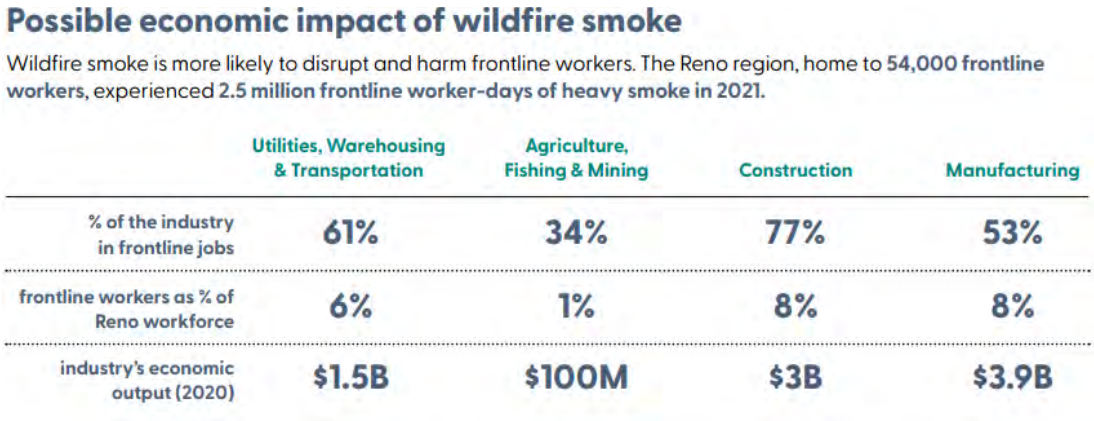
Census Tract Number	Population	Projected Wildfire Risk	Expected Building Loss Rate	Expected Population Loss Rate	Expected Agricultural Loss Rate
32031940200	1,525	90%	74%	78 %	99 %
32031002706	5,177	99%	3%	46%	–
32031002703	2,799	98%	33%	66%	57%
32031002704	5,500	95%	95%	59%	66%
32031001702	5,998	96%	2%	46%	30%
32031001701	3,598	99%	1%	62%	40%
32031001502	6,590	87%	0%	35%	53%
32031000102	3,031	33%	94%	55%	28%

[268] Climate & Economic Justice, 2024, "Washoe County, 27 Census tracts designated as disadvantaged in gray." https://screeningtool.geoplatform.gov/en/#13.45/39.6082/-119.76789
[269] Climate & Economic Justice, 2024, "Washoe County Census Tracts Designated as Disadvantaged" https://screeningtool.geoplatform.gov/en/#13.45/39.6082/-119.76789

Census Tract Number	Population	Projected Wildfire Risk	Expected Building Loss Rate	Expected Population Loss Rate	Expected Agricultural Loss Rate
32031000202	2,600	33%	79%	69%	–
32031001202	4,676	77%	96%	59%	57%
32031000700	5,248	33%	8%	40%	61%
32031002107	1,731	33%	37%	79%	68%
32031003000	7,087	33%	0%	34%	50%
32031001902	5,490	33%	0%	47%	71%
32031001901	4,654	33%	1%	48%	–
32031002802	5,815	90%	1%	43%	60%
32031002801	4,397	98%	5%	50%	–
32031001802	3,030	33%	2%	62%	–
32031001801	3,254	76%	1%	56%	46%
32031000201	3,424	33%	1%	61%	–
32031001009	3,358	33%	22%	68%	–
32031000900	4,799	33%	1%	47%	–
32031001008	4,630	33%	1%	48%	–
32031002211	3,798	33%	1%	56%	–
32031002212	5,068	80%	1%	51%	49%
32031980000	108	76%	96%	99%	92%
32031002204	4,894	91%	28%	49%	64%

DEVELOPMENT TRENDS

Economic: Regional economic development has caused demographic changes and increased urban growth that have put more people and structures in the WUI (Increased Vulnerability) (see Figure 151).



Possible economic impact of wildfire smoke

Wildfire smoke is more likely to disrupt and harm frontline workers. The Reno region, home to 54,000 frontline workers, experienced 2.5 million frontline worker-days of heavy smoke in 2021.

	Utilities, Warehousing & Transportation	Agriculture, Fishing & Mining	Construction	Manufacturing
% of the industry in frontline jobs	61%	34%	77%	53%
frontline workers as % of Reno workforce	6%	1%	8%	8%
industry's economic output (2020)	$1.5B	$100M	$3B	$3.9B

Figure 151: Possible Economic Impact of Wildfire Smoke in the Reno Metro Area, 2021[270]

Land Use: Recent development in unincorporated areas of the County near the cities of Reno and Sparks has occurred in the WUI (Increased Vulnerability).

The 2024 Washoe County Lands Bill would convey 15,860 acres of public land around Reno and Sparks to be sold at auction to developers; an additional 3,400 acres are designated for specific purposes, including roadway expansions, regional parks, and K–12 school sites, increasing the WUI.[271]

Continued regional growth and development pressure are likely to lead to additional development outside the urban centers of Reno and Sparks in the WUI. As new areas are developed, additional fire response resources will be needed to respond quickly to reported fires and limit damage.

[270]San Francisco Fed, 2021, https://www.frbsf.org/community-development/wp-content/uploads/sites/3/2023-wildfire-smoke-impact-snapshots-reno.pdf

[271] The Nevada Independent, Gabby Birenbaum, 2024, "Exclusive: Rosen introduces Washoe county lands bill years in the making." https://thenevadaindependent.com/article/exclusive-rosen-introduces-washoe-county-lands-bill-years-in-the-making

Table 101: Changes from Wildland Fire

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Wildland Fire	There are 21,388 developed parcels in the Extreme or High-Risk Fire Zones (including city properties – however, most of the WUI is in the unincorporated area). 21,470 residential units have been built on these properties. Out of these units, 1,656 units have been built since 2020, most of which are in the High-Risk Fire Zone. This represents an increase of 7.7% since 2020.	Based on countywide persons per household and occupancy data from the US Census Bureau, an additional 1,656 residential units represents a population increase of approx. 3,726 in High or Extreme Fire Risk zones.	Climate change continues to have a significant impact on the Reno-Tahoe region. Reno was one of the fastest warming cities in America over the last 20-years. Wildland fires are burning more frequently and hotter. Drought and fire conditions are more severe. In addition, smoke from fires in nearby regions tends to collect in the Truckee Meadows basin due to prevailing winds, creating health impacts due to frequent air quality degradation.	Overall vulnerability has increased slightly (by approx. 7%), mostly in the High-Risk Fire Zone. The vast majority of Extreme Fire Risk present in Washoe County is in the Incline Village/Crystal Bay area. However, the creation of new parcels in the Tahoe Basin is prohibited and new development is minimal; therefore, while the fire risk remains extreme, vulnerability in such areas has not increased.

COMMUNITY LIFELINES

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States. They are designed to address the essential needs of a community during and after a disaster. There are eight lifelines, each with its own focus and purpose (Figure 152).



Figure 152: Community Lifelines[272]

Wildfires pose a direct risk to many parts of the built environment, including homes and infrastructure. Wildfires can damage power lines and infrastructure, particularly in regions with overhead power lines running through forested areas. They can similarly damage or destroy communications infrastructure, including cell towers and fiber optic cables, causing service disruptions and isolating communities.

NV Energy implemented the Public Safety Outage Management (PSOM) program to plan power outages to more areas in Northern Nevada with elevated fire risk, recognizing safety as a priority. The goal of the program is to protect customers and the community from the risk of wildfires in extreme and elevated fire-risk areas by shutting off power in one or more of its extreme or elevated fire-risk zones when certain environmental conditions are met, and an evaluation of risk is done with guidance from local emergency management teams and other stakeholders. This helps prevent power lines, debris blown into power lines, and other equipment from causing a wildfire. Residents in Washoe County would be affected by the scheduled power outages. NV Energy will monitor weather patterns seven to 10 days ahead for any concerning weather patterns. By the 72-hour mark, NV Energy will begin to communicate with local emergency management officials to discuss where they see risks. While they can

[272] FEMA, "Community Lifelines Toolkit 2.0." https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf

provide much needed relief from a large wildfire event, these shut offs could impact community lifelines and residents' ability to cool themselves.

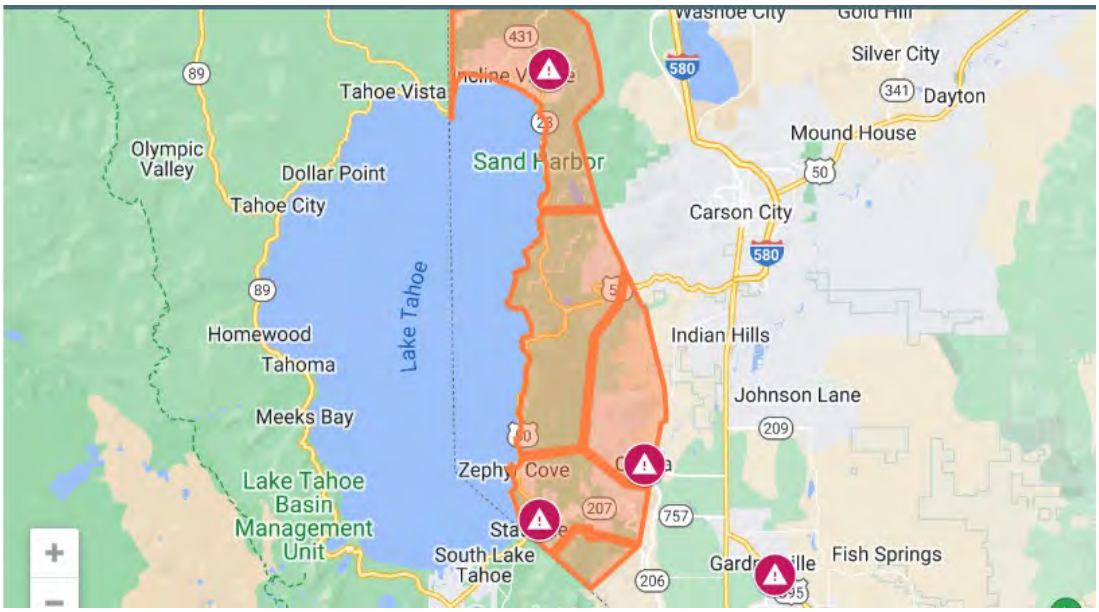


Figure 153: Northern Nevada Public Safety Outage Management Zone[273]

EXISTING MITIGATION CASE STUDY

In Fall 2023, the Lake Tahoe Basin Management Unit, along with fire resources from other California National Forests, completed approximately 60 acres of pile burning near the Lily Lake Trail above Tahoe Mountain Road, close to the Angora Ridge Trail. Next on the list is an area further up the ridgeline, past the Angora Lookout toward the Angora Lake Trailhead. USDA Forest Service Lake Tahoe Basin Management Unit (LTBMU) encourages collaborations among agencies to use fire to reduce hazardous fuels around the Lake Tahoe Basin. CAL FIRE, local fire protection districts, and state partners on the California and Nevada sides of the lake use these mitigation actions to counteract 100 years of the USDA Forest Service (FS) policy of rapid-fire suppression. The FS policy contributed to overcrowded forests dense with thick, impenetrable understory, trying to overpower fires, but it only made things worse. Many Native people in California, including the Washoe Tribe of Nevada and California, have used and continue to use burning to improve ecosystems and encourage desirable species to grow. In most of the Lake Tahoe Basin, the average "fire return interval" (time between historic lightning-caused fires and Tribal burning) is about 5–17 years.[274]

[273] NV Energy, Power Safe NV. https://www.nvenergy.com/safety/wildfire

[274] Tahoe In Depth, Winter 2023, Issue 25, Adrienne Freeman, USDA FS, "Prescribed Fires a Key Part of Fire Suppression." https://www.trpa.gov/wp-content/uploads/Winter2023_24pgs_No25_V2_WEB.pdf

VULNERABILITY SCORE

Based on the NRI, Washoe County has a high-risk index, with a risk index score of 97.6 for wildfire, which is higher than the national percentile (see Table 102 and Figure 154).

Table 102: Risk Factor for Wildfire in Washoe County

	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
Wildfire	High	High	Relatively High	$10M	High

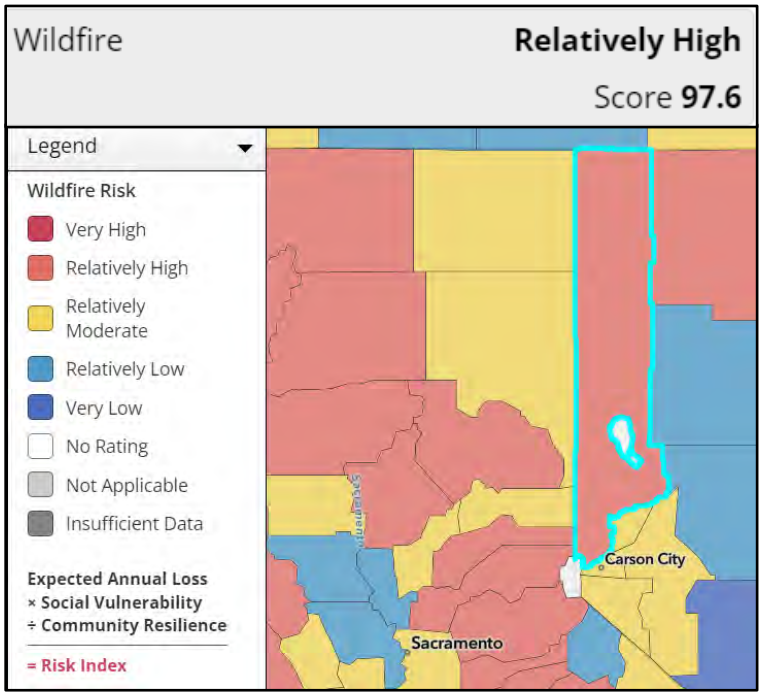


Figure 154: National Risk Index Washoe County Wildfire Score, Map, and Legend[275]

CONSEQUENCE ANALYSIS

Wildland Fire is the number one priority in Washoe County. The risk of Wildland Fire can be from natural causes or human activities, including, but not limited to, lightning, campfires, and machinery. This hazard is directly impacted by weather conditions such as high temperature, low relative humidity, wind, and lightning and can exacerbate Flooding (including closed-basin flooding), landslides, erosion, power outages, and more.

[275] FEMA, "National Risk Index Washoe County Wildfire Score, Map and Legend." https://hazards.fema.gov/nri/map

The information below provides the Consequence Analysis of the Potential for Detrimental Impacts of Wildland Fire, which was done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 103: EMAP Consequence Analysis for Wildland Fire in Washoe County

Subject	Ranking	Impacts/Wildland Fire
Public	High	Wildland fires pose a great risk to the health and safety of persons living in Washoe County. Wildland fires affect grass, forests, brushlands, and structures within populated areas. While the fire itself can be a danger to human life, the smoke that is generated from a wildland fire can also be detrimental to people, animals, and plant life.
Responders	Moderate	Wildland Fire can pose a threat to responders; however, responders normally train and dress for wildland fire conditions. While responders put health and safety first, catastrophic, and fatal incidents can occur.
Continuity of Operations	Moderate	Critical infrastructure, essential functions, and other areas necessary for the county to function could be compromised due to the Wildland Fire and the cascading effects of floods, landslides, erosion, degraded water quality, and power outages.
Property, Facilities, and Infrastructure	High	Wildland Fires can destroy property, facilities, and infrastructure. Measures can be taken to minimize the effect, such as debris removal, abiding by building codes, and constructing structures with fire-retardant materials.
Environment	High	Wildland fires can impact the environment, not only from the burn itself but also from the smoke generated. The loss of wildlife and vegetation can be extreme. While a Wildland Fire can also regenerate new growth, it can take years to recover. Wildfires can also generate landslides, erosion, water contamination, and more.
Economic Condition	Moderate	The economic conditions and financial impacts can be affected. Crops are at risk when there is a wildland fire of any etiology, again resulting in increased prices for the buyer and decreased revenue for the sellers. Livestock can be decimated. When a portion of a county's revenue is dependent upon tourism, the reduction of tourists could impact the economy.
Public Confidence in Governance	High	Wildland Fire can contribute to the loss of public confidence in governance. The Public can question the response time, what was done to preempt a fire before a fire happens. Training can

Subject	Ranking	Impacts/Wildland Fire
		come under fire. Depending on if the fire affects populated areas, the public confidence will be affected as they determine the speed with which help is provided to them.

COMMUNITY INPUT

The public ranked wildfires as the top hazard they were most concerned about impacting the planning area. Several members were worried about the lack of fire evacuation routes. The areas of concern mentioned were Red Rock, Silver Knolls, and Cold Springs Valley. Silver Knolls has only one entry and exit, and Cold Springs Valley has only two exits. Further, one public member was concerned with new developments in the Silver Springs area. The members expressed concern that the houses were being built close together, allowing for no defensible space between houses in a fire. Another member voiced concern that first responders and the public needed to be trained to evacuate livestock in areas where livestock are present efficiently. The elderly population was a concern due to not having sufficient transport to evacuate and the severe effects of smoke inhalation. Several members expressed concern over the possible insurance loss due to the number of wildfires. Another member was concerned about abandoned vehicles and other items on the property that could increase the fire and wanted to see code enforcement.

The public indicated that awareness is needed for wildfire prevention. One member indicated that wildfires are the most preventable of all hazards. Stakeholder support for the University of Nevada Cooperative Extensions Living with Fire Program and Desert Research Institute. Several members are in support of better evacuation routes and ensuring communities have more than one way in and out. One member mentioned air quality mitigation due to summer wildfires. Several members would support more defensible space near homes.

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CAPABILITY ASSESSMENT

Capability Assessment

FEMA	C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))

The capability assessment identifies the regional partner's existing plans, policies, programs, and resources that can help reduce vulnerability to hazards. Washoe County was responsible for developing this self-assessment. The County and its partners will implement the mitigation strategy through several internal and external capabilities. These planning and regulatory, administrative and technical, financial, and education and outreach capabilities form the baseline for the County's ability to implement mitigation actions and reduce known risks. In addition, the requirements of the National Flood Insurance Program (NFIP) include addressing these four types of capabilities.

This section focuses on Washoe County's capabilities. Refer to the Jurisdictional Annexes for the capability assessments of the regional partners.

Planning and Regulatory Capabilities

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards.

Table 104: Planning Capabilities of Washoe County

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
General Plan	Yes – County Master Plan & Strategic Plan	Y	If mitigation is identified as a goal in either plan.	Adopted in 2024. Planned revision in 10 years, or more.
Capital Improvement Plan	Y	Y	Mitigation projects can be submitted	It is adopted as part of the

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
			and included on an annual basis	annual budget.
Climate Change Adaptation Plan	Y – Climate Action Plan	Y – inadvertently as climate change creates Flooding (including closed-basin flooding), earthquake, etc. and plan attempts to prevent climate change or minimize	Overall healthier communities in 30+ years if all actions are implemented universally.	No previous versions. Tentatively 2024. Potentially early 2025 at the latest.
Community Wildfire Protection Plan	Y	Y	Each plan is specific to the community, so actions vary.	TMFPD* is working to constantly bring on more areas and can best respond to this.
Economic Development Plan	Y – Northern Nevada Economic Planning Indicators Committee Report 2019	Y – but not directly. It shows census and business growth, which will impact, and	It can encourage development in safer areas instead of expanding into areas of concern w/	2019. Update potentially in 2024 – states it is a 5-year forecast

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
	EDAWN* 3-Year Strategic Plan – 2019	potentially increase, hazard likelihood.	high risk of hazard impacts. The visible efforts into mitigation and preparedness will also be more marketable for businesses and investors.	
Land Use Plan	Y- WC Envision Master Plan	Y	The WC Codes and Ordinances are used to implement the Master Plan	The Master Plan was adopted Nov. 2023 and is anticipated to be updated approximately in 2030.
Local Emergency Operations Plan	Y	Y	It is a response plan.	2020. It will be updated by 2025.
Stormwater Management Plan	Y – Truckee Meadows Stormwater Drainage Manual	Y	Mitigate storm and flood water impacts	2009. SWPCC* is discussing an update to occur in the next year or two – TBD.

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
Transportation Plan	Y	Y	Unsure	The Master Plan for Land Use and Transportation Element was last updated in 2020. RTC's latest Regional Transportation Plan (RTP) was last updated in 2021 and is updated every 4 years.
Substantial Damage Plan	N	N/A	N/A	N/A
Other? (Describe)	Damage Assessment Plan. The Plan serves a similar purpose to the Substantial Damage Plan and covers all jurisdictions. It ensures a comprehensive approach to assessing and responding to damage during emergencies.	Y	By identifying community vulnerabilities and high-risk areas. This enables targeted strategies to strengthen these locations and reduce future damage.	2023, every five years

* Note: EDAWN = Economic Development Authority of Western Nevada, RTC = Regional

Transportation Commission, SWPCC = The Stormwater Permit Coordinating Committee, TMFPD = Truckee Meadows Fire Protection District

Table 105: Regulations and Ordinances of Washoe County

Plan	Does this regulation/ ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
Building Code	Yes	Yes	2018 – then amendments, as necessary. Update in 2024 to adopt regional revisions and updates to the IBC.* Expect adoption of the 2024 codes on January 1, 2025.
Flood Insurance Rate Maps	Yes	Yes	Some areas have been completed; others are in progress. The County is working with FEMA and the City of Reno on FIRM* updates. TRFMA* has submitted to FEMA a Physical Map Revision application for the Truckee River corridor, including portions of Steamboat Creek and the North Truckee Drain. Approval is expected in 2025.
Floodplain Ordinance	Yes	Yes	Last updated in 2007, minor amendment in 2011. No plans to update further.
Subdivision Ordinance	Yes	Yes	Last updated in 2015. Minor amendments to Final Map process planned for 2024.

Plan	Does this regulation/ ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
Zoning Ordinance	Yes	Yes	Ongoing updates, as necessary. Numerous updates in 2024 to implement a new Master Plan and address affordable housing elements, short-term rentals, and other matters.
Natural Hazard Specific Ordinance (Stormwater, Steep Slope, Wildfire)	Yes	Yes	The County has ordinances addressing stormwater, steep slopes, and the WUI. Ongoing updates, as necessary.
Acquisition of Land for Open Space and Public Recreation Use	Yes	Yes	The Regional Open Space and Natural Resource Management Plan was adopted in June 2008.
Prohibition of Building in At-Risk Areas	Yes	Yes	Flood: In accordance with FEMA regulations. Floodways are prohibited. Steep slope: nothing in slope greater than 30% if roadway access exceeds development regulations. No development allowed in Open Space.

Plan	Does this regulation/ ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
			No development within 300 feet of the center line of the Truckee River in the East Truckee River Canyon.
Other? (Describe)			

* Note: FIRM = Flood Insurance Rate Map, IBC = International Building Code, TRFMA = Truckee River Flood Management Authority, WUI = wildland–urban interface

Administrative and Technical Capabilities

Administrative and technical capabilities include staff and their skills. They also include tools that can help carry out mitigation actions.

Table 106: Administrative Capabilities of Washoe County

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	Y	Yes	Yes	Yes
Civil Engineer	Y	Yes	Partially, In initial stages	Yes
Community Planner	Y	Yes	Yes	Yes
Emergency Manager	Y	Yes	Yes	Yes

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Floodplain Administrator	Y	Yes	Yes	Yes
Geographic Information System (GIS) Coordinator	Y	No	Yes, but primarily for hazard response and lacking in mitigation.	Yes
Planning Commission	Y	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Yes
Fire Safe Council	N	Achieved through fire agencies, living with fire, Team Rubicon, and others, instead of the Fire Safe Council.	N/A	N/A
CERT (Community Emergency Response Team)	Y	Y	Unclear	Yes

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Active VOAD (Voluntary Agencies Active in Disasters)	Y	N	Unclear	Unclear
Other? (Please describe.)				

Table 107: Technical Capabilities of Washoe County

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
Mitigation Grant Writing	Y	Grant written for avalanche signage in 2024 via the Hazard Mitigation Grant Program.	Grant writing and application as need presents.
Hazard Data and Information	Y	Avalanche Study in 2023	Suggestions for mitigation actions were a part of the study.
GIS	Y	Assessment – No. Mitigation risk – create mapping, dashboard, etc. for awareness and visuals	Assessment – hydrology, hydrography, slope info, service, info, etc. and then do an analysis on what could flood in the

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
			next 5 years. Typically use info for external agencies instead of creating in house. Mitigation – maintain same capabilities for mapping, dashboard, etc.
Mutual Aid Agreements	Y – IMAC	N/A	N/A
Other? (Please describe.)			

Financial Capabilities

Financial capabilities are the resources to fund mitigation actions. Assessing funding and financial capabilities is important to determine what kinds of projects are feasible, given their costs.

Table 108 includes further descriptions of the potential funding sources available to Washoe County and its regional partners.

Table 108: Potential Funding Sources for Washoe County

Funding Source	Description
Building Resilient Infrastructure and Communities (BRIC) program	The FEMA BRIC program provides federal grants to states, U.S. territories, federally recognized Tribal governments, and local governments for hazard mitigation activities.

Funding Source	Description
Bureau of Land Management (BLM)	The mission of the BLM (in the U.S. Department of the Interior) is to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations.
Community Development Block Grant Program Disaster Recovery (CDBG-DR)	Under the CDBG-DR (14.218), the Department of Housing and Urban Development (HUD) provides flexible grants to help local governments, states, and tribes recover from Presidentially declared disasters, especially in low- and moderate-income areas, subject to the availability of supplemental appropriations.
Community Development Block Grant Program Mitigation (CDBG-Mit)	HUD's CDBG-Mitigation (CDBG-MIT) program provides additional funding to increase resilience to disasters by lessening the impact of future disasters. CDBG-DR and CDBG-MIT funds are governed by CDBG regulations at 24 CFR parts 91 and 570.
Flood Mitigation Assistance (FMA)	FEMA FMA provides grants to assist with the planning and implementation of flood mitigation projects that include measures to reduce flood losses by elevation, acquisition, or relocation of National Flood Insurance Program (NFIP)-insured structures.
Hazard Mitigation Grant Program (HMGP)/404 Mitigation)	The purpose is to reduce the loss of life and property from natural disasters. HMGP funds from FEMA also support the reduction and removal of hazards during the immediate recovery from a disaster. Section 404 of the Stafford Act authorizes the program. Funds are for projects to reduce or prevent losses from future disasters.
HMGP Post Fire	FEMA's HMGP Post Fire program provides funding to help communities implement hazard mitigation measures focused on reducing the risk of harm from wildfire.
Natural Resources Conservation Services (NRCS)	NRCS from the U.S. Department of Agriculture provides landowners with free technical assistance or advice for their land. Common technical assistance includes resource assessment, practice design, and resource monitoring. A conservation planner helps determine if financial assistance is right for you.
Nevada Division of Forestry	The Division of Forestry provides professional natural resource and wildland fire management services to Nevada citizens and visitors to enhance, conserve, and

Funding Source	Description
	protect forest, rangeland, and watershed values and endangered plants and other native flora.
Nevada Earthquake Safety Council	The Council promotes earthquake awareness and preparedness through education, research, and policy recommendations. The Council facilitates public input, develops consensus about seismic issues in the public and private sectors, and is the public advisory body for state seismic safety policy.
Public Assistance Mitigation (PA Mitigation/406 Mitigation)	FEMA PA funds mitigation measures for permanent work (Categories C–G). To be eligible for PA funding, mitigation measures must directly reduce the potential for damage to the damaged portion(s) of the facility.
Safeguarding Tomorrow Revolving Loan Fund (RLF)	Under the RLF program, FEMA provides capitalization grants to establish revolving loan funds for direct hazard mitigation assistance to local governments to reduce risk of natural hazards.
U.S. Army Corps of Engineers (USACE)	The USACE is one of the world's premier public engineering, design, and construction management agencies. Civil engineers plan, design, construct, and maintain the nation's water resources, Army installations, and many other federal and local projects.

Table 109: Financial Capabilities of Washoe County

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Capital Improvement Project Funding	Y	Y	Y – Related to County infrastructure	Y
General Fund	Y	Y – Creation of a Mitigation Position in Emergency Management	Y	Y

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Hazard Mitigation Grant Program (HMGP/404)	Y	Y – Home purchases in the flood zone	Y	N
Building Resilient Infrastructure & Communities (BRIC)	Y	Y – Planning	Y	N
Flood Mitigation Assistance (FMA)	Y	Y	Y	N
Public Assistance Mitigation (PA Mitigation/406)	Y	Y	Y	Y
Community Development Block Grant (CDBG)	Y	2024 approval for increased pedestrian access at an elementary school in Sun Valley. Also increasing wastewater capacity, which allowed for new homes and businesses.	Potentially.	Unsure.
Natural Resources Conservation	Y	Unsure.	Unsure.	Unsure.

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Services (NRCS) Programs				
U.S. Army Corps (USACE) Programs				
Property, Sales, Income, or Special Purpose Taxes	Y, except income tax. NV does not have individual income tax.	Various uses.	Unsure.	Unsure.
Stormwater Utility Fee	Yes, but only in Spanish Springs Flood Detention Facility	Unsure	Unsure	Unsure
Fees for Water, Sewer, Gas, or Electric Services	Y (sewer only)	Unsure	Unsure	Unsure
Impact Fees from New Development and Redevelopment	Y	RTC* has used fees from the Regional Road Impact Fee Program for transportation improvements associated with the	Potentially.	Unsure.

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
		new developments. The County collects the fee on behalf of RTC.		
General Obligation or Special Purpose Bonds	Y	Unsure other than general roads and schools. WC CSD* has its own general obligation, however.	unsure	unsure
Federal-funded Programs (Please describe)	Y	Emergency Management Performance Grant and Homeland Security Grant Program have funded planning, preparedness, equipment, personnel, and programs in emergency management.	No	Not for other grants.
Other State-funded Programs (Please describe)	N/A	N/A	N/A	N/A
Private Sector or Nonprofit Programs	N/A	N/A	N/A	N/A

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Other?				

* Note: RTC = Regional Transportation Commission, CSD = Community Services Department

FEMA-Funded Hazard Mitigation Projects

The planning area has received funding for previous hazard mitigation projects, including HMGP, Pre-Disaster Mitigation (PDM), and BRIC grants for elevations, acquisition/demolition, seismic retrofits, and wildfire retrofit projects. Table 110 outlines potential FEMA funding sources available with a FEMA-approved Hazard Mitigation Plan (HMP).

Table 110: FEMA Funding for Washoe County Relative to a Hazard Mitigation Plan

Grant Program	Is a Tribal/Local Hazard Mitigation Plan Required?
Individual Assistance	No
Public Assistance Categories A and B (e.g., debris removal, emergency protective measures)	No
Public Assistance Categories C through G (e.g., repairs to damaged infrastructure, publicly owned buildings)	No
Fire Mitigation Assistance Grants (FMAG)	No
Hazard Mitigation Grant Program Post Fire	Yes
Hazard Mitigation Grant Program (HMGP) planning grant	No
Hazard Mitigation Grant Program (HMGP) project grant	Yes
Building Resilient Infrastructure and Communities (BRIC) planning grant	No
Building Resilient Infrastructure and Communities (BRIC) project grant	Yes
Safeguarding Tomorrow Revolving Loan Fund Program	Yes

Education and Outreach Capabilities

Education and outreach capabilities are programs and methods that could communicate about and encourage risk reduction. These programs may be run by a participant or a community-based partner. Partners, especially those who work with underserved communities, can help support additional education and outreach capabilities.

Table 111: Education and Outreach Capabilities of Washoe County

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Community Newsletter(s)	Y	As needed. Part of the PIO toolbox	
Hazard Awareness Campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, School Programs)	Firewise, Living with Fire, Great Shakeout, Storm Ready, and others.	Not currently, but adding themed weeks/ months, campaigns and proclamations is an action item for this update.	
Public Meetings/Events (Please Describe)	Community Advisory Boards (CABs)	Y	Emergency Management, TMFPD,* NLTFPD, WC CSD, and WCSO all speak to mitigation
Emergency Management Listserv	Y – local and state level	Y	
Local News	Y	Y	
Distributing Hard Copies of Notices (e.g., public	Y – libraries, senior centers, public spaces. Unsure of door to door.	WC CSD posts hard copy notices about being prepared for flood events at	

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
libraries, door-to-door outreach)		various parks and libraries and CSD Engineering front counter. Unsure.	
Insurance Disclosures/ Outreach	Y	This resource refers customers to the NFIP	WC refers customers who live in the FEMA designated floodplain to the NFP to obtain insurance.
Organizations that Represent, Advocate for, or Interact with Underserved and Vulnerable Communities (Please Describe)	Y – DPBH, NNPH and their healthcare partners, HSA, etc.	To some extent.	
Social Media (Please Describe)	Y – X, Facebook, Instagram, YouTube, Inside Washoe website, public facing Washoe County website, Nextdoor	County and regional Public Information Officers meet and/or share timeline information on hazards of concern for awareness throughout the year.	

* Note: CSD = Community Services Department, DPBH = Nevada Division of Public and Behavioral Health, NLTFPD = North Lake Tahoe Fire Protection District CSD = Community Services Department, NNPH = Northern Nevada Public Health, TMFPD = Truckee Meadows Fire Protection District, WCSO = Washoe County Sherriff's Office

Coordination with Community Partners

The Washoe County Emergency Management and Homeland Security Office recognizes that disasters do not always occur within jurisdictional boundaries. Therefore, it takes a regional approach to planning for, mitigating, responding to, and recovering from disasters. The County collaborates with the community partners listed below and members of the public on an ongoing basis.

Education

- Sierra College at Lake Tahoe[276]
- Truckee Meadows Community College
- University of Nevada, Reno
- Washoe County School District
- Numerous additional schools in the County

Business and Industry

- Healthcare
- Local Chambers of Commerce
- Reno–Sparks Convention and Visitors Authority
- Inter-hospital Coordinating Council
- Renown Health
- Northern Nevada Medical System
- Northern Nevada Sierra Medical Center
- Saint Mary's Regional Medical Center
- Veteran's Administration Hospital
- DaVita Medical Care Center
- Fresenius Medical Care Center

[276] Sierra College, Tahoe-Truckee Campus. https://www.sierracollege.edu/visit-sierra-college/tahoe-truckee-campus/

- Washoe County District Board of Health
- Northern Nevada Public Health

Regional and Private Utilities

- AT&T
- Charter Communications
- NV Energy
- Truckee Meadows Water Authority
- Various Internet providers

Transportation

- Nevada Department of Transportation
- Regional Transportation Commission of Washoe County

Participation in the National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a FEMA program that provides flood insurance to millions of policyholders across the country. According to data provided by FEMA during the hazard mitigation plan update, as of May 7, 2024, the NFIP has paid out $4,718,263.42 in claims payments in Washoe County, with an average net payment of $17,410.57. There have been 271 net losses reported. There are currently 822 policies in force, with an average premium payment of $703.

FEMA implemented its new Risk Rating 2.0 pricing approach between 2021 and 2023. Since then, according to the Association of State Floodplain Managers, most policies in the southern part of the County, including the Reno–Sparks area, were expected to see a decrease in monthly premiums. No information was available in the northern part of the County due to limited policies in the zip code.

Table 112: Floodplain Management, Mapping, and Insurance for Washoe County

Question	Response
Who is the floodplain manager? Is this their primary or secondary role?	Washoe County CSD Engineering – Janelle Thomas, Certified Flood Manager – Secondary Role.

Question	Response
Does the floodplain manager have adequate training and capacity for their role? If not, what else is needed?	WC CSD is training additional staff members (one Senior Planner and one Licensed Engineer) to obtain Certified Floodplain Manager certifications in 2024. The current CSD Engineering Floodplain Manager is adequately trained and maintains her certification through continuing education units on a 2-year cycle.
How does the community enforce its floodplain rules? Does enforcement include monitoring compliance and acting to correct violations?	WC CSD requires permit applicants to incorporate both FEMA and County Development Code requirements into the proposed design documents. There are several steps in the permitting process which require compliance before issuance of a certificate of occupancy for a building permit or final inspection, including completion of appropriate FEMA elevation certificates and proper elevation of habitable structures.
When was the community's most recent Community Assistance Visit (CAV)?	WC CSD completed a CAV to support the Community Rating System (CRS) audit in 2023.
Were any violations noted on the community's most recent CAV?	No violations were noted in WC CSD's most recent audit in 2023.
Is there an upcoming CAV? If not, is one needed?	The next CAV is anticipated to occur in 2028.
When was the most recent floodplain management ordinance adopted?	WC Development Code Article 416, Flood Hazards, was most recently updated January 11, 2011.
Does your community participate in the Community Rating System (CRS)? If so, describe the steps the community has taken to achieve CRS goals.	Yes. WC CSD staff perform multiple tasks throughout the year in accordance with the most recent edition of the CRS Manual to achieve conformance with the various activities required to obtain the points for the 5-year audit analysis for classification. Currently, WC has achieved a classification of 6, which allows community members to obtain a 20% discount on flood insurance. The last audit occurred in 2023, and the next audit will occur in 2028.

Question	Response
Does the community's floodplain management ordinance include any higher standards? If so, please list.	WC Development Code, Article 416 Flood Hazards requires at least 1 foot of freeboard above the Base Flood Elevation (BFE) to be designed into the lowest finished floor elevation for habitable structures. In addition, this code establishes mitigation requirements for all properties being developed in the Critical Flood Zone 1 area. WC Development Code Article 438, Grading, is being amended to adopt additional volumetric mitigation requirements for all closed basin areas in unincorporated Washoe County. This amended code section will be adopted in late summer or early fall of 2024.
Who is responsible for permitting?	WC CSD Engineering and Building Departments have permit review staff responsible for implementing floodplain development rules and regulations.
How does the community issue development permits in the special flood hazard area (SFHA)?	WC CSD Engineering and Building Departments have permit review staff responsible for implementing floodplain development rules and regulations before the issuance of any building permits for properties in the SFHA.
Does the community maintain elevation certificates?	Yes – visible in the Washoe regional mapping system that has public access
Does the community track the number of buildings in the special flood hazard area? If yes, are there any trends?	WC CSD Engineering staff, with GIS Department staff, track the number of structures in the SFHA. To date, no specific trends have been identified in this practice.
How many repetitive loss (RL) structures does the community have? (List number and type of structure)	During the latest audit by FEMA, 19 repetitive loss structures were identified by NFIP. All repetitive loss structures were residential structures.
How many severe repetitive loss (SRL) structures does the community have? (List number and type of structure)	Per FEMA NFIP Repetitive Loss Overview, there is one repetitive loss structure in Sparks
Have any RL/SRL properties been mitigated since the last plan update?	WC CSD Engineering staff are unaware of any mitigation measures taken on any RL/SRL properties.

Question	Response
Who is responsible for making substantial damage/substantial improvement determinations?	WC CSD Engineering staff understand that substantial damage/substantial improvement determinations are made by FEMA through insurance and reimbursement claims.
How does the substantial damage/substantial improvement process work in your community?	WC CSD Engineering staff are unaware of the process of determining substantial damage/substantial improvements.
Are there sufficient staff and training to make substantial damage/substantial improvement determinations?	N/A
How are substantial damage/substantial improvement requirements messaged to the public before and after an event?	Should be completed partly by TRFMA. N/A
Have any damaged/substantially improved structures been mitigated since the last plan update?	N/A
How will the community remain in compliance with the NFIP moving forward? (Simply stating "the community will continue to comply with the NFIP" will not meet FEMA's planning requirements.)	WC CSD Engineering staff will work with FEMA auditor staff to determine how to implement additional processes to improve compliance with NFIP requirements in alignment with CRS activities.
How does the community support map change requests? This could be requested during the Risk MAP process or through Letters of Map Amendment or Revision.	WC CSD Engineering staff are responsible to review, comment, and recommend approval of all CLOMR and LOMR applications. WC County Engineer is required to sign application forms for all applications submitted to FEMA for any projects located in unincorporated Washoe County.
When did the latest Flood Insurance Rate Map (FIRM) become effective?	The most recent FIRM became effective on 6/18/2013.
When was the latest FIRM adopted?	The latest FIRM was adopted by WC immediately upon the effective date.
Is the FIRM and Flood Insurance Study (FIS) report in an accessible location? How would the public get access to their flood map information?	The FIRM maps are on the Washoe regional mapping system, accessible to the public. Also, the FEMA flood map service center website has a search-by-address feature.
Does the community use any Risk MAP products? If so, describe.	WC CSD Engineering uses several Risk MAP products created following impactful flood events in our region. These products identify

Question	Response
	historic Flooding (including closed-basin flooding) extents, etc.
Does the community collect updated floodplain data or modeling? Is this shared with partners and with FEMA?	Yes, as development occurs in WC, updated floodplain data and modeling are obtained by WC CSD Engineering staff. In the case of CLOMR, LOMR, etc., applications, the data and modeling information are shared with FEMA.
Other comments?	TRFMA and WC CSD together on sections for Flood. TRFMA for river-based. WC CSD for the remainder of the County.
How does the community educate the public on floodplain management and the availability of flood insurance, in and out of the floodplain?	Should be completed partly by TRFMA. WC CSD Engineering staff provide educational materials on its website, mail informational letters twice a year to property owners located in FEMA-designated floodplains and provide social media posts regarding floodplain management and insurance availability several times per year as part of the CRS program.
How does the community engage with insurance agents on flood insurance?	WC CSD Engineering staff provide educational letters twice a year to local insurance agents as part of the CRS program.
Does the community (or state) have flood hazard disclosure laws?	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation..
How familiar is the public with their flood insurance options?	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
How many properties have flood insurance in the community?	822
Are there any areas where flood insurance is lacking?	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.

Question	Response
Other comments?	TRFMA and WC CSD work together on sections for Flood. TRFMA for river based. WC CSD for the remainder of the County.

* Note: CLOMR = Conditional Letter of Map Revision, CSD = Community Services Department, LOMR = Letter of Map Revision, TRFMA = Truckee River Flood Management Authority is NA for NFIP as a special district.

Opportunities to Expand/Improve Upon Current Mitigation Capabilities

Planning and Regulations

- An updated evacuation plan for Incline Village/Crystal Bay is needed. Implementation of various elements (action items) identified in the newly adopted Master Plan.
- Truckee Meadows Regional Plan is being updated in 2024 – will include a new Natural Resource Management Plan and a Public Infrastructure Plan.

- If the Washoe County Lands Bill is approved by Congress, create plans for any federal land that is conveyed to the private sector or local government.

Administrative and Technical

- GIS – Technical – collection and storage of data, but GIS role ends there. This would refer to specialists in whatever field is needed to further gather and analyze data. Using authoritative data processes and referring to who owns the data. Specific to mitigation, staffing would need to increase the County GIS division to allow for specialized/formal training of GIS staff.

Financial

- Washoe County could apply for additional planning grants for an evacuation study.

Education and Outreach

- Washoe County can introduce additional hazard awareness campaigns to inform the public of their hazard risk and mitigation opportunities.
- The County can pursue additional measures to increase website interactivity, ensuring more readily accessible and engaging public information on hazards and mitigation.

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MITIGATION STRATEGY



Mitigation Strategy

FEMA	C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i)) C4. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement 44 CFR § 201.6(c)(3)(ii)) C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented and administered by each jurisdiction? (Requirement 44 CFR § 201.6(c)(3)(iii)); (Requirement 44 CFR § 201.6(c)(3)(iv)) E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3)) HHPD3: Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs? HHPD4: Did the plan include actions that address HHPDs and prioritize mitigation actions to reduce vulnerabilities from HHPDs?

The mitigation strategy serves as the regional partner's blueprint for the long-term reduction of disaster losses. The strategy is developed based upon a review of the planning area's risks and vulnerabilities, stakeholder and public input, and the mitigation capabilities or resources available to address those risks. It has three main required components: mitigation goals and objectives, mitigation actions, and a mitigation action plan for implementation. These components provide the framework to identify, prioritize, and implement actions to reduce the risk of hazards.

The following section focuses primarily on the actions the County has selected, but each section was influenced by the regional partners and stakeholders who participated in this plan update. Additional information on specific actions and action status updates for the other regional partners who intend to adopt this plan are in their respective annexes.

Mitigation Goals and Objectives

Mitigation goals are broad, policy-type statements which represent what the County and its partners seek to achieve by implementing their mitigation plan. The goals are general guidelines and provide a framework for identifying more detailed objectives and actions. In developing these goals, the MPT reviewed the goals from the 2023 SHMP and the goals and objectives from the 2020 RHMP update. Overall, the MPT thought that the goals and objectives continued to reflect its approach to hazard mitigation. There has been progress on some

objectives since the last plan update, but those objectives remain important considerations which should be noted in the current plan. A few changes were identified, including clarifying the intent of Goal 1, removing Objective 1.3, and adding a new objective to Goal 4. Both long-term and short-term goals and objectives were identified. Long-term initiatives may take longer the duration of the planning cycle (five years) to completely realize, while short-term initiatives may be accomplished in the next five years.

Therefore, the County and its partners have selected the following goals and objectives for this plan update:

Goal 1: Study, maintain, upgrade, and expand transportation routes, including evacuation routes across the County, to ensure function and public awareness during emergencies. (Long-term)

- **Objective 1.1:** Study, establish, upgrade, and maintain evacuation routes. (Short-term)
- **Objective 1.2:** Plan for continuity of operations of critical transportation facilities in the county in the event of a disaster or emergency. (Short-term)

Goal 2: Maintain emergency services capabilities by providing redundancies. (Long-term)

- **Objective 2.1:** Provide redundant lifeline utilities and services to allow medical and emergency response services to continue to operate following a disaster or emergency. (Long-term)
- **Objective 2.2:** Establish evacuation centers and provide redundant lifeline utilities to serve communities at risk from all identified hazards. (Long-term)

Goal 3: Maintain key communications to ensure connectivity during and after key hazard events. (Short-term)

- **Objective 3.1:** Provide methods for notification, warning, and emergency communications. (Short-term)
- **Objective 3.2:** Establish an additional emergency operations center (EOC) to serve the RSIC community. (Long-term)
- **Objective 3.3:** Harden electrical infrastructure in moderate to high-risk areas for wildland fire. (Long-term)
- **Objective 3.4:** Establish procedures for communication between the Governor's Office on Radiological Waste and Washoe County before transport of radiological waste. (Short-term)
- **Objective 3.5:** Develop a response plan for clean-up and disposal of ash fall from a volcanic eruption. (Short-term)

Goal 4: Maintain the reliability of utilities (electricity, gas, drinking water, sewer) during and after key hazard events. (Long-term)

- **Objective 4.1:** Provide redundant or hardened utility lifelines to areas at risk of energy emergencies, loss of communications, or loss of service. (Long-term)
- **Objective 4.2:** Identify vulnerable facilities and establish procedures for clean-up and disposal of ash fall from a volcanic eruption to minimize risk to lifeline utilities. (Short-term)
- **Objective 4.3:** Protect utility infrastructure from hazards like winter storms and high winds including acquiring resources ahead of time and hardening infrastructure. (Long-term)

Goal 5: Minimize property damage and reduce repetitive losses to property from key hazards. (Long-term)

- **Objective 5.1:** Provide additional emergency services resources to reduce response times. (Short-term)
- **Objective 5.2:** Adopt current international building and fire codes. (Short-term)
- **Objective 5.3:** Develop plans and provide resources to reduce risk in moderate to high-risk areas for wildland fire. (Short-term)
- **Objective 5.4**: Update flood maps to incorporate changes in conditions and flood risk. (Short-term)
- **Objective 5.5:** Complete improvements to storm water drainage infrastructure to address areas of localized Flooding (including closed-basin flooding), or insufficient capacity. (Long-term)
- **Objective 5.6:** Standardize Emergency Action Plans for dams in the City of Sparks. (Short-term)
- **Objective 5.7:** Complete infrastructure improvements identified as part of the Truckee River Flood Management Project. (Long-term)
- **Objective 5.8:** Elevate or mitigate flood risks to homes in neighborhoods identified by the TRFMA as being at a high risk of Flooding (including closed-basin flooding). (Long-term)
- **Objective 5.9:** Identify and complete retrofits to unreinforced masonry buildings and other facilities at increased risk of damage from earthquakes. (Long-term)
- **Objective 5.10:** Implement measures to prepare first responders for active shooter incidents or acts of terrorism. (Long-term)

- **Objective 5.11:** Purchase equipment to minimize the risk of and protect emergency responders in the event of criminal acts or terrorism. (Long-term)
- **Objective 5.12:** Purchase additional equipment to perform immediate containment of hazardous materials spills. (Long-term)
- **Objective 5.13:** Address risks to properties in the runway protection zones at Reno-Tahoe International Airport and airport-critical areas at Reno-Stead Airport, and along the railway. (Long-term)
- **Objective 5.**14: **Identify inundation areas for high hazard dams in Washoe County.**

Goal 6: Increase public participation and responsibility in reducing their risks. (Short-term)

- **Objective 6.1:** Educate members of the public on hazards that may affect their communities. (Short-term)
- **Objective 6.2:** Provide building requirements and standards to guide property owners and developers in reducing risk. (Short-term)
- **Objective 6.3:** Provide resources to involve residents in disaster preparedness, response, and recovery. (Short-term)

Mitigation Actions

A mitigation action is a specific act, project, activity, or process taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the region's mitigation goals and reduce vulnerability to the threats and hazards identified in the plan.

Mitigation plan regulations require the County and its partners to identify and analyze a comprehensive range of specific mitigation actions and projects to reduce the impacts identified in the County's risk assessment. A full range of actions were considered, including actions which will do the following:

- Reduce risk to existing buildings, structures, and infrastructure;
- Reduce risk to new development and redevelopment;
- Benefit underserved communities and socially vulnerable populations;
- Build capabilities and address data deficiencies where necessary; and
- Include both short-term and long-term approaches to hazard mitigation.

STATUS OF PREVIOUS MITIGATION ACTIONS

As part of the mitigation strategy update, each mitigation action in the 2020 plan was evaluated to determine its status and whether any ongoing or incomplete actions should be included in the current plan update. The MPT were responsible for discussing and identifying the status of actions for their respective communities and organizations. Table 113 shows the status of the County's mitigation actions. Further status updates are included in each of the plan participant's annexes.

Table 113: Washoe County Status of Previous Mitigation Actions

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
MH-1	Create a 3 to 5-minute video educating members of the public on hazards in Washoe County to be played at Department of Motor Vehicles offices. (Washoe County)	Washoe County Emergency Management and Homeland Security	On hold – potential project if WCEM obtains a full-time media position.	N
MH-2	Create a plan directing movement of patients to lower level facilities without relying on transportation by emergency medical services. (Washoe County)	Northern Nevada Public Health (NNPH) Emergency Medical Services Oversight Program	Alpha plan addresses. Addresses movement of patients to lower level facilities and transportation does not need to occur via EMS.	N
MH-3	Develop contract with Reno Sparks Convention and Visitors Authority for use of facilities as alternative health-care sites. (Washoe County)	NNPH	No contract in place, but there was a site review and plans drawn up in the event the Reno Sparks Convention was to be utilized for an alt health-care site. No formal agreement.	N
MH-9	Implement and/or use Community Emergency Response Teams, as well as the Citizens Homeland Security Council, to shift burden from sworn officers, where appropriate. (All Partners)	All Jurisdictions: • Emergency Managers • Police Departments	In-process and ongoing. CERT is used by all regional agencies, as needed, but is run through the Washoe County Sheriff's Office.	N
MH-17	Complete a continuity of operations plan for Reno-Tahoe International Airport. (Washoe County)	Reno-Tahoe Airport Authority	Complete. Currently in progress on an update. No ETA. Expecting to hire new EM October 2024 and this will move forward more with them.	N
WF-1	Develop surge capabilities in the region to handle burn patients. (All Partners)	Renown Health	IHCC brought in burn training on two occasions and flew providers to LV to train with UMC. There is also a burn appendix in the MCIP.	N
WF-13	Adopt 2018 wildland fire code County-wide. (All Partners)	Regional Fire Protection Districts	TMFPD – completed. NLTFPD – completed. NLTFPD is looking at adopting 2025 building codes. Reno – in process. Will be adopting 2024 WUI code. RSIC – 2018 building codes will be adopted as part of the Building Code Ordinance. PLPT – no response. Sparks – no response	Y

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
WF-23	Install fire mesh at the base of power poles to prevent poles from catching fire. (Washoe County)	Washoe County	Ongoing. NV Energy is funding this project. Utilizing fire modeling, evacuation maps, and fire risk maps to prioritize. As of 2022 the standard for pole replacement in high threat areas includes the use of covered conductor (tree wire) and Ductile iron poles for overhead builds. In areas where the installation of Ductile iron poles is not feasible wood pole with fiberglass fire wrapping used	N
WF-24	Install non-explosion fuses on power poles. (Washoe County)	Washoe County	No update	N
WF-25	Install lightning arrestors on power poles. (Washoe County)	Washoe County	Currently 464 porcelain arresters have been replaced in tier 3 with metal oxide varistor arresters. Identification of replacement lighting arresters for tier 2 and tier 1E areas.	N
WF-26	Vegetation management – Clear trees from powerline right-of-way (4-year cycle). (Washoe County)	Washoe County	Resiliency corridors established. To date ~35,400 poles grubbed, ~32,000 acres of fuel breaks. Tree trimming is on a four-year cycle to remove vegetation that is likely to fall into lines during wind and winter storms. Pole grubbing and patrolling for high threat areas are completed annually with herbicide being completed bi-annually.	N
WF-27	Clear vegetation from around the bases of power poles. (Washoe County)	Washoe County	Resiliency corridors established. To date ~35,400 poles grubbed, ~32,000 acres of fuel breaks.	N
WF-28	Replace wood power poles with steel poles. (Washoe County)	Washoe County	To date 45,208 poles in tiered fire areas have been replaced with an additional 5,500 poles replaced in non-wildfire areas to increase circuit resilience. As of 2022 the standard for pole replacement in high threat areas includes the use of covered conductor (tree wire) and Ductile iron poles for overhead builds. In areas where the installation of Ductile iron poles is not feasible wood pole with fiberglass fire used. Ongoing	N
WF-29	Purchase and install additional wildland fire cameras. (Washoe County)	Washoe County	Per Chief Sommers – Alert Wildfire cams in “Greater Tahoe CA-NV” from NV Energy are newer. 3 cams are in	N

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
			WC – Chimney Peak, Hillside NV and Steamboat NV as of 1/26/2024. Will remain as "in-progress item" as more are needed. Fire cameras can be seen at https://alertnevada.live/ Per NV Energy – To date 11 autonomous fire cameras have been installed. Plan to install 10 additional cameras through partnership with UNR. Pilot program to install FIREBird cameras to provide autonomous short range fire detection. Cameras are powered by solar with a battery backup and double as a weather station.	
WF-30	Purchase and install additional weather stations. (Washoe County)	Washoe County	In progress, 65 weather stations installed across tiered wildfire areas but no reported installs in the last few years. Potential area for install would be Peavine to help with N. Valleys Flooding (including closed-basin flooding) but nothing installed. This would be funding dependent. Should be held and carried over. Currently using Big Meadow but should pursue this one in the future.	N
FL-1	Update flood maps to incorporate recently completed Flooding (including closed-basin flooding) mitigation projects along the Truckee River in Sparks. (Washoe County, City of Reno, City of Sparks, Truckee River Flood Management Authority [TRFMA])	Washoe County Emergency Management and Homeland Security, Reno Fire Department Sparks Fire Department	As of Nov 2023 – Ongoing map updates in progress, including Risk Map, FEMA flood map updates currently under review by the City of Reno and Washoe County. LOMR for Swan and Silver Lakes was submitted for review by FEMA in February of 2024. Anticipated approval is projected as September of 2024. Washoe County CSD will be performing public outreach to Swan Lake impacted property owners in the Fall of 2024. The public outreach is above and beyond the FEMA requirements for LOMR approval. TRFMA – TRFMA is the lead. In March 2023, TRFMA submitted the Truckee River remapping package to FEMA for initial review. Comments were received in May 2023 and responses to comments were recently submitted.	N
FL-2	Update FEMA Flood Insurance Rate Maps to incorporate recent Letter of Map Revision, Conditional Letter of Map Revision, and changes	Washoe County Community Services Department	In Progress. TRFMA has submitted the PMR to FEMA for their review. 6–18 months out as of Nov 2023. East Lemmon Valley Hydrobasin FIRM update – Complete by	N

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
	in topography and impervious surfaces using regional LiDAR data. (Washoe County, City of Reno, City of Sparks)		end of 2024. East Washoe Valley Whites/Thomas and Galena Creek to be completed Spring 2025. Swan and Silver Lake LOMRs are anticipated to be approved Fall 2024.	
FL-14	Complete improvements to address undersized drainage ditches and systems County-wide. (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: • Public Works • Engineering	As of Nov 2023: CoS – in progress WC CSD Operations staff in the Roads Division perform normal operations and maintenance of all public ditches and channels in Washoe County. Several improvements were completed in early 2024 to roadside ditches in the Silver Knolls area east of Red Rock Road to address undersized ditches.	N
FL-15	Develop emergency response strategy for loss of Lemmon Valley Water Reclamation Facility due to Flooding (including closed-basin flooding) or a mechanical issue. (Washoe County)	Washoe County Utility Services	On hold – per WC CSD facility may close between 2028–2030, depending on regional factors.	N
FL-66	Install new redundant force main (Slough) and permanent bypass valves. (Steamboat Sanitary Sewer Lift Station)	Washoe County Community Services Department – Utility	Capital project to construct a new force main, convert existing force main to a redundant line, and upgraded lift station for peak wet weather flows.	N
EQ-1	Provide public educational materials related to earthquake hazards. (Washoe County)	Washoe County Emergency Management and Homeland Security	Ongoing. Provided when funding is available. EMPG is a potential resource.	N
EQ-3	Retrofit dialysis centers to maintain potable water service following a disaster. (Washoe County, City of Reno, City of Sparks)	Dialysis Centers (Fresenius, DaVita)	I am not sure what work if any TMWA did on this project but IHCC purchased a portable water tank, so did Renown and Saints to provide portable water to their healthcare systems. The third water tank was donated to Northern Nevada Healthcare Systems. IHCC did explore provided portable water to dialysis facilities however they do not own the facilities and retrofitting them would require an agreement with the property managers which was not explored.	N
EQ-9	Complete seismic strength evaluations of critical facilities in all jurisdictions, including schools, community colleges, public infrastructure, and	Washoe County, City of Sparks, RSIC, PLPT:	Per WC CSD – 4/2/2024 – Not aware of any seismic assessments of County owned buildings with the exception of Bower's Mansion. There were seismic	N

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
	other critical facilities, to identify vulnerabilities for mitigation to meet current seismic standards. Mothball or demolish life-threatening buildings, particularly unreinforced masonry buildings. (Washoe County City of Sparks, RSIC, PLPT)	• Public Works • Engineering • School Districts	retrofits done to the mansion several years ago based on inspections and recommendations made by an engineer specializing in historic structures. Some seismic retrofitting done to the historic portion of the Courthouse at 75 Court St. many years ago. In progress	
EQ-10	Assess, repair, and/or replace infrastructure that may fail during earthquakes (e.g., Keystone Ave. Bridge). (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: • Public Works • Engineering	Per WC CSD – 4/2/2024 – Not aware of anything completed in the past 5 years. In progress.	N
EE-2	Replace wooden power poles in high-risk areas with poles made of steel or an alternative material. (Washoe County, City of Reno, City of Sparks)	NV Energy	To date 45,208 poles in tiered fire areas have been replaced with an additional 5,500 poles replaced in non-wildfire areas to increase circuit resilience Pole replacement projections: • 2024: 1,385 poles • 2025: 2,038 poles • 2026: 1,704 poles As of 2022 the standard for pole replacement in high threat areas includes the use of covered conductor (tree wire) and Ductile iron poles for overhead builds. In areas where the installation of Ductile iron poles is not feasible wood pole with fiberglass fire wrapping used Ongoing	N
EE-3	Replace transmission and distribution cables with alternative cables able to withstand fallen branches and snow loading. (Washoe County, City of Reno, City of Sparks)	NV Energy	To date 52.8 miles of copper wife have been replaced since 2020. Currently 13.5 miles of copper wire replacement is projected through 2026 and another 27.6 miles beyond 2026. Removed 100% of street-light and night guard attachments. Identified 1,200 secondary/service attachments and developed a formal plan for removal. Identified 32 segments, totaling 80 miles, for undergrounding overhead infrastructure. Currently 19/32 segments, totaling 33 miles, in various stages of progress. Ongoing	N

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
EE-4	Provide an emergency generator for each organization providing dialysis services. (Washoe County)	NNPH	Most dialysis facilities do not own their buildings and do not have authority to hook up a generator or the ability to make the needed modifications to hook up a generator.	N
EE-5	Install backup generators for critical infrastructure and facilities along with other measures to improve reliability (e.g., alarms, meters, remote controls, and switchgear up-grades). (All Partners)	All Jurisdictions: • Emergency Management	There was a project several years ago to attempt to identify the types of generators needed but unaware where that project was left off.	N
CA-1	Implement measures to prepare for a potential active shooter incident, including new security measures, training and exercises, improved partnerships with law enforcement agencies, and policy changes (ex. Prohibiting open carry). (All Partners)	Local Elected Officials Federal Agencies	Ongoing. WCEM hired a Homeland Security Program Coordinator to build relationships with LE and intelligence agencies. Measures have taken place in the Washoe County School District (WCSD) and UNR, including a gun detection dog (WCSD) and automatic specialized locking doors (UNR).	N
SS-2	Identify facilities and venues that could be used as cooling centers and establish use agreements with property owners. (Washoe County)	Washoe County Emergency Management and Homeland Security	Not started. Not needed. Cooling centers not used. Education re: weather extremes, precautions, and resources such as casinos and libraries to public. Senior Centers, CARES Campus, and community recreation centers were used in 2023.	N
ID-1	Implement a range of emission reduction strategies (e.g., policies geared toward renewable energy measures and projects, reduction in vehicle miles traveled, and increased use of transit and multi-modal transportation) to reduce levels of particulate matter, ozone, and other criteria pollutants. (All Partners)	NNPH Air Quality Management Division	In progress. NNPH – Air Quality continues to advocate for code requirements related to land use planning and building requirements that would help reduce emission associated with the transportation sector. The AQMD also engages with Washoe County RTC and participates on the RTC TAC.	N
AL-1	Install additional signs and create materials educating the public on avalanche threats. (Washoe County)	NLTFPD	In progress – WCEM applied for grant funding for signage in Third Creek (Incline Village) and Crystal Bay in 2024. Expecting to hear if grant is approved in June of 2024. Do not carry over – will be completed.	N
TI-1	Purchase properties in the runway protection zones at Reno-Tahoe Interna-tional Airport and airport critical areas at Reno-Stead Airport. (Washoe County, City of Reno)	Washoe County Emergency Management and Homeland Security	No ETA on land purchases at this time. Still an item that RTAA is pursuing and is in progress, but no ETA can be provided at this time. Expecting to hire new EM October 2024 and this will move forward more with them.	N

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
RW-1	Establish procedures for communication between the Governor's Office on Radiological Waste and Washoe County before transport of radiological waste. (Washoe County)	Governor's Office on Radiological Waste	In process – still working on communication between Gov's office and WC, but have increased communication and awareness slightly.	Y
VC-1	Develop a response plan as part of the next Emergency Operations Plan update for clean-up and disposal of ash fall from a volcanic eruption, including identification/prioritization of vulnerable facilities and utilities and regional partners that can aid in response. (Washoe County)	Washoe County Emergency Management and Homeland Security	Not started. Need subject matter expert input. Recent connection made. Hoping to progress in the next few years. Notes added in change of priority section of capability doc.	N

CONSIDERED MITIGATION ACTIONS

The MPT considered a wide range of actions as part of this plan update. There are four types of mitigation actions:

Local Plans and Regulations

- These include government authorities, policies, or codes that influence the way land and buildings are developed and built.

  Examples: comprehensive plans, land use ordinances, subdivision regulations, building codes and enforcement, stormwater management plans, community wildfire protection plans.

Structure and Infrastructure Projects

- These involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures and critical facilities and infrastructure.

  Examples: acquisitions and elevations of structures in flood-prone areas, utility undergrounding, structural retrofits, floodwalls, detention and retention structures, culverts, safe rooms.

Natural Systems Protection

- This includes green infrastructure and low-impact development, nature-based solutions, engineering with nature, and bioengineering to incorporate natural features or processes into the built environment. Additional funding opportunities are available for projects that incorporate this kind of action.

  Examples: forest management, land conservation, wetland restoration and preservation, sediment and erosion control, stream corridor restoration, rain gardens, greenways, land conservation, living shorelines.

Education and Awareness Programs

- These keep residents informed about potential natural disasters. Many are eligible for funding through the FEMA Hazard Mitigation Assistance (HMA) program.

In accordance with EMAP recommendations, a wide range of actions across the stages of emergency management are included in this plan. The MPT discussed additional types of projects, including climate mitigation, preparedness, response, recovery, and prevention actions. However, most of the actions selected align with the FEMA-recommended types of mitigation actions listed above.

PRIORITIZING MITIGATION ACTIONS

Each plan participant was responsible for prioritizing its mitigation actions as a part of this plan update. The ultimate goal of this plan is to maximize loss reduction, and this perspective is incorporated into the region's mitigation strategy. While a full cost–benefit analysis is not required for a hazard mitigation plan update, the STAPLEE criteria were considered to help the plan participants prioritize the actions with the highest potential benefits compared with the costs.

The identified mitigation actions were prioritized, based on the following terms:

- **S – Social:** The public must support the overall mitigation implementation strategy and specific mitigation actions. Consider, will the action disrupt housing or cause the relocation of people? Will the proposed action adversely affect one segment of the population? Is the action compatible with present and future community/agency values?

- **T – Technical:** It is important to determine if the proposed action is technically feasible, will help reduce losses in the long term, and has minimal secondary impacts. How effective is the action in avoiding or reducing future losses? Does the action solve the problem or only a symptom? Will the action create more problems than it solves? Consider the root cause of the issue at hand to determine whether the action is a whole or partial solution, or not a solution at all.

- **A – Administrative:** This category examines the expected staffing, funding, time, and maintenance requirements for the mitigation action to determine if the jurisdiction/special district has the personnel and administrative capabilities to implement the action or whether outside help will be necessary. Consider, a) Staffing (enough staff and training): does the jurisdiction/special district have the capability (staff, technical experts) to implement the action? b) Funding allocated: does the jurisdiction/special district have the funding to implement the action or can it readily be obtained? c) Time: can it be accomplished in a timely manner? d) Maintenance/Operations: can the jurisdiction/special district provide the necessary maintenance? It is important to remember that most federal grants will not provide funding for maintenance.

- **P – Political:** This considers the level of political support for the mitigation action. Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far? Is there a local champion willing to help see the action to completion? Is there enough public support to ensure that the success of the action? Have all stakeholders been offered an opportunity to participate in the planning process?

- **L – Legal:** The jurisdiction/special district must have the legal authority to implement the action or consider what new laws or regulations would be needed to carry out the mitigation action. Evaluate, are the proper laws, ordinances, and resolutions in place to implement the action? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?

- **E – Economic:** Economic considerations must include evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt in a jurisdiction/special district. Consider benefits and costs at a planning level. A detailed benefit-cost analysis will be performed as project-specific funding becomes available. What financial benefits will the action provide? Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? Does the action contribute to community economic goals, such as capital improvements or economic development? Are there currently sources of funding that can be used to implement the action?

- **E – Environmental:** The impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), have to be kept in mind when using federal funds. How will this action impact land/water? Impact on endangered species: how will this action impact endangered species? How will this action impact hazardous materials and waste sites? Is this action consistent with community environmental goals? Is the action consistent with federal laws, such as the National Environmental Policy Act (NEPA)?

The actions were also assigned a prioritization category of low, medium, or high, based on the following definitions:

- **Low:** Based on one to two STAPLEE criteria, the action is feasible and important, with multiple potential challenges. The action should be implemented as funding becomes available.

- **Medium**: Based on three to four STAPLEE criteria, the action is feasible and important, with some potential challenges. Its implementation is not as urgent as a high priority action item and can be implemented over time.

- **High**: Based on five or more STAPLEE criteria, the action is feasible and important, with minimal to no concerns. It is very important to the jurisdiction to implement and may be prioritized in the short term.

The results are in Table 114.

Table 114: Washoe County Mitigation Action Prioritization

Action #	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Priority
1	3	4	3	3	4	3	3	High
2	4	4	4	4	4	4	4	High
3	3	3	3	4	4	2	4	Medium
4	1	4	3	4	4	3	3	High
5	3	2	4	4	4	3	3	High
6	2	4	4	4	3	4	4	High
7	3	3	4	4	3	4	4	High
8	2	2	2	3	3	2	3	Medium
9	3	2	3	2	3	2	3	Medium
10	4	4	4	4	4	4	4	High
11	1	2	2	1	3	2	2	Medium

Mitigation Action Plan

The mitigation action plan describes a comprehensive range of actions that the plan participants considered to address the vulnerabilities identified in the risk assessment.

The mitigation action plan outlines the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the County and its partners. The implementation plan includes both short-term strategies that focus on planning and assessment activities and long-term strategies that will cause ongoing capability or structural projects to reduce vulnerability to hazards.

Table 115 presents the 2024 actions for Washoe County.

Table 115: Washoe County Updated Mitigation Action Plan 2024–2029#

#	Project Title	Hazard Addressed	Vulnerability Addressed[1]	Responsible Agency	Partners	Existing Planning Mechanism(s)[2]	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
1	Inundation Study and Mapping	Flood	Residents in areas near high and significant dams	WC CSD*	Contracted Engineering Firm	Current EAP has maps (from 2008), but they are outdated due to increased land development, or planned development.	BRIC	$70K per dam. Prioritize top 5 dams and do one study per dam. Ex: South Reno Huffaker Dam due to planned Talus Valley development.	Flooded homes. Damaged lands. Displaced persons. Early warning due to mapping with expected levels and timeframes of water arrival.	Beneficial continuously until updated	Medium. Hire a contractor to complete the study, then decide based on findings	Medium
2	Themed Months/ Days per Hazard (including proclamations)	All Hazards	Residents and visitors	WCEM	Subject matter experts/ agencies for specific hazards (USGS, fire agencies, LE, NWS/NOAA, etc.)	RHMP itself	WCEM funded – staff time	$0 – staff time only to write proclamations and appear, as needed	Increased community awareness and resilience	Increased education and awareness of natural hazards and community vulnerabilities	Begin in short term	High
3	AFN	All Hazards	All persons	WCEM	WC HR and NVDEM	Unsure	Local, BRIC	Unsure	Increased individual resilience for the public for emergency management meetings and events	Increased individual understanding and participation	Begin in short term	Medium
4	Volcano Education and Awareness Program	Volcano	Residents and visitors	WCEM	USGS Menlo Park	RHMP itself	Unsure	Possibly USGS or local. Need better under-standing from SME about cost and whether	Increased awareness and under-standing of potential impact,	Beneficial until update is available or needed based on	Short term	Medium

#	Project Title	Hazard Addressed	Vulnerability Addressed[1]	Responsible Agency	Partners	Existing Planning Mechanism(s)[2]	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
								there are studies that could be used for reference	clean-up time, etc.	volcanic activity/ occurrence		
5	Special Events Working Group	Criminal Acts and Terrorism	Residents and visitors; First responders; Event promoters/ organizers	WCEM	Event promoters/ organizers, LE, Fire, etc.	RHMP itself	Unsure	Local	Previous plan had some considerations for safety. Now need to add verbiage for building an events working group to stand up and staff EOC during events in the region	Immediate and continuously	Short term	High
6	Evacuation Routes in the area – study	All Hazards requiring persons to leave the area	Residents and visitors; LE, Fire, etc.	WCEM	LE, Fire, first responders	Unsure	Local, FHA, PROTECT	$135K – cost of completed study in Nevada County tor a starting point	Loss of life, property, time spent by responders guiding persons out of area	Immediate and continuous. There are always additional persons due to tourism and general residents. Also, there is never not a time when evacuation might be necessary.	Medium. Hire a contractor to complete the study, then decide based on findings	Medium
7	EV Ready Code Change	All hazards involving transportation	Children, older adults, those with heart/lung disease, low-income and underserved communities	NNPH – AQMD	City of Reno City of Sparks Washoe County	Building code amendment recommendation to be adopted by municipalities	Local	Unsure	Better air quality	Beneficial continuously until updated	In the next 5 years	Low

#	Project Title	Hazard Addressed	Vulnerability Addressed[1]	Responsible Agency	Partners	Existing Planning Mechanism(s)[2]	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
8	Whites Creek Watershed Study	Flood and Wildland Fire	Population and Structures	CSD	TMFPD	Integrated into plans as appropriate.	NRCS, Local Budget, USGS, EPA	$100,000	Managing land use impacts.	Indefinitely	5 years	Medium
9	Ingress/ Egress Planning Code Change – Increase minimum number to 3 for new developmen t	MH [(Multiple Hazards)	Vulnerable populations	Washoe County Planning Commissi on	Emergency Management, Fire Departments	County Planning Code	BRIC, HMGP	Staff Time/25% cost share.	Population loss, domestic animal loss.	Indefinitely	5 Years	Medium
10	Dam tabletop exercises	Flood	Population	CSD & WCEM	Emergency Management, USACE	Dam Plans & REOP	USACE, Local Budget, Dam Safety Program	Minimal,	Preserving life, and wildlife, and structure of the dam and property downstream.	5 years	5 years	High
11	Creation of WC-wide stormwater utility fee	Flood	Older developments built under previous codes with storm drain Flooding (including closed-basin flooding)	CSD	County Legislators, BOCC	Utility fees	Stormwater utility fee – mimics the City of Reno and Spanish Springs Flood Detention Facility	Minimal	Less Flooding (including closed-basin flooding) in older developments county-wide	Indefinitely. Also, fees support the maintenance of the system long term.	In the next 5 years	Medium
12	Avalanche forecaster	Avalanche	Avalanche prediction risk, public	WCEM	N/A	Budgeting & funding, partnerships	County budget allocations,	$80,000 annually	Loss of life and injuries, financial losses, property	Life of filled position	1-3 years	High

#	Project Title	Hazard Addressed	Vulnerability Addressed[1]	Responsible Agency	Partners	Existing Planning Mechanism(s)[2]	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
			education, improving safety protocols, data collection & research, real-time monitoring & alerts			with local agencies	state and federal grants such as the Department of Agriculture or the Department of Interior		damage, emergency response costs, impact on reputation			
13	Comprehensive avalanche atlas	Avalanche	Geographical awareness, historical data, decision-making support, education and training, emergency planning, wildlife management	WCEM	National Parks Dept., Forestry Depart., Geological Survey Department, Meteorological services	Regional Hazard Mitigation plans, Mapping & GIS resources, public outreach and education, collaboration with local experts, permitting and land use planning, state and federal guidance	Federal grants (NOAA) & USGS), State grants such as Nevada Division of Outdoor Recreations and Nevada Department of Natural Resources, Local government funding, academic partnerships, user fees and permits	$50,000-200,000	Enhanced safety, risk assessment, education & awareness, emergency planning, data for researchers, land use planning, recreational opportunities, community engagement	Life of plan	1-3 years	medium
14	Permanent snow stabilization & defense structures	Avalanche	Avalanche risk, erosion & land stability, infrastructure protection, water management,	WCEM	U.S. Forest Service, NDOT, Washoe County Public Works,	Master Plan and Land Use Policies, Public Works & Engineering standards, Emergency	Federal grants (FEMA), State grants through the Nevada Division of	$2M	Avalanche protection, enhanced safety, infrastructure protection, long-term cost efficiency, habitat	30 Years	5+	Medium

#	Project Title	Hazard Addressed	Vulnerability Addressed[1]	Responsible Agency	Partners	Existing Planning Mechanism(s)[2]	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
			access & mobility, environmental impact, safety for recreation			Management Plans, Stormwater Management Plans, Building codes and regulations	Emergency Management for the Department of Transportation, Local government funding, CDBG		preservation, controlled water drainage			
15	Flood insurance study	Flooding	People and infrastructure	Washoe County	All participating jurisdictions	Needs further investigation	General Fund	$50,000	Studying areas lacking flood insurance can pinpoint vulnerable regions and guide policy decisions, enhancing community preparedness and economic resilience. It raises awareness about the need for adequate coverage and supports stronger disaster mitigation efforts.	5-10 years	1-2 Years	Medium

Description: This study aims to identify gaps in flood insurance coverage in Reno by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.

Notes: [1]Includes vulnerable populations; [2]Through which the action will be implemented.

*AFN = Access and Functional Needs; AQMD = Air Quality Management Division; BRIC = Building Resilient Infrastructure and Communities; CSD = Community Services Department; EAP = Emergency Action Plan; FHA = Fire Hazards Analysis; HR = Human Resources; LE = Law Enforcement; NNPH = Northern Nevada Public Health; NOAA = National Oceanic and Atmospheric Administration; NVDEM = Nevada Division of Emergency Management; NWS = National Weather Service; PROTECT = Program for Response Options and Technology Enhancements for Chemical/Biological Terrorism; RHMP = Regional Hazard Mitigation Plan; SME = subject matter expert; TMFPD = Truckee Meadows Fire Protection District; USGS = United States Geological Survey; WC = Washoe County; WCEM = Washoe County Emergency Management

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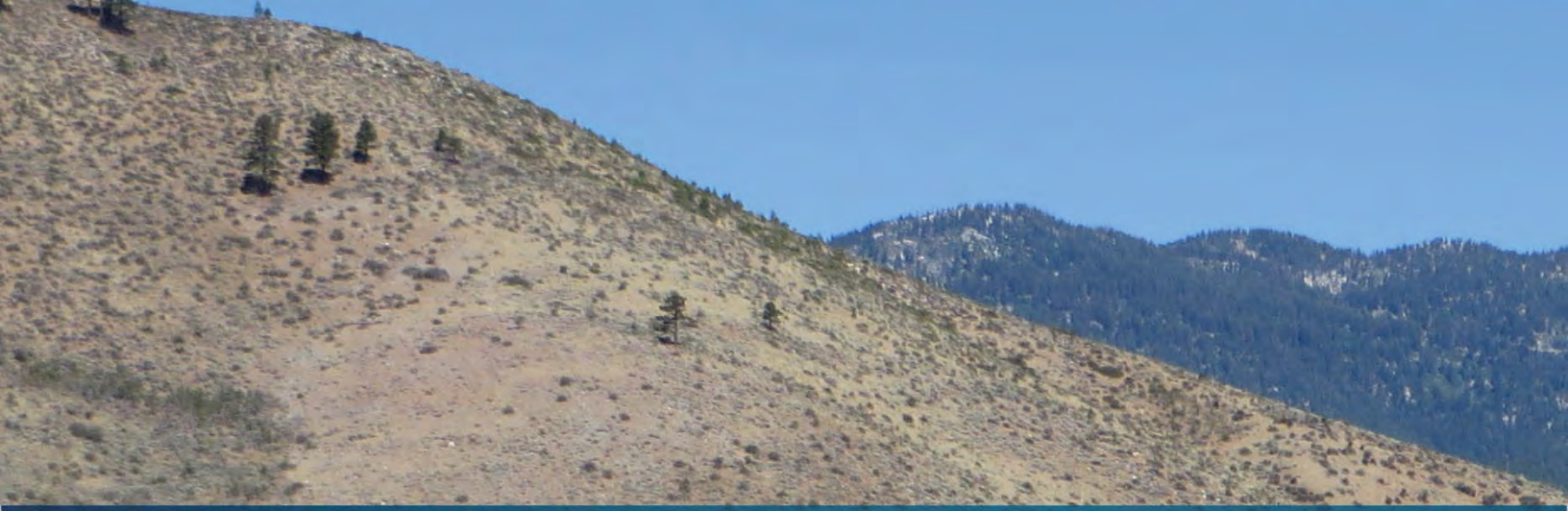

PROGRAM IMPLEMENTATION



Program Implementation

Plan Adoption

FEMA	F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5)) F2. For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))

44 CFR §201.6(c)(5) requires that the RHMP be formally adopted by the Board of Commissioners and elected officials from each participating jurisdiction. The Washoe County Board of Commissioners formally adopted the 2024 update of the Washoe County RHMP. The dates of adoption by each plan participant are included in their respective annexes.

This RHMP was approved by FEMA Region 9. Copies of the RHMP will be maintained in the emergency management offices of participating jurisdictions and on the County's website.

Plan Update and Review

FEMA	D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))

Ongoing Action Tracking

The County Mitigation Program Coordinator will be responsible for monitoring and evaluating the mitigation actions in this plan for all regional partners: the cities of Reno and Sparks, North Lake Tahoe Fire Protection District, Pyramid Lake Paiute Reservation, Reno-Sparks Indian Colony, Truckee Meadows Fire Protection District, and Truckee River Flood Management Authority. When needed, the County Mitigation Program Coordinator will be responsible for engaging all relevant parties for their status updates on each mitigation action included in this plan update.

Annual Review and Evaluation

The County Emergency Management Administrator is responsible for coordinating the annual review and evaluation of the RHMP and for making appropriate revisions. On an annual basis, the County Emergency Management Administrator will convene the MPT to conduct a

comprehensive review of the plan to ensure that all information is current and that planned initiatives are meeting the stated purpose and goals of the RHMP. The review and update process is as follows:

The MPT will meet to consider the following:

- Progress made in achieving plan goals and objectives during the previous 12 months;
- Mitigation accomplishments in projects, programs, and policies;
- Actual losses avoided by implementation of mitigation actions;
- Emerging disaster damage trends and repetitive losses;
- Identification of new mitigation needs;
- Changes in priorities;
- Cancellation of planned initiatives and the justification for doing so; and
- Changes in membership of the MPT.

The County Emergency Management Administrator will request input from other departments and outside entities not represented on the MPT on the issues listed above. Special effort will be made to gather information on non-capital projects and programs important for mitigation.

Following a Major Disaster

In a reasonable period after a major disaster warranting a Presidential Disaster Declaration, and as determined necessary for a smaller event, the County Emergency Management Administrator will convene the MPT. Because recovery is a long process and the full impact of a disaster may not be known for many months, this initial meeting may be followed by additional meetings over time.

The annual update process described above will also be used following a major disaster. However, post-disaster deliberations will also consider the following:

- “Lessons Learned” from the disaster and what new initiatives should be added to the plan to help reduce the likelihood of similar damage in the future;
- Follow-up needed on items relevant to mitigation from any after-action reports produced; and
- Integration of mitigation into the recovery process and coordination with local and/or regional recovery planning efforts.

Formal Plan Update

Every five years, the plan will be re-submitted for adoption to the Board of County Commissioners and elected officials for each plan participant. Prior to this, the County Emergency Management Administrator will use the following process to make sure that all relevant parties are involved:

- Conduct regular reviews of the plan and status tracking as described above and incorporate feedback from those reviews into the planning document;
- Conduct public engagement activities and initiate meetings with identified groups of interested parties and outside organizations to gain input and feedback;
- Integrate relevant feedback and circulate the revised plan to the MPT for approval;
- Submit the plan to the Board of County Commissioners for adoption by resolution;
- Submit the revised plan to FEMA.

It is anticipated that the next full update of this plan will begin 12–18 months prior to plan expiration.

Monitoring Project Implementation

Mitigation projects and project closeouts will be monitored and updated on quarterly reporting forms for FEMA-funded projects, provided by FEMA Region 9. County and local contract managers will ensure that project reporting is completed within specified timeframes. The Mitigation Project Progress Report will be requested annually by Washoe County's Emergency Management Administrator to determine progress made and track final closeout tasks. The County and its partners will comply with all applicable federal statutes and regulations with respect to the periods during which they receive grant funding, in compliance with 44 CFR 13.11(c).

Grant Management Process

The County implements a comprehensive grant management process to ensure compliance with all applicable grant requirements. The grant management process involves key governmental entities, including the Grants Coordinator, Comptroller, County Manager, Board of County Commissioners, Legal Counsel, and the appropriate program managers.

The County also maintains an extensive process to respond to audits. Office of Management and Budget Circular A-133 audits are performed annually. Through this process, new awards

are reviewed to ensure that compliance has been met and funding use aligns with the County's accounting records.

Mitigation Action Status and Tracking Loss Reduction

All departments are tasked with tracking the ongoing status of mitigation actions for which they are the lead. Departments should track the following:

- Project progress, including status of project funding and ongoing needs;
- Actual losses mitigated by project implementation; and
- Project needs that may be addressed in the next mitigation planning cycle.

Refer to the sample Mitigation Action Plan Annual Progress Report in Appendix C.

Incorporating Existing Planning Mechanisms

Previous Plan Integration

FEMA	E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))

Washoe County integrated the prior 2020 plan into other existing planning mechanisms. In this case, planning mechanisms refer to the governance structures used to manage local land use development and community decision-making, such as budgets, comprehensive plans, capital improvement plans, and other long-range plans, codes, and ordinances. The prior plan was integrated into the Washoe County Strategic Plan.

Future Plan Integration

FEMA	D3. Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))

As part of their day-to-day plan monitoring efforts, the County Emergency Management Administrator and County Mitigation Program Coordinator will coordinate with departments that have jurisdiction over mitigation action implementation areas to incorporate the plan into standard policies and procedures and long-term planning documents and budgets.

Specifically, the current hazard mitigation plan will be integrated into plans as appropriate.

Washoe County's Emergency Management Administrator will also work with departments to include mitigation projects in annual budgets—rather than relying solely upon grant programs—and integrate hazard mitigation in future land use and strategic planning.

Continued Public Involvement

FEMA	D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))

Public involvement is a key component of the plan implementation and update process. As part of this plan update, an ArcGIS StoryMap website has been developed to inform the public about the hazard mitigation plan update and their local risks. The StoryMap will be made available once the plan goes out for public comment in December. This user-friendly website is intended to make the hazard mitigation plan more accessible to the general public. This website also informs the public how to leave comments on the draft plan and continue participating in the plan maintenance process. The IEM Project Manager for the Washoe County RHMP update will collect, disseminate, and integrate any public comments received, as appropriate.

Following the annual review of the RHMP, the County will prepare and make available via the Internet an Annual Mitigation Status Report providing an update on the implementation of the current mitigation plan. This report, along with specific reports for each mitigation measure being implemented and all stakeholder comments received, will be assessed to make improvements in the plan update released every five years.

In addition to the ongoing input collected and compiled during the implementation of the previous plan, the MPT, as mentioned above, will review aspects of the draft update plan. Comments received from the public will also be considered and incorporated, where appropriate, into updates of the plan.

The County and its partners, The Cities of Reno and Sparks, North Lake Tahoe Fire Protection District, Pyramid Lake Paiute Reservation, Reno-Sparks Indian Colony, Truckee Meadows Fire Protection District, and Truckee River Flood Management Authority, will also engage community members on an ongoing basis through outreach at local events and meetings to ensure that public participation is incorporated outside the five-year plan update process. The County and its partners maintain public engagement and awareness programs focused on increasing the community's awareness of hazards and promoting actions to reduce individuals' and families' exposure to hazard risks. Recognizing that these are ongoing programs, the

The County and its partners will continue to implement the following programs during this five-year planning period:

- Seasonal Multi-Hazard Public Awareness Program;

- Annual weather safety activities to maintain the County's StormReady Community accreditation;
- Community Wildfire Protection Plan preparation;
- Community evacuation plan preparation and evacuation drills;
- Community Emergency Response Team (CERT) academy training sessions;
- Washoe County Emergency Preparedness Program;
- Green waste collection events;
- Food Truck Fridays in Reno;
- Meetings with homeowners' associations and other community groups; and
- Outreach through social media.

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Washoe County

REGIONAL HAZARD MITIGATION PLAN APPENDICES

2025

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Washoe County
Regional Hazard Mitigation Plan Update
Kickoff Meeting 3/14/2024

Participants

Name	Title	Agency/Jurisdiction
Jessica Adams	Homeland Security Program Coordinator	Washoe County Emergency Management (WCEM)
Andrew Ancho	Division Chief, City Emergency Manager	Reno Fire Department
Roy Anderson	Emergency Manager	Washoe County School District
Rob Bidart	Utilities Manager	City of Sparks
Sabrina Brasuell	Mitigation Program Coordinator	WCEM
Genn Bronczyk	Assistant Planner	Reno–Sparks Indian Colony (RSIC)
Jeanne Bunting	Hazard Mitigation Specialist – Project Manager	IEM
Francisco Ceballas	Program Coordinator	WCEM
Myrna Chase	Disaster Response Specialist	IEM
Eric Crump	Operations Division Director	Washoe County Community Services Department
Hal Dawson	Associate Engineer, Emergency Manager	Nevada Department of Transportation
Raquel DePuyGrafton	Program Coordinator – Public Health Preparedness Program	Northern Nevada Public Health (NNPH)
Kelly Echeverria	Emergency Management Administrator	WCEM
Ashley Elson	Senior Civil Engineer	City of Sparks
James English	Environmental Health Supervisor	NNPH, Environmental Health
Jon Ericson	City Engineer	City of Sparks

Name	Title	Agency/Jurisdiction
John Flansberg	Regional Infrastructure Administrator	City of Reno
Moni Fox	GIS	Washoe County GIS
Casey Garnett	Hazard Mitigation Specialist – Lead Planner	IEM
Danielle Henderson	Natural Resources Manager	Truckee River Flood Management Authority
Timothy Hill	Senior Emergency Management Administrator	NV Energy
August Isernhagen	Division Chief, Wildland Fuels	TMFPD
Joseph R. Kammann	Division Chief, EMS	Truckee Meadows Fire Protection District
Hudson Klein	Engineering Manager	Incline Village General Improvement District (IVGID)
Cameron Kramer	Emergency Services Assistant	RSIC
Sean Kunz	Emergency Management and Preparedness	Saint Mary's Regional Medical Center (SMRMC)
Bear Lewis	Northern Nevada Disaster Program Manager	American Red Cross
Jordyn Marchi		NNPH
Adam Mayberry	Fire Communications Officer, Public Information Outreach	Truckee Meadows Fire Protection District
Withanee Milligan	Communications Coordinator	City of Sparks
Kate Nelson	Interim Director of Public Works	IVGID
Brian Newman	Senior Planner	Regional Transportation Commission
Don Pelt	Fire Chief	Pyramid Lake Paiute Tribe
Derek T. Reid	Battalion Chief	Truckee Meadows Fire Protection District
Aaron Reyes	Emergency Management Coordinator	Truckee Meadows Water Authority
Jim Rich	State Disaster Liaison	American Red Cross
Ryan Rizzuto	Battalion Chief	TMFPD
Ceira Sampson	Emergency Services Manager	Reno–Sparks Indian Colony (RSIC)

Name	Title	Agency/Jurisdiction
Jon Simpson	Utility Services Engineering Manager	City of Reno
Kate Smith	Hazard Mitigation Planner – GIS	IEM
Eric Smith	Emergency Preparedness Coordinator	Renown Health
Dwayne Smith	Engineering & Capital Projects Division Director	Washoe County Community Services Division
Chris Smith	Director of Individual Assistance and Disaster Housing – Advisor	IEM
Ryan Sommers	Fire Chief	North Lake Tahoe Fire Protection District
Candace Stowell	Planning & Community Development	RSIC
Brett Taylor	Community Coordinator, Wildland Urban Interface	TMFPD
Brian Taylor	Emergency Manager	Regional Emergency Medical Services Authority (REMSA)
Travis Truhill	Director of Maintenance Operations	City of Reno
Nathan Ullyot	Director of Parks and Recreation	City of Reno
Francisco Vega	Division Director of Air Quality Management	NNPH, Air Quality Management Division
Walt White	Fire Chief	Sparks Fire Department
Khalil Wilson	Associate Director, Public Works	City of Reno
Gary Zaepfel	Technology Coordinator	Washoe County GIS

Summary

Welcome and Introductions

Kelli Echeverria started the meeting and welcomed everyone.

Casey Garnett, IEM Lead Planner, led introductions and gave an overview of the agenda.

Sabrina Braswell is a Mitigation Program Coordinator who will be supporting the plan including plan maintenance and action tracking as well.

Discussion

MITIGATION OVERVIEW

- Mitigation defined
  - FEMA Definition: Hazard mitigation is any sustained action to reduce or eliminate the long term risk to human life and property from hazards.
- Mitigation is cost-effective
- Benefits
  - Reduce disaster losses
  - Promotes partnerships
  - Following the law
  - Required and establishes eligibility for grants
  - Hazard mitigation plans form the foundation of the participant's approach to mitigation.
- NEW 2023 FEMA Local Mitigation Planning Guidance will be followed for this plan update. Some key elements include:
  - Stakeholder involvement
  - Future conditions
  - Climate change
  - NFIP
- Planning Process
- Regional partners all represented today:
  - Washoe County
  - City of Reno
  - City of Sparks

  - North Lake Tahoe Fire Protection District
  - Pyramid Lake Paiute Reservation
  - Reno–Sparks Indian Colony
  - Truckee Meadows Fire Protection District
- Expectations
  - Active participation, active communication, respect for deadlines
  - Reach out with questions.
  - Watch for deadlines and what deliverables are presented at each meeting.
  - Does anyone present have expectations for plan update?
    - County introduces a change in priorities for avalanche – urban avalanche mapping since prior avalanche detail didn't include slope, outrun area.
    - Further, emphasized increasing specifics and connecting proposed actions to appropriate funding sources.
- Question: Can Washoe County School District be added as a partner?
  - Casey addressed whether they want a separate annex/plan if applying for a grant directly versus participate under the county.
- SharePoint
  - Space to share forms and documents related to the plan.
  - You'll receive invite email, don't ignore it! This link is individual and for the individual person invited.
    - Make sure you are logged into your Microsoft account.
- Stakeholders
  - Identify stakeholders to be invited to participate in the form on SharePoint
  - Survey is an opportunity to participate and provide suggestions and ideas for mitigation.
- Public Outreach
  - How do you reach the public?
  - School District has Safe and Healthy Schools events, 2 online and 1 in person, sometimes kickoff fairs, annual PSA public outreach about lockdowns. Upcoming event in May.
  - Sparks Fire Dept. has community engagement meetings for public, at each of the 5 fire stations as part of the 5-year strategic planning process. Understanding what fire services are important to citizens.
  - Red Cross does outreach through schools, senior centers, meals on wheels [for those

with access and functional needs] (AFN) and vulnerable populations. They look at North Valley area, especially on wildland–urban interface. Work with Truckee Meadows Fire on outreach, using doorhangers to offer smoke detectors and different alarms for those with hearing disabilities.

  - Community advisory board has a county emergency management presence, give presentations to talk about their concerns.
  - Social media such as Nextdoor are useful for outreach.
  - City of Reno has a communications team that post frequently on social media for upcoming events, educational videos, regional messaging, good messaging network to help promote survey and other outreach.
  - IEM needs documentation that information about the mitigation plan is being shared.
- Consider other plans or reports that IEM should review and integrate into the plan.
  - Add these existing studies and reports to SharePoint.

RISK ASSESSMENT

- Hazard Profiles – including consequence analysis for the Emergency Management Accreditation Program (EMAP)
  - Avalanche and landslide
  - Criminal acts and terrorism
  - Drought
  - Earthquake
  - Energy emergency
  - Flooding
  - Hazardous materials incident
  - Infectious disease
  - Radiological waste transport
  - Severe storms (winter storm and windstorm)
  - Transportation incident (aircraft crash)
  - Volcano
  - Wildland Fire
  - Are the last hazards the ones you still wish to profile? Any changes?
  - Keep in mind each hazard will need mitigation action/s.
- Capability Assessment
  - What policies, resources, and programs are in place?
  - Do they support mitigation?
  - How can they be expanded/improved?
- Mitigation Strategy
  - Blueprint for reducing disaster losses

  - Two meetings will be held to discuss specifics.
  - Contribute success stories on past actions, celebrate them.
  - The STAPLEE [Social, Technical, Administrative, Political, Legal, Economic, and Environmental] method is used to prioritize actions.
  - Previous actions will be reviewed, and status updated.
- Plan Maintenance
  - How will plan be monitored, evaluated, updated?
- Plan Review
  - Can be multiple months for the review
- Plan adoption
  - The plan is not complete until it is adopted!

Next Steps

- Planning Process Forms: due March 29
- Risk Assessment Meeting: April 2024
- Mitigation Strategy Meeting: May 2024
- Mitigation Priority Meeting: June 2024
- Washoe County Plan Review: June 2024
- Committee Plan Review: July 2024
- Final Draft: August–October 2024
- Plan Adoption: following FEMA "Approvable Pending Adoption" status

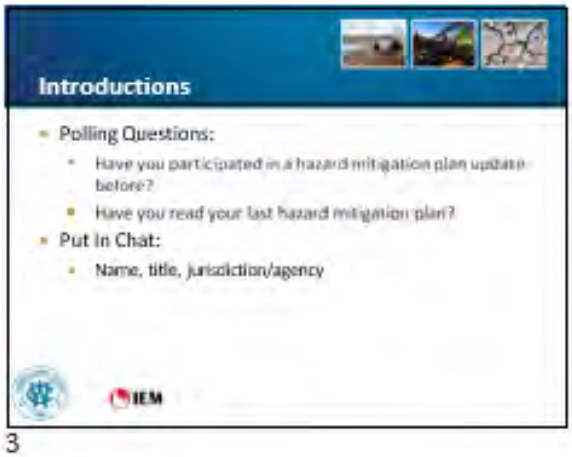
  Bulk of plan will be done by end of *June 2024*.

Closeout

Kelli closed out the meeting by emphasizing the importance of mitigation planning. It drives resilience and understanding. Mitigation is the chance to work together to reduce impacts. Fundamentals are the building blocks of fun. We have to do this plan before we do the fun projects. Be aware of time needed for fund match.


Washoe County Regional Hazard Mitigation Plan Update Kickoff Meeting
Casey Garnett, IEM Lead Planner
3/14/2024
IEM
1


Agenda
Introductions
Hazard Mitigation
Hazard Mitigation Planning
The Plan Update
Schedule
Next Steps
IEM
2


Introductions
Polling Questions:
Have you participated in a hazard mitigation plan update before?
Have you read your last hazard mitigation plan?
Put In Chat:
Name, title, jurisdiction/agency
IEM
3


Hazard Mitigation
Hazard Mitigation is any sustained action to reduce or eliminate the long-term risk to human life and property from hazards.
IEM
4


Hazard Mitigation Planning
Local plans are the foundation of a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repetitive damage.
Opportunity to promote partnerships and sustainable communities and reduce disaster-related costs.
Based on Disaster Mitigation Action (DMA) 2000, which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Stafford Act), creating the framework for state, local, tribal and territorial hazard mitigation planning.
IEM
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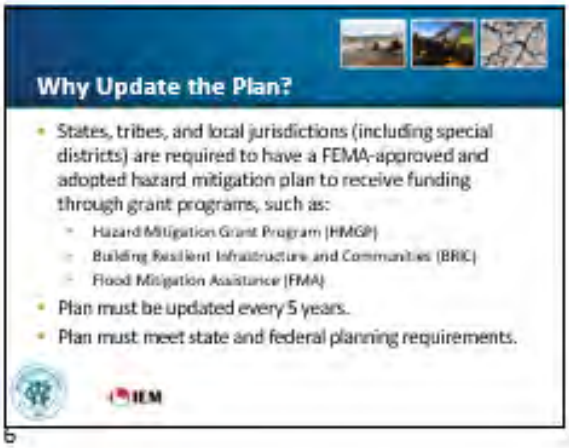
Why Update the Plan?
States, tribes, and local jurisdictions (including special districts) are required to have a FEMA-approved and adopted hazard mitigation plan to receive funding through grant programs, such as:
Hazard Mitigation Grant Program (HMGP)
Building Resilient Infrastructure and Communities (BRIC)
Flood Mitigation Assistance (FMA)
Plan must be updated every 5 years.
Plan must meet state and federal planning requirements.
IEM
6


NEW Local Mitigation Planning Guidance
New guidance as of April 2023
Some big changes include:
Emphasis on partnerships
Requires addressing future conditions/climate change
Increased discussion of the National Flood Insurance Program
Recognizes importance of building codes/land use ordinances
High Hazard Potential Dam (HHPD) element
Local Mitigation Planning Policy Guide
IEM

7


The Structure of the Plan
IEM

8


Planning Process
Assemble a planning team and identify stakeholders
Document opportunities to be involved in the plan update (team meetings, data and information provided, surveys, etc.)
Public outreach and engagement
Public

9


Plan Participants
Regional Partners
Washoe County
City of Reno
City of Sparks
Reno–Sparks Indian Colony
Pyramid Lake Paiute Reservation
North Lake Tahoe Fire Protection District
Truckee Meadows Fire Protection District
Stakeholders and public participants
IEM

10


Planning Expectations
ACTIVE PARTICIPATION
ACTIVE COMMUNICATION
RESPECT OF DEADLINES
IEM

11


SharePoint
Your SharePoint site is available now!
Each plan participant will have a folder.
All forms to be filled out, meeting notes, and updates will be added in SharePoint.
IEM

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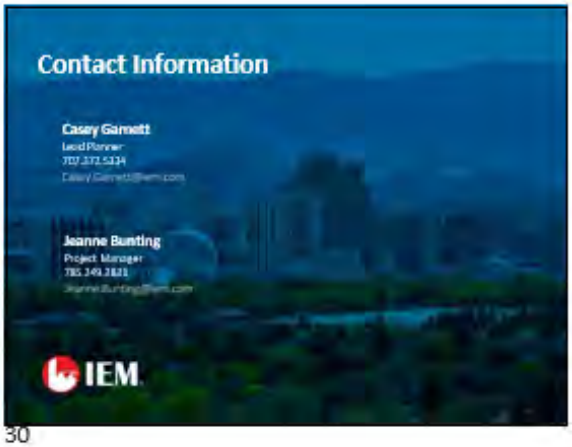

30

Washoe County
Regional Hazard Mitigation Plan Update
Risk Assessment Meeting 4/24/2024

Participants

Name	Title	Agency/Jurisdiction
Kelly Echeverria	Emergency Manager	Washoe County Emergency Management (WCEM)
Jessica Adams-Lopes	Program Coordinator – Homeland Security	WCEM
Francisco Ceballos	Program Coordinator	WCEM
Eric Crump	Division Director of Operations	Washoe County Community Services Department (CSD)
Rob Bidart	Planner	City of Sparks Planning and Zoning Department
Janelle Thomas	Engineering	Washoe County CSD – Engineering
Michael Drinkwater	Community Services	City of Sparks Community Services
Danielle Henderson	Natural Resources Manager	Truckee River Flood Management Authority
Chad Giesinger	Planning Manager	Washoe County Planning
Jordyn Marchi	Public Health Emergency Response Coordinator	Northern Nevada Public Health (NNPH) Public Health Preparedness/Inter-Hospital Coordinating Council (IHCC)
Stephen Shipman		NNPH
Brian Taylor	Emergency Manager	Regional Emergency Medical Services Authority (REMSA) Health
Andrew “Andy” Ancho	Emergency Manager	City of Reno Fire Department
Scott Means	Emergency Manager	City of Sparks Fire Department

Name	Title	Agency/Jurisdiction
Trenton Johnson		City of Reno Police Department
Trina Magoon	Director of Utility Services	City of Reno Utility Services
Charles Moore	Fire Chief	Truckee Meadows Fire District
John Rees		WCRCS
Harold "Hal" Dawson		Nevada Department of Transportation
Craig Petersen		NNPH, Air Quality
Travis Truhill	Director of Maintenance and Operations	City of Reno Maintenance and Operations
Jeanne Bunting	Project Manager	IEM
Myrna Chase	Planner	IEM
Kate Smith	Planner/GIS Specialist	IEM
Casey Garnett	Lead Planner	IEM

Summary

Casey provided brief plan update status.

Public outreach – The live digital public survey available and flyers have been sent to all plan participants. Public Health shared survey with their audience. Casey reports 5 responses to English survey, no responses to Spanish version of survey received. Of the survey responses received, Washoe County, Reno and Sparks residents shared information. Survey responses concerned about flooding, wildland fire, and extreme heat was mentioned in responses. Casey shared public outreach strategy next steps with planning team including encouraging each plan participant to share the survey.

Stakeholder outreach survey sent to all identified stakeholders. Some suggested holding town hall meeting to share mitigation plan. Nevada wildfire awareness month might be opportunity to share mitigation plan. Five community engagement meetings in May to first week of June at Sparks Fire Departments is another opportunity to share mitigation plan, flyer with link to survey. Truckee Meadows Fire Chief also may have suggestions for stakeholder outreach opportunities.

Outreach opportunity suggestion: Have a centralized meeting to provide the public and stakeholders the opportunity to learn about each hazard, including guest speakers. Washoe County is currently working on setting this up.

Casey states Stakeholder Engagement survey results on hazards of concern align with those identified by the Planning Team (PT), with one stakeholder response that identified Highway 80 as a prioritized hazard risk. Casey inquires of PT if there might be any specific incidents to

highlight related to Highway 80. Planning Team Member (PTM) suggests maybe hazardous materials, radiological waste transport, terrorism could be potential risks on Highway 80.

Casey stated FEMA definition of stakeholders to engage from Local Planning Review Tool.

Updating Risk Assessment

Casey stated purpose of the risk assessment, provided extended understanding of potential risks.

Vulnerable Populations – Casey explained vulnerable populations, potential impacts, and tools used to identify vulnerable populations. She discussed Justice 40 funding for climate adaptation in disadvantaged communities and shared tools used to identify potentially disadvantaged and at-risk populations including the National Risk Index, Climate and Economic Justice Screening tool, Community Disaster Resilience Zones CDRZs.

Planning Team Provided Risk Scenarios and Examples

Kelly provided example of situation where current mitigation plan failed to provide needed resource information on air quality mitigation actions – 2020 Covid pandemic, air quality improvement not explained in previous plan.

Truckee Meadows Fire PTM – Power grid goes down, e.g., from nuclear or cyberattack, can cause local power outages, drinking water systems shut down due to loss of power, fuel service for emergency vehicles shut down due to loss of power.

Public Health PTM – The plan should reflect how low probability, high impact hazards, such as infectious disease, space weather incident, or nuclear attack could lead to cascading hazards and impacts.

Casey agreed with PT on identifying multi-hazards mitigation actions, and the importance of conducting Cost Benefits Analysis to determine whether low probability, high impact hazards mitigation actions would be cost effective and why the prioritization exercise will support this.

Hazard Identification Risk Assessment Exercise with Planning Team

Avalanche and Landslide

- 10% of planning area in Mountain ranges. PTM report Crystal Bay (more sun exposure), Third Creek, All Crystal Bay/Third Creek Avalanche Alerts Now Lifted | Washoe Life (washoecounty.gov) ,Washoe Valley loss houses after 1983(?), Slide Creek Mountain landslide Knowing Nevada: The Disaster at Slide Mountain (mynews4.com).
- Mount Rose Highway, road to Mount Rose Ski Resorts controlled avalanches to blow up the snow pack threatening roadways to avoid road closures.

- The Nevada Department of Transportation might have incidents recorded. 2023 Rockslide Highway (HW) 395 over to Smith. Alexander lake road rock falls, Red Rock Road California Oregon border. Incline Village around the lake, one road access poses hazard.
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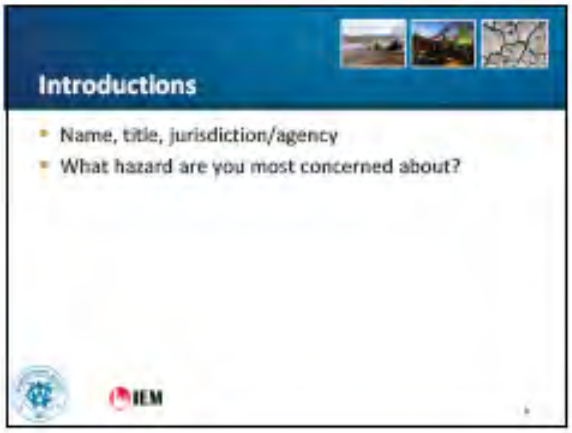
Mitigation Strategy Meeting – May 10th


Washoe County
Regional Hazard
Mitigation Plan Update
Risk Assessment
Meeting
Casey Garnett, IEM Lead Planner
4/24/2024
IEM

1


Agenda
Introductions
Hazard Mitigation
Plan Update Status
Public Outreach Update
Risk Assessment
SharePoint Forms
Next Steps
IEM

2


Introductions
Name, title, jurisdiction/agency
What hazard are you most concerned about?
IEM

3


Hazard Mitigation
Hazard Mitigation is any sustained action to reduce or eliminate the long-term risk to human life and property from hazards.
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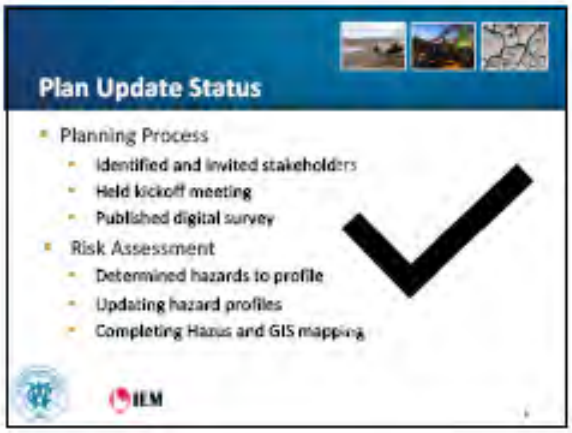
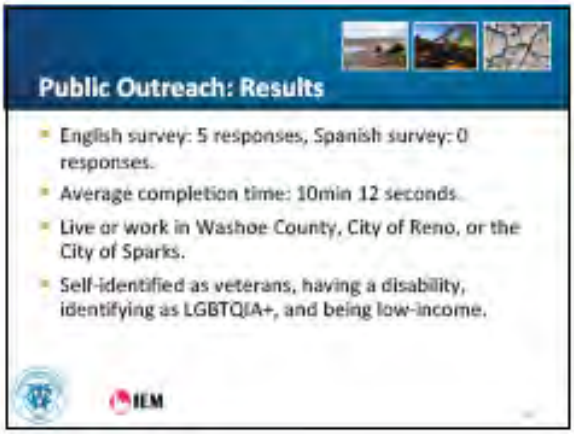
4


Plan Update Status
Planning Process
Identified and invited stakeholders
Held kickoff meeting
Published digital survey
Risk Assessment
Determined hazards to profile
Updating hazard profiles
Completing Hazus and GIS mapping
IEM

5


Public Outreach: Update
The digital survey is LIVE!
Have you shared the survey?
IEM

6


Public Outreach: Results
English survey: 5 responses, Spanish survey: 0 responses.
Average completion time: 10min 12 seconds
Live or work in Washoe County, City of Reno, or the City of Sparks.
Self-identified as veterans, having a disability, identifying as LGBTQIA+, and being low-income.
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Public Outreach: Results
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8


Public Outreach: Results
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9


Public Outreach: Results
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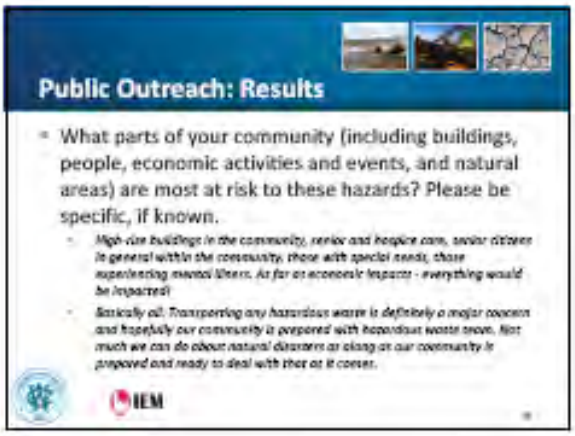
10


Public Outreach: Results
What parts of your community (including buildings, people, economic activities and events, and natural areas) are most at risk to these hazards? Please be specific, if known.
High-rise buildings in the community, senior and hospice care, senior citizens in general within the community, those with special needs, those experiencing mental illness. As far as economic impacts - everything would be impacted!
Basically all. Transporting any hazardous waste is definitely a major concern and hopefully our community is prepared with hazardous waste team. Not much we can do about natural disasters as along as our community is prepared and ready to deal with that as it comes.
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Stakeholder Engagement
The plan must provide an opportunity for stakeholders to be involved, including:
Local and regional agencies involved in hazard mitigation activities
Agencies that have the authority to implement mitigation actions
Neighboring communities
Representatives of businesses, academia, and other private organizations
Representatives of nonprofit organizations, including community-based organizations that work directly with and/or provide support to underserved communities and socially vulnerable populations
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Stakeholder Engagement: Results

- What ways of engaging the public have been successful for your organization within the planning area? Please list any opportunities at which the hazard mitigation plan could be discussed that are coming up before June 2024.
  - *Surveys & townhall meetings*
  - *During presentations to the public during the Nevada Wildfire Awareness Month community meetings (in May 2024)*

13

Stakeholder Engagement: Results



14

Stakeholder Engagement: Results

- What at-risk areas (including structures, infrastructures, and natural areas) or people in the planning area would you like to see protected from future disasters? Be specific, if known.
  - *North Valleys, Spanish Springs: Flooding/Wildfire*
  - *Metro areas: Civil Unrest, Terrorism*
  - *Union Pacific rail lines. Truckee River. Interstate 80 highway.*

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Risk Assessment



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Updating the Risk Assessment

1. Identify Hazards
2. Describe Hazards
3. Identify Community Assets
4. Analyze Impacts
5. Summarize Vulnerabilities

17

Community Assets

- Community assets refer to the people; structures; systems; natural, historic, and cultural resources; and/or activities that have value to the community.
- Local data is best! *Thank you to everyone who helped gather this information.*

18

Hazard Profiles

- Describe the location, extent, previous occurrences, future probability, vulnerability, and impacts.
- Develop a consequence analysis, which considers the public, responders, continuity of operations, property, facilities and infrastructure, the environment, economic conditions, and public confidence.
- Provide clear *problem statements* to use in the mitigation strategy

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Community Lifelines

- The most fundamental services in the community that, when stabilized, enable all other aspects of society to function.



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20

Vulnerable Populations

- The most vulnerable are often disproportionately impacted by disasters.
- Vulnerable populations may include:
  - Elderly and youth
  - Populations with limited English proficiency
  - Populations with disabilities
  - People with low socioeconomic status
  - Individuals experiencing homelessness
  - Rural communities
  - Renters

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21

CEJST

- The Climate and Economic Justice Screening Tool is a new tool designed to identify disadvantaged communities based on U.S. Census data and Federally Recognized Tribe status.



22

CDRZs



- These areas have a composite National Risk Index score that ranks in the top 50 nationally or in the top 1% within their state and they are identified as a disadvantaged community by CEJST.

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National Risk Index

- Online tool from FEMA which helps identify communities most at risk for 18 natural hazards.





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Washoe County
Regional Hazard Mitigation Plan Update
Risk Assessment Meeting 4/24/2024

Participants

Name	Title	Agency/Jurisdiction
Kelly Echeverria	Emergency Manager	Washoe County Emergency Management (WCEM)
Jessica Adams-Lopes	Program Coordinator – Homeland Security	WCEM
Francisco Ceballos	Program Coordinator	WCEM
Eric Crump	Division Director of Operations	Washoe County Community Services Department (CSD)
Rob Bidart	Planner	City of Sparks Planning and Zoning Department
Janelle Thomas	Engineering	Washoe County CSD – Engineering
Michael Drinkwater	Community Services	City of Sparks Community Services
Danielle Henderson	Natural Resources Manager	Truckee River Flood Management Authority
Chad Giesinger	Planning Manager	Washoe County Planning
Jordyn Marchi	Public Health Emergency Response Coordinator	Northern Nevada Public Health (NNPH) Public Health Preparedness/Inter-Hospital Coordinating Council (IHCC)
Stephen Shipman		NNPH
Brian Taylor	Emergency Manager	Regional Emergency Medical Services Authority (REMSA) Health
Andrew “Andy” Ancho	Emergency Manager	City of Reno Fire Department
Scott Means	Emergency Manager	City of Sparks Fire Department

Name	Title	Agency/Jurisdiction
Trenton Johnson		City of Reno Police Department
Trina Magoon	Director of Utility Services	City of Reno Utility Services
Charles Moore	Fire Chief	Truckee Meadows Fire District
John Rees		WCRCS
Harold "Hal" Dawson		Nevada Department of Transportation
Craig Petersen		NNPH, Air Quality
Travis Truhill	Director of Maintenance and Operations	City of Reno Maintenance and Operations
Jeanne Bunting	Project Manager	IEM
Myrna Chase	Planner	IEM
Kate Smith	Planner/GIS Specialist	IEM
Casey Garnett	Lead Planner	IEM

Summary

Casey provided brief plan update status.

Public outreach – The live digital public survey available and flyers have been sent to all plan participants. Public Health shared survey with their audience. Casey reports 5 responses to English survey, no responses to Spanish version of survey received. Of the survey responses received, Washoe County, Reno and Sparks residents shared information. Survey responses concerned about flooding, wildland fire, and extreme heat was mentioned in responses. Casey shared public outreach strategy next steps with planning team including encouraging each plan participant to share the survey.

Stakeholder outreach survey sent to all identified stakeholders. Some suggested holding town hall meeting to share mitigation plan. Nevada wildfire awareness month might be opportunity to share mitigation plan. Five community engagement meetings in May to first week of June at Sparks Fire Departments is another opportunity to share mitigation plan, flyer with link to survey. Truckee Meadows Fire Chief also may have suggestions for stakeholder outreach opportunities.

Outreach opportunity suggestion: Have a centralized meeting to provide the public and stakeholders the opportunity to learn about each hazard, including guest speakers. Washoe County is currently working on setting this up.

Casey states Stakeholder Engagement survey results on hazards of concern align with those identified by the Planning Team (PT), with one stakeholder response that identified Highway 80 as a prioritized hazard risk. Casey inquires of PT if there might be any specific incidents to

highlight related to Highway 80. Planning Team Member (PTM) suggests maybe hazardous materials, radiological waste transport, terrorism could be potential risks on Highway 80.

Casey stated FEMA definition of stakeholders to engage from Local Planning Review Tool.

Updating Risk Assessment

Casey stated purpose of the risk assessment, provided extended understanding of potential risks.

Vulnerable Populations – Casey explained vulnerable populations, potential impacts, and tools used to identify vulnerable populations. She discussed Justice 40 funding for climate adaptation in disadvantaged communities and shared tools used to identify potentially disadvantaged and at-risk populations including the National Risk Index, Climate and Economic Justice Screening tool, Community Disaster Resilience Zones CDRZs.

Planning Team Provided Risk Scenarios and Examples

Kelly provided example of situation where current mitigation plan failed to provide needed resource information on air quality mitigation actions – 2020 Covid pandemic, air quality improvement not explained in previous plan.

Truckee Meadows Fire PTM – Power grid goes down, e.g., from nuclear or cyberattack, can cause local power outages, drinking water systems shut down due to loss of power, fuel service for emergency vehicles shut down due to loss of power.

Public Health PTM – The plan should reflect how low probability, high impact hazards, such as infectious disease, space weather incident, or nuclear attack could lead to cascading hazards and impacts.

Casey agreed with PT on identifying multi-hazards mitigation actions, and the importance of conducting Cost Benefits Analysis to determine whether low probability, high impact hazards mitigation actions would be cost effective and why the prioritization exercise will support this.

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Regional Hazard
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Mitigation Strategy
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Casey Garnett, IEM Lead Planner
5/15/2024
IEM

1


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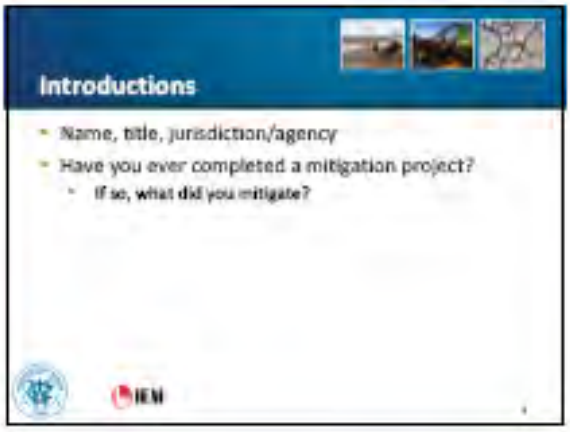
IEM

2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IEM

3


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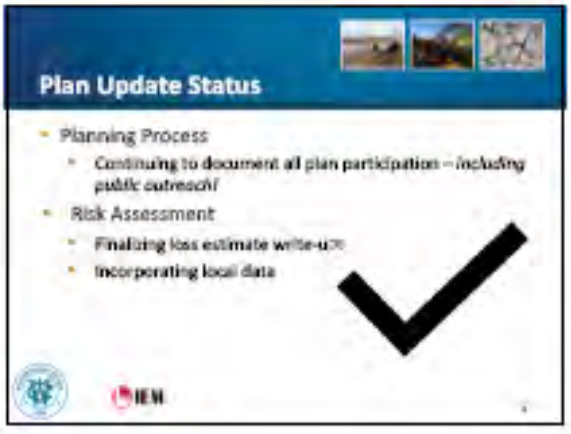
IEM

4


Plan Update Status
Planning Process
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Risk Assessment
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Incorporating local data
IEM

5


Public Outreach: Update
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IEM

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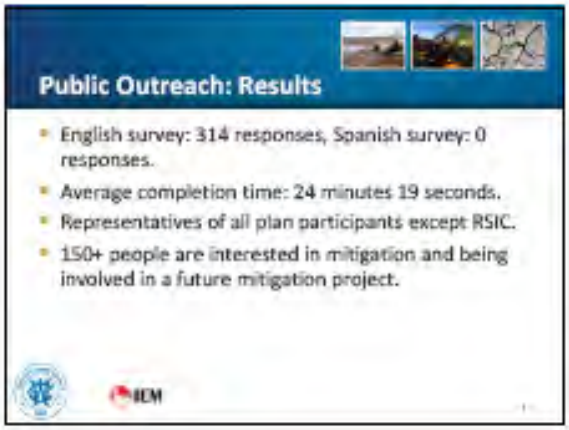
Public Outreach: Results
English survey: 314 responses, Spanish survey: 0 responses.
Average completion time: 24 minutes 19 seconds.
Representatives of all plan participants except RSIC.
150+ people are interested in mitigation and being involved in a future mitigation project.
BCM

7


Public Outreach Results
BCM

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Public Outreach: Results
BCM

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Public Outreach Results
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Public Outreach Results
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Public Outreach Results
BCM

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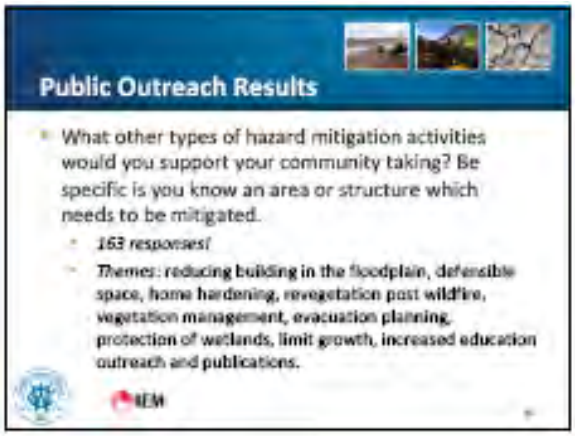

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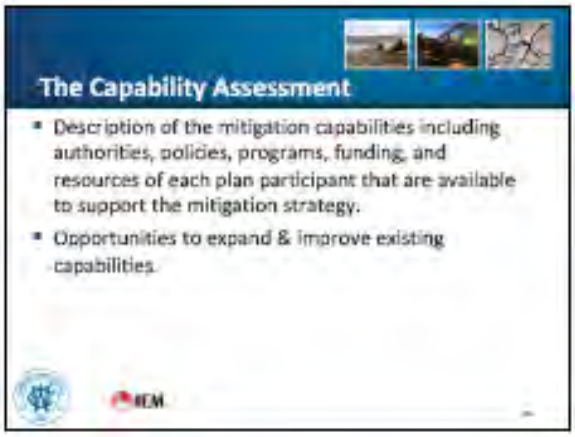

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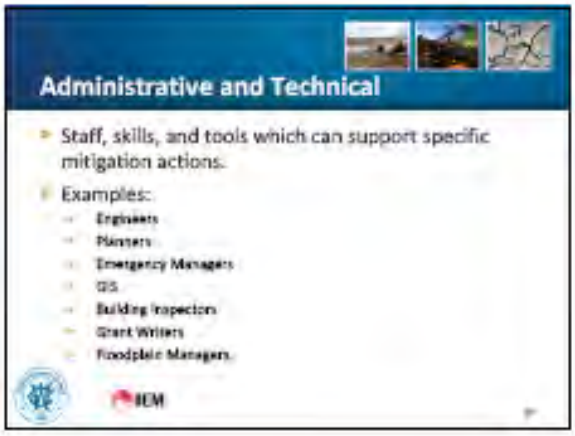

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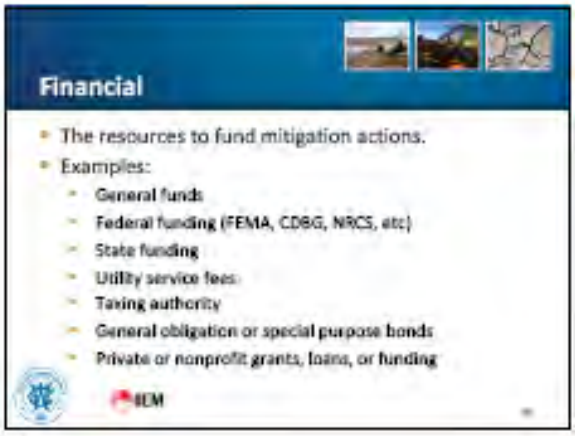

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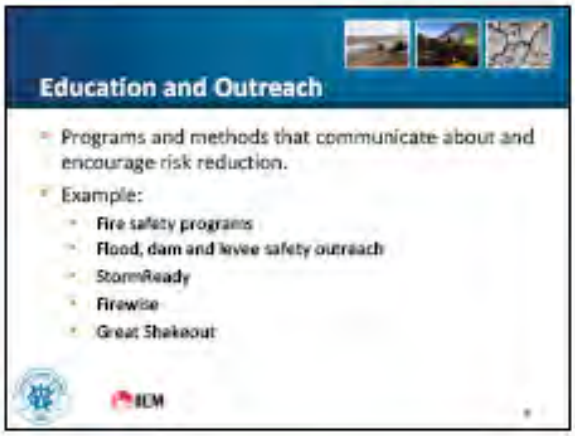

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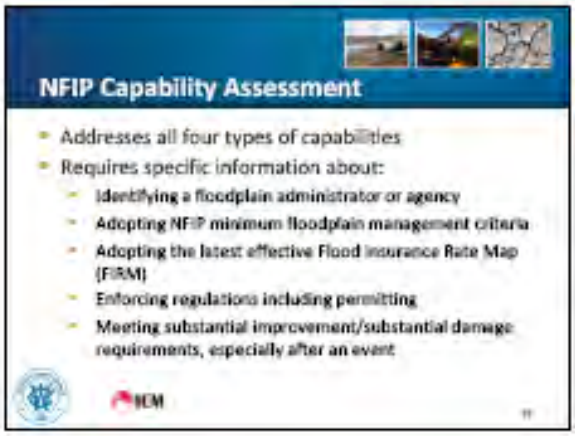

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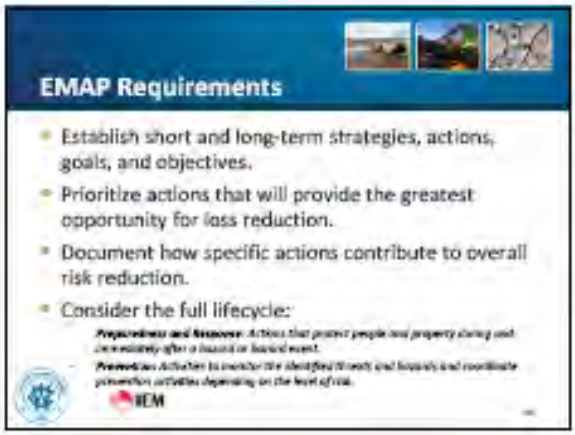

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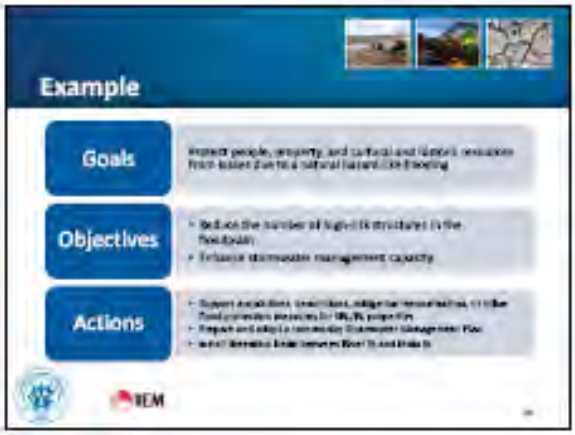

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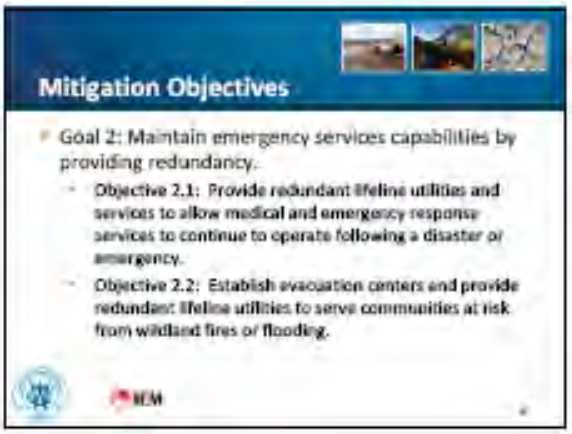

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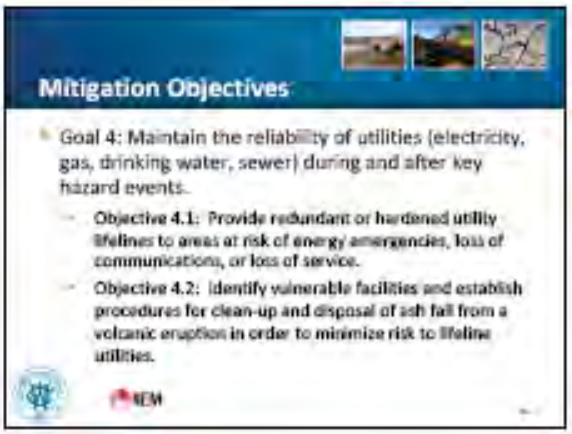

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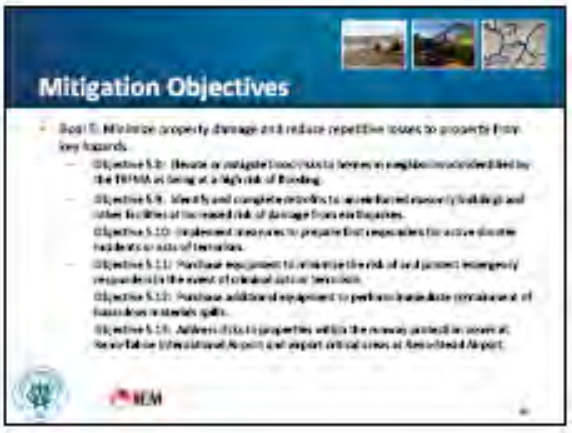

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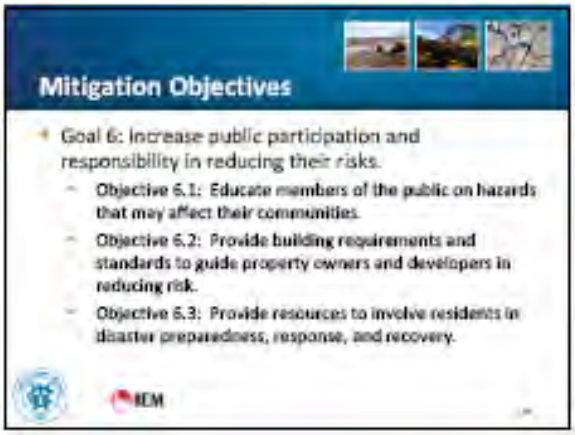

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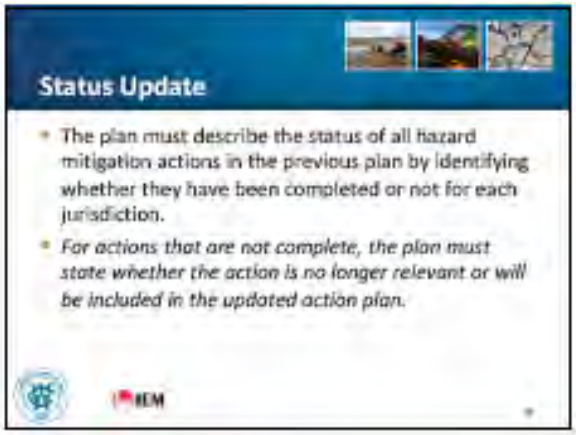

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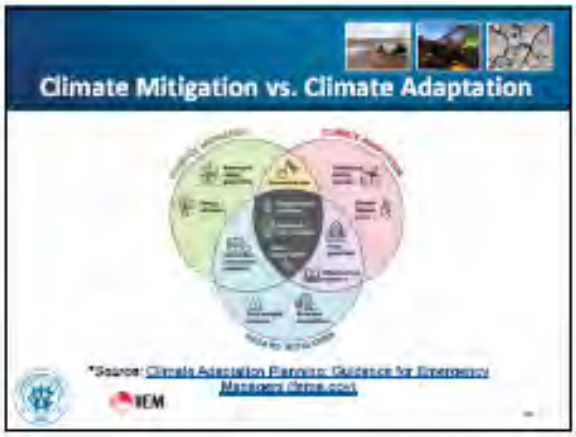

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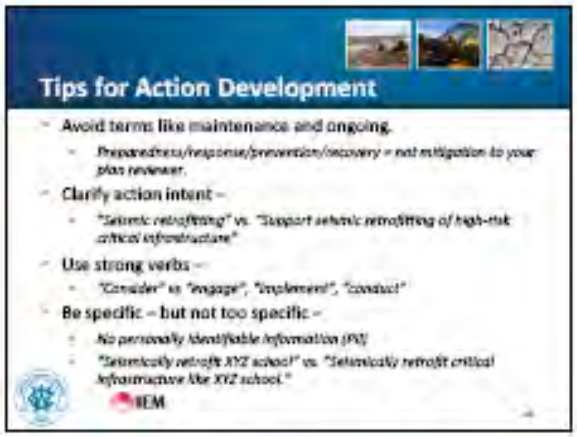

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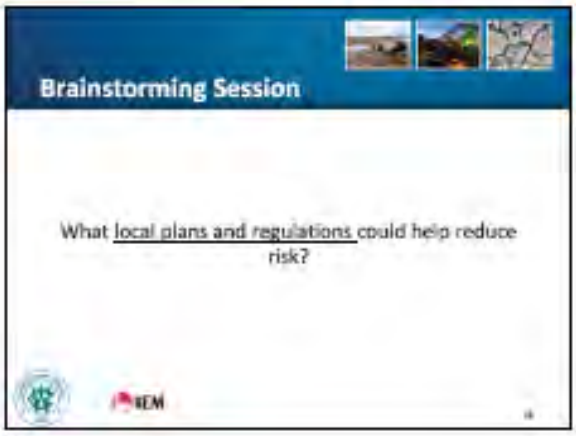

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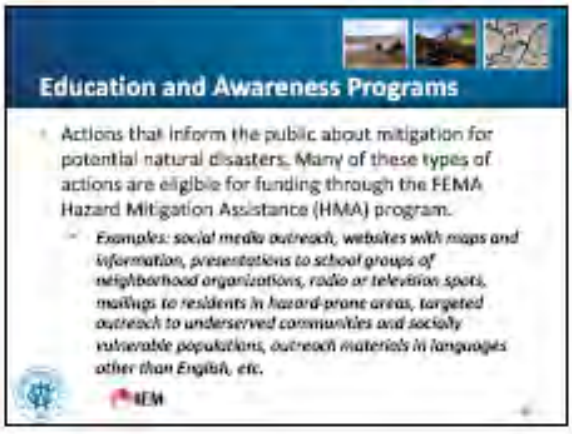

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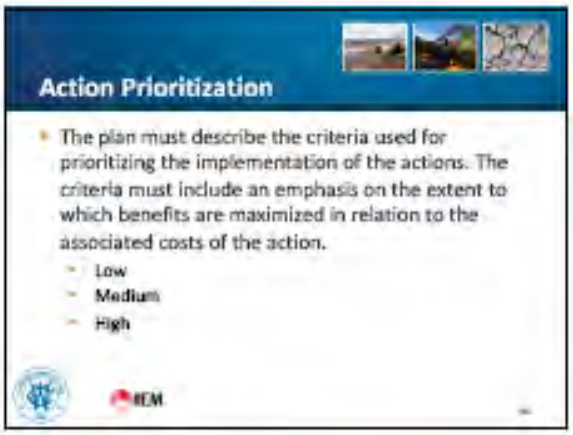

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Next Steps
Complete forms on SharePoint:
Risk Assessment
Capability Assessment
Mitigation Strategy
Share public survey/meeting information
Schedule meeting with IEM as needed / reach out with questions now!
IEM

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Resources
FEMA's Mitigation Ideas
Building Community Resilience with Nature-Based Solutions: A Guide for Local Officials (fema.gov)
Mitigation Best Practices | FEMA.gov
Hazard Mitigation Planning Successes (arcgis.com)
BRIC FY 2022 Subapplication and Selection Status
Nevada DEM Mitigation BRIC and FMA FFY 2023 Kickoff Meeting (youtube.com)
State Hazard Mitigation (nv.gov)
IEM

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Questions
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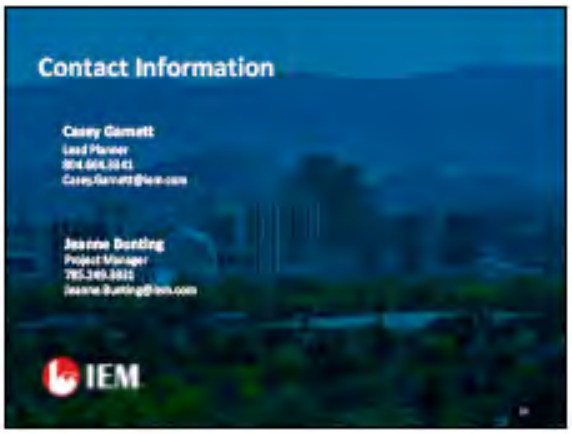
Contact Information
Casey Garrett
Lead Planner
Jeanne Bunting
Project Manager
IEM

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WASHOE COUNTY, NEVADA
1861


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CITY OF
RENO







Washoe County Regional Hazard Mitigation Plan Update Public Meeting

Casey Garnett, Lead Planner, IEM

Myrna Chase, Planner II, IEM

5/18/2024

IEM

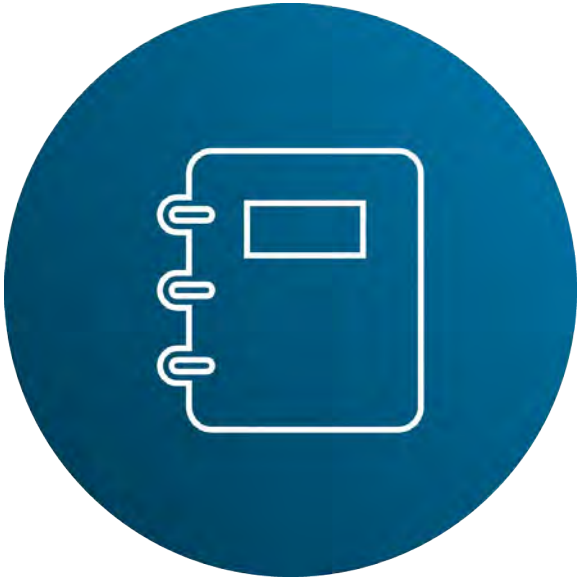
WASHOE COUNTY, NEVADA 1861





Agenda

- What is Hazard Mitigation?
- What is Hazard Mitigation Planning?
- Who's Involved
- Public Input
- Identifying Hazards
- Making a Hazard Profile
- Assessing Capabilities
- Developing the Mitigation Strategy
- Public Survey
- Next Steps







Hazard Mitigation

- ***Hazard Mitigation*** is any sustained action to reduce or eliminate the long-term risk to human life and property from hazards.





Benefits of Mitigation

- Break the cycle of disaster damage, reconstruction, and repetitive damage.
- Increase public safety and prevent loss of life of injury.
- Speed up recovery and reduce business and economic interruption.
- Help with other community objectives, such as capital improvements, preserving open(green) space, and increasing economic resiliency.





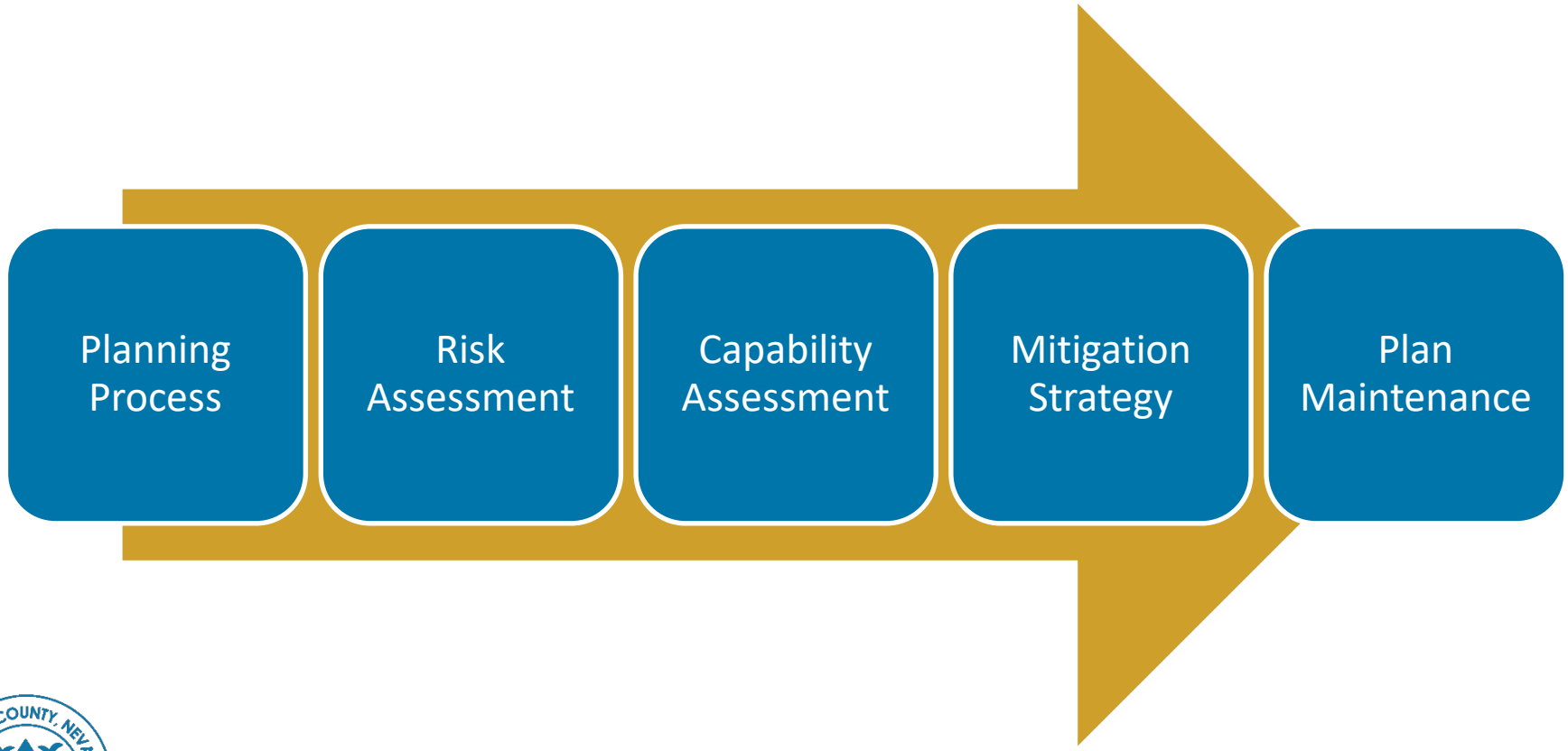
Hazard Mitigation Planning

- The mitigation plan describes the participants' vision for hazard mitigation.
- Opportunity to promote partnerships and sustainable communities and reduce disaster-related costs.





The Structure of the Plan





Why Update the Plan?

- States, tribes, and local jurisdictions (including special districts) are required to have a FEMA-approved and adopted hazard mitigation plan to receive funding through grant programs, such as:
  - Hazard Mitigation Grant Program (HMGP)
  - Building Resilient Infrastructure and Communities (BRIC)
  - Flood Mitigation Assistance (FMA)
- Plan must be updated every 5 years.
- Plan must meet state and federal planning requirements.

Overview of Your Hazard Mitigation Plan



- Executive Summary
- Introduction
- Planning Process
- Community Profile
- Risk Assessment
  - Hazard Profiles and Vulnerability Assessment
  - Consequence Analysis
- Capability Assessment
- Mitigation Strategy
- Program Implementation
- References
- Annexes
- Appendices





Who's Involved

- Plan Participants:
  - Washoe County
  - City of Reno
  - City of Sparks
  - Reno–Sparks Indian Colony
  - Pyramid Lake Paiute Reservation
  - North Lake Tahoe Fire Protection District
  - Truckee Meadows Fire Protection District
  - Truckee River Flood Management Authority





Public Input

- Public input helps identify areas of risk and potential solutions.
- Public Meeting: *thank you for participating*!
- Public Survey:







Identifying Hazards

- Hazards included:
  - Avalanche and landslide
  - Criminal acts and terrorism
  - Drought
  - Earthquake
  - Energy emergency
  - Flooding
  - Hazardous materials incident
  - Infectious disease
  - Radiological waste transport
  - Severe storms (winter storm and windstorm)
  - Transportation incident (aircraft crash)
  - Volcano
  - Wildland fire

IEM

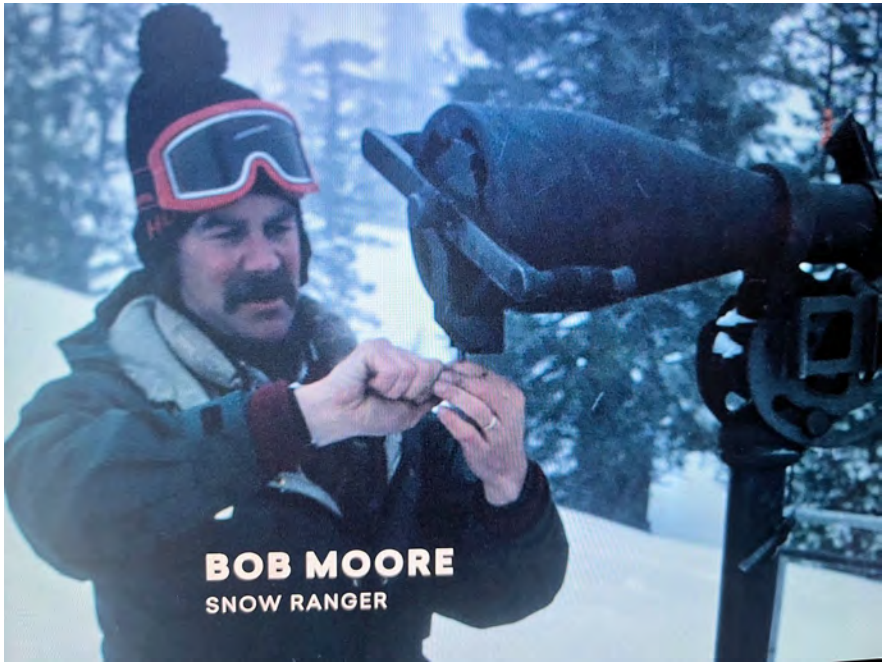


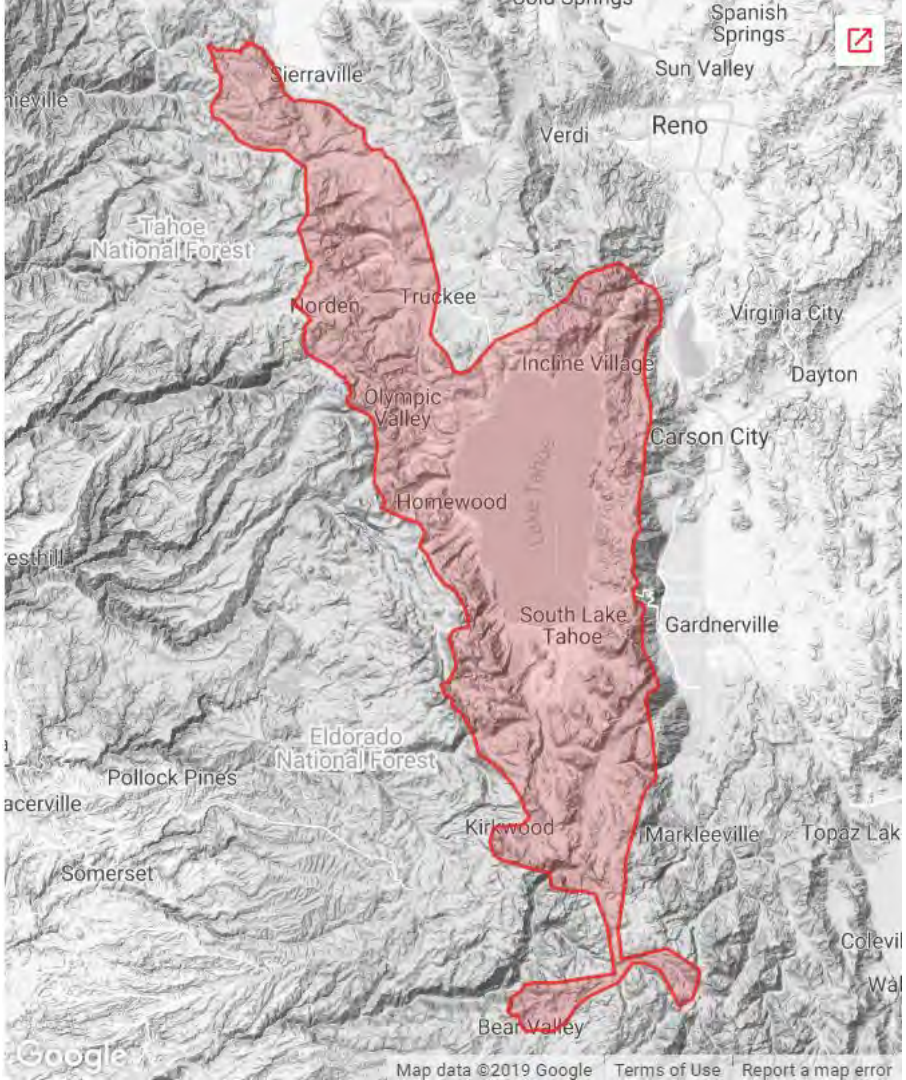
Discussion Question

Which of these hazards concern you the most?


Celebrating 20 years!
Sierra Avalanche Center

1985 – Bob Moore of Tahoe National Forest began issuing Avalanche Warnings during periods of HIGH danger.




Spanish Springs
Sun Valley
Sierraville
Verdi
Reno
Tahoe National Forest
Norden
Truckee
Virginia City
Incline Village
Dayton
Olympic Valley
Carson City
Homewood
South Lake Tahoe
Gardnerville
Eldorado National Forest
Pollock Pines
Kirkwood
Markleeville
Somerset
Bear Valley
Google
Map data ©2019 Google
Terms of Use
Report a map error


Incline Village
Carson City

THE BOTTOM LINE

New snow with strong winds will form slabs of wind-blown snow along ridges, gully features, and exposed areas. New storm snow may not bond well to itself or the old snow surface causing unstable storm slabs. Make a plan that includes cautious route finding and decision making to avoid todays avalanche problems.

Avalanche Forecast | Weather | Observations

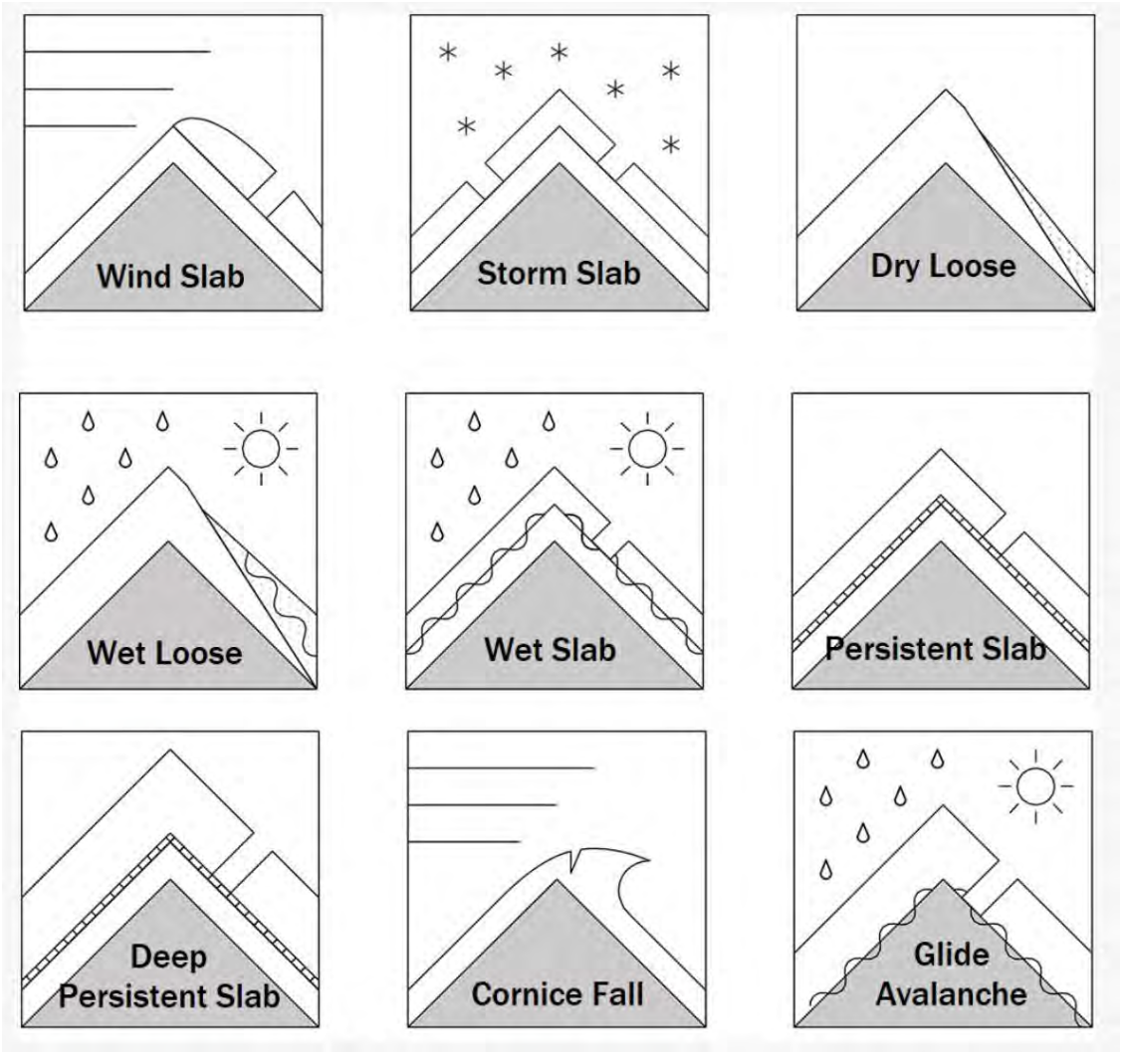
AVALANCHE DANGER



DANGER SCALE

1 - Low | 2 - Moderate | 3 - Considerable | 4 - High | 5 - Extreme

+ Danger Scale


Wind Slab
Storm Slab
Dry Loose
Wet Loose
Wet Slab
Persistent Slab
Deep
Persistent Slab
Cornice Fall
Glide
Avalanche

Today's Forecast:

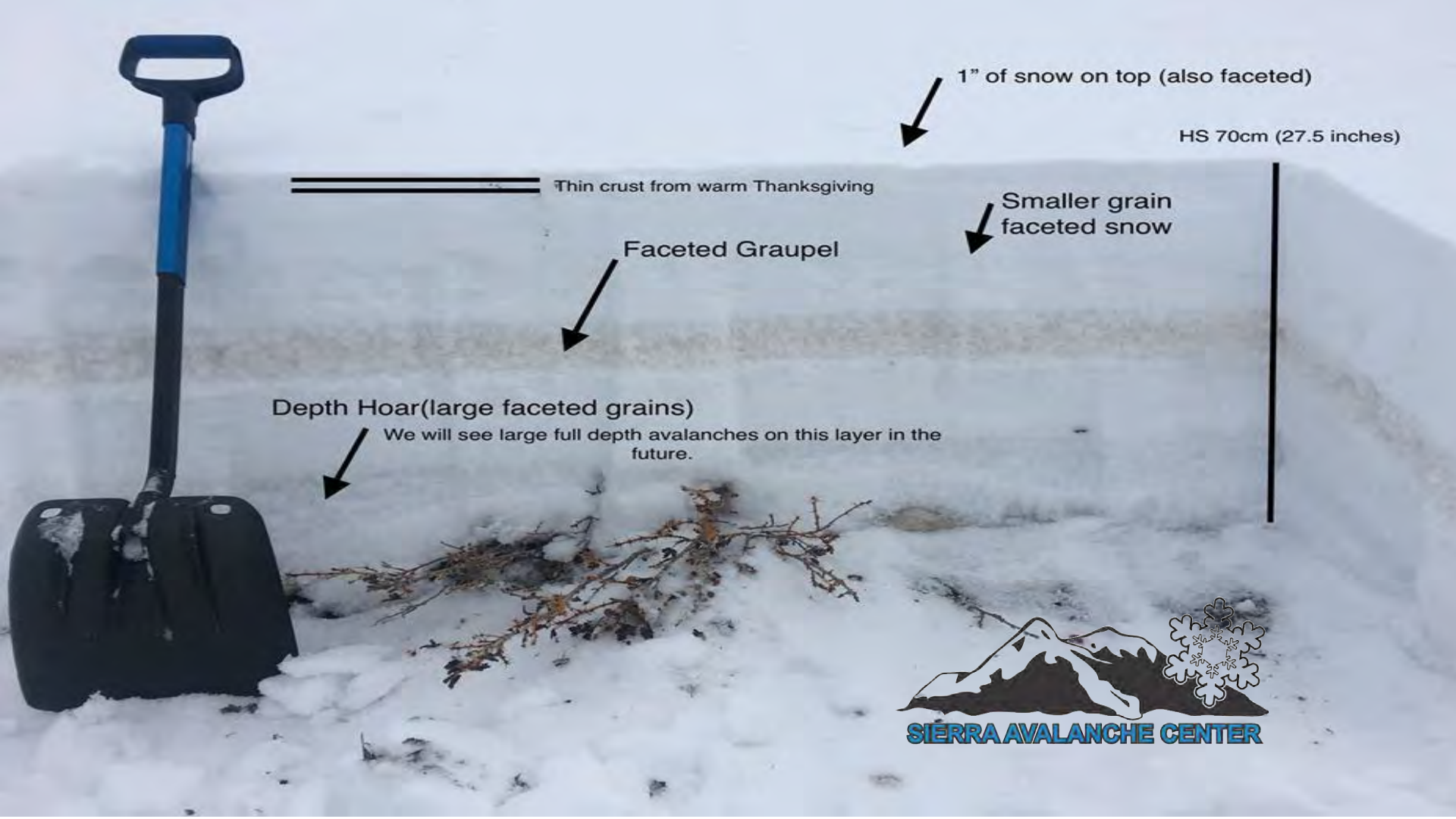
Recent snow and avalanche observations

Last night's remote weather data

Today's weather forecast

SIERRA AVALANCHE CENTER




1" of snow on top (also faceted)
HS 70cm (27.5 inches)
Thin crust from warm Thanksgiving
Smaller grain faceted snow
Faceted Graupel
Depth Hoar(large faceted grains)
We will see large full depth avalanches on this layer in the future.
SIERRA AVALANCHE CENTER




Celebrating 20 years!
SIERRA AVALANCHE CENTER

Drought Risk in Northern NV

Weather Forecast Office
Reno, NV
Saturday, May 18

weather.gov/reno 775-673-8100



Chris Johnston

Meteorologist

National Weather Service
Reno, Nevada

What is Drought?

The simplest definition is: insufficient water to meet needs.

FIVE TYPES OF DROUGHT

1. **METEOROLOGICAL** drought refers to an extended period of dry weather patterns.
2. **HYDROLOGICAL** drought refers to low water supply in our rivers, lakes, aquifers, and other reservoirs that often follows meteorological drought.
3. **AGRICULTURAL** drought occurs when a water shortage significantly damages or destroys agricultural crops.
4. **ECOLOGICAL** drought is the most recently defined type of drought and refers to widespread ecological damage caused by the lack of soil moisture.
5. **SOCIOECONOMIC** drought refers to when a water shortage affects the supply and demand of drought commodities, such as water, food grains, and fish.



Image and definition: Living with Drought, UNR

Drought

A Challenge From Many Perspectives

Nevada is the driest state in the nation; multi-year droughts are common

- Drought is hard to predict
- Drought is often a slow-moving disaster with nonstructural impacts
- **Many definitions of drought**
  - All relate to insufficient water to meet needs
  - A deficiency of precipitation over an extended period of time, resulting in a water shortage (Drought.gov)
  - A deficiency of moisture that results in adverse impacts on people, animals, or vegetation over a sizeable area (NOAA NWS)



How is Drought Monitored?

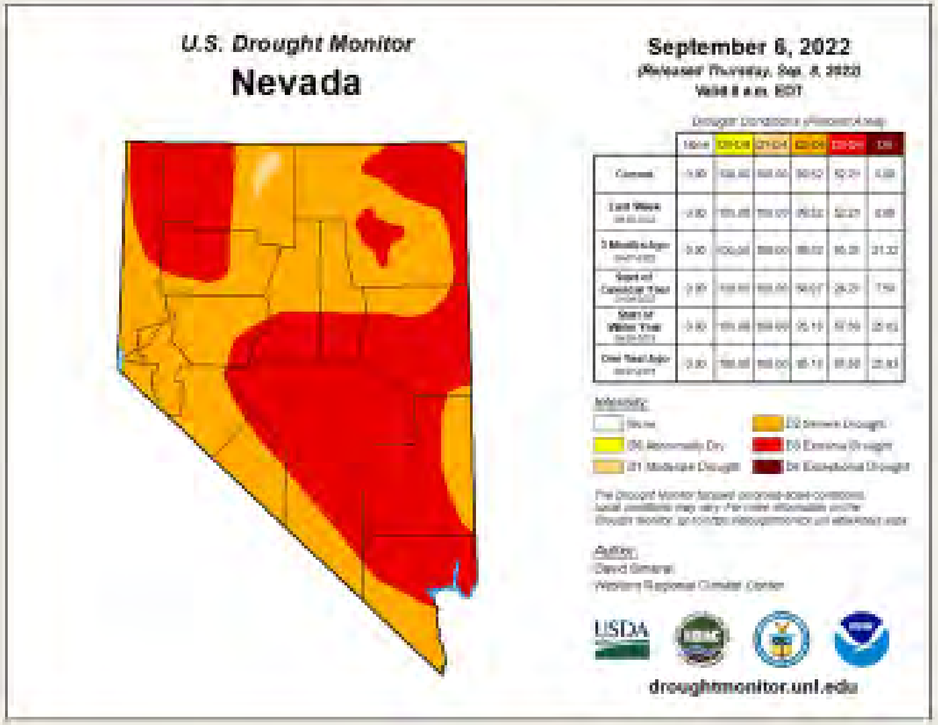
Drought Monitoring

Drought Monitor:

- Updated weekly
- Composite drought indicator tool
- Multiple variables are considered
  - Precipitation, streamflow, reservoir levels, temperature and evaporative demand, soil moisture, vegetation health, drought impact reports

U.S. Drought Monitor Category

- D0 - Abnormally Dry
- D1 - Moderate Drought
- D2 - Severe Drought
- D3 - Extreme Drought
- D4 - Exceptional Drought

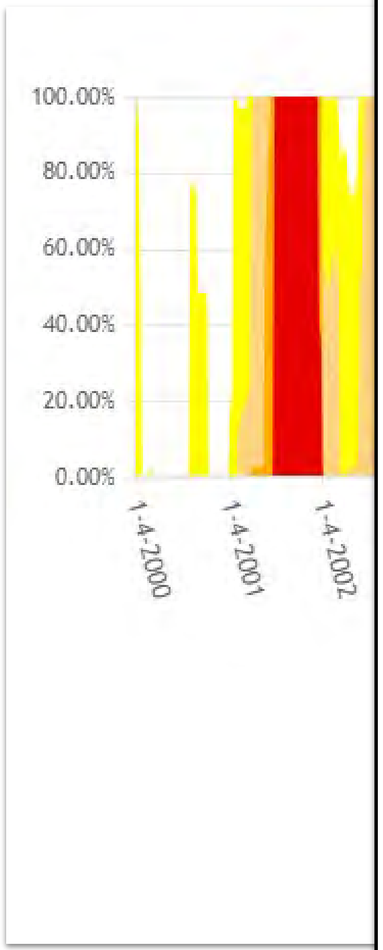


https://droughtmonitor.unl.edu/



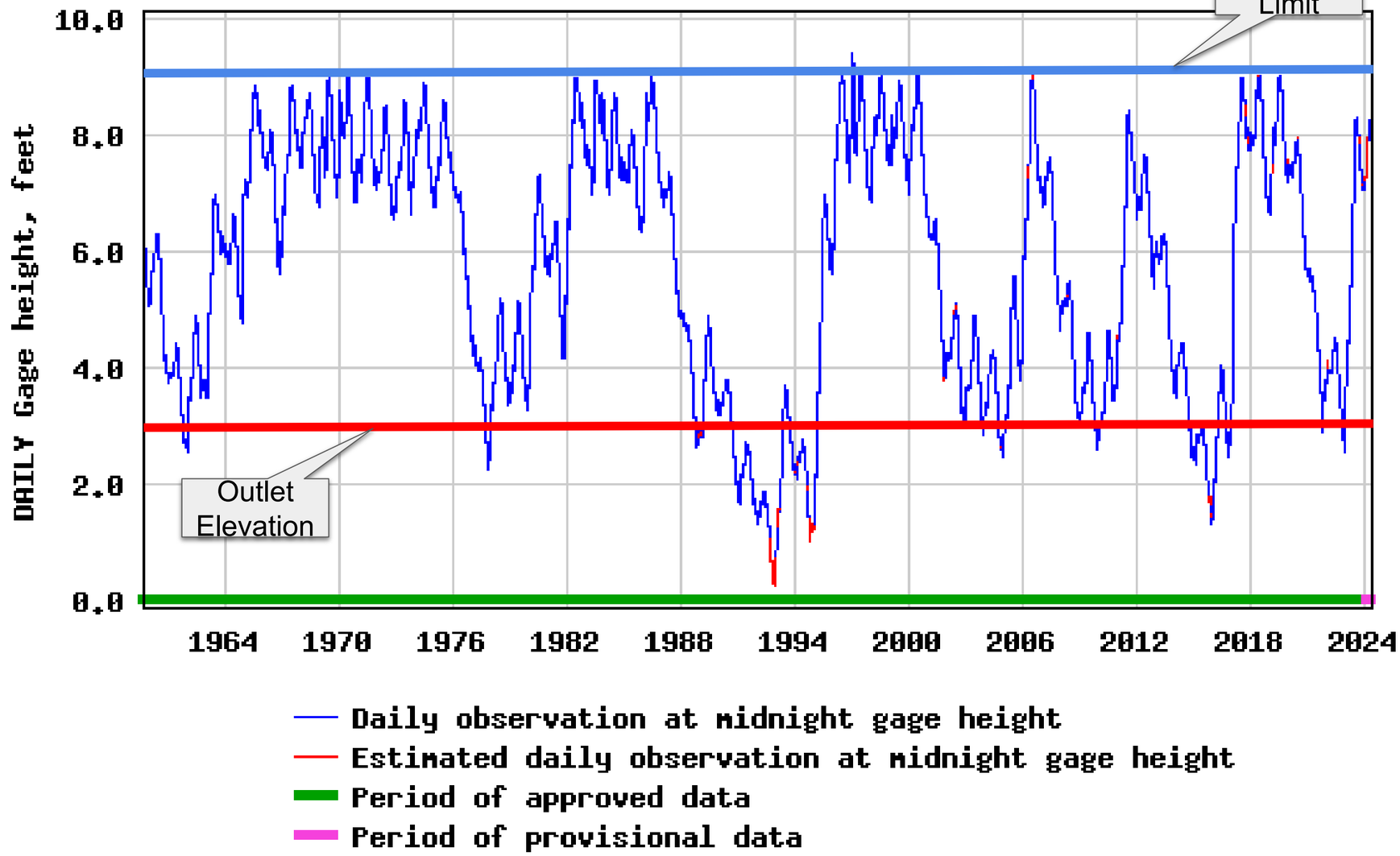
2024

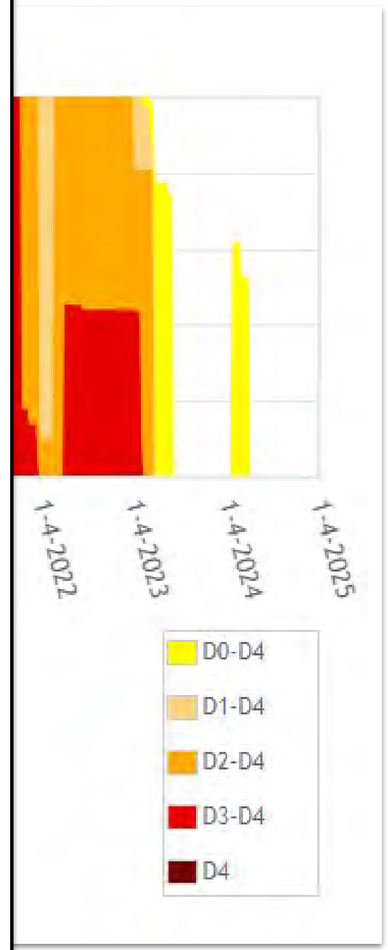
EDT



USGS

USGS 10337000 LAKE TAHOE A TAHOE CITY CA





Start and end timing of drought is very difficult to predict.

Climate Whiplash



Image: Yale Climate Connections, Spencer Platt/Getty Images.

- Harder to prepare from one extreme to the next.
- Changes in extremes can be thought of as the hydrologic cycle on steroids.
- Water supply timing may shift earlier as snow melts earlier
- More winter precip falling as rain → snow drought.

What are the Risks?

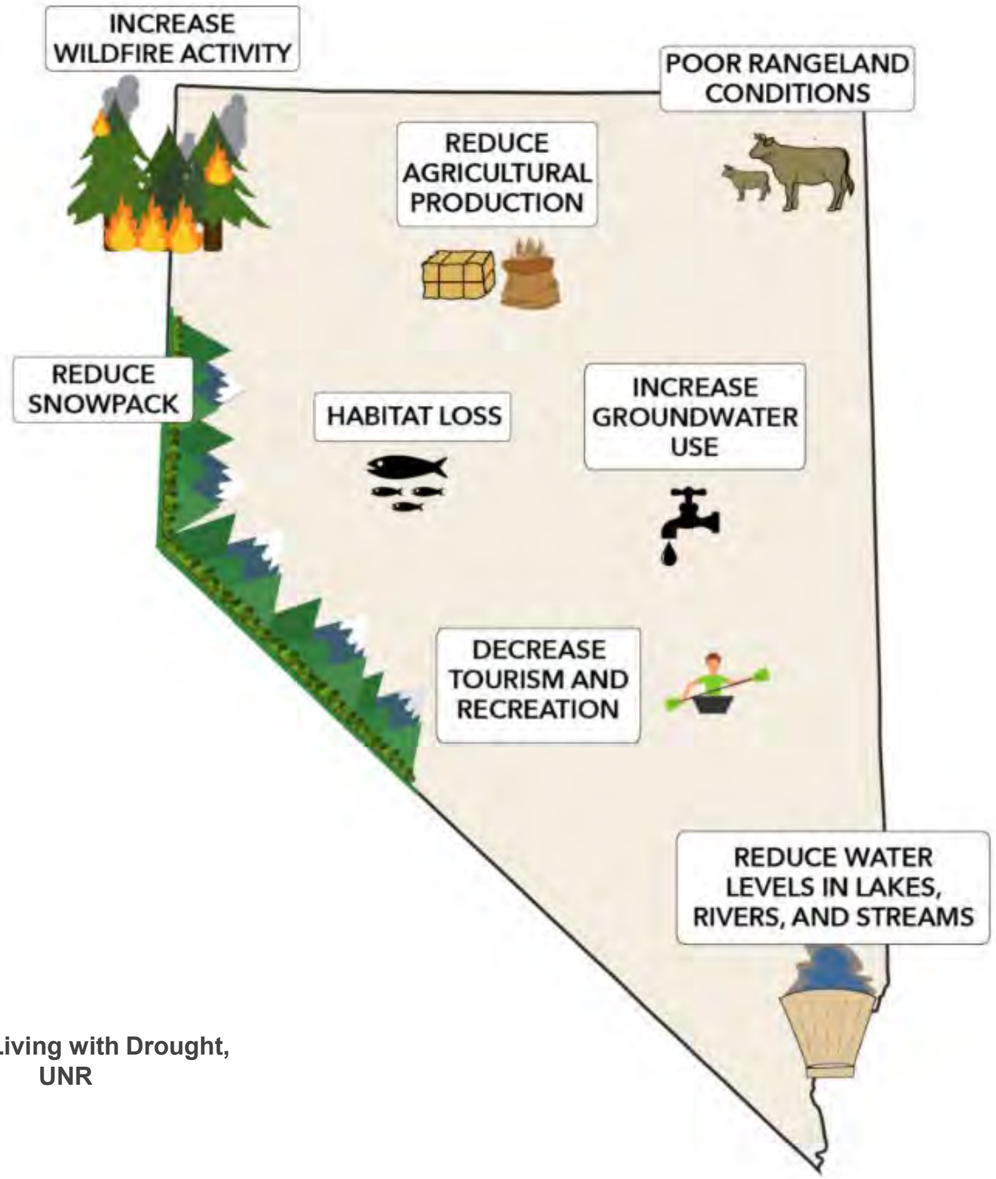


Image: Living with Drought, UNR

Water supply concerns - agriculture/livestock

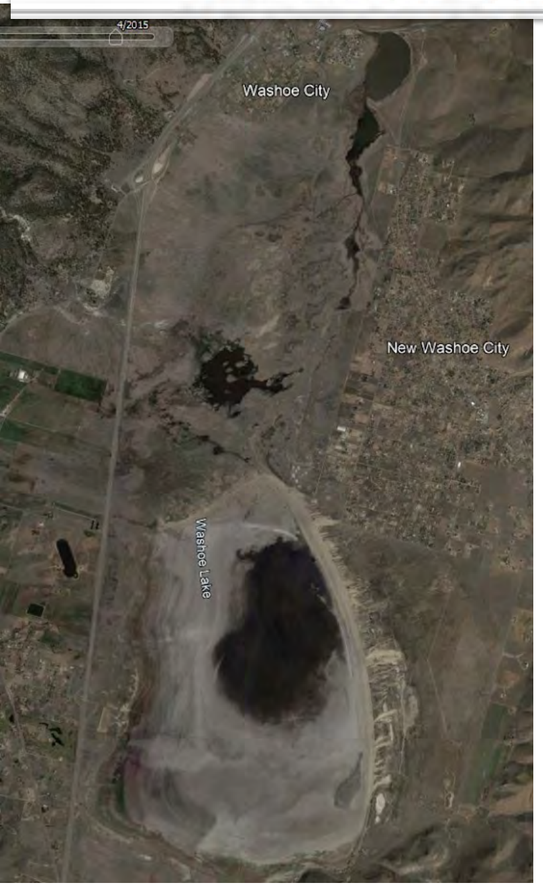
Water rights: Minimum flows allocated

Health, wildfire, dust, smoke concerns

Recreational impacts

What Might Drought Look Like in the Future?

Historical Trends	Projected Trends and Confidence
Increasing evaporative demand due to higher temperatures has worsened droughts.	Drought will increase in frequency and severity, in part to due higher temperatures, even if precipitation remains the same or slightly increases. HIGH confidence.



Washoe Lake: April 2015 vs June 2019





Washoe Lake: Drought years. Photo: UNR, Nevada Bureau of Mines and Geology

Thank You!



christopher.johnston@noaa.gov

Severe Storms

Weather Forecast Office
Reno, NV
Saturday, May 18

weather.gov/reno 775-673-8100



Chris Johnston

Meteorologist

National Weather Service
Reno, Nevada

What are Severe Storms?

Weather Forecast Office
Reno, NV
Saturday, May 18

Severe storms are any dangerous meteorological phenomenon with the potential to cause damage, serious social disruption, or loss of human life.







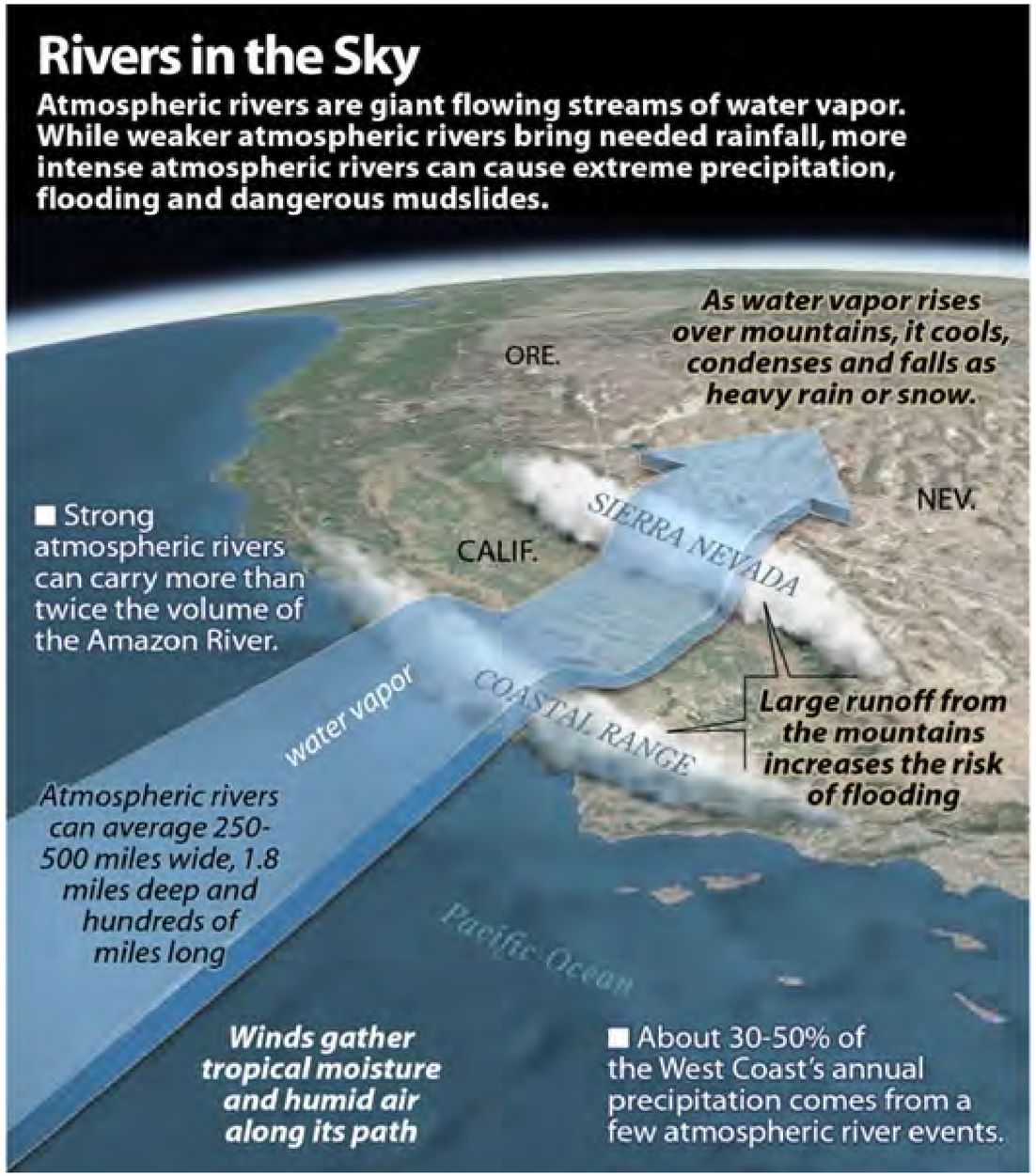






Atmospheric Rivers

Weather Forecast Office
Reno, NV
Saturday, May 18







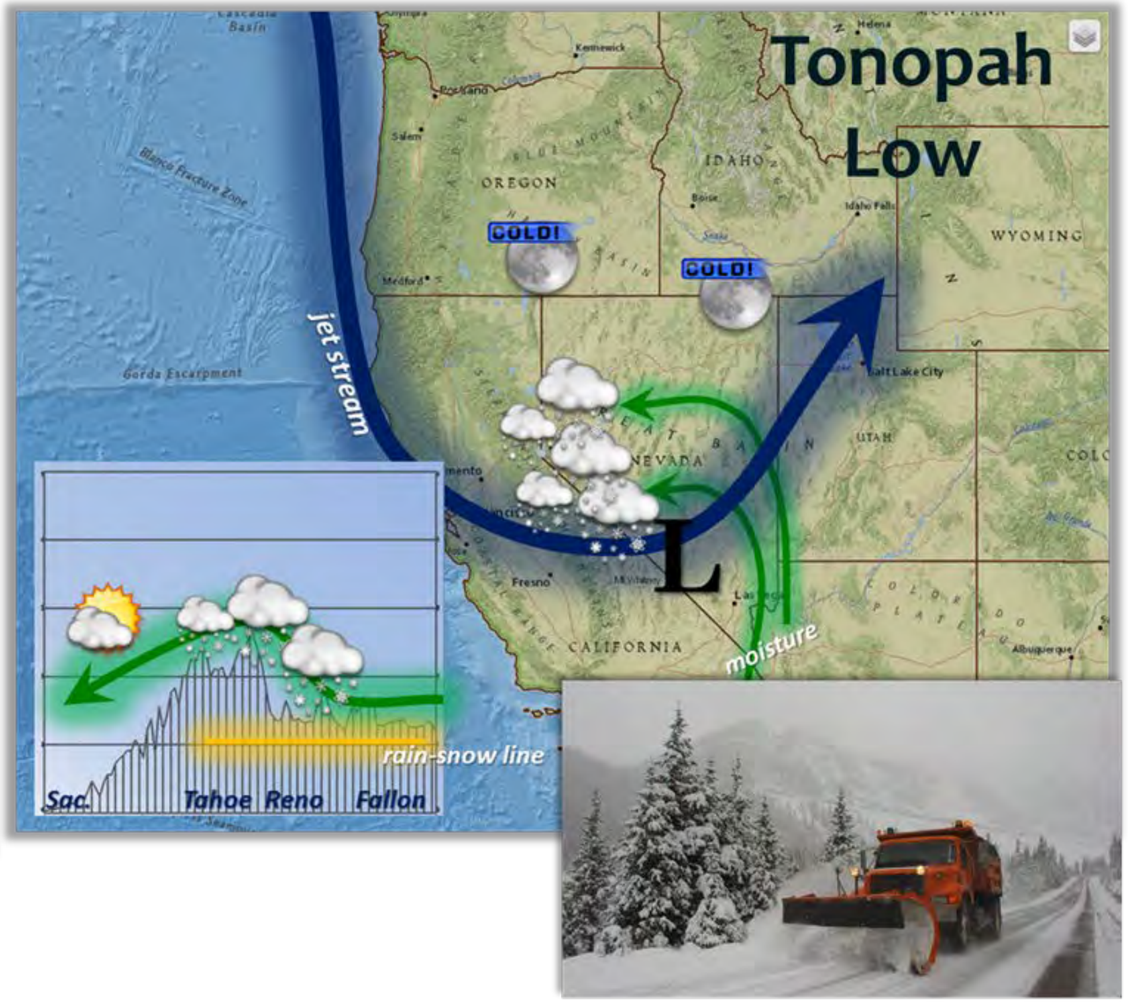




Inside Slider/Tonopah Low - Heavy Snow

Weather Forecast Office
Reno, NV
Saturday, May 18



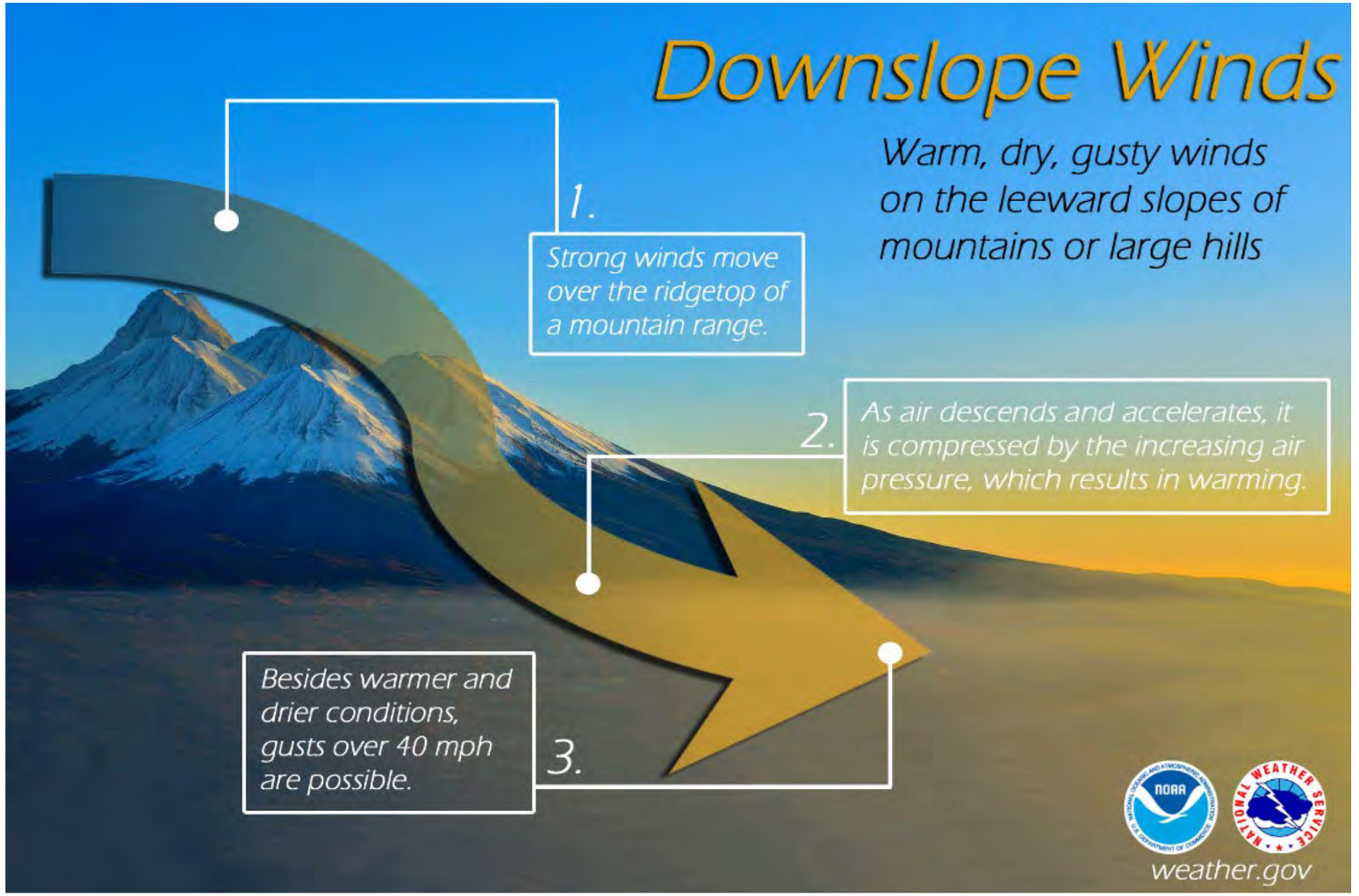


Low pressure systems that swing down from the northeast Pacific bring cold air, moisture, and convergence leading to heavy snows.

Downslope Winds - Damaging Winds

Weather Forecast Office
Reno, NV
Saturday, May 18

Here in western Nevada we can see strong downsloping winds during winter storms. We can also see strong winds from thunderstorms, too.







Lake Effect Snow

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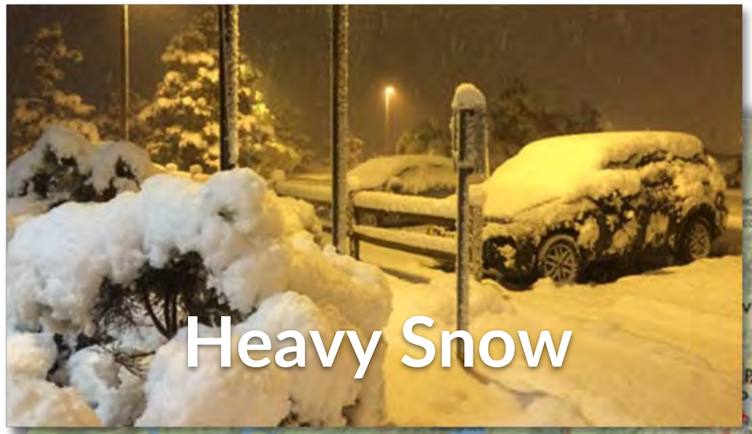



Cold air over Pyramid Lake/Lake Tahoe with warm lake waters can produce convective snow bands with the right wind direction.

Fire Weather - Wildfires

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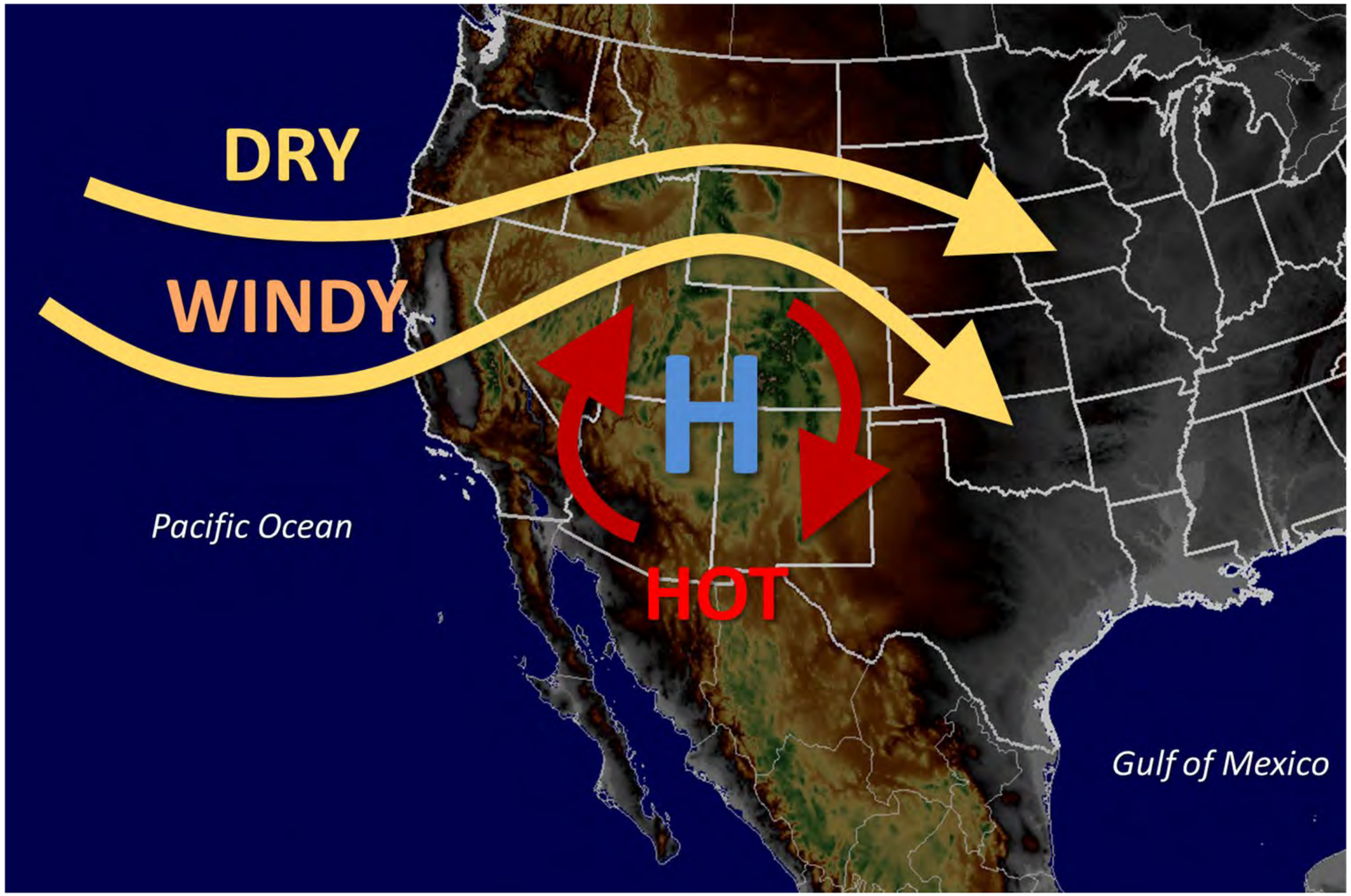
Reno, NV
Saturday, May 18



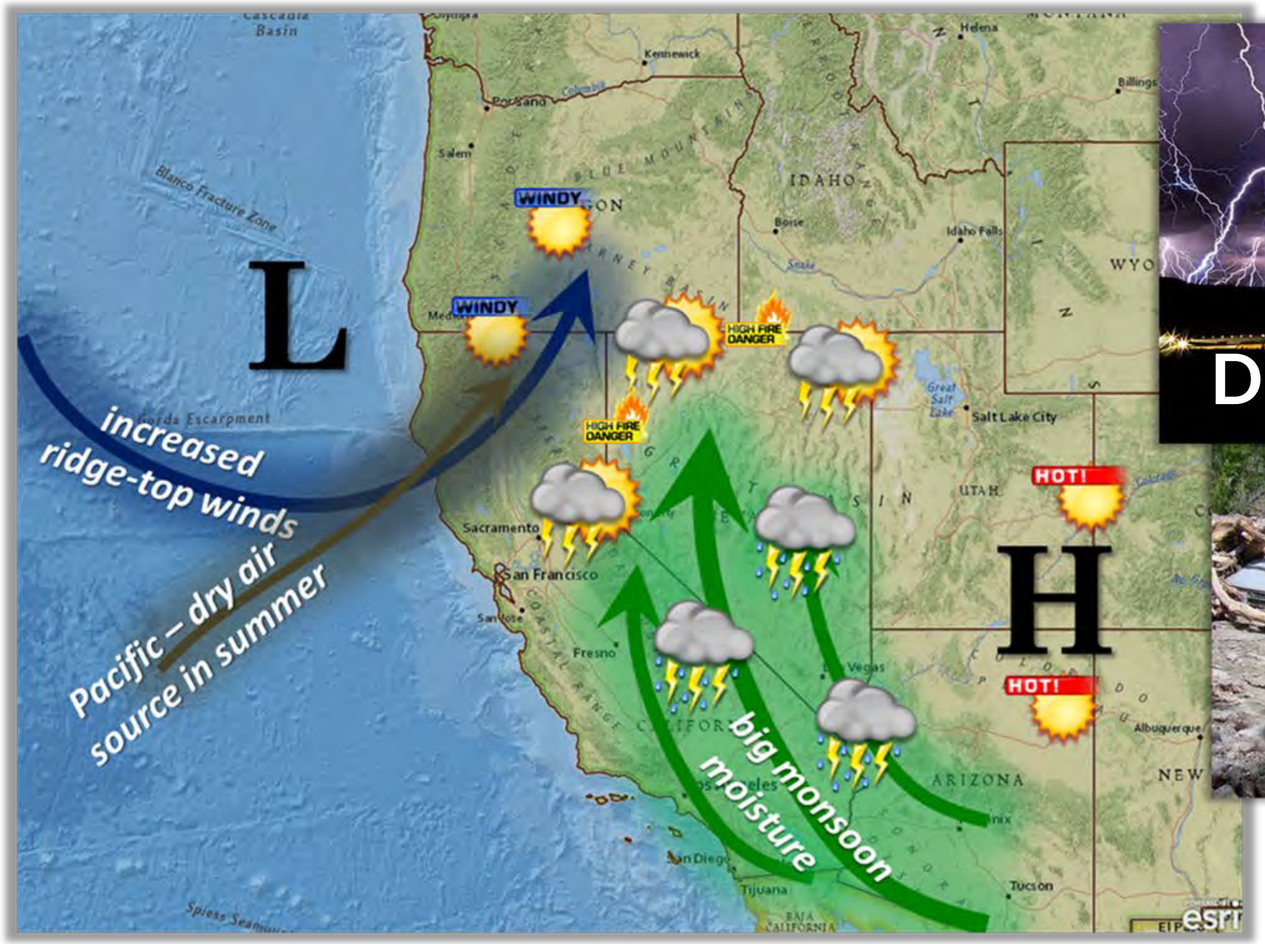






The combination of strong winds from a low pressure system over the west coast and dry/hot air from a high pressure system over the Great Basin can produce the conditions needed to start wildfires.

Strong Thunderstorms









During the summer we can see strong thunderstorms, which can produce strong winds, flash flooding, dust storms, large hail, and deadly lightning.

Thank You!



christopher.johnston@noaa.gov



Earthquake Safety in Nevada

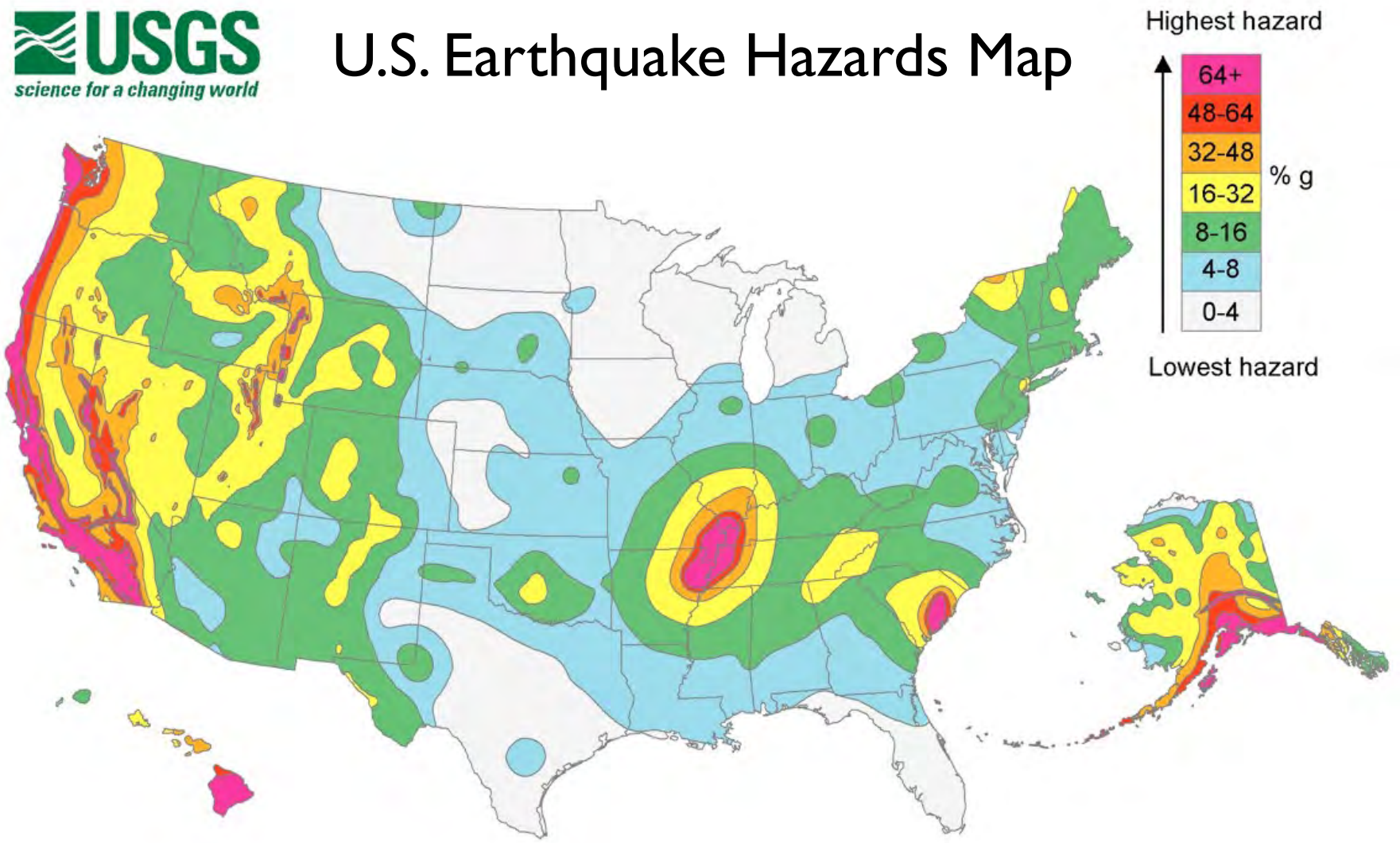
University of Nevada, Reno

NEVADA SEISMOLOGICAL LABORATORY

William Savran, Ph.D. | May 18, 2024

USGS
science for a changing world

U.S. Earthquake Hazards Map

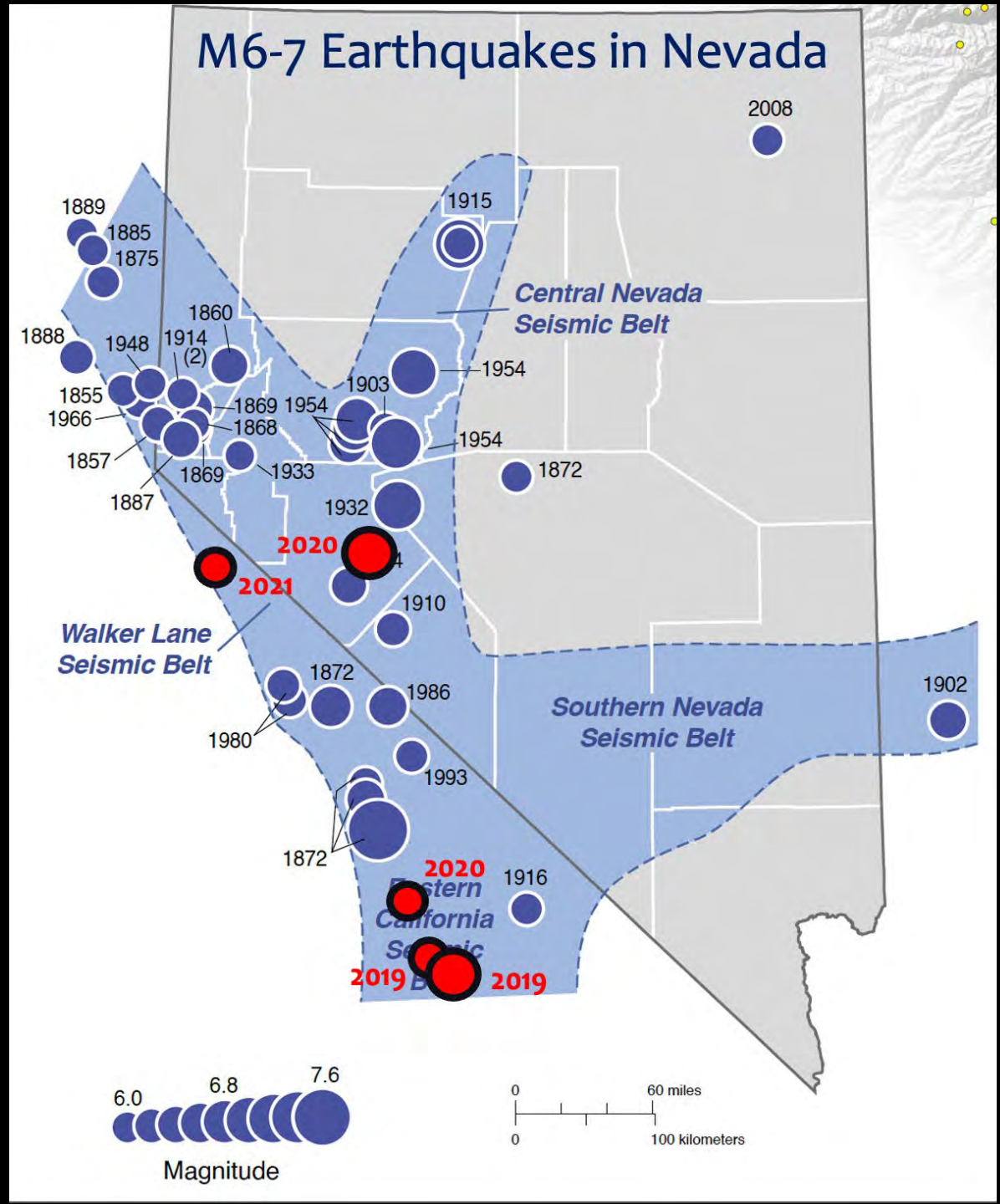


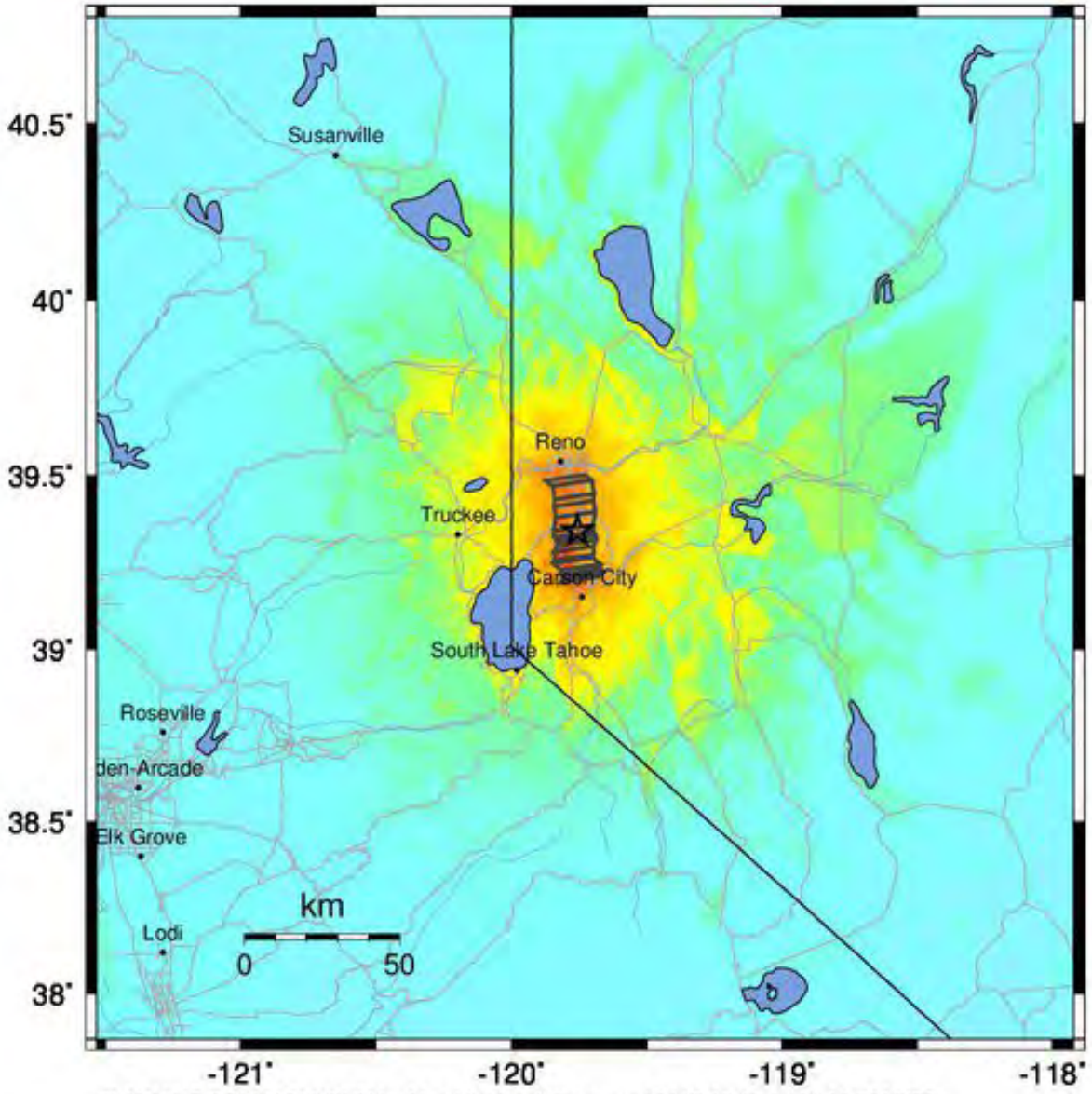
- Nevada ranks 3rd in seismic activity -
- 2nd in contiguous US -

x

Nevada is earthquake country!

- Nevada ranks third in the nation for earthquakes per year behind California and Alaska
- We have experienced numerous large earthquakes that have the potential to cause damage and casualties
- Most recently was the M6.5 Montecristo earthquake near Tonopah





PLANNING SCENARIO ONLY -- Map Version 3 Processed 2017-05-15 04:51:06 PM MDT

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	*<0.02*	*0.1*	*1.4*	*4.7*	*9.6*	*20*	*41*	*86*	*>178*
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

M6.9 Scenario on Mt. Rose Fault

- MMI 8-9 in Carson, Washoe, Reno Valley
- MMI 8 means nearly everything is thrown on the floor, poorly constructed buildings partial or full collapse, damage to well constructed buildings
- Ground motions on the order of 0.5-0.7g


EXCLUSIVE
CNC NEWS
ADT

What to do during an earthquake



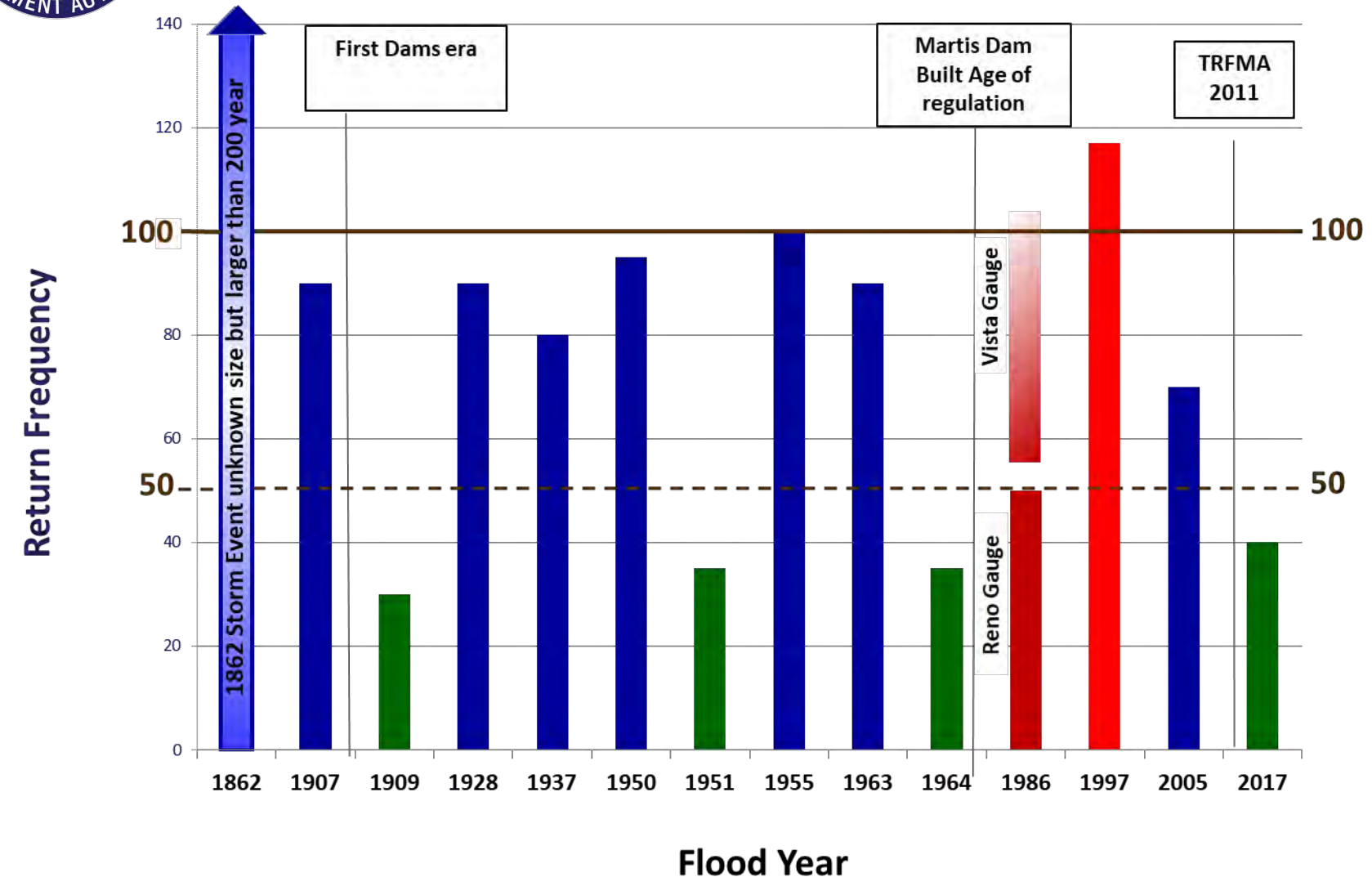
www.shakeout.org

Flood Hazards & Mitigation in the Truckee Meadows

May 18, 2024

Danielle Henderson
NATURAL RESOURCE MANAGER

Flooding History – Regional Risk



TRUCKEE RIVER FLOOD MANAGEMENT AUTHORITY

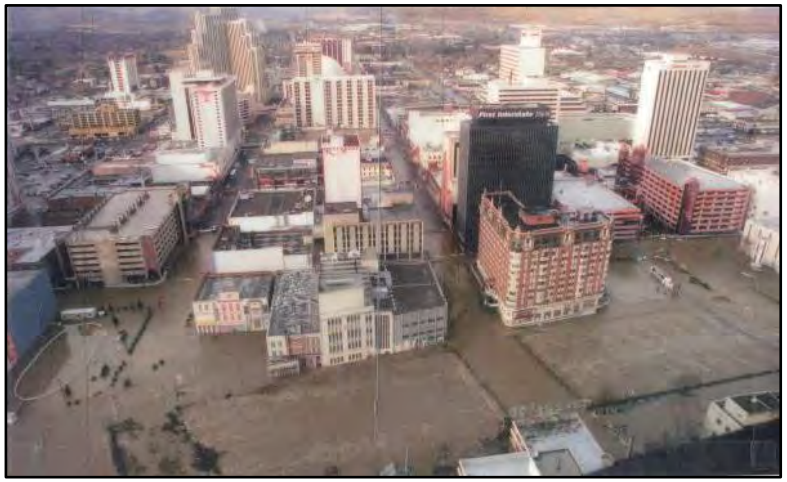
1997 Flood

Sparks Industrial Area

Lake Street Bridge Debris Removal







Downtown Reno



Rosewood Lakes & Hidden Valley

1997 Flood – Debris at Derby Dam



TRFMA – Organization & Funding



- Flood Project managed by WC from 1998 -2011
- **Flood Management Authority officially formed in 2011**
  - ✓ Interlocal Cooperative Agreement – Sparks, Reno, and WC
  - ✓ Governed by Board of Directors
    - Sparks: Mayor Lawson, Donald Abbott (Chair)
    - Reno: Naomi Duerr, Miguel Martinez
    - Washoe County: Alexis Hill (VC), Clara Andriola
- Sales Tax Funds (1998) – Dedicated 1/8-cent to public safety and Flood Project yields $8M ($5M to $6M after EOC debt service)
- Mission: create infrastructure and manage flood-related operations

Completed Capital Projects



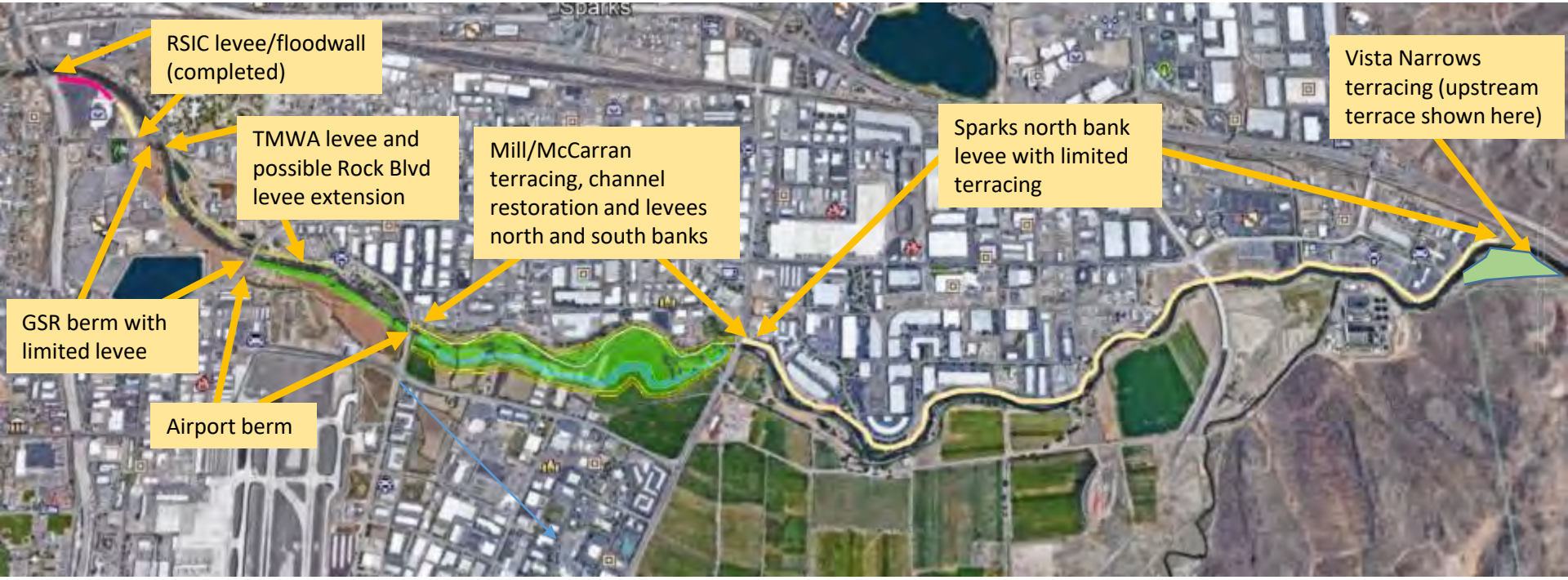
- New Virginia Street Bridge – $12.2M
- Reno-Sparks Indian Colony Levee & Floodwall – $1.8M
- Hidden Valley Engineering Study – $0.5M
- Ecosystem Restoration: 102 Ranch, Lockwood, Lower Mustang Ranch, Tracy Power Plant – $6.5M
- North Truckee Drain Realignment – $5M
- Property Purchases, Relocations, Demolitions – $48M

Current Work



- **Focused on Vista Narrows Floodplain Terracing Project**
- Developing 60% designs for new Meadows Project elements
- Managing the Physical Map Revision effort – just submitted package to FEMA for review (~2-yr process)
- Home Elevation Program continues (TRFMA + FEMA funds)
- Flood Warning System O&M and coordination with regional emergency managers
- Ongoing property management (security & clean-up)
- Overhauling TRFMA's website

New Meadows Project – Conceptual Design



WHAT'S NEW:

- Prioritize and build levees and berms (cost-effective, supported by stakeholders) rather than floodwalls
- Green infrastructure: excavate floodplain terraces and realign river channel (Mill & McCarran) to improve flood storage capacity and enhance habitat for fish and wildlife

**All "new" elements will have the same or better hydraulic properties to minimize downstream impacts.*

Proposed Construction Schedule

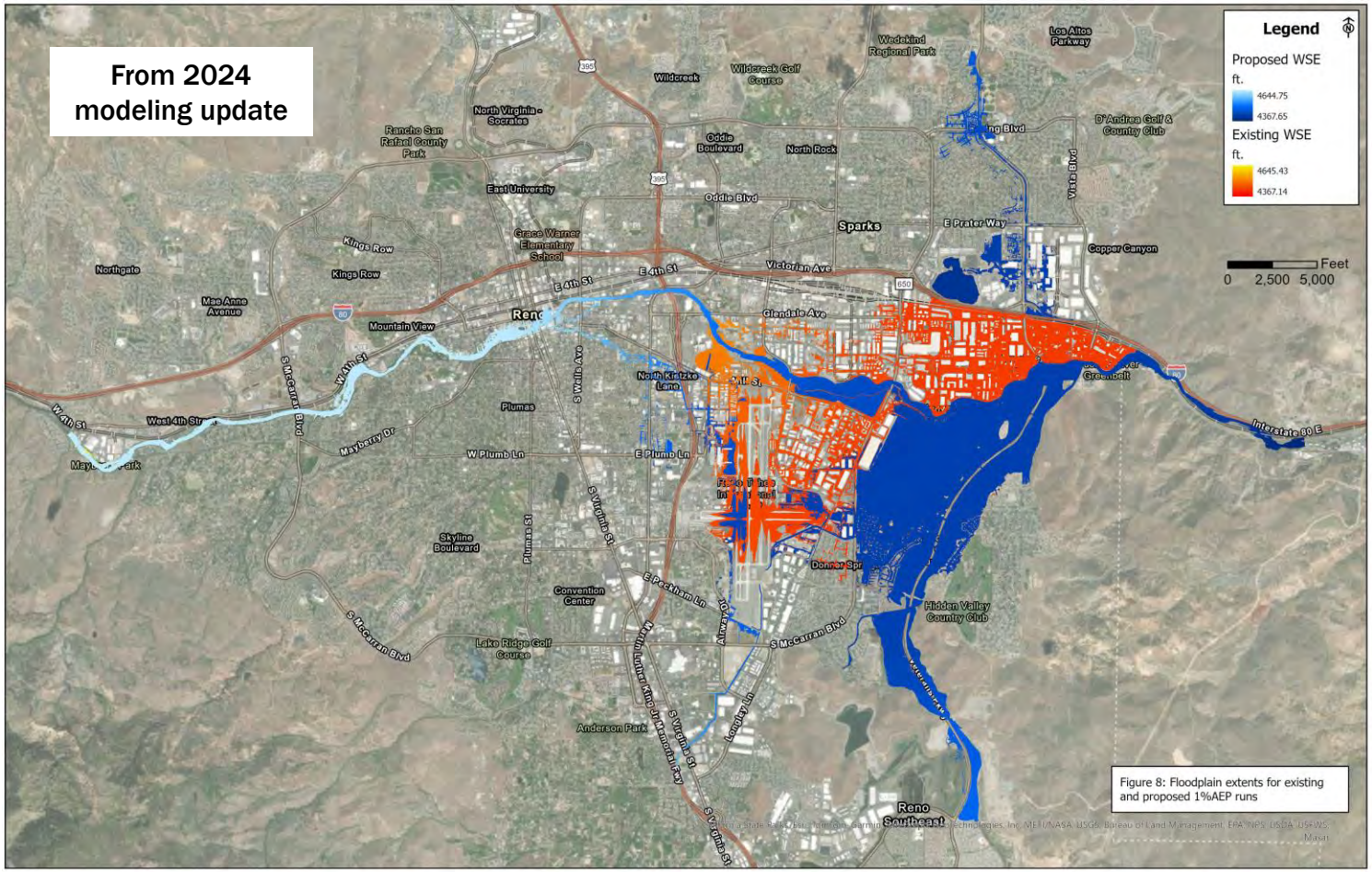


Area removed from 100-yr floodplain by Flood Project

Orange Areas: *Will be removed from the flood zone after project is complete*

Blue Areas: *Existing and future flood zone*

Economic Benefit: *Flood impact of a 1997-type flood event reduced by as much as $2 billion*



Vista Narrows Floodplain Terracing Project



- River Terracing (current project)
  - ✓ Revegetation / Environmental
- Levee (part of larger project done later)
  - ✓ Armoring / Willows
- Floodwall (part of larger project done later)

**Balance Meadows benefits with downstream impacts*

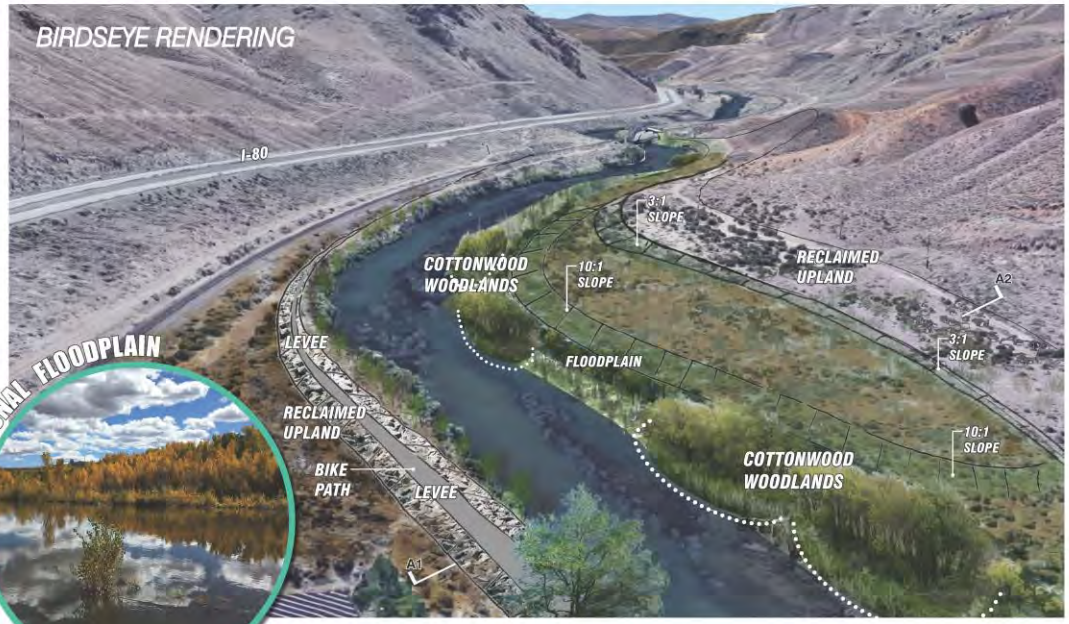
*** Only opens up enough to prevent project-induced flooding in Meadows outside of industrial areas (only a slight drop in WSE)*

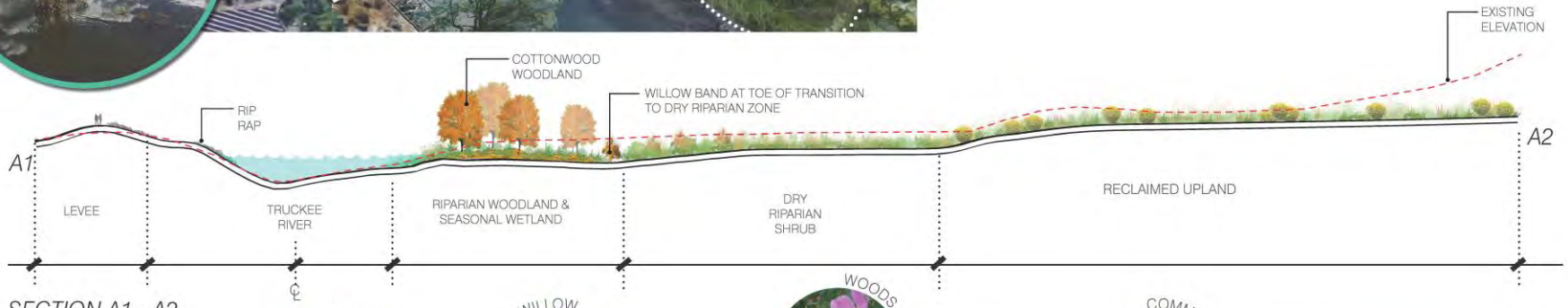
TRUCKEE RIVER
FLOOD MANAGEMENT
AUTHORITY

VISTA NARROWS

FLOODPLAIN TERRACE

SUMMARY: The construction of Terrace 6 involves lowering the south bank and re-establishing a wide, hydraulically-connected floodplain. The active floodplain areas nearest to the river bank will be planted with wetland and riparian vegetation that includes cottonwood and willow, native grasses, and emergent wetland plants. These areas will also include large rock to provide stability and hydraulic complexity in this geomorphically active zone. A band of willows will be situated along the toe of a gentle (10:1) slope that will support upland riparian shrubs adapted to periodic flooding. As the slope gradually transitions towards upland, more xeric, drought tolerant native shrubs and grasses will be established. Plantings will include container plants (for trees and some shrubs), live stakes (for willow), wetland plugs, and various mixes of hydroseed. The revegetation approach makes use of a detailed understanding of inundation frequencies and extents, anticipated depth to groundwater, and natural geomorphic processes to allow plant communities to become self-sustaining.





SECTION A1 - A2

















Are you prepared for the next flood?

Now is the time to get ready.

- ❑ MAKE A KIT
- ❑ HAVE A PLAN
- ❑ BE PREPARED

Helpful resources available online at

trfma.org

TRUCKEE RIVER FLOOD MANAGEMENT AUTHORITY

NORTHERN NEVADA
Public Health

Infectious Disease Risk Across the Region

Heather Kerwin, MPH, CPH
Epidemiology Program Manager

Infectious Diseases

- Epidemiology Program is with Northern Nevada Public Health's Epidemiology & Public Health Preparedness Division
  - Staff include 1 Program Manager/Senior Epidemiologist, 5 Epidemiologists, 2 Statisticians, and 1.5 FTE Office Support Specialist
  - Conduct surveillance and report data to CDC as required by the federal government and Nevada Revised Statues 441A
  - **24/7 infectious disease reporting line 775-328-2447**
- Track and investigate reportable infectious diseases
  - Person-to-person (many are vaccine preventable)
  - Vectors to people (mosquitos, ticks, wild game, livestock, pets)
  - Food or water to people (bacterial growth or contamination of fecal matter to mouth)
  - Healthcare associated infections (germs picked up in a hospital or healthcare setting)
- Also monitor for infectious agents which could be used in acts of bioterrorism
  - Botulism, anthrax

Infectious Disease Risk in the Region

Disease Group	Risk Level	Background	Examples
Foodborne or waterborne	Moderate	Most frequently reported Usually from improper food handling, storage, or reheating Drinking untreated/recreational water	*E. coli*, salmonella, giardia, cryptosporidiosis, campylobacteriosis, listeriosis, botulism
Vaccine preventable	High	Nevada has historically low vaccination rates Equates to a higher number of persons who can become case zero and spread to others Not a large urban center, however Washoe County is home to special events drawing visitors from around the county	Measles, polio, influenza, diphtheria, hepatitis A, hepatitis B, mumps, mpox
Vectorborne	Low → Moderate	Depending on drought conditions can see larger years for mouse & rodent populations Ticks are becoming more common As temperatures increase, concerns with *Anopheles* mosquito populations increasing	Hantavirus, West Nile Virus, Lyme Disease, rabies, malaria, plague, dengue

Infectious Disease Risk in the Region

Disease Group	Risk Level	Background	Examples
Person-to-person, not vaccine preventable	Varies	Various conditions	Sexually transmitted infections, tuberculosis (not routinely vaccinated in the US), outbreaks
Emergent pathogens	Low	Would not expect to see a case in our region first, however equal risk as rest of county – currently low across nation	Highly pathogenic avian influenza, viral hemorrhagic fevers like ebola
Antimicrobial resistant organisms	Moderate → Higher	Area hospitals have systems in place to prevent and reduce risk, however Las Vegas is home to the largest outbreak of *Candida auris* in the nation and still growing	Carbapenem resistant organisms, Carbapenemase producing organisms, *Candida auris*

NORTHERN NEVADA

Public Health

USGS
science for a changing world

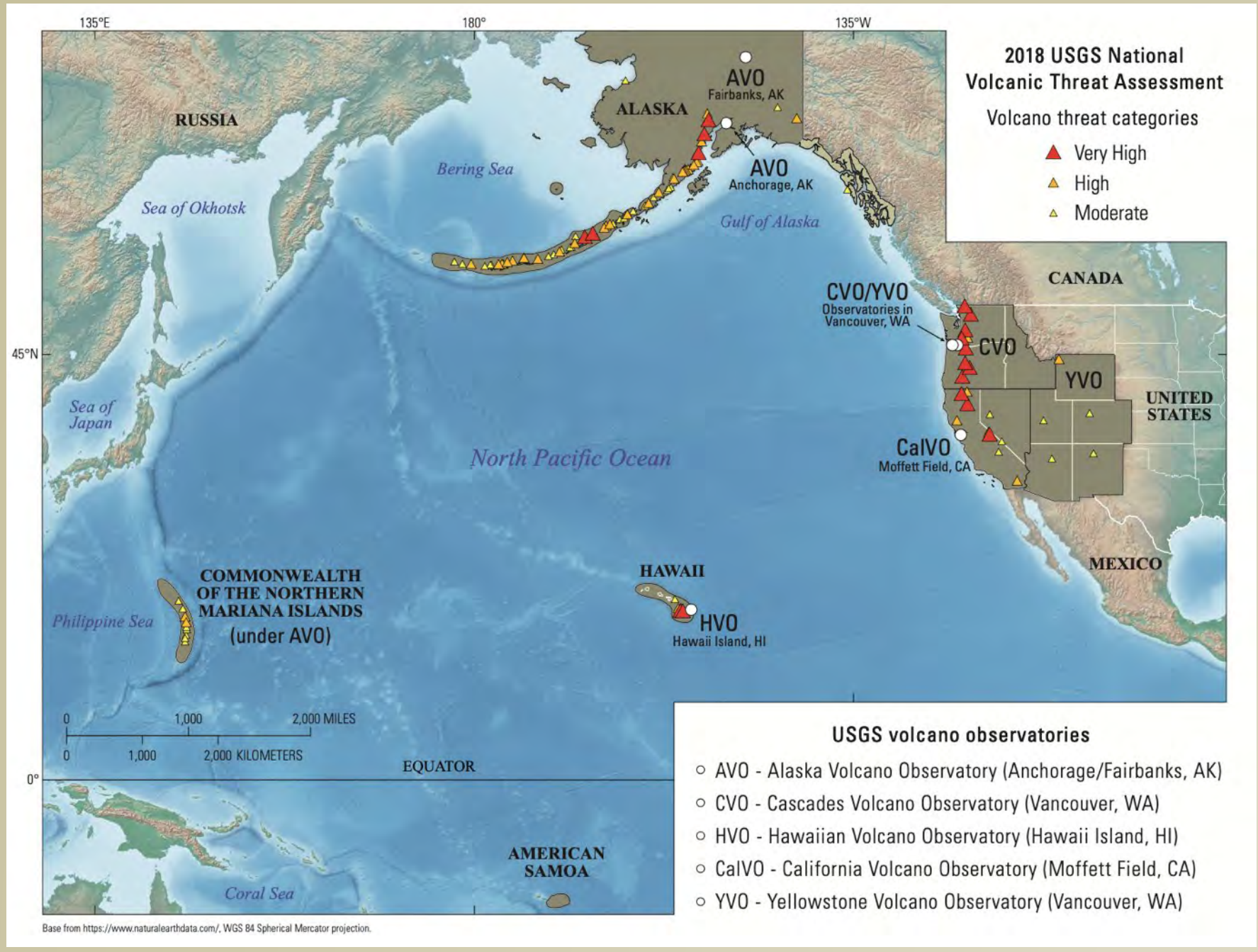
Andy Calvert

Scientist-in-Charge
USGS California
Volcano Observatory

Over the past 30 yrs, 43 volcanoes in the US produced 95 eruptions and 32 episodes of unrest. About 50 US volcanoes with potential to harm (red & orange).

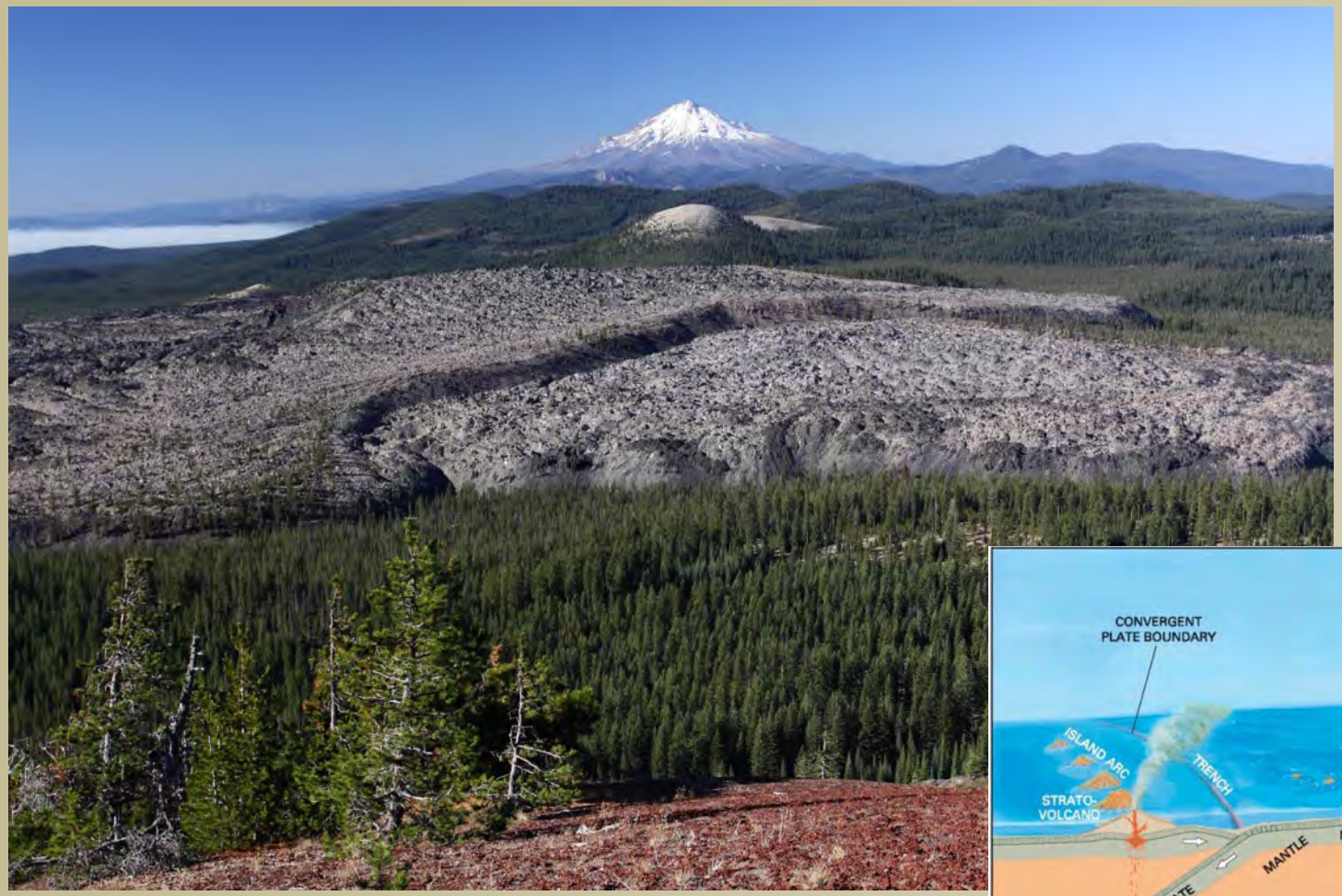
The USGS Volcano Science Center has ~200 staff in five observatories

- Monitor capable volcanoes
- Coordinate with partners
- Educate public
- Research volcanic histories and processes
- Respond to unrest

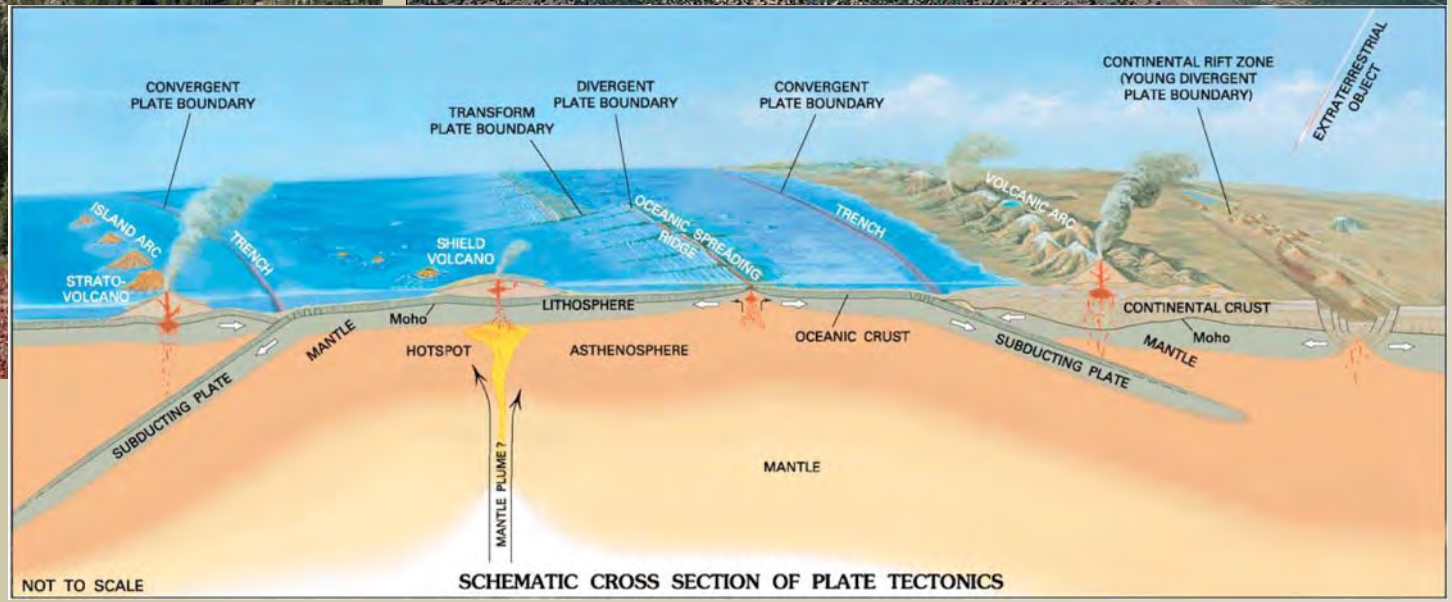


What is a volcano?

An area where melted rock (magma) reaches the surface.







USGS
science for a changing world

CalVO
CALIFORNIA VOLCANO OBSERVATORY
U.S. GEOLOGICAL SURVEY

Volcano Hazards



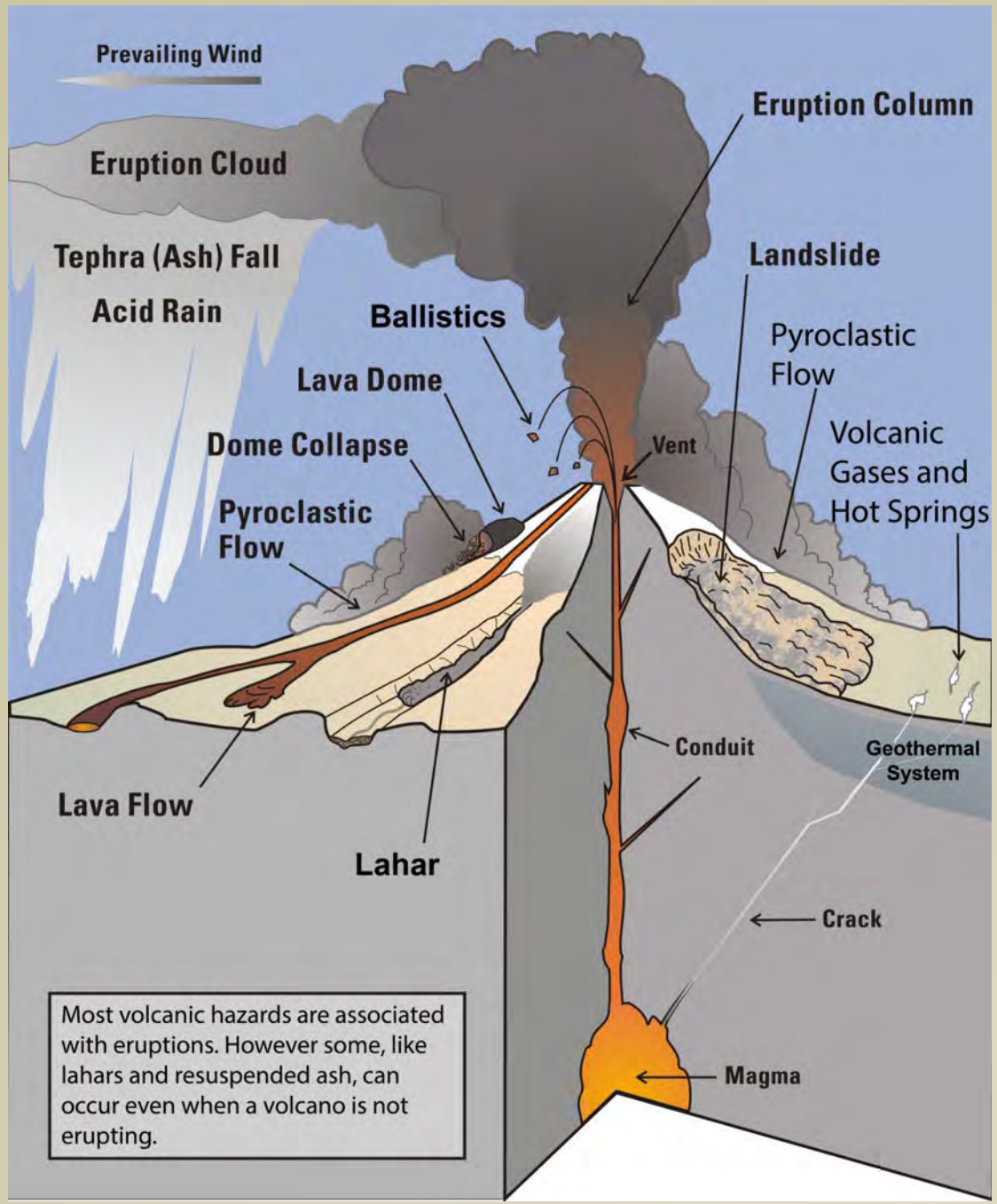
Explosive Eruptions

Damaging and life-threatening

Effusive Eruptions

Damaging, but probably not life threatening



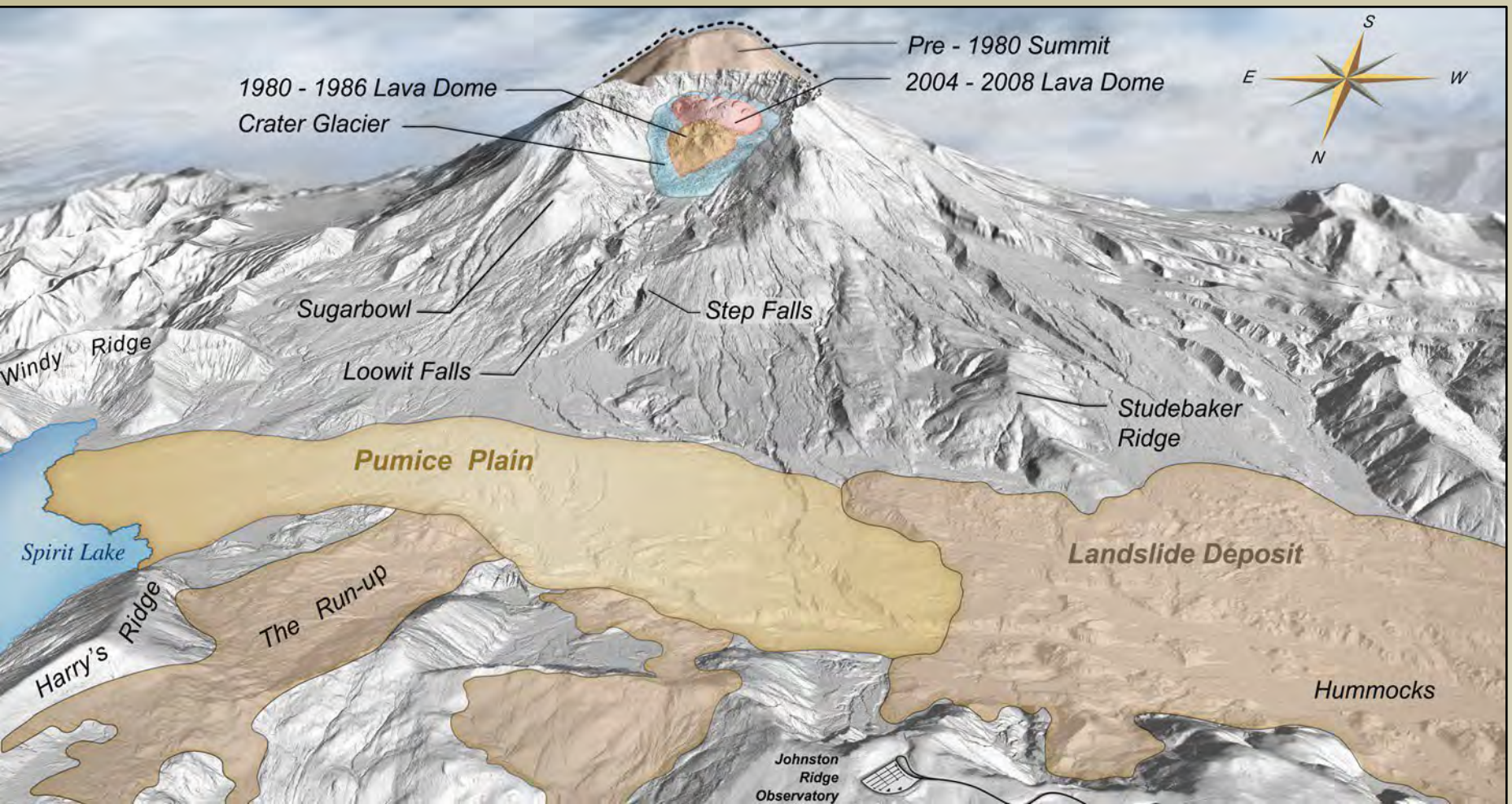


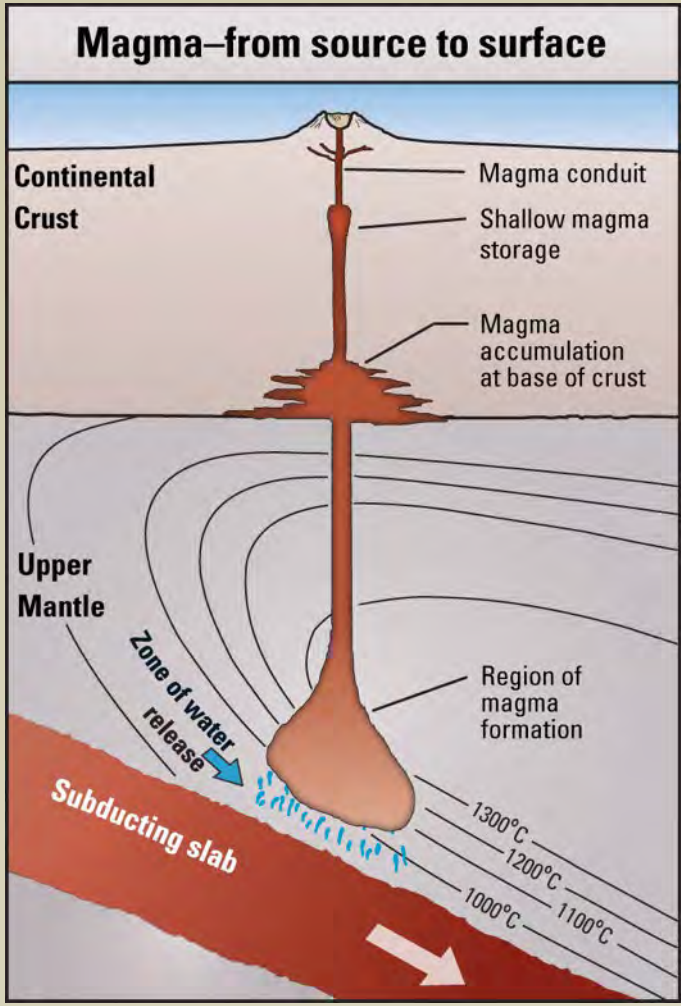
https://pubs.usgs.gov/fs/2018/3075/fs20183075.pdf

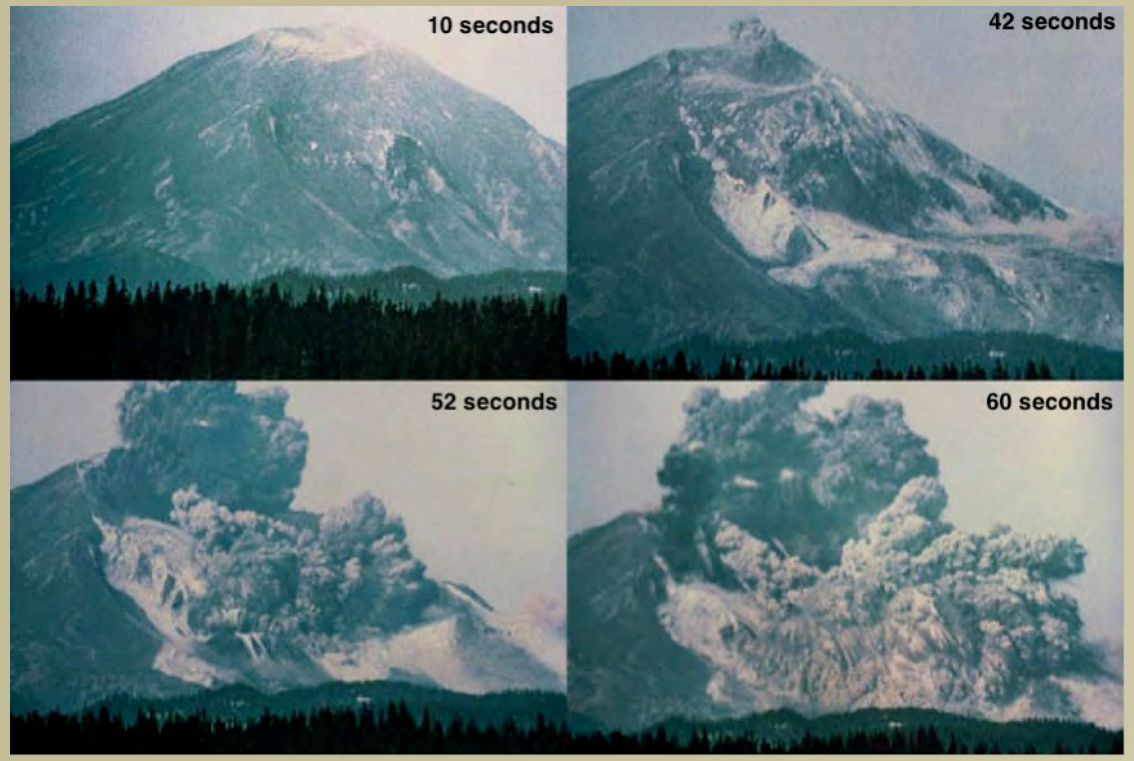
USGS science for a changing world

Mount St. Helens Washington

Mt. St. Helens unrest began March 1980 with a deep earthquake, followed by shallowing seismicity and significant deformation (>3’ per day) of the north flank through May. On Sunday morning, May 18 at 8:32 am a M5 earthquake triggered the largest recorded landslide, a pyroclastic surge that mowed down forests, and a Plinian eruption that delivered ash to the east.






10 seconds
42 seconds
52 seconds
60 seconds

May 18, 1980


USGS

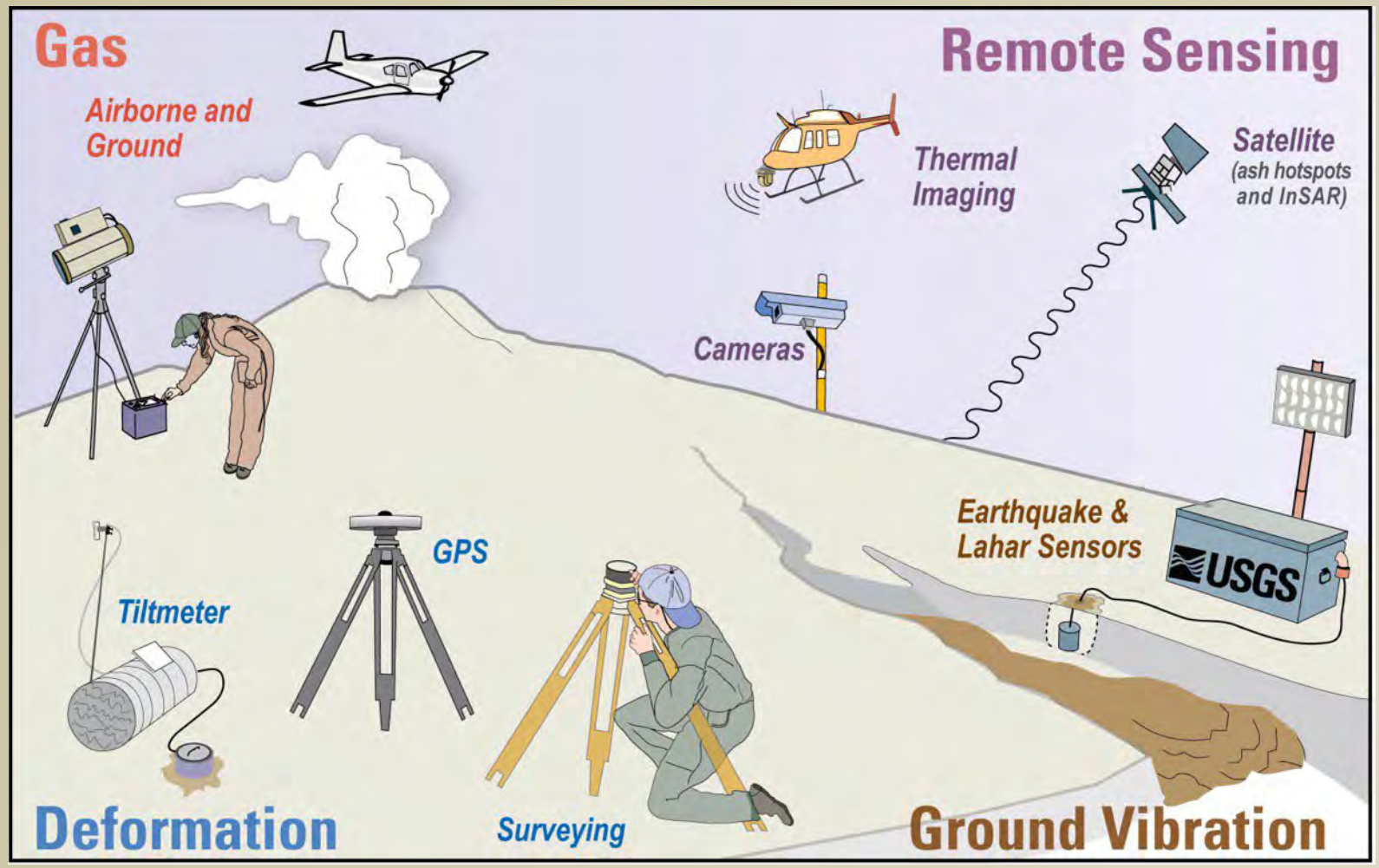

USGS


Monday
ASH FALLOUT
Cloud Turned Sunny Afternoon Into Darkness
Mount St. Helens Continues to Spew Ash, Steam
The Ash Crisis: Day 3
Tuesday
Volcano Wreaks Havoc Across Northwest
Don't Put Away Face Masks Yet, Health Officials Advise
Water, Power
Wednesday
The Ash Crisis: Day 4
Bugs Bite the Dust
Thursday
Rain Brings Reprieve From Blowing Ash
Molten Rock May Be Moving in Volcano Again
Friday
Destruction in Washington
No Survivors Found



Most volcanoes don't erupt most of the time. How do we tell when they might?

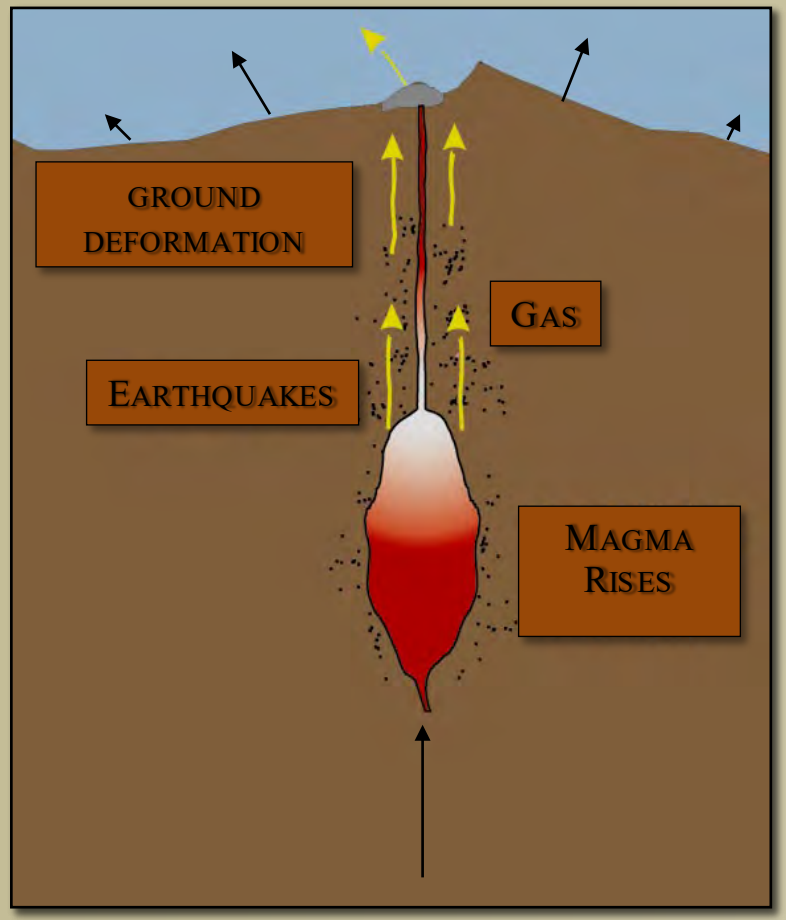
- Volcanoes typically cause earthquakes as magma/gas works its way to the surface
- They typically deform (commonly inflate) prior to eruption
- They usually emit gas as magma ascends



USGS
science for a changing world

Short-term Forecasting

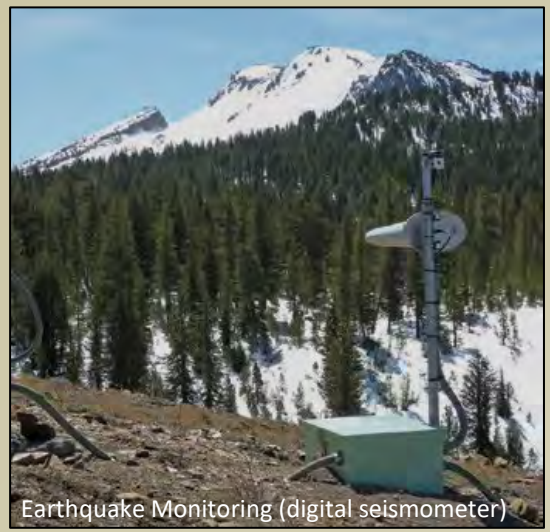
Sensors & Data Streams



USGS
science for a changing world

Modern Methods of Volcano Monitoring







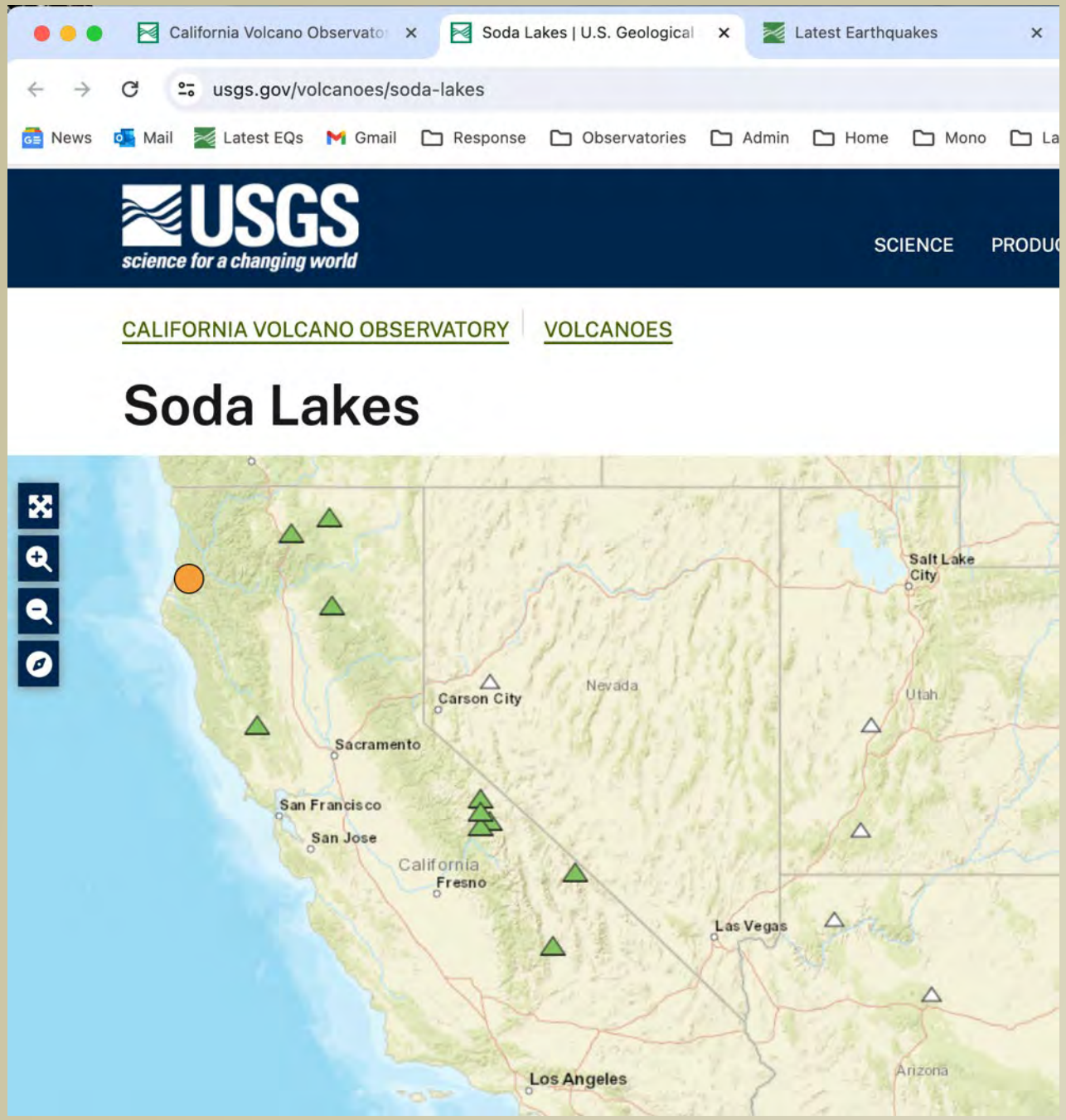




CalVO
California Volcano Observatory
U.S. Geological Survey

The California Volcano Observatory is responsible for monitoring and studying California and Nevada volcanoes, and for preparing for volcanic unrest.

https://usgs.gov/calvo





Making a Hazard Profile

- Describes the location, extent, previous occurrences, future probability, vulnerability, and impacts.
- Includes a consequence analysis.
- Evolves mapping and conducting loss estimates for identified hazards.



Discussion Question

What parts of your community are most vulnerable to these hazards?





Assessing Capabilities

- Evaluation of current mitigation capabilities:
  - What policies, resources, and programs are in place?
  - Do they support hazard mitigation?
  - How could these capabilities be expanded or improved upon?







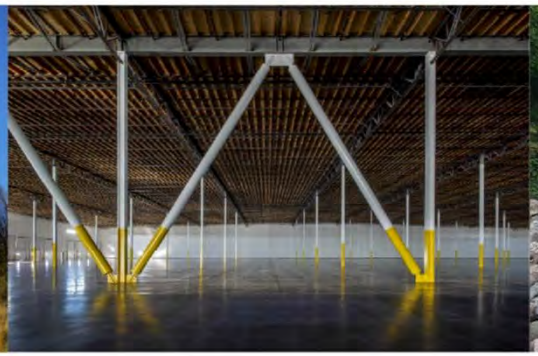



Developing the Mitigation Strategy

- Long-term blueprint for reducing disaster losses
- Includes goals, actions, and an action plan.
- Identifies a comprehensive range of actions.



Creating Defensible Space Reduces the Impacts of Wildfires



Seismic Retrofitting Helps Protect Communities from Earthquakes



Rain Gardens Provide Many Benefits Including Reducing Flooding and Stormwater Runoff





Mitigation Goals

- Goals from the previous plan:
  - Goal 1: Maintain and expand transportation routes across the County, during and after key hazard events.
  - Goal 2: Maintain emergency services capabilities by providing redundancy.
  - Goal 3: Maintain key communications to ensure connectivity during and after key hazard events.
  - Goal 4: Maintain the reliability of utilities (electricity, gas, drinking water, sewer) during and after key hazard events.
  - Goal 5: Minimize property damage and reduce repetitive losses to property from key hazards.
  - Goal 6: Increase public participation and responsibility in reducing their risks.





Types of Actions

- Local plans and regulations
- Structure and infrastructure projects
- Natural systems protection
- Education and awareness programs



Discussion Question

What mitigation actions do you want to see implemented?





Public Survey

- Any additional feedback? The public survey is open now till June 1st:

Washoe County Regional Hazard Mitigation Plan Public Survey

Encuestra del Plan Regional de Mitigación de Riesgos de Condado de Washoe



Next Steps

- Plan participant plan review.
- Public plan review.
  - *Please check the County website for updates*!
- Submit plan for State and FEMA plan review.
- Each plan participant adopts the plan.
- Receive final FEMA approval once plan is adopted.
- Implement the plan.

Questions

Contact Information

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Project Manager
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Jeanne.Bunting@iem.com

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Planner II
980.305.3944
Myrna.Chase@iem.com



Washoe County
Regional Hazard Mitigation Plan
Annual Review Questionnaire

Reporting Period: _____ through _____
Month 20XX Month 20XX

As conditions change, new details become available, or actions progress over time, the plan will need to stay up to date, to keep mitigation goals and actions moving forward and provide the public with awareness of the progress made and opportunities to participate in the plan maintenance process. The following questionnaire is provided to serve as a means to **monitor plan progress, evaluate the effectiveness of the current plan mitigation strategy, and solicit updated information to inform the overall plan relevancy**. All plan participants will be asked to contribute their insights to accomplish effective plan maintenance.

Table C-1: Planning Process Changes/Suggestions

Question	Answer
Should different/additional members be invited to the planning team? If so, please provide Name/s and Title/s.	
How can we engage planning team members more effectively in the process?	
How can we improve overall participation (e.g., of stakeholders and the public) in the process? All suggestions welcome.	
What outreach activities have been conducted to engage the public in the Regional Hazard Mitigation Plan or mitigation action projects (e.g., Interactive websites, social media, public meetings, public surveys)?	

Table C-2: Hazard Profiles Status Update

Question	Answer
What natural and/or human-caused disaster/s occurred in this reporting period?	
What natural and/or human-caused hazards have not been addressed in this Regional Hazard Mitigation Plan and should be?	
What additional maps/data or new hazard studies have become available? Please provide an internet link to the source	

Table C-3: Vulnerability Analysis Updates

Question	Answer
What new critical facilities or infrastructure should be added to the asset lists? Please provide details.	
How will additional maps/data or new hazard studies affect the current vulnerability analysis?	
What changes in development patterns (population growth, land use changes, building codes or zoning changes, etc.) could influence the effects of hazards or create additional risks? Please explain.	

Question	Answer
How has the vulnerability analysis changed as a result of implementing mitigation actions? Name specific mitigation action and related hazard	
Anything else?	

Table C-4: Mitigation Strategy Changes

Question	Answer
What new resources (financial, technical, and/or staffing) have become available for mitigation strategy planning?	
What goals are no longer current to the mitigation strategy? List the goal/s that have been accomplished and the mitigation action/s that accomplished the goal/s?	
What new mitigation actions should be added to the Mitigation Action Plan?	
Which mitigation actions, if any, do you believe should be reprioritized, deleted, or revised? Please name and explain.	
Are available resources sufficient to implement each mitigation actions in the Plan? If not, which actions are not adequately resourced and why? What is needed?	

Question	Answer
List any mitigation success stories. Provide link/s where available.	
Anything else?	

Table C-5: Plan Integration

Question	Answer
How has your agency/ organization used the Regional Hazard Mitigation Plan (RHMP) in other jurisdictional plans (General Plan, Fire Protection Plan, Flood Mitigation Plan, etc.)? List the plan/s and describe what happened.	
Has your agency/organization used any jurisdictional plans as a source to inform the RHMP? List and describe how those plans were used in the RHMP.	

Department Update to the 20XX Mitigation Action Plan

Reporting Period: _____ through _____
Month 20XX Month 20XX

Washoe County and its partners have developed a Regional Hazard Mitigation Plan (RHMP), most recently updated in 2025. This RHMP provides a template for tracking progress made in implementing the individual mitigation actions identified in the 2025–2030 Mitigation Implementation Plan.

Each year, departments should review each mitigation action for which they are the lead and provide the information requested in **Table C-6**, **Table C-7**, **Table C-8**, and **Table C-9**.

- Action status (complete, ongoing, no progress)
- Priority level (high, medium, low)
- Brief summary of the action, including progress made since last review
- Project metrics measuring actual losses mitigated by project implementation
- Updated timeline
- Additional comments, including funding or other needs

Table C-6: Status Summary

Action ID#	Mitigation Action	Action Status	Priority Level
Action ID#			

For project metrics in Table C-7, state how you measured progress for each mitigation action and any changes in the metric since the last review, such as the number of homes elevated or removed from the floodplain or the number of acres where fuels management has been completed, or

indicate whether a discrete action, such as purchasing an emergency generator, has been completed.

Table C-7: Progress Summary

Action ID#	Progress Summary	Project Metric/s

Table C-8: Mitigation Action Timelines

Action ID#	Task	Timeline
	Task 1	
	Task 2	
	Task 3	
	Task 1	
	Task 2	
	Task 3	
	Task 1	
	Task 2	
	Task 3	
	Task 1	

Action ID#	Task	Timeline
	Task 2	
	Task 3	

Table C-9: Other Comments and Identified Needs

Action ID#	Comments	Identified Need/s

Washoe County
Regional Hazard Mitigation Plan
Mitigation Action Progress Report

Reporting Period: _____ through _____
Month 20XX Month 20XX

Background

Washoe County and its partners have developed a Regional Hazard Mitigation Plan (RHMP), most recently updated in 2025. This Annual Progress Report identifies resources, information, and strategies for reducing risks associated with the hazards identified in the RHMP.

Purpose

This Annual Progress Report provides an update on the implementation of mitigation actions included in the 2025 RHMP. It is intended to be updated on an annual basis to capture successes and ensure progress is made toward improving the region's hazard mitigation program.

Overview of Mitigation Program Progress

Table C-10 provides an overview of progress made in implementing the 2025–2030 Mitigation Implementation Plan included in the 2025 RHMP.

Table C-10: Status of Mitigation Actions by Number and Percent

Metric	Data
Number of Mitigation Actions Identified	
Mitigation Actions Started and Completed • Percent of original list completed	
Mitigation Actions Not Started • Number not started • Percent of original list *not* completed	
Anything else?	

Table C-11 provides a snapshot of recent changes related to the region's hazard mitigation program.

Table C-11: Recent Changes to the Hazard Mitigation Program

Item	Response
Describe recent hazard events impacting Washoe County	See Table C-2
List any new studies and reports (provide internet link where available)	See Table C-2
Identify new opportunities for hazard mitigation program integration	See Table C-5
Identify changes in risk exposure	See Appendix. What increase in vulnerability has occurred in this period and from which hazard/s? Provide details and link/s where available.
Summarize mitigation success stories. Provide link/s where available	See Table C-4
Describe continued public engagement	See Table C-1
Anything else?	

Review of the Action Plan

Table C-12 provides a summary of progress made toward implementing the mitigation actions identified in the 2025–2030 Mitigation Implementation Plan. All departments are tasked with tracking the ongoing status of mitigation actions for which they are the lead. The Mitigation Action Plan template provided in the appendix of the 2025 RHMP can be used to summarize progress made in implementing individual mitigation actions, and that information can be used to complete Table C-12.

Table C-12: Review of Actions in the Current Period

Action ID #	Hazard/s Addressed	Funding Options	Timeframe	Objectives Met	Lead and Supporting Agencies	Performance Metrics

Truckee River Flood Management Authority

FLOOD PROJECT ELEMENTS ALONG THE TRUCKEE RIVER, PAST, PRESENT, AND FUTURE



Sparks Industrial Area shortly after January 1997 peak flood.

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1. Introduction to Truckee River Flood Management Authority

a. What is the Flood Management Authority

The Truckee River Flood Management Authority (TRFMA) is a joint effort among the cities of Reno and Sparks, Washoe County, and numerous other stakeholders to reduce the devastating impacts of flooding along the Truckee River in Washoe County, Nevada. TRFMA accomplishes this goal by planning, designing, and constructing flood impact reduction projects; maintaining existing flood infrastructure; providing information about flooding for planning and development; and providing logistical support to our first responders during actual flood events.

The purpose of this booklet is to introduce the Flood Project and show locations of possible flood protection project elements along the Truckee River. The Truckee River for the purposes of the project is divided into three reaches:

- The Downtown and West Reno Reach
- The Meadows Reach (From I 580 Bridge to Vista Narrows (East Sparks)
- The Downstream reach (Vista Narrows, (East Sparks) to Pyramid Lake)

In the past TRFMA wanted to complete a large-scale project in cooperation with the U.S. Army Corps of Engineers (USACE). This Corps project once had elements throughout the Reno Sparks area. In 2014 the USACE authorized the project, but the elements only consisted of projects in what we now call the Meadows Reach, and the scope was greatly reduced from previous plans. In 2019, the USACE rejected a locally preferred version of the project plan and TRFMA subsequently rejected the USACE project plan because it caused too much flooding in South Reno. Today the project and TRFMA is funded by 1/8 cent of the Washoe County Sales tax and from other miscellaneous sources including grants from the Federal Emergency Management Agency (FEMA).

b. Functions of the Flood Management Authority

As alluded to above, TRFMA does more than plan, design, and construct flood reduction projects. In addition, the Authority assists local governments in flood plain planning and development. Along these lines TRFMA recently funded a physical map revision of Floodplain Maps for the Federal Emergency Management Agency (FEMA). This will help future planners and developers to ensure that proper mitigation and design is done for structures being built in or near the floodplain. TRFMA also provides information such as hydraulic models and mapping for developers and engineers when they are planning and designing projects. TRFMA also assists with providing information to emergency responders during flooding events including information on the severity and extent of flooding to help them with prioritizing evacuations and other activities during a flood fight.

TRFMA Board of Directors has two elected representatives from Reno, Sparks and Washoe County. The Authority was formed in 2011 and was preceded by the Flood Project and various flood initiatives within Washoe County dating back to 1998 when the sales tax was passed. Past projects, many of which will be included in this booklet, include the purchase of 110 acres of floodplain land near Mill and McCarran Street, providing a portion of funding for the North Truckee Drain realignment and the Virginia Street bridge replacement as well as a flood wall and levee for the Reno Sparks Indian Colony downstream from I-580. In addition, TRFMA has worked with and provided part of the funding for numerous downstream restoration projects including Lockwood, Tracy, 102 Ranch and Mustang.

2. Section 1 – Downtown and West Reno Reach

Overview of the Downtown and West Reno reach project elements

The Truckee River upstream of the I-580 Bridge (Figure 1) consists of a confined channel with a series of bridges, floodwalls, and berms crossing and confining the river. The project elements in this reach consist of both new flood protection projects as well as maintenance for existing infrastructure. Unlike the Meadows Flood Project downstream of the I-580 bridge, none of the elements have proposed dates when an element or sub project will be addressed. These project elements will be prioritized based on targeting (if there is a cooperative agency constructing a related project where the flood element can be added and built in a cooperative fashion). For instance, TRFMA provided significant funding for the rebuilding of the Virginia Street Bridge in this reach in 2015-16.



Booth Street Area


Looking Upstream from Booth St. Bridge

- **Booth Street Bridge** is low to the to the water and gets inundated during high floods causing water to backup upstream.

- There is flooding along the north bank of the river with breakouts both upstream and downstream of the Booth Street Bridge.

- Conceptual plans and hydraulic studies have centered around raising the bridge, removing the bridge, and/or putting a floodwall or berm upstream of Booth Street.

- **Downstream from Bridge:** there was a conceptual plan for a large berm to be installed removing half of Riverside Drive as well as most trees along the river. That plan has been scrapped and instead a low berm is now proposed along the river that only gives partial protection up to perhaps only 14,000 cfs instead of a full 20,500 cfs flood but allowing the river and the neighborhood to still remain connected to the river.


Booth Street Bridge - Looking West

- **Upstream of the Bridge** a small berm or flood wall may be installed to about 1,500 feet upstream (see map next page). The bridge ramp on the north side will tie in to the upstream as well as downstream berm or floodwall.

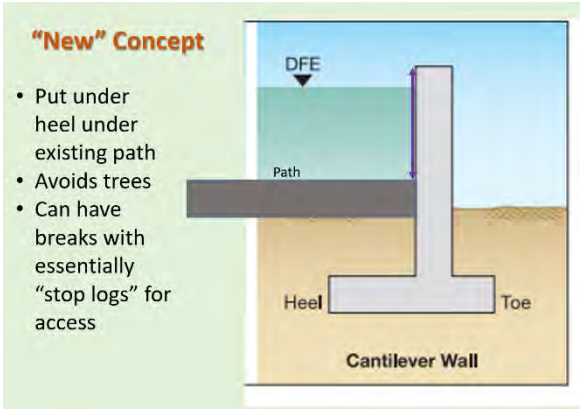
Booth Street Area Map



Booth to Arlington



- Along Riverside Drive there is a natural or small manmade berm that keeps water from overtopping into the neighborhood just north of the bank until around 11,000 cfs which unfortunately is a common flood event.
- Previously plans were drawn up to create a large levee/berm that would take out most the road in foreground and make it one way and remove most the trees pictured. The alternative being advocated here is to protect the river from smaller more frequent floods but not have the large, tall walls necessary to fully protect the river to the 100-year flood.
- This low floodwall will allow almost all trees to remain and will not be so intrusive to the river view and trail.
- The final height of the small wall will be determined in design after full community input.
- Closer to Arlington there is an existing floodwall that will be replaced and made slightly higher to protect to a higher flood level but not 100-year flood level.





Booth to Arlington Map



Image modified from Google Earth , 2023

Arlington Area



- This area has floodwalls on both banks and on the island as well.
- There are several bridges including the North and South Arlington Bridge and walking bridges.
- Previous renditions of these map books discussed replacing the bridge to have freeboard during a 100-year flood event. The current standard is that new bridges are to be built to an elevation that will not degrade hydraulic conditions.
- TRFMA's role is to provide advice and hydraulic models and data on river hydraulic conditions for redesign/rebuild that Regional Transportation Commission (RTC) is undergoing for Bridges.
- There are also numerous floodwalls (see picture below and to the right), TRFMA may assist technically or even financially in the future depending on the timing and situation of the improvement.



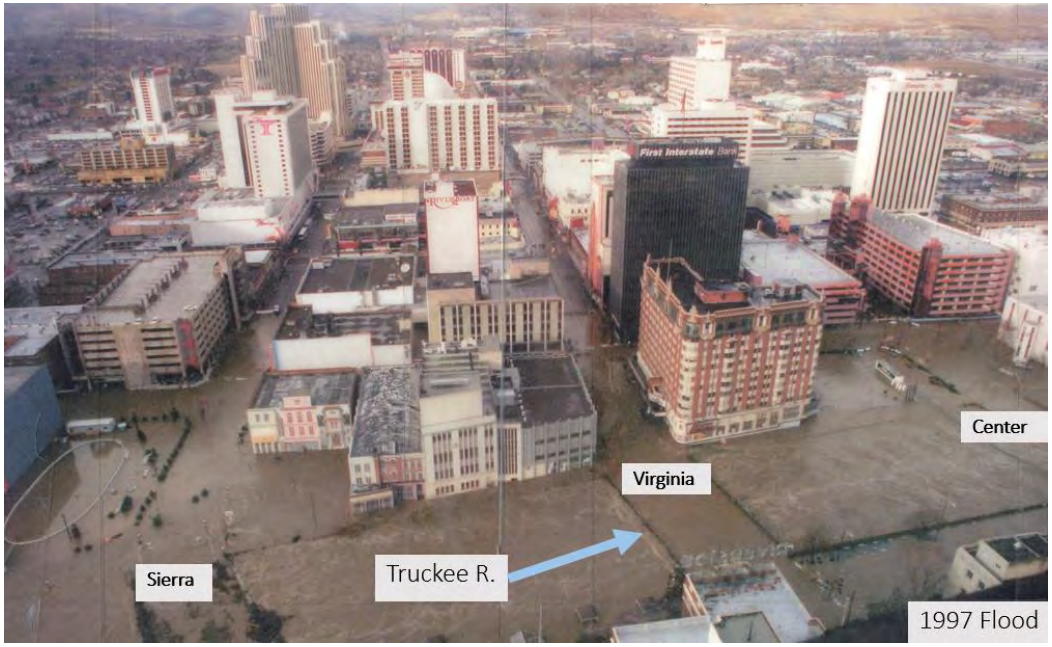


Arlington Area Map



Sierra to Lake Street Bridges Reach

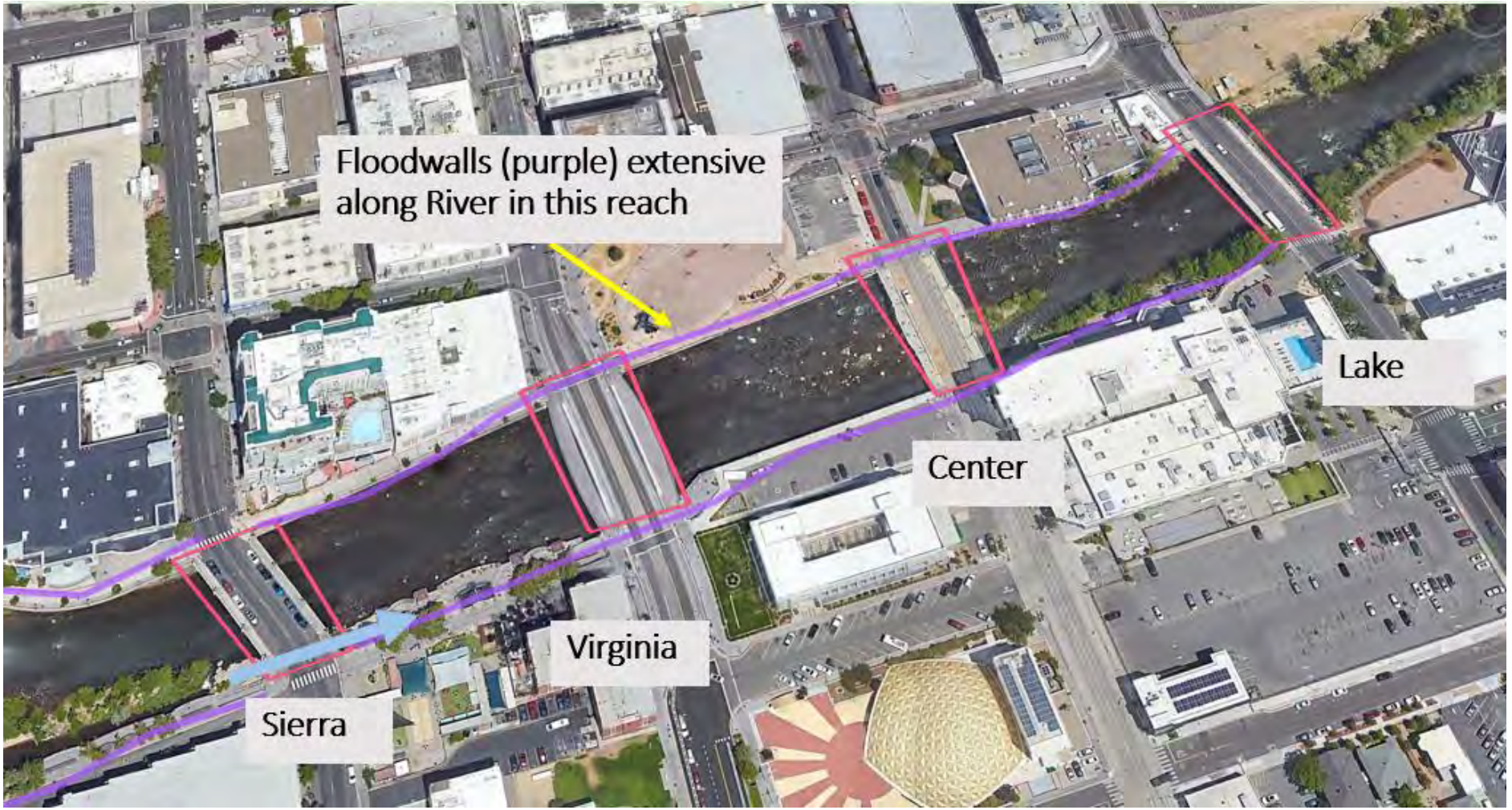
- This reach includes the Sierra Street, Virginia Street, Center Street and Lake Street Bridges.
- The area is very tight to the river, and this can cause flooding into large buildings.
- Virginia Street Bridge was replaced in 2016.
- Sierra Street Bridge is under design for replacement by RTC.
- Except for Lake Street in the future and Virginia Street in the past, TRFMA's role is to advise and provide models and data to aid in design.
- There are numerous flood walls and TRFMA may, depending on timing and circumstances, help with wall replacement projects as a cooperating agency.





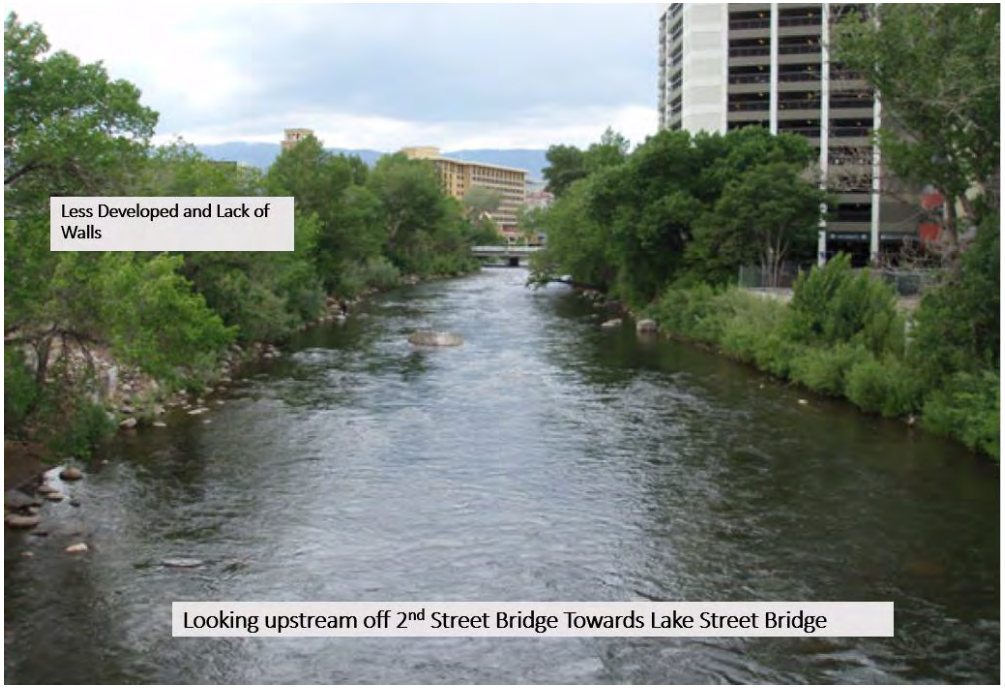


Sierra to Lake Street Bridge Reach



Lake Street to I-580

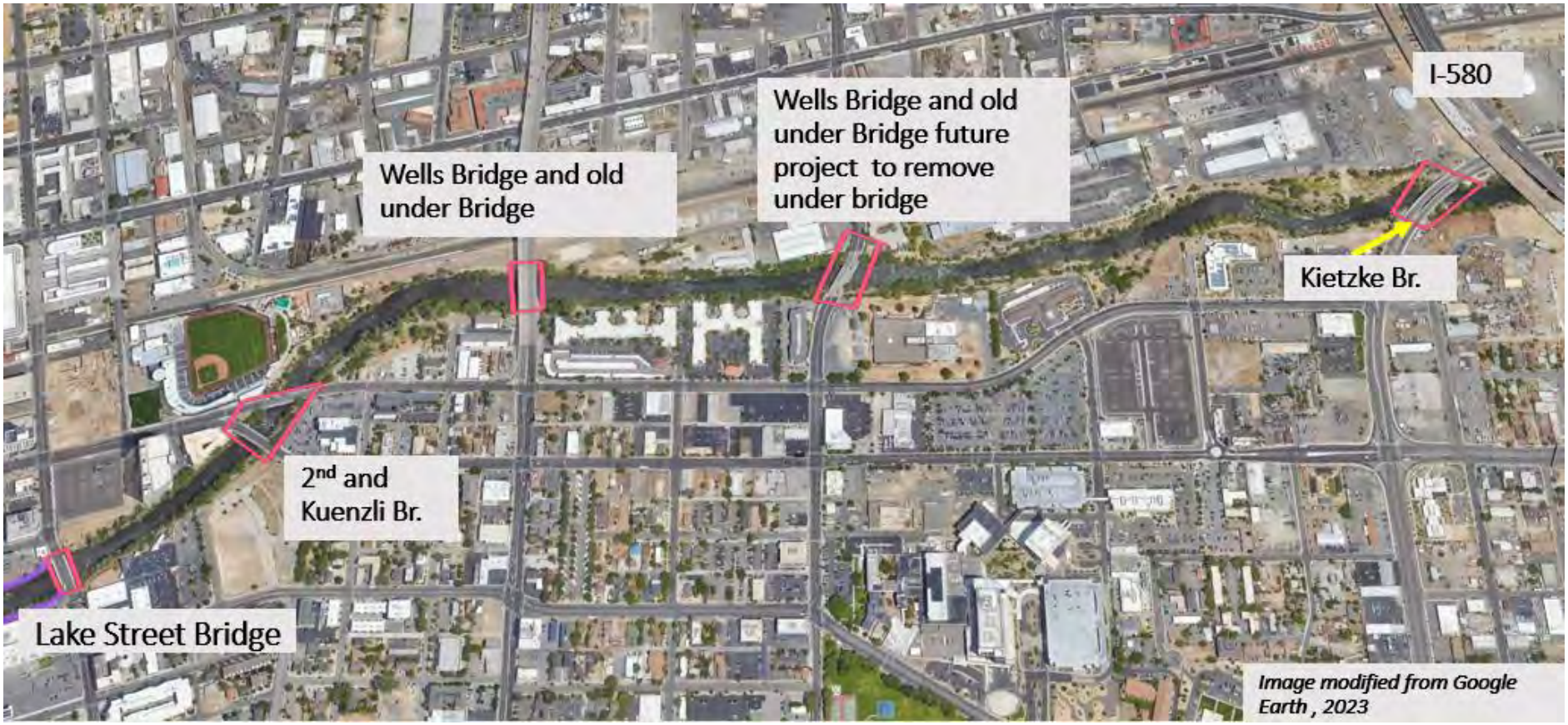
- From Lake Street to I- 580 the river is less constrained but there are still buildings near the river.
- Past plans have had several areas as candidates for random bank stability projects, but subsequent evaluation has found no specific needs.
- The only major project slated in this reach is the removal of the old Wells Bridge underneath the Wells Ave overpass. The Bridge is extremely low to the river and backs up water.
- Previous plans also had a pedestrian bridge to replace the old Wells Bridge however, the property on the north bank has changed ownership and there is no push to remove the Wells underpass Bridge, so a new pedestrian bridge is not a priority at this time.







Lake Street Bridge to I-580



Section 2 - The Meadows Reach and Project

The Meadows Flood Project extends from I-580 down to Vista Narrows east of Sparks. This project includes levee, floodwalls, berms, terracing, bank stability, and stream and riparian restoration activities. The Meadows Flood Project can be broken into phases or segments which include:

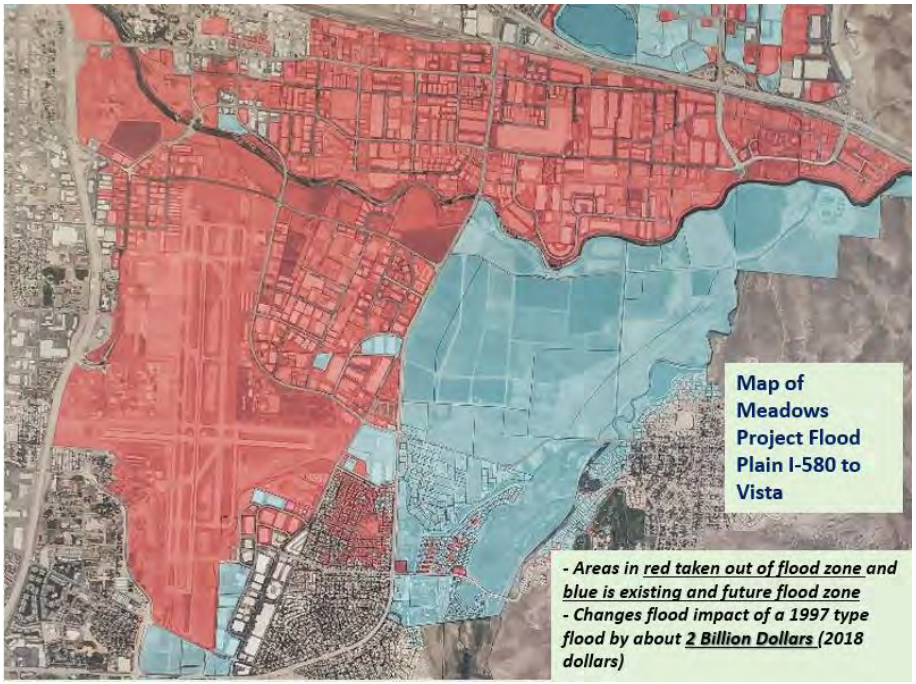
1. The Reno Sparks Indian Colony Levee and Floodwall – **Completed in 2009**
2. Grand Sierra Resort – Berm and Levee (planned construction 2024-25)
3. Truckee Meadows Water Authority Levee (planned construction 2026)
4. Reno Tahoe International Airport Berm and terracing (planned construction 2024-25)
5. Additional Levee Work North Bank Glendale to Rock (planned construction 2026)
6. Mill/McCarran Levees, Terracing, Channel and Riparian Restoration (planned construction 2027-28)
7. North Levee and Flood Wall – McCarran to Vista (planned construction 2029-30)
8. Vista Narrows Floodplain Terracing (**in permitting** planned construction 2024 and/or 2025)

This plan has many similarities to what was called the "Locally Preferred Plan" (LPP) that was proposed to the USACE as part of the the 2014 authorization of the project. The LPP differed from the USACE chosen plan called the National Economic Development (NED) Plan in that it opened up Vista Narrows slightly in order to not cause greater induced flooding along Steamboat Creek and South of the River. It also had slightly greater proection (higher walls and levees) and other minor differences. The USACE rejected the LPP mostly due to tribal concerns. TRFMA rejected the NED plan because the mitigation for induced flooding that it would cause without opening Vista Narrows is estimated to cost over 300 million dollars and would be a cost solely borne by local authorities that far outweighs the Corps match contribution of 160 million dollar maximum. In response the Meadows Plan was developed. The Truckee Meadows Plan differs in the following ways from the previous LPP plan:

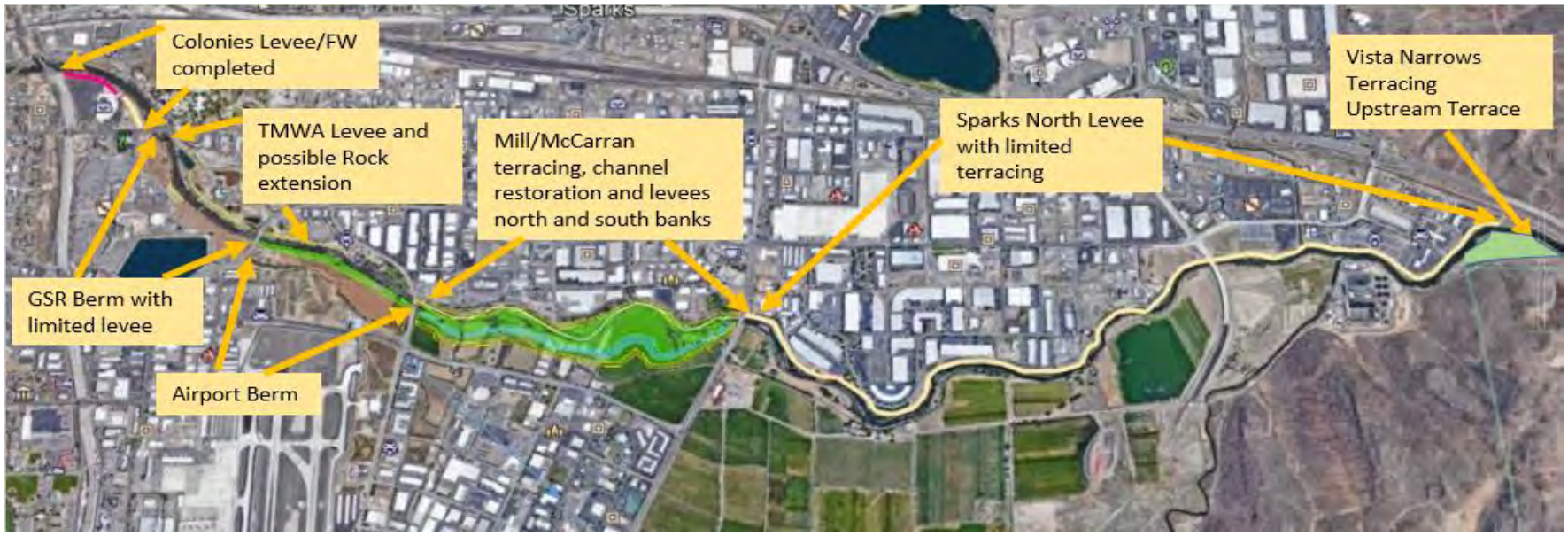
1. It shifts from floodwalls to a berm and levee at the Grand Sierra Resort (GSR). Floodwalls typically cost about twice as much to construct as a levee and also become graffiti magnets and eyesores. In addition, we are working with GSR on easement and cost share agreements that may also reduce costs further.
2. It shifts the TMWA floodwall to levees reducing costs and additional easement agreements may also significantly reduce costs.
3. It shifts the levee at the airport to a berm which is necessary for flight safety and also reduces costs. We have also discussed easements and cost share to further reduce costs.
4. It may add some levee or floodwall to north bank between the TMWA levee and Rock Park. There seems to be a vulnerability there that was not picked up in earlier analyses.
5. It shifts focus from floodwall to levee on the north bank for the Mill/McCarran part of project. In order to do this, the river itself may need to moved. This allows for the opportunity to conduct channel restoration and enhance spawning and rearing habitat for fish in this area. This zone also includes extensive terracing and riparian restoration as it did in the original Living River Plan.
6. Where possible the North Floodwall and Levee from McCarran to Vista will focus on installing levee over floodwalls. Earlier versions had this almost exclusively floodwall. Details on this section have not been worked out in design as others, but savings in using a levee vs. a floodwall can reduce cost by half.

Why the Meadows Project and how much will it cost.

- The cost to complete the Meadows Project **was estimated to be $185 million in 2021.**
- Each component of this project has a cost estimate with the accuracy of the estimates varying. For instance, there are detailed estimates for the Vista Narrows portion of the study vs. rough estimates of cost for the North Levee and Floodwall.
- One reason for the Meadows Project is it has tremendous benefit from reducing flooding vs. cost of implementation. See the area in red which represents areas taken out of the flood zone and note all the infrastructure and buildings present.
- In an evaluation done in 2021, the Meadows Project in its entirety (not just cost to complete) has a beneficial cost ratio near $1.6 and over $10 million per year in net economic benefit.
- In terms of "cost to complete," benefit cost ratio and annual net economic benefit are even greater.

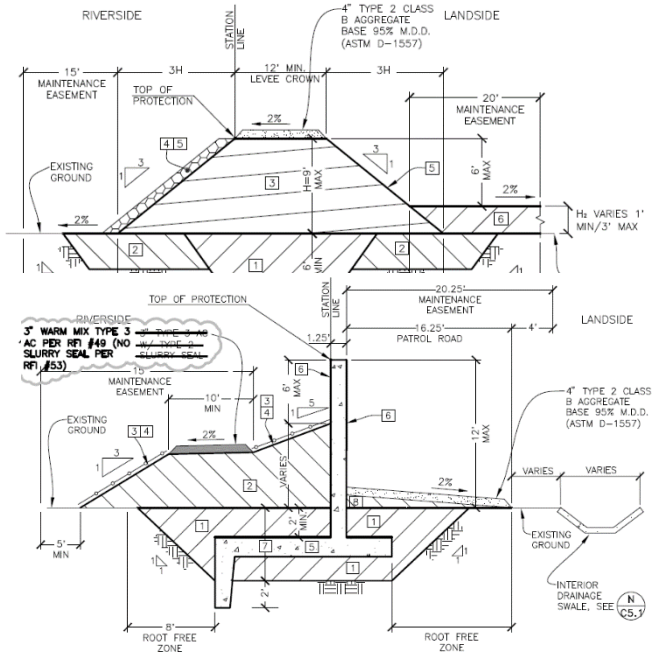


Map of Meadows Reach



RISC Levee and Floodwall (I-580 to Glendale)

- The Reno Sparks Indian Colony Levee and Floodwall project represents nearly one-half mile (2,240 feet) of levee and floodwall.
- The levee section is approximately 1,170 feet while the floodwall was 1,070 feet.
- The height of the floodwall is of moderate height due to the low nature of the river at this location with an above ground elevation of 12’ and a total of over 21 feet when considering the below ground portion.
- The levee is also of moderate height of 9’ above grade with a 6-foot deep keyway below.
- Another reason for the heights chosen is they were designed to resist the 1997 flood which is greater than a 100-year event plus there is considerable freeboard.
- The average costs for the levee were $1,294 per lineal foot while the floodwall was over $2,360 per lineal foot. The overall cost for the project was shared between Walmart, the Reno Sparks Indian Colony along with the Flood Project. This cooperation reduced costs.
- The project cost $5.8 million and was shared between the Flood Project ($1.72 million), Walmart ($2.28 million) and the Reno-Sparks Indian Colony ($1.7 million in land value).
- The project features a meandering trail along the river side that can be used for recreation. (Picture to the right)







RSIC Levee and Floodwall (I-580 to Glendale)



Grand Sierra Resort Berm and Levee (Glendale Ave. to Greg St. Bridge)



- The Grand Sierra Resort (GSR) Berm and Levee Project has been converted from a floodwall to a berm and levee after discussions between GSR and TRFMA staff.
- The berm allows for a gradual outslope that better connects the GSR with the river.
- The upstream part of the berm consitst of approximately 45,000 cubic yards of material with a cost of of 1.35 million in 2021 dollars.
- The downstream levee across from the pond is larger and involves about 52,000 cubic yards of material with a cost of 1.56 million in 2021 dollars.
- The GSR levee is in a narrow area between the two berms and requires about 7-8 feet of gain in elevation.
- The Levee Section in this estimate is 350 feet long with an estimated cost of $700,000.
- There is another narrow area between pond and River that may require a short levee section.
- The berms will be compacted and paved back over or used for other needs.
- Much of the current berm area has been used for parking.



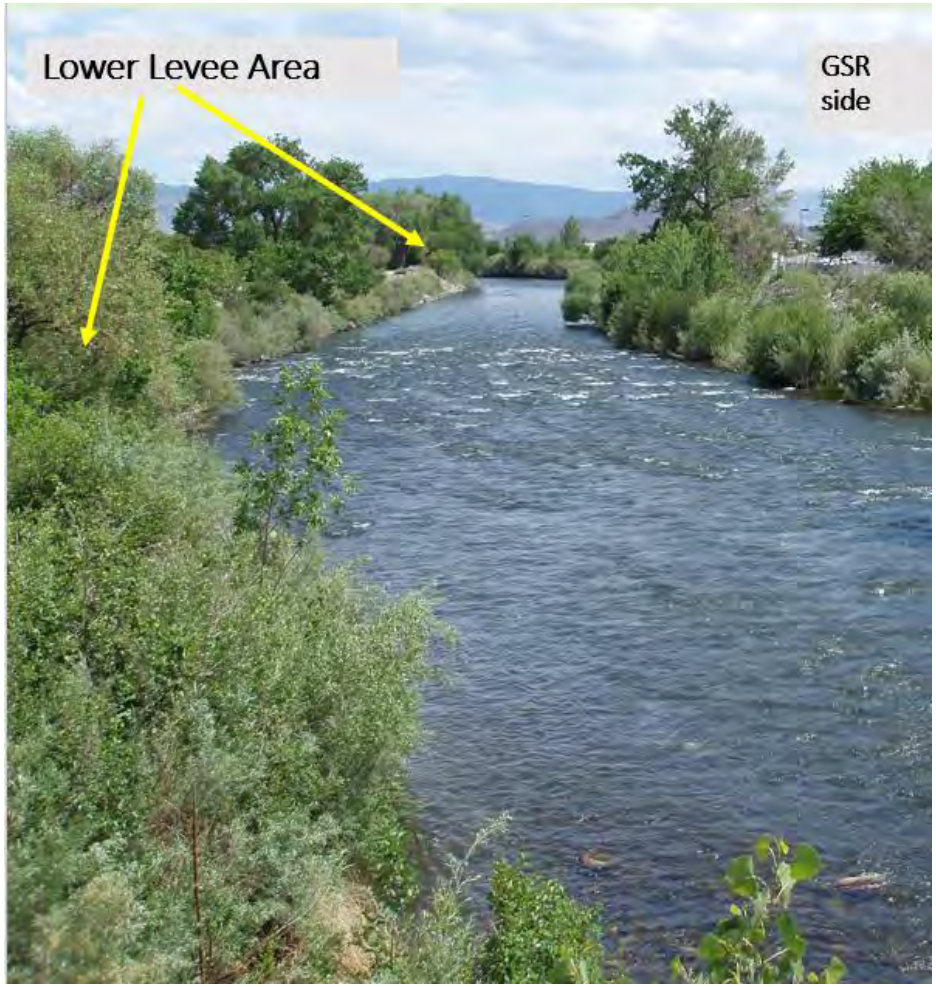
GSR Levee (Glendale to Greg Street)



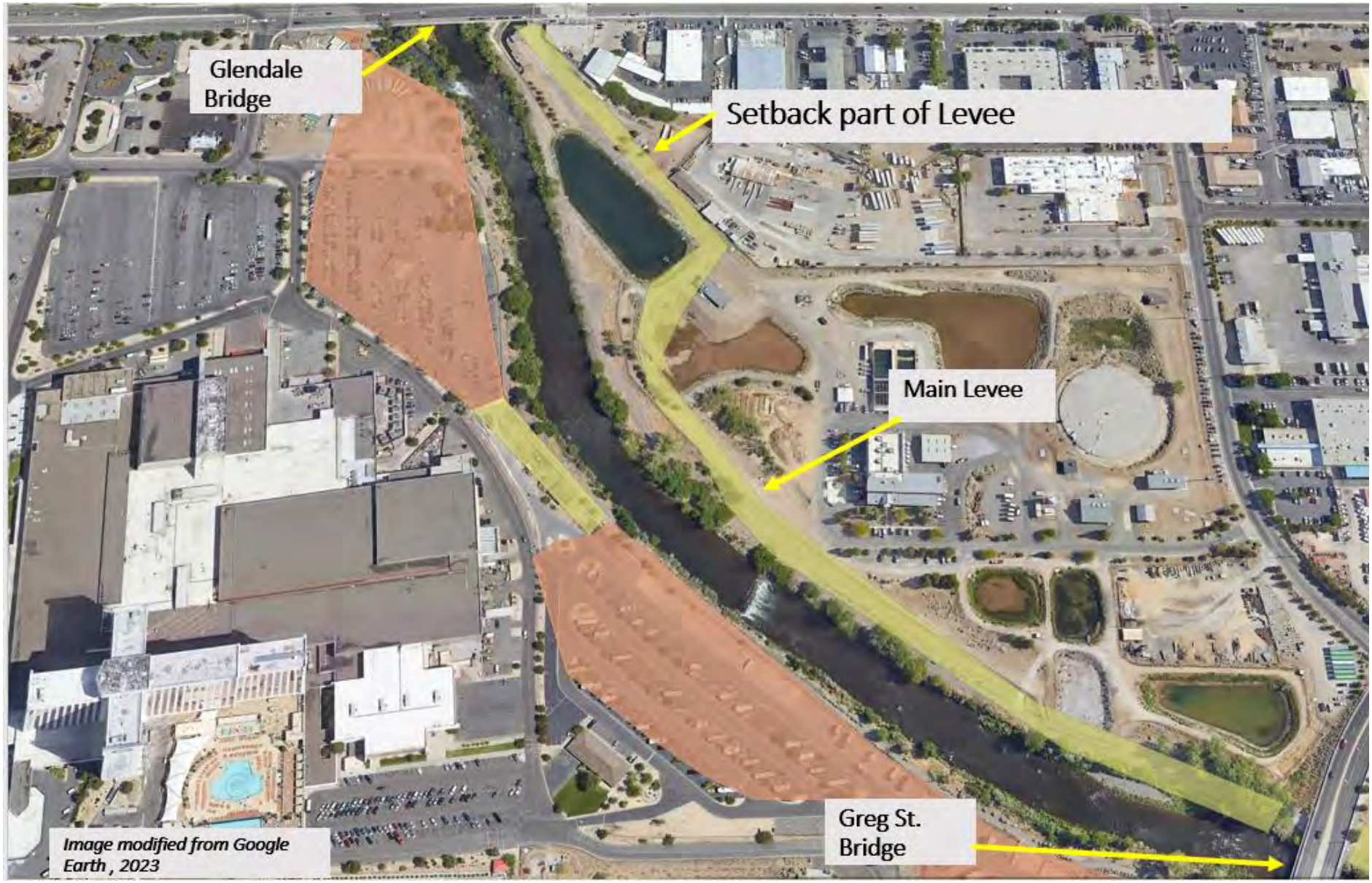
TMWA (Truckee Meadows Water Authority) Setback Levee

- This was proposed as a wall in the 2016 version of the mapbook and in the latest revision of the LPP.
- After on field discussion between TRFMA staff and in discussion with TMWA staff this was changed back to a set back levee in one section and a regular levee downstream.
- The reason for this change is the area that needed the wall the most was where the setback section was.
- There appeared to be plenty of room for a levee considering the needed elevation gains were less than 10 feet and in some cased only 5 feet.
- The length of the levee is approixmatley 3000 feet with a cost estimate of 4.5 million in 2021 dollars.
- In discussion it was apparent we could get help with access if we would help TMWA with fencing and security measures which would drive down the cost.





TMWA (Truckee Meadows Water Authority) Levee

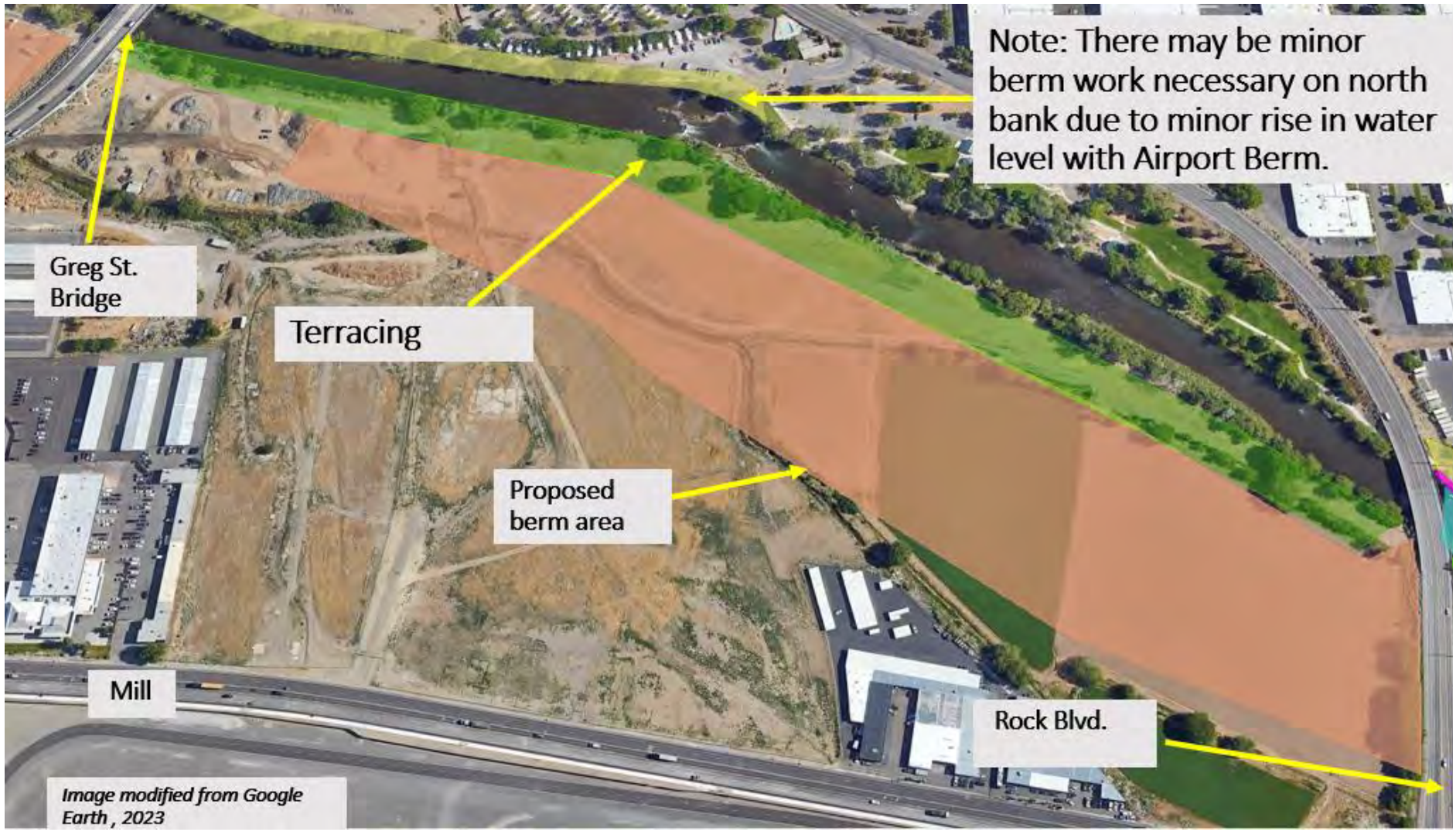


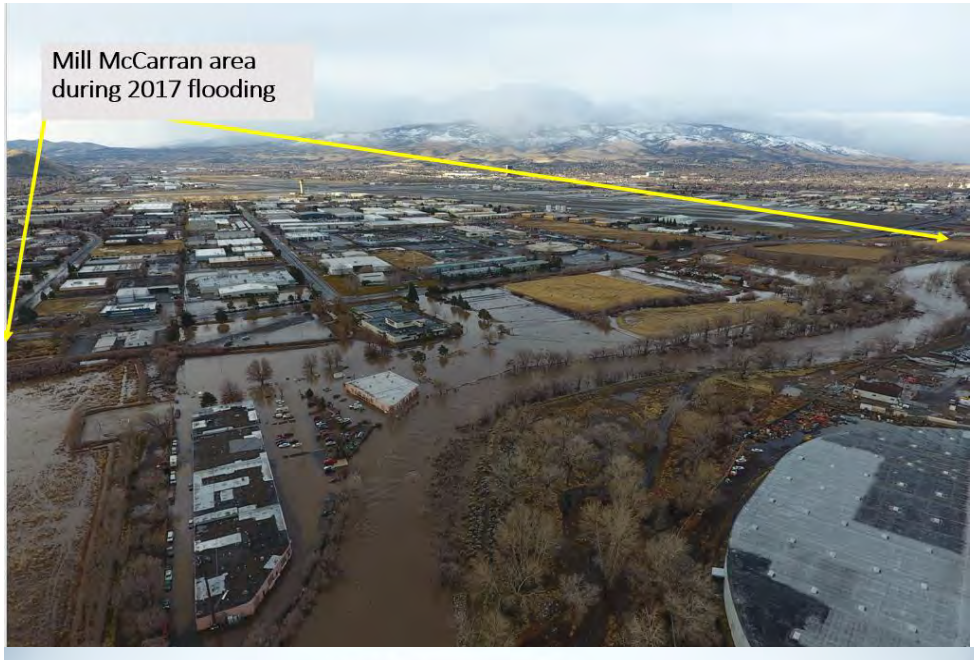
Reno International Airport Berm

- The Reno International Airport Berm is an alternative to the earlier idea of a Levee.
- Levees represent an abrupt obstacle to landing aircraft.
- Berms can be more gradual but need to be wider.
- The amount of elevation gains necessary averages between zero and eight feet in this area to protect from a 100-year flood.
- The estimated fill would be approximately 90,000 cubic yards but may be lower when more detailed design done.
- At a cost of $30 per yard (brought from Vista Narrows excavation) this would add up to 2.7 million in 2021 dollars.
- This project also has some considerable terracing with a cost of close to 2.4 million in 2021 dollars.
- Plant species used for terrace need to be low growing because of aircraft safety concerns.



Airport Berm and Terracing (Greg to Rock Blvd. Bridges)



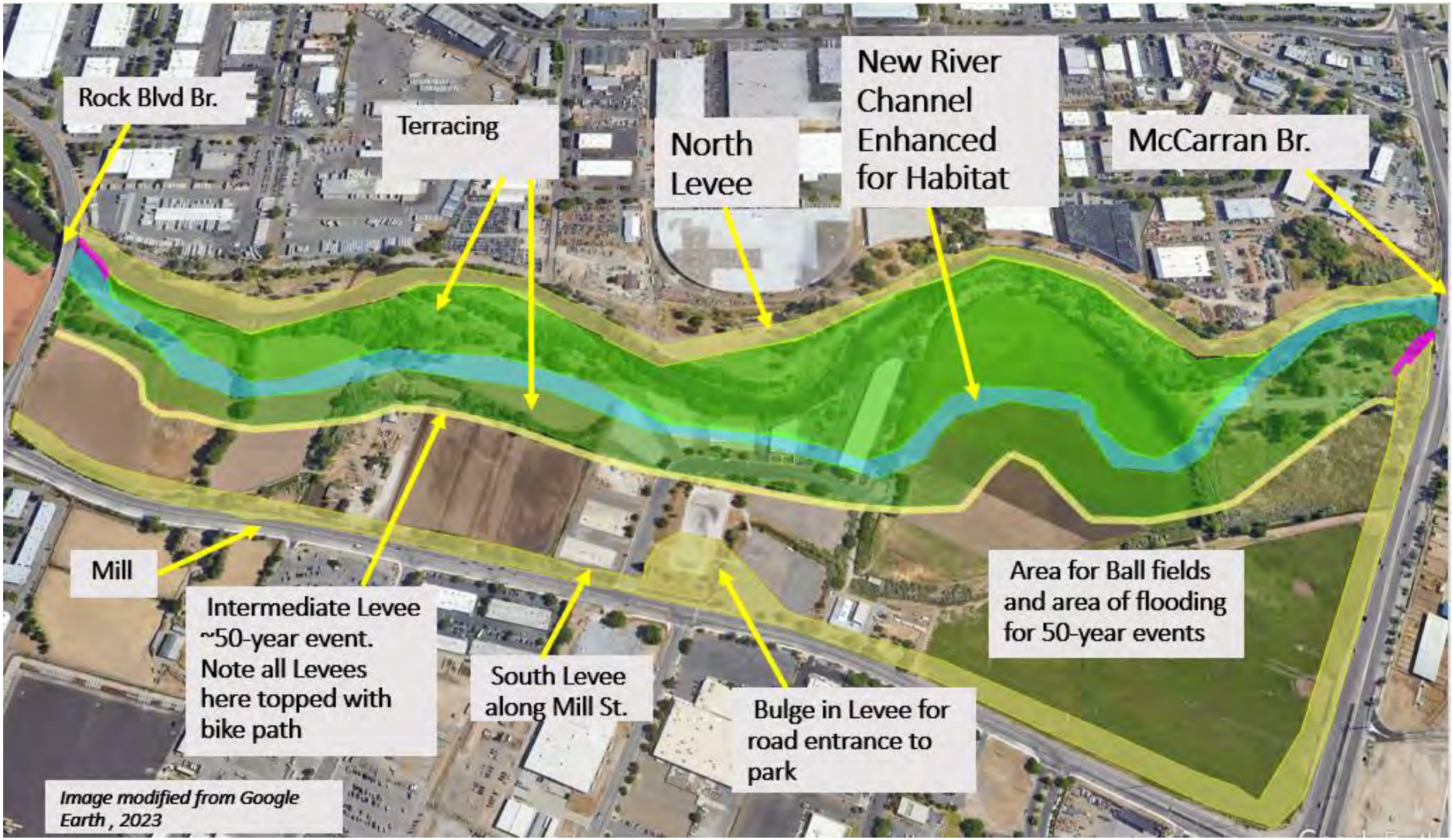




Mill/McCarran Levees and Terracing

- The Mill/McCarran Properties represents by far the largest investment by the Flood Authority.
- The overall investment so far is over $48 million for 110 acres of land along the river. There is also a remaining piece of property that may need to be acquired.
- There is over 1.2 miles of river frontage along the south side of the river along this property.
- Past plans called for mostly a floodwall on the north bank of the river and a levee on the south with considerable terracing.
- The new concepts call for moving the river, providing **restoration instream as well as terracing and riparian restoration** and the use of levees exclusively. This may attract outside funding.
- The current cost estimate for construction of the three (North, South, Intermediate South) levees is $20.4 million.
- The terracing and river restoration will have an approximate construction cost of near $20 million.
- The outcome will be a fully protected area for the North and South Industrial areas and the Reno Tahoe International Airport.
- In addition, this area will be ideal for both a nature and conventual park post construction. There will be grading and construction to help facilitate various forms of recreation. We anticipate transferring this area to Reno Parks or another regional park authority for recreational management.
- When all work is said and done the total investment of this stretch may reach nearly $100 million dollars.
- We hope to start design work this fall (if Vista Narrows portion of project receives permitting.

Mill/McCarran Levees and Terracing (from Rock Blvd Bridge to McCarran Blvd Bridge)

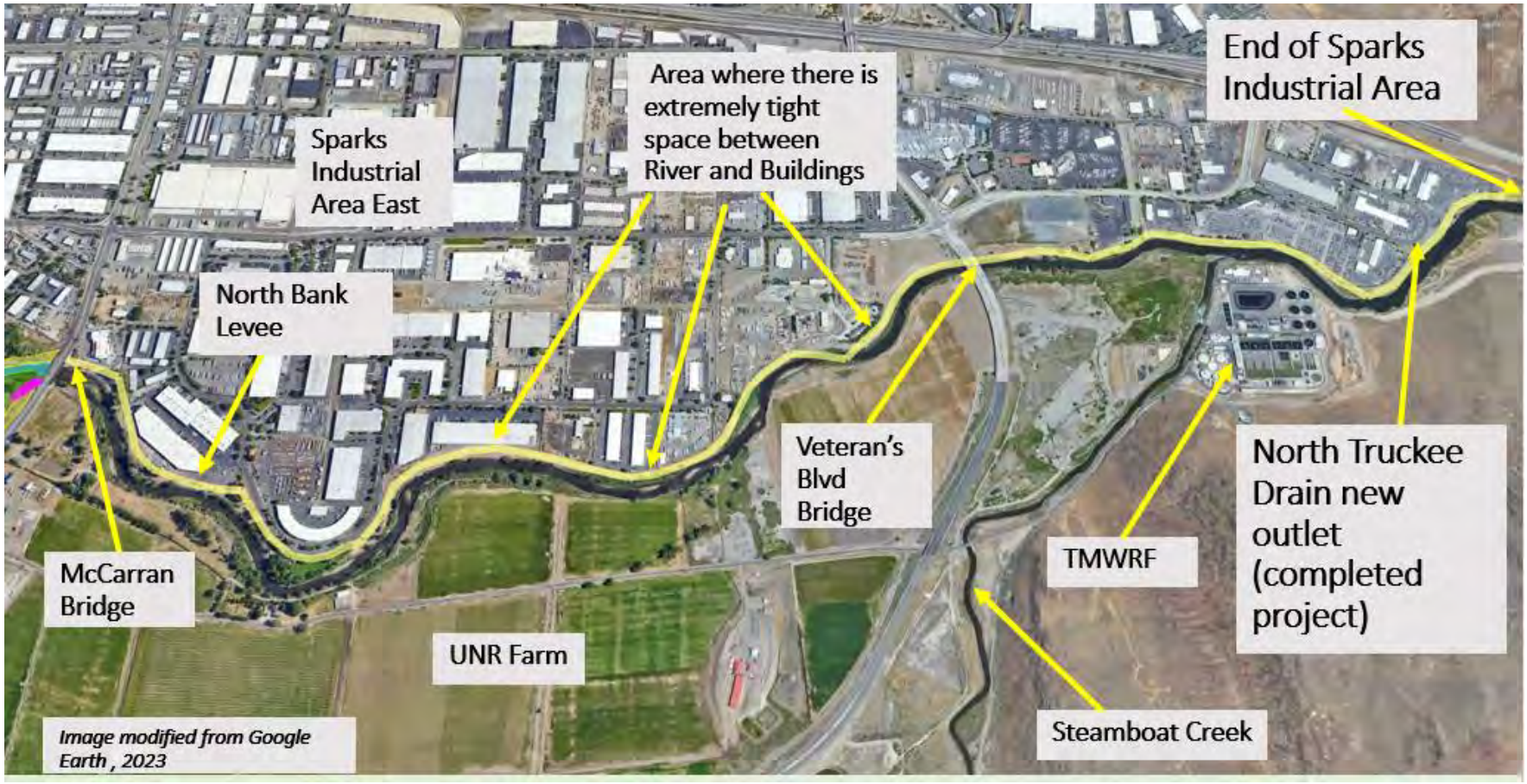


North Bank Levee and Floodwall (McCarran Bridge to East Edge of Sparks Industrial Area)



- The North Bank Levee and floodwall stretches almost 3.2 miles from the McCarran Bridge downstream to Vista.
- Past plans have had this stretch at about 70% floodwall.
- Going forward TRFMA staff is looking at working with stakeholders and creating plans to make most if not all of this levee.
- Using levee vs floodwall should reduce costs, avoid seepage problems, and allow for bike paths to be put on top of levee.
- The total cost for this based on 16,600 feet of Levee is $33 .2 million in 2021 dollars.
- This part of project is the least studied and researched so cost data is most unsure.
- The North Truckee Drain's outlet is along this stretch and represents a completed project, partially funded by TRFMA.
- In past map books, there was random erosion protection and some terracing on Steamboat Creek.
- Those two activities have been eliminated from the Meadows Plan due to mecury concerns on Steamboat Creek and no demonstrated need shown for bank armoring at locations specified.

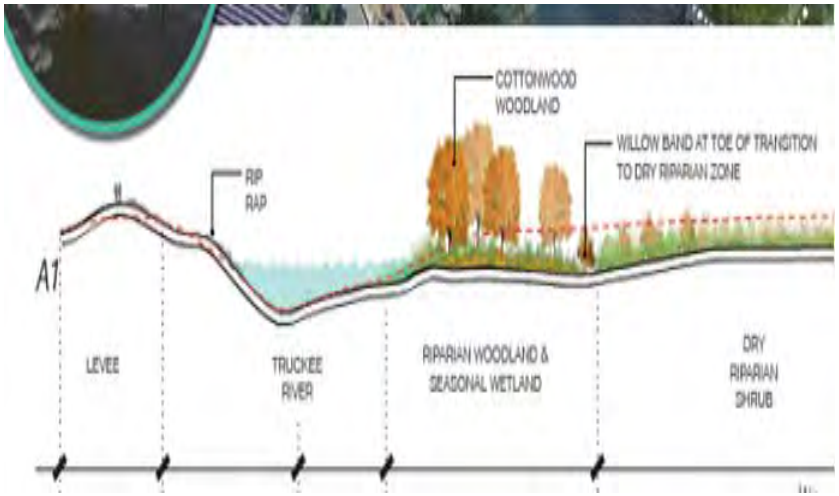
North Bank Levee and Floodwall (McCarran Bridge to East Edge of Sparks Industrial Area)



Vista Narrows

- The Vista Narrows Floodplain terracing project as currently proposed, consists of Floodplain terracing at 3 locations just East of Sparks Nevada on the Truckee River, areas in green in river terrace areas map on next page.
- Vista Narrows is key to the entire Truckee Meadows Project as it lowers water levels caused by other elements of the Meadows Project.
- It provides the water level lowering that allows for the project to be built while avoiding expensive mitigation in South Reno.
- It does increase peak flows downstream on the order of 730 cfs because of the opening up of the narrows which prevents some of the backwatering into South Reno and UNR farms.
- The larger Truckee Meadows Project which eliminates flood storage in industrial areas and the airport increases peak flows by another 1,669 cfs.
- This creates an increase of approximately 2,400 cfs peak flow increase.
- We have been in discussions with stakeholders downstream about mitigation because of these increased flows.
- It appears there are several projects in and around Wadsworth that may be useful for mitigation.
- We have also discussed this matter with Storey County and have a mitigation project planned for the Lockwood area.
- The cost for the terracing is approximately $42 million in 2021 dollars.
- Costs for downstream mitigation have not been fully worked out yet.
- These terraces are on both sides of the River and are a total of 8,600 feet long. They create low floodplain and wetlands that provide flow conveyance.
- The terracing occurs just above the ordinary high water mark so that the river itself is only marginally impacted along the banks. Because of the height of the banks this means approximately 450,000 cubic yards of materials are to be removed. Note: the redline denotes the old bank height.



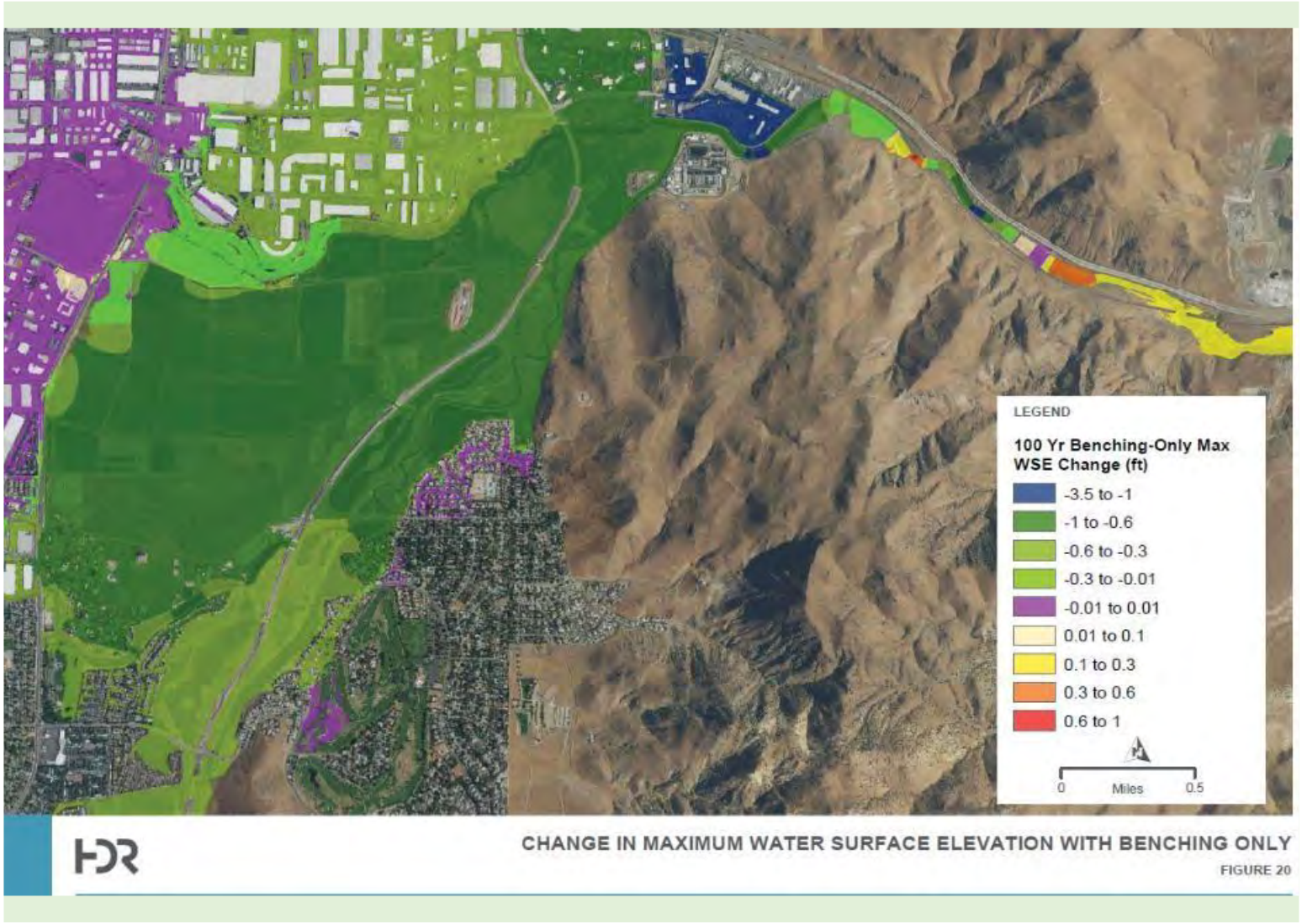


Vista Narrows (East Sparks down the Truckee River Canyon ~ 2 miles)

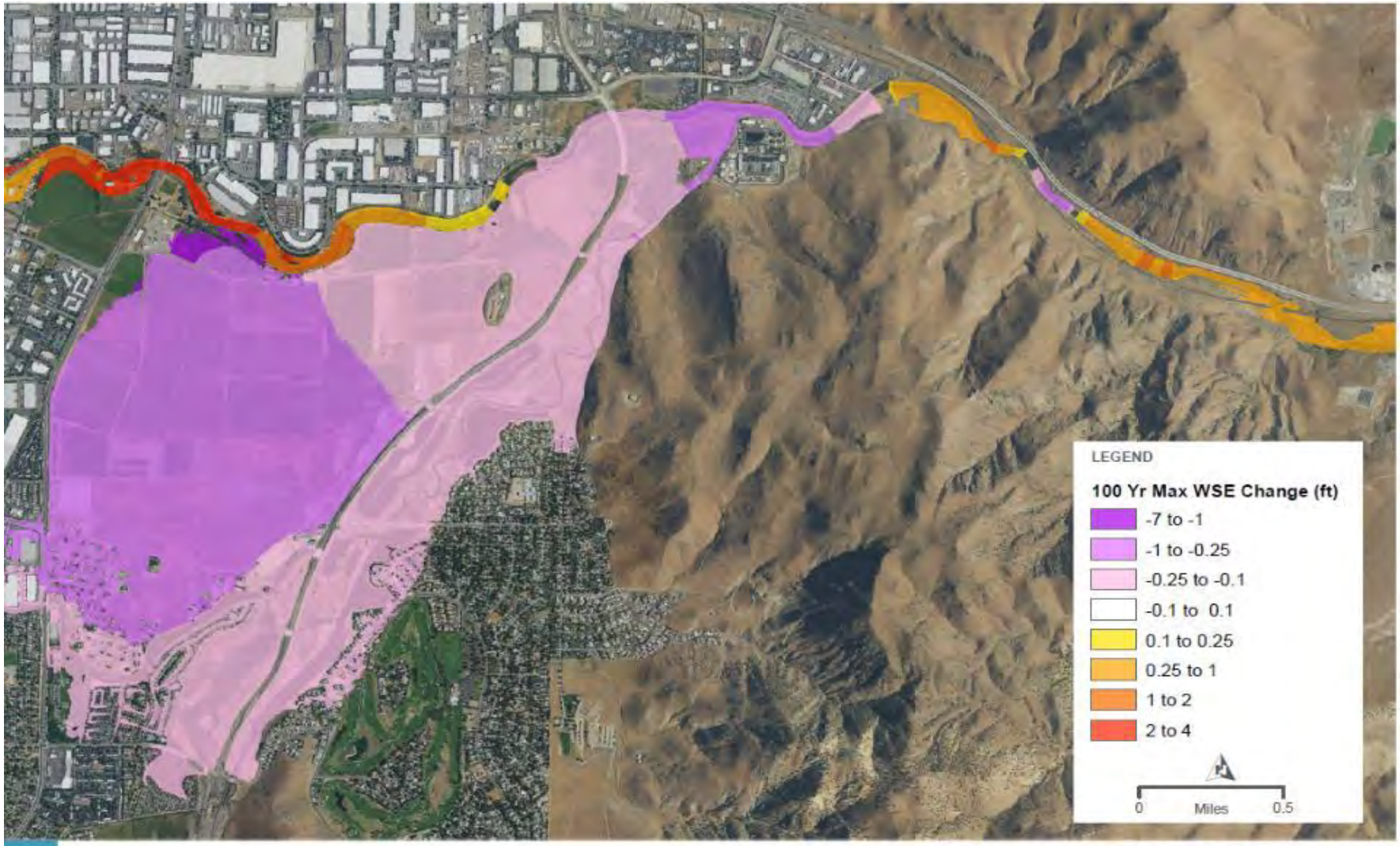




Why Vista Narrows? How Vista Reduces water levels (without cumulative effect of full Meadows Flood project)



Why Vista Narrows? How Vista Reduces water levels (with full project build out)



HDR

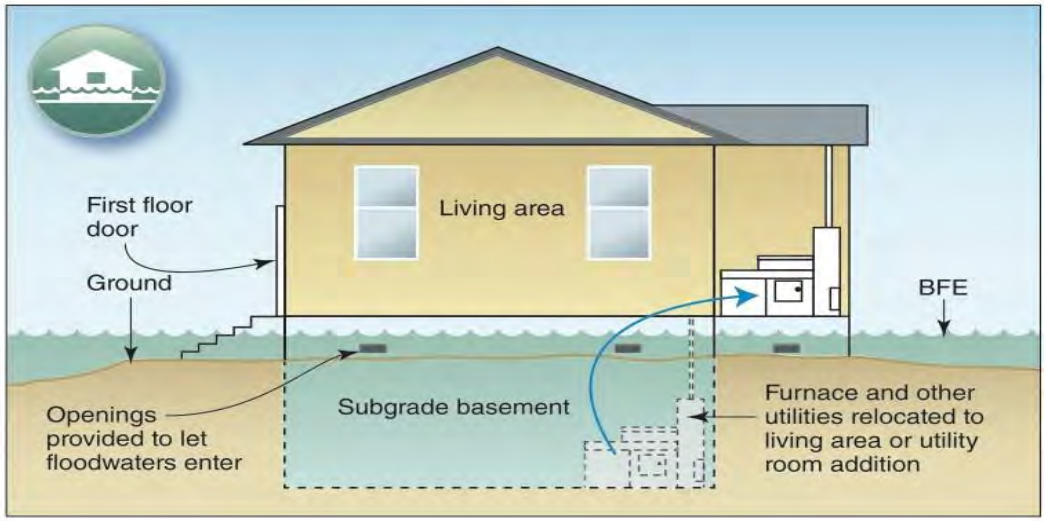
CHANGE IN MAXIMUM WATER SURFACE ELEVATION

FIGURE 18

Voluntary Home Elevation for the Steamboat Creek Tributary (Eastside Subdivision, Hidden Valley, and Rosewood Lakes Area)

- There are three primary areas that qualify for the home elevation program**: 1. Eastside subdivision, 2. Rosewood Lakes, and parts of 3. Hidden Valley Estates**.
- **Not all homes in these subdivisions qualify for the program.**
- Home elevation only makes sense when the costs of other mitigation methods is prohbitive such as when the number of homes protected is not enough to warrant a community flood wall or levee.
- It also can make sense when the cost to buy out and set aside is too great.
- The current program if in and qualified for a FEMA grant allows the homeowner to get significant home benefit without having to pay income tax.
- FEMA pays 50-90% of base costs and TRFMA pays the remaining match.
- Currently four homes have been completed since the inception of the program in 2011.
- The program has delays in getting grants, difficulty in finding qualified engineers and subcontractors.





Where is the home elevation program:



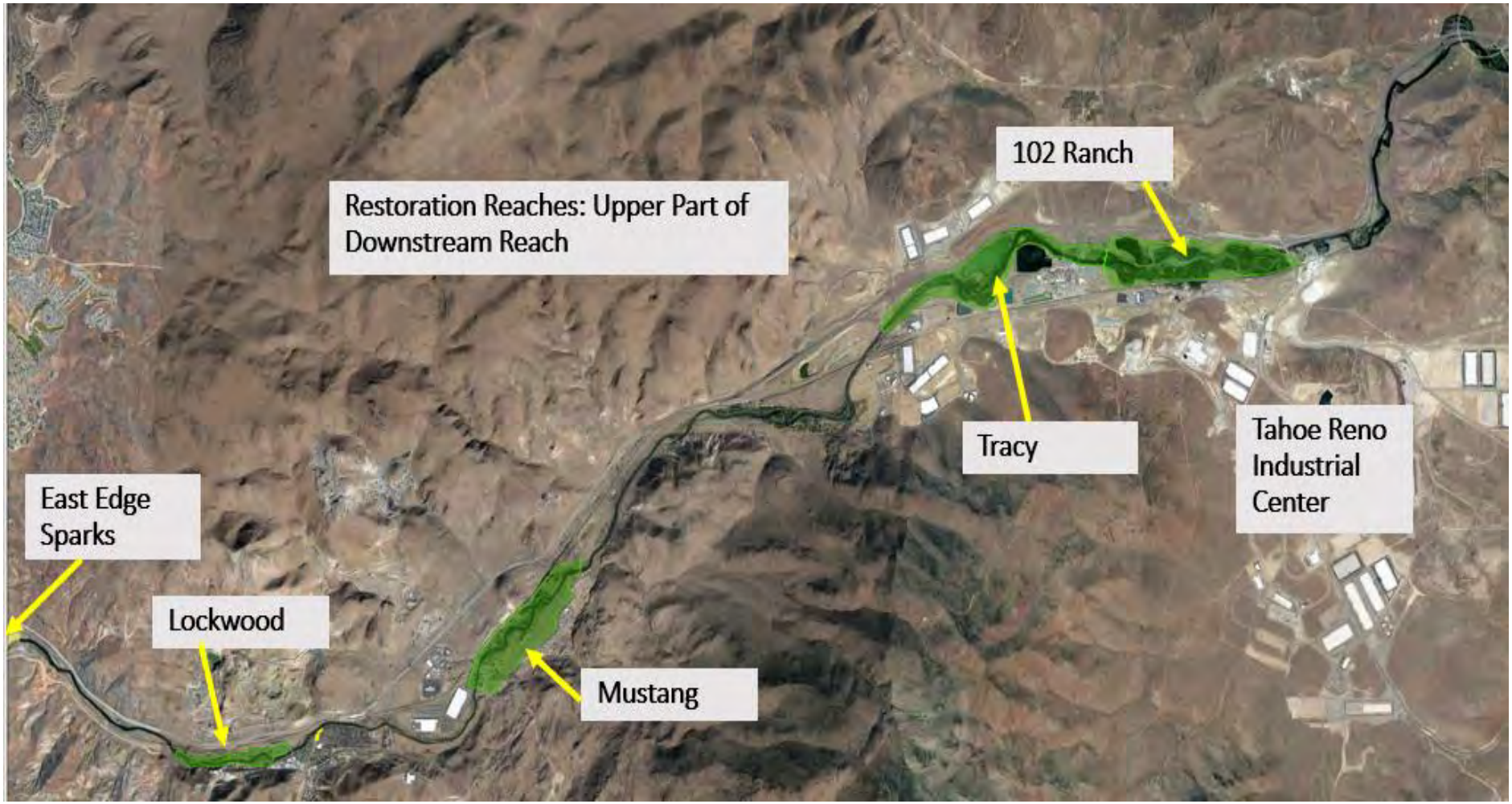
4. Section 3 – Truckee River Downstream Reach Restoration and Mitigation Projects

Goals for the Downstream Reach

- The aim of TRFMA with the downstream reach is that any effects from the Meadows Flood Project are fully mitigated. That is the residents and habitat along the river are at least as well off as they were before the project started. This means all possible impacts of the Meadows Flood Project need to be minimized and mitigated.
- Minimization of impacts include ensuring that whatever actions taken are warranted and other alternatives were explored.
- Mitigation of impacts mean studying possible impacts in detail and then designing ways to take away the negative effects without expense to the downstream stakeholders.
- The Meadows Project increases peak flow during 100-year and to a lesser degree 50-year events on the Truckee River at Vista. The idea is to study these increases to evaluate what possible impacts are and then propose mitigation for any that may be significant.
- Mitigation in the downstream reach may consist of restoration projects such as floodplain restoration that can in some cases lower peak flows at least minimally.
- Mitigation also consists of traditional protection such as levees, floodwalls, and flood proofing vulnerable infrastructure.
- Other mitigation options include restoring fish passage along the lower reach of the Truckee.



Upper Section of Downstream Reach (Restoration Sites TRFMA has partnered with other entities)



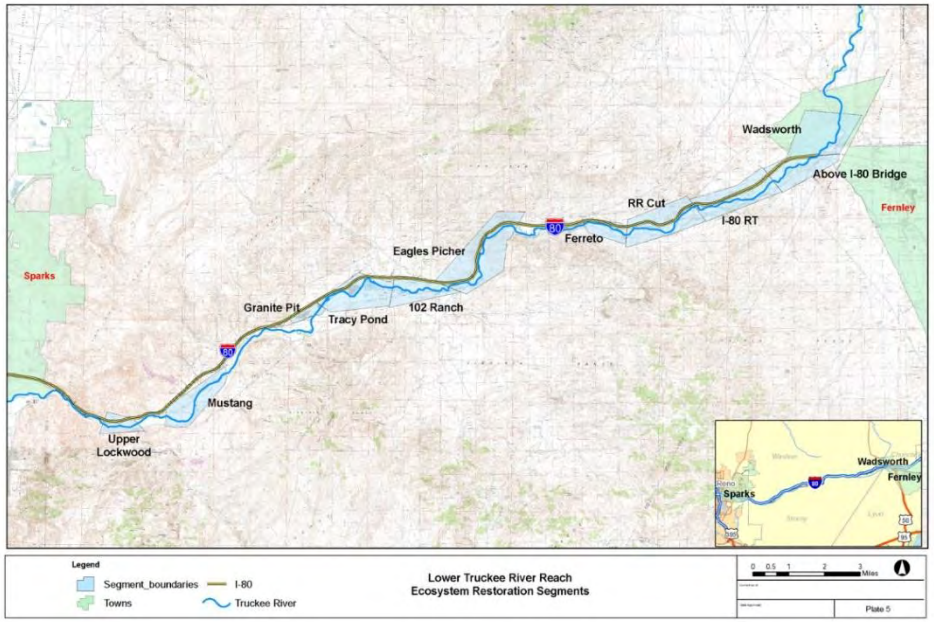
Ecosystem Restoration Projects

- Ecosystem restoration is a series of actions taken to reestablish the general structure, function, and dynamic but self-sustaining behavior of the ecosystem.
- The primary purpose of riverine ecosystem restoration projects is to restore the physical and biological functions of the river channel and floodplains; thereby improving water quality and enhancing habitat for native species of fish and wildlife.
- Other benefits include flood attenuation, decreased risk of developed property damage (floodplain preservation), riverbank stability, sediment retention (water quality improvement).
- The community's vision for the Truckee River Flood Project is to achieve flood protection goals through a combination of set-back levees, floodwalls, river terracing, bridge replacements, floodplain land acquisitions, instream and riparian restoration, and urban parkways.
- The Truckee River Flood Management Authority (TRFMA) is working with many other agencies and entities to restore the lower Truckee River, starting near Vista Narrows just east of Sparks, downstream all the way to Wadsworth, Nevada.



Before & after ecosystem restoration. (Photo courtesy of The Nature Conservancy)

- Several high-priority restoration projects have already been completed: **1. Lockwood, 2. Lower Mustang Ranch, 3. Tracy Power Plant, and 4. 102 Ranch** (total of 8 miles of river restoration and 450 acres of habitat created in/along the river).
- Monitoring is ongoing to ensure the projects are functioning as designed.
- Similar ecosystem restoration features are planned in the Truckee Meadows reach of the Flood Project.
- Future work may include a partnership with the Pyramid Lake Paiute Tribe to implement another Truckee River ecosystem restoration project at Wadsworth.
- TRFMA has partnered with The Nature Conservancy and numerous other local, state, and federal agencies and non-profit organizations to restore the lower Truckee River ecosystem (from Vista to Pyramid Lake). Partners include US Fish & Wildlife, US Bureau of Land Management, Nevada Division of Environmental Protection, Washoe County, City of Reno, City of Sparks, Pyramid Lake Paiute Tribe
- To date, the partners have invested more than $28 million to create more than 450 acres of habitat and restore more than 8 miles of the lower Truckee River. An estimated 216 jobs were created because of this work (full-time equivalents).
- The agency has contributed about $2.1 million in sales tax funds for land acquisition, planning, and construction—less than 8% of the overall cost of restoration project implementation.
- In addition, TRFMA transferred through $4.775 million in State of Nevada grant funds to implement ecosystem restoration projects via Assembly Bill No. 5 (AB-5), passed by the Nevada State Legislature in 2007.

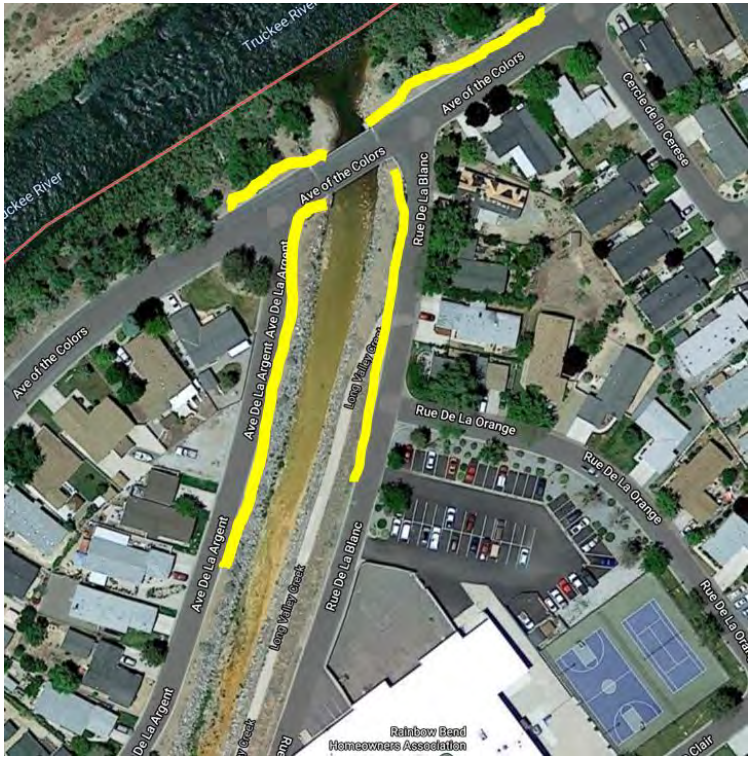




Lockwood and Rainbow Bend

- Rainbow Bend is a small community on the south bank of the Truckee River in Storey County.
- The community is plagued by flooding from Long Valley Creek and to a lesser degree the Truckee River.
- To understand impacts of the Meadows Flood Project a detailed 2-dimensional model was developed.
- The model showed that the Project and the increase in peak flows could lead to some nuisance street flooding.
- A small wall/berm was proposed to prevent this problem. (See area in yellow).







Extent of needed barrier wall or floodwall/levee for 97 event with flow increases has decreased.

Rainbow Bend Possible Solution:

- The solution was a small floodwall on the order of 8-20 inches high depending on location.
- The flood wall had a very limited extent.
- In some locations it transitioned to a small berm to allow people to get over it in a wheelchair or bike.
- The idea was it to be small and decorative.
- The floodwall will be pushed forward as mitigation when the Permit for Vista Narrows is obtained.
- Another major issue is flooding from Long Valley Creek which is not related to the Meadows Project.
- Long Valley Creek is a large watershed prone to flash flooding (see picture below).
- TRFMA assisted Storey County in getting a grant from FEMA regarding a feasibilty study on how to control or prevent flooding from the creek.

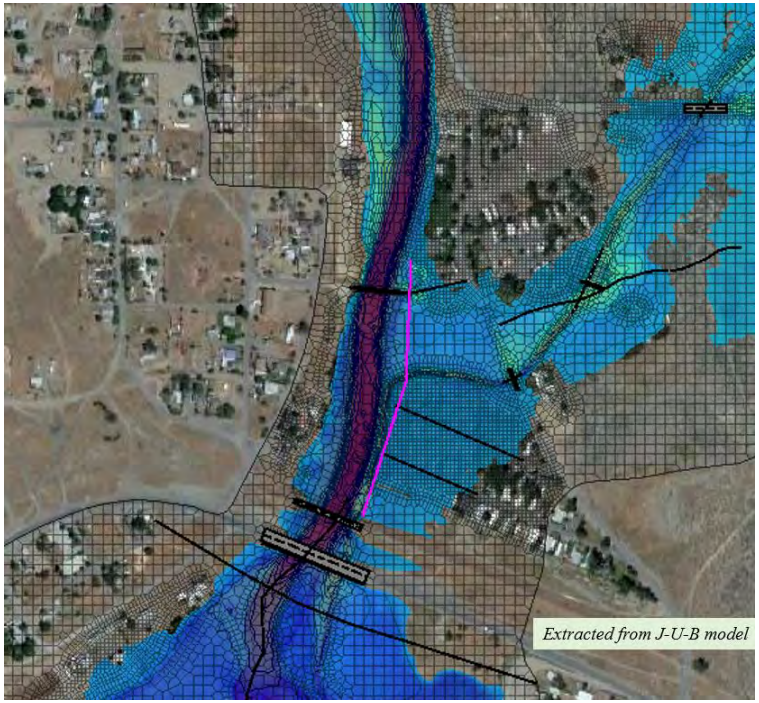


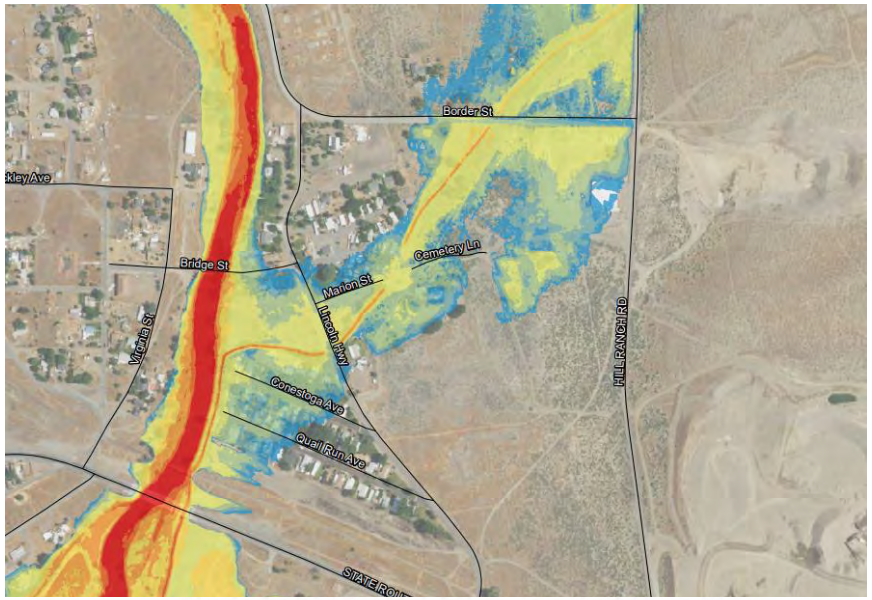


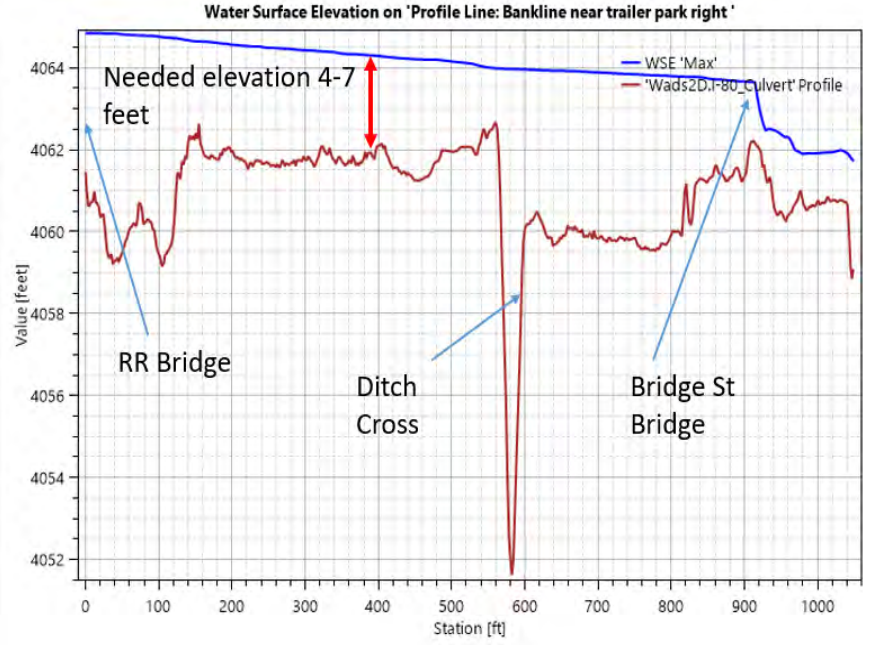


Wadsworth Bridge Mitigation (currently ongoing project)

- On the east bank of the Truckee River in the center of Wadsworth the Truckee River during floods breaks out of its bank during significant flood events.
- It often floods into a mobile home park and floods mobile homes and some other homes nearby.
- It also flows downstream and floods a quarry.
- Because of this known problem a detailed 2-dimensional model was commissioned to supplement other modeling that was done in the area.
- The Meadows Project increases in peak flow exacerbates the problem putting more water down the side channel.
- A prelininary design was commisioned to look at solutions including possible levee, floodwall and a bridge replacement to see if this helps mitigate the problem.







Wadsworth Bridge Mitigation (currently ongoing project)



- After an alternatives study, it was found that simply replacing the bridge mitigates the difference in flow levels between the existing conditions and flows with the new project.
- The old pedestrian bridge was also in bad shape, and it seems like several stakeholders were pleased with the idea of replacing the bridge. (See picture immediate right)
- The TRFMA Board of Directors has authorized the Wadsworth Bridge Mitigation to move forward immediately without waiting for the Vista Narrows permitting.
- One type of bridge being looked at are the metal bridges with wood floorboards and an arch such as the one below and to the right that is located just downstream from Mayberry Drive in Reno across the Truckee River.
- The project is in design and permitting and may be let out for construction later this year if permitting gets done.



Washoe County
Regional Hazard Mitigation Plan
Adoption Resolutions

Washoe County

REGIONAL HAZARD MITIGATION PLAN ANNEXES

2025

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City of Reno Hazard Mitigation Program

The City of Reno has a fully integrated approach to hazard mitigation planning and program implementation. Throughout the 2024 update process, the following Regional Hazard Mitigation Plan (RHMP) participation roles were recorded:

Name	Position	Department
Andrew Ancho	Division Chief, City Emergency Manager	Reno Fire Department
Douglas Buck	Planning Manager	Development Services
Kaytlin Canner	Clean and Safe Manager	City Manager's Office
Cynthia Esparza	Chief Equity and Community Relations Officer	City Manager's Office
John Flansberg	Administrator	Regional Infrastructure
Kayla Garcia	Management Analyst	Regional Infrastructure
Suzanne Groneman	Sustainability Manager	City Manager's Office
Lauren Knox	Senior Planner	Development Services
Robert Larson	Commander	Reno Police Department
Trina Magoon	Director	Utility Services
Mark Meranda	Building Official	Development Services
Oliver Miller	Deputy Chief	Reno Police Department
Jon Simpson	Engineering Manager	Utility Services
Eric Sparks	Safety and Training Administrator	City Manager's Office
Travis Truhill	Director	Maintenance & Operations
Nathan Ullyot	Director	Parks & Recreation
Khalil Wilson	Associate Director	Public Works

What's New in the 2024 Update?

With the 2024 RHMP update, Washoe County and its regional partners have recognized changes in planning priorities by placing an added emphasis on incorporating actionable strategies into the mitigation implementation plan and moving away from including ongoing coordination activities. Recent disasters and emerging hazards have also influenced planning priorities and the development of mitigation actions for the 2024 RHMP update.

The 2024 update of the RHMP includes the following major revisions to the 2020 plan:

- Incorporation of additional hazards and more comprehensive risk assessments;
- Expanded capability assessment;
- Additional mitigations.

See Appendix C in the Base Plan for the completed Federal Emergency Management Agency (FEMA) Local Plan Mitigation Review Tool for the Washoe County Regional HMP.

Plan Adoption

44 CFR §201.6(c)(5) requires that an HMP be formally adopted by elected officials from each participating jurisdiction. City Council formally adopted the 2020 update of the Washoe County RHMP.

This RHMP was approved by FEMA Region IX/ Once the plan is approved and signed, a copy of the City of Reno's adoption resolution will be placed in Appendix E of the Base Plan.

Community Profile

Governance

Now known as "The Biggest Little City in the World," the city of Reno started as a crossing point of the Truckee River for travelers moving westward during the California Gold Rush. It was officially founded in 1868 with the establishment of a railroad station, and later incorporated in 1903. Reno became the Washoe County seat in 1871. Host to a democratic municipal government, the City of Reno has a seven-member city council as the core of its governance structure, which includes the mayor, and six members representing each of the six districts—or wards—of Reno. The mayor and council members serve a four-year term. The council sets priorities and approves budgets and through the City Manager empowers city departments to advance these priorities. The City of Reno website identifies the following strategic priorities and goals for 2023-2025 (City of Reno Vision, Mission, and Priorities, n.d.).

Goals:

- Fiscal Sustainability
- Public Safety
- Economic Opportunity, Homelessness, and Affordable Housing
- Economic and Community Development

- Infrastructure, Climate Change, and Environmental Sustainability
- Arts, Parks, and Historical Resources

Areas of Focus for 2023–2025:

- Fiscal Responsibility
- Police and Fire Services
- Housing Affordability
- Master Plan Implementation
- Community Sustainability
- Downtown Revitalization

The City is organized into the following departments and offices, which oversee various divisions and programs:

- Business Licensing
- City Attorney
- City Clerk
- City Manager's Office
- Civil Service Commission
- Code and Parking Enforcement
- Communications
- Development Services
- Department of Information Technology
- Economic Development/ Redevelopment
- Equity and Community Relations
- Finance
- Fire Department
- Housing and Neighborhood Development
- Human Resources
- Maintenance & Operations
- Municipal Court
- Parks & Recreation
- Police Department
- Public Safety Dispatch
- Public Works
- Regional Infrastructure
- Utility Service

Geography and Climate

Reno is in northwestern Nevada, on the eastern slope of the Sierra Nevada range, in the Truckee Meadows basin, one of a series of north-south trending basins on the western edge of the Great Basin. The city is located approximately 23 miles northeast of Lake Tahoe and covers 111.7 square miles.

The Truckee River, one of the few terminal rivers in the United States, flows from Lake Tahoe (located in both Nevada and California) through downtown Reno to Pyramid Lake in Nevada. The city of Reno originally developed along the banks of the Truckee River "as a crossing point for travelers heading to the California gold rush in the late 1840s and 1850s."[1] "Reno was officially established in 1868, the same year that the transcontinental railroad, which paralleled the Truckee River, reached the town."[2]

Reno has a steppe climate, like Jaipur, India, or Murcia, Spain, which means it ranges between desert and humid climates. According to National Oceanic and Atmospheric Administration weather data, Reno's annual average precipitation is 7.4 inches. Most rainfall and snow occur in winter and spring, with the possibility of summer thunderstorms occurring between April and October. Extreme highs have reached 104–108 degrees Fahrenheit, and lows have reached -16 to -17. The city averages 252 days of sunshine per year. Figure 1 shows the City of Reno's average temperatures and precipitation. According to a 2024 report by Climate Central, Reno is among the fastest-warming cities in the U.S.[3]

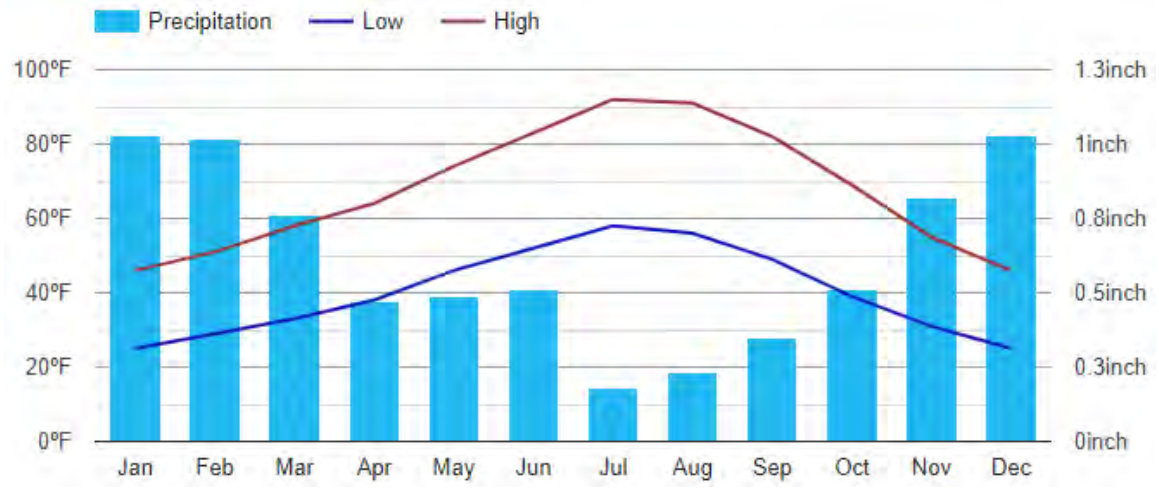


Figure 1: Climate in Reno, 2024

[1] Washoe County Nevada, "Regional-HMP-2020." https://www.washoecounty.gov/em/files/Regional-HMP-2020.pdf

[2] City of Reno, "Historic Markers." https://www.reno.gov/community/arts-culture/historic-preservation/history-of-reno

[3] Climate Central, "Earth Day: Fastest-Warming Cities and Record Clean Investment." https://www.climatecentral.org/climate-matters/earth-day-fastest-warming-cities

Population and Demographics

The 2023 Census recorded a population of 274,915 people in Reno. [4] The population grew by approximately 4.1% between 2020 and 2023, to an estimated 274,915 people in 2023.[5] (see Table 1).

Table 1: Demographics of the City of Reno[6]

Metric	City of Reno (%)	Nevada (%) (2024)
Population by age, 2024		
Under 05 years old	5.3%	5.4%
Under 18 years old	20%	21.5%
65 years and older	16.3%	17.4%
Women, 2024	49.3%	49.7%
Race/Ethnicity, 2024		
White	63.5%	71.5%
Black	3.2%	11%
American Indian, Alaskan Native	1.0%	1.7%
Asian alone	7.0%	9.7
Native Hawaiian, other Pacific Islander	0.8%	0.9%
Hispanic or Latino, any race	24.6%	39.9%

Between 2019 and 2023, an estimated 8.4% of Reno's population under the age of 65 years is disabled, and 12.4% of the city's population under the age of 65 does not have health insurance. The median household income from 2019-2023 was $78,448, with 12.5% of the city's population living in poverty. In the time range between 2019 and 2023, approximately 23.2% of the population aged five and older spoke a language other than English at home.

Between 2019 and 2023, 49.4% of housing units in Reno were owner-occupied, and the median value of these homes was $498,600. During this time, 95.7% of households owned a computer, and 88.4% had a broadband internet subscription.

[4] United States Census Bureau, "QuickFacts." https://www.census.gov/quickfacts/fact/table/renocitynevada/PST045224
[5] Ibid.
[6] Ibid.

The 2023 American Community Survey 5-year estimates reported that approximately 66.9% of the city's population over 16 years old was employed. The city's per capita income in 2023 was $45,180.

Economy

- **Industry Characteristics:** Reno's economy is predominantly service-providing, with around 80% of the workforce employed in service-providing industries and the remaining 20% in goods-producing industries. The city serves as a major outdoor resort hub, thanks to its proximity to recreational activities such as skiing and golfing, as well as legalized gambling. While gaming and recreational activities still play a significant role in the economy, Reno's business base is expanding into distribution, warehousing, and manufacturing. Over the past two decades, the proportion of Reno's workforce employed in casino-hotels has decreased from 15% to 7%, while the percentage of workers in construction, manufacturing, transportation, warehousing, public utilities, and financial activities has increased from 25% to 33%. [7]

Table 2: Businesses in the City of Reno 2022

Category	Number
All firms	7,675
Men-owned firms	4,312
Women-owned firms	S(Suppressed)
Minority-owned firms	1,335
Veterans-owned firms	391

Source: U.S. Census Bureau 2023[8]

- **Population Growth:** The population of Reno, NV, increased from 264,146 in 2020 to 274,915 in 2023. This represents an increase of 4.1%. (Reno Gazette Journal, n.d.)
- **Economic Growth:** (Reno's Economy, n.d.). The casino-hotel sector in the city of Reno is still recovering from the impact of the Great Recession. Although Reno's economy is mainly driven by service-providing industries, with 80% of the workforce employed in these fields, the city is seeing growth and development in distribution, warehousing, and manufacturing facilities.

[7] U.S. Bureau of Labor Statistics, "Western Information Office." https://www.bls.gov/regions/west/news-release/occupationalemploymentandwages_reno.htm#TableA

[8] United States Census Bureau, "QuickFacts." https://www.census.gov/quickfacts/fact/table/renocitynevada/SBO001217

Land Use and Ownership Trends

Reno is located between the Carson Range on the west and the Virginia Range on the east in a broad valley called the Truckee Meadows. Early development in Reno was located near the Truckee River, with heavy industrial uses growing along the river, including metal works, a refuse transfer station, and open storage. Public spaces are also located along the river.

As the city and adjoining areas have grown, development has pushed outward from the valley floor onto the mountain's alluvial fan or directly onto its hillside. Much of the current development in the northwest and southwest areas, and properties in between Reno and the Reno Stead Airport to the north, are in areas where slopes range from 10–30%.[9] Much of the City's new growth in the last 10 years has occurred in the North Valleys and southeast areas.

LAND USE PLANNING

The growing city currently measures 112 square miles. The city abuts large swaths of U.S. Forest Service lands in the Sierra Nevada mountains.

The 2019 Truckee Meadows Regional Plan describes the type, location, and pattern of growth desired for the Region. The plan highly prioritizes infill and core development supported by adequate facilities and services, and strongly discourages development in fringe areas. This is accomplished through a framework consisting of a Regional Land Designation tiering system and accompanying policies. Although The Truckee Meadows Regional Plan was recently updated and adopted in the fall of 2024, the overall substance and concepts of the 2019 plan were maintained.

Median housing prices are increasing in Reno and the surrounding region, making it likely that the development of new housing in and around the city will increase if the national economy continues to be strong. The Truckee Meadows Housing Study[10] calls for a wider variety of housing types to meet anticipated demographic shifts and affordable housing needs; it recommends infill in the metropolitan area to add additional "missing middle housing"—smaller, more affordable housing types—to support a situation in which the cost of owning single-family detached housing in the area has gone up by more than 60% over the last two decades while household incomes have increased by only 17%. Building on the Housing Study,

[9] City of Reno, "City of Reno Jurisdiction-Specific Annex-Washoe County Regional Hazard Mitigation Plan." https://ieminc4.sharepoint.com/sites/WashoeCountyNVMJHMPUpdate/IEM%20Internal%20Documentation/Forms/AllItems.aspx?id=%2Fsites%2FWashoeCountyNVMJHMPUpdate%2FIEM%20Internal%20Documentation%2FPrior%20Plan%2FReno%5FJurisdiction%20Annex%2Epdf&viewid=4c93d35a%2D64af%2D49de%2D8b83%2D0908815c6f42&parent=%2Fsites%2FWashoeCountyNVMJHMPUpdate%2FIEM%20Internal%20Documentation%2FPrior%20Plan

[10] Truckee Meadows Regional Planning Agency, "TMRPA 2016 Housing Study." https://tmrpa.org/affordable-housing/#HousingStudy

in 2019, the Regional Strategy for Affordable Housing was developed, with an aim to produce more affordable rental housing, diversify housing options, expand access to homeownership, preserve affordability, and protect residents from displacement. The 2019 Regional Strategy for Affordable Housing contains a community profile and a strategy roadmap for solutions and implementation over the next ten years.[11]

The City of Reno Master Plan is an evolving plan that provides a vision for the built environment of the city and guides land use decisions. Its current iteration, adopted in 2017, is called ReImagine Reno. It covers all of the land within the city limits and its Sphere of Influence. The ReImagine Reno Master Plan has a planning horizon through the year 2036. The Master Plan supports the community desire of Reno to become a base for outdoor activities, an art and culture center, and a technology center and university town. To achieve this, the Master Plan contains foundational guiding principles and goals, citywide policies, area-specific policies, a growth and reinvestment framework, and an implementation plan. The ReImagine Reno Master Plan is consistent with the Regional Plan in that it highly encourages core area and infill development to ensure efficient delivery of public services and reduce the impact on the surrounding natural areas.

- **Transportation:** Numerous initiatives are underway to improve public transportation in Reno. The Regional Transportation Commission (RTC) is currently working on an Active Transportation Plan for the Truckee Meadows to create a vision and identify measures to improve walking and biking infrastructure throughout the county. RTC has recently issued a draft Street Typology Guide which represents a systematic approach to prioritizing the safety and comfort of pedestrians and cyclists in the City and in Washoe County. (rtcwashoe.com) The City of Reno and RTC are working together on a downtown Micromobilty study which included a pilot Project in 2022 The City of Reno and RTC are paving the road for a more vibrant, safe, and strong downtown Reno by building on the Downtown Reno Action Plan. The City is focused on improved walking, biking, and transit connectivity to make it safer and easier for the public to take advantage of more sustainable ways to visit downtown, the Truckee River, the University of Nevada, Reno, and surrounding local businesses while enhancing road safety for all users. The Micromobility Pilot Project focuses on transportation improvements for small, low-speed, human or electric-powered transportation devices such as bicycles, scooters, and e-bikes, collectively referred to as “micromodes.” This project is one part of meeting the strategic goals outlined in adopted plans and addressing converging needs in transportation management, public health, and climate.[12]

[11] Truckee Meadows Regional Planning Agency, 2022, “2019 Regional Strategy for Housing Affordability”

[12] City of Reno, “Micromobility Pilot Project.” https://www.reno.gov/community/sustainability/bicycling-and-micromobility/micromobility-pilot-project

- **Public Parkland:** The City of Reno currently owns, operates, and maintains 89 parks and recreation facilities, totaling approximately 927 acres. In November of 2023, the city adopted a new Parks, Recreation, and Open Space Master Plan, which builds off of the community expressed desires and concepts in the ReImagine Reno Master Plan. ReImagine Reno has set goals for the preservation and enhancement of interconnection between the parks network and to support non-motorized transportation in the city.
- **Sustainability, Resiliency, and RenoResilience.** Reno is a 3-STAR Community under the STAR Communities Rating System, which helps communities track and gain points in the goal areas of built environment, climate and energy, economy and jobs, education, arts and community, equity and empowerment, health and safety, natural systems, and innovation and process. Per its first and only sustainability report in 2017, the city of Reno was ranked the number 31 greenest city in America by WalletHub.

Reno launched ReEnergize Reno to promote investment in energy efficiency and waste reduction, including improving the efficiency of commercial, industrial, and multifamily buildings by 20% by 2025. The program is part of the U.S. Department of Energy's Better Buildings Challenge. The city supports participants with technical assistance on benchmarking, education, financing options information, and recognition.

LEED is the world's most widely used green building program, created by USGBC as a leadership standard defining best practices for healthy, high-performing green buildings. In December 2022, Reno was advanced to a LEED Gold Certified City and was ranked #33 in LEED Cities for 2024.[13]

NATURAL RESOURCES

The following major natural systems are present in the Truckee Meadows basin:

- **Geology:** The city of Reno is located on the western edge of the Basin and Range geological province. The Basin and Range Province is characterized by high desert punctuated by rows of mountain ridges that run roughly north to south. As these mountain ridges push up through the Earth's crust, they can cause earthquakes, making this region one of the most earthquake prone in the U.S. These ridges also create a closed basin, meaning that water that falls in the basin stays there until it evaporates or is removed through human activity. Area geology is also affected by tectonic forces outside the Basin and Range, such as deformation along the San Andreas Fault system in California. The 500-mile-long Walker Lane zone of faulting passes approximately 30 miles northeast of the Reno area. Nearly 100

[13] United States Green Building Council, 2024, https://www.usgbc.org/leed/rating-systems/leed-for-cities-communities

faults have been mapped in the Truckee Meadows. However almost all of them have remained inactive for at least 1 million years.[14]

- **Watersheds:** Reno lies in the Truckee River watershed. The Truckee River flows 140 miles from Lake Tahoe to Pyramid Lake, north of Sparks. The river drains an area of 3,120 square miles in western Nevada and eastern California. The basin includes 11 major streams that drain into the river. Most of the river flow is allocated to users through a system of user rights set out in the Truckee River Operating Agreement.[15]
- **Wildlife:** Species that are native to lower montane woodlands and sagebrush habitats in the Truckee Meadows region include raptors like the ferruginous hawk and bald eagles, bats, sparrows, burrowing owls, lizards, small mammals, such as the dark kangaroo mouse and kit fox, mule deer, pronghorn antelope, and sage grouse. Natural communities and open spaces contribute to the region's scenic character and provide recreational opportunities for residents. The Truckee River supports the federally listed threatened Lahontan cutthroat trout and federally listed endangered cui-ui, as well as brown, brook, and rainbow trout and mountain whitefish.

Cultural Resources and Values

Cultural resources can be defined as the "physical evidence or place of past human activity: site, object, landscape, structure; or a site, structure, landscape, object, or natural feature of significance to a group of people traditionally associated with it".[16] Evidence of long-term human inhabitation of the Truckee Meadow region still exists in archaeological sites, including rock art, seasonal camps, and residential communities, and the artifacts that may be found at these sites. Both the Washoe and Paiute people inhabited territory in Truckee Meadows. The Washoe were a hunter–gatherer society. The southwest Truckee Meadows alluvial fan has significant archeologic sensitivity from long-term habitation, with resources, including hunting sites, game fences, quarries, and winter villages.

Paiute and Washoe people in the last 1800's and early 1900's were known to live on land currently occupied by Idlewild Park, University of Nevada, Reno campus, Vaughn Mill, near Manogue High School, in the hills north of Truckee Meadows, and along the river.

[14] City of Reno, "City of Reno Jurisdiction-Specific Annex-Washoe County Regional Hazard Mitigation Plan." https://www.washoecounty.gov/em/files/PDFs/Hazard%20Mitigation%202020/Reno_Jurisdiction%20Annex.pdf

[15] Truckee Meadows Water Authority, "Truckee River Operating Agreement." https://tmwa.com/your-water/topics-facts/truckee-river-operating-agreement/

[16] National Park Service, "Acadia." https://www.nps.gov/acad/learn/management/preserve-history.htm

HISTORIC RESOURCES

In 2012, the City Council adopted the Historic Plan as a component of the City of Reno Master Plan, with the following vision statement:

> Identify, recognize, and encourage the preservation of Reno's historic resources that include historic buildings, structures, objects, neighborhoods, emigrant trails and highways, archeological sites, and landscapes in an effort to foster civic and neighborhood pride so that future generations will have the opportunity to appreciate and understand Reno's unique cultural heritage.

The plan demonstrated the city's value for the preservation of historic resources. The City of Reno Register of Historic Place was established in 1993.

In ReImagine Reno, the most recent City of Reno Master Plan, the plan calls attention to sustainable development principles to be adhered to for all development in Reno's centers, corridors, and neighborhoods, including encouraging the retention and incorporation of historic and cultural resources. The same concept is applied to any alterations of public land at the urban–rural interface. The plan also encourages the integration of cultural and historic resources at the neighborhood design level. Adaptive reuse is encouraged.

Hazard Profiles and Vulnerability Assessments

This section presents hazard profiles and vulnerability assessments to determine the potential impact of hazards on the people, economy, and built and natural environments of the city of Reno. They have been streamlined to increase the effectiveness and usability of the RHMP. Additional details are contained in the Vulnerability Assessment Section of the Base Plan

FEMA	**B1.** Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [the City of Sparks]? (Requirement §201.6(c)(2)(i)) **B2.** Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for [the City of Sparks]? (Requirement §201.6(c)(2)(i)) **B3.** Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement 44 CFR 201.6(c)(2)(ii))

Washoe County has experienced several major disaster declarations that may have affected the city of Reno. In total, the County has experienced 41 federal disaster or fire management

assistance declarations since 1953. Table 3 identifies the declarations since 2020 that may have affected the city of Reno.

Table 3: Major Disaster Declarations in Washoe County since 2020[17]

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard Mitigation Program Declared	Declaration Date	Title
5448	No	Yes	Yes	08/14/2022	Fire
5382	No	Yes	Yes	11/17/2020	Fire
5328	No	Yes	Yes	08/15/2020	Fire
5326	No	Yes	Yes	08/03/2020	Fire
5322	No	Yes	Yes	7/21/2020	Fire
5316	No	Yes	Yes	06/27/2020	Fire

The hazard profiles and vulnerability assessments contained in this annex represent a considerable amount of work performed by the Mitigation Planning Team (MPT). Planning Team members ranked hazards using several key considerations, followed by activities to validate hazard analysis results and identify specific areas of risk. The City of Reno representatives to the MPT identified the following hazards for further assessment. (Refer to the HMP Base Plan for regional risk assessments for moderate and low-priority hazard profiles.)

- Avalanche and Landslide
- Criminal Acts and Terrorism
- Drought
- Earthquake
- Energy Emergency
- Flood
- Hazardous Materials Incident
- Infectious Disease
- Radiological Waste Transport
- Extreme weathers (Winter Storm, Windstorms, Extreme Heat)
- Transportation Incident
- Volcano
- Wildland Fire

[17] FEMA, "Disaster Declarations for States and Counties." https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

Hazard Ranking Methodology

A risk assessment result for the entire county does not mean that each municipality is at the same amount of risk for each hazard. Each jurisdiction considered how it is uniquely at risk of the hazards profiled. The Calculated Priority Risk Index (Table 4) assessment resulted in hazard rankings for the City of Reno.

Table 4: Factors for Calculating Risk

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Probability *What is the likelihood of the hazard occurring?*	1	Unlikely	Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.	30%
	2	Occasional	1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.	
	3	Likely	11 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years.	
	4	Highly Likely	91 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.	
Magnitude *What will be the overall impact?*	1	Negligible	Less than 5% of the affected area's critical and non-critical facilities and structures are damaged/destroyed. Only minor property damage and minimal disruption of life.	30%

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
			Temporary shutdown of critical facilities.	
	2	Limited	Greater than 5% and less than 25% of property in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than one day but less than one week.	
	3	Critical	Greater than 25%, but less than 50% of property in the affected area was damaged/destroyed. Complete shutdown of critical facilities for over a week but less than one month.	
	4	Catastrophic	Over 50% of critical and non-critical facilities and infrastructures in the affected area are damaged/destroyed. Complete shutdown of critical facilities for more than one month.	
Onset *How long will be there be between when it is recognized the hazard is approaching and when the hazard will begin affect the community?*	1	Self-defined	More than 24 hours	10%
	2	Self-defined	12 to 24 hours.	
	3	Self-defined	6 to 12 hours.	
	4	Self-defined	Less than 6 hours.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Duration *What is the length of time the hazard will remain active, including how long emergency operations will have to continue after the hazard event?*	1	Brief	Up to 6 hours.	10%
	2	Intermediate	Up to one day.	
	3	Extended	Up to one week.	
	4	Prolonged	More than one week.	
Frequency *How often has this kind of hazard resulted in an emergency or disaster?*	1	Every 10+ years	This hazard is not frequent but may still impact the area.	20%
	2	Every 5–10 years	This hazard is not as frequently occurring but it could occur in the next 10 years.	
	3	Every 1–5 years	This hazard is likely to occur relatively often. It may have occurred more or less frequently recently, but on average, it can be expected every 1–5 years.	
	4	Annually	This hazard is a frequent occurrence which the area actively has to respond to on an approximately annual basis.	

The following is the risk factor equation:

Risk Factor Equation

RF Value = [(Probability x .30) + (Magnitude x .30) + (Onset x .10) + (Duration x .10) + (Frequency x .20)]

The Washoe County base plan is comprehensive for regional assessments and effectively addresses the calculated risk indexes. It provides a thorough evaluation that highlights its commitment to risk management and community safety, while the annexes are specific to each jurisdiction.

Table 5: Calculated Priority Risk Index for the City of Reno

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Avalanche and Landslide	1	1	1	2	1	1.5
Criminal Acts and Terrorism	3	2	4	2	3	3.1
Drought	3	2	1	4	2	3.2
Earthquake	2	2	1	4	2	2.9
Energy Emergency	2	2	4	2	3	2.7
Flood	3	2	2	3	3	3.2
Hazardous Materials Incident	2	1	4	2	3	2.5
Infectious Disease	2	2	1	4	2	2.9
Radiological Waste Transport	1	2	4	2	1	2.1

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Extreme weathers (Winter Storm, Windstorms, Extreme Heat)	4	2	1	3	4	3.6
Transportation Incident	2	1	4	2	1	2.1
Volcano	1	1	1	3	1	1.2
Wildland Fire	4	2	4	3	4	3.9

Note: Radiological waste transport and volcano hazards were not initially ranked by the MPT. In subsequent meetings, these hazards were identified as low probability but potentially high-magnitude hazards. Risk assessments for both hazards are included in the Risk Assessment Section of the Base Plan.

Ratings: 1: 1 = lowest, 5 = highest; 2: 1 = slowest, 5 = fastest; 3: 1 = shortest, 5 = longest

Hazard-Specific Profiles and Risk Assessments

Wildland Fire

LOCATION

As the city and adjoining areas have grown, development has pushed outward from the valley floor onto the mountain's alluvial fan or directly onto its hillside—areas that fall in a higher fire risk rating. On its website, the City of Reno notes that "living among the foothills in Reno is known as living in the Wildland Urban Interface or WUI." Reno weather often brings high winds, low humidity, and hot temperatures during summer months. However recent years have shown that fire danger can exist all year round.

Washoe County maintains a geographic information system (GIS) Fire Risk Rating System from Low to Moderate to High to Extreme. Most of Reno's urban center and along Interstate 80 (I-80) and U.S. Route 395 (US 395) is Low Risk. However, nearing the foothills, the rating progressively increases to High. The Cold Springs area and the western reaches of the city are in this high-risk area.

In its Master Plan, the City expresses its intention to reduce wildland fire risk by working "collaboratively with Washoe County, the Bureau of Land Management, the U.S. Forest Service, and other partners to develop and implement management plans for lands surrounding the city to minimize fire hazards and risks that could be worsened due to more intense drought cycles, a decline in forest health, and other impacts of climate change."

Fire protection is provided by the Reno Fire Department, the Truckee Meadows Fire Protection District, and the Sparks Fire Department. The City of Reno Fire Department operates 14 fire stations with 17 fire companies and has 21 front-line structure engines, 4 ladder trucks, and 8 brush trucks designed to respond to wildland fires. Furthermore, the City of Reno has a minimum of two additional units dedicated strictly to emergency medical service response.

EXTENT

As economic growth continues to increase demand for residential and commercial growth outside the urban center, more development will take place in the foothills and in the WUI, increasing the likelihood that the city will be impacted by a wildland fire. While lightning strikes account for many wildland fires in the region, most fires are caused by people. On its website, the City recommends various ways humans can help reduce risk by creating defensible space (for example, reducing vegetation in the yard), properly disposing of cigarette butts, and following the law as related to fireworks and target shooting, to name a few.

In Washoe County, wildland fires are frequent and inevitable. Most fires burn between June and October, and they occur nearly every year. City of Reno representatives to the MPT rated wildland fires as one of the most frequent hazards likely to impact the city.

PREVIOUS OCCURRENCE/HISTORY

While there have not been wildland fires in the city of Reno boundaries listed in the Washoe Regional Mapping System since 2015, there have been instances of wildland fires just outside jurisdictional boundaries that underscore the threat, particularly to the growing communities in the foothills.

Wildland fires near the city between 2015 and 2023 are listed below. Based on these events and recorded historic occurrences of wildland fires, there is an estimated 35%–45% chance of a fire occurring within city boundaries each year.

- **August 2017 Whites Fire** – Natural caused, 30 acres, south of Reno
- **August 2017 Prater Fire** – Undetermined cause, 2,816 acres in Sparks
- **August 2017 I-80 Fire** – Undetermined cause, 514 acres in Sparks
- **July 2017 Cold Springs Fire** – Undetermined cause, 1,523 acres
- **August 2016 Hawken Fire** – Human-caused, 278 acres, just outside of Caughlin Ranch.

- **July 2016 S Fire** – Undetermined cause, 2,554 acres in Sparks
- **June 11, 2023: Trail Fire-Nevada** – A fire began on June 11th and is burning north of Reno near the communities of Stead, Lemmon Valley, and North Valley, NV. The combined population is 73,000. The fire threatened a local watershed, power transmission lines, and road and rail infrastructure.
- **October 24, 2023, Hill Fire near Verdi area** – A fire broke out at 11:00 pm, and homes were evacuated on both the Nevada and California sides of the state line near Dog Valley Road. Truckee Meadows Fire and Protection crews worked to stop the brush fire burning in the Verdi area that ultimately burned 47 acres of land due to erratic winds and threatened to encroach on an estimated 40-60 homes on Hill Road from Bridge Street to Dog Valley Road neighborhoods.
- **August 23, 2021, California Dixie and Caldor Fires –** Dense smoke from massive wildfires burning in neighboring California created hazardous air quality in the Reno-Tahoe area, canceling flights and forcing the closure of schools, parks, and popular summer beaches. Government air monitors recorded some of the region's most hazardous conditions in years. The National Weather Service issued an air quality alert for parts of northeast Nevada's Elko County, more than 300 miles (482 kilometers) east of the closest California fires. Smoke blowing from the Dixie and Caldor fires in California blanketed northern Nevada on and off for weeks, leaving particulate matter in the air and causing ash to rain on cars in some areas.
- **November 17, 2020, Greater Reno/Carson City –** Powerful Pacific jet stream, rain shadowing, and mountain waves yielded some of the highest winds the region has seen in a few years. Still, dry vegetation and high winds contributed to several major wildfires near Reno, NV, and Walker, CA. A brief period of spillover rain and snow occurred that night into the morning of November 18.
- **November 17, 2020, Pinehaven Fire** in Caughlin Ranch area of SW Reno with wind gusts 72-77 MPH measured in the vicinity. On Tuesday, November 17, at approximately 1 p.m., a fire started on the hillside just south of Pinehaven Road and Sierra Pine Drive. Five structures were lost, twenty-four structures damaged, and 1300 homes were evacuated. The fire caused utility interruption and street closures, with a 512-acre perimeter. The Reno Police Department and Reno Fire Department responded.
- **October 4, 2020, The Baccarat Fire** started near Red Rock Road north of Reno on the 4th before being contained on the 8th. The fire burned 10,500 acres, with no structures destroyed. However, the fire threatened 75 to 100 homes. Mandatory evacuations were ordered for some residents in the path of the fire. Firefighting costs were approximately $2.4M, according to the Carson City District Office, Nevada Bureau of Land Management. October was dry and warm, with much of the area reporting no measurable precipitation during the month.
- **June 27, 2020, Poeville Fire** – The Poeville Fire was reported burning on the east side of Peavine Mountain. High winds caused the fire to quickly grow and push into Northwest part

of the City of Reno. The fire burned approx. 3000 acres and was contained on July 6, 2020. The fire threatened businesses, roads and neighborhoods and resulted in the evacuation of over 400 people. Eight structures were lost in the fire.

- **August 24, 2019, the Long Valley Fire** started near the Red Rock exit along US Highway 395 and spread across the California/Nevada border into northwestern Nevada the 24th before being contained on the 27th. The fire burned 2,438 acres, and one structure was destroyed. FEMA stated that the fire threatened 250-300 homes in and around Rancho Haven Nevada. The fire also threatened five buildings, infrastructure, utilities, equipment, farms, ranches, and a watershed in the area. Mandatory evacuations were ordered for approximately 800 people before containment was reached. Firefighting costs were approximately $600K, according to the Nevada Bureau of Land Management. The fire was caused by warm temperatures and dry conditions that occurred from the 23rd through the end of the month. Breezy conditions occurred on the 24th and 25th, but the combined effects of winds and humidity did not reach critical fire weather criteria.
- **August 24, 2019, Cold Springs** – The Cold Springs Fire burned 1,523 acres south of Silver Lake. The fire was driven by high winds and aided by abundant fuel with few natural breaks. The fire damaged or destroyed power lines in multiple locations and threatened about 100 residences, though there were no casualties.

PROBABILITY OF FUTURE OCCURRENCES

Based on projected changes in the timing and quantity of snowmelt and increases in the frequency and magnitude of drought and extreme heat, the city may be impacted by an increase in the probability of future wildland fires.

The Washoe County Fire Plan[18] identified 41 communities included in the risk/hazard assessment for Washoe County. Nearly half of these areas have high and extreme fuel hazard conditions within one mile of the community boundary. In some cases, hazardous fuel conditions occur within the community boundaries. Many of the areas classified as moderate fuel hazards have a large component of cheatgrass. During years with above-normal precipitation and abundant growth of cheatgrass, perennial grass, and annual forbs, these areas can escalate into high fuel hazard conditions. Table 6 lists five primary factors that affect the potential fire hazard assessed to arrive at the community hazard assessment score: community design, construction materials, defensible space, availability of fire suppression resources, and physical conditions, such as the vegetative fuel load and topography.[19]

[18] Washoe County Fire Plan, 2004 Executive Summary – Washoe County Fire Plan – Nevada Community Wildfire Risk / Hazard Assessment – RCI (rci-nv.com)
[19] Ibid.

Table 6: Results of Community Risk and Hazard Assessment

Community	Interface Condition	Interface Fuel Hazard Condition	Ignition Risk Rating	Community Hazard Rating
High and Extreme Hazard Communities				
Red Rock	Intermix	Low to High	High	High
Moderate Hazard Communities				
Mogul (I-80 Corridor West)	Classic	Moderate	High	Moderate
Reno-Northwest	Classic	Moderate to High	High	Moderate
Reno-Southeast	Intermix	Moderate to High	High	Moderate
Verdi	Intermix	Moderate to Extreme	High	Moderate
Low Hazard Communities				
Reno-Southwest	Classic	Low to High	High	Low
Sparks	Classic	Low to Moderate	Low	Low

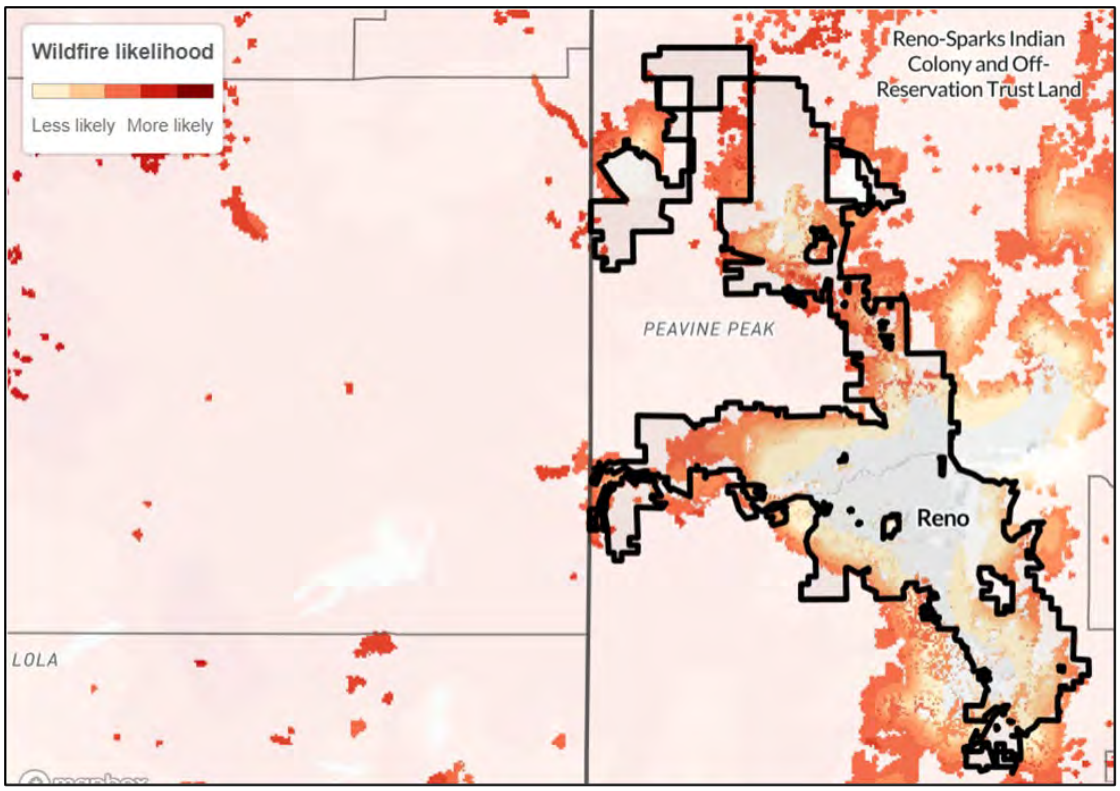


Figure 2: Populated Areas and Wildfire Likelihood in the City of Reno[20]

Populated areas in Reno have on average, greater risk than 81% of communities in the US. and are predominantly exposed to wildfire from indirect sources, such as embers or home-to-home ignition.[21]

VULNERABILITY ANALYSIS

According to USDA Forest Service Data on wildland fire potential, much of the northern reaches of the city of Reno and Northwest Reno, extending toward Verdi and the California border, are in high-risk zones. The Hidden Valley area and the Caughlin Ranch area also are high-risk zones. These are all areas at the outer reaches of City boundaries, where development is creeping toward the mountains.

City of Reno ranked wildland fires as **High Risk**.

ESTIMATED IMPACT AND POTENTIAL LOSSES

As development continues to increase in medium- and high-risk areas, the risk of wildland fire damage to homes and other structures will increase. New development is taking place in City

[20] Wildfire Risk to Communities, 2024, "City of Reno Populated Areas Wildfire Likelihood." Wildfire Risk to Communities
[21] Ibid.

outskirts and foothills, resulting in increased development in an eight-minute response time zone. Some new planned development, in the Cold Springs Valley for example, is outside the response time of existing fire stations, making any new development in this area especially vulnerable to wildland fires until a new fire station is acquired. Until a permanent fire station can be established, the Master Plan limits development to up to 1,700 single-family units.

IMPACT ON COUNTY ASSETS

Several critical infrastructure facilities have a medium risk of wildland fire. Galena High School—established in 1992—is rated 3 on a scale of 1–6 for wildland fire risk. Two fire stations at lower medium risk (2 on a scale of 1–6) include Peavine near Peavine Mountain in northwest Reno and Station 39 in the wooded foothills of southwest Reno.

VULNERABLE POPULATION

Diminished air quality is an environmental impact that can result from a wildfire event and pose a potential health risk. The smoke plumes from wildfires can contain potentially inhalable carcinogenic matter. Fine particles of invisible soot and ash that are too small for the respiratory system to filter can cause immediate and possibly long-term health effects. The elderly, those with compromised respiratory systems, and the unsheltered community may be more vulnerable to the effects of diminished air quality after a wildfire event.

2020 SARS-CoV2 studies conducted in Reno Nevada indicated that wildfire smoke may have greatly increased the number of COVID-19 cases in Reno. The results substantiate the role of air pollution in exacerbating the pandemic and can help guide the development of public preparedness policies in areas affected by wildfire smoke, as wildfires were likely to have coincided with the COVID-19 pandemic in 2021.[22]

[22] Kiser, D., Elhanan, G., Metcalf, W. J. et al. “SARS-CoV-2 test positivity rate in Reno, Nevada: association with PM2.5 during the 2020 wildfire smoke events in the western United States”. J Expo Sci Environ Epidemiol 31, 797–803 (2021). https://doi.org/10.1038/s41370-021-00366-w

Table 7: Demographics of the City of Reno by Vulnerability to Wildfire[23]

Vulnerable populations
All areas in Reno

Indicator	Number	Percent
Families in poverty	4,751 ±529	6.3% ±0.7%
People with disabilities	36,039 ±1,523	11.6% ±0.5%
People over 65 years	49,764 ±1,627	15.9% ±0.6%
People under 5 years	18,473 ±1,269	5.9% ±0.4%
People of color	117,190 ±7,202	37.5% ±2.4%
Black	8,377 ±1,078	2.7% ±0.3%
Native American	4,202 ±629	1.3% ±0.2%
Hispanic	73,239 ±3,497	23.4% ±1.2%
Difficulty with English	9,749 ±1,087	3.3% ±0.4%
Households with no car	9,753 ±735	7.6% ±0.6%
Mobile homes	6,265 ±572	4.9% ±0.7%

[23] Wildfire Risk to Communities, 2024. "City of Reno Population Demographics by Vulnerability to Wildfire." https://wildfirerisk.org/explore/vulnerable-populations/48/48409/

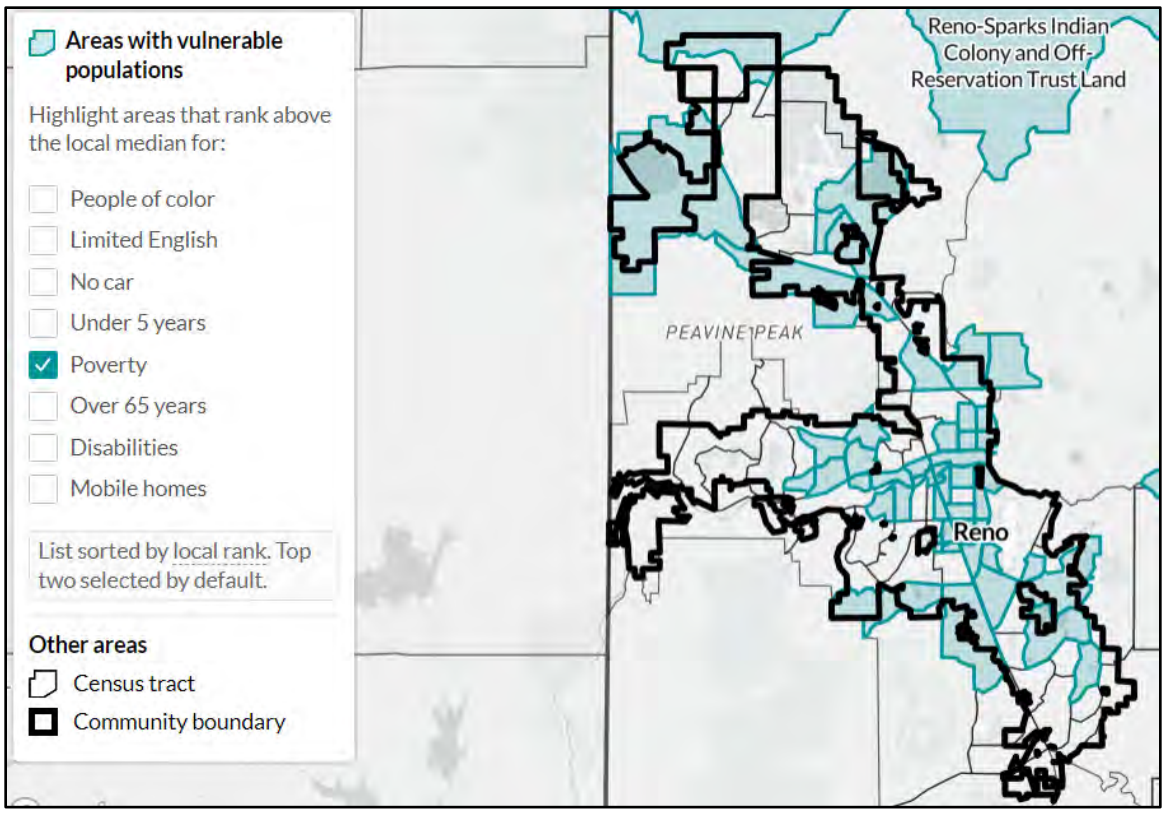


Figure 3: Areas in the City of Reno with Vulnerable Populations – Poverty[24]

The Climate and Economic Justice Screening Tool from the U.S. Climate Resilience Toolkit was used to determine what vulnerabilities impacted Washoe County. According to this tool, which uses 2020 U.S. Census data, Washoe County has 27 disadvantaged populations by census tract, depending on the portion of the County, because it meets the threshold for more than one of the following categories: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. According to the Climate and Economic Justice Screening Tool, the portion of Reno considered disadvantaged is represented in Figure 4.

[24] Wildfire Risk to Communities, 2024, "City of Reno Areas with Vulnerable Populations." Wildfire Risk to Communities

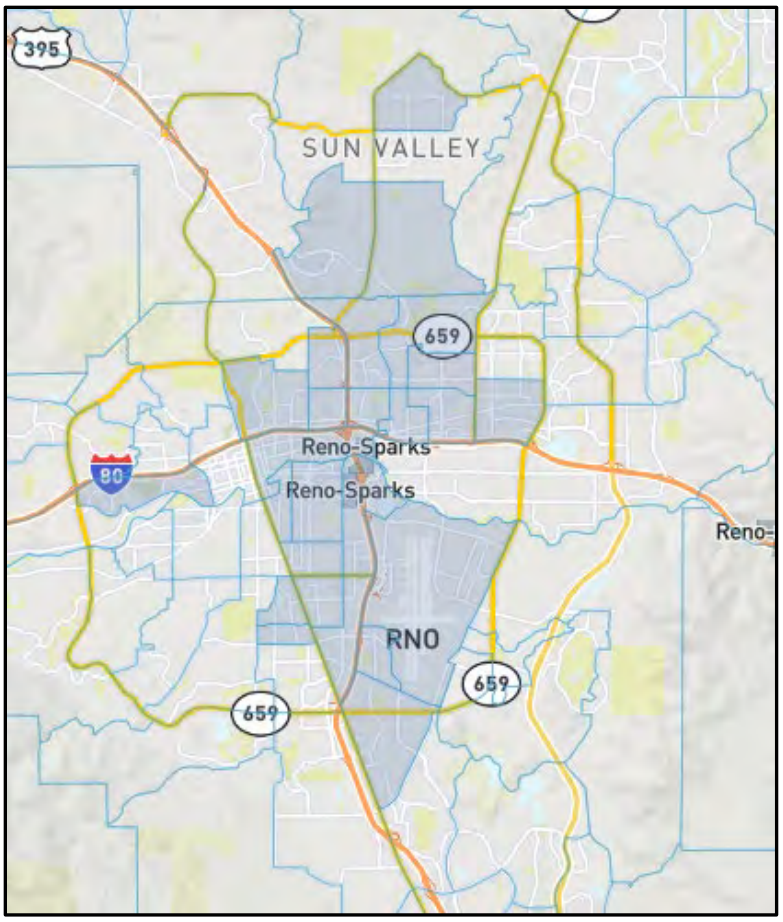


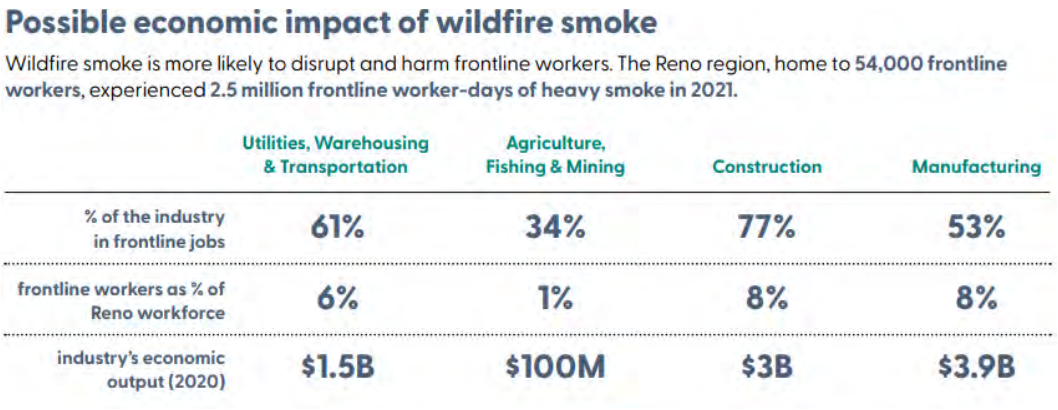
Figure 4: 27 Census Tracts in Washoe County Designated as Disadvantaged (in Gray)[25]

DEVELOPMENT TRENDS

- **Economic:** Regional economic development has resulted in demographic changes and increased urban growth that has put more people and structures in the WUI (Increased Vulnerability).
- **Land Use:** Recent development in unincorporated areas of the County near the cities of Reno and Sparks has occurred in the WUI (Increased Vulnerability).
- 2024 Washoe County Lands Bill would convey 15,860 acres of public land around Reno and Sparks to be sold at auction to developers; an additional 3,400 acres are designated for

[25] Climate & Economic Justice, 2024, "Washoe County-27 Census tracts designated as disadvantaged in gray" Explore the map – Climate & Economic Justice Screening Tool (geoplatform.gov)

specific purposes, including roadway expansions, regional parks, and K-12 school sites, increasing the WUI.[26]



Possible economic impact of wildfire smoke

Wildfire smoke is more likely to disrupt and harm frontline workers. The Reno region, home to **54,000 frontline workers**, experienced **2.5 million frontline worker-days of heavy smoke in 2021.**

	Utilities, Warehousing & Transportation	Agriculture, Fishing & Mining	Construction	Manufacturing
% of the industry in frontline jobs	61%	34%	77%	53%
frontline workers as % of Reno workforce	6%	1%	8%	8%
industry's economic output (2020)	$1.5B	$100M	$3B	$3.9B

Figure 5: Possible Economic Impact of Wildfire Smoke in the Reno Metro Area in 2021[27]

Continued regional growth and development pressure is likely to lead to additional development outside the urban centers of Reno and Sparks in the WUI. As new areas are developed, additional fire response resources will be needed to quickly respond to reported fires and limit damage.

VULNERABILITY SCORE

City of Reno ranked Wildland Fire as **High Risk**.

EXISTING MITIGATION CASE STUDY

The world's largest public-facing network of wildfire detection cameras, an AI-assisted system, delivers early alerts about new fires, improving response times and helping firefighters put out small fires before they become major incidents. The ALERTWest system is the result of a merger of systems developed by the University of Nevada, Reno, along with the University of California San Diego and the University of Oregon's Oregon Hazards Lab. ALERTWest includes about 1,200 cameras providing a real-time view of wildfire prone areas. The cameras, which typically are mounted on top of tall mountains, lookout towers, or high-rise buildings to allow a 360-degree view of the landscape, can zoom, rotate, and tilt, enabling fire managers to monitor conditions in real time or later through time-lapse footage. The ALERTWest operating software uses artificial intelligence to continuously monitor for new wildfire ignitions and deliver timely alerts to firefighters and dispatch centers. One benefit of the ALERTWest network is that the public is

[26] The Nevada Independent, Gabby Birenbaum, 2024, Exclusive: Rosen introduces Washoe county lands bill years in the making – The Nevada Independent

[27] San Francisco Fed, 2021, "Possible Economic Impact of Wildfire Smoke." Wildfire Smoke in the Reno Metro Area (frbsf.org)

able to access the cameras and see what the fire is doing so that communities and individuals can make more informed decisions.[28]

COMMUNITY WILDFIRE PROTECTION PLAN

A Community Wildfire Protection Plan (CWPP) is a collaborative strategy crafted by communities and stakeholders to mitigate the risks posed by wildfires. These plans involve assessing local vulnerabilities, engaging residents, government agencies, fire departments, and other stakeholders in the planning process, and outlining specific measures to reduce the potential impacts of wildfires. Key CWPP components include conducting risk assessments, implementing mitigation strategies, such as creating defensible spaces around homes and infrastructure, improving emergency access routes, and enhancing community preparedness and evacuation planning. CWPPs are often mandated or encouraged by government agencies at various levels to promote wildfire resilience and public safety. For example, the City of Reno's CWPP is tailored to address the specific challenges and opportunities presented by its urban-wildland interface, focusing on prevention and response strategies to safeguard lives, property, and natural resources while fostering a resilient community.[29]

Energy Emergency

LOCATION

Energy emergencies can affect any portion of the planning area. Rural and populated areas alike are known to experience power outages during winter and windstorms that can last anywhere from several hours to several weeks. The overall effects of a widespread energy emergency would be concentrated in population centers, but the condition is likely to be present throughout the planning area. The electric utility provider for the planning area is NV Energy (formerly Sierra Pacific Power Company). NV Energy owns and operates no facilities that are rated "critical" according to the Department of Homeland Security criteria for National Critical Facilities.

EXTENT

The overall magnitude and potential severity of impacts of energy emergencies is considered Low in Washoe County. Typical energy emergency events are handled at the regional level, and economic impacts could affect the entire County. Considering a worst-case scenario, an energy emergency could require federal support, impact critical facilities, disrupt services for several days, and have national economic impacts. According to the Nevada Office of Energy, multiple

[28] KOLOTV News Now, May 6, 2024, "Western Wildfire Camera Network Now Largest of its Kind." https://www.kolotv.com/2024/05/06/western-wildfire-camera-network-now-largest-its-kind/

[29] City of Reno, 2024, "Community Wildfire Protection Plan." Wildfires and Living in the Wildland Urban Interface | City of Reno

alternative energy sources are in place, which may reduce the extent of a possible energy emergency by providing alternatives in the event of a failure.

PREVIOUS OCCURRENCE/HISTORY

Historically, utility disruptions have been caused by both natural and human-caused events. These events include earthquakes, wildland fires, floods, and human activities. Most energy emergencies can be traced back to weather events. Outages can affect fewer than 20 customers in rural areas or more than 50,000 in the cities of Reno and Sparks.

Between 2009 and 2015, there were nine large weather outages in the County, resulting in power loss ranging from 8 to 31 days. The 2013 State of Nevada Enhanced HMP lists an additional six significant outages between 2009 and 2014. NV Energy provided updated data on outages across its system for the 2020 RHMP update (Table 8).

Table 8: Power Outages between 2014 and 2018

Year	Number of Outages	Average Duration (minutes)
2014	934	201
2015	1,323	412
2016	962	219
2017	1,134	223
2018	1,042	192
Grand Total	**5,395**	**259**

The 2018 Nevada State Enhanced HMP references a major power outage in Washoe County due to a weather-related event. From November 9 to 10, 2015, a severe winter storm resulted in numerous broken tree branches because of heavy, wet snow. Over 35,000 customers were without power in Washoe County due to downed power lines.

- **In January 2019,** another winter storm caused 4,000 homes in Washoe County to lose power, requiring 10 specialized NV Energy trouble crews and 50 power line technicians working for over 12 hours to address the issue. [30]
- **On April 11, 2022**, more than 4,400 customers were without power across Northern Nevada. NV Energy reported that the biggest outages were in Washoe and Humboldt

[30] 2 News Nevada, "Northern Nevada's Power Outages: Causes and Cures." https://www.2news.com/townnews/electricity/northern-nevadas-power-outages-causes-and-cures/article_715b0b56-6289-56bf-8cdf-6f80b7e17a56.html

counties and Carson City. The biggest outage in Washoe County was in Sparks and affected more than 700 customers. More than 1,200 customers in Carson City were affected.[31]



Figure 6: Utility Pole with Power Lines and Transformers[32]

- **On March 2, 2024, March 26, 2024, and June 1, 2023,** Electrical Outages at the Truckee Meadows Water Reclamation Facility (TMWRF) – Several pieces of equipment were corrupted or were otherwise damaged or destroyed. Off-shift personnel were required to respond to the wastewater treatment plant, incurring overtime costs, battery backups for operations technology and information technology were drained, causing a hard shutdown of the servers. Upon startup, there were significant challenges due to degraded or failed mechanical, electrical, IT, and controls equipment. Lack of control systems, accumulation of water in the collection system, storm conditions, and the failure of 25% of the granular media filtration process caused significant hydraulic bottleneck conditions in the filter process. As a result of this hydraulic constraint, several areas of the treatment facility, including the filter building, post-aeration tank, spent backwash tank, pipe trench A, pipe trench B, and nitrification tower moats, experienced flooding. In spite of severe complications due to the power outage, TMWRF staff prevented permit violations.
- **On March 3, 2024**, NV Energy reported numerous outages across Norther Nevada. More than 2,700 customers across Northern Nevada were without power. In a release, NV Energy stated the outages were related to severe wind and significant snow. NV Energy stated that poor visibility and road conditions increased restoration times.[33]

[31] 2News Nevada, 2022, Power Restored to 600+ NV Energy Customers Across Northern Nevada | News | 2news.com
[32] Reno Gazette Journal, 2015, Jupiter Images, http://www.jupiterimages.com
[33] 2News Nevada, 2024, NV Energy Reports Numerous Outages Across Northern Nevada, Sierra | News | 2news.com

- **On January 21, 2024**, NV Energy reported that over 2,100 NV Energy customers were without power in parts of Northern Nevada. Around 6 a.m., 6,000 NV Energy customers did not have power in the region, but that number dwindled to about 1,100 people by 7:30 p.m., according to NV Energy's website. NV Energy's outage map showed that most of the outages were concentrated in and around Reno and Carson City, with the largest single outage in Reno impacting 845 people.[34]

PROBABILITY OF FUTURE EVENTS

Due to the sporadic history of occurrences, the broad range of potential causes, the unpredictability of these causes, and the improvements in energy supply systems because of previous failures, the probability of future occurrence is difficult to measure for this hazard. The overall probability of future energy emergency events is considered medium.

The probability of energy emergencies may increase because of climate change. According to NV Energy, "changes in the climate and environment are contributing to an increased risk of wildfires and other natural disasters. We're responding to these changes in a number of ways to protect our customers, community, and equipment from the risk of extreme weather. This includes public safety outages and other measures."

One way that climate change could impact the odds of an energy emergency is due to increased demand. As temperatures rise and extreme heat events become more frequent, there is increased demand for power to keep cool, which could cause widespread power outages. Extreme weather events due to climate conditions could further increase the risk of weather-related equipment damage as well.

NV Energy implemented the Public Safety Outage Management (PSOM) program to plan power outages to more areas in Northern Nevada with elevated fire risk, recognizing safety as a priority. The goal of the program is to protect customers and the community from the risk of wildfires in extreme and elevated fire-risk areas of Nevada by shutting off power in one or more of its extreme or elevated fire-risk zones when certain environmental conditions are met, and an evaluation of risk is done with guidance from local emergency management teams and other stakeholders. This helps prevent power lines, things that are blown into power lines, and other equipment from causing a wildfire. Residents in Carson City, Washoe, would be affected by the scheduled power outages. NV Energy monitors weather patterns seven to 10 days ahead for any concerning weather patterns. By the 72-hour mark, NV Energy will begin to communicate with local emergency management officials and discuss where they see risks.

[34] Las Vegas Review Journal, Taylor Lane, January 14, 2024, Reno, Carson City experience power outages across region from downed power lines | Local Nevada | Local (reviewjournal.com)

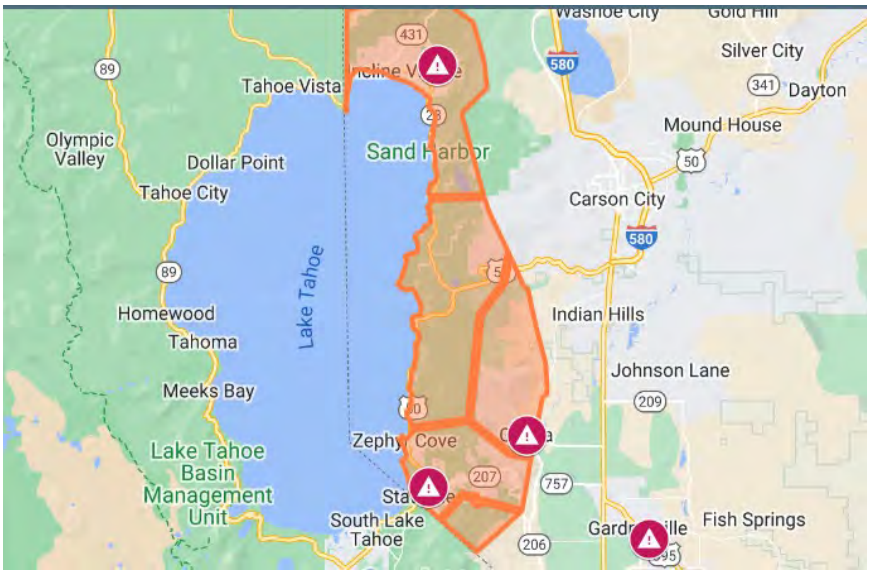


Figure 7: The Northern Nevada Public Safety Outage Management Zone

VULNERABILITY ANALYSIS

Prolonged power outages can cause health emergencies and increased demand for emergency medical services, especially in Nevada, where vulnerable people may be exposed to extreme summer or winter weather conditions. Power outages can also cause disrupted utilities or damaged infrastructure, such as frozen pipes, and economic impacts due to the loss of perishable food and other items. Depending on the cause, a power outage or other energy emergency can cause cascading impacts—most significantly, wildland fires—if an outage was caused by a downed line or other physical damage.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Nevada Governor's Office of Energy Status of Energy Report 2023 states that Nevada's economy relies on the production of safe and affordable energy. It provides essential services to Nevadans and serves as a magnet for new businesses, new industries, and new jobs. For this reason, in 2023, Governor Joe Lombardo outlined a comprehensive and balanced energy policy for Nevada that embraces a wide range of fuels, technologies, and supporting infrastructure. The policy goal is to develop and maintain a robust and diverse energy portfolio that will ensure that Nevada's energy needs are met, making significant progress toward this objective on multiple fronts.[35]

The estimated impacts and potential losses to the City of Reno due to an energy emergency can be significant. Economically, businesses that rely on energy may face operational disruptions,

[35] Nevada Governor's Office of Energy Status of Energy Report 2023, Nevada (nv.gov)

leading to financial losses, especially for small businesses that could temporarily or permanently close.

Public services, including water supply and emergency services, could also be strained, raising public health concerns. Job losses may occur in industries affected by energy shortages, increasing unemployment and destabilizing the local economy.

Additionally, property damage is a risk, particularly for businesses with perishable goods or reliance on machinery, leading to further economic repercussions. Infrastructure may also suffer, as power outages disrupt traffic signals and public transportation, posing safety hazards for residents.

Socially, residents may experience reduced quality of life due to lack of heating or cooling and limited access to information from internet outages. Increased costs for emergency responses and repairs could strain the district's budget.

Finally, the long-term economic effects of energy emergencies could deter investment in the region, making it crucial for local leaders to implement effective energy management strategies and resilience planning.

VULNERABLE POPULATIONS

In addition to the human toll, utility failures, such as power outages, can disrupt daily routines and activities. They can cause transportation delays, canceled trips, and difficulties commuting to work, school, or other important engagements. They can also disrupt access to essential services, such as clean water, electricity, healthcare facilities, and communication networks, compromising people's health, safety, and quality of life. Populations with disabilities or limited mobility face heightened vulnerability. Inaccessible infrastructure because of power failures, such as access to ramps, elevators, or accommodations for visual or hearing impairments, can hinder their ability to evacuate, access emergency services, or receive timely information during incidents.

NV Energy states that some outages occur because of events beyond their control, such as extreme weather conditions and vehicle accidents involving utility poles and equipment. Customers who rely on electricity to power their electrically operated medical equipment must plan to have a backup power supply or make alternate plans for using those devices and refrigerating medications. Also, periods of high heat, high winds, and winter snowfall can cause power outages, and extended outages could impact the community; for example, closing stores, transportation, banks, and gas stations.

DEVELOPMENT TRENDS

- **Economic:** NV Energy has been working to expand its energy generation facilities to incorporate more renewable energy facilities and replace aging equipment on a regular basis. Nevada leads the nation in solar power potential and has already made significant

strides in growing its solar energy capacity. Since 2016, the state's solar energy generation has nearly tripled. As of 2022, solar energy generation accounts for 23 percent of the state's total electricity. Currently, 37 percent of Nevada's electricity comes from renewable sources, helping meet the growing demands of the state, and ensuring that homes and businesses can rely on a robust and secure energy supply (Decreased Vulnerability).

- **Land Use:** The County's upward trend in development increases the overall demand on utilities (Increased Vulnerability).
- **Future development** will create increased demand for utility services. In general, utility providers plan for and complete capital improvements to meet future demands. Factors such as budget constraints or the need to construct new utility plants, like wastewater treatment plants or power generation facilities, may affect the ability of utility providers to serve a significant number of new customers.

VULNERABILITY SCORE

City of Reno ranked energy emergency as **High Risk**.

Extreme weathers (Windstorms)

EXTENT

The NOAA National Center for Environmental Information (NCEI) database reports 193 High Wind events for Sparks from 2019 to 2024, resulting in $5k in property damage, 2 injuries, and one death.

- **July 14, 2019:** A long wave trough moved across the northwestern US from the 13th through the 17th and brought breezy conditions each afternoon to western Nevada. A 9-year-old Reno girl died on 19 July from injuries she suffered when strong winds blew an inflatable bounce house with three children inside into power lines. The Washoe County Sheriff's Office says the bounce house was uplifted about 10 feet and got caught on the lines in a south Reno neighborhood.

  Deputies and firefighters rescued the children. They treated two for minor injuries at the scene and transported the 9-year-old girl to the hospital, where she succumbed to her injuries 19 July. The incident occurred on the afternoon of 14 July around 3 p.m. PST. Authorities told KOLO-TV that the bounce house seemed to be secured to the ground but was caught by an especially strong gust of wind. Winds were sustained 15-20 mph with gusts 20-25 mph at nearby Reno-Tahoe International Airport around the incident time.

PROBABILITY OF FUTURE EVENTS

The probability of severe windstorms is **High**, and the potential impact of future climate conditions could increase the risk of Extreme weather events. However, since Extreme weathers occur each year, Reno has a number of mechanisms in place to promote safety.

DEVELOPMENT TRENDS

- **Economic:** Over $30 million from the City and one billion dollars in private/other public investment has been made in downtown Reno to modernize and beautify infrastructure and facilities (Increased Vulnerability).
- **Land Use:** The City's upward trend in development increases the overall strain on responding to winter storm impacts at various locations (Increased Vulnerability).
- **Future Land Use:** The city's increasing population trends put more individuals and assets at risk of Extreme weathers (Increased Vulnerability).

VULNERABILITY SCORE

City of Reno ranked Extreme weathers as **High Risk**.

VULNERABLE POPULATIONS

In Reno, several populations may be particularly vulnerable to extreme windstorms. One of the most affected groups includes the elderly. Older adults often face mobility challenges, making it difficult for them to evacuate or seek shelter during severe weather events. Additionally, they may rely on external assistance for basic needs, which can be disrupted during such storms.

Another group at risk is low-income residents. Many individuals in this demographic may lack the resources to prepare for extreme weather, such as purchasing necessary supplies or accessing transportation to safer areas. Their living conditions may also be less stable, with homes that are not as well-equipped to withstand harsh winds, increasing the likelihood of damage and resulting displacement.

The homeless population is also particularly vulnerable. Without access to safe housing or emergency shelters, individuals experiencing homelessness are exposed to the elements during windstorms, facing serious health risks. Community outreach and support services become essential in these situations to ensure that they receive protection and assistance.

Children and families are also at risk, especially those living in mobile homes or inadequately constructed housing. These structures are more susceptible to damage from windstorms, and young children may rely on their guardians to make decisions regarding safety and evacuation.

Ultimately, individuals with disabilities may encounter distinct challenges during windstorms. They may require specific accommodations or support to navigate evacuations or access emergency services safely.

Earthquake

An earthquake is sudden motion or trembling of the ground caused by shifting tectonic plates. Earthquakes are potentially catastrophic and capable of causing multiple fatalities and major structural and infrastructure damage, including disruption of utilities, communications, and transportation systems. Secondary effects can include landslides, seiches, liquefaction, fires, and dam failure.

Earthquakes occur abruptly, with little or no warning time. However, seismic monitoring in certain cases can detect increases in geologic and seismic activity that precede an earthquake event. The duration of earthquakes ranges from a few seconds to a few minutes. Aftershocks can recur over hours, weeks, or months, usually with diminishing frequency and intensity.

LOCATION

The State of Nevada is the third most seismically active state in the United States, and Washoe County is in one the most seismically active areas in Nevada. Overall, any area of the County is susceptible to noticeable effects of earthquakes. The most hazardous fault zones in Washoe County are the Mount Rose fault zone, the West Tahoe fault, and the Pyramid Lake fault. In addition, dozens of smaller faults are in developed areas throughout the County. Fault zones in the Earth's crust are the result of shear motion between tectonic plates and are the causal locations of most earthquakes.

Seiches, or standing waves in a closed body of water, can cause inundation impacts similar to a tsunami. Areas near the shorelines along Lake Tahoe and Pyramid Lake may be affected by seiches following an earthquake. The potential inundation zone surrounding Lake Tahoe includes shoreline areas with an elevation of 6,260 feet.

The location of seismic activity in the State of Nevada from the 1840s through 2015 is indicated in Figure 8. Southern Washoe County, near Reno, Sparks, and north of Lake Tahoe, has higher probabilities of occurrence and more severe potential impacts due to population densities.

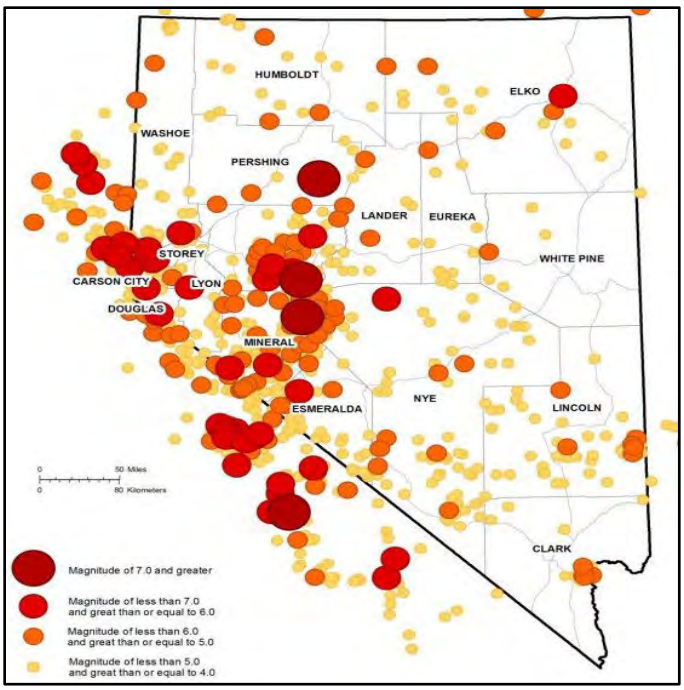


Figure 8: Earthquakes of Magnitude ≥4 in Nevada and Adjacent States, 1840s–2015[36]

EXTENT

There are many methods for measuring the power of an earthquake. The Richter Scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as a magnitude 6.3. Velocity, acceleration, and amplitude (displacement) are examples of aspects of ground motion that can be directly measured. The amount of energy released during an earthquake is commonly expressed on the moment magnitude scale and is a measure of energy released from the fault or epicenter, as recorded on seismographs. The use of the moment magnitude scale has largely replaced the use of the Richter Scale.

Another measure of earthquake magnitude is intensity. Intensity is an expression of the amount of shaking at a given location on the surface as felt by humans and is defined by the Modified Mercalli Intensity (MMI) Scale. It is typically the greatest cause of losses to structures during earthquakes and is determined by many factors, including distance from epicenter and soil types. Table 9 features abbreviated descriptions of the 12 levels of intensity of the Modified Mercalli Intensity Scale.

[36] 2018 State of Nevada Enhanced Hazard Mitigation Plan, Nevada Seismological Lab, Nevad Bureau of Mines and Geology, “Earthquakes in Nevada Magnitude 4.0 or Greater, 1840-2015.”

Table 9: Magnitude/Intensity Comparison for Earthquakes[37]

Magnitude	Typical Maximum MMI	Abbreviated Modified Mercalli Intensity Scale
1.0–3.0	I	I. Not felt except by a very few under especially favorable conditions.
3.0–3.9	II–III	II. Felt only by a few persons at rest, especially on upper floors of buildings.
		III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4.0–4.9	IV–V	IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
		V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0–5.9	VI–VII	VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
		VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0–6.9	VIII–IX	VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
		IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.

[37] US Geological Survey, "Magnitude/Intensity Comparison for Earthquakes" (http://earthquake.usgs.gov/learn/topics/mag_vs_int.php, page last modified September 29, 2014)

Magnitude	Typical Maximum MMI	Abbreviated Modified Mercalli Intensity Scale
7.0 and higher	X and Higher	X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
		XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
		XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Figure 9 is the National Seismic Hazard model illustrating the chance of slight (or greater) damaging earthquake shaking (MMI VI or greater) in 100 years. Washoe County is in the 75-95% greater chance range.

Earthquakes can cause significant, widespread structural damage throughout the region. Most critical facilities in Washoe County are in areas that may experience relatively high seismic ground motion hazards. These facilities may experience peak ground acceleration with a 2% probability of exceedance in 50 years of greater than 48% gravity, which would be experienced as severe shaking likely to cause moderate or heavy damage to structures. For most critical facilities in the County, smaller earthquakes (resulting in peak ground acceleration with a 10% probability of exceedance in 50 years) could produce ground motion ranging from 16% to 64% gravity. These levels of peak ground acceleration would be experienced as strong to severe shaking and could cause light to heavy damage to structures.

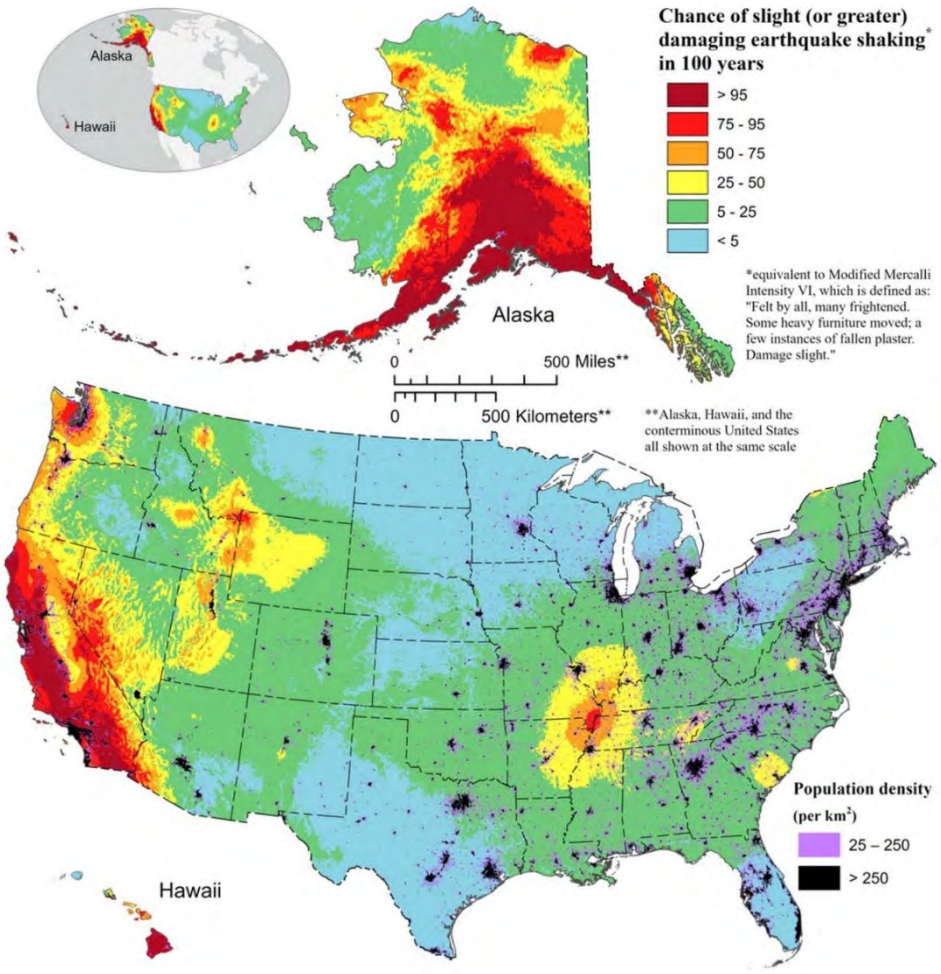


Figure 9: National Seismic Hazard Model[38]

PREVIOUS OCCURRENCE/HISTORY

The National Center for Environmental Information (NCEI) storm database, one source of historic information presented in the data of this plan, does not capture earthquake events in the same way as other hazards. Previous earthquake data in Washoe County were extracted from the Nevada Seismological Laboratory and the USGS online archives (Nevada Seismological Laboratory 2010; USGS n.d.). Magnitudes less than five on the MMI Scale are likely to be felt by many people but are unlikely to cause damage to property. At a magnitude of 5 or greater on the MMI Scale, earthquakes are felt by most people, and some unstable objects may be broken or overturned. Previous earthquake occurrences are highlighted when an occurrence resulted in a magnitude of 5 or higher on the MMI Scale between 1852 and 2023.

[38] USGS, 2023, "National Seismic Hazard Model." National Seismic Hazard Model (2023) – Chance of Damaging Earthquake Shaking | U.S. Geological Survey (usgs.gov)

The following earthquakes of M5 or greater occurred in Washoe County between 1852 and 2023:

- May 30, 1868: M6.0
- December 27, 1869: M6.7
- July 10, 1877: M5.0
- June 3, 1887: M5.5
- November 18, 1894: M5.5
- February 18, 1914: M6.0
- April 24, 1914: M6.4
- April 27, 1914: M5.0
- May 25, 1937: M5.0
- June 18, 1937: M5.3
- May 9, 1942: M5.1
- December 3, 1942: M5.9
- December 29, 1948: M6.0
- May 9, 1952: M5.1
- September 26, 1953: M5.5
- September 26, 1959: M5.3
- April 25, 2008: M5.0

The largest earthquake in the past 50 years in Washoe County occurred on April 25, 2008. Small earthquakes began in the western Reno, Nevada, region in February 2008 and grew in size and frequency until mid-April. On April 15, 2008, seismic activity greatly increased, producing four events of magnitude 3 and above. The earthquake swarm increased again on April 24, 2008, with two magnitude 4 events. The mainshock occurred on April 25, 2008, with a magnitude of 5 and caused violent shaking at Mogul and Somersett. A vigorous aftershock sequence followed into the summer of 2008.

Figure 10 illustrates recorded earthquakes in and near Reno Nevada at magnitude 5 or greater between 2018 and March 2024.

While buildings overall survived the shock well, reports indicated that the violent rocking of buildings led to some structural damage, such as cracked paint and plaster along drywall seams, wall and ceiling corners, and doors and entryways. There were some instances of cracked stucco on outside walls and dislodged roof tiles. These types of repairs to a home can cost a couple thousand dollars. In fewer cases, garage walls were displaced from the foundation. More complicated repairs such as this are estimated to cost $5,000–$10,000. There was significant nonstructural damage due to the earthquake. Many homes and businesses withstood damage to household items and merchandise. One utility, a water canal used as a source for local water treatment, withstood damage from the earthquake (Figure 11).

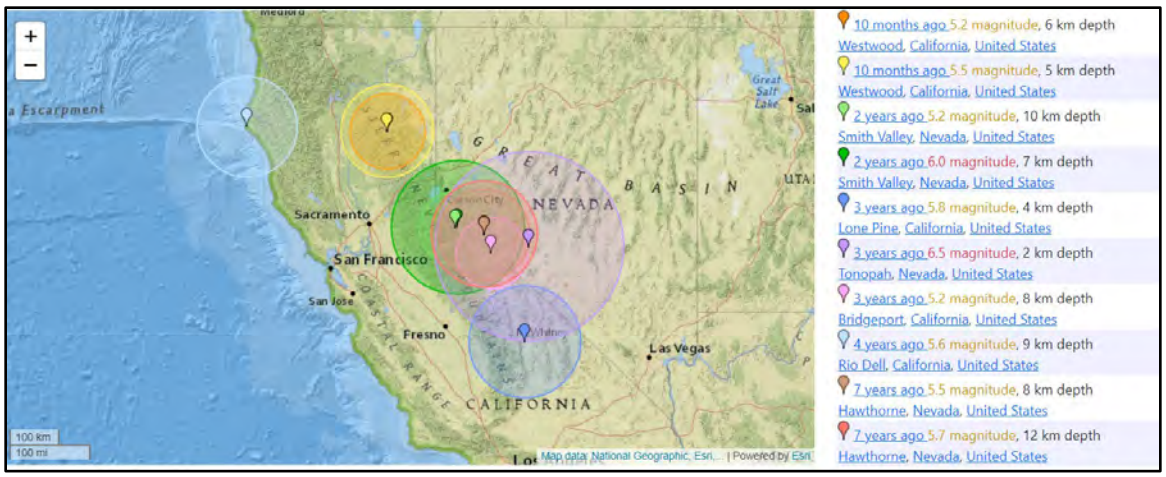


Figure 10: Earthquakes >M5 Near Reno Nevada (As of 4/1/2024)[39]



Figure 11: Water Flume Damaged by the 2008 Mogul–Somersett Earthquake[40]

PROBABILITY OF FUTURE EVENTS

Figure 12 maps the potential intensity of earthquakes in Nevada at a common level of peak ground acceleration. The map shows the intensity of peak ground acceleration with a 2% probability of exceedance in 50 years. The recurrence interval for an event with this probability is 2,500 years. The region of Washoe County with the highest predicted peak acceleration is centered on the Reno/Carson City metropolitan area. The peak ground acceleration range at this probability for the city of Reno is 80–120% percent gravity.

[39] Earthquaketrack.com, 2024, "Earthquakes M5> recorded Near Reno Nevada (As of 4/1/2024)." Earthquakes in Reno, Nevada, United States – Most Recent > 5.0M (earthquaketrack.com)

[40] 2020 Regional HMP, "2008 Mogul-Somersett Earthquake Damage Rock fall damage to water flume" (Nevada Bureau of Mines and Geology, University of Nevada, Reno; dePolo 2008)

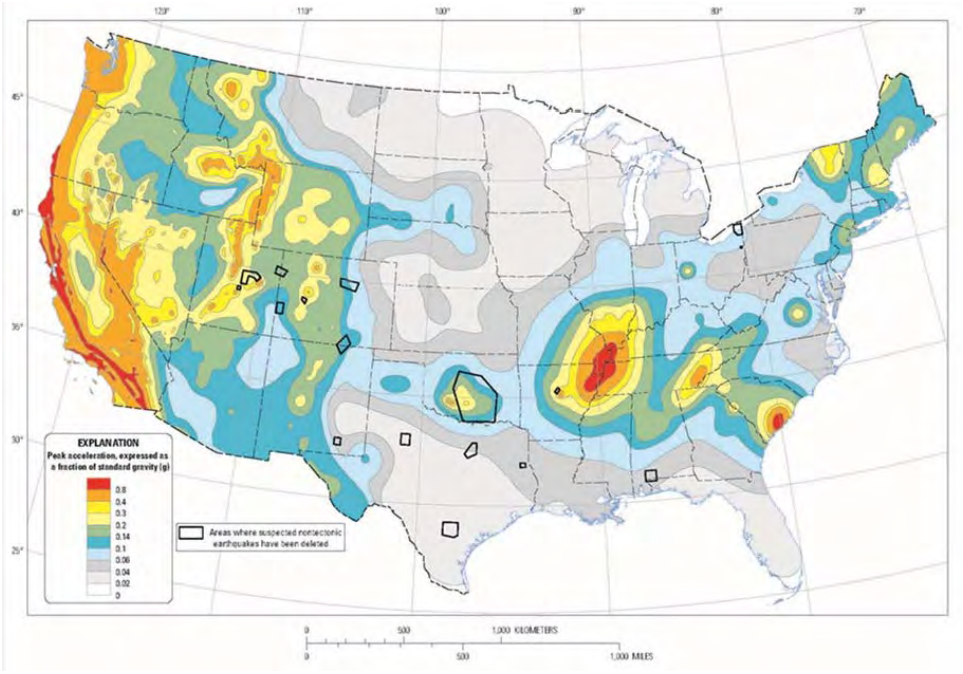


Figure 12: Peak Ground Acceleration (%g) with 2% Probability of Exceedance in 50 Years[41]

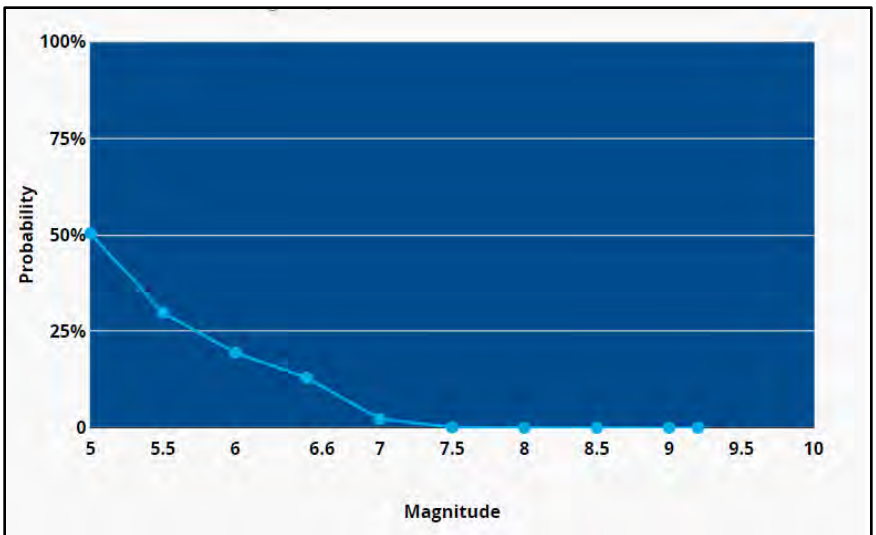
According to the previous lists of earthquake occurrences in Washoe County, 17 earthquakes with a magnitude >5 have occurred in the last 150 years. The probability of future occurrence can be estimated at 10%; this means that there is roughly a 10% chance of an earthquake with a magnitude >5 to occur every year. The overall probability of future occurrence of an earthquake measuring 5.0 magnitude or higher is considered Medium, with an estimated 1%–10% chance of occurrence in a given year.

Future climate conditions are unlikely to have any effect on earthquake magnitude, severity, or probability.

VULNERABILITY ANALYSIS

The 2018 Enhanced State Hazard Mitigation Plan (SHMP) states that earthquakes are responsible for the formation of the Nevada mountain ranges, which continue to develop. Seismicity, earthquake faults, and geodetically measured deformation all indicate that future large earthquakes can occur anywhere in the state. In the short term, personal preparedness, emergency response planning, and community recovery planning are critical. In the long term, constructing seismically resilient buildings, planning future development around earthquake faults, and developing earthquake early warning systems will help reduce injuries and damage from future earthquakes.

[41] 2020 Regional HMP, USGS 2014, "Peak Ground Acceleration (%g) with 2% Probability of Exceedance in 50 Years." https://www.washoecounty.gov/em/files/Regional-HMP-2020.pdf



MAGNITUDE	PROBABILITY	MAGNITUDE	PROBABILITY	MAGNITUDE	PROBABILITY
5.0	50.33%	6.0	19.44%	7.1	1.37%
5.1	45.29%	6.1	18.02%	7.2	0.82%
5.2	45.29%	6.2	16.78%	7.3	0.43%
5.2	40.71%	6.3	15.57%	7.4	0.22%
5.3	36.61%	6.4	14.30%	7.5	0.09%
5.4	32.98%	6.5	12.87%	7.6	0.01%
5.5	29.81%	6.6	9.70%	7.7	0.00%
5.6	27.05%	6.7	7.41%	7.8	0.00%
5.7	24.68%	6.8	5.57%	7.9	0.00%
5.8	22.65%	6.9	3.80%	8.0	0.00%
5.9	20.91%	7.0	2.25%	8.1	0.00%

Figure 13: Washoe County Earthquake Probability and Magnitude[42]

ESTIMATED IMPACT AND POTENTIAL LOSSES

Due to its seismic activity, the estimated impacts and potential losses to the city of Reno from earthquakes can be significant. Structural damage to buildings and infrastructure is a primary concern; older structures, particularly at risk, could face severe repair costs and even collapse. These damages lead to economic implications, as business interruptions can decrease revenue and affect local tourism, which is crucial for the economy.

[42] Homefacts, 2024,"Washoe County Earthquake Probability and Magnitude." Washoe County, NV Earthquake Data & Risk | Homefacts

Emergency services would likely be overwhelmed after a major earthquake, resulting in substantial costs for response and recovery efforts. Additionally, injuries and fatalities could strain healthcare systems and raise public safety concerns. Disrupting essential services like water and electricity can create prolonged outages, complicating recovery efforts.

The local insurance market may also be affected, with increased claims potentially leading to higher premiums for property owners. Preparing for these risks through comprehensive assessments and resilient infrastructure is vital for minimizing potential losses and ensuring community safety in Reno.

Washoe County's building codes require all development to meet building standards based on seismic zones. The codes that have been adopted are the 2018 International Building Code and the 2018 International Residential Code (IRC) with the Northern Nevada Amendment package.

SEISMIC DESIGN

Washoe County has established the following requirements for structures:[43]

- **International Building Code (IBC), Chapter 16, Section 1613, amended:** The seismic design for structures in Washoe County shall be based on the response parameters and equations of Chapter 16. See ASCE 7-16 as referenced in the IBC.
- **International Residential Code (IRC), Chapter 3 for single-family residential structures:** Use Category "D2."

Most earthquake-related property damage and death are caused by the failure and collapse of structures due to ground shaking. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (in mountain regions and along hillsides), and liquefaction. According to USGS data, damage caused by an earthquake will begin at a level of ground shaking (peak ground acceleration, or PGA) of approximately ten percent of the force of gravity (0.1g, or 10%g). Below this level, damage is typically very slight except in unusually vulnerable facilities. Damages from ground shaking at 10%g–20%g tend to be minor to moderate, with only unusually poor buildings being subject to potential collapse. Events in the range of 20%g to 50%g may cause significant damage in some modern buildings and very high levels of damage (including collapse) in poorly designed buildings. Events of more than 50%g may cause higher levels of damage in many buildings, even those designed to resist seismic forces.

Earthquakes can cause a variety of impacts, such as structural damage to buildings, fires, damage to bridges and highways, initiation of slope failures, and liquefaction. The types of impacts depend on factors, such as the location of the earthquake, the level of development of the area, and the ability of infrastructure to withstand shaking. Earthquakes can also cause death, injury, destruction of homes, disruption of transportation and communication networks,

[43] Washoe County, Nevada, 2024, Seismic Design, Design Requirements (washoecounty.gov)

and water supply contamination. This is all dependent upon the magnitude of the earthquake, the depth of the focus, the distance from the epicenter, the population density, and the mitigation actions in effect to disrupt the impacts of the earthquake. Cascading impacts of earthquakes of high magnitude, potentially resulting in the need for additional mitigation actions, include landslides, utility failures, infrastructure failures, conflagration, food, hydration, medical supply shortages, and economic disruption.

The overall magnitude and potential severity of impacts of earthquakes is considered High in Washoe County. Events are handled at the county level; they disrupt services for one to three days, and their economic impacts affect a city or community. In a worst-case scenario, earthquakes can require federal support, can impact critical facilities and disrupt services for more than 20 days, and can have national economic impacts.

Figure 14 illustrates the National Risk Index rating the Expected Annual Loss for Washoe County at $166M from earthquake, with a rating of relatively moderate expected annual losses, and a risk score of 99.5.

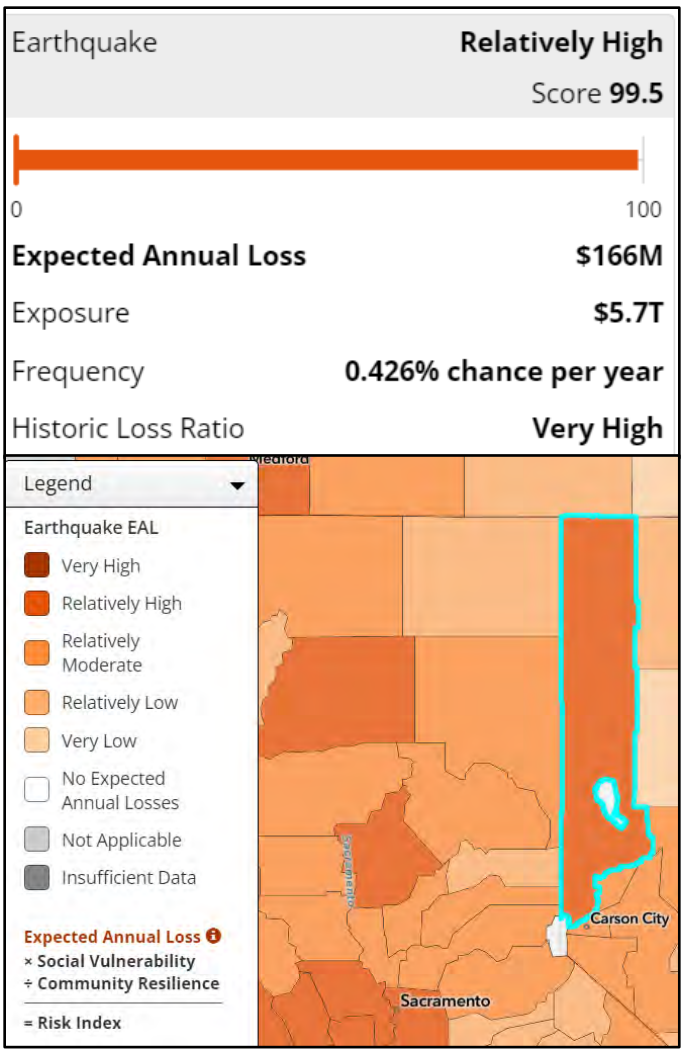


Figure 14: National Risk Index Estimated Annual Loss[44]

VULNERABLE POPULATIONS

When an earthquake damages buildings and infrastructure, the people around and within are in danger. Individuals and families can suffer injury and death during and following an earthquake. Debris and damage can trap people in buildings, creating unknown survival conditions, depending on the extent of building damage and resources available. When buildings collapse, roads crack, or bridges suffer damage, resulting injuries to those in the vicinity can range from minor to extensive to the point of permanent disability or death. Following a severe earthquake with extensive damage, entire communities can become homeless, and emergency services can

[44] FEMA, National Risk Index, "Washoe County Earthquake Expected Annual Loss Score, Map and Legend," Map | National Risk Index (fema.gov)

be stressed beyond capacity. This type of devastation can have lasting effects on people's physical, emotional, and mental well-being.

Earthquakes can have immediate and long-term impacts on health. Immediate heath impacts include trauma-related deaths and injuries from building collapse and trauma-related deaths and injuries from secondary effects, such as burns from fires. Long-term health effects from earthquakes can include conditions such as posttraumatic stress disorder (PTSD), depression, and severe anxiety. Earthquakes strike quickly with no warning, putting those in impacted areas in danger. Because of the unpredictable nature of earthquakes, it is normal for people to experience emotional distress. Feelings such as overwhelming anxiety, trouble sleeping, and other depression-like symptoms are common responses to these types of disasters.

Long-term impacts on the community following an earthquake may include displacement, disruption of government services, economic impacts, and health risks because of increased airborne particulate matter or contamination of water or soils from hazardous materials spills or releases of sewage. The severity and duration of these impacts would depend on the severity of the earthquake and damage to infrastructure and buildings across the region. A significant loss of population following an earthquake because people relocating outside the region could cause an extended loss of revenue for local governments and economic impacts from a decrease in the workforce.

COMMUNITY LIFELINES

In the event of an earthquake, electrical power lines on the National Power Grid are likely to be damaged and cause extended power outages and potential fires. Downed telecommunication towers would cause a loss of communications systems throughout the county. Road debris (i.e., downed trees, powerlines, other structural debris) could block roads and cracks in road surfaces because the earthquake's impact could limit access of emergency responders.

DEVELOPMENT TRENDS

- **Economic:** While the County has implemented current seismic codes to reduce risks to new development, regional economic development in recent years has increased the potential dollar valuation of damage caused by a catastrophic earthquake (Increased Vulnerability).
- **Building codes** adopted by Washoe County require all development to meet building standards based on seismic zones. The currently adopted codes are the 2018 International Building Code and the 2018 IRC with the Northern Nevada Amendment package. Future development in Washoe County will be required to comply with current seismic codes, which will decrease vulnerability to earthquakes.
- **Land Use:** New buildings have been constructed to higher standards to withstand the potential impacts of an earthquake (Decreased Vulnerability).

VULNERABILITY SCORE

The city of Reno ranked earthquakes as **High Risk**.

Table 10: National Risk Index for Earthquake in the City of Reno

Earthquake	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	High	High	High	$166M	High

Based on the National Risk Index (NRI), Washoe County has a rating of relatively high for the risk index and a score of **99.4** for earthquake which is higher than the national percentile. Figure 15 illustrates the USGS probability risk score of 50.33% and the high-risk level for Washoe County.

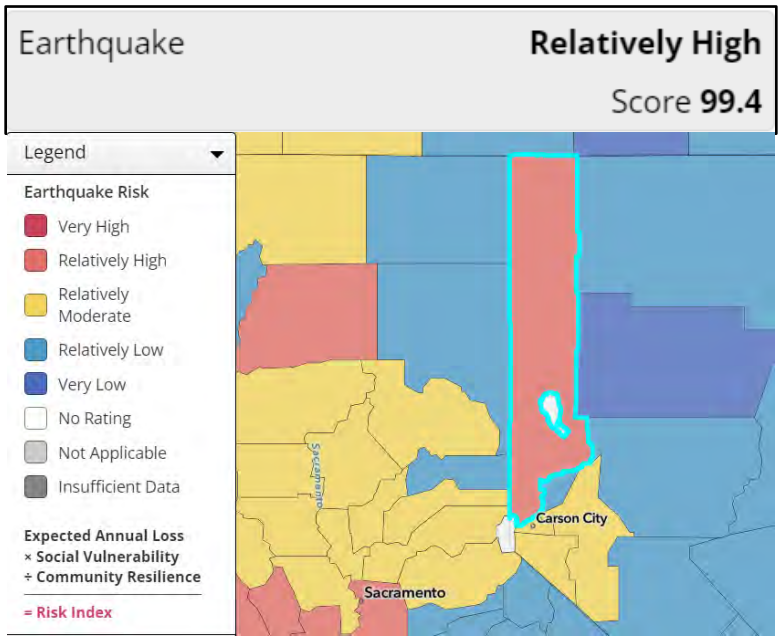


Figure 15: National Risk Index Washoe County Earthquake Score, Map, and Legend[45]

Figure 16 shows the USGS probability risk score of 50.33% and the high-risk level for Washoe County. The County has a high earthquake risk, having had 211 earthquakes since 1931. The USGS database shows that there is a 50.33% chance of a major earthquake within 50km of Washoe County in the next 50 years. The largest earthquake within 30 miles of Washoe County, NV was a 4.8 Magnitude in 1993.

[45] FEMA, NRI, "National Risk Index Washoe County Earthquake Score, Map and Legend," Map | National Risk Index (fema.gov)

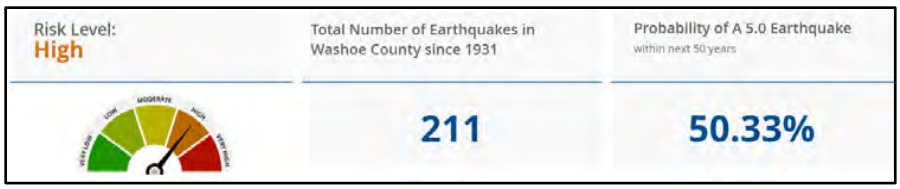


Figure 16: USGS Probability Risk Score for Washoe County[46]

Flooding

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. They can cause substantial damage to structures, landscapes, and utilities and jeopardize life safety. Specific health hazards also are expected in flooding events. Standing water and wet materials in structures can become breeding grounds for microorganisms, such as bacteria, mold, and viruses. When flooding occurs in populated areas, warnings and evacuation will reduce life and safety impacts. Please refer to the base plan, specifically pages 250 and 258, for flood maps.

- **Flash flooding** is associated with floods of significant volume and short duration. Flash floods often fall short of a 100- or 500-year flooding event and generally create impacts associated with stormwater runoff. In contrast to riverine flooding, this type usually results from heavy rainfall on a relatively small drainage area and usually occurs in the spring and summer from thunderstorms. It is important to note that even in drought, scattered summer thunderstorms can bring excessive rainfall and flash flooding, particularly near wildland fire burn scars that enhance water runoff. Flash floods produce debris flows and significant water runoff laden with burn debris and mud. Urbanization increases runoff by two to six times compared with undeveloped terrain because of the relative impermeability of surfaces in urban areas.
- **Closed-basin flooding** occurs when a lake has no outlet or a relatively small outlet that limits the lake's ability to drain during storm events. Floodwaters in closed-basin lakes accumulate over long periods and are susceptible to dramatic fluctuations in water levels that may remain for weeks, months, or years.
- **Riverine flooding** is flooding that occurs along a channel. Here, a "channel" is defined as a feature on the ground that carries water through and out of a watershed. It can be a channel, such as a river or streams, or a human-made channel, such as a drainage ditch. Riverine flooding occurs when excessive rainfall over an extended period causes a river to exceed its capacity.

[46] HomeFacts, 2024, "USGS Probability Risk score for Washoe County." https://www.homefacts.com/earthquakes/Nevada/Washoe-County.html

- **Overbank flooding** occurs along a channel, as excess flows overflow channel banks. Overbank flooding occurs when downstream channels receive more rain or snowmelt from their watersheds than normal.
- **Urban drainage flooding** occurs when the capacity of an urban drainage system is exceeded. An urban drainage system comprises ditches, storm sewers, retention ponds, and other facilities constructed to store runoff or carry it to a receiving stream or lake.. Urban drainage flooding can also occur in areas protected by levees, as water collects on the protected side of the levee when pump capacities are exceeded during Extreme weathers. Storm water is a natural part of the Washoe County landscape, but too much creates public hazards and causes damage to both private and public property.

The National Weather Service (NWS) publishes public alert statements, along with watches, warnings, and advisories. Table 11 lists the categories and their descriptions.

Table 11: Watches, Warnings, and Advisories Issued by the National Weather Service

Category	Action	Interpretation
Flash Flood Warning	Take Action	A Flash Flood Warning is issued when a flash flood is imminent or occurring.
Flood Warning	Take Action	A Flood Warning is issued when the hazardous weather event is imminent or already happening. A Flood Warning is issued when flooding is imminent or occurring.
Flood Advisory	Be Aware	A Flood Advisory is issued when a specific weather event that is forecast to occur may become a nuisance. A Flood Advisory is issued when flooding is not expected to be bad enough to issue a warning. However, it may cause significant inconvenience, and if caution is not exercised, it could lead to situations that threaten life and/or property.
Flood Watch	Be Prepared	A Flood Watch is issued when conditions are favorable for a specific hazardous weather event to occur. A Flood Watch is issued when conditions are favorable for flooding. This does not mean flooding will occur, but it is possible.

The National Weather Service (NWS) categorizes the extent (magnitude or severity) of riverine and flash flooding in which a river has reached the flood stage as minor, moderate, and major. The categories are based on property damage and public threat and are as follows:

- **Minor flooding** – Minimal or no property damage but possibly some public threat or inconvenience.
- **Moderate flooding** – Some inundation of structures and roads near streams; some evacuations of people and/or transfer of property to higher elevations.

- **Major flooding** – Extensive inundation of structures and roads; significant evacuations of people and/or transfer of property to higher elevations.

100-year and 500-year floods have a 1 in 100 chance or 1 in 500 chance (i.e., 0.1% or 0.2% chance) of being exceeded in a year. Major flooding at this scale generally occurs in Washoe County as a result of two types of storm events: 1) heavy, prolonged rainfall on top of a deep snowpack in the Sierra Nevada, and 2) heavy, prolonged rainfall that spills over into the normally rain-shadowed Reno/Sparks area. A hybrid of both scenarios can lead to these levels of flooding. Floods of this magnitude occur in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. Truckee River flooding, in particular, has been of primary concern to the Reno/Sparks metropolitan area. Intense storms can overwhelm local waterways and the integrity of flooding control structures.

LOCATION

The geographic location of flooding is concentrated in the floodway and floodplain of the Truckee River and its tributaries, including Steamboat Creek and Dry Creek in eastern Reno and southern Sparks. Recent flash flooding in the Hidden Valley area impacted roughly 100 homes. The areas impacted most by flood waters stretch from Blue Hills Drive down to Loma Vista Lane and East Hidden Valley Drive. Moderate flooding is forecast in urban areas and near rivers and streams. The Truckee River headwaters comprise the Lake Tahoe Basin. The river drains part of the high Sierra Nevada and empties into Pyramid Lake, the sole outlet of Lake Tahoe.

The Truckee River runs directly through the city of Reno, which makes it important for residents adjacent to the river to be prepared in the event of a flood. Reno Ward 3 has significant components with a FEMA Critical Flood Zone 1 along Steamboat Creek and Veterans Parkway and encompassing the residential communities along Mira Loma Drive and adjacent to Mira Loma Park. The communities in Ward 3 along Dry Creek are also within Critical Flood Zone 1.

Flash flooding is usually associated with development and urbanization as well as inadequate storm drainage systems. Results of the concentrated development were heavily felt during the 2005 flood events. Reno is less susceptible to alluvial fan flooding and flash flooding, which is experience more in Hidden Valley, Jumbo Grade, Stormy Canyon, Virginia Foothills, Whites Creek and Galena Creek

EXTENT

The magnitude and potential severity of impacts of flooding is considered High in Washoe County. Severe floods may cause serious injuries and deaths and damage public facilities and private property. The river's height can determine the extent of flooding flows compared with flooding stages determined by USGS stream gauges throughout the area. It can also be measured by comparing water elevations to past flooding damage. Major floods may disrupt services for weeks, and response likely requires state and, potentially, federal support. In closed basins, flooding conditions may be present over a long period, ranging from months to years, because of the lack of natural drainage.

Areas of the County with poor drainage may experience limited, localized flooding annually. Major floods on the Truckee River have occurred approximately once a decade. Since 1986, closed basins in the North Valleys have flooded roughly once a decade. The highest lake elevations were measured following the winter storms in March 2017.[47]

Figure 17 illustrates a Special Flood Hazard Area (SFHA), the land area covered by the floodwaters of the base flood (red line in the above figure), requiring NFIP floodplain management enforcement and mandatory flood insurance applies for federally backed mortgages. The SFHA designates an area that is covered by the floodwaters of the base flood; that is, a flood that has on average, a 1% chance of occurring in a given year.

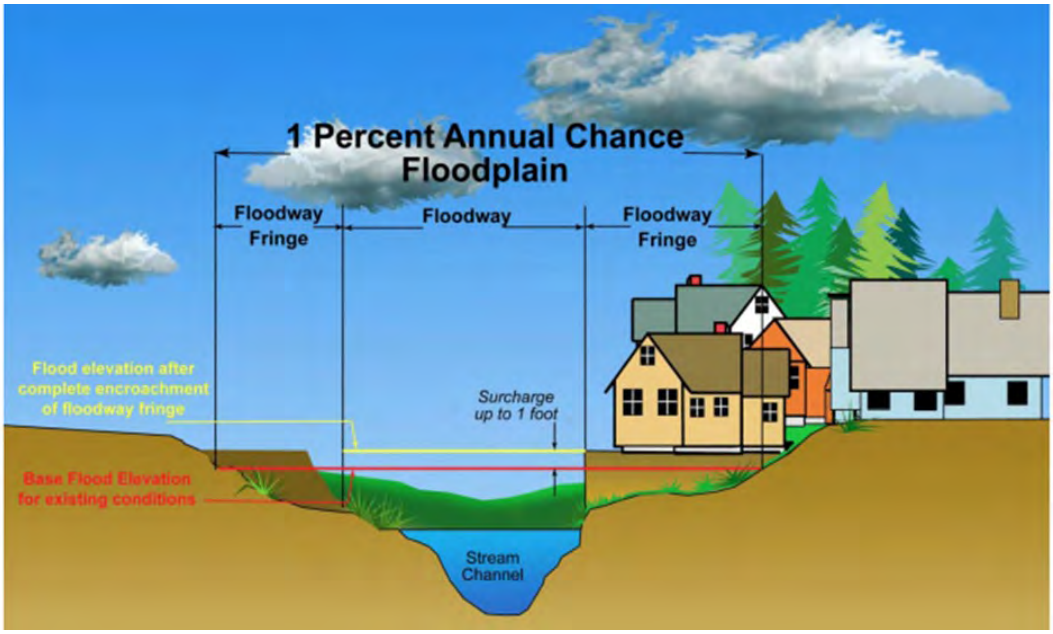


Figure 17: Schematic of 100-Year Floodplain[48]

PREVIOUS OCCURRENCE/HISTORY

NOAA's NCEI Storm Events Database records 9 flooding episodes (flash flood, flooding, and lakeshore flooding) in Washoe County (Greater Lake Tahoe Area, Greater Reno-Carson City-Minden Area, Western Nevada Basin and Range including Pyramid Lake, Northern Washoe County) between 2018 and 2024 causing no recorded property damage or crop damage, and no injuries.

[47] Truckee Meadow Water Authority Water Resource Plan, 2020-2040 Water Resource Plan – Truckee Meadows Water Authority (tmwa.com)

[48] Nebraska Department of Natural Resources, Nebraska department of natural resources floodway schematic – Search (bing.com)

The FEMA web site (www.fema.gov/disasters) documents no major disaster declaration for Washoe County due to flooding.

Numerous major flooding events have impacted the county. The most significant impact events include the following:

- **December 2022–April 2023:** Back-to-back atmospheric rivers and widespread flooding impact residential areas. Irrigation ditches ice dams and overtopping, resulting in flooding of downstream residential areas. Stream and creek flooding. Sustained high Truckee River flows, resulting in erosion and concerns at bridge crossings.
- Hidden Valley, July 25, 2024
- Steamboat, March 9–10, 2023
- Huffaker Hills, August 5, 2022
- Sparks, December 23, 2021
- Harold's Trapshoot SP, December 23, 2021
- Washoe City, July 1, 2021
- Sparks, June 30, 2021
- Reno Stead Airport, July 25, 2019
- Closed-basin flooding in Lemmon Valley, January and February 2017
- Truckee River and tributary flooding
  - December 24, 2005, to January 3, 2006
  - December 16, 1996, to January 6, 1997
  - February 11 to February 20, 1986

There was considerable flooding of Swan Lake in December 2017. Figure 18 shows efforts by Washoe County to control the flooding, while Figure 19 is an aerial photograph of the flooding.



Figure 18: Flood Barriers Being Set Up on the Edge of Swan Lake by Washoe County[49]



Figure 19: Aerial Photograph of Swan Lake Flooding, March 23, 2017[50]

REPETITIVE FLOOD LOSSES

The NFIP tracks Repetitive Loss (RL) properties, which are NFIP-insured properties that, since 1978 and regardless of any changes in ownership during that period, have experienced any of the following:

- Four or more paid losses in excess of $1,000.
- Two paid losses in excess of $1,000 in any rolling 10-year period.
- Three or more paid losses that equal or exceed the current value of the insured property.

[49] Reno Gazette Journal, March 5, 2018, photo credit Jason Bean https://www.rgj.com/story/news/2018/03/05/

[50] Ibid., Photo credit Tech Sgt. Emerson Marcus/Nevada National Guard.

SEVERE REPETITIVE FLOOD LOSSES

The NFIP also tracks Severe Repetitive Loss (SRL) properties, which are NFIP-insured properties that, since 1978 and regardless of any changes in ownership during that period, have experienced any of the following:

- Four or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or
- At least two separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceeding the fair market value of the insured building on the day before each loss.

PROBABILITY OF FUTURE EVENTS

The probability of flooding in the planning area is High. Given a potential increase in high-intensity precipitation events, particularly in the winter months, and increasing development resulting in additional impervious surface, the County may be impacted by the rise in the probability of future floods and closed-basin flooding.

IMPACTS OF CLIMATE TRENDS AND VARIATIONS

Even though it is known as the driest state, Nevada has experienced many catastrophic floods. Because a warmer atmosphere can carry more water, the most extreme storms are expected to become even more extreme. For example, projected near-term and long-term changes in peak annual runoff rates (the maximum daily runoff rate occurring during the average year) are projected to increase more than 25% to 50% above historical peak rates across much of the state, especially in and around many mountain ranges.[51] Flooding impacts related to climate change include increased high-intensity precipitation events in the winter months, increased intensity of winter storms, and changing flooding regimes and return patterns.

VULNERABILITY ANALYSIS

The magnitude and potential severity of impacts of flooding is considered High in Washoe County. Severe floods may cause serious injuries and deaths and damage public facilities and private property. The river's height can determine the extent of flooding flows compared with flooding stages determined by USGS stream gauges throughout the area. It can also be measured by comparing water elevations to past flooding damage. Major floods may disrupt services for weeks, and response likely requires state and, potentially, federal support. In closed basins, flooding conditions may be present over a long period, ranging from months to years, because of the lack of natural drainage.

[51] University of Nevada, College of Agriculture Extension Program, 2024, Climate Change Impacts in Nevada | Extension | University of Nevada, Reno (unr.edu)

ESTIMATED IMPACT AND POTENTIAL LOSSES

All types of flooding can cause widespread damage throughout rural and urban areas, including but not limited to: water-related damage to the interior and exterior of buildings; destruction of electrical and other expensive and difficult-to-replace equipment; injury and loss of life; proliferation of disease vectors; disruption of utilities, including water, sewer, electricity, communications networks and facilities; loss of agricultural crops and livestock; placement of stress on emergency response and healthcare facilities and personnel; loss of productivity; and displacement of persons from homes and places of employment. Any type of agricultural, commercial, residential, and recreational development and natural communities (e.g., wetlands, marshes) in a floodplain (inland or coastal) are vulnerable to flooding. Increased urbanization, and thus an increase in paved surfaces, enhances the threat of flooding where drainage systems cannot cope with the increased input of stormwater runoff and decrease in natural water infiltration into the soil (increasing runoff). In rural areas, property damage caused by flooding can be devastating to farmers. When flooding occurs during the growing season, farmers can suffer widespread crop loss. Livestock farmers may lose livestock if they are unable to find safe ground during rising floodwaters. This threat to agricultural areas is primarily associated with flash flooding.

Flooding can also pose several threats to industrial, residential, and commercial properties. Industrial facilities of all types typically handle and store various quantities of hazardous materials for their operations. These materials can come into contact with flood waters and be released into the environment, impacting local water sources and natural resources and threatening public health. Buildings can experience significant water-related damage, sometimes beyond repair, because of flooding. Household furnishings and business inventories can be lost if there is not adequate time to remove items to safe locations. Besides being at risk because of floodwater, people face the threat of explosions and fires caused by leaking gas lines, along with the possibility of being electrocuted.

Even wild animals, forced out of their homes and brought into contact with humans by floodwaters, can be a threat. Post-flood concerns could include mold growth on structures, creating an increased health concern. Severe flooding can cause extensive damage to public utilities and disrupt the delivery of services. Loss of power and communications can be expected. Drinking water and wastewater treatment facilities may be temporarily out of operation. The impacts of flooding on transportation are particularly noteworthy. Flooded streets and roadblocks make it difficult for emergency vehicles to respond to calls for service. Floodwaters can wash out sections of roadway and bridges. Most importantly, most fatalities that occur in floods are the result of people trying to drive on roads covered by floodwaters.

Figure 20 illustrates the National Risk Index rating the Expected Annual Loss for Washoe County at $65M from riverine flooding, with a rating of very high expected annual losses, and a risk score of 99.7.

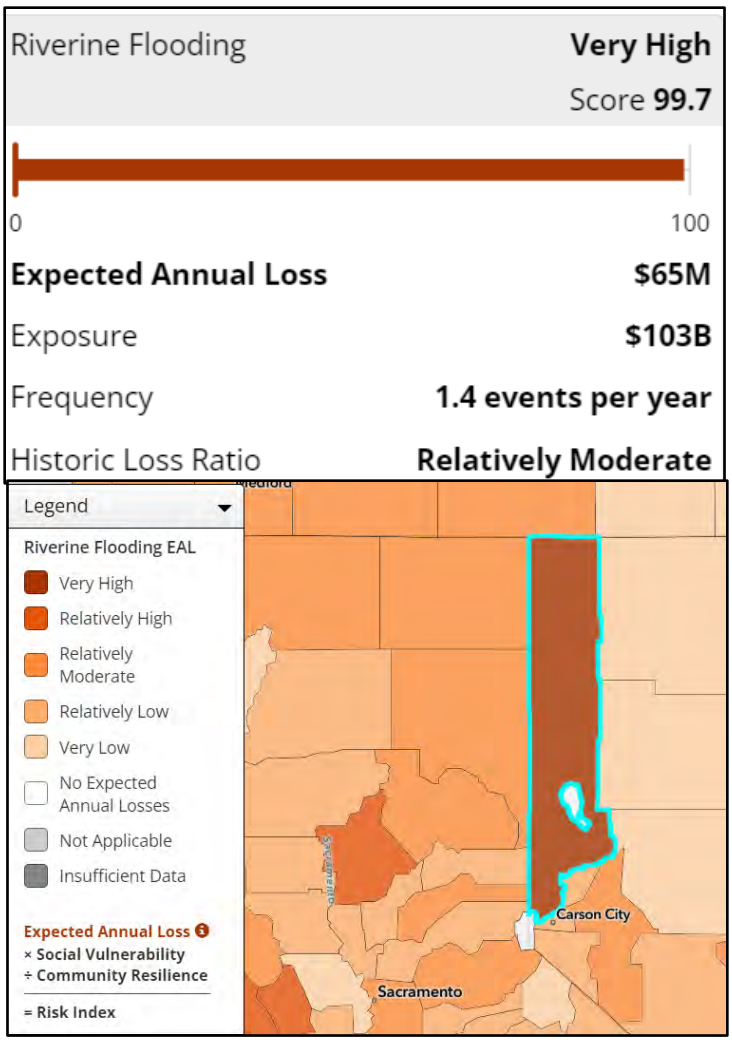


Figure 20: National Risk Index Washoe County Riverine Flooding Expected Annual Loss Score, Map, and Legend[52]

IMPACT ON COMMUNITY ASSETS

Riverine or flash flooding in the County often results in the washout or flooding of roadways and infrastructure in waterways, such as bridges or culverts. Due to the concentration of urban development along the Truckee River, many critical facilities in the County are located within the 100-year or 500-year mapped floodplains and are vulnerable to riverine flooding. Flash flooding can affect smaller creeks and streams and areas near burn scars, and critical facilities outside of mapped floodplains may be affected.

Closed-basin flooding in Washoe County occurs in and around playas, which may become shallow lakes during periods of increased precipitation. Development on a playa or in adjacent

[52] FEMA, National Risk Index, "Washoe County Riverine Flooding Expected Annual Loss Score, Map and Legend," Map | National Risk Index (fema.gov)

low-lying areas is most vulnerable to the impacts of closed-basin flooding. Vulnerable areas in Washoe County include established residential neighborhoods on the shorelines of Swan Lake and commercial and residential areas near Silver Lake and White Lake. Closed-basin flooding of these lakes also affects public facilities and infrastructure, including US Highway 395, Village Parkway, Lemmon Drive, Lemmon Valley Elementary School, and the Reno-Stead Water Reclamation Facility. See Appendix B for an additional discussion of closed-basin flooding hazards in Washoe County.

Major floods can impact the community by displacing residents and business owners; damaging and disrupting infrastructure, including roads and bridges, water treatment facilities, and wastewater treatment facilities; and causing health risks due to contaminated public water supplies and private wells.

PROPERTY

- Sixteen critical facilities, including 14 dams and two fire stations, are at least partially in the 100-year floodplain.
- Three critical facilities, including one hospital and two schools, are at least partially in the 500-year floodplain.

VULNERABLE POPULATIONS

Social vulnerability is a broad concept that examines the differential impact of hazards on society based on existing socio-demographic and socio-economic conditions and community characteristics. A person's vulnerability to disaster is influenced by many factors, exacerbated by the increasing number of natural hazard events and disasters in the U.S., a trend that is expected to continue to affect "the capacity to anticipate, cope with, resist, and recover from the impact" of a discrete and identifiable disaster in nature or society. However, there are many more actions that can be taken on the local scale to combat hazard- and climate-related inequalities.

Flooding is the deadliest natural disaster that occurs in the U.S. each year, and it poses a constant and significant threat to the health and safety of the people in the Washoe County planning area. Impacts to the planning area can include the following:

- Flood-related rescues may be necessary at swift and low water crossings or in flooded neighborhoods where roads have become impassable, placing first responders in harm's way.
- Evacuations may be required for entire neighborhoods because of rising floodwaters, further taxing limited response capabilities and increasing sheltering needs for displaced residents.

- Health risks and threats to residents are elevated because contaminated floodwaters (untreated sewage and hazardous chemicals) and mold growth typical in flooded buildings and homes remain after the floodwaters have receded.
- Significant flood events often cause widespread power outages, increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.

Extended power outage can cause an increase in structure fires and/or carbon monoxide poisoning as individuals attempt to cook or heat their homes with alternative, unsafe cooking or heating devices, such as grills.

- Floods can destroy or make residential structures uninhabitable, requiring the shelter or relocation of residents in the aftermath of the event.
- First responders are exposed to downed power lines, contaminated and potentially unstable debris, hazardous materials, and generally unsafe conditions, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Emergency operations and services may be significantly impacted because of damaged facilities.
- Significant flooding can cause the inability of emergency response vehicles to access areas of the community.
- Critical staff may suffer personal losses or otherwise be impacted by a flood event and unable to report for duty, limiting response capabilities.
- City or county departments may be flooded, delaying response and recovery efforts for the entire community.

Private sector entities that the jurisdiction and its residents rely on, such as utility providers, financial institutions, communication and media outlets, and medical care providers, may not be fully operational and may require assistance from neighboring communities until full services can be restored.

- Damage to infrastructure may slow economic recovery, since repairs may be extensive and lengthy.
- Some businesses not directly damaged by the flood may be negatively impacted, while utilities are being restored or water recedes, further slowing economic recovery.
- When the community is affected by significant property damage, it is expected that funding would be required for infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.

- Residential structures substantially damaged by a flood may not be rebuilt for years, and uninsured or underinsured residential structures may never be rebuilt, reducing the tax base for the community.

Large floods may cause dramatic population fluctuations, as people are unable to return to their homes or jobs and must seek shelter and/or work outside the affected area.

- Businesses that are uninsured or underinsured may have difficulty reopening, which results in a net loss of jobs for the community and a potential increase in the unemployment rate.

Recreation activities, such as fishing, boating, and camping activities may be unavailable, and tourism can be unappealing for years following a large flood event, devastating directly related local businesses and negatively impacting economic recovery.

- Flooding may cause significant disruptions of clean water and sewer services, elevating health risks and delaying recovery efforts.
- The psycho-social effects on flood victims and their families can traumatize them for long periods of time, creating long-term increases in medical treatment and services.
- Extensive or repetitive flooding can lead to decreases in property value for the affected community.
- Flood poses a potential catastrophic risk to annual and perennial crop production and overall crop quality, leading to higher food costs.
- Flood-related declines in production may lead to an increase in unemployment.
- Large floods may cause loss of livestock, potential increased livestock mortality because of stress and water-borne disease, and increased cost for feed.

The overall extent of damage caused by floods is dependent on the extent, depth, and duration of flooding, and the velocities of flows in the flooded areas. The level of preparedness and pre-event planning done by government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a flood event.

DEVELOPMENT TRENDS

- **Economic:** The Truckee River Flood Management Authority, a joint powers authority created under an Interlocal Cooperative Agreement among Washoe County, the City of Reno, and the City of Sparks, is continuing to implement the Truckee River Flood Management Project by constructing, maintaining, and operating infrastructure designed to reduce flooding risks. The Flood Project has evolved over decades of study, consideration, and community involvement. The current plan represents the outcomes of countless meetings, community input, and local and federal planning. The Flood Project extends approximately 33 miles along the Truckee River, from downtown Reno (near Jones Street)

to the town of Wadsworth, Nevada (near Pyramid Lake)[53]. Once completed, the Flood Project will reduce flood damage from a 100-year event throughout the Truckee Meadows – economic benefits have been estimated at $2 billion (Decreased Vulnerability).

- **Land Use:** Areas targeted for new development are generally outside mapped floodplains. The City requires the potential impacts of new development on floodplains to be mitigated to avoid downstream flooding impacts. Residential and commercial development has resulted in the creation of additional impervious surfaces in the closed basins of the North Valleys (Increased Vulnerability).

VULNERABILITY SCORE

The city of Reno ranked flooding as **High Risk**.

Table 12: National Risk Index for Flood in the City of Reno

Flood	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Very High	High	High	$65M	High

Based on the National Risk Index (NRI), Washoe County has a rating of very high for the risk index and a score of **99.7** for flood which is higher than the national percentile.

[53] Truckee River Flood Management Authority, 2024, "The Flood Project". The Project – TRFMA

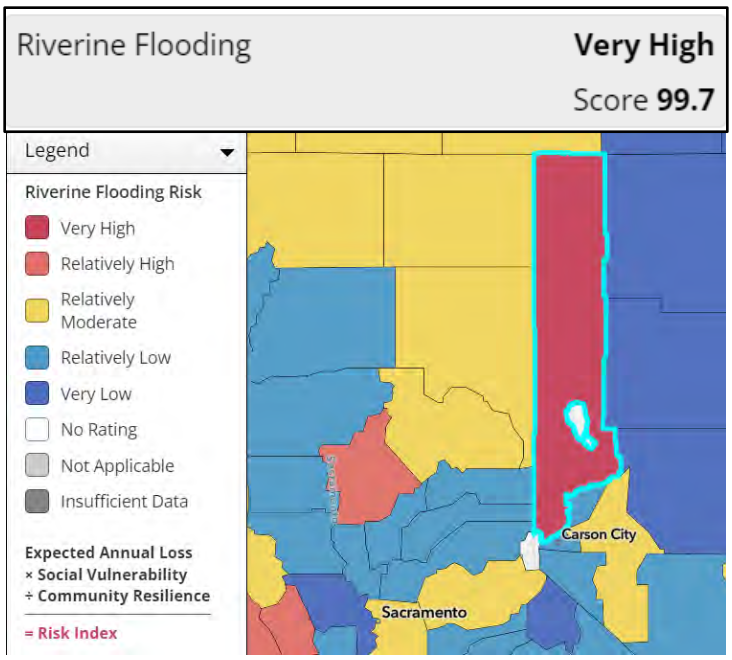


Figure 21: National Risk Index Washoe County Flood Score, Map, and Legend[54]

EXISTING MITIGATION CASE STUDY

Lemmon Valley and Swan Lake Flood Prevention Measures

Lemmon Valley, with a population of about 5,000, is one of several basins north of the City of Reno that has no natural outlet for water. With nowhere else to go, stormwater collects at the valley floor—filling Swan Lake—until it infiltrates into the ground or evaporates. If there is too much water, flooding occurs. In 2019, three Lemmon Valley property owners were awarded $1.2M in damage, interest, and costs after their homes were damaged. After a court decision held that the City of Reno was liable for the flooding at Swan Lake in 2017, because their decision to develop properties nearby caused more runoff to reach Swan Lake.[55] Since 2017, Washoe County has developed a proactive flood management plan. It monitors the lake levels and surrounding snowpack and implements certain responses dictated by the conditions and lake levels. Washoe County has prepared for rising Swan Lake water levels by constructing protective berms in certain areas around the lake and installing high-flow pumps to manage water that flows down from the surrounding areas. [56] Washoe County Engineering monitors lake elevations and takes regular measurements, reviews weather forecasts and precipitation

[54] FEMA, "National Risk Index Washoe County Flood Score, Map and Legend," Map | National Risk Index (fema.gov)

[55] 2News Nevada, March 2021, City Of Reno Reaches Global Settlement For Swan Lake Flooding Damages | | 2news.com

[56] WashoeLife, Bethany Dryesdale, 2023, Lemmon Valley and Swan Lake flood prevention measures | Washoe Life (washoecounty.gov)

patterns, performs field inspections of the stormwater infrastructure (drainage channels, cross pipes, roadside ditches, etc.), and is prepared to respond should rapidly rising lake levels and flooding occur. The linked Swan Lake Elevations data are used by the Washoe County team to assess necessary operation changes to protect public safety.[57]

Extreme weathers (Winter Storm)

LOCATION

High elevations of the western portion of Washoe County experience the effects of winter storms, oftentimes snowstorms, with greater frequency. City of Reno locations often affected by snowstorms include Mt. Peavine and I-80 near the County's border with California. Winter storms plunge southward from artic regions and drop heavy amounts of snow and ice. The severity of winter storms is generally minor. However, a heavy accumulation of ice can create hazardous conditions. A large winter storm event can also cause exceptionally high rainfall that persists for days, resulting in heavy flooding. Flooding is generally exacerbated by a rain on snow event. Extreme cold temperatures often accompany severe winter storms in Washoe County.

EXTENT

The magnitude and potential severity of impacts of Extreme weathers is considered Low. Typical Extreme weather events are handled at the city or county level, can disrupt local government and business services for a period of days to weeks, and can have economic impacts on a statewide scale. Considering a worst-case scenario, a Extreme weather event could require federal-level support, could impact critical facilities and disrupt services for more than 20 days, and could have nationwide economic impacts.

The severity of the effects of snowstorms increases as the amount and rate of precipitation increase. In addition, storms with a low forward velocity are in an area for a longer duration and become more severe in their effects. Storms that are in full force during morning or evening rush hours tend to have their affects magnified because more people are out on the roadways and directly exposed.

PREVIOUS OCCURRENCE/HISTORY

Reno's annual average snowfall is 22 inches, with snowfalls generally occurring in November through March according to data from 1981–2010 climate normal (U.S. Climate Data, n.d.). Most snowfall occurs from December through February. The City of Reno Public Works Department notes that Reno experiences 13 storms annually.

[57] Washoe County, NV, 2024, Swan and Silver Lake Water Monitoring (washoecounty.gov)

The 2018 State of Nevada Enhanced HMP lists the following severe winter storms occurring in Washoe County over the past 20 years:

- **December 29, 2004–January 10, 2005**: Severe winter storm in Northern Nevada, prompting FEMA to designate 16 counties for federal funding to alleviate the cost for emergency protective measures.
- **February 25, 2011**: Winter storm with up 18 inches of snow and 50 miles per hour winds, causing multiple auto accidents, two injuries, and roughly $250,000 in damage.
- **January 13–14, 2013**: Prolonged winter temperatures led to Governor Sandoval declaring a state of emergency, and subzero temperatures were responsible for deaths across the state, including in Reno, Nevada.
- **November 9–10, 2015**: A severe winter storm resulted in downed power lines due to heavy, wet snow, and over 35,000 customers were without power in Washoe County.
- **January 30–31, 2016**: Snow totals of 4 to 8 inches around Reno/Sparks area, and areas in and near the foothills west of Reno received between 8 to 10 inches of snow. Whiteout conditions occurred due to heavy lake-effect snow off Pyramid Lake.
- **February 22, 2022:** Another inside slider tracked through the region with more snow and wind. This inside slider-type system moved into the region late Sunday through Tuesday. It brought periods of snow showers, increased wind, travel difficulties, and much lower temperatures to the region through Wednesday night. Snow Monday and into Tuesday morning overperformed in some areas, with several inches of new snow falling in bands over parts of the eastern Sierra, and western NV. A vehicle crash occurred the morning of Tuesday, February 22, around 6:00 a.m. PST involving two vehicles and three passengers were injured. A slider-type weather system moved over the region late Sunday, February 20, into the morning of Tuesday, February 22, producing a couple rounds of snowfall.
- **December 10, 2022:** A stronger winter storm brought another round of heavy snow, strong winds, and travel impacts on Sierra passes December 9–11. Peak snowfall totals occurred through the period of December 10–11, with 2–4 feet of snow widely reported in Sierra locations and northeast CA. Storm total snowfall amounts even exceeded 5 feet over parts of the Sierra crest. Several inches of new snow also fell over some western Nevada valleys, with a foot plus falling across some eastern Sierra foothill areas as well. Strong winds having gusts of 65-75 mph in far western Nevada resulted in reports of $8M in damage across parts of Sparks during the early morning of December 10.
- **January 6, 2023:** City of Reno emergency declaration Widespread downed trees, power outages, travel impacts.

PROBABILITY OF FUTURE EVENTS

The probability of Extreme weathers is High, and the potential impact of future climate conditions could increase the risk of Extreme weather events. However, since Extreme weathers occur each year, Reno has a number of mechanisms to promote safety.

On its website, the City of Reno provides mapped Snow and Ice Control Routes (revised 2023) for 19 segments of the City, along with a list of priority snow plow streets and an affiliated Winter Snow and Ice Control Plan developed by the City of Reno Public Works Department. Priority is given to arterial and collector streets along with school zones, hospitals, emergency facilities, bus routes, dangerous intersections, hills, and curves. Secondary streets are given low priority and generally receive a lower level of service or no service due to the limited availability of resources. Examples of Priority 1 streets include portions of Virginia Street, Longley Lane, and Stead Boulevard. Examples of Priority 2 streets include Center Street, Evans Avenue, and Hunter Lake Drive. The City uses the assistance of private contractors through the Associated General Contractors Auxiliary for snow accumulations greater than 8 inches based on current and forecasted conditions for the region.

VULNERABILITY ANALYSIS

Vulnerabilities from winter storms include those related to power outages and impairments to transportation. Because nearly all social and economic activity depends on transportation, snow can have a serious impact. Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of ice or snow, downed trees, or debris, or from increases in demand beyond the capacity of the electrical system.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of Extreme weather events. Members of the community who are isolated or have disabilities may be more vulnerable, especially those who may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Snowstorms can also adversely impact employees without certain benefits, as closures may result in unpaid time away from work.

IMPACT ON COUNTY ASSETS

The impacts of severe winter storms, extreme heat, and windstorms on community assets in Reno can be significant and multifaceted. One primary concern is the damage to infrastructure. Severe winter storms and windstorms can lead to the deterioration of roads, bridges, and public buildings. Snow and ice accumulation create hazardous driving conditions, while strong winds can uproot trees and bring down power lines, resulting in power outages and safety hazards for residents.

Public health is another critical area affected by extreme weather. High temperatures during heatwaves pose serious risks, particularly for vulnerable populations, including the elderly and those with pre-existing conditions. This can lead to an increase in heat-related illnesses and place additional pressure on local healthcare systems. Conversely, winter storms can obstruct

access to medical facilities, leaving those in need without timely care due to blocked transportation routes.

The economic impact of severe weather is also notable. Local businesses may experience disruptions due to temporary closures during storms, leading to financial losses. Retail and service industries often see reduced customer traffic during extreme weather events, while prolonged heat can heighten electricity demand as residents turn to air conditioning, straining the local power supply and potentially resulting in outages.

Environmental considerations come into play as well, as extreme weather can lead to erosion, damage to local ecosystems, and harm to parks and green spaces. Severe storms can uproot trees and disrupt wildlife habitats, resulting in long-term consequences for local biodiversity. Additionally, these weather challenges underline the need for improved community preparedness and resilience strategies. Local governments may need to invest in better emergency response systems and infrastructure capable of withstanding such extreme conditions.

VULNERABLE POPULATIONS

In Reno, several populations are particularly vulnerable to winter storms. First and foremost, the elderly are at a higher risk. Many seniors may have mobility issues that make it difficult for them to navigate icy sidewalks and streets. Additionally, they may rely on heating systems that can fail during severe weather, putting them at risk for hypothermia.

Low-income residents also face significant challenges during winter storms. Those who live paycheck to paycheck may lack the resources to prepare adequately for harsh weather, such as purchasing emergency supplies or accessing heat. Additionally, housing instability can lead to situations where families are forced to live in inadequate shelters that are ill-prepared for winter conditions.

Another vulnerable group is individuals experiencing homelessness. A sudden winter storm can pose life-threatening conditions for those without adequate shelter. Access to warm and safe spaces becomes critically important during extreme weather events, and not all areas may have sufficient resources to aid those in need.

Children are also a vulnerable demographic, especially if they depend on school systems for meals and warmth. Snow days can disrupt routine and access to necessary support services.

Finally, individuals with chronic health conditions or disabilities may find winter storms especially challenging. These individuals might require regular medical attention or have specific needs regarding heating and mobility that can be compromised during severe winter weather.

DEVELOPMENT TRENDS

- **Economic:** Over $30 million dollars of city and one billion dollars in private/other public, investment has been made in downtown Reno to modernize and beautify infrastructure and facilities (Increased Vulnerability).
- **Land Use:** The City's upward trend in development increases the overall strain on responding to winter storm impacts at various locations (Increased Vulnerability).
- **Future Land Use:** The city's increasing population trends put more individuals and assets at risk of Extreme weathers (Increased Vulnerability).

VULNERABILITY SCORE

The city of Reno ranked winter storms as **High Risk**.

Criminal Acts and Terrorism

LOCATION

Acts of violence can impact any populated area. These areas include, but are not limited to, shopping centers, business centers, financial districts, clinics/hospitals, schools, and government offices and buildings. The University of Nevada, Reno, and Peppermill Resort Spa Casino are examples of highly populated areas where an act of violence may occur.

Figure 22 illustrates the crime rate for the City of Reno rating of average indicated by the color orange for 500 incidents. The legend indicates that green represents a very low rate of incidents (up to 50); yellow represents a low rate of incidents (50–200); orange represents an average rate (200–500 incidents); red represents a high rate of incidents (500–1000); and brown represents very high rate of incidents (more than 1,000).

EXTENT

It is difficult to estimate the extent or probability of criminal activity or a terrorist incident. Nonetheless, it can be deduced that these threats could affect all populated areas in Washoe County; government facilities and schools may be most likely targeted.

City-Data.com compiles crime indexes across the United States and compares crime rates of U.S. cities to provide a framework for analyzing the extent of crimes and the types of crime occurring in each city. Figure 23 shows that, for the City of Reno in 2022, the City-Data crime index rate was 324, which is 1.3 times greater than the national average or 90% crime index (red on crime index meter), and is greater than the City of Sparks, Truckee, and South Lake Tahoe (the bar graph).

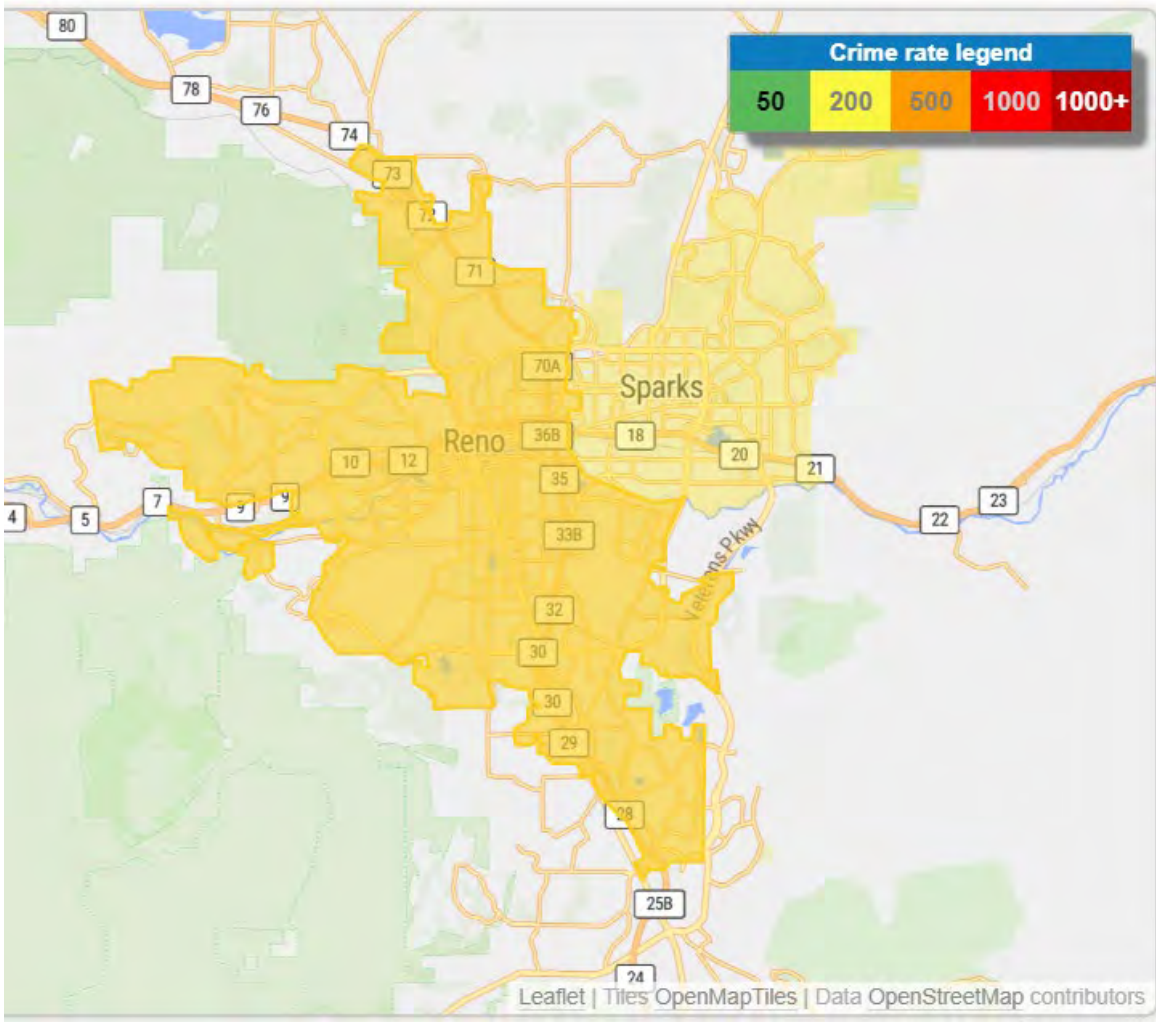


Figure 22: Map of Reno and Sparks with Crime Rate Legend[58]

[58] City-Data.com, 2024, "Map of Reno and Sparks with Crime Rate Legend." Crime in Reno, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

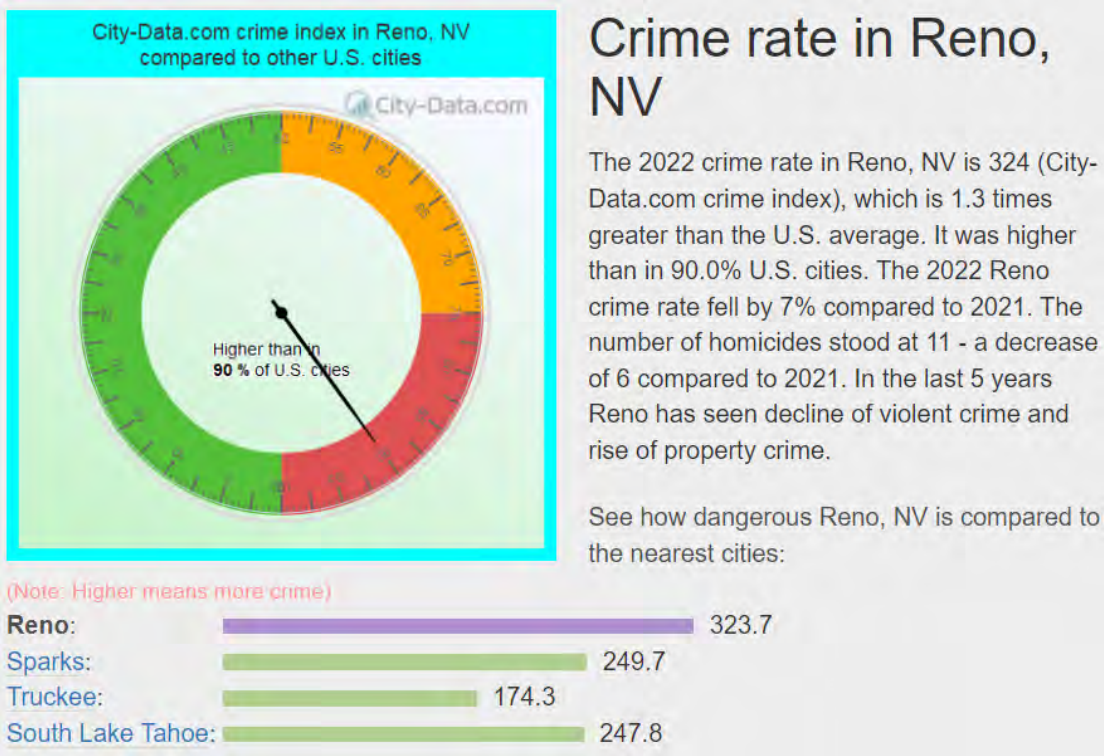


Figure 23: Crime Rate Meter for Reno Nevada Compared with Other US Cities[59]

Figure 24 illustrates crime statistics compiled by City-Data.com in percentages of different types of crime committed in the City of Reno for 2022. From the pie chart, the percentage of thefts in 2022 was 55.7% and would represent the greatest number of criminal acts committed, with burglaries, auto thefts, and assaults following.

[59] City-Data.Com, 2024, Crime in Reno, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

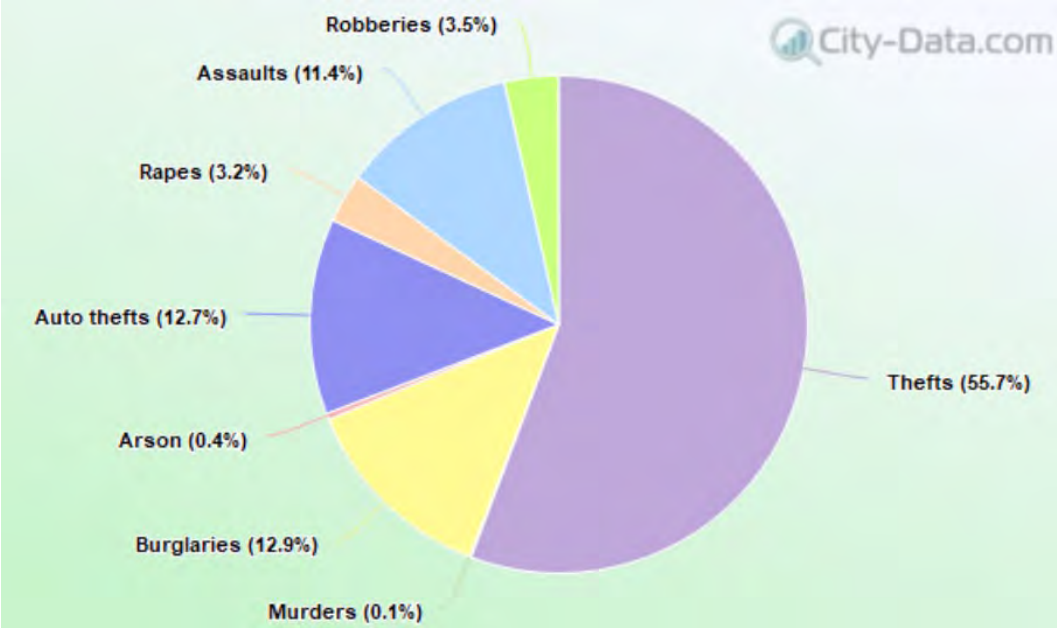


Figure 24: Crimes by Type for the City of Reno, 2022[60]

PREVIOUS OCCURRENCE/HISTORY

- **May 30, 2020:** A gathering of 1,000 protesters in downtown Reno became violent, and civil unrest ensued. This forced the need for barricades, street closures (Virginia Street/First Street), and law enforcement. The protestors broke windows at City Hall and even started a fire inside City Hall. There was vandalism to downtown businesses and the Central Police Station.
- **November 28, 2017:** A 30-year-old male gunman rained gunfire down onto Sierra Street from the 8th floor of the Montage condominiums in downtown Reno and barricaded himself and a hostage inside of an apartment. The suspect died after being taken into custody after the Reno Police Department and the Washoe County Sheriff's Office SWAT team breached the room. The hostage was uninjured, but a passerby reported one minor injury.
- **October 29, 2015:** A Reno Walmart employee shot and wounded three Walmart employees.
- **December 17, 2013:** A gunman entered the Center for Advanced Medicine and accessed Urology Nevada. He shot two doctors and a patient. One of the doctors later died of their injuries.
- **October 21, 2013:** A 12-year-old student opened fire with a semi-automatic handgun at Sparks Middle School, injuring two students and killing a teacher.

[60] City-Data.Com, 2024, "City-Data Crimes by Type Statistics for City of Reno 2022." Crime in Reno, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

Future weather conditions have no direct connection to acts of violence and terrorism. However, increased development and urbanization can increase the probability of active threats. UN Secretary General Antonio Guterres asserts, climate impacts can, however, compound conflicts and exacerbate fragility…When the loss of livelihoods leaves populations in despair, the promises of protection, income, and justice—behind which terrorists sometimes hide their true designs—become more attractive.[61]

Figure 25 illustrates crime rates in the City of Reno by year from 2009 to 2022, the types of crimes committed (per 100,000 population) and the trends of increasing/decreasing crime acts identified in comparison to state averages.

Crime rates in Reno by year

Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Murders (per 100,000)	↓9 (4.1)	↓9 (4.0)	↑14 (6.2)	↓7 (3.0)	↑14 (6.0)	↑15 (6.4)	↑15 (6.3)	↓9 (3.7)	↑19 (7.6)	↓6 (2.4)	↕12 (4.7)	↕17 (6.6)	↕17 (6.5)	↓11 (4.0)
Rapes (per 100,000)	↑84 (38.0)	↓46 (20.4)	↓27 (11.9)	↓33 (14.3)	↑68 (29.2)	↑↑128 (54.5)	↑↑136 (56.7)	↑↑139 (56.8)	↑142 (57.1)	↑↑174 (69.0)	↑↑180 (70.8)	↑↑269 (103.8)	↑↑230 (87.5)	↑↑277 (101.2)
Robberies (per 100,000)	↑409 (185.1)	↑385 (170.9)	↑383 (168.6)	↑327 (141.9)	↑305 (131.1)	↑263 (111.9)	↑345 (143.9)	↑↑393 (160.7)	↑↑382 (153.7)	↑303 (120.1)	↑312 (122.7)	↑↑295 (113.8)	↑↑301 (114.5)	↑↑300 (109.6)
Assaults (per 100,000)	↑↑971 (439.3)	↑728 (323.2)	↑684 (301.2)	↑825 (357.9)	↑767 (329.8)	↑741 (315.2)	↑↑923 (385.0)	↑↑ 1,176 (480.9)	↑↑ 1,131 (455.1)	↑↑ 1,153 (456.9)	↑927 (364.5)	↑997 (384.7)	↑ 1,000 (380.3)	↑977 (357.0)
Burglaries (per 100,000)	↑ 1,848 (836.2)	↕ 1,638 (727.3)	↕ 1,618 (712.4)	↕ 1,633 (708.5)	↕ 1,411 (606.7)	↕ 1,312 (558.2)	↑ 1,440 (600.7)	↕ 1,208 (494.0)	↑ 1,347 (542.0)	↑ 1,073 (425.2)	↕902 (354.6)	↑↑ 1,353 (522.1)	↑↑ 1,271 (483.4)	↑↑ 1,113 (406.7)
Thefts (per 100,000)	↑ 6,209 (2,809)	↑ 5,101 (2,265)	↕ 4,311 (1,898)	↕ 4,909 (2,130)	↑ 4,901 (2,107)	↑ 4,711 (2,004)	↑ 5,070 (2,115)	↑ 5,381 (2,200)	↑ 4,890 (1,968)	↕ 3,930 (1,557)	↕ 3,684 (1,448)	↑ 4,470 (1,725)	↑ 5,147 (1,958)	↑ 4,790 (1,750)
Auto thefts (per 100,000)	↑753 (340.7)	↑729 (323.7)	↑621 (273.4)	↑↑881 (382.2)	↑↑868 (373.2)	↑↑775 (329.7)	↑↑ 1,021 (425.9)	↑↑ 1,344 (549.6)	↑↑ 1,432 (576.2)	↑↑ 1,050 (416.1)	↑↑ 1,184 (465.5)	↑↑989 (381.6)	↑↑ 1,377 (523.7)	↑ 1,091 (398.7)
Arson (per 100,000)	↓33 (14.9)	↓29 (12.9)	↓26 (11.4)	↓29 (12.6)	↓18 (7.7)	↓15 (6.4)	↓26 (10.8)	↓10 (4.1)	↓18 (7.2)	↓16 (6.3)	↓15 (5.9)	↓27 (10.4)	↓21 (8.0)	↑36 (13.2)
City-Data.com crime index	380.1	307.7	280.3	297.0	297.4	298.6	338.8	363.8	360.9	312.7	295.7	343.3	347.4	323.7

↓ - means the value is smaller than the state average.
↕ - means the value is about the same as the state average.
↑ - means the value is bigger than the state average.
↑↑ - means the value is much bigger than the state average.

Figure 25: Crime Rates in Reno by Year, 2009–2022, Indicating Types of Crime and Trends[62]

[61] United Nations, UN News Global Perspectives Human Stories, 2021 https://news.un.org/en/story/2021/12/1107592

[62] City-Data.com, 2024, "Crime Rates in Reno by Year, 2009-2022, indicating types of crime and trends." Crime in Reno, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

Figure 26 illustrates the five-year trend of violent crime statistics compiled by the City of Reno Police Department between 2019 and 2023 by the number of violent crimes committed each year, indicating a steady increase in violent crimes. Violent Crime is composed of four offenses: Murder and Nonnegligent Manslaughter, Rape, Robbery, and Aggravated Assault.

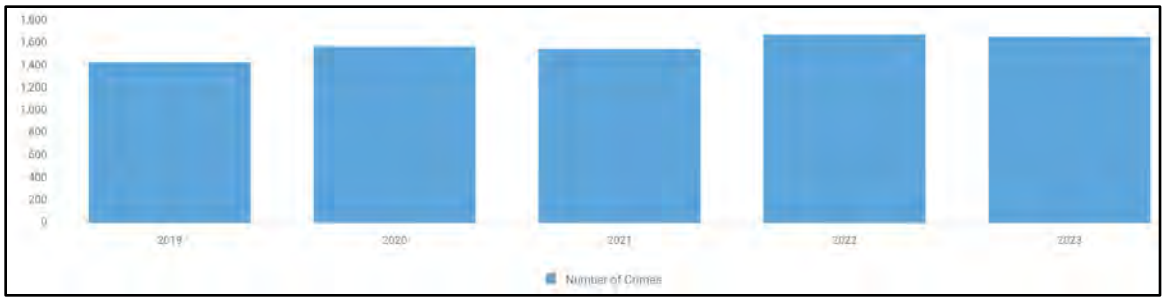


Figure 26: Nevada Crime Statistics, Violent Crime, Reno Police Department, 2019–2023[63]

Figure 27 illustrates a five-year trend of property crime statistics compiled by the City of Reno Police Department between 2019 and 2023 by the number of property crimes committed each year, indicating a decrease in property crime between 2021 and 2023.

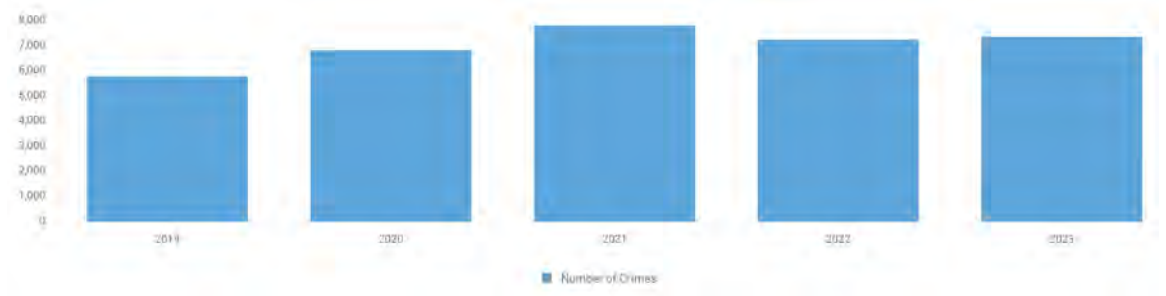


Figure 27: Nevada Crime Statistics, Property Crime, Reno Police Department, 2019–2023[64]

Figure 28 illustrates monthly violent crime statistics compiled by the City of Reno Police Department for 2023, indicating the number of actual offenses committed per month and the total number of offenses cleared by the police department.

[63] Nevada Government, City of Reno Police Department, 2023, "Nevada Crime Statistics, Violent Crime, Reno Police Department, 2019-2023." Violent Crime 2023 (nv.gov)
[64] Nevada Government, City of Reno Police Department, 2023, "Nevada Crime Statistics, Property Crime, Reno Police Department, 2019-2023." Violent Crime 2023 (nv.gov)

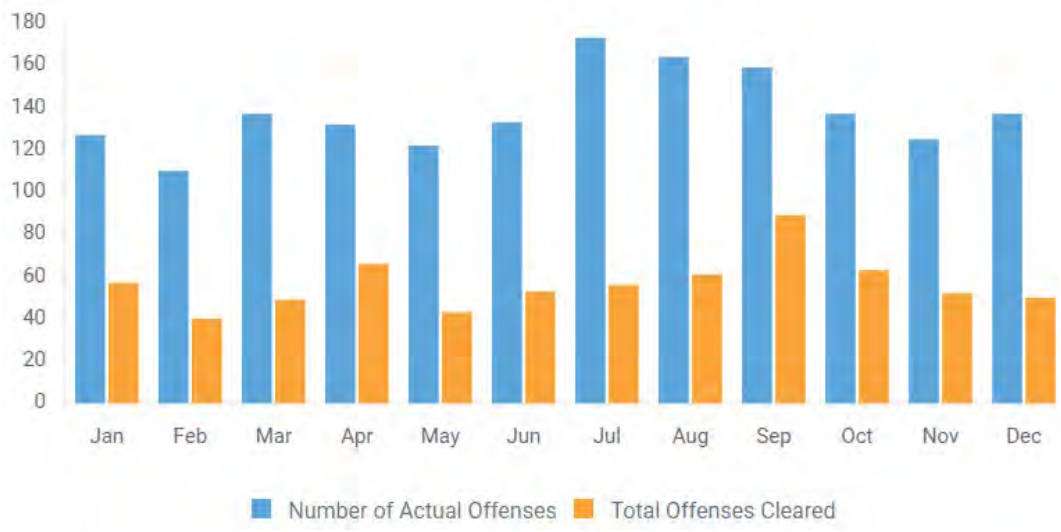


Figure 28: City of Reno Police Department Violent Crimes Statistics by Month, 2023, Actual Offenses and Offenses Cleared[65]

PROBABILITY OF FUTURE EVENTS

The probability of future criminal activity in Reno, Nevada, can generally be considered as "likely," given various factors such as population density, socioeconomic conditions, and historical crime data. However, it is important to note that the nature and frequency of such events can vary based on numerous circumstances.

As for terrorism events, the likelihood is typically categorized as "unlikely" due to the extensive security measures in place and the specific targeting that usually characterizes such incidents. Overall, while criminal activity remains a concern, terrorism is considered less probable in that region.

VULNERABILITY

County, schools, government buildings, or other public gathering places or public events would likely be the top targets for acts of terrorism. Many acts of violence also occur in public gathering places. Acts of violence could have an impact on the community in the following ways: loss of human life; damage to buildings and structures; temporary displacement during the threat and/or investigation; stress on medical, emergency response, and security services; decrease in economic activity and hospitality business after the event; psychological and emotional trauma; and an increased need for emergency services and funding.

[65] Nevada Government, City of Reno Police Department, 2023, “City of Reno Police Department Violent Crimes Statistics by Month 2023, Actual Offenses and Offenses Cleared.” Violent Crime 2023 (nv.gov)

Figure 29 illustrates the number of full-time law enforcement employees/police officers for the State of Nevada and for the City of Reno from 2003 to 2021. The line graph indicates the number of full-time police officers employed with the City of Reno has decreased significantly, from 1.5 police officers per 1,000 residents in 2003 to maintain a steady decline of 1.2 police officer per 1,000 residents in 2021, compared with 2.6 per 1,000 residents State of Nevada full-time law enforcement officers.

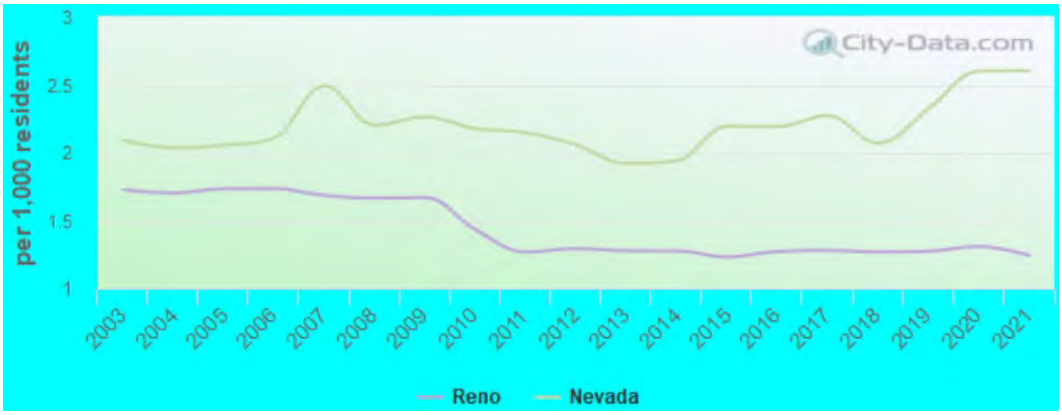


Figure 29: City of Reno Police Department Full-Time Law Enforcement Employees – Police Officers per 1,000 Residents, 2003–2021[66]

Figure 30 illustrates statistics compiled by the City of Reno Police Department for the number of murders committed for 2023 and the victim's age.

[66] City-Data.com, 2024, "City of Reno Police Department Full Time Law Enforcement Employees-Police Officers Per 1,000 Residents, 2003-2021." Crime in Reno, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

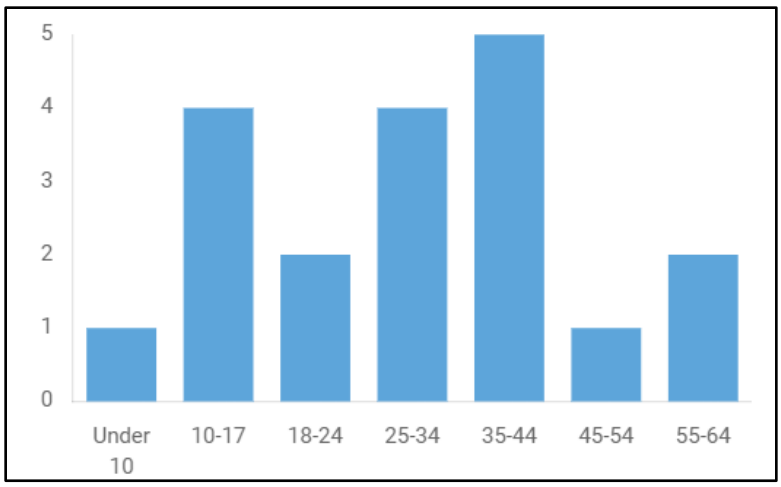


Figure 30: City of Reno Murders by Victim Age, 2023[67]

Figure 31 illustrates statistics compiled by the City of Reno Police Department for the number of murders committed for 2023 and the victim's gender.

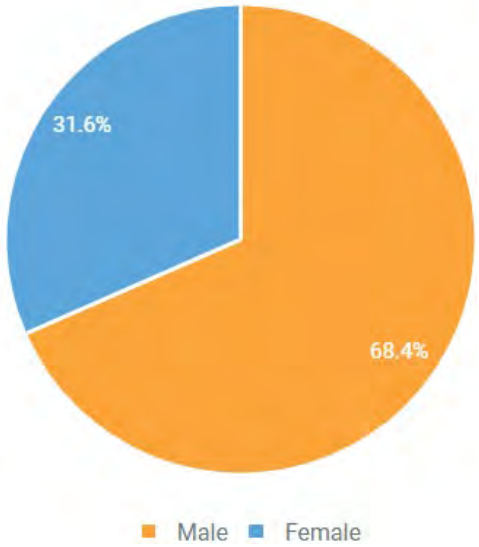


Figure 31: City of Reno Murders by Victim Gender, 2023[68]

Figure 32 illustrates statistics compiled by the City of Reno Police Department for the number of murders committed for 2023 and the victim's race.

[67] Nevada Government, City of Reno Police Department, 2023, "City of Reno Number of Murders by Victim Age (Murder) 2023." Violent Crime 2023 (nv.gov)
[68] Nevada Government, City of Reno Police Department, 2023, "City of Reno Number of Murders by Victim Gender (Murder) 2023." Violent Crime 2023 (nv.gov)

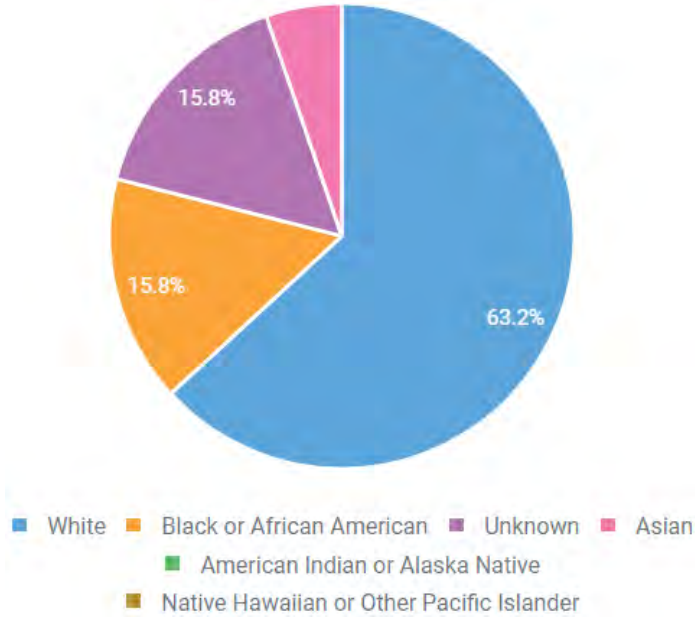


Figure 32: City of Reno Murders by Victim Race, 2023[69]

VULNERABLE POPULATIONS

In Reno, several populations may be considered vulnerable to criminal acts and terrorism due to various factors. One of the most at-risk groups includes low-income individuals and families. Economic hardship can make these populations more susceptible to crime, as they may have fewer resources for security and community support. Additionally, those living in transient or unstable housing conditions often face heightened vulnerabilities due to their lack of social networks and increased isolation.

Another demographic that is vulnerable includes the elderly and individuals with disabilities. These groups may have physical limitations that can hinder their ability to protect themselves or seek help in dangerous situations. Furthermore, they may be targeted by scams or exploitation, making awareness and prevention efforts essential for their safety.

Cultural and ethnic minorities can also be at risk, particularly if they face discrimination or language barriers. Such challenges can limit their access to resources, making them more exposed to criminal elements. In some cases, these populations may avoid reporting crimes due to fear of retribution or distrust of law enforcement, which further exacerbates their vulnerability.

Additionally, youth and young adults, especially those involved in gangs or high-risk activities, may find themselves at higher risk for both violent crime and recruitment into extremist

[69] Nevada Government, City of Reno Police Department, 2023, "City of Reno Number of Murders by Victim Race (Murder) 2023." Violent Crime 2023 (nv.gov)

groups. This demographic often requires targeted intervention programs to address underlying issues and prevent future victimization.

DEVELOPMENT TRENDS

- **Economic:** Tourism is the major industry in the Reno area. The hotel and casino industry attracts more than five million visitors annually and adds over $4 billion to the local economy each year. The business climate also has a strong presence in manufacturing and logistics in industries, such as computers, electronics, financial services, and communications. This diversity supports the thriving local economy and includes a wide range of restaurants and retail options (Increased Vulnerability).

VULNERABILITY SCORE

The city of Reno ranked criminal acts and terrorism as **High Risk**.

Avalanche and Landslide

An avalanche is a natural disaster caused when a mass of snow, ice, or rock suddenly slides down a mountainside or slope. Different snow avalanches include slab avalanches, loose snow avalanches, gliding avalanches, powder avalanches, and wet snow avalanches.[70]

Landslides, also known as mass movements, are complex phenomena that occur due to a combination of geological, climatological, and human factors. They are defined as the downward movement of a mass of rock, debris, or earth along a slope or cliff. Heavy rainfall, snowmelt, earthquakes, volcanic activity, and human activities, such as mining or construction, can trigger landslides. The type of slope, the nature of the soil and rock, and the presence of vegetation all play a role in determining the likelihood of landslide occurrence. There are five modes of slope movement: falls, topples, slides, spreads, and flows, and these are further categorized based on the type of geological material and type of movement: bedrock, debris, or earth. Movements include rotational, translational, block, rockfall, topple, debris flow, debris avalanche, earthflow, and creep. Landslides may be small or very large, and they can move at slow to very high speeds. They can be initiated by storms, earthquakes, fires, volcanic eruptions, and human modifications of the land that lead to slope instability.

LOCATION

Avalanche risk is highest in the steep, mountainous areas of the Carson Range of the Sierra Nevada in southwestern Washoe County. Incline Village and Crystal Bay are under avalanche advisories several times each winter.

[70] WSL Institute for Snow and Avalanche Research, “Avalanche Types.” https://www.slf.ch/en/avalanches/avalanche-science-and-prevention/avalanche-types/#:~:text=Slab%20avalanches%20are%20the%20most,and%20caught%20in%20the%20avalanche.

PREVIOUS OCCURRENCE/HISTORY

No previous occurrences of avalanches or landslides.

PROBABILITY OF FUTURE EVENTS

The probability of future avalanche events in Reno can vary based on several factors, including weather conditions, snowpack stability, and geographical features, but it is unlikely. While Reno itself is not typically a high-risk area for avalanches due to its lower elevations and urban environment, surrounding mountainous regions, such as those in the Sierra Nevada, are prone to avalanches during the winter months.

VULNERABILITY ANALYSIS

Mountain communities in the Lake Tahoe Basin, including Incline Village and Crystal Bay, are vulnerable to the effects of avalanches. When avalanche conditions are present, risks are highest for recreational users and others in backcountry areas who may trigger avalanches or be injured or killed by an avalanche. Besides injuries and deaths, avalanches can damage or destroy property and utilities and cover roadways in snow. Transportation disruptions caused by avalanches or area closures because avalanche risks can have economic impacts on ski resorts and other businesses in the Lake Tahoe Basin over a period of days to a week or more.

The City of Reno ranked avalanche and landslide hazards as **Low Risk**.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Avalanches and landslides can have significant impacts and potential losses on Reno despite their low risk. Infrastructure damage is a primary concern, as both events can severely affect roads, bridges, and buildings, leading to costly repairs and disrupting transportation and emergency services.

Economically, these natural disasters can result in lost business revenue during closures and a decline in tourism, particularly for winter sports, which would negatively impact the local economy and job market.

Safety is another critical factor; avalanches and landslides pose immediate risks to residents and visitors, leading to injuries or fatalities. This can strain healthcare resources and create legal liabilities for the city.

Environmental impacts include ecosystem disruptions and the potential loss of vegetation and wildlife habitats, leading to costly restoration efforts. Additionally, insurance premiums may rise as risks increase, placing financial burdens on homeowners and businesses.

VULNERABLE POPULATIONS

In Reno, several populations may be particularly vulnerable to avalanches and landslides due to a combination of geographical, social, and economic factors.

Firstly, residents living in mountainous areas or near steep slopes are at heightened risk. This includes neighborhoods located at higher elevations or those close to natural drainages that can become overwhelmed during heavy rains or snowmelt. Many homes in these regions may not be sufficiently engineered to withstand the forces of an avalanche or landslide.

Another group at risk includes lower-income households and communities experiencing housing insecurity. These populations may reside in less stable housing conditions, often in areas that are less monitored for geological hazards. Limited access to transportation and resources can exacerbate their vulnerability, making evacuation and access to emergency services more challenging during a disaster.

Additionally, elderly individuals and those with disabilities are particularly susceptible due to mobility challenges that can impede their ability to escape quickly in the event of an avalanche or landslide. Lack of awareness or access to information about local hazards can further increase their risk.

Finally, tourists and seasonal visitors who may not be familiar with the local terrain and its risks can unwittingly place themselves in harm's way.

Drought

Nevada is the driest state in the nation, and the planning area has experienced multiple droughts. Drought cycles consisting of successive years of low precipitation are a normal, recurrent phenomenon across the Great Basin. Drought differs from most other natural hazard events due to its slow onset, gradual impact, and duration. With no defined starting period and limited long-range predictability, drought is a "creeping hazard" that may be recognized only after it is well underway. The onset of drought involves many factors, but in Washoe County, it is generally caused by successive years of inadequate winter precipitation, resulting in insufficient natural supplies to meet local demand. It is critical to note that the region depends almost exclusively on winter snowpack and rainfall for its water supply. Rains from summer thunderstorms do little to recharge reservoirs and raise groundwater tables.

LOCATION

Drought affects broad regions and can include any portion of Washoe County. Historically, the southern section of the County has had less frequent droughts than the central and northern sections because of extensive stored water in reservoirs in the Truckee River basin. However, low snowpack in the Truckee River basin can cause droughts of a greater magnitude in the southern section of the County, as was experienced between 2012 and 2017. With the implementation of the Truckee River Operating Agreement, the Truckee Meadow Water

Authority can store credit water in the Boca Reservoir. The reservoir is currently operated for wintertime flood control based on the 1985 US Army Corps of Engineers' (USACE) Water Control Manual (WCM), which requires minimum specific flood space requirements in the reservoir and prohibits the capture of springtime runoff before April. Stakeholders throughout the Truckee River Basin recognize that the system can be better operated for both flood control and water supply.

PREVIOUS OCCURRENCE/HISTORY

2021-2022 Extreme drought in Washoe County

PROBABILITY OF FUTURE EVENTS

The probability of future drought events in Reno can be considered likely. The region has experienced variations in precipitation and increasing temperatures, which can contribute to drought conditions.

VULNERABLE POPULATIONS

In Reno, Nevada, several populations are particularly vulnerable to drought conditions. These include low-income families, who may struggle to afford increased water prices or adopt conservation measures. Drought can exacerbate existing financial strains, making it difficult for these households to secure reliable access to water.

Additionally, elderly residents and those with health issues are at heightened risk. They often rely on consistent access to water for hydration and medical needs, and may face challenges in adapting their routines or finding resources during water shortages. Furthermore, individuals living in rural or underserved areas may lack infrastructure for efficient water delivery and storage, leaving them more exposed to the impacts of drought.

The hospitality and agricultural sectors also face vulnerability, as they depend heavily on water for operations. Farmers may suffer crop losses due to water scarcity, while businesses reliant on tourism may see a decline in visitors during periods of extreme drought.

Lastly, Native American communities in the region may experience unique challenges related to land rights and water access, further complicating their vulnerability during drought periods.

VULNERABILITY ANALYSIS

Drought can impact surface water and groundwater availability and have direct, disastrous effects on human populations. The indirect consequences of drought are not often fully known. They include unemployment, reduced tax revenues, increased food prices, reduced outdoor recreation opportunities, higher energy costs as water levels in reservoirs decrease and consumption increases, and water rationing. This complex web of impacts can affect people and economies well beyond the area physically experiencing the drought.

The City of Reno ranked drought hazard as **High Risk.**

Hazardous Materials Incident

A hazardous material is any item or agent (biological, chemical, or physical) that can cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials can be present in the form of gas, solid, or liquid. Environmental or atmospheric conditions can influence hazardous materials if they are uncontained.

LOCATION

The potential for contact with hazardous materials is present in all areas of Washoe County. Notably, hazardous materials are transported through the I-80 corridor, the North 395/South 580, and the Union Pacific Railroad on a daily basis and can have major impacts due to transportation accidents.

PREVIOUS OCCURRENCE/HISTORY

No significant hazardous materials incidents in the City of Reno have occurred over the past 5 years. City of Reno Utility Services – Environmental Control Section and the Reno Fire Department occasionally encounter and mitigate minor incidents with hazardous materials, including biohazardous material cleanups.

PROBABILITY OF FUTURE EVENTS

The probability of future hazardous materials events in Reno can be classified as likely. Factors such as industrial activities, transportation routes, and population density contribute to this likelihood.

VULNERABILITY ANALYSIS

The City of Reno ranked hazardous material incident hazards as **High Risk**.

VULNERABLE POPULATIONS

In Reno, certain populations are more vulnerable to hazardous materials incidents due to a variety of factors, including socioeconomic status, health conditions, and geographical location.

One of the most susceptible groups includes low-income communities, which may lack the resources to prepare for or respond to emergencies effectively. These neighborhoods often have limited access to transportation, making it difficult for residents to evacuate quickly in case of a hazardous incident. Additionally, those living in poverty may not have the financial means to stockpile essential supplies or take preventative measures.

Children and the elderly are other vulnerable populations. Children are at greater risk due to their developing bodies, which can be more sensitive to environmental toxins, and they may not understand the dangers associated with hazardous materials. The elderly may have pre-existing health conditions that can be exacerbated by exposure to harmful substances, and they might face mobility challenges that hinder their ability to evacuate if needed.

Individuals with chronic illnesses or disabilities are also at higher risk. Conditions such as asthma, respiratory diseases, or other health issues can be aggravated by exposure to hazardous materials. Moreover, those with disabilities might require additional assistance during emergencies, making them more vulnerable in hazardous situations.

Additionally, communities located near industrial areas or transport routes for hazardous materials are at increased risk. Proximity to chemical plants, warehouses, or busy highways can heighten the likelihood of exposure in the event of an accident.

Lastly, racial and ethnic minorities can face unique challenges during hazardous materials incidents, often due to systemic inequalities that limit their access to resources, information, and support during emergencies.

Infectious Disease

While chronic disease has placed a lasting strain on the nation's healthcare system, acute infectious disease poses a greater immediate and severe threat to its capacity. These diseases, caused by pathogenic bacteria, viruses, fungi, or parasites, are often marked by debilitating symptoms, such as fever, diarrhea, fatigue, muscle aches, coughing, respiratory issues, and rashes.[71] An outbreak of infectious diseases can bring socioeconomic activity and critical government functions to a standstill.

LOCATION

Infectious diseases spread by humans, and vector-borne infectious diseases can occur in both urban and non-urban areas throughout the County. Areas in the county that are more susceptible to infectious diseases are typically those with higher population density, such as Reno and Sparks, and areas with poor sanitation and limited access to healthcare services. On the other hand, areas more susceptible to vector-borne diseases are often those with standing water or extensive vegetation, providing suitable habitats for disease-carrying vectors, such as mosquitoes and ticks. These are more prevalent in non-urban areas.

[71] Mayo Clinic, "Infectious Diseases." https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/syc-20351173

PREVIOUS OCCURRENCE/HISTORY

- **03/13/20 Covid 19** – City of Reno emergency declaration, global pandemic, community shutdown. Complete community shutdown. Economic, tourism, mental health, physical illness, hospitalization, death.
- **2019 –** Other diseases, such as West Nile Virus, are present. In addition, the resurgence of diseases previously considered largely eradicated has been identified in vulnerable (unhoused) populations.

PROBABILITY OF FUTURE EVENTS

The probability of future infectious disease events in Reno can be considered "likely." Factors such as population density, movement of people, and environmental conditions contribute to the potential for outbreaks. Monitoring and preventive measures can help mitigate risks, but the likelihood of infectious disease events remains a concern in urban areas.

VULNERABILITY ANALYSIS

Infectious diseases are known to spread quickly through communities. Many spread through close contact, meaning that highly populated areas like Reno and Sparks are more prone to widespread outbreaks. Public gathering places where people may be together in close quarters, such as schools and childcare facilities, offices, and transportation terminals, provide more opportunities for diseases to pass from one person to another.

Land use changes can have a major impact on infectious disease numbers. This is done by changing the rate of contact between individuals and disease hosts, whether animal, insect, or fungal. Along with this change in contact rate, land use changes can alter the composition of local species, potentially allowing vector species to become the dominant species.

Outbreaks of infectious diseases most often affect vulnerable populations. However, a worst-case scenario could overwhelm local hospitals and medical facilities and require a surge response.

The City of Reno ranked infectious disease hazards as **High Risk**.

Radiological Waste Transport

The transportation of radiological waste and other types of radiological materials is a common practice in Washoe County. Washoe County roadways, railways, and airways ship different forms of radiological materials daily. The transportation of radioactive materials through Nevada must follow the hazardous materials regulations of the U.S. Department of Transportation. Most shipments do not require prior notification and do not follow restricted routes. If the type or quantity of radiation exceeds a “Quantity of Concern,” the shipper must notify the state of the planned time and route. Shipments of Radioactive Material in Quantities

of Concern are not restricted and are not required to wait for approval. A more restricted category is Highway Route Controlled Quantity (HRCQ), which requires prior notification, and pursuant to a Governor's directive, the shipment and transportation vehicle are inspected and then escorted by the Nevada Highway Patrol. These shipments occur about once every three years through Washoe County.

LOCATION

Radiological waste could be transported along rail systems, major airports, and highway corridors in Washoe County. The zones of potential impact extend beyond these transportation facilities. The sizes and shapes of those zones are affected by the material released and atmospheric and environmental effects, such as wind speed and water flow.

PREVIOUS OCCURRENCE/HISTORY

No previous occurrences of Radiological Waste Transport.

PROBABILITY OF FUTURE EVENTS

The probability of future radiological waste transport events in Reno, Nevada, is generally considered unlikely. However, it can depend on factors such as regional policies regarding waste management, proximity to facilities that handle radioactive materials, and transportation routes utilized for such purposes.

VULNERABILITY ANALYSIS

The MPT determined that hazards from transporting radiological waste have a low probability of occurring. However, the vulnerability of the public, continuity of operations, and infrastructure to radiological waste transport are assessed below. A radiological incident on a transportation corridor could cause a fire or explosion, dispersing radiological particles that contaminate people and property. Depending on several factors, communities in the immediate vicinity of the event would be the most vulnerable. Moreover, if the radioactive materials are not effectively contained, they can spread through the air, soil, and/or water. In the immediate aftermath of a radiological incident on a roadway, the materials pose a substantial risk to first responders and other emergency personnel. Due to the infrequent occurrence of these accidents, emergency personnel may not be sufficiently trained in appropriate response protocols.

The City of Reno ranked radiological hazards as **Moderate Risk**.

VULNERABLE POPULATIONS

In Reno, several populations may be considered vulnerable to radiological waste transport incidents. These groups include low-income communities, elderly individuals, children, and those with existing health issues.

Low-income populations often reside in areas near major transportation routes, thereby increasing their risk of exposure to hazardous materials. Limited resources may diminish their capacity to evacuate or respond effectively during an emergency. Similarly, elderly individuals may face mobility challenges, making it harder for them to evacuate in a timely manner.

Children are particularly vulnerable due to their developing bodies and higher respiration rates, which increase their exposure risk. Additionally, individuals with pre-existing health conditions may be more susceptible to the adverse effects of radiological exposure, requiring targeted attention in emergency planning.

Transportation Incident (Aircraft Crash)

An aircraft crash may occur for many reasons, including mechanical failure, poor weather conditions, or criminal activity. Aircraft of varying sizes are subject to this hazard, from small single-engine aircraft and gliders to helicopters and commercial airliners. The damage from an aircraft crash depends on the location of the accident (densely versus sparsely populated area) and the potential for releasing hazardous materials.

LOCATION

Washoe County has four publicly operated airports: the Reno–Tahoe International Airport (RNO). Several privately operated airports in the County serve commercial, non-commercial, private commuter, and recreational aircraft. The greatest volume of commercial aircraft service passes through Reno–Tahoe International Airport. Federal agencies, such as the Bureau of Land Management, also operate and lease airports in Nevada.

PREVIOUS OCCURRENCE/HISTORY

- **September 17, 2023** – Two pilots were killed when their planes collided in midair during an air race in Reno, Nevada. The aircrafts—a North American T-6G and a North American AT-6B—crashed during the final day of competition at the National Championship Air Races. Only the pilots were on board at the time of the collision, according to the Federal Aviation Administration. The tragic incident occurred on the last day of the famed air races, which were being held for the last time ever that year in Reno. The competition took place at the Reno-Stead Airport for 59 years, but the airport will no longer host the event, "citing the region's significant growth amongst other concerns," according to the Reno Air Racing Association Board of Directors. The deadliest crash was in 2011, when an and plunged into the ground near a seating area, killing one pilot and 10 spectators. Dozens of others were injured.[72]

[72] NPR.com, September 18, 2023, Juliana Kim, "Two pilots were killed in a midair collision on the last day of Nevada air races," https://www.npr.org/2023/09/18/1200092542/reno-air-show-crash

VULNERABILITY ANALYSIS

Public airports that have accepted federal assistance, including the Reno–Tahoe International Airport, must designate runway protection zones (RPZs) at each end of their runways to protect people and property on the ground if an aircraft lands or crashes beyond the runway. Reno–Tahoe International Airport owns most of the land in its RPZs in Reno.[73] Aircraft crashes are more likely to occur in mixed commercial, residential, and commercial–industrial development in the RPZs.

Reno Stead Airport has designated airport-critical areas at the ends of its runways. These trapezoidal areas help ensure that land use is compatible with airport operations to reduce risks to people and property on the ground. The airport-critical areas at either the end of Runway 8/26 or the south end of Runway 14/32 extend beyond airport property. Residential areas in the County and industrial and recreational areas in Reno near the airport are critical areas where aircraft crashes are more likely to occur.

The City of Reno ranked aircraft crash hazard as **Moderate Risk.**

VULNERABLE POPULATIONS

In Reno, certain populations are particularly vulnerable to transportation incidents, including aircraft-related incidents. Low-income families often find themselves at greater risk due to reliance on public transportation or living in proximity to airports. This demographic may have limited access to resources or emergency information that could help them navigate dangerous situations effectively.

Children also represent a vulnerable group, especially those attending schools located near airports. Their limited understanding of safety protocols can put them at risk during emergencies. Additionally, the noise and air pollution from air traffic can have adverse effects on their health and well-being.

Elderly residents face unique challenges as well. Many older adults may have mobility issues that complicate their ability to evacuate quickly in the event of an incident. This demographic is often more susceptible to health complications that can arise from transportation-related disturbances.

Individuals with disabilities are another group that may experience heightened vulnerability. Whether due to physical or cognitive impairments, these individuals can encounter difficulties in navigating their environment safely, especially in chaotic situations like transportation incidents.

[73] Reno-Tahoe Regional Airport, "RNO.C3_Facility Requirements_Final.docx." https://www.renoairport.com/wp-content/uploads/2022/08/RNO-MP-2018_Facility-Requirements.pdf

Moreover, low-income communities tend to lack the same level of access to resources and support systems that enhance safety. Economic disadvantages can limit options for effective emergency responses, putting these populations at an elevated risk during transportation incidents.

Finally, tourists and visitors in Reno may not be familiar with the local area or safety measures, making them particularly vulnerable during incidents. Their lack of awareness regarding potential risks at the airport or surrounding areas can increase the likelihood of encountering dangerous situations.

Volcano

A volcano is an opening or rupture of the earth's surface that allows ash, gases, and/or molten rock under tremendous pressure to emerge from the surface. Volcanic activity over long periods can either form mountains, as molten rock is gradually extruded, or rapidly obliterate mountains during explosive eruptions.

LOCATION

No active volcanoes are in Washoe County.

PREVIOUS OCCURRENCE/HISTORY

No previous occurrence of Volcanos.

PROBABILITY OF FUTURE EVENTS

The probability of future volcanic events in Reno, Nevada is considered unlikely. The region is not known for volcanic activity, as it is situated away from major volcanic centers. While there may be some geological features in the broader area, the risk of a volcanic eruption directly impacting Reno is minimal.

VULNERABILITY ANALYSIS

The City of Reno ranked volcano hazard as **Low Risk**.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The potential impacts of a volcanic eruption on the city of Reno, while unlikely, could still be significant. Air quality issues would be a major concern, as eruptions can release ash and gases that degrade air quality, leading to respiratory problems and increased healthcare costs for residents.

Infrastructure damage is another critical issue, as volcanic ash can accumulate on buildings, roads, and power lines, causing structural failures and resulting in expensive repairs.

Additionally, essential services such as water supply and electricity could be disrupted, leading to economic repercussions.

Evacuations may be necessary if an eruption threatens the area, creating challenges related to temporary housing and relocations. The tourism industry could also face serious impacts, as visitors may be deterred, affecting local hotels, restaurants, and attractions.

Overall, while the chances of a volcanic event affecting Reno are low, the potential consequences for the city's economy and residents' well-being could be significant.

VULNERABLE POPULATIONS

In Reno, certain populations are especially vulnerable to the impacts of volcanic activity, despite the region not being known for active volcanoes. One of the primary groups at risk is the low-income community. These individuals often lack the resources necessary for effective disaster preparedness and recovery. Limited access to transportation, emergency supplies, and critical information can leave them particularly exposed to the hazards associated with volcanic eruptions, such as ash fallout and the need for evacuation.

Another vulnerable demographic is the elderly population. Seniors may face significant challenges during a volcanic event due to mobility issues and chronic health conditions that could impede their ability to evacuate quickly. They are likely to require additional support, not only in the evacuation process but also in accessing medical services and ensuring they have their essential medications and supplies on hand.

Children and families also represent a group that may struggle during such emergencies. Young children might not fully grasp the dangers posed by a volcanic eruption, relying heavily on adults for guidance and protection. Families may face logistical difficulties when evacuating, especially if they have multiple children, pets, or special needs to consider, thereby complicating their efforts for a safe exit.

People with disabilities constitute another vulnerable population under volcanic threat. Individuals with physical or cognitive limitations may require specialized assistance during an evacuation, making their safety more complicated to secure. Emergency response plans must incorporate their specific needs to ensure they receive the necessary support during a volcanic crisis.

Furthermore, those experiencing homelessness are particularly at risk. They often lack access to information about potential volcanic hazards and may find themselves without a plan or means of shelter during an eruption. Their absence of a stable living situation can lead to significant danger during such emergencies, emphasizing the need for targeted outreach and support.

Visitors and temporary residents, such as tourists or seasonal workers, are another group that is often overlooked. They may not be familiar with local emergency protocols, or the geological risks associated with the area, leaving them unprepared in the event of volcanic activity.

Vulnerability Assessment

JURISDICTION-SPECIFIC VULNERABILITIES

Table 13: Vulnerable Assets in the City of Reno

Vulnerable Assets	What makes this group/asset vulnerable during hazards? Have there ever been issues with recovery after an event?
People (residents, workers, visiting populations, and socially vulnerable populations like seniors, individuals with disabilities, lower-income individuals, etc.)	
Fires	
IES will provide mapping/HAZUS	
Unsheltered along river/streams (flooding) and rail (trains)	Unsheltered individuals residing along the river and train tracks face significant health and safety risks due to rising waters and constant railroad traffic.
Unsheltered during extreme heat/cold or fires (smoke)	During extreme heat/cold weather conditions, unsheltered individuals are directly exposed to the elements, which increases the risks of hypothermia, frostbite, heat exhaustion, and heatstroke. In addition, hazards related to air quality events and failure to seek adequate refuge can cause immediate danger for those with pre-existing health conditions and may result in an increased risk of cancer.
Structures (residential, commercial, industrial, government-owned, planned capital improvement, etc.)	
Walgreens bridge with communications line	Earthquake impacts on bridge structure could affect major communications lines located on the bridge.
Unreinforced structures	Subject to damage/destruction from earthquake
Unhoused trespassing at Truckee Meadows Water Reclamation Facility (TMWRF)	Unhoused trespassing at TMWRF could pose safety for individuals and/or staff at the plant.
Economic Assets (major employers, primary economic sectors, key infrastructure like telecommunications networks, etc.)	
Natural, Historic, and Cultural Resources (areas of conservation, beaches, parks, critical habitats, community centers, historic places, etc.)	
Pyramid Lake Paiute Tribe downstream partner affected by Truckee River water quality.	Disaster occurrence, major power outage, earthquake or flood could impact water quality discharge to the Truckee River.

Vulnerable Assets	What makes this group/asset vulnerable during hazards? Have there ever been issues with recovery after an event?
Critical Facilities and Infrastructure (hospitals, law enforcement, water, power, transportation systems, etc.)	
TMWRF power supply redundancy.	TMWRF does not have backup generators, only small scale battery backup for IT controls. Need increased battery backups for the server room. TMWRF currently working on a redundant power assessment.
TMWRF flooding	No employee access during major flood event
TMWRF seismic assessment	Destruction of critical wastewater infrastructure leading to wastewater entering the Truckee River
TMWRF cybersecurity assessment, on-site badging	
RSWRF cybersecurity assessment	
Community Activities (major local events, such as festivals, or economic events, like farming or fishing)	
Air Races now Air Show	
Multiple annual downtown festivals	
Regional festivals – i.e., Hot August Nights, Street Vibrations, Wing Fest, BBQ, Brews, & Blues	

ASSET INVENTORY

Local assets that may be affected by hazards include residents, properties, utilities, and infrastructure. GIS data from federal, state, and local databases were used to inform the vulnerability assessment and identify critical infrastructure. The Vulnerability Assessment Section of the Base Plan discusses the sources and types of data used in the RHMP. Data collection for the vulnerability assessment was complicated by the fact that the region has never comprehensively identified critical infrastructure; therefore, the list of critical infrastructure in the city of Reno may be incomplete. Similarly, valuation information has not been compiled by the region, so valuation data were not available to be included in the vulnerability assessment. Washoe County and its partners are committed to continuing to refine and build on the list of critical infrastructure over the next five years to improve the data in the next plan update.

REPETITIVE LOSS PROPERTIES

The city of Reno has 12 repetitive loss properties ($7,767,495 in total claims paid), which is three times more than any other jurisdiction in the state. There are zero severe repetitive loss properties ($0 in claims).

Land Use and Development Trends

FEMA	**D1.** Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

Reno's population continues to grow as economic development and more moderate housing prices compared with California draw new residents to the region. The City of Reno's development has expanded outward to areas in foothill regions with greater vulnerability to wildland fires.

The vulnerability subsection of each hazard profile in Section 3.3 outlines recent development trends to illustrate the ways in which vulnerability may have changed over the past five years. Vulnerability changes have been measured for economic interests and land use trends. Each measure has been identified as having an increased, decreased, or unchanged vulnerability. Table 14 provides a snapshot of how vulnerability has changed since the development of the 2012 HMP.

Table 14: Recent Development Trends in the City of Reno

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Avalanche and Landslide	No changes	No changes	No changes	No changes
Criminal Acts and Terrorism	No changes	No changes	No changes	No changes
Drought	No changes	No changes	Climate change	Increased frequency and intensity

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Earthquake	No changes	No changes	No changes	No changes
Energy Emergency	No changes	No changes	No changes	No changes
Flood	No changes	No changes	Climate change	Increased frequency and intensity
Infectious Disease	No changes	No changes	No changes	Vulnerability decreased in response to COVID-19 Pandemic. New protocols and processes are in place for remote meetings, work, etc.
Radiological Waste Transport	No changes	No changes	No changes	No changes
Extreme weathers (Winter Storm, Windstorms, Extreme Heat)	No changes	No changes	Climate change	Increased frequency and intensity
Transportation Incident	No changes	No changes	No changes	No changes
Volcano				

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Wildland Fire	Valley View and The Canyons developments in S Meadows on the mountain above DRHS. Approx 150 homes in WUI area. Stonegate development on the W side of White Lake. 4000–5000 homes in WUI area. Meridian development Garson Road in Verdi. 120 homes in WUI area. Daybreak development in S. Meadows. Approx 4000 homes in WUI areas. New above-ground power line from Somersett to Cold Springs in WUI area.	Valley View and The Canyons homes will be built on the slope fronting prevailing SW winds. Stonegate and Daybreak will create large population increases and will impact emergency services capabilities. High winds and above-ground power lines are at increased risk in WUI.	During years of drought, the frequency and severity of wildfires are more likely to increase.	Increased

Capability Assessment

FEMA	**C1.** Does the plan document [the City of Reno's] existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))

Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. Based on the City of Reno's self-assessment, the city has the following planning and regulatory capabilities.

Table 15: Planning Capabilities of the City of Reno

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
General Plan	City of Reno Master Plan – ReImagine Reno	Yes	It reflects the City's goals and the Council's priorities	Last update effective November 2021. Begin update in winter 2025
Capital Improvement Plan	Yes	Yes	It can help us plan for and fund the identified mitigation projects	Updated with the FY25 budget. Updated annually as part of the budget process.
Climate Change Adaptation Plan	No	n/a	n/a	n/a

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
Community Wildfire Protection Plan	No. In the grant selection process for plan development funding	n/a	n/a	n/a
Economic Development Plan	City of Reno – No Economic Development Authority of Western Nevada (EDAWN) – Yes, which is approved by the Reno City Council	No	--	EDAWN plan last updated July 2019. Next update, 2025.
Land Use Plan	City of Reno Master Plan – ReImagine Reno	Yes	It reflects the City's goals and the Council's priorities	Last update effective November 2021. Begin update in winter 2025
Local Emergency Operations Plan	Yes Regional Emergency Operations Plan	Yes	Outlines plans and operations during emergencies/hazards. AARs	July 2020 Fall 2024

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
Stormwater Management Plan	Yes	Some	Identifies needed improvements.	Multiple previous stormwater and flood control reports have to be updated. Currently working on Phase 1 of a 3-Phase Storm Drain Master Plan.
Transportation Plan	Yes – through the RTC* and adopted by the Reno City Council		Address emergency evacuation routes, secondary routes during shutdowns, accidents, storms	Updated 2021 Next update 2025
Substantial Damage Plan	No	n/a	n/a	n/a
Other	Washoe County has a Damage Assessment Plan that serves the same intent and covers all jurisdictions.			

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
Other? (Describe)	Re-Leaf Reno Strategy to build parks and athletic fields in flood zones/plains	Yes – extreme heat Yes	Yes	n/a
Regional Hazardous Material Response Agreement	Yes	Yes	Yes	2024

Table 16: Regulations and Ordinances of the City of Reno

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
Building Code	Yes. 2018 International Building Code, 2018 International Residential Code, 2018 International Existing Building Code, 2018 International Energy Conservation Code, 2018 International Fuel Gas Code, 2018 Uniform Plumbing Code, 2018 Uniform Mechanical Code,	Yes	2018 Building Codes were mandatory July 1, 2019. Northern Nevada Amendments adopted 2018. Anticipate the adoption of 2024 Building Codes in 2025. Nevada Blue Book, which summarizes NRS, NAC, building codes, city and county ordinances,

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
	2017 National Electrical Code, The Nevada Blue Book		board policies, and recommended minimum practices and standards, was adopted in 2020.
Flood Insurance Rate Maps	Yes	Yes	Varies, major Truckee River floodplain/floodway revision underway through the Truckee River Flood Management Authority (TRFMA). Swan and Silver Lake floodplain revisions are currently underway. South Reno tributaries to the Truckee River floodplain revisions underway though FEMA Risk Map study.
Floodplain Ordinance	Yes, Title 18	Yes	Updated effective October 2022. Currently being updated, should be adopted in 2025.
Subdivision Ordinance	Yes, annexation and land development code (title 18)	Yes	Updated effective October 2022. Currently being updated, should be adopted in 2025.

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
Zoning Ordinance	Yes, Title 18.	Yes.	Updated effective October 2022. Currently being updated, should be adopted in 2025.
Natural Hazard Specific Ordinance (Stormwater, Steep Slope, Wildfire)	Yes, Title 18 regarding, flood hazard areas, source water protection, wildland interface/fire safety, wetland and stream environment protection, erosion prevention, hillside development and slopes. No – stormwater ordinance.	Yes	Updated effective October 2022. Currently being updated, should be adopted in 2025.
Acquisition of Land for Open Space and Public Recreation Use	City has a strategy of developing parks or athletic fields in flood zones/plains		
Prohibition of Building in At-Risk Areas	Yes, Title 18	Yes	Updated effective October 2022. Currently being updated, should be adopted in 2025.
Other? (Describe)			

Administrative and Technical Capabilities

Table 17: Administrative Capabilities of the City of Reno

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	Yes	Yes, additional staff would be helpful in planning for hazard mitigation.	Yes, ongoing and updated training is required.	Yes
Civil Engineer	Yes	Yes, additional staff would be helpful in planning for hazard mitigation.	Yes, ongoing and updated training is required.	Yes
Community Planner	Yes	Yes, additional staff would be helpful in planning for hazard mitigation.	Yes, ongoing and updated training is required.	Yes
Emergency Manager	Yes	No	Yes	Yes
Floodplain Administrator	Yes	No	Yes	Yes
Geographic Information System (GIS) Coordinator	Yes	No	Thorough research revealed a lack of sufficient	Thorough research revealed a lack of

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
			information to evaluate or categorize this, indicating a need for further investigation.	sufficient information to evaluate or categorize this, indicating a need for further investigation.
Planning Commission	Yes	Yes	No	Yes
Fire Safe Council	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
CERT (Community Emergency Response Team)	Reno – no Washoe County – yes	n/a	n/a	n/a
Active VOAD (Voluntary Agencies	Yes	Defer to Red Cross	Defer to Red Cross	Yes

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Active in Disasters)				
Other? (Please describe.)	Sustainability Manager	yes	no	yes

Table 18: Technical Capabilities of the City of Reno

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
Mitigation Grant Writing	Yes	Application for Community Project Funding to address Hazard Mitigation Projects	Continue to seek out and apply for Hazard Mitigation Grants through FEMA or other agencies
Hazard Data and Information	Yes – maintained by each department, such as Utility Services, Public Works, Maintenance and Operations	Planning for severe winter storms for street closures, bridge removals, sandbag locations.	Continue to work together to coordinate efforts, review hazards after they occur to evaluate response and update plans for future response.
GIS	Yes	Yes – used during development review	Geospatial review of potential

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
			hazards in relation to development
Mutual Aid Agreements	Yes	Assist when local resources are exhausted. Assist when Mutual Aid resources are geographically closer to the risk	Refine Mutual Aid Plans as the region experiences unprecedented growth and zoning changes while resource growth lags behind.
Other? (Please describe.)			

Financial Resources

Financial capabilities are the resources to fund mitigation actions. Talking about funding and financial capabilities is important to determine what kinds of projects are feasible given their cost. Mitigation actions like outreach programs are lower cost and often use staff time and existing budgets. Other actions, such as earthquake retrofits, could require substantial funding from local, state, and federal partners. Partnerships, including partners willing to donate land, supplies, or an in-kind match and cash, can be included.

Table 19: Financial Capabilities of the City of Reno

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Capital Improvement	Yes	Designing/Building capital	Yes	Yes

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Project Funding		improvement projects, maintaining capital assets		
General Fund	Yes	Yes, this is the most flexible funding source that the City has. It has been used for the Seismic Retrofit of City Hall as the matching funds for a Hazard Mitigation Grant.	Yes	Yes
Hazard Mitigation Grant Program (HMGP/404)	Yes	Yes, City Hall Seismic Retrofit.	Yes – plan to apply for upcoming hazard mitigation grants	No
Building Resilient Infrastructure & Communities (BRIC)	Yes	Yes, Was awarded for microgrid planning and through the RTC, the region received an award for Lemmon Drive Phase II Roadway Reconstruction.	Yes	No
Flood Mitigation	Thorough research	Thorough research revealed a lack of	**Yes**	**No**

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Assistance (FMA)	revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	sufficient information to evaluate or categorize this, indicating a need for further investigation.		
Public Assistance Mitigation (PA Mitigation/406)	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	**Yes**	**No**
Community Development Block Grant (CDBG)	Yes	Yes, limited funding for ADA Accessibility improvements like curb ramps and audible traffic signal crosswalk indicators. Has been used to fund housing and	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a	No

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
		neighborhood development programs.	need for further investigation .	
Natural Resources Conservation Services (NRCS) Programs	Yes	Yes, design and construction or mitigation of High Hazard Dams. West Wash Dam is currently under review for design.	Yes	No
U.S. Army Corps (USACE) Programs	Yes – Water Resources Development Act (WRDA)	Yes, received money for conservation projects on the lower Truckee River	Yes	No
Property, Sales, Income, or Special Purpose Taxes	Yes – Property, Sales No – Income	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation .	Thorough research revealed a lack of sufficient informatio n to evaluate or categorize this, indicating a need for further investigatio n.

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Stormwater Utility Fee	No	No	Yes	Yes
Fees for Water, Sewer, Gas, or Electric Services	Yes	Sewer – city; gas and electric come from franchise fees	Yes – though they are currently allocated to fund other programs	
Impact Fees from New Development and Redevelopment	Yes	For funding capacity and growth projects	Yes	Yes
General Obligation or Special Purpose Bonds	Yes		Yes	Yes
Federal-funded Programs (Please describe)	Yes	It has been used for creek and dam	Yes	Yes
Other State-funded Programs (Please describe)	Truckee Meadows Stormwater Management Program	Flood preparedness, stormwater mitigation	Yes	Yes

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Private Sector or Nonprofit Programs	N/A			
Other?	HMGP from FMAG, CWDG, WUI Grant, FP&S for CWPP	Wildland Fire restoration and mitigation	Yes	No

*Note: FMAG = Fire Management Assistance Grant Program, RTC = Regional Transportation Commission

Education and Outreach

Education and outreach capabilities are programs and methods that could communicate about and encourage risk reduction. These programs may be run by a participant or a community-based partner. Partners, especially those who work with underserved and multilingual communities, can help identify additional education and outreach capabilities.

Table 20: Education and Outreach Capabilities of the City of Reno

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Community Newsletter(s)	Yes – Quarterly Development Services Newsletter, public safety e-newsletters as needed	No.	City has extensive email list with 30,000 subscribers we can push newsletters out to. Content is also

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
			available in Spanish.
Hazard Awareness Campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, School Programs)	Yes – Firewise, Ready Set Go, Fire Adaptive NV, Living with Fire, Dumpster program, Defensible Space programs, Flood awareness programs, Great Nevada Shakeout	Yes	none
Public Meetings/Events (Please Describe)	Yes – Neighborhood Advisory Boards and HOAs, which address Ward-specific concerns and issues that occur, City Council Meetings	Yes, the Council considers funding for projects to address hazards and emergencies. NABs and HOAs may bring hazard situations to the attention of city staff and the city council.	none
Emergency Management Listserv	City has a list serve of 30,000 subscribers that it can push emergency	No	none

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
	management information out to		
Local News	Yes – 2 News, News 4/Fox 11, KOLO 8 News/Telemundo, Univision, Reno Gazette Journal, KOH Radio, KUNR Public Radio, and The Nevada Independent	Local media partners help amplify city's messaging regarding upcoming hazards or emergencies.	Local news include Spanish media including television and radio.
Distributing Hard Copies of Notices (e.g., public libraries, door-to-door outreach)	No	n/a	n/a
Insurance Disclosures/Outreach	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Organizations that Represent, Advocate for, or Interact with Underserved and Vulnerable	Yes – Clean and Safe coordinates with contractors to interact with the unsheltered	Clean and Safe Staff have standard operation	

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Communities (Please Describe)	population to educate them on concerns and issues that occur	procedures to mitigate life and safety concerns during inclement weather and/or hazards.	
Social Media (Please Describe)	Yes – Facebook, Twitter, Instagram, YouTube, Nextdoor, Blog – "Around the Arch"	Yes	Provides notification of storm preparedness tips, street closures, emergency evacuations, available resources
Other? (Please Describe)	Neighborhood Advisory Board Meetings	No.	

National Flood Insurance Program Participation

The National Flood Insurance Program (NFIP) is a Federal Emergency Management Agency (FEMA) program that provides flood insurance to millions of policyholders across the country. The plan must describe participation in the NFIP for each participant, as applicable, in accordance with NFIP regulatory requirements.

Table 21: Floodplain Management, Mapping, and Insurance for the City of Reno

Question	Response
Who is the floodplain manager? Is this their primary or secondary role?	Joe Coudriet, secondary role

Question	Response
Does the floodplain manager have adequate training and capacity for their role? If not, what else is needed?	Yes. However, additional staff and staff training are needed for crossover.
How does the community enforce its floodplain rules? Does enforcement include monitoring compliance and acting to correct violations?	Through implementation and enforcement of the Reno Municipal Code via the Development Services Department, ensuring that all permit related activities comply with Reno Municipal Code. Yes
When was the community's most recent Community Assistance Visit (CAV)?	November 8, 2019
Were any violations noted on the community's most recent CAV?	No
Is there an upcoming CAV? If not, is one needed?	The five-year CAV is expected November 2024.
When was the most recent floodplain management ordinance adopted?	November 2007
Does your community participate in the Community Rating System (CRS)? If so, describe the steps the community has taken to achieve the CRS goals.	No
Does the community's floodplain management ordinance include any higher standards? If so, please list.	Yes Section 18.12.605 – Requires compensatory flood storage in Critical Flood Zone 1, as identified by the Truckee River Flood Project. 1.3:1 Section 18.12.1703(a)(3)d3 – The City regulates development in Shaded Zone X and requires elevation of the bottom of the lowest floor beam to one foot above the highest adjacent grade. Section 18.12.1703(d)(1)a – The City requires the development of Base Flood Elevation data for ALL subdivision proposals irrespective of the 5 acre-50 lot NFIP requirement. Section 18.12.1703(a)(3) – The City has a Freeboard Requirement and requires elevation of the bottom of the lowest

Question	Response
	floor beam to one foot above Base Flood Elevation or Base Flood Depth. Section 18.12.1703(a)(3)e – The City requires that ALL manufactured homes, regardless of location in a new or an existing manufactured home park or subdivision, meet the same elevation requirements as all other new development or substantial improvement. Section 18.12.1703(b)(6) – The City prohibits manufactured homes on alluvial fans, except in existing manufactured home parks or subdivision. Section 18.04.102(a)(8) – The City requires compensatory flood storage for Closed Intermittent Lakes. Onsite detention/retention basins that are adequately sized to mitigate the increase of stormwater runoff as the result of the development to a minimum mitigation ratio of 1:1.3 during the 100-year, 10-day storm. No Rise in Floodplain?
Who is responsible for permitting?	Development Services Department, Utility Services, Floodplain Manager, and Director of Utility Services
How does the community issue development permits in the special flood hazard area?	Verify Zoning is consistent with proposed use (Planning) and that activities comply with the Reno Municipal Code and Federal Emergency Management Agency (FEMA) regulations. Staff utilizes a checklist to implement the process and follow up documentation and other requirements are met.
Does the community maintain elevation certificates?	Yes

Question	Response
Does the community track the number of buildings in the special flood hazard area? If yes, are there any trends?	No
How many repetitive loss (RL) structures does the community have? (List number and type of structure)	1 – Single Family Structure
How many severe repetitive loss (SRL) structures does the community have? (List number and type of structure)	1 – Business – Non-Residential
Have any RL/SRL properties been mitigated since the last plan update?	Yes, two (2)
Who is responsible for making substantial damage/substantial improvement determinations?	Development Services Department
How does the substantial damage/substantial improvement process work in your community?	Development Services determines whether an improvement to a structure is a "substantial improvement." If the application pertains to a property located in a floodplain, the flood zone s recorded on the permit which is stored electronically. The City then requires an elevation certificate for the new construction or a cost verification if it is a substantial improvement. The cost verification certificate is given to the applicant to complete for valuation of the project and market value of the structure. When this ratio reaches 40%, the City does a complete verification of the certificate. This same system is used for substantial damage. Once the applicant has complied with the City's codes and regulations, a permit is issued. The applicant submits another elevation certificate upon completion of construction. After an inspector approves the final construction, a certificate of occupancy is issued.

Question	Response
Is there sufficient staff and training to make substantial damage/substantial improvement determinations?	Yes
How are substantial damage/substantial improvement requirements messaged to the public before and after an event?	We haven't had any substantial damage/substantial improvement permits since the last plan update.
Have any substantially damaged/substantially improved structures been mitigated since the last plan update?	Not applicable – We have not had any SD/SI permits come through since the last plan update.
How will the community remain in compliance with the NFIP moving forward? (simply stating "the community will continue to comply with the NFIP" will not meet FEMA's planning requirements)	We will continue to apply and enforce the Reno Municipal Code as it pertains to development within flood hazard areas. Additionally, we hire and retain staff to engage in all aspects of planning and design and maintenance and operations related to internal, and external development projects and related matters. Furthermore, this program relies on staff from multiple departments, thereby ensuring continuity and continued compliance.
How does the community support map change requests? This could be requests during the Risk MAP process or through Letters of Map Amendment or Revision.	The City is currently working through a FEMA Risk Map effort to revise floodplains in the South Reno area for tributaries to the Truckee River.
When did the latest FIRM become effective?	Majority of FIRM panels DATE. Numerous LOMRs, LOMAs, etc. have updated these FIRM panels.
When was the latest Flood Insurance Rate Map (FIRM) adopted?	FIRM dated : 03.16.2009 FIS dated: 07.09.2021
Is the FIRM and FIS report in an accessible location? How would the public get access to their flood map information?	Through the FEMA website.
Does the community use any Risk MAP products? If so, describe.	The City is currently working through a FEMA Risk Map effort to revise floodplains in the South Reno area for tributaries to the Truckee River.
Does the community collect updated floodplain data or modeling? Is this shared with partners and with FEMA?	Yes, except for the Truckee River mainstem and portions of Steamboat

Question	Response
	Creek, where the TRFMA maintains the latest models.
How does the community educate the public on floodplain management and the availability of flood insurance, in and out of the floodplain?	Through citizen inquiry response and development review submittals.
How familiar is the public with their flood insurance options?	The City does not engage with insurance agents.
How many properties have flood insurance in the community?	822
Are there any areas where flood insurance is lacking?	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation. Mitigation action added.
Other comments?	

Opportunities to Expand and/or Improve Capabilities

Table 22: The City of Reno's Opportunities to Develop Capabilities

Capability Type	Opportunity to Expand and/or Improve
Planning and Regulations	Sustainability plan to address climate hazards, such as heat islands in the City; Stormwater Utility
Administrative and Technical	Utility Services Staffing must accomplish CIP and programmatic work.
Financial	The city of Reno has not provided information regarding opportunities to expand and/or improve financial capabilities for stakeholders interested in developing initiatives that could benefit the community.
Education and Outreach	The city of Reno has not provided information regarding opportunities to expand and/or improve education and outreach capabilities for stakeholders interested in developing initiatives that could benefit the community.

Plan Integration

FEMA	**C6.** Does the Plan describe a process by which]will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?

An updated plan must explain how the plan participants incorporated the previous mitigation plan, when appropriate, into other planning mechanisms over the last 5 years. This demonstrates progress in local mitigation efforts. Planning mechanisms refer to the governance structures used to manage local land use development and community decision making, such as budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances. Table 23 lists the previous plans that have been integrated into this one.

Table 23: Integration of Previous Plans by the City of Reno

Plan Name	Description
Washoe County Hazard Mitigation Plan	Adopted by Reno City Council and Washoe County Board of Commissioners in 2020
Reimagine Reno Master Plan	Citywide policies, specifically in Guiding Principle 6, discuss and address the integration of hazard mitigation considerations in the development review process. In addition, Policy 6.2B specifically addresses the Washoe County Regional Hazard Mitigation Plan.
Title 18 – Annexation and Land Development Code	Title 18 does not address the Hazard Mitigation Plan directly but contains many policies relating to natural hazard considerations for development review including flood hazards, wildland interface/fire safety, water protection, and slope protection.

The plan must also identify the local planning mechanisms where the updated hazard mitigation information/actions may be integrated and how. Listing specifics, such as who will be responsible, the timeframe for the update, and ongoing work, such as hiring a contractor or gathering data, can help meet this requirement. Table 24 lists opportunities for future plan integration.

Table 24: Opportunities for Future Plan Integration for the City of Reno

Plan Name	Description
Zoning Code	Applied for Fire Prevention and Safety Grant for funds to develop and facilitate the Community Wildfire Protection Plan (CWPP). The Reno Fire Prevention Bureau will be responsible for the Plan

Plan Name	Description
Reimagine Reno Master Plan	Updates to Master Plan to incorporate additional policies and implementation measures related to hazard mitigation

Mitigation Strategy

FEMA	**C4.** Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?

Review of 2020 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2020 plan were evaluated to determine the status of the action and whether any ongoing or incomplete actions should be included as actions in the 2020 plan update.

Table 25: Status of Previous Mitigation Actions by the City of Reno

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
MH-4	Increase staffing level in the Reno Fire Department to allow all fire stations to be staffed with an engine company and provide for two rescue and four truck companies across the city (City of Reno).	Reno Fire Department	Complete – All Stations staffed with 4 person Engine Companies, 2 full time Rescues with a 3rd Rescue situationally staffed. 2 Truck companies with a potential 3rd if the Safer Grant is awarded to RFD.	No
MH-9	Implement and/or use Community Emergency Response Teams and the Citizens Homeland Security Council, to shift burden from sworn officers, where appropriate (All Partners).	All Jurisdictions: • Emergency Managers • Police Departments	CERT is available and has been active since last plan update	No
WF-1	Develop surge capabilities in the region to handle burn patients (All Partners).	Renown Health		No
WF-2	Identify moderate to high risk areas for wildland fire and develop Community Wildfire Protection Plans (CWPPs) or Fire Adapted Communities programs for each community through home owners' associations. (City of Reno)	Reno Fire Department	In progress – Working with HOAs in WUI areas to assist in developing CWPPs and Wildfire education through fuel mitigation grant programs and public outreach activities.	Yes
WF-3	Provide free or low-cost resources to private property owners as an incentive to maintain defensible space on their properties (e.g., free weekend use of	Reno Fire Department	Complete (but ongoing) Implemented annual free dumpster program for green waste in high-risk areas and provided free fuels mitigation with hand crews. Educate on Defensible Space measures.	No

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
	dump trailers or free dump day drops (City of Reno).			
WF-4	Enforce State adopted Wildland–Urban Interface (WUI) code on new developments in the WUI and monitor and enforce required vegetation management plans (City of Reno).	Reno Fire Department	Review PUD handbooks in WUI areas for defensible space compliance and vegetation management plans.	Yes
WF-5	Identify high risk properties owned by the City of Reno and hire an abatement crew for defensible space clearing and weed pre-emergent application. Currently identified areas of high risk include Rosewood Canyon and the Northwest Reno Peavine area. (City of Reno)	Reno Fire Department	Complete (ongoing) – Implemented fuel mitigation with grant funding in high-risk areas. Completed the Rosewood Canyon project and multiple mitigation efforts in the Peavine area. 400 inspections for Defensible Space in Rosewood Canyon area through WUI grant.	No
WF-6	Offer incentives for private property owners to clear 30-foot fire breaks on City-owned property adjacent to their homes (City of Reno).	Reno Fire Department	Complete (ongoing) – Provide free services with dumpster program and hand crew fuel mitigation to encourage participation.	No
WF-7	Adopt the 2024 International Fire Code with amendment based on requirements in the Nevada Revised Statutes and regional challenges. (City of Reno)	Reno Fire Department	In the process of being adopted through the Northern Nevada Code Adoption Committee.	Yes

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
WF-13	Adopt 2018 wildland fire code County-wide (All Partners).	Regional Fire Protection Districts	In process – Will be adopting the 2024 WUI Code	Yes
WF-16	Review and update (as needed) evacuation plans for communities in wildland fire-prone areas and hold evacuation drills at least once every two years (All Partners).	Regional Fire Protection Districts	Complete – Perimeter and Code Red Regional Full Scale Exercise Incline	No
FL-2	Update FEMA Flood Insurance Rate Maps to incorporate recent Letter of Map Revision, Conditional Letter of Map Revision, and changes in topography and impervious surfaces using regional LiDAR data (Washoe County, City of Reno, City of Sparks).	Washoe County Community Services Department Truckee River Flood Manage-ment Authority (TRFMA) Reno Utility Services Department	In progress – Current map revisions underway; North Valleys Swan and Silver Lake (WC), Truckee River PMR (TRFMA, Sparks, Reno), South Reno Channels (Reno, WC)	No
FL-3	Implement scour countermeasures, including channel stabilization at bridge piers and abutments for 14 bridges identified as scour critical bridges. Work would include countermeasure design, permitting, diversions,	Reno Utility Services Department	In progress – Various repairs have taken place post flooding on 3 of the 14 bridges. Items must remain on the list.	Yes

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
	excavation, and riprap placement (City of Reno).			
FL-4	To address localized flooding on Ranger Road, connect adjacent development to the storm drain system (City of Reno).	Reno Public Works and Utility Services Departments	City of Reno Maintenance and Operations continue to address during flooding events – Should remain in the plan	Yes
FL-5	To address localized flooding on Ranger Road, work with residents of the adjacent trailer park to mitigate runoff from impervious surfaces that adds to flood depth (City of Reno).	Reno Development Services Departments	Not complete – Ranger Road area flooding events have continued.	Yes
FL-10	Complete Rosewood Wash culvert and channel upgrades. (City of Reno)	Reno Utility Services Department	Portion from Plumas to Virginia Lake has been upgraded. Upstream improvements still needed.	Yes
FL-11	Complete Cemetery Drain water quality, erosion control, drainage and sewer improvements (City of Reno).	Reno Utility Services Department	Not complete.	Yes
FL-12	Complete Warren Estates Evaluation and Drainage Improvement Project (City of Reno).	Reno Utility Services Department	Project no longer needed.	No
FL-13	Complete Autumn Hills Flood Control Project (City of Reno)	Reno Utility Services Department	Not complete.	Yes
FL-14	Complete improvements to address undersized drainage ditches and	All Jurisdictions: Reno Utility	In progress – City of Reno Maintenance and Operations continue to address during	Yes

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
	systems County-wide (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	Services Department Public Works Engineering	flooding events – Should remain in the plan	
FL-21	Booth Street Bridge: Remove Booth Street Bridge, which constricts flows and increases flood water elevations (TRFMA, City of Reno)	TRFMA, CTWCD, Reno Public Works and Utility Services Departments	Might be deleted as new modeling shows no major benefit to bridge removal	No
FL-22	Jones Street Signal Improvements: Construct signal at Jones and Keystone Avenue (TRFMA, City of Reno)	Public Works	Project no longer a priority.	No
FL-24	Pumping Station: Construct pumping station along Riverside Drive (TRFMA, City of Reno)	TRFMA	Review with TRFMA – may be old infrastructure associated with a 100-year event levee along riverside	No
FL-25	Pedestrian Closure Gate Structures: Pedestrian gates are needed along the length of the floodwall to maintain the current pedestrian access points. A product, such as FloodBreak or approved equivalent (TRFMA, City of Reno)	TRFMA	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book and may no longer be necessary. City of Reno would likely be the lead agency for this action. Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.	No

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
FL-29	Replace Floodwalls: Replace old, inadequate floodwalls from Arlington St. to Lake St.	TRFMA	Arlington Ave Area: TRFMA's 2023 Map Book identifies existing floodwalls from Arlington Ave to Lake St, and states that TRFMA may provide technical or possibly financial assistance to the project lead agency in the future. Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.	No
FL-30	Sierra Street Bridge: Replace Sierra Street Bridge, which constricts flows and increases flood water elevations, with a new bridge that is hydraulically efficient and capable of passing the 100-year flood (TRFMA, City of Reno)	TRFMA, RTC, Reno Public Works and Utility Services Departments	In progress – Currently under design with the RTC and anticipate construction 2027 after the completion of Arlington Bridge(s) replacement	Yes
FL-31	Center Street Bridge: Replace Center Street Bridge, which constricts flows and increases flood water elevations, with a new bridge that is hydraulically efficient and capable of passing the 100-year flood (TRFMA, City of Reno)	TRFMA	Center St Bridge Replacement: This mitigation item is included in TRFMA's 2023 Map Book. However, TRFMA's role is to provide technical support to the project lead (i.e., provide hydraulic models and data to aid in the design process). Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities	No

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
			to partner with other entities and leverage funding.	
FL-32	Lake Street Bridge: Replace Lake Street Bridge, which constricts flows and increases flood water elevations, with a new bridge that is hydraulically efficient and capable of passing the 100-year flood (TRFMA, City of Reno)	TRFMA	Lake St Bridge Replacement: This mitigation item is included in TRFMA's 2023 Map Book. Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.	No
FL-33	Remove existing pedestrian bridge at Wells Ave. Install new pedestrian bridge upstream of Wells Ave. (TRFMA, City of Reno)	TRFMA	Lake St Bridge to I-580 Reach: This mitigation action now includes the removal of the existing Wells Ave Bridge (as well as any required bank stabilization and/or protection for the Wells Ave overpass), but not installation of a new pedestrian bridge. Previous plans included installation of a pedestrian bridge to replace the Wells Ave Bridge; however, the property on the north bank of the river has changed ownership and because the Kuenzli St Bridge is only a few hundred feet upstream, TRFMA has determined that replacing the Wells Ave Bridge is not necessary.	No

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
FL-34	Bank stabilization and bridge protection around Wells Avenue at Wells Ave. Bridge (TRFMA, City of Reno)	TRFMA	Same as FL-33	No
FL-35	Grand Sierra Floodwall: On the south (right) bank of the Truckee River a 3,000-foot-long, 6-foot-high floodwall would be built from Glendale to Greg Street (Costs included in Element 19 Sparks Levees and Floodwalls: Glendale to Greg.) (TRFMA, City of Reno)	TRFMA	Grand Sierra Resort Berm & Levee (Glendale Ave Bridge to Greg St Bridge): Construct an earthen berm and levee along the south bank of the Truckee River at the Resort location (Glendale Ave Bridge to Greg St Bridge). The proposed upstream berm would consist of approximately 45,000 cubic yards of compacted material; estimated cost is $1.35 million in 2021 dollars. The proposed downstream berm would consist of approximately 52,000 cubic yards of compacted material; estimated cost is $1.56 million in 2021 dollars. The berms would be connected by a levee section approximately 350 feet long (estimated cost $700,000 in 2021 dollars). This design concept is a shift from previous plans, which included a floodwall. The berms would be designed with gentle slopes that would allow better connection between the GSR and the river. This would also allow more options for use of the berm	No

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
			area (such as parking) during non-flooding conditions. Planned construction: 2026-2027 or 2027-2028.	
FL-41	Terracing Rock to McCarran: Reduced terracing to reduce the amount of excavation and avoid the existing Pioneer Ditch. The terracing and associated levees are moved northward toward the Truckee River and levee ties into the Rock Blvd. bridge. The land between Mill Street and the relocated levee can be used as a fill disposal site and reserved for future recreational use (TRFMA, City of Reno)	TRFMA	Mill/McCarran Levees & Terracing (Rock Blvd Bridge to McCarran Blvd Bridge): Currently in 60% design phase (June 2024). Planned construction: 2027-2028. Between the Rock Blvd Bridge and the McCarran Blvd Bridge, relocate the Truckee River channel and increase its sinuosity, excavate floodplain terraces, and construct levees to reduce flood risk, restore the ecosystem, and enhance recreational opportunities. The updated conceptual design omits floodwalls and includes higher levees on both the north and south banks of the Truckee River, as well as a lower “intermediate” levee on the south side. The intermediate levee would be designed to contain a 50-year flood event. Ecosystem restoration is proposed to improve instream and riparian habitat for fish and wildlife species. Recreational enhancements may include nature-based activities along the river corridor and improved river access, as well as sports fields and park facilities	No

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
			on the south side in between the intermediate levee and the outer, high levee. The estimated cost to construct the levees (north, south, south intermediate) is $20.4 million. Excavation of the floodplain terraces and ecosystem restoration is estimated to cost $20 million. TRFMA has already invested more than $48 million to acquire 110 acres of land in this area (more than 1.2 miles of river frontage on the south bank of the river). Implementation of this flood project element will significantly reduce flood risk for the north and south industrial areas and the airport.	
FL-54	Autumn Hills, Offenhauser, Longley & McCarran storm drain improvements and detention solutions	Reno Development Services and Utility Services Departments	Not complete. Should be carried forward.	Yes
FL-55	Sagittarius storm drain improvements	Utility Services Department	In progress – City of Reno Maintenance and Operations continue to repair after flooding events; Should remain in the plan.	Yes

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
FL-56	Miscellaneous Various Storm Drain: Greenridge to Moore, various "island 18," Edison Wy, Sage St yard area, California Ave, Isbell Rd, Avenida de Landa, Wedekind, Scottsdale/Clear Acre	Reno Public Works	Greenridge in progress, to be completed Fall, 2024 – All other areas to remain in the plan	Yes
FL-57	Double Diamond Levee Upgrades: Construct levee improvements at Double R Blvd and Double Diamond Blvd to provide FEMA certified flooding protection.	Reno Development Services and Utility Services Departments	Incomplete, should be carried over to the next plan.	Yes
FL-58	Belford Drainage Overpass at Lake Ditch: Provide overpass/bypass such that the Belford Drainage flows will continue down the drainageway and not be intercepted by the Lake Ditch.	Reno Building, Planning, and Engineering Division	Not complete – should remain in the plan.	Yes
FL-59	In and Out Basins – 12th and Brookfield, 12th and Washington, Plumas & Hillcrest: Remove in and out basins and tie to storm drain.	Reno Public Works	Not complete – Public Works addressed Plumas & Hillcrest. All other locations need to remain.	Yes
FL-60	Miscellaneous Grading-Regrading – Len Cir, Orange and Apple St, Hatch, Brentwood, Walker, Skyline: Grading/regrading curb and gutters to address ponding issues.	Reno Public Works	Public Works addressed Walker and Skyline locations. All other locations need to remain.	Yes

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
FL-61	Sadleir Southworth (Wells Ave) Area Storm Drain Improvements: Upgrade/enlarge or provide surcharge relief system for storm drain system.	Reno Public Works and Utility Services	Partially complete – Storm Drain improvement work completed summer of 2024 with RTC Oddie Wells project that addresses downstream flow along Oddie from Sadleir to 9th Street. Location needs to remain on list as storm drain improvement needed along Sadleir and downstream on 9th Street.	Yes
FL-62	Irrigation Ditch Tributary Crossing Improvements: Improve the ditch crossings at three irrigation ditches to reduce ditch failures and overtoppings.	Washoe County and City of Reno Utility Services Department	Conceptual report complete. Should remain in plan update.	Yes
FL-63	Stead Storm Drain and Channel Improvements	Reno Utility Services Department	Not complete. Should remain on the list and be pursued.	Yes
FL-64	Aquila Ave/Krupp Cir Drainage Improvements: Enlarge and reinforce roadside ditches, upsize/install new storm drain.	Reno Utility Services Department Reno Public Works	In progress – City of Reno Maintenance and Operations continue to repair after flooding events. Should remain in the plan.	Yes
FL-65	Thomas Creek at South Virginia St between approximately Patriot & Gavian storm drain improvements: Improve storm drainage across roadways.	Reno Utility Services and Public Works Department	Not complete. Should remain on the list and be pursued.	Yes

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
EQ-3	Retrofit dialysis centers to maintain potable water service following a disaster (Washoe County, City of Reno, City of Sparks)	Dialysis Centers (Fresenius, DaVita)	No update.	No. This is not a City of Reno item. It is at the discretion of the individual dialysis centers.
EQ-4	Develop a process to provide financial and professional assistance for seismic retrofits to make unreinforced masonry buildings identified by the Nevada Earthquake Council safer (City of Reno)	Reno Building, Planning and Engineering Division	Not complete – This has not been addressed but should remain on the list and be pursued.	Yes
EQ-5	Retrofit Reno's City Hall with seismic upgrades (ex. seismic dampers and improved column splices) to ensure that the building remains functional after an earthquake (City of Reno)	Reno Public Works	Project Complete in 2024.	No
EQ-6	Relocate Reno's City Hall offices to address seismic risks (City of Reno)	Reno Public Works	Remove Project	No
EQ-10	Assess, repair, and/ or replace infrastructure that may fail during earthquakes (e.g., Keystone Ave. Bridge) (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions – Public Works Engineering	Not complete – Keystone bridge currently under preliminary feasibility analysis. Construction to be determined, as project will need funding.	Yes
EE-2	Replace wooden power poles in high-risk areas with poles made of steel or an alternative material (Washoe County, City of Reno, City of Sparks)	NV Energy	Ongoing	Yes – this should continue on the new plan as it is included in NV Energy's

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
				system resiliency efforts through their pole inspection and pole replacement program
EE-3	Replace transmission and distribution cables with alternative cables able to withstand fallen branches and snow loading (Washoe County, City of Reno, City of Sparks)	NV Energy	Ongoing	Yes – this should be included in the next plan as it is part of NV Energy's system resiliency efforts through the removal of copper wire, removing tree attachments, and their covered conductor program
EE-5	Install back-up generators for critical infrastructure and facilities along with other measures to improve reliability (e.g., alarms, meters, remote controls, and switchgear upgrades) (All Partners)	All Jurisdictions: • Emergency Management	In progress, power redundancy assessment for Truckee Meadows Water Reclamation Facility being conducted	Yes
CA-1	Implement measures to prepare for a potential active shooter incident, including new security measures, training and exercises, improved partnerships with law enforcement	Law Enforcement Agencies Facility Managers	In the last year, RPD has completed Active Assailant Training for the Department, participated in Rescue Task-Force Training with regional partners, and received Tactical Combat Casualty Care training.	No

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
	agencies, and policy changes (ex. Prohibiting open carry). (All Partners)			
CA-2	Procure bullet proof vests, helmets, and other equipment needed to support rescue task forces during an active assailant, civil unrest, or terrorist event (City of Reno)	Reno Fire Department	Complete – 70 sets of bullet proof vests, helmets and other necessary equipment to support Rescue Task Forces have been procured and distributed to RFD crews.	No
HM-1	Purchase additional equipment, such as booms or collapsible spill containment berms or walls to ensure that responding fire crews have the capability to perform immediate containment of hazardous material spills (City of Reno)	Reno Fire Department	In progress – Booms for spill containment have been acquired to ensure that the Triad has the capability to perform containment of Hazmat spills. Collapsible berms or walls have not been acquired.	Yes
DT-2	Implement current TMWA Conservation Plan including encouraging transition to less water-intensive landscaping on both public and private properties (City of Reno, City of Sparks, RSIC, PLPT)	City of Reno, City of Sparks, RSIC, PLPT: • Water utilities • Planning Departments	The Reimagine Reno Master Plan contains Policy 2.5C Drought Tolerant Landscaping, which requires the use of "landscaping which utilizes drought tolerant plant materials, efficient irrigation, incorporates soil amendments to support plant health and resiliency, and other low water usage practices." In addition, Title 18, Section 18.04.806, Water Conservation, addresses landscaping plan requirements that aim to reduce water consumption by limiting the	No

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
			amount of lawn/turf, requiring water-conserving irrigation systems, low water consumption plants, and preventing overspray, among other items.	
ID-1	Implement a range of emission reduction strategies (e.g., policies geared toward renewable energy measures and projects, reduction in vehicle miles traveled, and increased use of transit and multimodal transportation) to reduce levels of particulate matter, ozone, and other criteria pollutants (All Partners)	Washoe County Health District Air Quality Management Division	WC, City of Reno, and RTC all applied for a grant under the Climate Pollution Reduction Grants – award pending. Most likely will not know the status by 05/2024. The City updated its fee model for installing solar to reduce the cost for permitting.	No
TI-1	Purchase properties in the runway protection zones at Reno-Tahoe International Airport and airport critical areas at Reno-Stead Airport (Washoe County, City of Reno)	Reno-Tahoe Airport Authority	Ongoing	Yes

*Note: RTC = Regional Transportation Commission

2024–2029 Mitigation Implementation Plan

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the City. The implementation plan includes both short-term strategies that focus on planning and assessment activities, and long-term strategies that will cause ongoing capability or structural projects to reduce vulnerability to hazards.

Considered Mitigation Actions

The City of Reno considered a broad range of actions, including actions that benefit vulnerable populations and current and new development, as a part of this plan update. There are four main types of mitigation actions, listed below. The results are presented in Table 26.

- Local plans and regulations
- Structure and infrastructure projects
- Natural systems protection
- Education and awareness programs

Table 26: Considered Mitigation Actions

Mitigation Action	Type of Action	Selected? (Y/N)	If not selected, why not?
Lemmon Drive Reconstruction to elevate above 100-year WSEL* for emergency access	Structure and Infrastructure Projects:	Y	In design
Silver Lake Floodplain Update	Educational and Awareness Washoe County Updated Silver Lake Base Flood Elevations	Y	
Development of N. Valley Maintenance Facility	Structure and Infrastructure Projects	Y (but not funded)	Planned in phases for affordability
Vulnerable populations	Targeted outreach to the unsheltered population before and/or during natural disasters, such as extreme temperatures, flooding, wildfire, etc.	Y	

*Note: WSEL = Water Surface Elevation Level

Updated Mitigation Action Plan

Table 27 presents the mitigation action plan for the next five years. In that table, Community Lifelines are defined at Lifelines Toolkit v2.0 (fema.gov) and include the new Water Systems lifeline. Timeframes are defined as follows:

- Short term: Less than 1 year
- Medium term: 1–3 years
- Long term: 3–5 years

Table 27: 2024–2029 Mitigation Implementation Plan

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
1	TMWRF* Power redundancy assessment	Energy Emergency	Critical infrastructure, protect a Native American water body down-stream	City of Reno Utility Services	City of Sparks	Power redundancy assessment	Sewer Enterprise Fund	30K	Protect critical infrastructure Maintain biology health during outages.	30 years	1-3 years	All	High
Description: Look for alternatives and power redundancy options including alarms, meters, remote controls, and switchgear upgrades for Truckee Meadows Water Reclamation Facility after experiencing 3 power outages within 12 months.													
2	Implement scour countermeasures at 11 bridges identified as scour critical bridges.	Flooding, Extreme weather	The population that utilizes bridges	City of Reno Utility Services	NDOT, RTC, TRFMA	Needs further investigation	Sewer Enterprise Fund	300,000	Bridge stability	20 years	1–3 years	Transportation	High
Description: Implement scour countermeasures, including channel stabilization at bridge piers and abutments. Work would include countermeasure design, permitting, diversions, excavation, and riprap placement.													
3	Ranger Road Storm drain improvements	Flooding	People and property	City of Reno Utility Services and Public Works Departments	NDOT	Needs further investigation	Sewer Enterprise Fund	100,000	Protect people and property	20 Years	1–3 years	Water systems	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
Description:													
4	Complete Autumn Hills Flood Control Project (City of Reno)	Flooding	People and property	City of Reno Utility Services		Needs further investigation	Sewer Enterprise Fund	100,000	Protection of people and property from flood waters	20 Years	1–3 years	Water systems	High
Description:													
5	Complete improvements to address undersized drainage ditches and systems County-wide.	Flooding, Extreme weathers	People and property, and protect transportation routes	City of Reno Public Works, Utility Services, and Maintenance and Operations	Washoe County, City of Reno, City of Sparks, RSIC, PLPT	Needs further investigation	Sewer Enterprise Fund	100,000	Protection of people and property from flood waters	20 Years	1–3 years	Transportation	Medium
Description:													
6	Sierra Street Bridge	Flooding, Extreme weathers	Transportation	City of Reno Utility Services and Public Works	TRFMA, RTC	Regional Transportation Plan	Multiple Sources	300,000	Protection of people and property from flood waters	50 years	1–3 Years	Transportation	High
Description: Replace Sierra Street Bridge, which constricts flows and increases flood water elevations, with a new bridge that is hydraulically efficient and capable of passing the 100-year flood.													
7	Sagittarius storm drain improvements	Flooding, Extreme weathers	Pooling of water, protection of infrastructure, reduction in stagnant water	City of Reno Utility Services	Needs further investigation	Needs further investigation	Sewer Enterprise Fund, Street Fund	100,000	Protection of people and property from flood waters	20 Years	1–3 years	Safety and security	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
Description:													
8	Storm Drain Improvements	Flooding, Extreme weathers	Pooling of water, protection of infrastructure, reduction in stagnant water	City of Reno Utility Services and Public Works	None	Needs further investigation	Sewer Enterprise Fund, Street Fund	100,000	Protection of people and property from flood waters	20 years	1–3 years	Safety and security	Medium
Description: Island 18," Edison Wy, Sage St yard area, California Ave, Isbell Rd, Avenida de Landa, Wedekind, Scottsdale/Clear Acre													
9	Miscellaneous Grading	Flooding, Extreme weathers	Prevent erosion, waterlogging, and related safety hazards, thereby enhancing the resilience of urban and residential areas against heavy rainfall and storm events.	City of Reno Utility Services and Public Works	None	Needs further investigation	Sewer Enterprise Fund, Street Fund	50,000	Flood damage protection, erosion control, infrastructure longevity, public dafety, reduced maintenance costs	20 Years	1–3 years	Safety and security	Medium
Description: Regrading Len Cir, Orange and Apple St, Hatch, Brentwood, Grading/regrading curb and gutters to address ponding issues.													
10	9th Street and Sadleir Southworth (Wells Ave) Area Storm Drain Improvements	Flooding, Extreme weathers	Pooling of water, protection of infrastructure, reduction in stagnant water	City of Reno Utility Services	None	Needs further investigation	Sewer Enterprise Fund	100,000	Protection of people and property from flood waters	20 Years	1-3 years	Safety and security	Medium
Description: Upgrade/enlarge or provide surcharge relief system for storm drain system.													

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
11	Aquila Ave/ Krupp Cir Drainage Improvements	Flooding	Pooling of water, protection of infrastructure, reduction in stagnant water	City of Reno Utility Services, Public Works	none	Needs further investigation	Sewer Enterprise Fund	100,000	Protection of people and property from flood waters	20 Years	1-3 years	Safety and security	Medium
Description: Enlarge and reinforce roadside ditches, upsize/install new storm drain.													
12	Develop a process to provide financial and professional assistance for seismic retrofits to make unreinforced masonry buildings identified by the Nevada Earthquake Council safer.	Earth-quake	The risk to safety and structural integrity is posed by seismic events.	City of Reno Development Services, Public Works, Maintenance and Operations	Washoe County, City of Sparks, RTC	Needs further investigation	Needs further investigation	50,000	Property damage reduction, injury and loss of life protection, economic disruption mitigation, insurance cost savings, community resilience enhancement.	50 years	1-3 years	Shelter	Low
Description:													
13	Assess, repair, and/ or replace infrastructure that may fail during earthquakes	Earth-quake	People, and transportation,	City of Reno	Washoe County, City of Sparks, RTC	Needs further investigation	Needs further investigation	300,000	Economic losses, loss of life and injury, disruption of services, insurance	50 years	1-3 years	All	Low

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
	(e.g., Keystone Ave. Bridge).								cost reductions,				
Description:													
14	Purchase additional equipment, such as collapsible spill containment berms or walls to ensure that responding fire crews have the capability to perform immediate containment of hazardous material spills.	Hazardous Materials	Containment, personal protection, neutralization, decontamination, storage, response time, environmental impacts	City of Reno Fire	none	Needs further investigation	Needs further investigation	200,000	Health risks, environmental damage, property damage, regulatory fines, operation downtime, liability issues	30 Years	1–3 years	Food, water, shelter, safety and security, health and medical, communications, energy	Medium
Description:													
15	North Valleys Maintenance Facility	Extreme weathers, Flooding, Emergency response to critical	Critical infrastructure	City of Reno Maintenance and Operations	None	Capital Improvement Program	Sewer Enterprise Fund, Street Fund	$10M	Protection of critical infrastructure in the immediate region.	40 years	1-3 years	Emergency services able to reach the North Valleys	High

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
		infra-structure										during severe winter storms	
Description: During Extreme weathers, the traffic out to the North Valleys has the tendency to back up and be at a standstill. Staff can either not get to downtown to get the necessary equipment to address the road conditions, or they cannot get out to North Valleys with all the traffic to address the road conditions. A northern facility would allow for access and decreased response time to address road conditions and emergency infrastructure repair during Extreme weathers.													
16	Swan Lake Flood Prevention measures	Extreme weathers, flooding	damage due to environmental factors and human activities	City of Reno and Washoe County	none	Needs further investigation	FEMA Hazard Mitigation Grant, Sewer Enterprise Fund	$12M	$4M mitigation	50 years	1–3 years	Water systems	Medium
Description: Underground the temporary overland pipeline from Swan Lake to American Flat for flood mitigation of Swan Lake.													
17	In and Out Basins	Flooding/ Extreme weathers	Flood reduction, improved water quality, ecosystem health, infrastructure reliability, maintenance efficiency, urban heat island mitigation	City of Reno Public Works, Utility Services	none	Needs further investigation	Sewer Enterprise Fund, Street Fund	$1 million	Flood damage, erosion control, water quality improvement, emergency response sosts reduced, insurance costs reduced, reduction in	20 years	1–3 years	Water systems, health	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
									public health risks				
Description: 12th and Brookfield, 12th and Washington, Remove in and out basins and tie to storm drain.													
18	PFAS Treatment at Swan Lake	Hazardous Materials Incident	Emerging contaminant with developing standards for stormwater and other exposure pathways (TBD)	City of Reno, Washoe County	EPA, NDEP, WRWC, NNWPC, UNR	WRWC has begun work with consultant (Jacobs) for a preliminary study and potential next steps.	WRWC, Reno Sewer Fund, Washoe County, state, federal	$1 M	Public health risks, ecosystem health, recreational opportunities, property value, liability and legal costs, restoration of natural resources	10 years	1-3 years for action steps 3-5 years for fundin g and next steps	Safety and security, health and medical, food and hydration	Medium
Description:													
19	Stead area storm drain and channel improvements	Flooding/ Extreme weathers	Pooling of water, protection of infrastructure, reduction in stagnant water	City of Reno Utility Services	none	Needs further investigation	Sewer Enterprise Fund	$200,000	Protection of people and property from flood waters	20 years	1–3 years	Safety and security	Low
Description:													
20	Improve storm drainage across roadways.	Flooding, Extreme weathers	Pooling of water, protection of infrastructure, reduction in stagnant water	City of Reno Utility Services and Public Works	none	Needs further investigation	Sewer Enterprise Fund, Street Fund	$200,000	Protection of people and property from flood waters	20 years	1–3 years	Safety and security	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
Description: Thomas Creek at South Virginia St between approximately Patriot & Gavian storm drain improvements.													
21	Complete Rosewood Wash culvert and channel upgrades	Flooding/ Extreme weathers	Pooling of water, protection of infrastructure, reduction in stagnant water	City of Reno Utility Services & Public Works	none	Needs further investigation	Sewer Enterprise Fund	$1M	Protection of people and property from flood waters	30 years	1–3 years	Transportation	High
Description:													
22	Enforce State adopted WUI code	Wildfire	Damage to people and property	Reno Fire Dept	none	Needs further investigation	Needs further investigation	$50,000	Protection of people, property and ecosystem	30 years	1-3 years	Safety and Security	High
Description: Enforce state adopted Wildland–Urban Interface (WUI) code on new developments in the WUI and monitor and enforce required vegetation management plans (City of Reno)													
23	Underground the temporary overland pipeline from Swan Lake to American Flat to mitigate Swan Lake flooding	Flooding	Pooling of water, protection of infrastructure, reduction in stagnant water, flooding	City of Reno Utility Services	Washoe County	Needs further investigation	FEMA Hazard Mitigation Grant, Sewer Enterprise Fund	$4M	$12M	50 years	1-2 years	Water systems	High
Description:													
24	TMWRF seismic assessment and retrofitting	Earthquake	Critical Infrastructure	City of Reno Utility Services	City of Sparks – Seismic Assess-	Needs further investigation	Sewer Enterprise Fund & Hazard	$50,000	Infrastructure protection	50 years	1-3 years	shelter	High

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
					ment Consultant		Mitigation Grants						
Description: TMWRF seismic assessment and retrofitting or rebuilding of at-risk buildings/infrastructure													
25	Stormwater Utility CIP	Flooding	Critical Infrastructure, Property, Life	City of Reno Utility Services	N/A	Feasibility study completed, rate analysis completed	Sewer Enterprise Fund	$600M	Protection of people and property	30-75 years	3-5 years	all	Medium
Description:													
26	Storm drain Master Plan CIP	Flooding	Critical Infrastructure, Property	City of Reno Utility Services	N/A	Phase 1 master plan completed, Phases 2-4 as funding allows	Sewer Enterprise Fund	$500M	Improved storm performance in 25-year rain events	50-75 years	3-5 years	All	Medium
Description:													
27	Cemetery Improvements	Flooding	Property and Infrastructure	City of Reno Utility Services	N/A	Preliminary scope of work	Sewer Enterprise Fund or Stormwater Utility	$25,000	Area flooding	20 years	3-5 years	All	Medium
Description: Complete Cemetery Drain water quality, erosion control, drainage and sewer improvements													
28	Irrigation Ditch Tributary Crossing Improvements	Flooding		City of Reno Utility Services	Washoe County, Associated Ditch Companies	Preliminary scope of work	Sewer Enterprise Fund or Stormwater Utility	$50,000	Area flooding	50 years	3-5 years	All	Medium
Description: Irrigation Ditch Tributary Crossing Improvements: Improve the ditch crossings at three irrigation ditches to reduce ditch failures and overtoppings													

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
29	Belford Drainage Overpass at Lake Ditch	Flooding	People and infrastructure	City of Reno Utility Services	Needs further investigation	Preliminary scope of work	Sewer Enterprise Fund or Stormwater Utility	Needs further investigation	Area flooding	50 years	3-5 years	All	Low
Description: Provide overpass/bypass such that the Belford Drainage flows will continue down the drainage way and not be intercepted by the Lake Ditch													
30	EV Ready Code Change	All hazards involving transportation	Children, older adults, those with heart/lung disease, low-income and underserved communities	NNPH – AQMD	City of Reno City of Sparks Washoe County	Building code amendment recommendation to be adopted by municipalities	Local	Unsure	Better air quality	Beneficial continuously until updated	In the next 5 years	Safety and security	Low
31	Evacuation Routes in the area – study	All Hazards requiring persons to leave the area	Residents and visitors; LE, Fire, etc.	WCEM	LE, Fire, first responders	Unsure	Local, FHA, PROTECT	$135K – cost of completed study in Nevada County tor a starting point	Loss of life, property, time spent by responders guiding persons out of area	Immediate and continuous. There are always additional persons due to tourism and general residents. Also, there is never not a time when evacuation might	Medium. Hire a contractor to complete the study, then decide based on findings	Safety and security	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Community Lifeline	Priority
										be necessary.			
32	Flood insurance study	Flooding	People and infrastructure	Washoe County	City of Reno	Needs further investigation	General Fund	$50,000	Studying areas lacking flood insurance can pinpoint vulnerable regions and guide policy decisions, enhancing community preparedness and economic resilience. It raises awareness about the need for adequate coverage and supports stronger disaster mitigation efforts.	5-10 years	1-2 Years	Safety & security, food, water and shelter, health and medical, communications	Medium

Description: This study aims to identify gaps in flood insurance coverage in the county by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.

*Note: CIP = Capital Improvement Plan, EPA = Environmental Protection Agency, NDEP = Nevada Division of Environmental Protection, NDOT = Nevada Department of Transportation, NNWPC = Northern Nevada Water Planning Commission, PFAS = Per- and Polyfluoroalkyl Substances, PLPT

= Pyramid Lake Paiute Tribe, RSIC = Reno-Sparks Indian Colony, RTC = Regional Transportation Commission,, TMWRF = Truckee Meadows Water Reclamation Facility,, TRFMA = Truckee River Flood Management Authority, UNR = University of Nevada, Reno, WRWC = Western Regional Water Commission, WUI = Wildland–Urban Interface

Prioritizing Mitigation Actions

The identified mitigation actions were then prioritized, based on the following terms:

- **S – Social:** The public must support the overall mitigation implementation strategy and specific mitigation actions. Consider, will the action disrupt housing or cause the relocation of people? Will the proposed action adversely affect one segment of the population? Is the action compatible with present and future community/agency values?
- **T – Technical:** It is important to determine if the proposed action is technically feasible, will help reduce losses in the long term, and has minimal secondary impacts. How effective is the action in avoiding or reducing future losses? Does the action solve the problem or only a symptom? Will the action create more problems than it solves? Consider the root cause of the issue at hand to determine whether the action is a whole or partial solution, or not a solution at all.
- **A – Administrative:** This category examines the expected staffing, funding, time, and maintenance requirements for the mitigation action to determine if the jurisdiction/special district has the personnel and administrative capabilities to implement the action or whether outside help will be necessary. Consider, a) Staffing (enough staff and training): does the jurisdiction/special district have the capability (staff, technical experts) to implement the action? b) Funding allocated: does the jurisdiction/special district have the funding to implement the action or can it readily be obtained? c) Time: can it be accomplished in a timely manner? d) Maintenance/Operations: can the jurisdiction/special district provide the necessary maintenance? It is important to remember that most federal grants will not provide funding for maintenance.
- **P – Political:** This considers the level of political support for the mitigation action. Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far? Is there a local champion willing to help see the action to completion? Is there enough public support to ensure that the success of the action? Have all stakeholders been offered an opportunity to participate in the planning process?
- **L – Legal:** The jurisdiction/special district must have the legal authority to implement the action or consider what new laws or regulations would be needed to carry out the mitigation action. Evaluate, are the proper laws, ordinances, and resolutions in place to implement the action? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?
- **E – Economic**: Economic considerations must include evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt in a jurisdiction/special district. Consider benefits and costs at a planning level. A detailed benefit-cost analysis will be performed as project-specific funding becomes available. What

financial benefits will the action provide? Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? Does the action contribute to community economic goals, such as capital improvements or economic development? Are there currently sources of funding that can be used to implement the action?

- **E – Environmental:** The impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), have to be kept in mind when using federal funds. How will this action impact land/water? Impact on endangered species: how will this action impact endangered species? How will this action impact hazardous materials and waste sites? Is this action consistent with community environmental goals? Is the action consistent with federal laws, such as the National Environmental Policy Act (NEPA)?

The actions were also assigned a prioritization category of low, medium, or high, based on the following definitions:

- **Low:** Based on one to two STAPLEE criteria, the action is feasible and important, with multiple potential challenges. The action should be implemented as funding becomes available.
- **Medium**: Based on three to four STAPLEE criteria, the action is feasible and important, with some potential challenges. Its implementation is not as urgent as a high priority action item and can be implemented over time.
- **High**: Based on five or more STAPLEE criteria, the action is feasible and important, with minimal to no concerns. It is very important to the jurisdiction to implement and may be prioritized in the short term.

The results are in Table 28.

Table 28: Priorities Assigned to the Mitigation Actions of the City of Reno

Action #	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Priority
1	4	4	4	3	4	2	4	High
2	3	4	3	3	3	3	3	High
3	3	2	2	2	3	2	3	Medium
4	3	3	2	3	3	2	3	High
5	3	2	2	2	3	2	3	Medium

Action #	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Priority
6	3	3	3	3	3	3	3	High
7	3	3	2	2	3	2	3	Medium
8	3	3	2	2	3	2	3	Medium
9	3	3	2	2	3	2	3	Medium
10	3	3	2	2	3	2	3	Medium
11	3	2	2	2	3	2	3	Medium
12	2	2	1	2	2	1	2	Low
13	3	2	1	2	2	1	2	Low
14	3	4	2	3	2	2	3	Medium
15	4	3	3	3	3	2	3	High
16	3	3	2	3	2	2	2	Medium
17	3	3	2	2	3	2	3	Medium
18	3	2	2	3	2	1	3	Medium
19	2	2	2	2	3	2	3	Low
20	3	2	2	2	3	2	3	Medium
21	3	3	3	3	3	2	3	High
22	4	4	2	3	2	3	3	High
23	4	4	2	3	2	3	3	High
24	3	3	2	2	4	3	4	High
25	2	2	2	2	2	1	3	Medium
26	2	2	2	2	2	1	3	Medium
27	2	3	2	2	2	2	3	Medium
28	1	2	2	1	1	2	2	Low
29	2	3	2	2	3	2	3	Medium
30	1	3	2	1	1	2	2	Low

MITIGATION SUCCESS STORIES

- **City Hall Seismic Retrofit:** Placement of dampeners and strengthening welds in upper stories of City Hall to mitigate "whip" from seismic event.
- **Vista Narrows Project:** The Vista Narrows Project is a key element of TRFMA's Truckee River Flood Management Project (Flood Project), which was designed and permitted as a standalone project. The overall $400 million Flood Project is a joint effort between TRFMA, the Cities of Reno and Sparks, Washoe County, and numerous stakeholders. The Flood Project will reduce flood damage from 100-year flows in the Truckee Meadows region. Some elements have already been completed, such as the realignment of the North Truckee Drain; replacement of the Virginia Street Bridge; and river restoration projects at Lockwood, 102 Ranch, Tracy, and Mustang Ranch. The full extent of the Flood Project is from Reno to the town of Wadsworth.

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Acronyms

BRIC	Building Resilient Infrastructure & Communities
CAV	Community Assistance Visit
CIP	Capital Improvement Plan
CWPP	Community Wildfire Protection Plan
EPA	Environmental Protection Agency
FMAG	Fire Management Assistance Grant Program
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
I-80	Interstate 80
MMI	Modified Mercalli Intensity
MPT	Mitigation Planning Team
NCEI	National Center for Environmental Information
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NNWPC	Northern Nevada Water Planning Commission
NRI	National Risk Index
PFAS	Per- and Polyfluoroalkyl Substances
PG&E	Pacific Gas and Electric Company
PLPT	Pyramid Lake Paiute Tribe
RHMP	Regional Hazard Mitigation Plan
RSIC	Reno-Sparks Indian Colony
RTC	Regional Transportation Commission
Southern Pacific	Southern Pacific Railway Company

TMWRF	Truckee Meadows Water Reclamation Facility
TRFMA	Truckee River Flood Management Authority
UNR	University of Nevada, Reno
WRWC	Western Regional Water Commission
WSEL	Water Surface Elevation Level
WUI	wildland–urban interface

City of Sparks Hazard Mitigation Program

The City of Sparks has a fully integrated approach to hazard mitigation planning and program implementation. Throughout the 2020 update process, the following Regional Hazard Mitigation Plan (RHMP) participation roles were recorded:

Name	Position	Department
Mark Andersen	Public Works Director	City of Sparks Public Works
Robert R. Bidart	Utilities Director	City of Sparks Planning and Zoning
Brian Cason	Capital Projects Manager	City of Sparks Engineering Services
Chris Crawforth	Police Chief	City of Sparks Police Department
Michael Drinkwater	Treatment Plant Manager	City of Sparks Community Services
Jon Ericson	City Engineer	City of Sparks Engineering Services
Scott Means	Division Chief, City of Sparks Emergency Manager	City of Sparks Division of Emergency Management
Casey Mentzer	Plant Manager	Truckee Meadows Water Reclamation Facility
Walt White	Fire Chief	City of Sparks Fire Department

What's New in the 2025 Update?

With the 2024 RHMP update, Washoe County and its regional partners have recognized changes in planning priorities by placing an added emphasis on incorporating actionable strategies into the mitigation implementation plan and moving away from including ongoing coordination activities. Recent disasters and emerging hazards have also influenced planning priorities and the development of mitigation actions for the 2024 RHMP update.

In the years since the release of the 2020 HMP, the city has undergone nearly constant change—with a growing population, some vulnerabilities have increased, while others have been effectively mitigated to an acceptable level. New development in the city has primarily occurred in the Spanish Springs Valley, which is more prone to wildland fire hazards. Mitigation actions have been added to the 2025 RHMP update to reflect the increase in priority of actions to address wildland fire hazards.

The 2025 update of the RHMP includes the following major revisions to the 2020 plan:

- Incorporation of additional hazards and more comprehensive risk assessments;
- Expanded capability assessment;

- Integration of hazard mitigation planning into existing mechanisms; and
- Comprehensive and focused mitigation strategy with prioritized mitigation actions.

See Appendix C in the Base Plan for the completed Federal Emergency Management Agency (FEMA) Local Plan Mitigation Review Tool for the Washoe County RHMP.

Plan Adoption

44 CFR §201.6(c)(5) requires that an HMP be formally adopted by elected officials from each participating jurisdiction. City Council formally adopted the 2020 update of the Washoe County RHMP on April 27, 2020.

This HMP was approved by FEMA Region 9. Once the plan is approved and signed, a copy of the City of Sparks' adoption resolution will be placed in Appendix E of the Base Plan.

Community Profile

Governance

The City of Sparks was established as a planned community by the Southern Pacific Railway Company (Southern Pacific) and incorporated in 1905. The City of Sparks government operates using a council/ manager form of government, under which the Mayor and City Council make policy decisions that are implemented by the City Manager and staff. The mayor and the five members of the City Council are elected for staggered four-year terms.

The City is organized into the following departments and offices, which oversee various divisions and programs:

- Building Permits
- Business License Department
- City Attorney's Office
- City Clerk and Records Management
- City Manager's Office
- Code Enforcement
- Community Services
- Customer Service
- Engineering Services
- Environmental Control Section
- Financial Services
- Fire Department
- Fire Prevention Bureau
- Government Affairs
- Housing Program
- Human Resources
- Maps and Geographic Information System (GIS) Resource Portal
- Parks & Recreation
- Planning and Zoning
- Police Department

- Public Information/Community Relations
- Purchasing
- Public Works
- Sparks Municipal Court

Geography and Climate

The City of Sparks is 4,410 feet above sea level in the semiarid Truckee Meadows basin, situated between the Sierra Nevada range and the Great Basin. The city covers approximately 36 square miles east of the City of Reno. Interstate 80 (I-80) crosses the southern part of the city from east to west, and the Truckee River forms most of the City's southern boundary. The city's oldest parts are in the south, between the railroad line and the river. Starting in the 1970s, commercial and residential development began to spread to areas north and east of downtown, and during the 1990s, Sparks expanded its city limits northward into the Spanish Springs Valley. Figure 33 is a map of the city.

The Truckee Meadows region has a semiarid climate, with summer highs averaging in the 80s (Fahrenheit) to low 90s and winter lows in the 20s. The region generally experiences low humidity and precipitation, although severe snowstorms and heavy precipitation can occur.

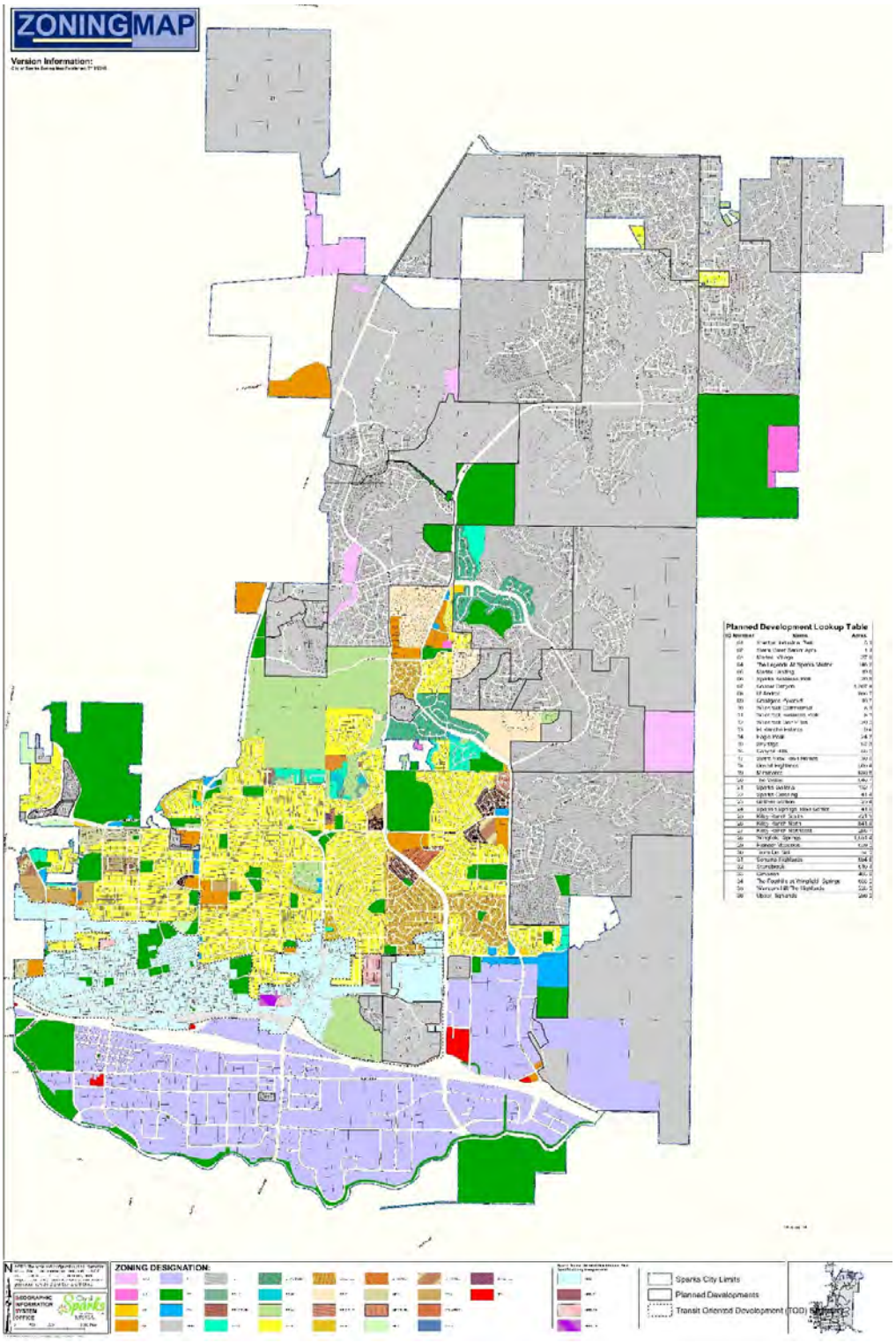


Figure 33: City of Sparks Zoning Map (2018 City GIS Services)

Population and Demographics

The 2020 Census recorded a population of 108,463 people in the City of Sparks.[74] Between 2020 and 2023, the population grew by approximately 1.7%, resulting in an estimated 2023 population of 110,323 people (see Table 1).[75]

Table 28: City of Sparks Demographic Characteristics[76]

Metric	City of Sparks (%)	Nevada (%) (2023)
Population by age, 2023		
Under 5 years old	6.3%	5.5%
Under 18 years old	23.5%	21.7%
65 years and older	15.5%	16.9%
Women, 2023	48.9%	49.5%
Race/Ethnicity, 2023		
White	64.6%	72.1%
Black	2.0%	10.8%
American Indian, Alaskan Native	1.2%	1.7%
Asian, Native Hawaiian, other Pacific Islander	6%	10.3%
Hispanic or Latino, any race	34.2%	30.3%

As of 2023, an estimated 9.0% of Sparks's population under the age of 65 years was disabled, and 11.4% of the City's population under age 65 do not have health insurance.[77] The median household income in 2018–2022 was $82,938, with 8.5% of the City's population living in poverty. In the time range between 2018 and 2022, approximately 27.5% of people over the age of 5 spoke a language other than English at home.

[74] United States Census Bureau, "QuickFacts." https://www.census.gov/quickfacts/fact/table/sparkscitynevada/PST045223
[75] United States Census Bureau, 2023, "QuickFacts, Sparks City, Nevada," U.S. Census Bureau QuickFacts: Sparks city, Nevada
[76] United States Census Bureau, 2023, "QuickFacts, Nevada," U.S. Census Bureau QuickFacts: Nevada
[77] United States Census Bureau, 2023, "QuickFacts, Sparks City, Nevada," U.S. Census Bureau QuickFacts: Sparks city, Nevada

As of 2022, 59.4% of housing units in the City of Sparks are owner-occupied. The median value of owner-occupied homes is $423,500.[78] During this time, 97% of households owned a computer, and 91.7% had a broadband internet subscription.[79]

The 2022 American Community Survey 5-year estimates reported that approximately 63.3% of the population over 16 years old in the City was employed, and 4.4% of the population over 16 years old was unemployed. Per capita income in the City in 2022 was $32,436, and approximately 7.9% of the City's population lived below the poverty line.[80]

Economy

In 2009, *Business Week* named Sparks the number one city in Nevada to start a new business. Nevada has no corporate income or gross receipts taxes, which supports economic development.

By employment, the largest sectors of Sparks's economy are the service sectors of entertainment, hotel, and food services, followed by education. Construction also plays a major role. The City has benefited from the recent development of advanced manufacturing and technology facilities in the Reno-Sparks metropolitan area, which has resulted in a period of job growth. Figure 34 shows images that promote downtown Sparks as a redevelopment district.

In 2022, the most common employment sectors for those who live in Sparks are manufacturing (6,454 people), retail trade (6,329 people), and healthcare and social assistance (5,466 people).[81]

[78] Ibid.
[79] Ibid.
[80] United States Census Bureau, 2022, "Selected Economic Characteristics" DP03: Selected ... – Census Bureau Table
[81] Ibid.



Figure 34: Images Promoting Downtown Sparks as a Redevelopment District

Land Use and Ownership Trends

The following is the most up-to-date information from the City's current Comprehensive Plan or "Master Plan" called Ignite Sparks, a guide to help the City's growth through 2030.

According to its Comprehensive Plan, the City of Sparks experienced 38% growth from 2000 to 2010 and an additional 4% from 2010 to 2015. "People who live in Sparks appreciate its quality of life and small-town feel. Sparks is known as the premiere special events venue for northern Nevada, hence the City Slogan "It's Happening Here." Most properties in the City are privately owned. The City of Sparks owns and operates public facilities, including government administration facilities; City parks and open space; public works facilities and utilities, including the Truckee Meadows Water Reclamation Facility (jointly owned with the City of Reno); libraries; and fire and police stations.

The Comprehensive Plan provides the following information:[82]

As of January 2016, Sparks covers approximately 36 square miles, with an estimated current population of 93,581 (Source: Nevada State Demographer). Situated at 4,410 feet above sea level in a semiarid valley, daily temperatures are temperate, with daily highs and lows varying by as much as 45 degrees Fahrenheit. The sun shines roughly 290 days a year, or eight of every

[82] City of Sparks, "Sparks Comprehensive Plan (Master Plan)." https://cms7files1.revize.com/sparksnv/Document_Center/Department/Planning%20&%20Zoning/Sparks%20Comprehensive%20Plan_Full%20Plan_2021.03.08.pdf

10 days. Annual precipitation averages 8.26 inches per year. Sparks has four seasons, with a relatively short growing season.
Sparks is one of two incorporated cities in Washoe County (County). The other City is Reno. Sparks is connected to the western United States by U.S. 395, Interstate 80, and the Union Pacific Railroad and is served by the Reno–Tahoe International Airport.

Older housing is located near downtown, while most of the newer housing is in the Spanish Springs Valley. Single-family detached houses make up approximately 64% of the housing stock. The City of Sparks uses a strong city manager form of government. The City Manager reports to the mayor and a five-member City Council."

Historically—in the early 1900s—the area was just swampland and ranches. When Southern Pacific altered its railroad lines, it offered incentives for employees to move to lots in what became Sparks in 1905. Sparks remained small until growth in Reno pushed populations outward in the 1950s. "In the 1970s, the area south of the railroad to the Truckee River started to develop with warehouses and industry and in time became the main employment area for Sparks. During the 1970s, Sparks experienced a housing boom in the area north and east of its downtown, which continued into the 1980s." Numerous commercial spaces were developed in the decades that followed, including a high-rise hotel/casino, movie complex, and public plaza. By the 1990s, city limits had expanded northward to Spanish Springs Valley, which continues to grow with 15 approved developments.

In 1997, a 77-acre lake was developed. "From 1999 through 2006, the City of Sparks experienced an upward trend in revenue, number of building permits, jobs, and new businesses. The number of building permits and planning cases peaked in 2006. Starting in 2007, city revenues and the number of building permits and planning cases, all indications of a growing economy, began to contract. The Great Recession, which proved to be more severe and last longer than in many parts of the United States, had come to Sparks.

Consolidated taxes (the primary component of which is sales taxes), a major source of revenue for the City's general fund, dropped for the first time ever in 2007. This was followed by a six-year decline in total general fund revenue. Nationally, the Great Recession is recorded as lasting from December 2007 to June 2009, but not until 2014 did Sparks begin to see an increase in revenues. During those tough years, one-third of city personnel were laid off. The City is still recovering, but it has not significantly increased personnel or city services."

NATURAL RESOURCES

The following major natural systems are present in the Truckee Meadows basin:

- **Geology:** The City of Sparks and Washoe County are located on the western edge of the geological formation known as the Great Basin, which is part of the Basin and Range geological province. The Basin and Range Province are characterized by high desert punctuated by rows of mountain ridges that run roughly north to south. As these mountain

ridges push up through the earth's crust, they can cause earthquakes, making this region one of the most earthquake prone in the United States. These ridges also create a closed basin, meaning that water that falls in the basin stays there until it evaporates or is removed through human activity.

- **Watersheds:** Sparks lies in the Truckee River watershed. The Truckee River flows 140 miles from Lake Tahoe to Pyramid Lake, north of Sparks. The river drains an area of 3,120 square miles in western Nevada and eastern California. The basin includes 11 major streams that drain into the river. Most of the river flow is allocated to users through a system of user rights set out in the Truckee River Operating Agreement.[83]
- **Wildlife:** Species that are native to lower montane woodlands and sagebrush habitats in the Truckee Meadows region include raptors like the ferruginous hawk and bald eagles, bats, sparrows, burrowing owls, lizards, small mammals, such as the dark kangaroo mouse and kit fox, mule deer, pronghorn antelope, and sage grouse. Natural communities and open spaces contribute to the region's scenic character and provide recreational opportunities for residents.

Cultural Resources and Values

Cultural resources can be defined as the "physical evidence or place of past human activity: site, object, landscape, structure; or a site, structure, landscape, object, or natural feature of significance to a group of people traditionally associated with it" (National Park Service 2015). Evidence of long-term human inhabitation of the Truckee Meadow region still exists in archaeological sites, including rock art, seasonal camps, and residential communities, and the artifacts that may be found at these sites. The region was part of the territory of the Northern Paiutes, who inhabited and moved between various habitats.

Historic buildings in the City that are older than 50 years and eligible for listing in the National Register of Historic Places also are considered cultural resources and important contributors to the City's character.

Most cultural sites in the city have not been mapped or surveyed, which can lead to the degradation of these sites if they are developed. Private development can degrade archaeological sites because federal and state regulations do not require the protection of cultural resources on private property. Unregulated use of off-road vehicles, mountain bikes, or hiking can also damage archaeological sites.[84]

[83] Truckee Meadows Water Authority, "Truckee River Operating Agreement." https://tmwa.com/your-water/topics-facts/truckee-river-operating-agreement/
[84] City of Sparks, "Sparks Comprehensive Plan (Master Plan)." https://cms7files1.revize.com/sparksnv/Document_Center/Department/Planning%20&%20Zoning/Sparks%20Comprehensive%20Plan_Full%20Plan_2021.03.08.pdf

Hazard Profiles and Vulnerability Assessments

FEMA	**B1.** Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [the City of Sparks]? (Requirement §201.6(c)(2)(i)) **B2.** Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for [the City of Sparks]? (Requirement §201.6(c)(2)(i))

This section contains hazard profiles and vulnerability assessments to determine the potential impact of hazards on the people, economy, and built and natural environments of the City of Sparks. They have been streamlined to increase the effectiveness and usability of the RHMP. Additional details are contained in the Vulnerability Assessment Section of the Base Plan.

General

Washoe County has experienced several major disaster declarations that may have affected the City of Sparks. In total, the County has received 30 major disaster declarations, including 10 since the previous HMP update.

The hazard profiles and vulnerability assessments contained in this annex represent a considerable amount of work performed by the Mitigation Planning Team (MPT). Planning Team members ranked hazards using several key considerations, followed by activities to validate hazard analysis results and identify specific areas of risk. The City of Sparks representatives to the MPT identified the following hazards for further assessment. (Refer to the RHMP Base Plan for regional risk assessments for moderate and low-priority hazard profiles.)

- Avalanche and Landslide
- Criminal Acts and Terrorism
- Drought
- Earthquake
- Energy Emergency
- Flood
- Hazardous Materials Incident
- Infectious Disease
- Radiological Waste Transport
- Extreme weathers (Winter Storm, Windstorms, Extreme Heat)
- Transportation Incident
- Volcano
- Wildland Fire

Hazard Ranking Methodology

The hazards identified in the RHMP were initially ranked by the City of Sparks on the provided risk assessment form. A risk assessment result for the entire county does not mean that each

participant has the same amount of risk for each hazard. Each plan participant should consider how they are uniquely at risk of the hazards profiled.

Hazards identified as having a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor value of less than 2.0 are considered low risk. The highest possible RF value is 4. Table 30 lists the factors for calculating risk.

Volcanoes will not be profiled for the City of Sparks because of its very low risk.

Table 29: Factors for Calculating Risk

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Probability *What is the likelihood of the hazard occurring?*	1	Unlikely	Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.	30%
	2	Occasional	1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.	
	3	Likely	11 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years.	
	4	Highly Likely	91 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.	
Magnitude *What will be the overall impact?*	1	Negligible	Less than 5% of the affected area's critical and non-critical facilities and structures are damaged/destroyed. Only	30%

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
			minor property damage and minimal disruption of life. Temporary shutdown of critical facilities.	
	2	Limited	Greater than 5% and less than 25% of property in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than one day but less than one week.	
	3	Critical	Greater than 25%, but less than 50% of property in the affected area was damaged/destroyed. Complete shutdown of critical facilities for over a week but less than one month.	
	4	Catastrophic	Over 50% of critical and non-critical facilities and infrastructures in the affected area are damaged/destroyed. Complete shutdown of critical facilities for more than one month.	
Onset *How long will be there be between when it is recognized the hazard is approaching and when the hazard*	1	Self-defined	More than 24 hours	10%
	2	Self-defined	12 to 24 hours.	
	3	Self-defined	6 to 12 hours.	
	4	Self-defined	Less than 6 hours.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
will begin affect the community?				
Duration *What is the length of time the hazard will remain active, including how long emergency operations will have to continue after the hazard event?*	1	Brief	Up to 6 hours.	10%
	2	Intermediate	Up to one day.	
	3	Extended	Up to one week.	
	4	Prolonged	More than one week.	
Frequency *How often has this kind of hazard resulted in an emergency or disaster?*	1	Every 10+ years	This hazard is not frequent but may still impact the area.	20%
	2	Every 5–10 years	This hazard is not as frequently occurring but it could occur in the next 10 years.	
	3	Every 1–5 years	This hazard is likely to occur relatively often. It may have occurred more or less frequently recently, but on average, it can be expected every 1–5 years.	
	4	Annually	This hazard is a frequent occurrence which the area actively has to respond to on an approximately annual basis.	

The following is the risk factor equation:

Risk Factor Equation

RF Value = [(Probability x .30) + (Magnitude x .30) + (Onset x .10) + (Duration x .10) + (Frequency x .20)]

The Washoe County base plan is comprehensive for regional assessments and effectively addresses the calculated risk indexes. It provides a thorough evaluation that highlights its commitment to risk management and community safety, while the annexes are specific to each jurisdiction.

Table 30: Calculated Priority Risk Index for the City of Sparks

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Avalanche and Landslide	1	1	4	3	1	1.20
Criminal Acts and Terrorism	2	2	4	3	2	2.00
Drought	3	2	4	4	1	2.10
Earthquake	4	2	4	4	1	2.40
Energy Emergency	3	3	2	3	2	2.40
Flood	4	2		4	3	2.40
Hazardous Materials Incident	2	2	4	3	1	1.80
Infectious Disease	2	3	1	4	1	1.80

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Radiological Waste Transport	1	3	4	4	1	1.80
Extreme weathers (Winter Storm, Windstorms, Extreme Heat)	4	1	1	3	3	2.20
Transporta-tion Incident (Aircraft Crash)	2	1	1	3	1	1.20
Volcano	1	1	1	4	1	0.90
Wildland Fire	3	1	1	4	4	2.10

Avalanche and Landslide

LOCATION

Avalanche risk is highest in the steep, mountainous areas of the Carson Range of the Sierra Nevada in southwestern Washoe County. Incline Village and Crystal Bay are under avalanche advisories several times each winter. The Avalanche Hazard Report prepared by Dick Penniman for the County in 1993 identified three high-hazard avalanche areas (areas where an avalanche could damage standard wood-frame structures and/or automobiles). They are described in the following sections. The hazard zones were identified as high, medium, and low potential. The data were provided to IEM by Washoe County.

Certain areas are more susceptible to landslides than others. Regions with steep slopes, loose soil or rock, and heavy rainfall are particularly prone to landslides. In addition, areas previously disturbed by human activities, such as construction, mining, or deforestation, are at higher risk.

Landslides in Nevada are typically confined to specific areas and generally cause less severe economic consequences than hazards that affect larger regions. Landslide hazard areas include foothills and mountain areas with fractured and steep slopes.

These areas in Washoe County include the Sierra Nevada Mountains foothills just southwest of Reno, the Virginia Mountains along the western side of Pyramid Lake, the Pah Rah Range just south of Pyramid Lake, and the Carson Range of the Sierra Nevada in southern Washoe County near Lake Tahoe.

There are no avalanche risk areas near the City of Sparks.

EXTENT

In Washoe County, the overall magnitude and severity of the impacts of avalanches are generally classified as Very Low. Secondary impacts, such as blocked roads, can affect larger areas and cause detours. However, places like Incline Village/Crystal Bay and sections along Mount Rose Highway above Galena Park face Moderate avalanche impacts. In response to typical avalanche effects, local resources, including state, county, and local agencies, such as the Incline Village General Improvement District and the North Lake Tahoe Fire Protection District, are deployed. Search and rescue efforts are facilitated by local volunteers organized through the County Sheriff's Office, while road-clearing operations are typically managed by state or county resources.

Landslide hazard areas in Washoe County include foothill and mountain areas where fractured and steep slopes are present. These areas include the Sierra Nevada Mountains foothills just southwest of Reno, the Virginia Mountains along the western side of Pyramid Lake, the Pah Rah Range just south of Pyramid Lake, the Lake Range east of Pyramid Lake, mountain ranges to the west of Long Valley in the northwestern part of the County, and the Carson Range of the Sierra Nevada in Southern Washoe County near Lake Tahoe. Small slides and slumping may occur along the steep banks of rivers and creeks. Areas where steep slopes are present are not generally heavily populated, and most are located on federal or state land. The overall magnitude and potential severity of impacts from a landslide is considered Medium.

Less severe landslide events could be handled at the state or county level, disrupt services for 4 to 7 days, and have minor economic impacts on a communitywide scale. Considering a worst-case scenario, a landslide event could require state- or county-level support, impact critical facilities, disrupt services for 8 to 14 days, and have countywide economic impacts.

PREVIOUS OCCURRENCES/HISTORY

The City of Sparks has not reported any previous occurrences of Avalanche and Landslide.

PROBABILITY OF FUTURE EVENTS

The 2023 enhanced SHMP reports that Washoe County is one of the areas in the state that is expected to experience the highest annual losses due to avalanches. Due to the steep mountainous terrain, high elevations, and winter snows common on the eastern slopes of the Sierra Nevada range, minor avalanches with negligible impact occur annually or semiannually in Washoe County. More severe avalanches that cause injuries, damage property, or impact roadways arise less frequently.

The probability of severe avalanche events that impact public safety, property, or infrastructure is considered Medium, with roughly a 14% chance of occurrence each year. This indicates that high-risk avalanches typically occur between once in 10 years and once in 100 years in Washoe County. On a smaller scale, the 2023 Avalanche Analysis Report categorized Third Creek as having a potential for avalanches affecting the lower inhabited draining between every 20–50 years or a 30-year average return period. Avalanche impacts in the Crystal Bay area on the upslope side of Tuscarora Road occur approximately once every 3 years. The Sierra Avalanche Center monitors specific avalanche probability and provides forecast data for the Lake Tahoe-Sierra region on the following website: http://sierraavalanchecenter.org/index.html. Figure 35 shows the Sierra Avalanche Center's forecast area.

VULNERABILITY ANALYSIS

Mountain communities in the Lake Tahoe Basin, including Incline Village and Crystal Bay, are vulnerable to the effects of avalanches. When avalanche conditions are present, risks are highest for recreational users and others in backcountry areas who may trigger avalanches or be injured or killed by an avalanche. Besides injuries and deaths, avalanches can damage or destroy property and utilities and cover roadways in snow. Transportation disruptions caused by avalanches or area closures because avalanche risks can have economic impacts on ski resorts and other businesses in the Lake Tahoe Basin over a period of days to a week or more.

The City of Sparks ranked avalanches and landslide hazards as **Low Risk**.

ESTIMATED IMPACT AND POTENTIAL LOSSES

When avalanches intersect with humans, there can be substantial costs associated with impacts on commerce, damage to infrastructure, and loss of human life. In the western United States, avalanches are the most frequently occurring lethal form of mass movement and, on an annual basis, cause more fatalities than earthquakes and all other forms of slope failure combined. They can also impact roads and railways, causing substantial damage and disruption to commerce.[85]

[85] Ibid.



Figure 35: Map of Sierra Avalanche Center's Forecast Area

VULNERABLE POPULATIONS

People caught in avalanches can die from suffocation, trauma, or hypothermia. An average of 28 people die in avalanches every winter in the U.S.[86] Most avalanche-related injuries and fatalities will likely continue to be related to recreationalists drawn to the steep snow-covered slopes prone to avalanches, and most developed ski areas have avalanche control measures and rescue teams on site to deal with avalanche-related emergencies. However, an ever-increasing number of outdoor enthusiasts use snowmobiles in undeveloped areas with no

[86] FEMA, Preparedness Community, 2024, Avalanche | Impact (fema.gov)

avalanche controls or available emergency personnel. In 2009, twice as many snowmobilers died in avalanches in the U.S. as did participants in any other winter sports activities. As the population increases and as more snowmobilers' venture into the winter backcountry, avalanches may become an increasing threat in Nevada in the future, but currently, they do not account for a large number of deaths or injuries in this state. There were only two snowmobiler fatalities in Nevada between 1951 and 2016.[87]

The City of Sparks ranked avalanches and landslide hazards as **Low Risk**.

DEVELOPMENT TRENDS

The County has installed a camera system above Crystal Bay to monitor snow conditions and provide early warning of avalanches. Planned future development in the Incline Village and Crystal Bay communities will occur primarily as an infill. The County reviews development proposals in these communities to identify and mitigate avalanche hazards. Risks in these areas have not changed. Avalanche hazard areas have been mapped near Incline Village and Crystal Bay, and development is directed away from these areas. Backcountry recreational areas and access roads may be more vulnerable to avalanches and landslides. Overall, the risk of these hazards has not changed since the last plan update due to changes in development.

RECENT MITIGATION CASE STUDY

For all development in unincorporated areas of the County in identified avalanche hazard areas, developers must complete a geotechnical study and comply with the study's final recommendations to reduce vulnerability to avalanches.

Criminal Acts and Terrorism

LOCATION

Crime and violence can impact any population. The map in Figure 36 include shopping centers, business centers, financial districts, clinics/hospitals, schools, and government offices and buildings in the City of Sparks. The University of Nevada, Reno, and Peppermill Resort Spa Casino are examples of highly populated areas where an act of violence may occur.

[87] 2018 State Enhanced HMP, Colorado Avalanche Information Center, "Avalanche Fatalities by Activity in Nevada, from 1951–2016." http://avalanche.state.co.us/?s=avalanche+statistics

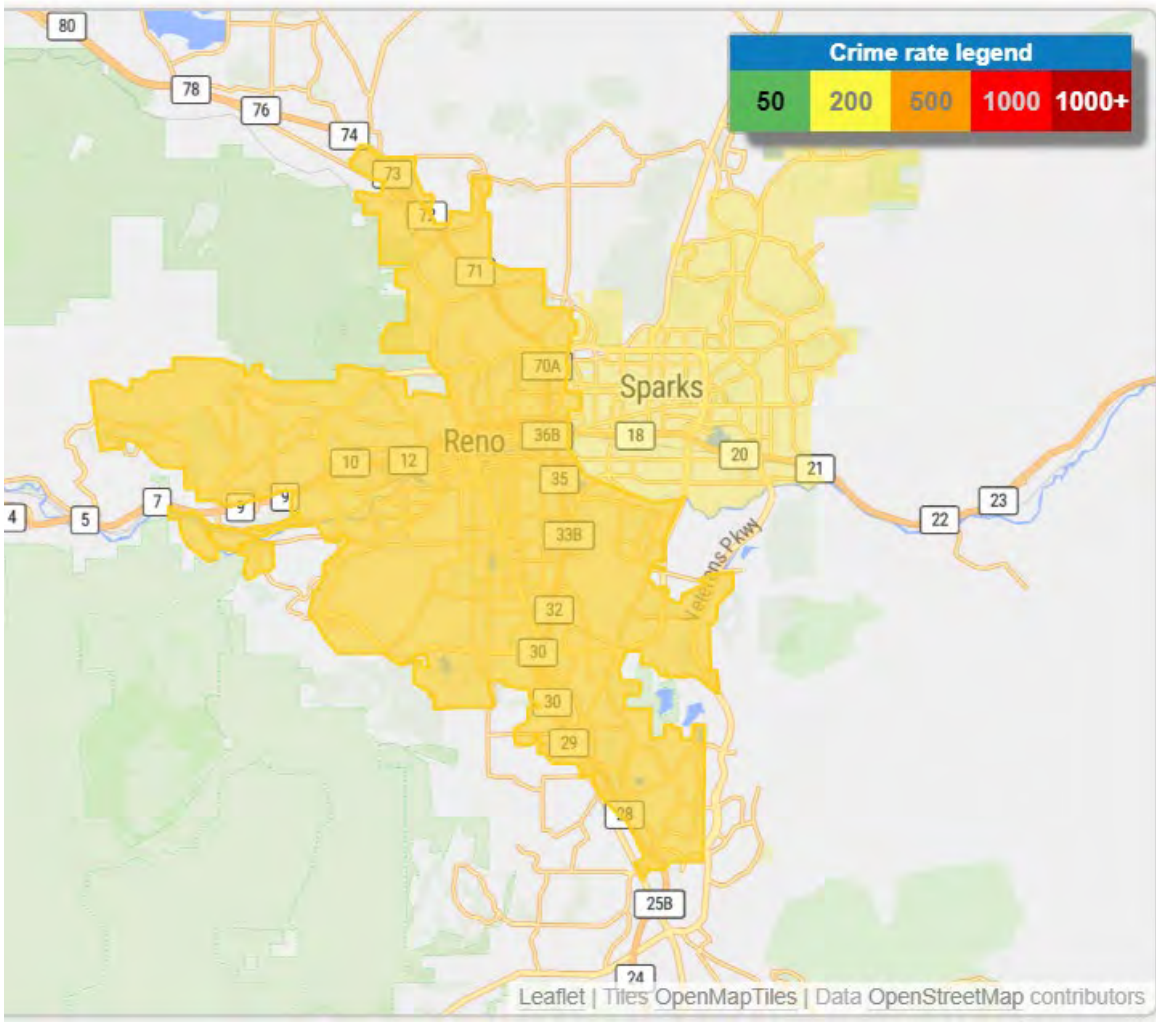


Figure 36: Map of Reno and Sparks with Crime Rate Legend[88]

Figure 37 shows the crime rate for the City of Sparks rating of average indicated by the color orange for 500 incidents. The legend indicates that green represents a very low rate of incidents or 50 or less, yellow represents a low rate of incidents or between 50 and 200 incidents, orange represents an average or between 200 and 500 incidents, red represents a high rate of incidents or between 500 and 1000 incidents, and brown represents a very high rate of incidents or greater than 1,000 incidents.

[88] City-Data.com, 2024, "Map of Reno and Sparks with Crime Rate Legend." Crime in Reno, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

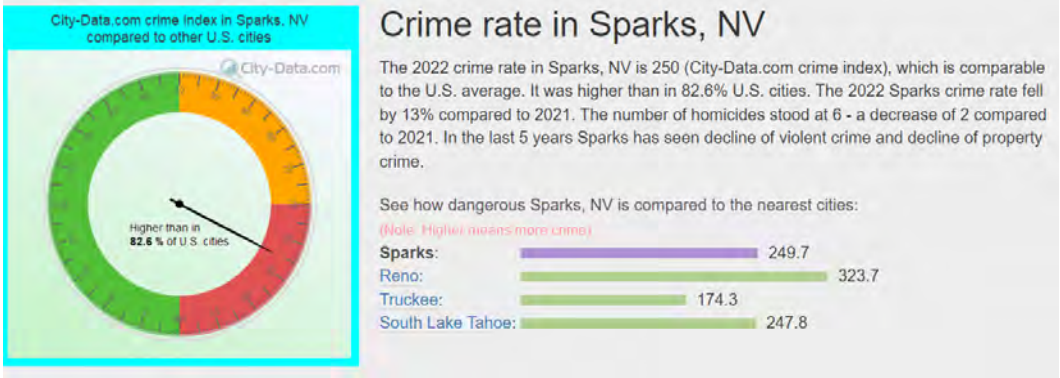


Figure 37: Crime Rate Meter for Sparks Nevada Compared with Other U.S. Cities[89]

EXTENT

It is difficult to estimate the extent or probability of criminal activity or a terrorist incident. However, threats of crime and terrorism could affect all populated areas in Washoe County, and government facilities and schools may be most likely targeted.

City-Data.com compiles a crime index across the United States and provides comparisons of crime rates of U.S. cities to provide a framework for analysis of the extent of crime increases or declines of types of crime occurring for each city. Figure 37 shows that the City of Sparks City-Data crime index rate was 250 in 2022, which was comparable to the national average and higher than 82.6% of American cities. The bar graph in that figure compares the crime rates in Sparks to those of nearby cities.

Figure 38 is a pie chart of crime statistics compiled by City-Data.com in percentages of different types of crime committed in the City of Sparks for 2022. From the pie chart, the percentage of thefts in 2022 was 58.8% and would represent the greatest number of criminal acts committed, with burglaries, auto thefts, and assaults following.

[89] City-Data.Com, 2024, Crime in Sparks, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

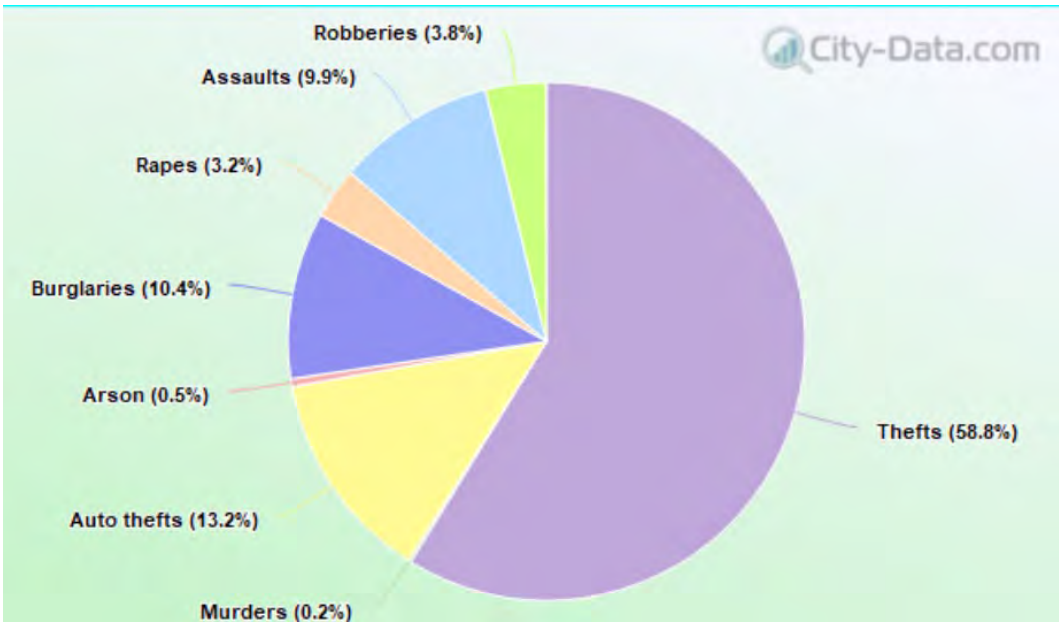


Figure 38: City-Data Crimes by Type Statistics for the City of Sparks, 2022[90]

PREVIOUS OCCURRENCES/HISTORY

- **May 2020:** Law enforcement significantly mobilized in response to the George Floyd riots, and City facilities suffered minor damage.
- **October 21, 2013:** A 12-year-old student opened fire with a semiautomatic handgun at Sparks Middle School, injuring two students and killing a teacher.[91]

Figure 39 is a bar graph of the crime index compiled by City-Data.com for the City of Sparks from 2005 to 2022, comparing the U.S. average index rating to the City's index rating for each year.

[90] City-Data.Com, 2024, "City-Data Crimes by Type Statistics for City of Sparks 2022." Crime in Sparks, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

[91] CNN, Catherine E. Shoichet. Amanda Watts and Chuck Johnston, 2013, "Nevada School Shooting, Teacher Killed, Two Students Wounded," https://www.cnn.com/2013/10/21/justice/nevada-middle-school-shooting/index.html



Figure 39: Crime Rates in the City of Sparks and the U.S. Average, 2005–2022[92]

PROBABILITY OF FUTURE EVENTS

Future weather conditions, such as climate change, have no direct connection to acts of violence and terrorism. However, increased development and urbanization can increase the probability of a future active threat. UN Secretary General Antonio Guterres states that climate impacts can increase conflicts and fragile economies when the loss of stable economic conditions leaves large portions of the population with little resources, protection, income, or security and may increase terrorist ideological interests.[93]

Figure 40 illustrates crime rates in the City of Sparks by year from 2009 to 2022, the types of crimes committed (per 100,000 population), and the trends of increasing/decreasing crime acts identified in comparison to state averages.

Figure 41 shows a five-year trend of violent crime statistics compiled by the City of Sparks Police Department between 2019 and 2023 by the number of violent crimes committed each year, indicating a steady decrease in violent crimes, down from 2022 by 7.78%. Violent Crime is composed of four offenses: murder and nonnegligent manslaughter, rape, robbery, and aggravated assault.

[92] City-Data.com, 2024, "City-Data.com Crime Index for City of Sparks crime rates from 2005 to 2022, compared to the U.S. Average." Crime in Sparks, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

[93] United Nations, UN News Global Perspectives Human Stories, 2021, https://news.un.org/en/story/2021/12/1107592

Crime rates in Sparks by year														
Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Thefts (per 100,000)	↕ 2,007 (2,195)	↕ 1,829 (2,026)	↓ 1,600 (1,758)	↕ 1,710 (1,851)	↕ 1,710 (1,843)	↕ 1,701 (1,809)	↕ 1,731 (1,807)	↕ 1,662 (1,709)	↕ 1,684 (1,689)	↕ 1,536 (1,501)	↕ 1,538 (1,451)	↕ 1,353 (1,268)	↑ 1,763 (1,623)	↕ 1,586 (1,436)
Burglaries (per 100,000)	↑ 850 (929.8)	↑ 699 (774.4)	↕ 656 (720.7)	↕ 609 (659.2)	↕ 559 (602.6)	↕ 545 (579.7)	↑ 657 (685.7)	↕ 448 (460.6)	↑ 591 (592.6)	↑ 570 (556.9)	↑ 513 (483.9)	↑ 429 (402.2)	↑ 357 (328.7)	↕ 281 (254.4)
Auto thefts (per 100,000)	↕ 248 (271.3)	↕ 233 (258.1)	↕ 191 (209.8)	↑ 240 (259.8)	↑ 253 (272.7)	↑ 248 (263.8)	↑ 270 (281.8)	↑ 340 (349.5)	↑↑ 417 (418.1)	↑ 334 (326.3)	↑↑ 376 (354.7)	↑ 325 (304.7)	↑↑ 421 (387.6)	↑ 355 (321.3)
Assaults (per 100,000)	↕ 242 (264.7)	↕ 211 (233.8)	↓ 157 (172.5)	↓ 133 (144.0)	↓ 156 (168.2)	↓ 181 (192.5)	↕ 206 (215.0)	↑ 317 (325.9)	↑ 313 (313.8)	↑ 349 (341.0)	↑ 297 (280.2)	↕ 284 (266.3)	↕ 291 (267.9)	↕ 267 (241.7)
Robberies (per 100,000)	↕ 112 (122.5)	↕ 103 (114.1)	↓ 75 (82.4)	↓ 68 (73.6)	↓ 70 (75.5)	↓ 56 (59.6)	↕ 97 (101.2)	↓ 89 (91.5)	↕ 105 (105.3)	↕ 87 (85.0)	↓ 76 (71.7)	↕ 75 (70.3)	↕ 74 (68.1)	↑ 103 (93.2)
Rapes (per 100,000)	↑↑ 40 (43.8)	↑ 35 (38.8)	↑↑ 46 (50.5)	↑ 32 (34.6)	↑↑ 43 (46.4)	↑↑ 68 (72.3)	↑↑ 54 (56.4)	↓ 26 (26.7)	↑ 54 (54.1)	↑↑ 68 (66.4)	↑↑ 76 (71.7)	↑↑ 87 (81.6)	↑↑ 106 (97.6)	↑↑ 85 (76.9)
Arson (per 100,000)	↑ 24 (26.3)	↕ 17 (18.8)	↑ 22 (24.2)	↓ 14 (15.2)	↕ 13 (14.0)	↓ 9 (9.6)	↕ 12 (12.5)	↓ 12 (12.3)	↓ 11 (11.0)	↑↑ 19 (18.6)	↓ 4 (3.8)	↓ 7 (6.6)	↓ 6 (5.5)	↕ 14 (12.7)
Murders (per 100,000)	↕ 5 (5.5)	↑↑ 8 (8.9)	↑↑ 7 (7.7)	↓ 1 (1.1)	↓ 2 (2.2)	↓ 2 (2.1)	↓ 2 (2.1)	↓ 3 (3.1)	↓ 2 (2.0)	↓ 4 (3.9)	↓ 1 (0.9)	↓ 4 (3.8)	↕ 8 (7.4)	↓ 6 (5.4)
City-Data.com crime index	310.2	285.6	252.6	221.7	235.4	252.6	265.4	248.7	284.2	279.8	257.1	250.4	285.8	249.7

↓ - means the value is smaller than the state average.
↕ - means the value is about the same as the state average.
↑ - means the value is bigger than the state average.
↑↑ - means the value is much bigger than the state average.

Figure 40: Crime Rates in Sparks by Year, 2009–2022, Indicating Types of Crime and Trends[94]

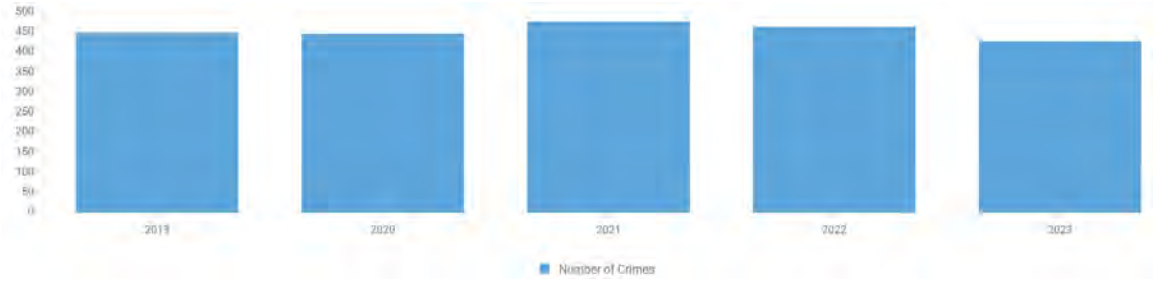


Figure 41: Nevada Crime Statistics, Violent Crime, Sparks Police Department, 2019–2023[95]

[94] City-Data.com, 2024, "Crime Rates in Sparks by Year, 2009–2022, indicating types of crime and trends." Crime in Sparks, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

[95] Nevada Government, City of Sparks Police Department, 2023, "Nevada Crime Statistics, Violent Crime, Sparks Police Department, 2019–2023." Violent Crime 2023 (nv.gov)

Figure 42 shows a five-year trend of property crime statistics compiled by the City of Sparks Police Department between 2019 and 2023 by the number of property crimes committed each year, indicating an increase in property crime between 2022 and 2023, up by 11.64%.

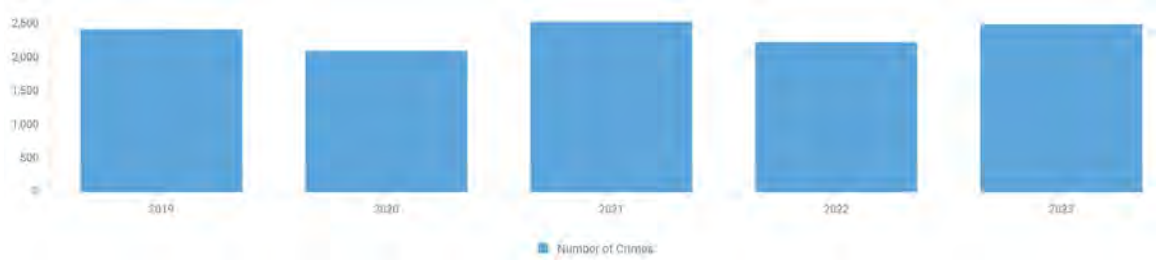


Figure 42: Nevada Crime Statistics, Property Crime, Sparks Police Department, 2019–2023[96]

Figure 43 illustrates monthly violent crime statistics compiled by the City of Sparks Police Department for 2023, indicating the number of actual offenses committed per month and the total number of offenses cleared by the police department.

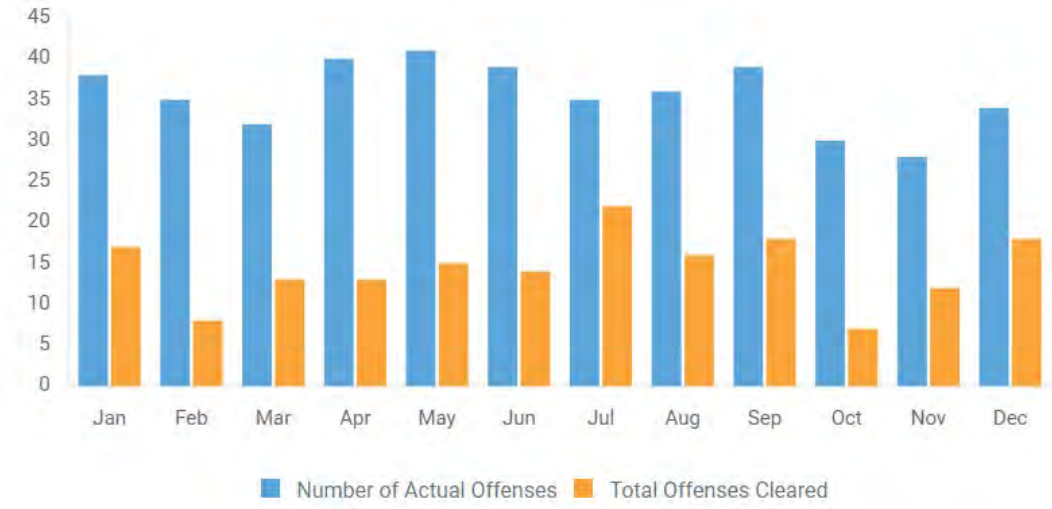


Figure 43: City of Sparks Police Department Violent Crimes Statistics by Month 2023, Actual Offenses and Offenses Cleared[97]

VULNERABILITY ANALYSIS

Community well-being includes physical and mental health and is emphasized by the importance of understanding and fostering community resilience. The criminal justice system

[96] Nevada Government, City of Sparks Police Department, 2023, "Nevada Crime Statistics, Property Crime, Sparks Police Department, 2019–2023." Violent Crime 2023 (nv.gov)
[97] Nevada Government, City of Sparks Police Department, 2023, "City of Sparks Police Department Violent Crimes Statistics by Month 2023, Actual Offenses and Offenses Cleared." Violent Crime 2023 (nv.gov)

and the legal system must also address major challenges to law enforcement agencies to maintain staffing to manage workloads due to increased crime rates and implement effective crime prevention measures. Added to this burden on the local jurisdiction, court congestion, delays, and the issues of overcrowded prisons can impact the ability to maintain safety and lead to changes in policy that can cause strategic interventions aimed at addressing the root causes of crime.[98]

The City of Sparks ranked Criminal Acts and Terrorism hazards as **Low Risk**.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Because criminal acts tend to target areas with higher populations, as Sparks grows, its vulnerability to crime and its impact on businesses and citizens will increase. The psychological effects of crime on individuals have social implications that alter community dynamics and foster an environment of fear. Economically, crime decreases property values, causes financial losses to businesses, and can cause job displacement, contributing to broader economic losses.[99]

Figure 44 shows the number of full-time law enforcement employees/police officers per 1000 residents for the State of Nevada and for the City of Sparks from 2003 to 2020. The line graph indicates the number of full-time police officers employed with the City of Sparks has maintained at 1 police officer per 1,000 residents between 2003 and 2020, compared with 2.5 per 1,000 residents State of Nevada full-time law enforcement officers.

[98] Criminal Justice, 2024 "The Impact on Crime in Communities," The Impact of Crime on Communities – Criminal Justice – iResearchNet
[99] Criminal Justice, 2024 "The Impact on Crime in Communities," The Impact of Crime on Communities – Criminal Justice – iResearchNet

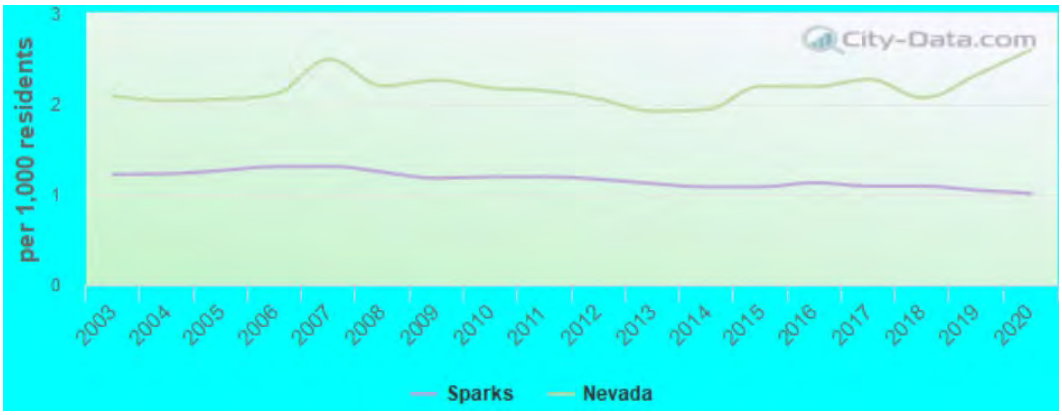


Figure 44: City of Sparks Police Department Full-Time Law Enforcement Employees/Police Officers per 1,000 Residents, 2003–2020[100]

VULNERABLE POPULATIONS

County, schools, government buildings, or other public gathering places or public events would likely be top targets for acts of terrorism. Many acts of violence also occur in public gathering places. Acts of violence could have an impact on the community in the following ways: loss of human life; damage to buildings and structures; temporary displacement during the threat and/or investigation; stress on medical, emergency response, and security services; decrease in economic activity and hospitality business after the event; psychological and emotional trauma; and an increased need for emergency services and funding.

Figure 45 shows statistics compiled by the City of Sparks Police Department for the number of murders committed for 2023 and the victim's age.

[100] City-Data.com, 2024, "City of Sparks Police Department Full Time Law Enforcement Employees-Police Officers Per 1,000 Residents, 2003–2021." Crime in Sparks, Nevada (NV): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map (city-data.com)

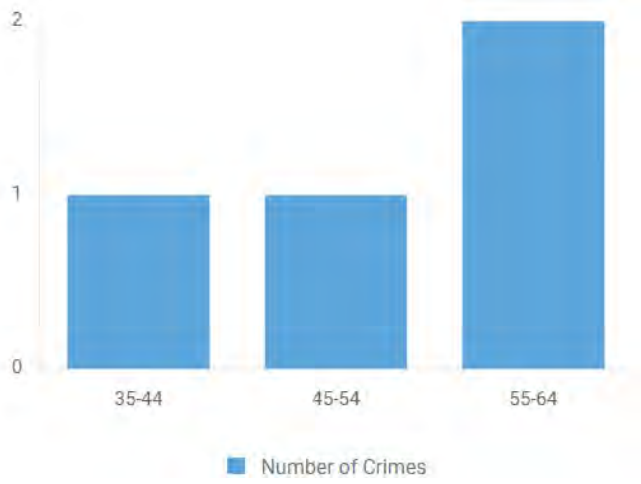


Figure 45: City of Sparks Number of Murders by Victim Age (Murder) 2023[101]

Figure 46 shows statistics compiled by the City of Sparks Police Department for the number of murders committed for 2023 and the victim's gender.

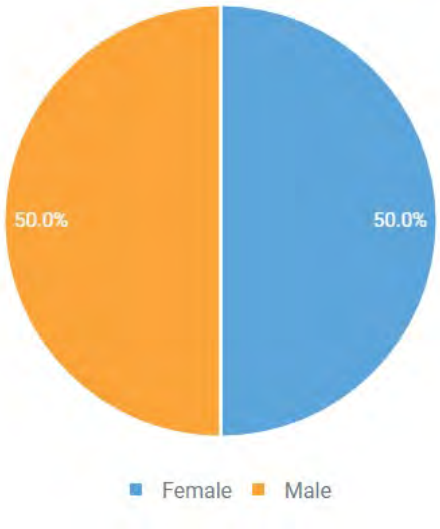


Figure 46: City of Sparks Number of Murders by Victim Gender, 2023[102]

Figure 47 shows results compiled by the City of Sparks Police Department for the number of murders committed for 2023 and the victim's race.

[101] Nevada Government, City of Sparks Police Department, 2023, "City of Sparks Number of Murders by Victim Age (Murder) 2023." Violent Crime 2023 (nv.gov)
[102] Nevada Government, City of Sparks Police Department, 2023, "City of Sparks Number of Murders by Victim Gender (Murder) 2023." Violent Crime 2023 (nv.gov)

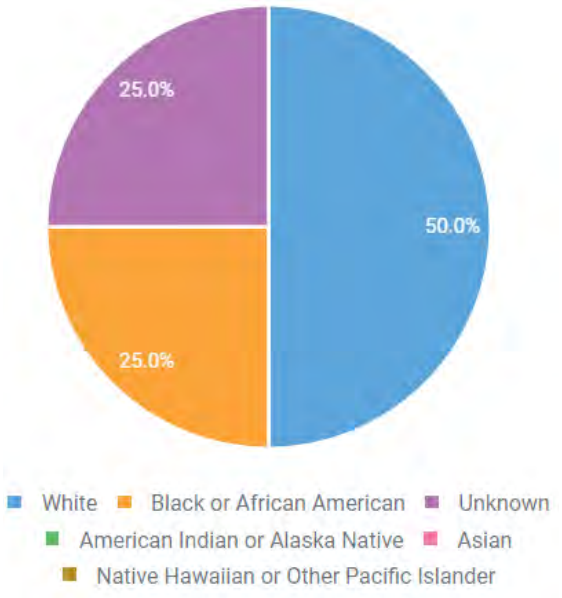


Figure 47: City of Sparks Number of Murders by Victim Race, 2023[103]

Drought

LOCATION

Drought affects broad regions and can include any portion of Washoe County, including the City of Sparks. Historically, the southern section of the County has had less frequent droughts than the central and northern sections because of extensive stored water in reservoirs in the Truckee River basin. However, low snowpack in the Truckee River basin can cause droughts of a greater magnitude in the southern section of the County, as was experienced between 2012 and 2017. With the implementation of the Truckee River Operating Agreement, the Truckee Meadows Water Authority (TMWA) can store credit water in the Boca Reservoir. The reservoir is currently operated for wintertime flood control based on the 1985 Water Control Manual of the U.S. Army Corps of Engineers, which requires the reservoir to have a minimum flood space and prohibits the capture of springtime runoff before April. Stakeholders in the Truckee River Basin recognize that the system can be better operated for both flood control and water supply.

EXTENT

The overall magnitude and potential severity of drought are considered relatively moderate in Washoe County. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts from droughts in Washoe County are those related to water-intensive activities, such as agriculture; wildland fire protection; municipal,

[103] Nevada Government, City of Sparks Police Department, 2023, "City of Sparks Number of Murders by Victim Race (Murder) 2023." Violent Crime 2023 (nv.gov)

industrial, and commercial use; tourism; and recreation. Reduced electric power generation in the region and deteriorating water quality also are potential problems. Moreover, drought conditions can cause soil to compact and reduce its ability to absorb water, potentially making an area more susceptible to flooding. An ongoing drought can impact the health of existing vegetation, which may also leave an area more prone to beetle kill and create conditions that fuel wildland fires. Drought impacts increase with the length of a drought, as annual carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

PREVIOUS OCCURRENCES/HISTORY

The City of Sparks has not reported any previous occurrences of drought.

PROBABILITY OF FUTURE EVENTS

The 2023 Enhanced SHMP states that precipitation in the State of Nevada has been historically difficult to predict, with different models providing varying results. However, the average of projections shown in the State of Nevada Climate Initiative suggests the potential for slightly more precipitation in northern Nevada. If precipitation does increase, it is not expected to offset the drying effects of higher temperatures. Changes in average temperature and/or precipitation will combine with the occurrence of periodic droughts related to precipitation shortfalls and/or periods of warmer than normal temperatures. Climate projections suggest that there is potential for greater year-to-year variability in precipitation. This may further complicate drought planning in the future.

VULNERABILITY ANALYSIS

The TMWA has sufficient water reserves to meet current and future regional water demands in drought years, up to and including a worst-case scenario equivalent to the 1987–1994 drought period, the worst drought period on record. The 2020–2040 Water Resource Plan looks different from TMWA's previous plans, with more emphasis on future conditions and analysis of TMWA's water resources and its ability to provide a reliable water supply under variable climate conditions and continued population growth. Estimating future demand is largely a function of projected population growth for Truckee Meadows. TMWA's 20-year water demand projection estimates that water demand will increase 15%, from approximately 83,000 acre-feet in 2020 to 96,000 acre-feet in 2040.

The City of Sparks ranked drought hazards as **Moderate Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

Droughts are slow-onset hazards, but over time, they can severely affect crops, municipal water supplies, recreational resources, and wildlife. If drought conditions extend over a number of years, the direct and indirect economic impacts can be significant. High temperatures, high winds, and low humidity can worsen drought conditions and make areas more susceptible to wildfires. In addition, human actions and demands for water resources can accelerate drought-

related impacts. Drought impacts occur over large areas and cross jurisdictional boundaries. All existing and future buildings, facilities, and populations are considered to be exposed to this hazard and could be impacted. However, drought impacts are mostly experienced in water shortages and crop losses on agricultural lands and have no impact on buildings. NOAA's National Center for Environmental Information (NCEI) storm database reports no historic or recent crop or property losses from drought in Washoe County.

Common direct impacts of drought include diminished crop yields or total crop loss, the depletion of aquifers, livestock mortality, soil erosion, dust storms, wildfires, reduced electricity production from hydroelectric dams, and reduced water quality or availability. The economic impacts of drought can range from crop losses and increased costs incurred by farmers and ranchers who must buy additional water or feed for livestock to economic losses for tourism and hospitality businesses in the Lake Tahoe Basin if there is a low snowpack. The effects of drought can last from one to several years, and the effects of drought are likely to be compounded the longer drought conditions last.

VULNERABLE POPULATIONS

Drought can impact both surface water and groundwater availability and can have direct, disastrous effects on human populations. The indirect consequences of drought, such as unemployment, reduced tax revenues, increased food prices, reduced outdoor recreation opportunities, higher energy costs as water levels in reservoirs decrease and consumption increases, and water rationing, are not often fully known. This complex web of impacts can affect people and economies well beyond the area physically experiencing drought.

Every resident of the region using water for domestic purposes relies, to some degree, on groundwater supplies. TMWA wells typically supply 15%–20% of annual net water production. These wells provide water to meet summer peak demands. Between June and October during extremely dry years, when Truckee River water is not plentiful, the TMWA relies even more heavily on its wells to meet summer and fall peak demands. Besides its retail customers, the TMWA provides wholesale water to the Sun Valley General Improvement District, whose only source of water is the TMWA. Other water purveyors in the region rely exclusively on groundwater to meet customer demands. All domestic well owners are solely dependent on groundwater to meet their domestic water needs. The TMWA's surface water treatment and groundwater production facilities are operated as an integrated system that allows for conjunctive use, making it possible for TMWA to reliably meet demands under drought and non-drought conditions. Generally, TMWA diverts as much surface water as possible year-round and begins to bring on groundwater production wells later in the spring, when customer demands increase and when needed during drought situations.[104]

[104] Truckee Meadows Water Authority, 2020, https://tmwa.com/wp-content/uploads/2020/11/TMWA-WRP-2020-Final.pdf

DEVELOPMENT TRENDS

The Truckee River Operating Agreement (TROA) allows TMWA flexibility in storing and withdrawing water supplies, thereby increasing the agency's ability to respond to hydrologic drought conditions. Economic development across the region has increased the demand for water and the region's vulnerability to drought. However, the TMWA has sufficient water supplies and production facilities to meet demand through 2035. Truckee Meadows has been experiencing renewed population growth and increased development since recovering from the economic recession. Economic and population growth has been positive since the completion of TMWA's 2035 Water Resource Plan (WRP) in 2016. However, the annual growth rates have not been as fast as those experienced before the start of the Great Recession in 2007. TMWA estimates future population growth and water demand annually to ensure that water resources are sufficient to meet increasing demand.[105]

While humans cannot control the natural drought cycle, the water authority has taken measures to minimize the impact of drought, thereby decreasing Sparks' vulnerability.

RECENT MITIGATION CASE STUDY

Groundwater is used for drinking water by more than 50% of people in the United States. In Truckee Meadows, groundwater is vital to the community's water supply. Much of the local water demand is met using surface water from the Truckee River. However, during times of low river flows (such as under drought conditions) or when Truckee River water is heavy with sediment or otherwise unavailable, the community may be entirely dependent on groundwater. In Truckee Meadows, up to 30% of drinking water is currently derived from groundwater in a given year. Groundwater wells must be protected or abandoned in accordance with State regulations to keep them from becoming conduits for groundwater contamination. The Washoe County Health District (WCHD) also regulates activities to protect the environment from contamination.[106]

Earthquake

LOCATION

Any area of Washoe County, including the City of Sparks, is vulnerable to the noticeable effects of earthquakes. The most hazardous fault zones in the County are the Mount Rose fault zone, the West Tahoe fault, and Pyramid Lake fault. While these fault zones do not underlie Sparks, smaller faults occur within city boundaries, and the City may experience noticeable shaking and damage from an earthquake along any of the region's faults.

[105] Truckee Meadows Water Authority, 2020, https://tmwa.com/wp-content/uploads/2020/11/TMWA-WRP-2020-Final.pdf
[106] WashoeCounty.gov, 2024, Groundwater & Our Local Water Supply (washoecounty.gov)

During an earthquake, the City may experience severe seismic ground motion hazards. Most of the City, including areas north of E. Prater Way and east of Vista Boulevard, may experience peak ground acceleration with a 2% probability of exceedance in 50 years of between 48% and 64% gravity, which would be experienced as severe shaking capable of causing moderate to heavy damage. Areas of the City generally south of Prater Way and E. Prater Way and west of Vista Boulevard could experience more severe shaking. These areas may experience peak ground acceleration with a 2% probability of exceedance in 50 years of greater than 64% gravity, which would be experienced as violent shaking with the potential to cause heavy damage.

EXTENT

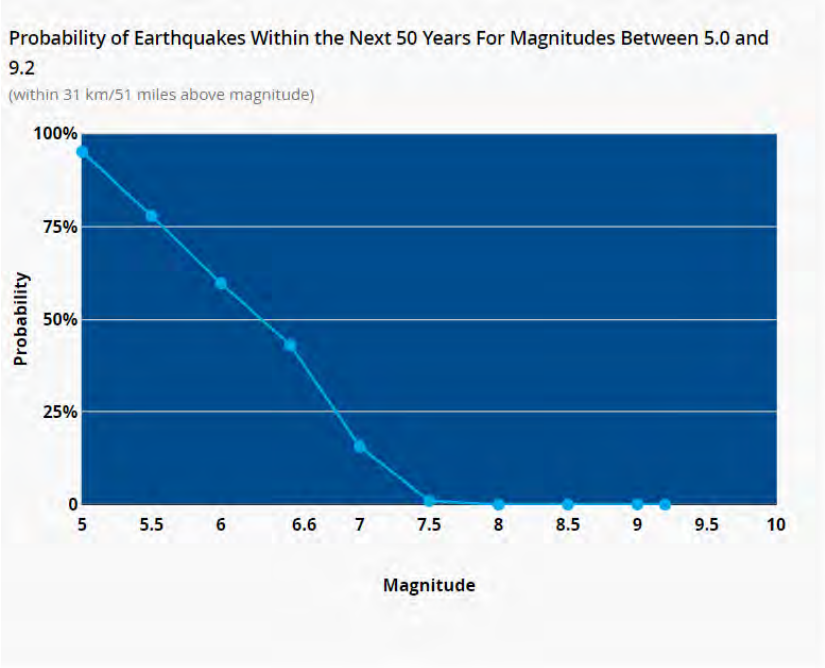
A major earthquake can cause widespread and significant damage to structures in the City of Sparks, as well as injuries and deaths. Because of their potential to damage structures, roads, and utilities, earthquakes may disrupt government operations and the local economy for a period of days to weeks and may require evacuations or create increased demand for emergency medical services. Response to and recovery from an earthquake may require state and federal support.

PREVIOUS OCCURRENCES/HISTORY

Information on previous major earthquakes with magnitudes greater than 5 on the Modified Mercalli Intensity (MMI) Scale in Washoe County is included in the Base Plan. Shaking from these earthquakes would have been felt in the City of Sparks and may have caused structural damage.

PROBABILITY OF FUTURE EVENTS

A total of 17 earthquakes with a magnitude greater than 5 on the MMI Scale have occurred in Washoe County in the last 150 years. The probability of future occurrence can be estimated at 10%; this means that there is roughly a 10% chance of an earthquake with a magnitude >5 to occur every year. Climate, economic, and land use trends do not affect the probability of an earthquake; however, economic trends and land use patterns can affect the amount of damage caused by an earthquake. With additional development occurring in the City of Sparks, there is an increased probability that future earthquakes will cause damage to structures, roads, and utilities in the City (Figure 48).



MAGNITUDE	PROBABILITY
5.0	95.10%
5.1	92.53%
5.2	92.53%
5.2	89.39%
5.3	85.80%
5.4	81.90%
5.5	77.85%
5.6	73.81%
5.7	69.88%
5.8	66.18%
5.9	62.75%
6.0	59.63%

Figure 48: Probability of 5.0–9.2 Magnitude Earthquakes in Sparks, NV, in the next 50 years[107]

VULNERABILITY ANALYSIS

Earthquakes can cause significant, widespread structural damage throughout the region. Critical facilities in Sparks are in areas that may experience relatively high seismic ground motion hazards. Most of these facilities may experience peak ground acceleration with a 2% probability of exceedance in 50 years of between 48% and 64% gravity, which would be experienced as severe shaking capable of causing moderate to heavy damage. For most critical facilities in the City, smaller earthquakes (resulting in peak ground acceleration with a 10% probability of exceedance in 50 years) could produce ground motion ranging from 32% to 48% gravity. These levels of peak ground acceleration would be experienced as very strong to severe shaking, with the potential to cause moderate to heavy damage.

The City of Sparks ranked earthquake hazards as **Moderate Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The overall magnitude and potential severity of earthquakes is considered Very High in the City of Sparks. Events are handled at the county level. They disrupt services for one to three days, and their economic impacts affect a city or community. In a worst-case scenario, earthquakes

[107] Homefacts, 2024, Earthquake Information for Sparks, Nevada, Sparks, NV Earthquakes | Homefacts

can require federal support, impact critical facilities, disrupt services for more than 20 days, and have national economic impacts.

Several critical facilities would be exposed to higher seismic ground motion hazards, including the following:

- **Sparks Police Department** – In an area with potential peak ground acceleration of greater than 64% gravity, with a 2% chance of being exceeded in 50 years. This level of peak ground acceleration would be experienced as violent shaking, with the potential to cause heavy damage.
- **Sparks Fire Department Station 3 and the University of Nevada Farm** – In areas with potential peak ground acceleration of greater than 64% gravity (with a 2% chance of being exceeded in 50 years) or 48% to 64% gravity (with a 10% chance of being exceeded in 50 years). At the high end, peak ground acceleration would be experienced as violent shaking, with the potential to cause heavy damage. At the low end, peak ground acceleration would be experienced as severe shaking, with the potential to cause moderate to heavy damage.
- **Sierra Regional Center (Hospital), Lincoln Park Elementary School, and Sparks Fire Department Station 1** – In an area with potential peak ground acceleration of 48% to 64% gravity (with a 10% chance of being exceeded in 50 years). This level of peak ground acceleration would be experienced as severe shaking, with the potential to cause moderate to heavy damage.

VULNERABLE POPULATIONS

In Sparks, several populations may be considered vulnerable to earthquakes due to various factors. One of the most at-risk groups includes low-income residents who may live in older buildings that are not seismically retrofitted. These structures may not adhere to modern building codes that require earthquake-resistant designs, making them particularly hazardous in the event of a seismic event.

Another vulnerable population includes the elderly, many of whom may have limited mobility and require assistance to evacuate their homes quickly. In the chaos following an earthquake, they may face additional challenges in accessing medical care or evacuation routes. Additionally, individuals with disabilities may also find themselves at increased risk during an earthquake if they rely on accessible infrastructure that may be compromised or if they require assistance from caregivers.

Children in schools can also be particularly vulnerable during an earthquake. Many Sparks schools may not have adequate emergency plans or drills in place to ensure the safety of students and staff. In the event of a seismic activity, the risk of injury in school buildings that may not be properly equipped to withstand earthquakes could be significant.

Finally, the transient population, including tourists or seasonal workers, may lack awareness of local seismic risks and preparedness measures. This lack of preparation can exacerbate vulnerabilities in the event of an earthquake, as they may not understand evacuation routes or emergency procedures specific to the area.

VULNERABILITY SCORE

The City of Sparks has a very high risk level for earthquake, based on research found in the USGS database, with a 95.10% chance of a major earthquake (5.0 magnitude) within 50km of Sparks, NV, in the next 50 years (Figure 49).



Figure 49:Earthquake Risk Level for Sparks, Nevada[108]

DEVELOPMENT TRENDS

Newer construction in Sparks and new retrofits are better able to withstand seismic forces, decreasing the vulnerability to earthquakes.

Energy Emergency

LOCATION

Any area of the City may be impacted by an energy emergency or power outage. Sparks is an urban area, and sufficient redundancy in electrical infrastructure exists in most areas of the city to prevent widespread power outages as a result of localized damage to the power system. Rural and populated areas alike are known to experience power outages during winter and windstorms that can last several hours to several weeks. The overall effects of a widespread energy emergency would be concentrated in population centers, but the condition is likely to be present throughout the planning area. The electric utility provider for the planning area is NV Energy (formerly Sierra Pacific Power Company). NV Energy owns and operates no facilities that are rated “Critical” according to the Department of Homeland Security criteria for National Critical Facilities.

EXTENT

It is difficult to predict the impacts of future energy emergencies, but they can impact all government and business operations and cause extensive economic losses, among other

[108] Homefacts, 2024, Earthquake Information for Sparks, Nevada, Sparks, NV Earthquakes | Homefacts

impacts. Due to the sporadic nature of power outages and other energy emergencies, it is also difficult to estimate how frequently such failures will occur, or their duration. The city's electric provider, NV Energy, generally deals with power outages multiple times per year, with many of them lasting only a matter of hours. Every several years, more significant power outages are experienced.

The overall magnitude and potential severity of impacts of energy emergencies is considered Low in Washoe County. Typical energy emergency events are handled at the regional level, and economic impacts could affect the entire County. Considering a worst-case scenario, an energy emergency could require federal support, impact critical facilities, disrupt services for several days, and have national economic impacts.

PREVIOUS OCCURRENCES/HISTORY

Historically, utility disruptions have been caused by both natural and human-caused events. These events include earthquakes, wildland fires, floods, and human activities. Most energy emergencies can be traced back to weather events. Outages can affect fewer than 20 customers in rural areas or more than 50,000 in the cities of Reno and Sparks.

Between 2009 and 2015, there were nine large weather outages in the County, resulting in power loss ranging from 8 to 31 days. The 2013 State of Nevada Enhanced HMP lists an additional six significant outages between 2009 and 2014. NV Energy provided updated data on outages across its system for the 2020 HMP update (Table 32).

Table 31: Power Outages, 2014–2018

Year	Number of Outages	Average Duration of Outages (minutes)
2014	934	201
2015	1,323	412
2016	962	219
2017	1,134	223
2018	1,042	192
Grand Total	5,395	259

The 2018 Nevada State Enhanced HMP references a major power outage in Washoe County due to a weather-related event. From November 9 to 10, 2015, a severe winter storm resulted in many broken tree branches because of heavy, wet snow. Over 35,000 customers were without power in Washoe County due to downed power lines.

In July 2019, a power outage affected more than 7,000 customers in Sparks until electrical service was restored to all customers approximately 11 hours later. Longer-duration power

outages have led to temporary increases in welfare checks, more need for medical care, and negative impacts on local economic interests.

Interruptions in energy services may also be planned, for example, to allow for system repairs or maintenance. In 2019, NV Energy and Pacific Gas and Electric Company (PG&E) in California began implementing extensive public safety outage management programs in areas with extreme fire risks. To prevent downed power lines and damaged equipment from causing fires, these electric providers may de-energize parts of the electrical grid during weather conditions conducive to wildland fires (e.g., high temperatures, low humidity, high winds, lightning storms) or based on field observations or information from first responders (NV Energy 2019). Planned outages can affect fuel availability for Washoe County. Outages affecting PG&E's system would cut power to the equipment that controls the operation of the fuel pipeline serving the region.

In January 2019, another winter storm caused 4,000 homes in Washoe County to lose power, requiring 10 specialized NV Energy trouble crews and 50 power line technicians working for over 12 hours to address the issue.



Figure 50: Utility Pole with Power Lines and Transformers[109]

- **On April 11, 2022,** more than 4,400 customers were without power across Northern Nevada. NV Energy reported that the biggest outages were in Washoe and Humboldt Counties and Carson City. The biggest outage in Washoe County was in Sparks and affected more than 700 customers. More than 1,200 customers in Carson City were affected.
- **On August 21, 2023,** more than 6,000 customers in Sparks in the area of Wedekind Regional Park were without power according to the NV Energy Website.

[109] Reno Gazette Journal, 2015, Jupiter Images, www.jupiterimages.com.

- **On January 21, 2024,** NV Energy reported that over 2,100 NV Energy customers were without power in parts of Northern Nevada. Around 6 a.m., 6,000 NV Energy customers did not have power in the region, but that number dwindled to about 1,100 people by 7:30 p.m., according to NV Energy's website. NV Energy's outage map showed that most of the outages were concentrated in and around Reno and Carson City, with the largest single outage in Reno impacting 845 people.
- **On March 3, 2024,** NV Energy reported many outages across Norther Nevada. More than 2,700 customers across Northern Nevada were without power. In a release, NV Energy stated the outages were related to severe wind and significant snow. NV Energy stated that poor visibility and road conditions increased restoration times.[110]

PROBABILITY OF FUTURE EVENTS

Due to the sporadic history of occurrences, the broad range of potential causes, the unpredictability of these causes, and the improvements in energy supply systems after previous failures, the probability of occurrence is difficult to measure for this hazard. The overall probability of future energy emergency events is considered Medium. According to the Nevada Office of Energy, multiple alternative energy sources are in place, which may reduce the extent of a possible energy emergency by providing alternatives in the event of a failure.

The probability of energy emergencies may increase due to climate change. Changes in climate and environment contribute to increased risk of wildfires and other natural disasters. NV Energy has made a number of mitigation measures to protect customers, the community, and equipment from the risk of extreme weather, including public safety outages and other measures.

NV Energy implemented the Public Safety Outage Management (PSOM) program to plan power outages to more areas in Northern Nevada with elevated fire risk, recognizing safety as a priority. Figure 51 shows the PSOM zone for Northern Nevada. The goal of the program is to protect customers and the community from the risk of wildfires in extreme and elevated fire-risk areas of Nevada by shutting off power in one or more of its extreme or elevated fire-risk zones when certain environmental conditions are met, and an evaluation of risk is done with guidance from local emergency management teams and other stakeholders. This helps prevent power lines, things that are blown into power lines, and other equipment from causing a wildfire. Residents in Carson City, Washoe, would be affected by the scheduled power outages. NV Energy monitors weather patterns seven to 10 days ahead for any concerning weather patterns. By the 72-hour mark, NV Energy will begin to communicate with local emergency management officials and discuss where they see risks.

[110] 2News Nevada, 2024, NV Energy Reports Numerous Outages Across Northern Nevada, Sierra | News | 2news.com

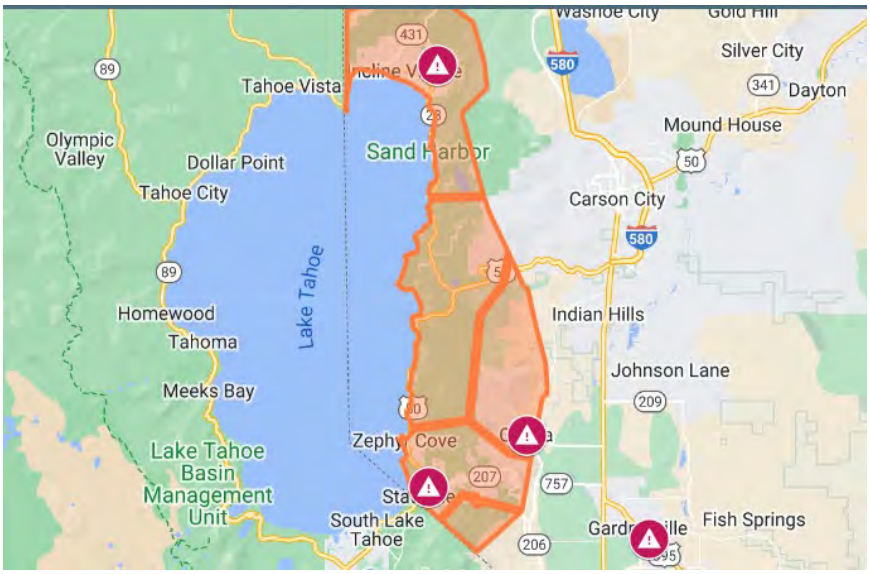


Figure 51: The Public Safety Outage Management Zone for All Northern Nevada

VULNERABILITY ANALYSIS

Prolonged power outages can cause health emergencies and increased demand for emergency medical services, especially in Nevada, where vulnerable people may be exposed to extreme summer or winter weather conditions. Power outages can also cause disrupted utilities or damaged infrastructure, such as frozen pipes, and economic impacts due to the loss of perishable food and other items. Depending on the cause, a power outage or other energy emergency can cause cascading impacts—most significantly, wildland fires—if a downed line or other physical damage caused an outage.

The City of Sparks ranked energy emergency hazards as **Moderate Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The increased energy demands caused by climate change may increase the potential for energy emergencies. Higher temperatures and extreme heat events are more frequent and increase the power demand, causing widespread power outages and weather-related damage to equipment.

An energy emergency in Sparks could significantly impact the local economy. Businesses relying on electricity may face increased costs and productivity disruptions, potentially leading to layoffs and reduced income for workers. This could hurt overall economic activity and risk the closure of smaller businesses.

Public services would also suffer during an energy emergency, with essential functions like water supply and emergency response potentially disrupted. This would compromise public safety and health, placing additional strain on local government resources.

Residents might see higher utility bills due to fluctuating energy prices, and power outages could disrupt daily life, affecting heating, cooling, and access to electronic devices—especially important during extreme weather.

Infrastructure challenges could arise as well, with traffic lights and public transportation affected, leading to congestion and safety risks on the roads. The overall quality of life could decline for residents as community functioning is hindered.

Lastly, there may be negative environmental consequences if there's a rush to less sustainable energy sources to meet immediate needs, resulting in increased pollution and harm to the local ecosystem. Overall, an energy emergency in Sparks could have wide-ranging effects on the economy, public health, infrastructure, and the environment.

VULNERABLE POPULATIONS

Besides the human toll, utility failures, such as power outages, can disrupt daily routines and activities. They can cause transportation delays, canceled trips, and difficulties commuting to work, school, or other important engagements. They can also disrupt access to essential services, such as clean water, electricity, healthcare facilities, and communication networks, compromising people's health, safety, and quality of life. Populations with disabilities or limited mobility face heightened vulnerability. Inaccessible infrastructure due to power failures, such as access to ramps, elevators, or accommodations for visual or hearing impairments, can hinder their ability to evacuate, access emergency services, or receive timely information during incidents.

The NV Energy website states that sometimes outages do occur because of events beyond their control, such as extreme weather conditions and vehicle accidents involving utility poles and equipment. Customers who rely on electricity to power their electrically operated medical equipment must plan to have a backup power supply or make alternate plans for using those devices and refrigerating medications. Also, periods of high heat, high winds, and winter snowfall conditions can cause power outages, and extended outages could impact the community, for example, closing stores, transportation, banks, and gas stations.

DEVELOPMENT TRENDS

Nevada Governor's Office of Energy Status of Energy 2023 Report states Nevada's economy relies on the production of safe and affordable energy, providing essential services to Nevadans and attracting new businesses, industries, and jobs to the state. The 2023 comprehensive and balanced energy policy for Nevada provides a wide range of fuels, technologies, and supporting infrastructure to the state. The policy will help Nevada make significant progress toward meeting its energy needs by bringing a diverse energy portfolio to the state.

Future development will create increased demand for utility services. Utility providers generally plan for and complete capital improvements to meet future demands. Factors such as budget

constraints or the need to construct new utility plants, like wastewater treatment plants or power generation facilities, may affect the ability of utility providers to serve a significant number of new customers.

RECENT MITIGATION CASE STUDY

NV Energy has been working to expand its energy generation facilities to incorporate more renewable energy facilities and replace aging equipment on a regular basis. Nevada leads the nation in solar power potential and has already made significant strides in growing its solar energy capacity. Since 2016, the state's solar energy generation has nearly tripled. As of 2022, solar energy generation accounts for 23% of the state's total electricity. Currently, 37% of Nevada's electricity comes from renewable sources, helping meet the growing demands of the state, and ensuring that homes and businesses can rely on a robust and secure energy supply, decreasing vulnerability. The County's upward trend in development increases the overall demand on utilities, increasing vulnerability.

Flood

LOCATION

The geographic location of flooding is concentrated in the floodway and floodplain of the Truckee River and its tributaries, including Steamboat Creek and Dry Creek in eastern Reno and southern Sparks. The Truckee River headwaters comprise the Lake Tahoe Basin. The river drains part of the high Sierra Nevada and empties into Pyramid Lake, the sole outlet of Lake Tahoe.

Historically, areas of the city prone to riverine flooding include the following:

- About 75% of Sparks's industrial area south of the railroad tracks;
- Recreational and residential areas north of the river, south of Prater Way, and east of McCarran Boulevard;
- Areas between Greg and Mill Streets west of McCarran Boulevard; and
- Bridges over the Truckee River and tributaries, which are closed during major floods (with observed stage readings over 20.5 feet at the Vista gauge).

The 100-year and 500-year floodplains in the planning area are shown in the Flood Section of the Base Plan.

Flash flooding is usually associated with development, urbanization, and inadequate storm drainage systems. Most of Washoe County's population and urbanization sits in the County's southern portion, Reno, and Sparks, along the I-80 and U.S. Highway 395 corridors. The results of the concentrated development were heavily felt during the 2005 flooding events.

Please refer to the base plan, specifically pages 250 and 258, for flood maps.

EXTENT

Severe flooding may cause serious injuries and deaths and damage public facilities and private property. The extent of flooding can be determined by comparing the height of river flows to flood stages determined by U.S. Geological Survey stream gages located in the area. It can also be measured by past flooding damage. Sparks may experience limited localized flooding on an annual basis.

100-year and 500-year floods have a 1 in 100 chance or 1 in 500 chance (i.e., 0.1% or 0.2% chance) of being exceeded within a year. Major flooding at this scale generally occurs in Washoe County because of two types of storm events: 1) heavy, prolonged rainfall on top of a deep snowpack in the Sierra Nevada, and 2) heavy, prolonged rainfall that spills over into the normally rain-shadowed Sparks area. A hybrid of both scenarios can lead to these levels of flooding. Floods of this magnitude occur in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. Truckee River flooding has been of primary concern to the Sparks metropolitan area. Intense storms can overwhelm local waterways and the integrity of flooding control structures.[111]

PREVIOUS OCCURRENCES/HISTORY

In January 2017, northern Nevada experienced significant flooding from a storm that dropped between 3 and 6.5 inches of rain in the region and snow in the mountains. The combination of heavy rain and mountain snow led to flood conditions in the valleys of the Reno-Sparks area. Other recent major floods in the region that affected Sparks include the following:

- December 24, 2005, to January 3, 2006
- December 16, 1996, to January 6, 1997
- February 11 to February 20, 1986.

The following are the most recent flood incidents that occurred in the City of Sparks as reported by the Storm Events Database: three flooding episodes (flash flood, flooding, and lakeshore flooding) in Sparks between 2019 and 2024 causing no recorded property damage or crop damage, and no injuries.

- **June 3, 2021:** Heavy rainfall and thunderstorms produced excessive runoff, causing flooding of small creeks and streams; urban areas; highways, streets (Figure 52), and underpasses; and other drainage areas and low-lying spots.[112]
- **June 30, 2021:** Near-record high temperatures and increasing moisture led to the development of scattered, slow-moving thunderstorms with heavy rainfall. Training

[111] Truckee Meadow Water Authority Water Resource Plan, 2020-2040 Water Resource Plan – Truckee Meadows Water Authority (tmwa.com)
[112] MyNews4.com, Ramsey Pfeffinger, 2021, https://mynews4.com/news/local/heavy-rain-brings-flood-advisory-to-reno-surrounding-areas

thunderstorms produced heavy rainfall over Spanish Springs, particularly near Pyramid and La Posada. Standing water on many roads and fields made access impossible. Washoe Alert gauge station, not in the core of the storm, reported 1.69 inches in 3 hours.

- **December 23, 2021**: The Nevada Department of Transportation (NDOT) closed I-80 and Rock Blvd underpass (Figure 53)due to minor flooding caused by a series of eastern Pacific winter storm pulses, occasionally aided by induction of warmer subtropical moisture, caused various hazardous winter conditions that disrupted holiday travel and commerce over the Sierra and Wester Nevada.



Figure 52: Roads on Tyler Way in Sparks begin to flood on June 3, 2021[113]

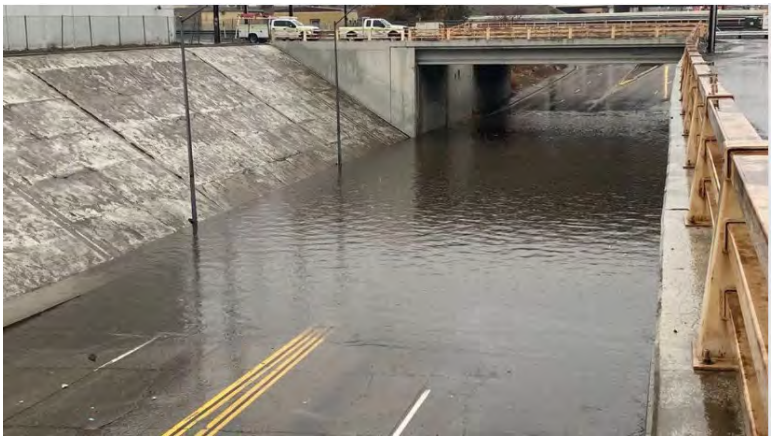


Figure 53: Rock Blvd under water after heavy rainfall in Washoe County[114]

[113] MyNews4.com, 2021, "Roads on Tyler Way in Sparks begin to flood on June 3, 2021," https://mynews4.com/news/local/heavy-rain-brings-flood-advisory-to-reno-surrounding-areas
[114] MyNews4.com, 2021, "Rock Blvd under water after heavy rainfall in Washoe County," Flooding on Rock Blvd. in Sparks prompts road closure (mynews4.com)

PROBABILITY OF FUTURE EVENTS

Based on the potential increase in high-intensity precipitation events and increased urban development in the Spanish Valley, Sparks may be impacted by an increase in the probability of future floods and flash flooding. RiskFactor.com integrates all major flood types (from tides, coastal surges, rains, and rivers) and uses historical flooding events to calculate risk, in addition to considering future environmental changes. The line graph in Figure 54 compares the flood risk levels of Nevada, Sparks, Incline Villages, and the United States. RiskFactor.com reports 6,982 properties, or 18.7% of all properties in Sparks, at risk of flooding over the next 30 years.[115]

VULNERABILITY ANALYSIS

Riverine or flash flooding in the city often results in the washout or flooding of roadways and infrastructure in waterways, such as bridges or culverts. The City of Sparks has concentrated industrial, commercial, and recreational land uses in mapped floodplains along the Truckee River, and most of the city's critical facilities are located outside these floodplains. Flash flooding can affect smaller creeks and streams and areas near burn scars, and critical facilities outside mapped floodplains may be affected.

The City of Sparks ranked flood hazards as **Moderate Risk.**

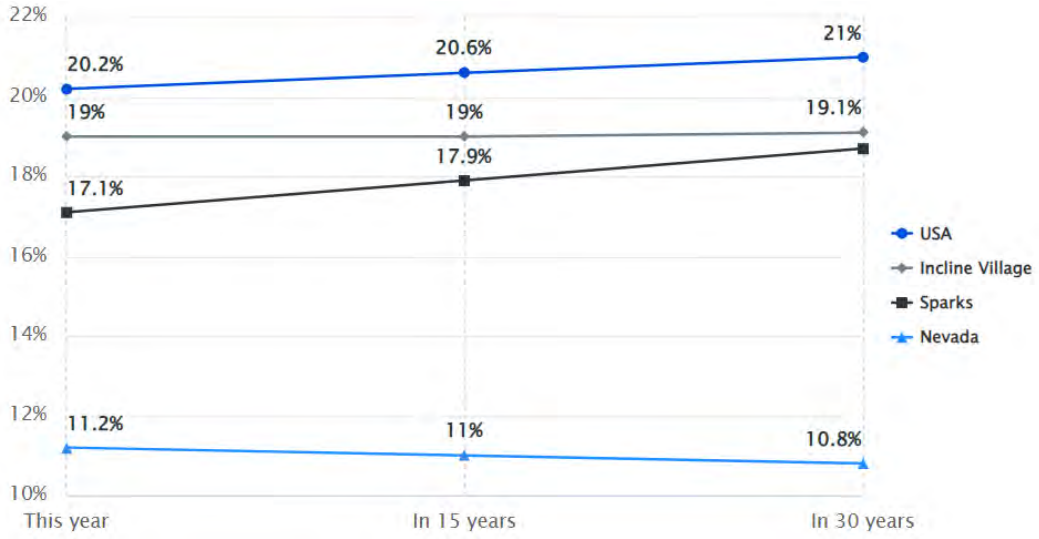


Figure 54: Percentage of Properties in Sparks, NV, at Risk of Flooding[116]

[115] RiskFactor.com, 2024, Sparks Flooding Risk, Sparks, NV Flood Map and Climate Risk Report | Risk Factor

[116] Ibid.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Major flooding can impact the community by displacing residents and business owners; damaging and disrupting infrastructure, including roads and bridges, water treatment facilities, and wastewater treatment facilities; and causing health risks due to contaminated public water supplies and private wells. Major floods can disrupt, and have in the past disrupted, business activities, transportation, and recreation in the southern part of the city for a period of days or weeks. Four critical facilities, including three dams and one fire station, are located in the 100-year floodplain. One school, the University of Nevada Farm facility, is located in a 500-year floodplain. In addition, RiskFactor.com reports that 620 properties in Sparks are in the Special Flood Hazard Area (Zone A or V).[117]

VULNERABLE POPULATIONS

The City of Sparks is protected by 10 flood risk reduction projects which protect 192 properties in the county. These include four adaptation mitigation measures: (1) 161 properties protected by the I-80 in Sparks adjacent to Sparks Marina adaptation; (2) 31 properties protected by the Washoe County Levee 2 adaptation measure; (3) 4 properties protected by the Washoe County Levee 3 adaptation measure; (4) 2 properties protected by the Reno-Sparks Indian Colony Levee and Flood Wall adaptation measure.[118]

The CDC reports vulnerable populations, such as the elderly, people with disabilities, and children, can be adversely exposed to floodwater and standing water after a flooding incident, exposing individuals to infectious disease, chemical hazards, and injuries. Respiratory illnesses can develop from the growth of some bacteria, viruses, mold, and mildew from flood waters in buildings. Also, floodwaters pose risks to drivers, as cars can be swept away or break down in the flood waters. People can drown in swift moving or rising floodwaters.[119]

DEVELOPMENT TRENDS

The industrial area has been built for years, so the risk is static, but the realignment of the North Truckee Drain has reduced the impact of flooding, decreasing vulnerability.

[117] Ibid.

[118] RiskFactor.com, 2024, Sparks Flooding Risk, Sparks, NV Flood Map and Climate Risk Report | Risk Factor

[119] CDC, 2024, Natural Disasters, What to Do to Prevent Getting Hurt or Sick After a Disaster | Natural Disasters | CDC

Hazardous Materials Incident

LOCATION

The potential for contact with hazardous materials is present throughout all areas of Washoe County because of four main factors:

- The widespread distribution of hazardous materials **storage locations** (fixed facility);
- The transport of hazardous materials via motor **transportation and rail** (transportation);
- River and water ditches; and
- The transport of hazardous materials by **pipeline** (pipeline).

The following description defines the diversity of hazardous products that move through the Cities of Reno and Sparks and Washoe County.[120]

1. Transportation Routes – Highways, railways, and commercial and military aviation routes constitute a major threat because of the multitude of chemicals and hazardous substances transported along them. Interstate 80, Highway 395, and other main thoroughfares are areas of concern, as are the Union Pacific railroad tracks.
2. Pipeline – Several pipelines transect the Cities of Reno and Sparks and Washoe County, carrying a wide variety of products for industrial, commercial, and residential use. The Kinder Morgan Pipeline Company, possibly the largest of the pipelines, services Washoe County and the Fallon Naval Air Station with petroleum products. The Paiute Pipeline and Tuscarora Pipeline supply high- pressure natural gas for service to the communities and businesses.
3. Business and Industry – The manufacturing and light industrial firms in the Cities of Reno and Sparks and Washoe County offer the potential for hazardous materials incidents. These facilities use and/or store products that may be harmful to the population living and working in the area and to the sensitive ecosystems of the region.
4. Agriculture – Accidental releases of pesticides, fertilizers, and other agricultural chemicals may be harmful to human health and the environment. Most of the agricultural industry consists of ranching and farming operations located in the Cities of Reno and Sparks and Washoe County.
5. Illegitimate Business – Illegitimate businesses, such as clandestine drug laboratories, are a significant threat to human health, property, and the environment. In many instances, the residue is dumped in remote areas of the county or along the side of the road, posing a serious health threat to the unsuspecting person who stumbles across it.

[120] Washoe County LEPC Hazardous Materials Emergency Plan, 2020, Hazardous Materials Emergency Plan (washoecounty.gov)

6. Hazardous Waste – Hazardous waste (e.g., used motor oil, solvents, or paint) is occasionally dumped in remote areas of the county or along roadways. Like drug lab residue, illegally dumped hazardous waste poses a threat to human health, property, and the environment.
7. Radioactive Materials – Interstate 80, Highway 395, other main thoroughfares, and railroads are authorized routes for the shipment of radioactive materials.
8. Acts of Terrorism – Terrorist acts are becoming more common today and much more sophisticated. Events in recent years have prompted a move toward terrorist preparedness.

EXTENT

The overall magnitude and potential severity of hazardous materials incidents are considered Low in Washoe County but vary based on the type of facility. The vulnerability to hazardous materials disasters at fixed facilities includes the potential for either an explosive release or insidious leaking of materials into the ground or groundwater. The impact of an accident or spill during roadway or rail transport depends largely on the spill location relative to population centers and waterways.

PREVIOUS OCCURRENCES/HISTORY

The City of Sparks reported no previous occurrences of hazardous materials incidents.

PROBABILITY OF FUTURE EVENTS

The probability of future hazardous materials events varies based on the type of accident considered High. Based on the frequency of past incidents, particularly during transportation of hazardous materials, the overall probability of hazardous materials incidents is considered Medium. As the transport, handling, and production of hazardous materials increase, the expected frequency of accidents involving uncontained releases increases correspondingly.

It is important to note, however, that an increase in hazardous materials regulation is likely to decrease the potential for hazardous materials releases. The probability of a hazardous materials release on a roadway, rail line, or fixed facility is marginally higher than that of pipeline accidents, due to increased potential for human error or mechanical failure.

VULNERABILITY ANALYSIS

Hazardous materials incidents can be caused by a number of factors, including technological failures, natural hazards, such as earthquakes or floods, and human factors. The County and local governments maintain records of hazardous materials storage sites in the Regional Hazardous Materials Response Plan and maintain communications with Nevada Highway Patrol regarding shipments of hazardous materials on all transportation routes throughout the County. Hazardous materials incidents can be caused by a number of factors. The region's most pressing vulnerability is presented by a transportation incident occurring on the I-80 and/or I-580 highway. Many of the critical facilities and valuable assets are near I-80 and I-580,

particularly in the Reno/Sparks corridor. Hazardous materials may be transported through the Reno-Tahoe International Airport. In addition, power plants, water and wastewater treatment plants, hospitals, fire stations, and other critical facilities in Washoe County may store hazardous materials on site.

The City of Sparks ranked hazardous materials incident hazards as **Low Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

- **Economic:** Increased transportation of hazardous materials in the corridor increases the probability of a release or spill of bulk hazardous materials causing fire, explosion, toxic cloud, or direct contamination of people or property. Damage to property could range from immediate destruction by explosion to permanent contamination by a persistent hazardous material (Increased Vulnerability).
- **Land Use:** Kinder Morgan operates an underground pipeline that transports approximately 13 million barrels of petroleum products (gasoline, diesel, and jet fuel) from the pump station in Rocklin, California, to the Sparks, Nevada, terminal. Jet fuel is then pumped from the Sparks terminal to the Fallon Naval Air Station. Kinder Morgan also shares a storage facility in Sparks[121] (Increased Vulnerability).
- **Future Land Use**: Excavation is the most likely cause of damage to the pipeline. The potential for rupture because of nearby excavation is greatest in areas where the pipeline corridor intersects highways and railroad right of ways and areas of new construction. As the area in the pipeline corridor continues to grow and expand, the potential for damage will also continue to grow[122] (Increased Vulnerability).

VULNERABLE POPULATIONS

Any release from the pipeline may have severe consequences for the population and the environment. The proximity of the pipeline to the Truckee River and its inlets and outlets signifies a potential threat to the water system. All the communities located along the Truckee River draw their water supply from the river or from wells that are directly affected by any product released from the pipeline. Environmental damage, including the potential for wildland fires, is an additional consideration.

[121] Washoe County Emergency Management and Homeland Security Program, 2020, "Regional Washoe County Hazardous Materials Emergency Response Plan" HAZMAT-Annex-D-12-17-2020.pdf (washoecounty.gov)

[122] Washoe County Emergency Management and Homeland Security Program, 2020, "Regional Washoe County Hazardous Materials Emergency Response Plan" HAZMAT-Annex-D-12-17-2020.pdf (washoecounty.gov)

RECENT MITIGATION CASE STUDY

KINDER MORGAN PIPELINE MITIGATION ACTIONS

There are several locations along the pipeline where leak detection can occur; the threshold of detection is about one-tenth of one percent over a period of about 15 minutes. In a catastrophic break, the pipeline can be shut down in about 30 seconds using automatic shutoff valves. Isolation of manual valves is dependent on weather conditions and could require 30 minutes to an hour to close. If this break is caused by a single isolated event, such as a landslide or rockslide, the damage can be detected, contained, and repaired relatively quickly, assuming fair weather conditions and transportation routes are clear.[123]

Infectious Disease

LOCATION

Infectious diseases spread by humans, and vector-borne infectious diseases can occur in both urban and non-urban areas in the County. Areas in the county that are more susceptible to infectious diseases are typically those with higher population density, such as Reno and Sparks, and areas with poor sanitation and limited access to healthcare services. On the other hand, areas more susceptible to vector-borne diseases are often those with standing water or extensive vegetation, providing suitable habitats for disease-carrying vectors, such as mosquitoes and ticks. These are more prevalent in non-urban areas.

EXTENT

The overall magnitude and potential severity of infectious disease outbreak impacts are considered Medium in Washoe County. Typical disease outbreaks are handled at the city or county level. Severe outbreaks may disrupt services for weeks, and economic impacts may be felt at the county level.

The Northern Nevada Public Health 2022 Annual Communicable Disease Summary reports that communicable diseases are a continuing threat to everyone, regardless of age, gender, lifestyle, ethnic background, or socioeconomic status. They cause illness, suffering, and death and place an enormous financial burden on society. Currently, over 90 diseases or conditions are reportable in Nevada. In 2022, over 60,000 cases were reported to Norther Nevada Public Health. The numbers dramatically increased between 2020 and 2022 because of COVID-19 (see Figure 55).

[123] Ibid.

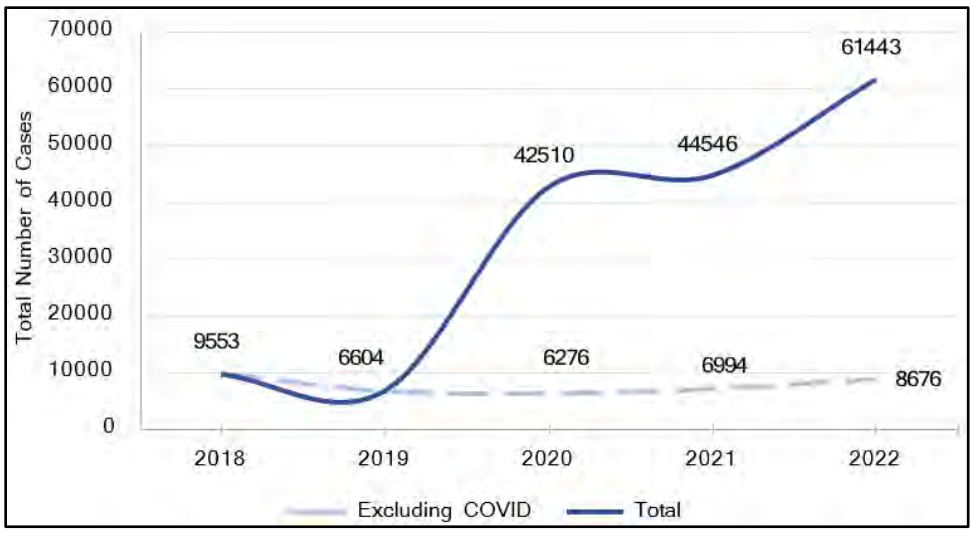


Figure 55: Northern Nevada Annual Communicable Disease Total, 2018–2022

PREVIOUS OCCURRENCES/HISTORY

- **2020–COVID-19:** COVID-19, or coronavirus disease 2019, is caused by the SARS-Co-V-2 virus. It is considered a respiratory illness, but it can affect areas of the body besides the respiratory system. Respiratory symptoms range from mild to severe. COVID-19 was declared a public health emergency of international concern (PHEIC) on January 30, 2020, and a global pandemic by the World Health Organization on March 11, 2020. The United States declared COVID-19 a national emergency from March 13, 2020, to May 11, 2023. The state of Nevada declared COVID-19 a public health emergency on March 12, 2020. Additional guidance and recommendations on gatherings and closure were issued in the weeks following and are detailed in the COVID-19 timeline of the Nevada Department of Health and Human Services Division of Public and Behavioral Health.

PROBABILITY OF FUTURE EVENTS

Climate change can have significant impacts on the spread of infectious diseases. As temperatures and precipitation patterns shift, the geographic range of disease-carrying vectors, such as mosquitoes and ticks, can expand, bringing diseases like malaria, dengue fever, and Lyme disease into new areas. Warmer temperatures can also speed up the reproduction and development of these vectors, allowing them to spread diseases more quickly. In addition, changes in precipitation can create new breeding grounds for disease-carrying organisms. Overall, climate change can create more favorable conditions for the transmission and spread of infectious diseases, posing a threat to global public health.

Cases of infectious disease occur annually in Washoe County, and the probability of future events is estimated at Medium. Based on potentially changing climate patterns, an increase in the likelihood of emerging infectious diseases may impact Washoe County.

VULNERABILITY ANALYSIS

Infectious diseases are known to spread quickly through communities. Many spread through close contact, meaning that highly populated areas like Reno and Sparks are more prone to widespread outbreaks. Public gathering places where people may be together in close quarters, such as schools and childcare facilities, offices, and transportation terminals, provide more opportunities for diseases to pass from one person to another.

Land use changes can have a major impact on infectious disease numbers. This is done by changing the rate of contact between individuals and disease hosts, whether animal, insect, or fungal. Along with this change in contact rate, land use changes can also alter the composition of local species, potentially allowing vector species to become the dominant species.

Outbreaks of infectious diseases most often affect vulnerable populations. However, a worst-case scenario could overwhelm local hospitals and medical facilities and require a surge response.

The City of Sparks ranked infectious disease hazards as **Low Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

Vaccine hesitancy has been a public health issue for many years, and it increased during the COVID-19 pandemic. Many infectious diseases are entirely vaccine preventable (e.g., Hepatitis A) or have reduced transmission, extent, and severity (e.g., influenza, COVID-19). Vaccines are a powerful public health tool to prevent and mitigate diseases and reduce the potential for outbreaks. Increases in vaccine hesitancy are of concern, as herd immunity is necessary to help reduce the likelihood of outbreaks.

VULNERABLE POPULATIONS

Population growth could increase the risk of infectious disease outbreaks and their impact on hazard mitigation for Nevada. The estimated population of Washoe County in 2024 was 499,064, with a growth rate of 0.21% in the past year, according to the most recent United States census data. Washoe County is the second largest county in Nevada. The 2010 population was 421,969, and it has grown 18.27% since that time. An increase in the population can impact infectious disease risk. For example, areas with higher population densities saw earlier outbreaks of COVID-19. Population density has been found to be a risk factor for the spread of infectious diseases, particularly those that spread from person to person and through food and water. Furthermore, vector-borne illnesses can also increase or change patterns with increasing population density.

Various populations are vulnerable to communicable diseases, and understanding these groups is crucial for effective public health interventions. One vulnerable population consists of infants and young children whose immune systems are still developing, making them more susceptible

to infection. Their proximity to daycare centers and schools increases the risk of disease transmission.

Another vulnerable group is the elderly, particularly those with preexisting health conditions or weakened immune systems. Age-related declines in immune function can make them more susceptible to infectious diseases and increase the severity of illness. Long-term care facilities and nursing homes often house a significant proportion of elderly individuals, further amplifying the risk of disease outbreaks.

Individuals with compromised immune systems (such as those with HIV/AIDS), cancer, organ transplants, or autoimmune diseases are highly vulnerable. These conditions weaken their ability to fight infections, leaving them more susceptible to communicable diseases. Strict infection control measures and targeted prevention strategies are essential for protecting this group.

Homeless populations also face increased vulnerability to communicable diseases due to factors such as crowded living conditions, limited access to healthcare, poor nutrition, and higher rates of substance abuse. These circumstances can contribute to the spread of infections such as tuberculosis, hepatitis, and respiratory illnesses in homeless communities.

Lastly, marginalized and socioeconomically disadvantaged populations may be at higher risk. Factors such as limited access to healthcare, overcrowded living conditions, inadequate sanitation, and lack of education can increase the vulnerability to communicable diseases.

DEVELOPMENT TRENDS

An increased population in the same area increases the vulnerability of infection. Infectious, communicable, and vector-borne diseases can significantly impact development trends in many ways. They can strain healthcare systems, lead to workforce absenteeism, and cause economic disruptions. In addition, investment in infrastructure and public services may be diverted to disease control efforts, affecting overall development. Furthermore, the fear of contracting these diseases can affect consumer behavior, tourism, and foreign investment, influencing economic growth and development. The burden of infectious diseases can hamper development's social, economic, and environmental aspects, and emerging infectious diseases can pose vulnerabilities to economic and land use trends in several ways.

- **Economic:** These diseases can increase healthcare expenditures and reduce productivity due to illness or workforce absenteeism. This can strain healthcare systems and have direct economic impacts on businesses and industries.
- **Land Use:** Emerging infectious diseases can also influence land use patterns. For instance, areas affected by outbreaks may experience changes in land development plans, shifting the focus toward healthcare infrastructure and away from other projects. Moreover, the occurrence of infectious diseases can lead to changes in travel patterns, affecting tourism and trade, which can further impact land use and economic trends.

- **Future Land Use:** Infectious diseases can affect future land use by impacting population distribution and density. An increased population can lead to more urbanization, which may lead to converting agricultural land into residential and commercial uses. In addition, the spread of infectious diseases can lead to changes in land use patterns, such as the creation of quarantine zones or restricted areas to control the spread of the diseases. This can impact land use for agriculture, housing, and other purposes.

Radiological Waste Transport

LOCATION

Radiological waste could be transported along rail systems, major airports, and highway corridors in Washoe County. The zones of potential impact extend beyond these transportation facilities. The sizes and shapes of those zones are affected by the material released and atmospheric and environmental effects, such as wind speed and water flow.

EXTENT

The potential magnitude and severity of impacts from a radiological waste transport incident in Washoe County are categorized as Very High. Incidents involving the release of radioactive materials can necessitate federal support for response efforts, impact critical facilities, cause disruptions in services for weeks, and have widespread economic repercussions across the nation.

PREVIOUS OCCURRENCES/HISTORY

The City of Sparks reported no previous occurrence for Radiological Waste Transport.

PROBABILITY OF FUTURE EVENTS

Medical, construction, and traditional radiological materials, including waste, are commonly transported on major transportation routes through Washoe County. As traffic on these routes increases, the potential for radiological waste transport incidents increases. However, given the safety measures in place to prevent these incidents and the fact that no incidents have been reported in Washoe County, the probability of future events is estimated to be Very Low.

VULNERABILITY ANALYSIS

The MPT determined that hazards from transporting radiological waste have a low probability of occurring. However, the vulnerability of the public, continuity of operations, and infrastructure to radiological waste transport are assessed below. A radiological incident on a transportation corridor could cause a fire or explosion, dispersing radiological particles that contaminate people and property. Depending on several factors, communities in the immediate vicinity of the event would be the most vulnerable. Moreover, if radioactive materials are not

effectively contained, they can spread through the air, soil, and/or water. In the immediate aftermath of a radiological incident on a roadway, the materials pose a substantial risk to first responders and other emergency personnel. Due to the infrequent occurrence of these accidents, emergency personnel may not be sufficiently trained in appropriate response protocols. Radiological materials incidents on transportation corridors require extensive administrative and operational support from impacted jurisdictions. Remote communities may not have the capacity to direct a response to a radiological incident.

Radiological materials would impact jurisdictions' continuity of operations, particularly if a major transportation corridor were affected. Radiological incidents could require the mobilization of resources to evacuate and/or shelter in place. Remote communities with few resources may be limited in their ability to mobilize these resources, and larger communities would have to expend more resources to protect population centers from the impacts of a radiological incident. Infrastructure and facilities near the radiological incident could be temporarily or permanently contaminated or physically impacted by a radiological incident.

The City of Sparks ranked radiological waste transport hazards as **Low Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

Climate change can significantly impact the transportation of radiological waste. As extreme weather events become more frequent and intense, the risks associated with transporting radiological materials also increase. For example, extreme weather events, such as heavy storms, flooding, and hurricanes, can disrupt transportation routes and infrastructure, potentially leading to accidents or incidents involving radiological waste.

Furthermore, rising global temperatures can affect the stability and safety of transportation routes, increasing the likelihood of road and infrastructure damage. This, in turn, can pose significant challenges to the safe transport of radiological waste and increase the risk of incidents such as spills or releases of radioactive materials.

VULNERABLE POPULATIONS

In Sparks, several populations may be vulnerable to incidents related to the transport of radiological waste. These include low-income communities, which often lack the resources to effectively respond to emergencies or access information about potential risks. Additionally, the elderly population may be particularly at risk due to mobility issues and potential health complications that could arise in the event of an incident.

Children are another vulnerable group, as they are more susceptible to the harmful effects of radiation. Schools located near transportation routes for radiological waste could face heightened risks, and children may have less awareness of safety protocols during an emergency.

Furthermore, individuals with disabilities may also face challenges in evacuating quickly or understanding the scope of the incident. Communities that lack robust emergency response plans or access to timely information may find themselves at greater risk as well.

Lastly, residents living near major highways or transportation hubs used for radiological waste transport are inherently more exposed to potential accidents.

DEVELOPMENT TRENDS

Despite population growth in Washoe County, the risk of incidents during the transport of radiological waste is small. However, an area's development trends may change if climate change impacts the transportation of radiological waste. Since the last plan, vulnerability has remained unchanged.

Extreme weathers (Winter Storm)

LOCATION

Any area of the city may be affected by winter storms. High elevations in the western portion of Washoe County experience the effects of winter storms, often snowstorms, with greater frequency than low elevations. Winter storms plunge southward from arctic regions and drop heavy amounts of snow and ice. The severity of winter storms is generally minor. However, a heavy accumulation of ice can create hazardous conditions. A large winter storm event can also cause exceptionally high rainfall that persists for days, resulting in heavy flooding. Extreme cold temperatures often accompany severe winter storms in Washoe County.

EXTENT

Typical Extreme weather events are handled at the city or county level. They can disrupt service for days to weeks and have economic impacts on a statewide scale. In a worst-case scenario, a Extreme weather event could require federal support, impact critical facilities, disrupt services for more than 20 days, and have nationwide economic impacts.

PREVIOUS OCCURRENCES/HISTORY

There are no FEMA declarations for winter storms from 2019 to 2024.

Sparks's annual average snowfall is 6 inches, with snowfalls generally occurring in November through March, according to data from 2010–2019 climate normal. The same source shows 8.26 inches average annual precipitation; monthly averages of 0.87 inches and higher occur in the same months.

The NCEI database reports average annual snowfall for Sparks from 1991 to 2020 at 6.8 inches.

The 2018 State of Nevada Enhanced HMP lists the following severe winter storms occurring in Washoe County over the past 20 years:

- **December 29, 2004**–January 10, 2005: Severe winter storm in Northern Nevada, prompting FEMA to designate 16 counties for federal funding to alleviate the cost for emergency protective measures.
- **February 25, 2011:** Winter storm with up 18 inches of snow and 50 miles per hour winds, causing multiple auto accidents, two injuries, and roughly $250,000 in damage.
- **January 13–14, 2013:** Prolonged winter temperatures led to Governor Sandoval declaring a state of emergency, and subzero temperatures were responsible for deaths across the state, including in Reno, Nevada.
- **November 9–10, 2015**: In a severe winter storm, heavy, wet snow-downed power lines, over 35,000 customers were without power in Washoe County.
- **January 30–31, 2016:** Snow totals of 4 to 8 inches around Reno/Sparks area, and areas in and near the foothills west of Reno received between 8 to 10 inches of snow. Whiteout conditions occurred due to heavy lake-effect snow off Pyramid Lake.
- **December 10, 2022:** A stronger winter storm brought another round of heavy snow, strong winds, and travel impacts on Sierra passes December 9–11. Peak snowfall totals occurred through the period of December 10–11 with 2–4 feet of snow widely reported in Sierra locations and northeast CA. Storm total snowfall amounts even exceeded 5 feet over parts of the Sierra crest. Several inches of new snow also fell over some western Nevada valleys, with a foot plus falling across some eastern Sierra foothill areas as well. Strong winds having gusts of 65–75 mph in far western Nevada resulted in reports of $8M in damage across parts of Sparks during the early morning of December 10.
- **February 22, 2022:** Another inside slider tracked through the region with more snow and wind. This inside slider-type system moved into the region late Sunday through Tuesday. It brought periods of snow showers, increased wind, travel difficulties, and much lower temperatures to the region through Wednesday night. Snow Monday and into Tuesday morning overperformed in some areas, with several inches of new snow falling in bands over parts of the eastern Sierra, and western NV. A vehicle crash occurred the morning of Tuesday, February 22, around 6:00 a.m. PST involving two vehicles and three passengers were injured. A slider-type weather system moved over the region late Sunday, February 20, into the morning of Tuesday, February 22, producing a couple rounds of snowfall.

PROBABILITY OF FUTURE EVENTS

The probability of severe winter storms is high, and the potential impact of future climate conditions could increase the risk of severe winter storm events. However, since severe winter storms occur each year, Sparks has a number of mechanisms in place to promote safety.

VULNERABILITY ANALYSIS

Vulnerabilities from winter storms include those related to power outages and impairments to transportation. Because nearly all social and economic activities depend on transportation, snow can have a serious impact. Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Physical damage to electrical infrastructure as a result of ice or snow, downed trees, or debris can cause power outages, as can increases in demand beyond the capacity of the electrical system.

The City of Sparks ranked winter storm hazards as **Moderate Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

Power outages may disrupt businesses, especially facilities without backup generators, potentially increasing the economic impact of Extreme weather events. Members of the community who are isolated or have disabilities may be more vulnerable, especially those who may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Snowstorms can also adversely impact employees without certain benefits, as closures may result in unpaid time away from work.

VULNERABLE POPULATIONS

During severe winter storms, dangerous roads are closed at Highway 580, going south toward Washoe Valley, restricting emergency access to Mount Rose ski resorts and Incline Village community access roads. Planning Team Members report multi-car pile ups on highways at Donner pass due to severe winter storm conditions. Emergency sheltering is required for residents when the I-80 Donner pass closes. In addition, natural gas transports are delayed or cut off by winter storms road closing. Food shortages also have been issues in the pass due to food chain distribution issues when transportation is delayed by closures on the I-80 Donner Pass.

Extreme weathers (Windstorm)

LOCATION

Any area of the city may be affected by windstorms. Windstorms can cause power outages from downed power lines, tree damage, damage to homes and other buildings and aboveground structures, and damaged or blocked roads and bridges.

EXTENT

A severe windstorm could cause moderate damage and disrupt economic activity, electric service, government operations, and transportation across the city. High winds can accompany

other types of Extreme weather events, such as thunderstorms and winter storms, and typically occur multiple times each year.

PREVIOUS OCCURRENCES/HISTORY

There are no FEMA declarations for windstorms from 2019 to 2024.

High winds can accompany winter storms and severe thunderstorms and may occur multiple times a year. The National Oceanic and Atmospheric Administration's National Climatic Data Center records that the Reno-Sparks area experienced 143 days with weather events that had measured wind speeds above 40 knots (46 miles per hour) between January 2015 and July 2024. One of these high wind events resulted in reports of $25K in property damage outside the City of Sparks.

PROBABILITY OF FUTURE EVENTS

The city is likely to continue to experience a high frequency of windstorms. There is no reliable data indicating whether windstorms will increase or decrease in frequency or intensity due to climate change. However, changes in the environment have resulted in warmer seas, changing weather patterns, and increasing incidents of severe windstorms as the atmosphere warms and increases the energy available for storms to create intense wind events, often originating in warmer oceans that feed storms that develop into major wind events as they head toward land. Risk Factor.com reports minimal wind risk factor for City of Sparks, which means there is a very low likelihood that hurricane, tornado, or Extreme weather winds will impact the area, with 36, 263 properties identified at risk. Therefore, the likelihood of a windstorm resulting in very severe winds (a 1-in-3,000-year hurricane) is unlikely to occur in Sparks.[124]

VULNERABILITY ANALYSIS

Windstorms may affect any aboveground structures and can cause secondary effects, such as damage to buildings, power outages caused by fallen trees or tree limbs, or disruption to transportation if roads are blocked by debris. Sparks businesses, residents, and visitors who rely on electric power would be affected in the event of a power outage caused by a windstorm, and high winds could disrupt government operations and business activities, especially those operating outdoors.

Vulnerability to wind for any area is determined primarily by its topography, surface roughness, and proximity to the sea. Damage to roofs, walls, and windows can depend on the angle at which the wind approaches a house. Major damage structures can occur if construction codes have not been updated and building materials have not been tested against severe winds. Also, the layout and use of space in buildings, dense neighborhoods, or proximity to commercial

[124] RiskFactor.com, 2024, Wind Risk Factor, Sparks, NV Hurricane Map and Climate Risk Report | Risk Factor

buildings can increase vulnerability to debris. Proximity to large bodies of water, such as Lake Tahoe, can increase wind speed in areas. Having trees, hills, and plants between bodies of water and homes may block the wind from storms and reduce damage to homes (Figure 56).[125]

The City of Sparks ranked wind storm hazards as **Moderate Risk.**

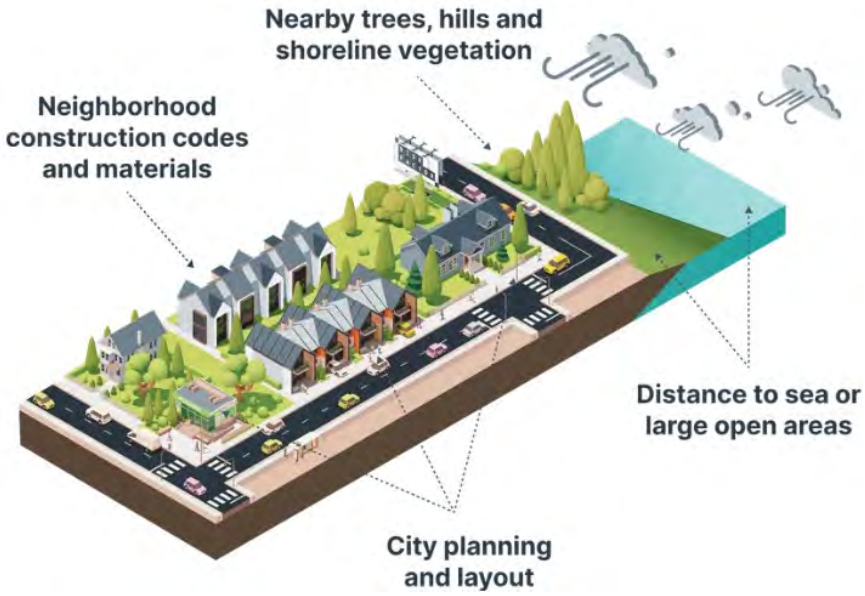


Figure 56: Common Vulnerabilities to Wind Damage[126]

ESTIMATED IMPACT AND POTENTIAL LOSSES

Power outages may disrupt businesses, especially facilities without backup generators, potentially increasing the economic impact of Extreme weather events. Members of the community who are isolated or have disabilities may be more vulnerable, especially those who may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Snowstorms can also adversely impact employees without certain benefits, as closures may result in unpaid time away from work.

VULNERABLE POPULATIONS

In Reno several populations are particularly vulnerable to the impacts of windstorms. The elderly are often at greater risk due to mobility challenges and health concerns that can hinder their ability to seek shelter quickly.

[125] RiskFactor.com, 2024, Wind Risk Factor, Sparks, NV Hurricane Map and Climate Risk Report | Risk Factor

[126] RiskFactor.com, 2024, "Common Vulnerabilities to Wind Damage," Sparks, NV Hurricane Map and Climate Risk Report | Risk Factor

Low-income families may also face significant vulnerabilities. Those living in substandard housing are less likely to have structures that can withstand strong winds, increasing the likelihood of damage or injury during storms. Furthermore, financial constraints may limit their ability to prepare adequately for such events, making them more reliant on community resources for assistance.

Homeless individuals are another group that faces severe risks during windstorms. Without access to stable shelter, they are left vulnerable to the elements and lack crucial information about storm warnings and safety measures.

Children and individuals with disabilities are particularly susceptible during windstorms as well. Young children may not have the awareness or understanding to react appropriately in emergencies, while those with disabilities might face logistical challenges in evacuating or accessing safe spaces.

Residents of mobile homes are at heightened risk, as these structures are often less durable in high winds, which increases the potential for significant damage. Lastly, outdoor workers, such as those in construction, are also exposed to hazardous conditions and debris, making them more vulnerable during wind events.

Transportation Incident (Aircraft Crash)

LOCATION

Washoe County has four publicly operated airports: the Reno–Tahoe International Airport (RNO), the Reno–Stead Airport (RTS), the Spanish Springs Airport (N86) in Reno, and the Empire Airport (1A8) in Empire. There are also several privately operated airports in the County that serve commercial, non-commercial, private commuter, and recreational aircraft. The greatest volume of commercial aircraft service passes through Reno–Tahoe International Airport. Federal agencies, such as the Bureau of Land Management, also operate and lease airports in Nevada.

EXTENT

It is difficult to estimate the extent or probability of the occurrence of an aircraft accident. This type of incident is most likely to occur during takeoff or landing. Aircraft crashes often cause injuries or death to people in the aircraft and on the ground. Crashes can also damage or destroy structures or cause secondary hazards, such as fires or the release of hazardous materials. Aircraft crashes are typically handled at the local level and can disrupt transportation and business services nearby. The magnitude and potential severity of the impact of an aircraft crash is considered Medium in Washoe County. Such events are not likely to have significant regional impacts.

PREVIOUS OCCURRENCES/HISTORY

The City of Sparks reported no previous occurrence of aircraft crashes.

PROBABILITY OF FUTURE EVENTS

Weather conditions are associated with up to 70% of aircraft incidents.[127] Climate change is likely to impact the occurrence, extent, or probability of aircraft crashes in Washoe County. Furthermore, increased development and urbanization can increase the number of people on the ground who may be affected by an aircraft crash. The probability of an aircraft crash with severe consequences on the ground is considered Medium.

VULNERABILITY ANALYSIS

Aircraft crashes, particularly those that involve small aircraft, may happen farther away from the runway near flight tracks. Buildings and aboveground infrastructure may be damaged or destroyed by an aircraft crash. Crashes are likely to cause injury or death to the pilot and passengers on a plane and can cause injuries and fatalities on the ground. Aircraft crashes are localized events and can be handled by local governments.

The City of Sparks ranked transportation incident (aircraft crash) hazards as **Low Risk.**

VULNERABLE POPULATIONS

In Sparks, certain populations are particularly vulnerable to transportation incidents, including aircraft-related events. One significant group is the elderly, who often face mobility challenges and are more susceptible to health complications. During an emergency, they may struggle to evacuate quickly or access medical care, placing them at increased risk.

Low-income families in Sparks also face heightened vulnerability. These residents may rely heavily on public transportation and often live in areas closer to flight paths, increasing their exposure to potential incidents. Limited resources for disaster preparedness can hinder their ability to respond effectively during emergencies, making targeted outreach and support essential for this demographic.

Children and youth represent another vulnerable segment of the population. Schools and playgrounds situated near transportation routes mean that children may be at risk during incidents. Their limited awareness of surroundings can complicate evacuation efforts, highlighting the necessity for comprehensive safety education and planning that involves parents and caregivers.

[127] Department of Transportation, Weather and Aviation: How Does Weather Affect the Safety and Operations of Airports and Aviation, and How Does FAA Work to Manage Weather-related Effects?https://www.transportation.gov/sites/dot.gov/files/docs/kulesa_Weather_Aviation.pdf

Individuals with disabilities form yet another group that is particularly vulnerable during transportation incidents. Challenges related to mobility can prevent them from evacuating swiftly or safely in emergencies. Emergency response procedures must consider the diverse needs of disabled individuals to ensure equitable protection and support.

Additionally, residents living near the airport face unique risks associated with aircraft incidents. Communities adjacent to flight paths may experience environmental hazards, necessitating tailored evacuation and safety measures to protect those living in close proximity to potential risks.

Finally, tourists and temporary residents in Sparks may not be familiar with local safety protocols, increasing their vulnerability during transportation incidents. Providing clear information and guidance ahead of time can help mitigate risks for this transient population.

Volcano

A volcano is an opening or rupture of the Earth's surface that allows ash, gases, and/or molten rock under tremendous pressure to emerge from below the surface. Volcanic activity over long periods can either form mountains, as molten rock is gradually extruded, or rapidly obliterate mountains during explosive eruptions.

Depending on the type of volcano, an eruption can be among the more spectacular of natural hazard events, ejecting materials thousands of feet into the air, darkening skies, and blanketing surrounding areas with fine powdery ash or rivers of molten lava. Because of advanced geologic and seismic monitoring techniques, warning times for major eruptions are usually measured in weeks or months, and the duration of volcanic activity typically ranges from a few weeks to a few years.

Volcanic hazards can be described in terms of the distance from the volcano in which they may occur. Proximal hazards such as lava flows, pyroclastic flows, and lahars are considered to have an impact within 30 miles. Distal hazards, such as eruption clouds and ashfalls, may impact areas further than 30 miles from the volcano.

LOCATION

No active volcanoes are in the City of Sparks.

VULNERABILITY ANALYSIS

The City of Sparks ranked volcano hazards as **Low Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The potential impacts and estimated losses to the City of Sparks due to a volcanic event can vary significantly depending on the eruption's severity. One major concern is air quality;

volcanic eruptions can release ash and gases that impact health, leading to increased healthcare costs and reduced productivity.

Infrastructure could also be severely affected, with buildings, roads, and utilities at risk from ashfall or lava flow. The costs of repairing such damage could be substantial. Additionally, essential services like water supply and electricity might be disrupted, complicating recovery efforts.

Economically, the city could face reduced tourism and business interruptions, leading to financial losses and higher unemployment. Emergency response would entail significant costs, including evacuation plans and shelter for displaced residents. Long-term environmental changes could also affect local ecosystems, agriculture, and wildlife, further impacting industries reliant on these resources. Overall, the consequences of a volcanic eruption could be extensive and challenging for Sparks.

VULNERABLE POPULATIONS

In Reno several populations could be considered vulnerable to volcanic activity. Local residents are at the forefront, as they live in areas that may be affected by ashfall, lava flows, or other volcanic hazards. Many residents may not be fully aware of the risks or evacuation routes, particularly if they are new to the area.

Tourists and visitors also represent a vulnerable population. Reno attracts many people, especially during peak seasons for skiing and outdoor activities. These individuals may lack knowledge about volcanic risks and may not have a clear understanding of how to respond in the event of an emergency, which can complicate evacuation efforts.

Low-income communities could face significant challenges during a volcanic event. Limited resources can hinder access to emergency information or transportation for evacuation. Without the means to relocate quickly, these populations may experience heightened risk during a volcanic crisis.

Additionally, elderly and disabled individuals are particularly vulnerable due to mobility challenges or health concerns. They may require extra assistance to evacuate safely and might be less able to respond swiftly in an emergency situation. Similarly, young children need attentive care during such events, as they may be more susceptible to health impacts from ashfall and require guidance to navigate the situation effectively.

Finally, outdoor workers, such as those in agriculture or forestry, may face unique risks during volcanic activity. Exposure to volcanic ash and deteriorating air quality can pose health threats, making it essential for this group to stay informed and prepared for possible emergencies.

PROBABILITY OF FUTURE EVENTS

The probability of future volcanic events in Sparks, Nevada is considered unlikely. Nevada is not known for volcanic activity, and the nearest significant volcanic systems are located far from this area.

Wildland Fire

LOCATION

South of Baring Boulevard and N. McCarran Boulevard, Sparks is largely built out. Developed properties and open spaces in this part of the city have very low to moderate potential for wildland fire. Since the 1990s, development has spread from the city's urban center north into areas with increased fire risk. Wildland–Urban Interface (WUI) areas occur in the foothills of the northern and eastern parts of the city, where the potential for wildland fire is rated between moderate and very high. As residential development occurs in the foothills, more homes are in areas of increased fire risk in the WUI. For example, in the Spanish Springs Valley north of Vista Boulevard, residential development has occurred in an area with high to very high fire potential.

EXTENT

As economic growth continues to increase demand for residential and commercial growth, more development is likely to occur in the foothills east of the city center and to the north in the Spanish Springs Valley. Increased development in these areas increases the risk that future wildland fires will damage structures, including homes and businesses.

In Washoe County, wildland fires are frequent and inevitable due to the arid climate; availability of fuels, such as sagebrush, rabbit brush, and cheat grass; and mountainous terrain. The vast majority of wildland fires burn between June and October. While Washoe County experiences wildland fires nearly every year, fewer fires have occurred in the City of Sparks. Based on recent historic occurrences of wildland fires, there is an estimated 10% to 15% chance of a wildland fire occurring in the city each year.

PREVIOUS OCCURRENCES/HISTORY

Past wildland fires in the city limits between 2015 and 2024 are listed below. This information supplements data on wildland fires that may have affected the city listed in the Wildfire Section of the Base Plan.

- **In 2017, the Earthstone Fire** burned 41,515 acres in the northeastern part of the city. This fire was human caused.
- **In 2017, the Prater Fire** burned 2,816 acres in the eastern part of the city near the foothills (see Figure 57). The cause of this fire has not been determined.

- **The I-80 Fire in 2017** burned 514 acres adjacent to I-80 on the southern edge of the city. The cause of this fire has not been determined.
- **In 2016, the S Fire** burned 2,554 acres in the southeastern part of the city near the foothills. The cause of this fire has not been determined.

Based on these recent events and recorded historic occurrences of wildland fires, there is an estimated 35%–45% chance of a fire occurring within city boundaries each year.



Figure 57: Map of Burn Area Prater Fire 2017, 6 Square Miles[128]

MOST RECENT INCIDENTS

- **June 11, 2024, The Sullivan Fire** burned in and around the City of Sparks, threatening the communities of Sparks, Sun Valley, and Spanish Springs (combined population 147K), with mandatory evacuations temporarily issued and later rescinded for the area along Wedekind Rd. northwest of North McCarran Blvd. and Pyramid Way, according to Washoe County. The fire threatened water towers and power transmission lines, destroying one transformer and road infrastructure. Multiple agencies helped battle the blaze, including the Sparks Fire Department and the Bureau of Land Management. The Sparks Police Department reported several vehicle accidents in the area due to onlookers.[129] Figure 58 and Figure 59 provide more details about this fire.

[128] RiskFactor.com, 2024, "2017 Prather Fire Burn Area Map," Sparks, NV Wildfire Map and Climate Risk Report | Risk Factor
[129] Ibid.



Figure 58: Sullivan Fire Burning behind Hug High School in Sparks[130]

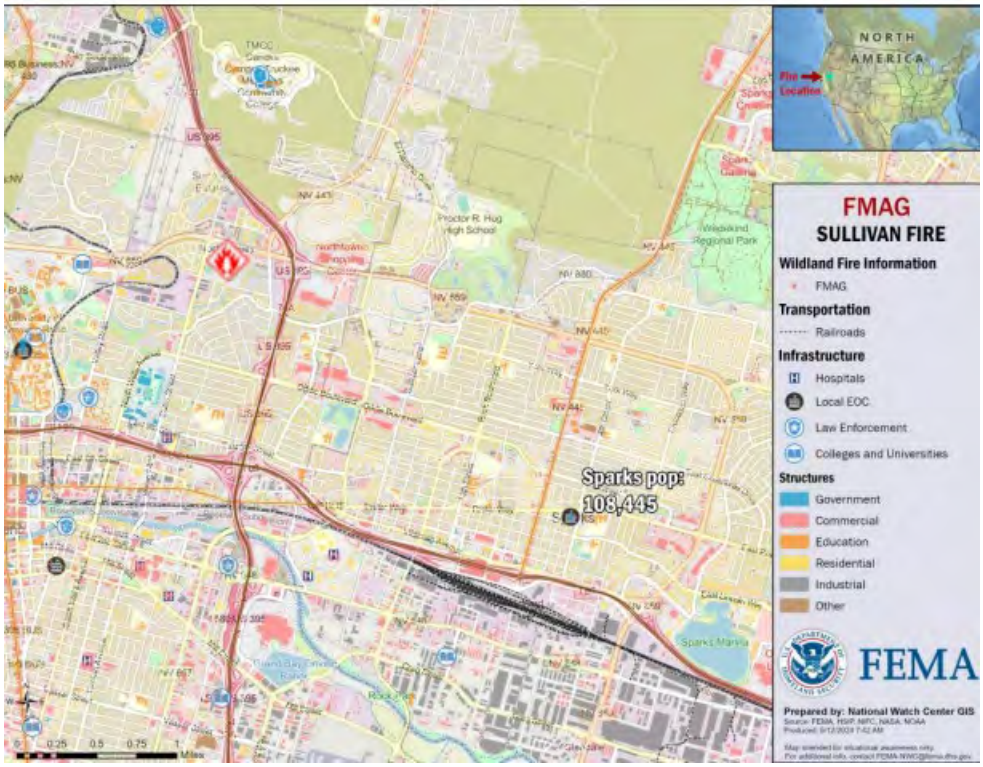


Figure 59: Information Map for the Sullivan Wildland Fire from the Fire Management Assistance Grant Program [131]

[130] MSN.com, June 12, 2024, "Sullivan Fire Burning behind Hug High School in Sparks," Sullivan Fire burns estimated 150 acres behind Hug High School, evacuations lifted (msn.com)
[131] FEMA, 2024, "Daily Operations Briefing 6-12-2024," FEMA Daily Ops Briefing 06-12-2024.pdf (govdelivery.com)

- **October 29, 2023:** Multiple agencies stopped forward progress on a fire that burned in the hills east of Sparks. The fire broke out during the evening hours of October 29 in the area above Northern Nevada Medical Center off Prater Way. Fire officials estimated the blaze burned roughly 10–20 acres. Structures in the area were briefly threatened, but no evacuations were issued.
- **July 4–5, 2023, Northeast Sparks –** Fireworks started a 5-acre brush fire in Sparks near Los Altos Parkway in the area of Culpepper Drive. The fire was reported around 10:30 p.m. No buildings were threatened, but the fire could be seen from nearby homes.
- **August 23, 2021, California Dixie and Caldor Fires –** Dense smoke from massive wildfires burning in neighboring California created hazardous air quality in the Reno–Tahoe area, canceling flights and forcing the closure of schools, parks, and popular summer beaches. Government air monitors recorded some of the region's most hazardous conditions in years. The National Weather Service issued an air quality alert for parts of northeast Nevada's Elko County, more than 300 miles (482 kilometers) east of the closest California fires. Smoke blowing from the Dixie and Caldor fires in California blanketed northern Nevada on and off for weeks, leaving particulate matter in the air and causing ash to rain on cars in some areas.

PROBABILITY OF FUTURE EVENTS

Based on projected changes in the timing and quantity of snowmelt and increases in the frequency and magnitude of drought and extreme heat, the city may be impacted by an increase in the probability of future wildland fires.

The Washoe County Fire Plan identified 41 communities in the risk/hazard assessment for Washoe County.[132] Nearly half of these areas have high and extreme fuel hazard conditions within one mile of the community boundary. In some cases, hazardous fuel conditions occur within the community boundaries. Many of the areas classified as moderate fuel hazards have a large component of cheatgrass. During years with above-normal precipitation and abundant growth of cheatgrass, perennial grass, and annual forbs, these areas can escalate into high fuel hazard conditions. Table 33 lists five factors for fire hazard used to arrive at the community hazard assessment score: community design, construction materials, defensible space, availability of fire-suppression resources, and physical conditions, such as vegetative fuel load and topography. [133]

[132] Washoe County Fire Plan, 2004 Executive Summary – Washoe County Fire Plan – Nevada Community Wildfire Risk / Hazard Assessment – RCI (rci-nv.com)
[133] Ibid.

Table 32: Community Fire Risk and Hazards Assessment Results

Community	Interface Condition	Interface Fuel Hazard Condition	Ignition Risk Rating	Community Hazard Rating
High- and Extreme-Hazard Community				
Red Rock	Intermix	Low to High	High	High
Moderate-Hazard Communities				
Mogul (I-80 Corridor West)	Classic	Moderate	High	Moderate
Reno-Northwest	Classic	Moderate to High	High	Moderate
Reno-Southeast	Intermix	Moderate to High	High	Moderate
Verdi	Intermix	Moderate to Extreme	High	Moderate
Low-Hazard Communities				
Reno-Southwest	Classic	Low to High	High	Low
Sparks	Classic	Low to Moderate	Low	Low

Populated areas in Sparks have greater likelihood of wildfire than 76% of communities in the U.S. (Figure 60) and are predominantly exposed to wildfire from indirect sources, such as embers or home-to-home ignition. In the City of Sparks, 33,344 properties (89%) have some risk of being affected by wildfire over the next 30 years. Of those, 30,391 residential structures, 458 commercial structures, 21 infrastructure facilities, and 57 social facilities are at major risk.[134]

[134] RiskFactor.com, 2024, "Major Fire Factor," Sparks, NV Wildfire Map and Climate Risk Report | Risk Factor

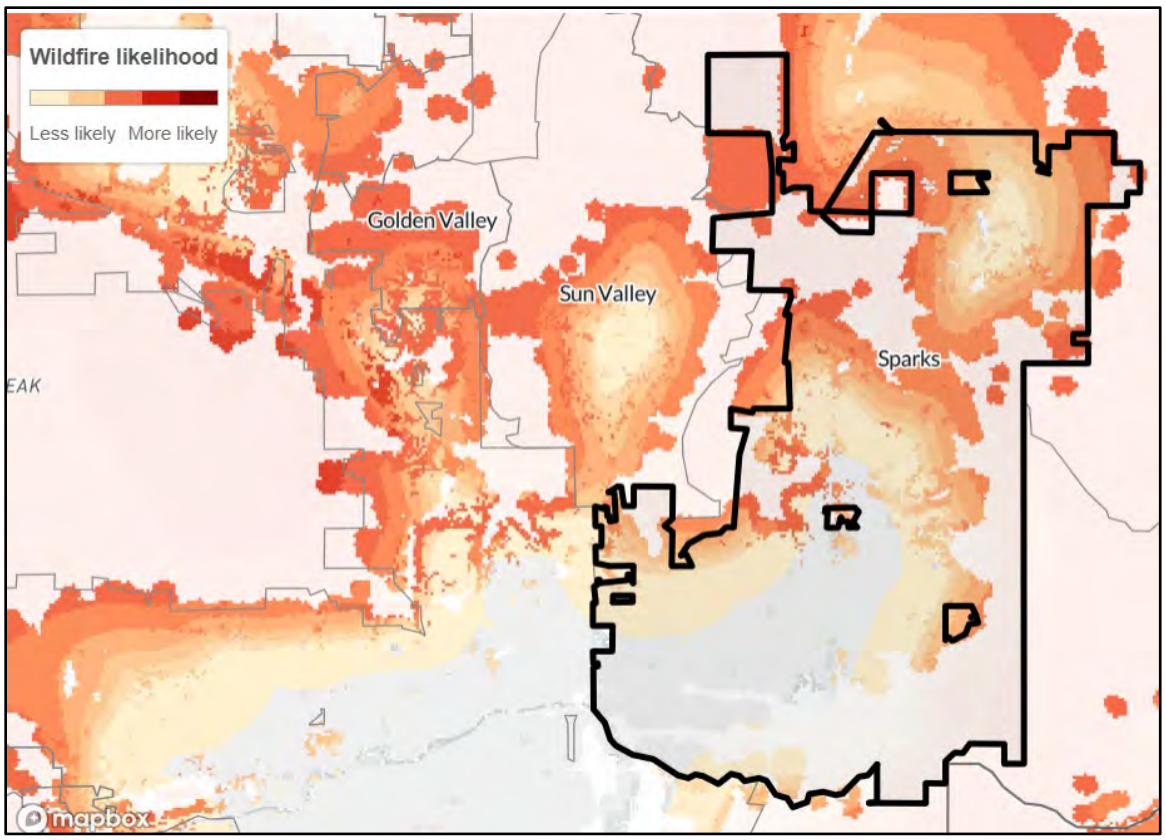


Figure 60: City of Sparks Populated Areas Wildfire Likelihood[135]

VULNERABILITY ANALYSIS

As development continues to increase in the WUI, the risk of wildland fire damage to homes and other structures will increase. New development in the Spanish Springs Valley has extended the response area for the city's fire department, resulting in longer response times that may increase the city's vulnerability to wildland fires. Currently, the city relies on the Truckee Meadows Fire Protection District to provide a response to fires in areas of the Spanish Springs Valley through a mutual aid agreement. Mitigation action AH-5 (2019 HMP), discussed in Section 5, is designed to address this vulnerability.

The City of Sparks ranked wildland fire hazards as **Moderate Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

Besides damaging properties, wildfire can also cut off access to utilities and emergency services, impact evacuation routes, and affect the overall economic well-being of an area. Overall, Sparks

[135] Wildfire Risk to Communities, 2024, "City of Sparks Populated Areas Wildfire Likelihood." Wildfire Risk to Communities

has a major risk of wildfire over the next 30 years. This is based on the level of risk the properties face, rather than the proportion of properties with risk.

Figure 61 illustrates the key factors that make an area vulnerable to wildfire, including vegetation and fuel sources, possible ignition sources, topography, and weather conditions. Dry grass is a type of fuel source that can catch fire and spread quickly in high winds. Electric transmission lines, frequent lightning strikes, and human causes can cause wildfires. Land surface features or topography—such as mountains, hills, creeks, and other bumps—and weather conditions work together to determine how fast and how far wildfires spread. Fires climb uphill, and high winds can spread fire quickly and carry fire embers further.

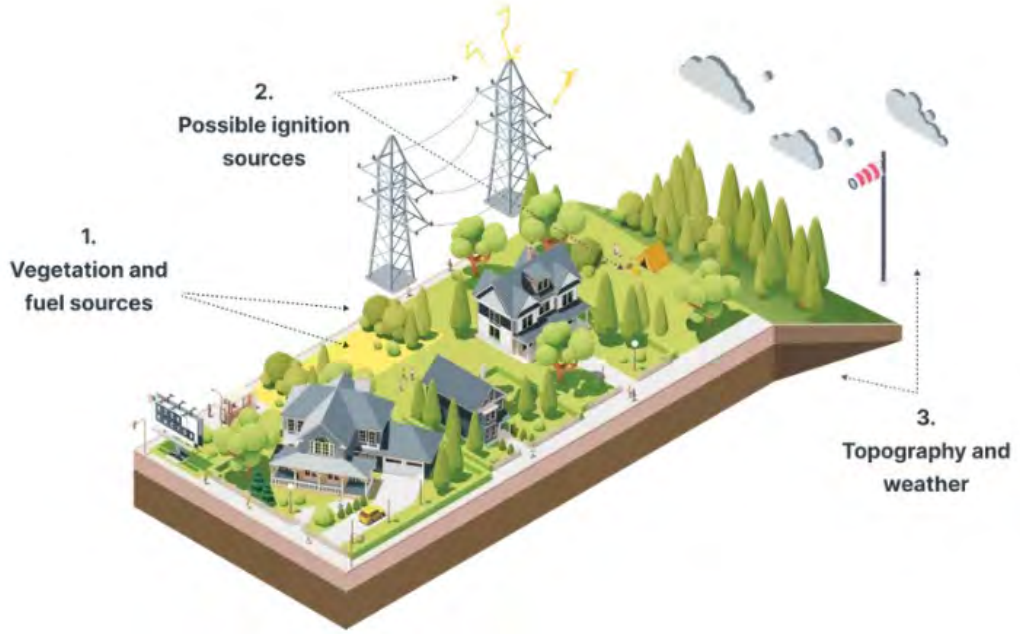


Figure 61: Key Factors that Make an Area Vulnerable to Wildfire[136]

VULNERABLE POPULATIONS

Diminished air quality is an environmental impact that can result from a wildfire event and pose a potential health risk. The smoke plumes from wildfires can contain potentially inhalable carcinogenic matter. Fine particles of invisible soot and ash that are too small for the respiratory system to filter can cause immediate and possibly long-term health effects. The elderly and those with compromised respiratory systems may be more vulnerable to the effects of diminished air quality after a wildfire event. Table 34 provides the statistics on vulnerable populations living in the City of Sparks. Figure 62 shows the areas with vulnerable populations in Sparks.

[136] RiskFactor.Com, 2024, "Key Factors that Make an Area Vulnerable to Wildfire," Sparks, NV Wildfire Map and Climate Risk Report | Risk Factor

Table 33: Demographics of the City of Sparks by Vulnerability to Wildfire[137]

Vulnerable populations
All areas in Sparks

Indicator	Number	Percent
Families in poverty	2,393 ±408	7% ±1.2%
People with disabilities	17,787 ±1,146	13.3% ±0.9%
People over 65 years	20,955 ±990	15.6% ±0.9%
People under 5 years	8,670 ±887	6.5% ±0.7%
People of color	58,759 ±4,773	43.9% ±3.8%
Black	2,670 ±547	2% ±0.4%
Native American	1,717 ±449	1.3% ±0.3%
Hispanic	43,714 ±3,100	32.6% ±2.5%
Difficulty with English	5,453 ±787	4.4% ±0.6%
Households with no car	2,788 ±425	5.5% ±0.9%
Mobile homes	3,751 ±439	7.4% ±1.6%

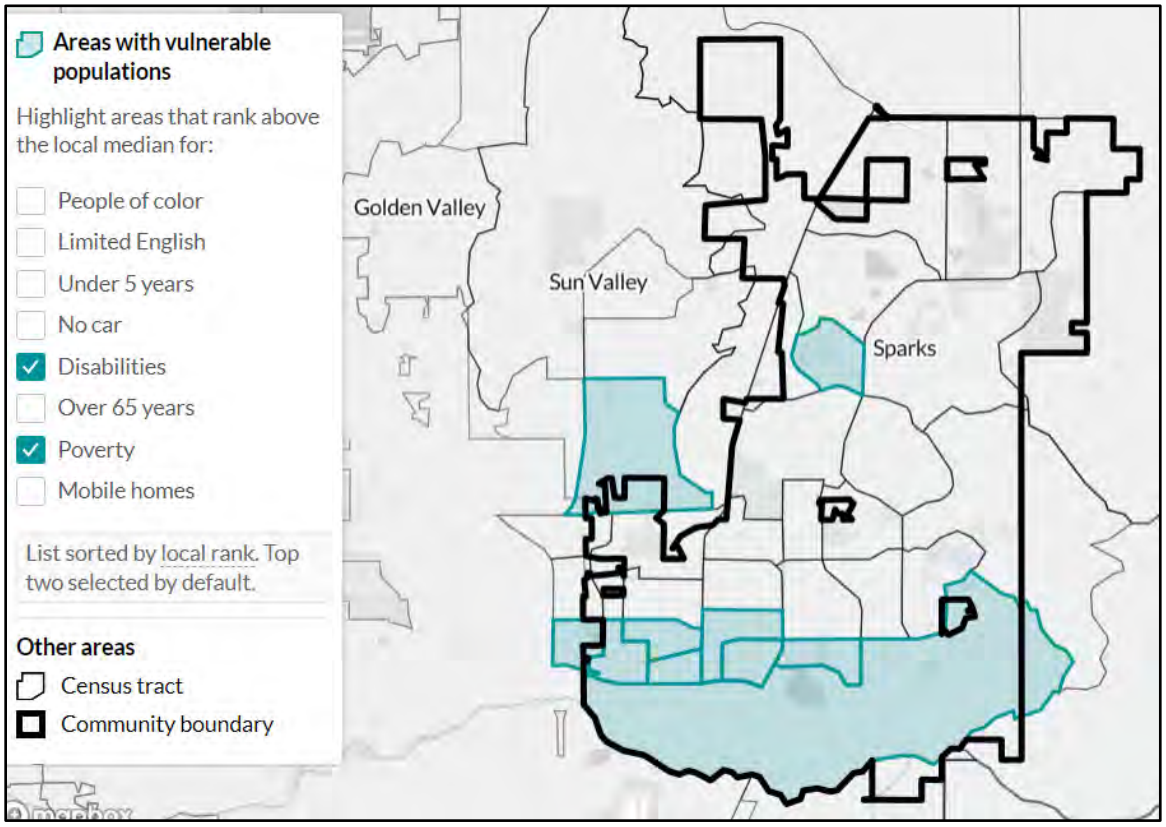


Figure 62: Areas in the City of Sparks with Vulnerable Populations – Disabilities and Poverty

The Climate and Economic Justice Screening Tool from the U.S. Climate Resilience Toolkit was used to determine what vulnerabilities impact the City of Sparks. According to this tool, which uses 2020 U.S. Census data, the City of Sparks has several disadvantaged populations identified by census tract, as they meet the threshold for more than one of the following categories: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. According to the Climate and Economic Justice Screening Tool, the portion of Sparks considered disadvantaged is represented in Figure 63.

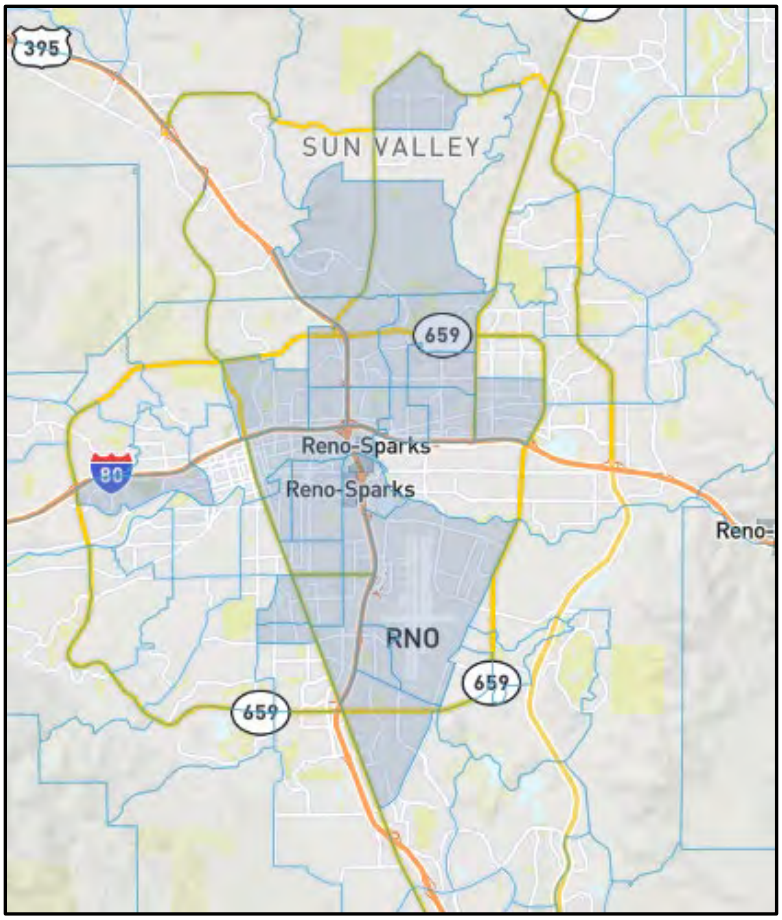


Figure 63: 27 Census Tracts in Washoe County Designated as Disadvantaged (in Gray)[138]

DEVELOPMENT TRENDS

As development continues to increase in medium- and high-risk areas, the risk of wildland fire damage to homes and other structures will increase. New development is taking place in city outskirts and foothills, resulting in increased development in an eight-minute response time zone. Some new planned development in the Cold Springs Valley, for example, is outside the

[138] Climate & Economic Justice, 2024, "Ren-Sparks-27 Census tracts designated as disadvantaged in gray," Explore the map – Climate & Economic Justice Screening Tool (geoplatform.gov)

response time of existing fire stations, making any new development in this area especially vulnerable to wildland fires until a new fire station is acquired. Until a permanent fire station can be established, the Master Plan limits development to 1,700 single-family units.

Regional economic development in the City of Sparks has resulted in demographic changes and increased urban growth that have put more people and structures in the WU, increasing vulnerability to wildland fire. Recent development in unincorporated areas of the County near the cities of Reno and Sparks has occurred in the Wildland Urban Interface, increasing vulnerability to wildland fire. The 2024 Washoe County Lands Bill conveyed 15,860 acres of public land around Reno and Sparks to be sold at auction to developers; an additional 3,400 acres are designated for specific purposes, including roadway expansions, regional parks, and K–12 school sites, increasing the WUI. Continued regional growth and development pressure are likely to cause additional development outside the urban centers of Reno and Sparks in the WUI. As new areas are developed, additional fire response resources will be needed to quickly respond to reported fires and limit damage.[139]

RECENT MITIGATION CASE STUDY

DEFENSIBLE SPACE PUBLIC EDUCATION PROGRAM

Sparks Fire Department Community Risk Reduction Division proactively focuses on educating the community about the benefits of proper safety practices and identifying and eliminating hazardous conditions posing a threat to life, property, and the environment. The Fire Department's Defensible Space program encourages residents to create defensible space around their home by implementing the three "R's" into their landscaping design: Removal, Reduction, and Replacement. They encourage the removal of dead or flammable vegetation, the reduction of vegetation by pruning or mowing, and providing space between plants and trees removes the continuous fuel bed that might otherwise exist throughout the yard. The more contiguous and denser the vegetation in yards, the greater the threat of wildfire to the home. The program encourages replacing flammable vegetation with less hazardous choices, shorter plants for taller plants, and non-woody plants for evergreens or junipers. The Fire Department provides the following website to calculate an effective defensible space home: http://www.livingwithfire.info .[140]

[139] The Nevada Independent, Gabby Birenbaum, 2024, Exclusive: Rosen introduces Washoe county lands bill years in the making – The Nevada Independent

[140] City of Sparks Fire Department, 2024,"Fire Prevention, Defensible Space, Living in Nevada Means Learning to Live in an Environment That Burns," Sparks Fire Department, NV (cityofsparks.us)

JURISDICTION-SPECIFIC VULNERABILITIES

Vulnerable Assets	What makes this group/asset vulnerable during hazards? Have there ever been issues with recovery after an event?
People (residents, workers, visiting populations, and socially vulnerable populations like seniors, individuals with disabilities, lower-income individuals, etc.)	
Unhoused population	Homeless encampments along the Truckee River in danger due to floods and likely not receiving timely information regarding emergencies. None
Senior population	Seniors and health compromised susceptible to degraded air quality during large wildland fire events. No past events
Bilingual population (Spanish)	The City of Sparks is seeing growth in the percentage of population that does not speak English as their first language. No past events
Structures (residential, commercial, industrial, government-owned, planned capital improvement, etc.).	
	The entirety of the industrial area is susceptible to Truckee River Flooding. Recover after 1996–1997 flood and 2017 flood takes weeks
Reno/Sparks Wastewater Treatment plant	Older infrastructure, including the regional wastewater treatment plant, were constructed before modern earthquake mitigation measures being required.
Economic Assets (major employers, primary economic sectors, key infrastructure like telecommunications networks, etc.)	
None	
Natural, Historic, and Cultural Resources (areas of conservation, beaches, parks, critical habitats, community centers, historic places, etc.)	
Multiple parks along Rock Blvd, through Industrial Park	Continued development into the WUI and along floodways place these areas at higher risk
Critical Facilities and Infrastructure (hospitals, law enforcement, water, power, transportation systems, etc.)	
Northern Nevada Medical Center	Backs up to wildland

Vulnerable Assets	What makes this group/asset vulnerable during hazards? Have there ever been issues with recovery after an event?
Truckee Meadows Water Reclamation Facility (TMWRF)	Isolated during the 1997 and 2017 floods. Access by helicopter was required in 1997 to relieve crews and adjacent to WUI.
Community Activities (major local events, such as festivals, or economic events, like farming or fishing)	
Various Public Events	Large gatherings are common in Victorian Square, including Star Spangled Sparks (4th of July celebration), Rib Cook off, approximately 10 concerts at the Nugget Events Center, various other special events place a large number of people in a small area.

VULNERABILITY ASSESSMENT

ASSET INVENTORY

Local assets that may be affected by hazards include residents, properties, utilities, and infrastructure. GIS data from federal, state, and local databases were used to inform the vulnerability assessment and identify critical infrastructure. The Vulnerability Assessment Section of the Base Plan discusses the sources and types of data used in the RHMP. Data collection for the vulnerability assessment was complicated by the fact that the region has never comprehensively identified critical infrastructure; therefore, the list of critical infrastructure in the City of Sparks may be incomplete. Similarly, valuation information has not been compiled by the region, so valuation data were not available to be included in the vulnerability assessment. Washoe County and its partners are committed to continuing to refine and build on the list of critical infrastructure over the next five years to improve the data in the next plan update.

REPETITIVE LOSS PROPERTIES

No repetitive loss properties currently exist in the City of Sparks.

EXPOSURE ASSESSMENT

Table 35 summarizes the exposure of critical facilities in the City of Sparks to hazards that can be mapped.

Table 34: Exposure Assessment of Critical Facilities in the City of Sparks

Type	Name	Address	Jurisdiction	Flood Zone	Seismic Ground Motion (2% Probability)	Seismic Ground Motion (10% Probability)	Landslide Susceptibility	Wildland Fire Hazard Potential
Dam	Sun Valley Detention Dam	N/A	Sparks	–	48–64	32–48	Low	1
Dam	Spanish Springs Stormwater Detention Facility	N/A	Sparks	100-year Flood Zone	48–64	32–48	Low	1
Dam	Sidehill Detention Basin	N/A	Sparks	–	48–64	32–48	Low	1
Dam	D'andrea Ranch Hole #6 Pond	N/A	Sparks	–	48–64	32–48	Low	1
Dam	Wetlands at Kiley Ranch	N/A	Sparks	–	48–64	32–48	Low	1
Dam	North Spanish Springs Flood Sediment Basin	N/A	Sparks	100-year Flood Zone	48–64	32–48	Low	1
Dam	North Spanish Springs Flood Detention Facility	N/A	Sparks	100-year Flood Zone	48–64	32–48	Low	1
Dam	D'andrea Detention Basin #1	N/A	Sparks	–	48–64	32–48	Low	1
Dam	D'andrea Detention Basin #3	N/A	Sparks	–	48–64	32–48	Low	1
Fire Station	Sparks Fire Department Station 2	2900 North	Sparks	–	48–64	32–48	Low	1

Type	Name	Address	Jurisdiction	Flood Zone	Seismic Ground Motion (2% Probability)	Seismic Ground Motion (10% Probability)	Landslide Susceptibility	Wildland Fire Hazard Potential
		Truckee Lane						
Fire Station	City Of Reno Fire Department Station 17	500 Rockwell Boulevard	Sparks	–	48–64	32–48	Low	1
Fire Station	Sparks Fire Department Station 3	1750 East Greg Street	Sparks	100-year Flood Zone	64+	48–64	Low	1
Fire Station	Wadsworth Volunteer Fire Department 225	400 Stampmill Road	Sparks	–	48–64	32–48	Moderate	1
Fire Station	Sparks Fire Department Station 4	1450 Disc Drive	Sparks	–	48–64	32–48	Low	1
Fire Station	Sparks Fire Department Station 5	6490 Vista Boulevard	Sparks	–	48–64	32–48	Low	1
Fire Station	Sparks Fire Department Station 1	1605 Victorian Avenue	Sparks	–	48–64	48–64	Low	1
Fire Station	Hungry Valley Volunteer Fire Department	Eagle Canyon Drive	Sparks	–	48–64	32–48	Low	1
Police Station	Sparks Police Department	1701 East Prater Way	Sparks	–	64+	32–48	Low	1

Land Use and Development Trends

D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

Sparks's population continues to grow as economic development and more moderate housing prices compared with California draw new residents to the region. Since the 1990s, Sparks has been expanding to the north into the Spanish Springs Valley, where most new housing is being constructed. This relatively new development may be vulnerable to key hazards outlined in the RHMP, particularly wildland fires.

The vulnerability subsection of each hazard profile outlines recent development trends to illustrate ways in which vulnerability may have changed over the past five years. Vulnerability changes have been measured for economic interests and land use trends. Each measure has been identified as having an increased, decreased, or unchanged vulnerability. Table 36 provides a snapshot of how vulnerability has changed since development of the 2020 HMP.

Table 35: Recent Development Trends

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Avalanche and Landslide	No changes	No changes	No changes	No changes
Criminal Acts and Terrorism	No changes	No changes	No changes	No changes
Drought	No changes	No changes	No changes	Decreased – while the natural drought cycle is not controllable by humans, the water authority has taken measures to minimize the

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
				impact of drought
Earthquake	No changes	No changes	No changes	Decreased – newer construction and new retrofits are better able to withstand seismic forces
Energy Emergency	No changes	Increased – Sparks Population is now approx. 120,000	No changes	Increased – more population exacerbates any shortage of energy during extreme heat or cold
Flood	No changes	No changes	No changes	Decreased – the industrial area has been built out for years so the risk is static, but the realignment of the North Truckee Drain has reduced the impact of flooding

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Hazardous Materials Incident	No changes	No changes	No changes	No changes
Infectious Disease	No changes	Increase in population	No changes	Increased – more people in the same area increases the likelihood of infection
Radiological Waste Transport	No changes	No changes	No changes	No changes
Extreme weathers (Winter Storm, Windstorms, Extreme Heat)	No changes	Increase in population, senior population seeking retirement homes	No changes	Increased – more people and more development subject to the same number of storms
Transportation Incident	No changes	Increase in population increases the risk of road accidents on existing infrastructure conditions	No changes	No changes
Volcano	N/A	N/a	N/A	N/A

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Wildland Fire	Almost all development in Sparks is on the perimeter, most of which is in or near the WUI	Increase housing subdivisions due to increase in population on outer limits of city	No changes	Increased vulnerability

Capability Assessment

FEMA	**C1.** Does the plan document [the City of Spark's] existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))

Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards.

Table 36: Planning Capabilities of the City of Sparks

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
General Plan	Yes	No	Need further investigation	2021, 2030
Capital Improvement Plan	Yes	No	Need further investigation	Annually updated

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
Climate Change Adaptation Plan	No	N/A	N/A	N/A
Community Wildfire Protection Plan	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Economic Development Plan	No	N/A	N/A	N/A
Land Use Plan	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
Local Emergency Operations Plan	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Stormwater Management Plan	Yes	Yes	Used to identify potential hazards and mitigation projects to address them	2016
Transportation Plan	Yes	Yes	Support HMP goals for mitigation actions	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
Substantial Damage Plan	No	N/A	N/A	N/A
Other? (Describe)	Washoe County has a Damage Assessment Plan that serves the same intent and covers all jurisdictions.			

Table 37: Regulations and Ordinances of the City of Sparks

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it next be updated?
Building Code	Yes	Yes	2018, but we will be adopting the 2024 updates later this year
Flood Insurance Rate Maps	Yes	Yes	Available online and at Washoe County
Floodplain Ordinance	No	N/A	N/A
Subdivision Ordinance	Yes	Yes	Chapter 17 of Sparks Muni Code

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it next be updated?
Zoning Ordinance	Yes	Yes	Chapter 20 of Sparks Muni Code
Natural Hazard Specific Ordinance (Stormwater, Steep Slope, Wildfire)	No	N/A	N/A
Acquisition of Land for Open Space and Public Recreation Use	No	N/A	N/A
Prohibition of Building in At-Risk Areas	Yes – development in the floodway is prohibited with the exception of improvements that would not impede flow e.g., a parking lot. Development in the flood plain is required to 1 foot above Base Flood Elevation.	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Other? (Describe)			

Administrative and Technical

Administrative and technical capabilities include staff and their skills. They also include tools that can help you carry out mitigation actions. If you do not have local staff, consider how state and regional partners can help.

Table 38: Administrative Capabilities of the City of Sparks

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	Yes	Yes	Yes	Yes
Civil Engineer	Yes	No – several vacant positions have to be filled	Yes	Yes, when staffing allows for such coordination
Community Planner	Yes	Yes	Yes	yes
Emergency Manager	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Floodplain Administrator	No	No	N/A	We have a CFM, but no floodplain administrator title position.
Geographic Information	Yes	No	No	Yes

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
System (GIS) Coordinator				
Planning Commission	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Fire Safe Council	No	N/A	N/A	N/A
CERT (Community Emergency Response Team)	No	N/A	N/A	N/A
Active VOAD (Voluntary Agencies Active in Disasters)	No	N/A	N/A	N/A
Other? (Please describe)				

Table 39: Technical Capabilities of the City of Sparks

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
Mitigation Grant Writing	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Hazard Data and Information	No	NA	NA
GIS	Yes	NA	NA
Mutual Aid Agreements	No	NA	Need to ask Fire Dept.
Other? (Please describe)			

Financial

Financial capabilities are the resources to fund mitigation actions. Talking about funding and financial capabilities is important to determine what kind of projects are feasible given their cost. Mitigation actions like outreach programs are lower cost and often use staff time and existing budgets. Other actions, like earthquake retrofits, could require substantial funding from local, state, and federal partners. Partnerships, including partners willing to donate land, supplies, in-kind matches and cash, can be included.

Table 40: Financial Capabilities of the City of Sparks

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Capital Improvement Project Funding	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
General Funds	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Hazard Mitigation Grant Program (HMGP/404)	Thorough research revealed a lack of sufficient	Thorough research revealed a lack of sufficient information to	Thorough research revealed a lack of sufficient	Thorough research revealed a lack of sufficient

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
	information to evaluate or categorize this, indicating a need for further investigation.	evaluate or categorize this, indicating a need for further investigation.	information to evaluate or categorize this, indicating a need for further investigation.	information to evaluate or categorize this, indicating a need for further investigation.
Building Resilient Infrastructure & Communities (BRIC)	Yes	Seismic risk analysis for the regional wastewater treatment plant	Yes	Yes
Flood Mitigation Assistance (FMA)	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Public Assistance Mitigation (PA Mitigation/406)	Thorough research revealed a lack of	Thorough research revealed a lack of sufficient	Thorough research revealed a lack of	Thorough research revealed a lack of

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
	sufficient information to evaluate or categorize this, indicating a need for further investigation.	information to evaluate or categorize this, indicating a need for further investigation.	sufficient information to evaluate or categorize this, indicating a need for further investigation.	sufficient information to evaluate or categorize this, indicating a need for further investigation.
Community Development Block Grant (CDBG)	Yes	Urban residential street sidewalk upgrades.	Yes	Yes
Natural Resources Conservation Services (NRCS) Programs	No	N/A	N/A	N/A
U.S. Army Corps (USACE) Programs	No	N/A	N/A	N/A
Property, Sales, Income, or Special Purpose Taxes	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
		further investigation.	need for further investigation.	need for further investigation.
Stormwater Utility Fee	Yes	Yes, storm drain infrastructure improvement	Yes	Yes
Fees for Water, Sewer, Gas, or Electric Services	Yes	Fees for Sewer that are used for sewer infrastructure improvements	Yes	Yes
Impact Fees from New Development and Redevelopment	Yes	Used for new improvements for new development or redevelopment areas	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
General Obligation or Special Purpose Bonds	Yes	Capital for the new Fire Station 6 to provide coverage to	Thorough research revealed a lack of sufficient information	Thorough research revealed a lack of sufficient information

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
		Northwest Spaks	to evaluate or categorize this, indicating a need for further investigation.	to evaluate or categorize this, indicating a need for further investigation.
Federal-funded Programs (Please describe)	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Other State-funded Programs (Please describe)	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
	further investigation.		further investigation.	further investigation.
Private Sector or Nonprofit Programs	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Other?				

Education and Outreach

Education and outreach capabilities are programs and methods that could communicate about and encourage risk reduction. These programs may be run by a participant or a community-based partner. Partners, especially those who work with underserved communities, can help identify additional education and outreach capabilities.

Table 41: Education and Outreach Capabilities of the City of Sparks

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Community Newsletter(s)	Yes – MySparks	Yes – both are used to send and receive	

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
	App and city website	information to/from the community	
Hazard Awareness Campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, School Programs)	Yes	significant outreach through website, news and social media regarding many hazards, such as wildfire awareness, Extreme weathers, winter driving	
Public Meetings/Events (Please Describe)	Yes	All city committees and commissions are required to hold public meetings at least quarterly	
Emergency Management Listserv	Yes	The City's Emergency Management Team is on a consolidated email list for quick communication	
Local News	YES	The city's PIO team works very closely with local media to distribute information during emergencies and special events	
Distributing Hard Copies of Notices (e.g., public libraries, door-to-door outreach)	No	N/A	

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Insurance Disclosures/Outreach	No	N/A	
Organizations that Represent, Advocate for, or Interact with Underserved and Vulnerable Communities (Please Describe)	Yes	City staff works with regional teams to communicate with homeless, senior and other communities	
Social Media (Please Describe)	Yes	Sparks PIO team used Facebook, X, Instagram and Nextdoor to communicate with the public for all issues, including hazard mitigation and during emergencies	
Other? (Please Describe)			

National Flood Insurance Program Participation

The National Flood Insurance Program **(**NFIP) is a Federal Emergency Management Agency **(**FEMA) program that provides flood insurance to millions of policyholders across the country. The plan must describe participation in the NFIP for each participant, as applicable, in accordance with NFIP regulatory requirements.

Table 42: Floodplain Management, Mapping, and Insurance for the City of Sparks

Question	Response
Who is the floodplain manager? Is this their primary or secondary role?	Robert Bidart, PE – Secondary Role
Does the floodplain manager have adequate training and capacity for their role? If not, what else is needed?	Yes, but additional training is always warranted.
How does the community enforce its floodplain rules? Does enforcement include monitoring compliance and acting to correct violations?	Yes, through Planning and Building Departments in the Admin Review process and building permit process.
When was the community's most recent Community Assistance Visit (CAV)?	Over 10 years.
Were any violations noted on the community's most recent CAV?	There were violations that rendered the Community ineligible for CRS rating.
Is there an upcoming CAV? If not, is one needed?	No.
When was the most recent floodplain management ordinance adopted?	12/26/1995
Does your community participate in the Community Rating System (CRS)? If so, describe the steps the community has taken to achieve the CRS goals.	No
Does the community's floodplain management ordinance include any higher standards? If so, please list.	No
Who is responsible for permitting?	Building Department
How does the community issue development permits in the special flood hazard area?	Through Planning and Building Department.
Does the community maintain elevation certificates?	Yes
Does the community track the number of buildings in the special flood hazard area? If yes, are there any trends?	Yes, not aware of any trends.
How many repetitive loss (RL) structures does the community have? (List number and type of structure)	27, 1 single family, 21 non-residential and 5 non-residential business
How many severe repetitive loss (SRL) structures does the community have? (List number and type of structure)	0
Have any RL/SRL properties been mitigated since the last plan update?	none
Who is responsible for making substantial damage/substantial improvement determinations?	Building Department Inspectors

Question	Response
How does the substantial damage/substantial improvement process work in your community?	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Is there sufficient staff and training to make substantial damage/substantial improvement determinations?	Staff and training are needed.
How are substantial damage/substantial improvement requirements messaged to the public before and after an event?	Through City PIO
Have any substantially damaged/substantially improved structures been mitigated since the last plan update?	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
How will the community remain in compliance with the NFIP moving forward? (simply stating "the community will continue to comply with the NFIP" will not meet FEMA's planning requirements)	"Not sure how to address this question"
How does the community support map change requests? This could be requests during the Risk MAP process or through Letters of Map Amendment or Revision.	"Not sure how to address this question"
When did the latest FIRM become effective?	March 16, 2009
When was the latest Flood Insurance Rate Map (FIRM) adopted?	March 16, 2009
Is the FIRM and FIS report in an accessible location? How would the public get access to their flood map information?	Through Washoe County
Does the community use any Risk MAP products? If so, describe.	No
Does the community collect updated floodplain data or modeling? Is this shared with partners and with FEMA?	Yes
How does the community educate the public on floodplain management and the availability of flood insurance, in and out of the floodplain?	The City does not do much flood awareness education. That is largely done by the Truckee Meadows Flood Management Authority.
How does the community engage with insurance agents on flood insurance?	N/A

Question	Response
Does the community (or state) have flood hazard disclosure laws?	Yes – statewide law requires disclosure before transfer of title in all real estate transactions
How familiar is the public with their flood insurance options?	Not Sure
How many properties have flood insurance in the community?	251
Are there any areas where flood insurance is lacking?	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Other comments?	

No repetitive loss properties are located in the City of Sparks.

Opportunities to Expand and/or Improve Capabilities

Table 43: The City of Sparks's Opportunities to Develop Capabilities

Capability Type	Opportunity to Expand and/or Improve
Planning and Regulations	Flood Hazard – Limited opportunity as the vast majority of the flood plain has been developed for many years. Current regulations regarding development are adequate to address any new projects.
Administrative and Technical	None
Financial	Grants to support seismic risk mitigation for municipal facilities, particularly regional wastewater plant and older public safety facilities
Education and Outreach	Possible expansion of Public Service Announcements to cover flood insurance information for residents

Plan Integration

FEMA	**C6.** Does the Plan describe a process by which will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?

An updated plan must explain how the plan participants incorporated the previous mitigation plan, when appropriate, into other planning mechanisms over the last 5 years. This demonstrates progress in local mitigation efforts. Planning mechanisms refer to the governance structures used to manage local land use development and community decision making, such as budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances. Table 45 lists the previous plans that have been integrated into this one.

Table 44: Integration of Previous Plans by the City of Sparks

Plan Name	Description
Washoe County Regional Hazard Mitigation Plan – 2020	Regional HMP adopted by the City of Sparks and used until update/current revision
Planning and Zoning/ Building Code	Used and considered when updating codes
Master Plan – Valid until 2030, but with updates every 4 years	Used and considered when updating master plan

The plan must also identify the local planning mechanisms where the updated hazard mitigation information/actions may be integrated and how. Listing specifics, such as who will be responsible, the timeframe for the update, and ongoing work, such as hiring a contractor or gathering data, can help meet this requirement. Table 46 lists opportunities for future plan integration.

Table 45: Opportunities for Future Plan Integration for the City of Sparks

Plan Name	Description
Community Wildfire Protection Plan (CWPP)	Creating CWPP for City of Sparks and will use HMP information.
Building Code	Used and considered when updating codes.
Master Plan – Valid until 2030, but with updates every 4 years	Used and considered when updating master plan.

Mitigation Strategy

FEMA	**C4.** Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?

Review of 2020 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2020 plan were evaluated to determine the status of the action and whether any ongoing or incomplete actions should be included as actions in the 2024 plan update. Table 47 shows the results.

Table 46: Status of Previous Mitigation Actions by the City of Sparks

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
MH-5	Build an additional fire/rescue station (Station 6) so response times are equal to 4 minutes of travel time (City of Sparks)	Sparks Fire Department	Approved by City Council in 2024. ETA for completion October 2025.	No due to estimated completion date and secured funding.
MH-9	Implement and/or use Community Emergency Response Teams and the Citizens Homeland Security Council, to shift burden from sworn officers, where appropriate (All Partners)	All Jurisdictions: • Emergency Managers • Police Departments	In progress and ongoing. CERT is used by all regional agencies, as needed, but is run through the Washoe County Sheriff's Office.	No
MH-15	Address needed technological updates and repairs for the City of Sparks' Mobile Command Center, including providing new radios, repairing the telescoping pole for the camera, and providing other updated equipment (City of Sparks)	Sparks Police Department	In progress – radio upgrade began. Item is no longer needed as there are now better alternatives for remote response for dispatch and leadership to be on site.	No

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
MH-16	Develop an evacuation plan for northern Sparks, including evacuation routes, available emergency services, a communications strategy, animal evacuation support, and many other support functions (City of Sparks)	City of Sparks	In progress – working with WCEM on evacuation study opportunities/funding and City of Sparks (CoS) Emergency Management will be responsible.	Yes
WF-1	Develop surge capabilities in the region to handle burn patients (All Partners)	Renown Health	IHCC brought in burn training on two occasions and flew providers to Las Vegas to train with UMC. There is also a burn appendix in the MCIP.	N
WF-8	Develop standardized policies and regulations across Washoe County governing open burning (City of Sparks)	Sparks Fire Department	Not completed. No longer needed.	N
WF-9	Manage fuels through targeted grazing on an as-needed basis (City of Sparks)	Sparks Fire Department	In-Process. Applied for grant funding for goat grazing around wastewater treatment plant specifically. Pending approval of grant.	Y

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
WF-10	Partner with Nevada Division of Forestry (NDF) crews on fuel reduction on an as-needed basis (City of Sparks)	Sparks Fire Department	In progress – change from NDF to TMFPD. Partnership has already begun.	Y
WF-11	Place containers around the City of Sparks for residents to dump wood and brush from their yards (City of Sparks)	Sparks Fire Department	Not started. With CWPP efforts, will aim to find homeowner associations and neighborhood efforts for green waste cleanup.	Y
WF-12	Partner with NDF to develop educational materials and multi-media blasts (City of Sparks)	Sparks Fire Department	In progress. Partnerships are with all fire agencies and governmental agencies like NDF. Will continue.	Y
WF-13	Adopt 2018 wildland fire code Countywide (All Partners)	Regional Fire Protection Districts	Completed. Adopted 2020 when available. Will adopt new code when applicable.	N
WF-16	Review and update (as needed) evacuation plans for communities in wildland fire-prone areas and hold evacuation drills at least once every two years (All Partners)	Regional Fire Protection Districts	In progress. Will aim to incorporate Sparks-specific examples in tabletops and drills but remain focused on working as a region in this process.	Y

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
FL-1	Update flood maps to incorporate recently completed flooding mitigation projects along the Truckee River in Sparks (Washoe County, City of Reno, City of Sparks, Truckee River Flood Management Authority [TRFMA])	Washoe County Emergency Management and Homeland Security Reno Fire Department Sparks Fire Department	As of Nov 2023: Ongoing map updates in progress, including Risk Map, FEMA flood map updates currently under review by the City of Reno and Washoe County. TRFMA – TRFMA is the lead. In March 2023, TRFMA submitted the Truckee River remapping package to FEMA for initial review. Comments were received in May 2023 and responses to comments were recently submitted.	No
FL-2	Update FEMA Flood Insurance Rate Maps to incorporate recent Letter of Map Revision, Conditional Letter of Map Revision, and changes in topography and impervious surfaces using regional LiDAR data (Washoe County, City of Reno, City of Sparks)	Washoe County Community Services Department	In Progress. TRFMA has submitted the Physical Map Revision to FEMA for their review. 6–18 months out as of Nov 2023.	No

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
FL-7	Install larger drainage pipes to reduce flooding in and around Baring Blvd (City of Sparks)	Sparks Public Works	As of Nov 2023: CoS – In progress, construction with Phase 2 of RTC Sparks Blvd widening TRFMA – Construction with Phase 2 of RTC Sparks Blvd widening	No
FL-8	Increase flow capacity at bottle neck sections of the Truckee River in the City of Sparks (City of Sparks)	Sparks Public Works	As of Nov 2023: CoS – In progress, TRFMA is lead (Vista Narrows) TRFMA – TRFMA is the lead for the Vista Narrows Floodplain Terracing Project. TRFMA has completed the 65% design for the Vista Narrows Project. Environmental permit applications have been submitted to the regulatory agencies for review. TRFMA is working with downstream stakeholders (e.g., Storey County, PLPT) to address impacts and develop a plan for mitigation. Construction is expected in 2024–2025.	No

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
FL-9	Complete drainage ditch improvements (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: • Public Works	As of Nov 2023: Steamboat Ditch preliminary evaluation completed. Other ditches not started.	No
FL-14	Complete improvements to address undersized drainage ditches and systems Countywide (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: • Public Works • Engineering	As of Nov 2023: CoS – in progress	No
FL-17	Create a master Emergency Action Plan for dams in the City of Sparks to create consistency and eliminate the confusion caused by plans in different formats (City of Sparks)	Sparks Community Services Sparks Engineering Services	CoS – Completed	No
FL-18	Construct a storm drain pump station and force main and gravity main improvements at the intersection of Vista Blvd. and Prater Way to address flash	Sparks Community Services	CoS – Completed	No

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
	flooding at this intersection (City of Sparks)	Sparks Engineering Services		
FL-19	Complete a feasibility study, including a geotechnical investigation, hydraulic model, and outfall recommendations, to investigate detaining stormwater behind the Spanish Springs Dam to meter discharge to the North Truckee Drain during floods and winter storms (City of Sparks)	Sparks Community Services Sparks Engineering Services	In process. Sparks Blvd widening project w/RTC, currently in design, have looked at flood hazards on N. Truckee Drain between Baring Blvd. and Lincoln Way.	Yes
FL-36	Sparks Levees and Floodwalls Glendale to Greg: Replacement of the existing levee on the north bank with on-bank floodwalls to minimize construction and right-of-way impacts on the TMWA Glendale Water Treatment Plant. Trail can be incorporated into floodwall maintenance road (TRFMA, City of Sparks)	TRFMA	Truckee Meadows Water Authority (TMWA) Levee (Glendale Ave Bridge to Greg St Bridge): Construct a levee approximately 3,000 ft long along the north bank of the Truckee River with one portion set back from the riverbank (as space allows). Estimated cost is $4.5M in 2021 dollars. TRFMA plans to work collaboratively with TMWA on site access, fencing, and	Yes

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
			security. This design concept is a shift from the previous (2016) version of the Flood Project plan, which included a floodwall. Planned construction: 2026–2027 or 2027–2028.	
FL-37	Mill Street Levee – Greg to Rock: Reduced south bank floodplain terracing with the associated levee move closer to the Truckee River. Reduces excavation costs and reduces impacts on the existing Pioneer Ditch (Costs included in Element 19 Sparks Levees and Floodwalls: Glendale to Greg.) (TRFMA, City of Sparks)	TRFMA	Reno–Tahoe International Airport Berm & Terracing (Greg St Bridge to Rock Blvd Bridge): Excavate a floodplain terrace and construct an earthen berm along the south bank of the Truckee River near the airport (Greg St Bridge to Rock Blvd Bridge). The floodplain terrace would be revegetated with low-growing plant species because of airport safety regulations. The estimated cost to construct the floodplain terrace is $2.4M in 2021 dollars. The amount of fill material required for the berm would be approximately 90,000 cubic yards or less; construction cost is estimated at $2.7M in 2021 dollars. Cost savings may be achieved by using	Yes

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
			spoil material from the Vista Narrows Floodplain Terracing Project. If necessary to alleviate a minor rise in water level due to the airport berm, construct a small berm on the north bank of the Truckee River. This design concept is a shift from earlier plans, which included a levee. A wide berm with a gentle slope is now the preferred alternative because a levee would be more of an obstacle to landing aircraft, and therefore a safety concern. Planned construction: 2026–2027 or 2027–2028.	
FL-38	Terracing Greg to Rock: Reduced terracing to stabilize the river bank, reduce the amount of excavation, and avoid the existing Pioneer Ditch. The terracing and associated levee are moved northward toward the Truckee River and levee ties	TRFMA	Same as FL-37	Yes

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
	into the McCarran Blvd. bridge (TRFMA, City of Sparks)			
FL-39	Abutment, pier, and bank scour protection measures (as required) from Rock Blvd Bridge to Vista Narrows. Includes East McCarren Blvd Bridge (TRFMA, City of Reno, City of Sparks)	TRFMA	This mitigation action requires further analysis to determine exactly what is required along the reach.	No
FL-40	Mill Street Levee – Rock to McCarran: Reduced south bank floodplain terracing with the associated levee move closer to the Truckee River. Reduces excavation costs and reduces impact on the existing Pioneer Ditch. Pioneer Ditch will be piped to allow for use of the fill disposal area (TRFMA, City of Sparks)	TRFMA	Mill/McCarran Levees & Terracing (Rock Blvd Bridge to McCarran Blvd Bridge): Currently in 60% design phase (June 2024). Planned construction: 2027–2028. Between the Rock Blvd Bridge and the McCarran Blvd Bridge, relocate the Truckee River channel and increase its sinuosity, excavate floodplain terraces, and construct levees to reduce flood risk, restore the ecosystem, and enhance recreational opportunities. The updated conceptual design omits floodwalls	Yes

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
			and includes higher levees on both the north and south banks of the Truckee River, as well as a lower "intermediate" levee on the south side. The intermediate levee would be designed to contain a 50-year flood event. Ecosystem restoration is proposed to improve instream and riparian habitat for fish and wildlife species. Recreational enhancements may include nature-based activities along the river corridor and improved river access, as well as sports fields and park facilities on the south side in between the intermediate levee and the outer, high levee. The estimated cost to construct the levees (north, south, south intermediate) is $20.4M. Excavation of the floodplain terraces and ecosystem restoration is estimated to cost $20M. TRFMA has already invested more than $48M to acquire 110 acres of land in this area (more than 1.2 miles of river frontage	

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
			on the south bank of the river). Implementation of this flood project element will significantly reduce flood risk for the north and south industrial areas and the airport.	
FL-42	Sparks Levees and Floodwalls – Rock to McCarran: Replacement of the north bank levee with on-bank floodwalls to minimize impacts on existing properties and railroad spurs. Some minor terracing on the north bank. Fill localized low lying areas on the landside of the floodwall. Trail can be incorporated into floodwall maintenance road (TRFMA, City of Sparks)	TRFMA	Same as FL-40	Yes
FL-43	Terracing – Rock to Steamboat: Benching on north bank at Living River Parkway. Minimized terracing on south bank along Treatment Plant. Remove	TRFMA	Same as FL-40	Yes

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
	existing buildings as necessary (TRFMA, City of Sparks)			
FL-45	Sparks Levees and Floodwalls – McCarran to Vista: Replacement of existing levee with on-bank floodwalls for approximately 20,000 feet east of McCarran to reduce overall footprint. Construction of levees for most of the remainder of the reach. Floodwall will be used near Larkin Circle to eliminate impacts on the roadway (TRFMA, City of Sparks)	TRFMA	North Bank Levee & Floodwall (McCarran Blvd Bridge to east edge of Sparks Industrial Area at Vista): Construct a levee and floodwall (where necessary) on the north bank of the Truckee River from the McCarran Blvd Bridge to the eastern edge of the Sparks Industrial Area at Vista. This section of levee and floodwall is approximately 3.2 miles long. Previous conceptual plans included mostly floodwall; the latest plan prioritizes levee construction to reduce costs, avoid seepage problems, and allow for recreational trail access on the levee crown (for example, a bike path). The cost of this project element is roughly estimated at $33.2M in 2021 dollars (this portion of the flood project requires	Yes

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
			additional study). Note that this reach includes the North Truckee Drain Realignment Project, a flood hazard mitigation project partially funded by TRFMA and completed in 2018 (refer to past plans or visit trfma.org for more information). Planned construction: 2029–2030.	
EQ-3	Retrofit dialysis centers to maintain potable water service following a disaster (Washoe County, City of Reno, City of Sparks)	Dialysis Centers (Fresenius, DaVita)	I am not sure what work if any TMWA did on this project but IHCC purchased a portable water tank, so did Renown and Saints to provide portable water to their healthcare systems. The third water tank was donated to Northern Nevada Healthcare Systems. IHCC did explore provided portable water to dialysis facilities however they do not own the facilities and retrofitting them would require an agreement with the property managers which was not explored.	No

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
EQ-7	Conduct study to determine City of Sparks facilities in need of reinforcement to withstand earthquakes (City of Sparks)	Sparks Engineering Services	Dam assessment to begin Sept, 2024	Yes
EQ-8	Reinforce City of Sparks facilities not meeting seismic standards based on seismic study (City of Sparks)	Sparks Engineering Services	Anticipated in 2025, following assessment (EQ-7) In progress – Seismic study of wastewater treatment plant completed and submitted to CoS in November 2024. Pending next steps based on report results.	Yes
EQ-9	Complete seismic strength evaluations of critical facilities in all jurisdictions, including schools, community colleges, public infrastructure, and other critical facilities, to identify vulnerabilities for mitigation to meet current seismic standards. Mothball or demolish life-threatening buildings, particularly unreinforced	Washoe County, City of Sparks, RSIC, PLPT: • Public Works • Engineering • School Districts	Per WC CSD, as of April 2, 2024: Not aware of any seismic assessments of County-owned buildings with the exception of Bower's Mansion. Seismic retrofits were done to the mansion several years ago based on inspections and recommendations made by an engineer specializing in historic structures. Some seismic retrofitting done to the historic	No

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
	masonry buildings (Washoe County City of Sparks, RSIC, PLPT)		portion of the Courthouse at 75 Court St. many years ago. In progress	
EQ-10	Assess, repair, and/ or replace infrastructure that may fail during earthquakes (e.g., Keystone Ave. Bridge) (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: • Public Works • Engineering	Seismic risk and flow metering analysis for Sun Valley and Spanish Springs dams begins Sept. 2024 with any necessary mitigation in 2025	Yes
EE-2	Replace wooden power poles in high-risk areas with poles made of steel or an alternative material (Washoe County, City of Reno, City of Sparks)	NV Energy	To date 45,208 poles in tiered fire areas have been replaced with an additional 5,500 poles replaced in non-wildfire areas to increase circuit resilience Pole replacement projections: • 2024: 1,385 poles • 2025: 2,038 poles • 2026: 1,704 poles As of 2022 the standard for pole replacement in high threat areas includes the use of covered conductor	No

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
			(tree wire) and Ductile iron poles for overhead builds. In areas where the installation of Ductile iron poles is not feasible wood pole with fiberglass fire wrapping used Ongoing	
EE-3	Replace transmission and distribution cables with alternative cables able to withstand fallen branches and snow loading (Washoe County, City of Reno, City of Sparks)	NV Energy	To date 52.8 miles of copper wife have been replaced since 2020. Currently 13.5 miles of copper wire replacement is projected through 2026 and another 27.6 miles beyond 2026. Removed 100% of street-light and night guard attachments. Identified 1,200 secondary/service attachments and developed a formal plan for removal. Identified 32 segments, totaling 80 miles, for undergrounding overhead infrastructure. Currently 19/32 segments, totaling 33 miles, in various stages of progress. Ongoing	No

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
EE-5	Install backup generators for critical infrastructure and facilities along with other measures to improve reliability (e.g., alarms, meters, remote controls, and switchgear up-grades) (All Partners)	All Jurisdictions: • Emergency Management	There was a project several years ago to attempt to identify the types of generators needed but unaware where that project was left off.	No
CA-1	Implement measures to prepare for a potential active shooter incident, including new security measures, training and exercises, improved partnerships with law enforcement agencies, and policy changes (ex. Prohibiting open carry). (All Partners)	Law Enforcement Agencies Facility Managers	Ongoing. WCEM hired a Homeland Security Program Coordinator to build relationships with LE and intelligence agencies. Measures have taken place in the Washoe County School District (WCSD) and UNR, including a gun detection dog (WCSD) and automatic specialized locking doors (UNR).	No
CA-3	Install crash-worthy type barriers, barricades, and bollards in downtown Sparks to help reduce the risk of errant or intentional vehicle attacks	Sparks Community Services Sparks Engineering Services	Mostly complete – one phase remains for the Victorian Square pedestrian safety improvements	Yes

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
	through large crowds at special events (City of Sparks)			
DT-2	Implement current TMWA Conservation Plan including encouraging transition to less water-intensive landscaping on both public and private properties (City of Reno, City of Sparks, RSIC, PLPT)	City of Reno, City of Sparks, RSIC, PLPT: • Water Utilities • Planning Departments	The Reimagine Reno Master Plan contains Policy 2.5C Drought Tolerant Landscaping, which requires the use of "landscaping which utilizes drought tolerant plant materials, efficient irrigation, incorporates soil amendments to support plant health and resiliency, and other low water usage practices." In addition, Title 18, Section 18.04.806, Water Conservation, addresses landscaping plan requirements that aim to reduce water consumption by limiting the amount of lawn/turf, requiring water-conserving irrigation systems, low water consumption plants, and preventing overspray, among other items.	No

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
ID-1	Implement a range of emission reduction strategies (e.g., policies geared toward renewable energy measures and projects, reduction in vehicle miles traveled, and increased use of transit and multi-modal transportation) to reduce levels of particulate matter, ozone, and other criteria pollutants (All Partners)	WCHD Air Quality Management Division	In progress. NNPH – Air Quality continues to advocate for code requirements related to land use planning and building requirements that would help reduce emission associated with the transportation sector. The AQMD also engages with Washoe County RTC and participates on the RTC TAC.	No

* Note: CoS = City of Sparks, CSD = Community Services Department, NDF = Nevada Division of Forestry, NNPH = Northern Nevada Public Health, PLPT = Pyramid Lake Paiute Tribe, RSIC = Reno-Sparks Indian Colony, RTC = Regional Transportation Commission, TMFPD = Truckee Meadows Fire Protection District, UNR = University of Nevada Reno, WCEM = Washoe County Emergency Management, WCSD = Washoe County School District

Considered Mitigation Actions

The City of Reno considered a broad range of actions, including actions that benefit vulnerable populations and current and new development, as a part of this plan update. There are four main types of mitigation actions:

- Local plans and regulations
- Structure and infrastructure projects
- Natural systems protection
- Education and awareness programs

The results are presented in Table 48.

Table 47: Considered Mitigation Actions of the City of Sparks

Mitigation Action	Type of Action	Selected? (Y/N)	If not selected, why not?
Seismic retrofit of aging infrastructure	Analyze and determine necessity of any seismic retrofits for existing city facilities	No	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Fuel management on WUI	Where residential neighborhoods abut native vegetation, manage fuel loading or defensible space to minimize wildfire risk	No	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.

2024–2029 Mitigation Implementation Plan

FEMA	**C5.** Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by [the City of Sparks]? (Requirement §201.6(c)(3)(iii))

Table 49 presents the mitigation action plan for the next five years. In that table, Community Lifelines are defined at Lifelines Toolkit v2.0 (fema.gov) and include the new Water Systems lifeline. Timeframes are defined as follows:

- Short term: Less than 1 year
- Medium term: 1–3 years
- Long term: 3–5 years

Table 48: 2024–2029 Mitigation Implementation Plan for the City of Sparks

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
1	TMWA* Levee (Glendale Ave Bridge to Greg St Bridge)	Flooding	People/ Structures/ Economic Assets/ Critical Facilities & Infra-structure	TRFMA	TMWA	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	Existing TRFMA funds Possible funding or in-kind contribution from TMWA, such as site access/ easements, fencing?	Total for design, permitting, construction, and contin-gency = $5.7M (from TRFMA's FY2024–2025 CIP)	Would provide 100-yr flood protection for TMWA's Glendale Water Treatment Plant and surrounding area.	30 years	Planned construction: FY2026–2027 or FY2027–2028. 1–3 years	Medium
Description: Construct a levee approximately 3,000 ft long along the north bank of the Truckee River with one portion set back from the riverbank (as space allows). The estimated cost is $4.5M in 2021 dollars. TRFMA plans to work collaboratively with TMWA on site access, fencing, and security. This design concept is a shift from the previous (2016) version of the Flood Project plan, which included a floodwall.												
2	Reno–Tahoe Inter-national Airport Berm & Terracing (Greg St Bridge to Rock Blvd Bridge)	Flooding	People/ Structures/ Economic Assets/ Critical Facilities & Infra-structure/ Community Activities	TRFMA	RTAA,* City of Reno	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	Existing TRFMA funds Possible funding or in-kind contribution from RTAA, such as ease-ments?	Total for design, construc-tion, and contingency = $6.1M (from TRFMA's FY2024–2025 CIP)	Would provide 100-yr flood protection for the Reno–Tahoe Internation al Airport and surrounding area.	30 years	Planned construction: FY2026–2027 or FY2027–2028. 1–3 years	Medium
Description: Excavate a floodplain terrace and construct an earthen berm along the south bank of the Truckee River near the airport (Greg St Bridge to Rock Blvd Bridge). The floodplain terrace would be revegetated with low-growing plant species because of airport safety regulations. The amount of fill material required for the berm would be approximately 90,000 cubic yards or less. If necessary, to alleviate a minor rise in water level because of the airport berm, construct a small berm on the north bank of the Truckee River. This design concept is a shift from earlier plans,												

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
which included a levee. A wide berm with a gentle slope is now the preferred alternative because a levee would be more of an obstacle to landing aircraft, and therefore a safety concern. Cost savings may be achieved by using spoil material from the Vista Narrows Floodplain Terracing Project.												
3	Mill/ McCarran Levees & Terracing (Rock Blvd Bridge to McCarran Blvd Bridge)	Flooding	People/ Structures/ Economic Assets/ Natural, Historic, and Cultural Resources/ Critical Facilities & Infrastructure/ Community Activities	TRFMA	Washoe County, City of Reno, City of Sparks, USFWS, NDOW*	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	Existing TRFMA funds Possible grant funding through USBR, USFWS, FEMA	Property acquisition (~$6M) + design, permitting, contingency (~$7.8M) + construction of levees, terraces, channel realignment, ecosystem restoration (~$32.2M) =Total of $46.5M (from TRFMA's FY2024–2025 CIP)	Would provide 100-yr flood protection for extensive industrial areas in the north and south, and for RTIA.* It would restore the Truckee River ecosystem, creating habitat for federally listed fish species and improving water quality (for example, TMDL* for temperature and dissolved oxygen). It would also provide the local	30 years	Currently in 60% design phase (June 2024). Planned construction FY2027–2028 or FY2028–2029 3–5 years	High

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
									community (and tourists) with open space/ park amenities and various outdoor recreational opportuni-ties.			
Description: Between the Rock Blvd Bridge and the McCarran Blvd Bridge, relocate the Truckee River channel and increase its sinuosity, excavate floodplain terraces, and construct levees to reduce flood risk, restore the ecosystem, and enhance recreational opportunities. The updated conceptual design omits floodwalls and includes higher levees on both the north and south banks of the Truckee River and a lower "intermediate" levee on the south side. The intermediate levee would be designed to contain a 50-year flood event. Ecosystem restoration is proposed to improve instream and riparian habitats for fish and wildlife species. Recreational enhancements may include nature-based activities along the river corridor and improved river access and sports fields and park facilities on the south side between the intermediate levee and the outer, high levee. TRFMA has already invested more than $48M to acquire 110 acres of land in this area (more than 1.2 miles of river frontage on the south bank of the river). Implementation of this Flood Project element will significantly reduce flood risk in the north and south industrial areas and the airport.												
4	North Bank Levee & Floodwall (McCarran Blvd Bridge to east edge of Sparks Industrial Area at Vista)	Flood	People/ Structures/ Economic Assets/ Critical Facilities & Infra-structure/ Community Activities	TRFMA	City of Sparks, Washoe County	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	Existing TRFMA funds	Estimate for design, construc-tion, and contingency = $48.8M (includes an estimate for inflation until actual construc-tion) (from TRFMA's FY2024–2025 CIP)	Would provide 100-yr flood protection for the Sparks Industrial Area, a warehousing and manu-facturing district that is significant to the region's economic	30 years	Planned construction: FY2029–2030 and FY2030–2031. Note: construction may be split into smaller projects that are prioritized based on what sections are most	High

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
									growth and stability.		vulnerable. 3–5 years	
Description: Construct a levee and floodwall (where necessary) on the north bank of the Truckee River from the McCarran Blvd Bridge to the eastern edge of the Sparks Industrial Area at Vista. This section of levee and floodwall is approximately 3.2 miles long. Previous conceptual plans included mostly floodwalls. The latest plan prioritizes levee construction to reduce costs, avoid seepage problems, and allow for recreational trail access on the levee crown (for example, a bike path). This portion of the Flood Project requires additional study to refine designs and cost estimates. Note that this reach includes the North Truckee Drain Realignment Project, a flood hazard mitigation project partially funded by TRFMA and completed in 2018 (refer to past plans or visit trfma.org for more information).												
5	Spanish Springs and Sun Valley Dam Assessment	Earthquake	Structural integrity of the dams and metering of the outfall	City of Sparks		Need further investigation	Sparks Stormwater utility funding	$200,000	Possibly identify deficiencies in the dams, improve outfall to minimize flooding	50 years	1 year	High
Description:												
6	Assess, repair, and/or replace infrastructure that may fail during earthquakes (e.g., Keystone Ave. Bridge).	Earthquake	people	City of Sparks,	Washoe County, City of Reno, RTC	Need further investigation	Need further investigation	$1M	Protect lives and property	30 years	1–3 years	Low
Description:												

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
7	Victorian Square pedestrian safety improve-ments	Pedestrian safety	Reduce vulnerability of crowds to accidental or deliberate attack by vehicles	City of Sparks		Need further investigation	City of Sparks general funding	$1,000,000	Protect crowds during downtown special events	50 years	1–3 years	Medium
Description:												
8	Themed Months/ Days per Hazard (including proclama-tions)	Avalanche and Landslide, Drought, Extreme weathers, (Extreme Heat, Windstorms, Winter Storms), Flood, Earthquake, Volcano	Residents and visitors	City of Sparks Emergency Management, WCEM	Subject matter experts/ agencies for specific hazards (USGS, fire agencies, LE, NWS/NOAA, etc.)	RHMP itself	City of Sparks, WCEM funded – staff time	$0 – staff time only to write proclamations and appear, as needed	Increased community awareness and resilience	30 years	1 year	High
Description:												
9	Volcano Awareness Program	Volcano	Residents and visitors	City of Sparks Emergency	USGS Menlo Park	RHMP itself	Need further investigation	Possibly USGS or local. Need better under-	Increased awareness and under-standing of potential	Beneficial until update is available or needed based on	1 year	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
				Management, WCEM				standing from SME about cost and whether there are studies that could be used for reference	impact, cleanup time, etc.	volcanic activity/ occurrence		
Description:												
10	Develop an evacuation plan for northern Sparks	Flood, Winter Storm, Wildfire	People and animals	City of Sparks	Need further investigation	Need further investigation	Existing budget	$100,000	Protect property and lives	30 years	1–3 years	Medium
Description: Including evacuation routes, available emergency services, a communications strategy, animal evacuation support, and many other support functions (City of Sparks)												
11	Manage fuels through targeted grazing on an as-needed basis (City of Sparks)	Wildfire	People and infrastructure	City of Sparks Fire Department	Need further investigation	Need further investigation	Grant	$50,000/year	Protect property and lives	30 years	1–3 years	Medium
Description:												
12	Partner with NDF* crews on fuel	Wildfire	People and infrastructure	City of Sparks Fire Department	Need further	Need further investigation	Grant	$5,000/year	Protect property and lives	30 years	1–3 years	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
	reduction as needed				investigation							
Description:												
13	Place containers around the City of Sparks for residents to dump wood and brush from their yards	Wildfire	People and infrastructure	City of Sparks	Need further investigation	Need further investigation	Grant	$150,000/year	Protect property and lives	30 years	1–3 years	Medium
Description:												
14	Partner with NDF to develop educational materials and multi-media blasts	Wildfire	People and infrastructure	City of Sparks Fire Department	Need further investigation	Need further investigation	Grant	$25,000	Protect property and lives	30 years	1–3 years	Medium
Description:												
15	Review and update (as needed) evacuation plans for communitie	Wildfire	People and infrastructure	City of Sparks, Regional Fire Protection Districts	Need further investigation	Need further investigation	Existing budget	$10,000/plan. $50,000/year	Protect property and lives	30 years	1 year	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
	s in wildland fire-prone areas and hold evacuation drills at least once every two years (All Partners)											
Description:												
16	Complete a feasibility study	Flood	People and infrastructure	City of Sparks Community Services, Sparks Engineering Services	Need further investigation	Need further investigation	Existing budget	$150,000	Protect property and lives	30 years	1–3 years	Medium
Description: Complete a feasibility study, including a geotechnical investigation, hydraulic model, and outfall recommendations, to investigate detaining stormwater behind the Spanish Springs Dam to meter discharge to the North Truckee Drain during floods and winter storms (City of Sparks)												
17	Reinforce City of Sparks facilities	Earth-quake	People and infrastructure	Sparks Engineering Services	Need further investigation	Need further investigation	Grant	$1M	Protect property and lives	30 years	3–5 years	Medium
Description: Reinforce City of Sparks facilities not meeting seismic standards based on seismic study (City of Sparks)												
18	Special Events Working Group	Criminal Acts and Terrorism	Residents and visitors; First responders; Event promoters/ organizers	Sparks	N/A	N/A	General Budget	$100,000	Previous plan had some considerations for safety. Now need to	Immediate and continuously	Short term	High

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
									add verbiage for building an events working group to stand up and staff EOC during events in the region			
19	Evacuation Routes in the area – study	All Hazards requiring persons to leave the area	Residents and visitors; LE, Fire, etc.	Sparks	N/A	N/A	General Budget	$100,000	Loss of life, property, time spent by responders guiding persons out of area	Immediate and continuous. There are always additional persons due to tourism and general residents. Also, there is never not a time when evacuation might be necessary.	Medium. Hire a contractor to complete the study, then decide based on findings	Medium
20	EV Ready Code Change		Children, older adults, those with heart/lung disease, low-income and underserved communities	NNPH – AQMD	City of Reno City of Sparks Washoe County	Building code amendment recommendation to be adopted by municipalities	Local	Unsure	Better air quality	Beneficial continuously until updated	In the next 5 years	Low
21	Flood insurance study	Flooding	People and infrastructure	Washoe County	Sparks	Needs further investigation	General Fund	$50,000	Studying areas lacking flood insurance can	5-10 years	1-2 years	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
									pinpoint vulnerable regions and guide policy decisions, enhancing community preparedness and economic resilience. It raises awareness about the need for adequate coverage and supports stronger disaster mitigation efforts.			

Description: This study aims to identify gaps in flood insurance coverage in the county by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.

Notes: *Includes vulnerable populations; **Through which the action will be implemented.

AQMD = Air Quality Management Division, BRIC = Building Resilient Infrastructure and Communities, DEI = Diversity, Equity, and Inclusion, EAP = Emergency Action Plan, FHA = Fire Hazards Analysis, HR = Human Resources, LE = Law Enforcement, NNPH = Northern Nevada Public Health, NOAA = National Oceanic and Atmospheric Administration, NVDEM = Nevada Division of Emergency Management, NWS = National Weather Service, PROTECT = Program for Response Options and Technology Enhancements for Chemical/Biological Terrorism, RHMP = Regional Hazard Mitigation Plan, RTAA = Reno-Tahoe Airport Authority, SME = subject matter expert; TMFPD = Truckee Meadows Fire Protection District, TMDL = Total Maximum Daily Limit, TRFMA = Truckee River Flood Management Authority, USGS = United States Geological Survey, WC = Washoe County, WCEM = Washoe County Emergency Management

Prioritizing Mitigation Actions

The identified mitigation actions were then prioritized, based on the following terms:

- **S – Social:** The public must support the overall mitigation implementation strategy and specific mitigation actions. Consider, will the action disrupt housing or cause the relocation of people? Will the proposed action adversely affect one segment of the population? Is the action compatible with present and future community/agency values?
- **T – Technical:** It is important to determine if the proposed action is technically feasible, will help reduce losses in the long term, and has minimal secondary impacts. How effective is the action in avoiding or reducing future losses? Does the action solve the problem or only a symptom? Will the action create more problems than it solves? Consider the root cause of the issue at hand to determine whether the action is a whole or partial solution, or not a solution at all.
- **A – Administrative:** This category examines the expected staffing, funding, time, and maintenance requirements for the mitigation action to determine if the jurisdiction/special district has the personnel and administrative capabilities to implement the action or whether outside help will be necessary. Consider, a) Staffing (enough staff and training): does the jurisdiction/special district have the capability (staff, technical experts) to implement the action? b) Funding allocated: does the jurisdiction/special district have the funding to implement the action or can it readily be obtained? c) Time: can it be accomplished in a timely manner? d) Maintenance/Operations: can the jurisdiction/special district provide the necessary maintenance? It is important to remember that most federal grants will not provide funding for maintenance.
- **P – Political:** This considers the level of political support for the mitigation action. Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far? Is there a local champion willing to help see the action to completion? Is there enough public support to ensure that the success of the action? Have all stakeholders been offered an opportunity to participate in the planning process?
- **L – Legal:** The jurisdiction/special district must have the legal authority to implement the action or consider what new laws or regulations would be needed to carry out the mitigation action. Evaluate, are the proper laws, ordinances, and resolutions in place to implement the action? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?
- **E – Economic:** Economic considerations must include evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt in a jurisdiction/special district. Consider benefits and costs at a planning level. A detailed benefit-cost analysis will be performed as project-specific funding becomes available. What

financial benefits will the action provide? Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? Does the action contribute to community economic goals, such as capital improvements or economic development? Are there currently sources of funding that can be used to implement the action?

- **E – Environmental:** The impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), have to be kept in mind when using federal funds. How will this action impact land/water? Impact on endangered species: how will this action impact endangered species? How will this action impact hazardous materials and waste sites? Is this action consistent with community environmental goals? Is the action consistent with federal laws, such as the National Environmental Policy Act (NEPA)?

The actions were also assigned a prioritization category of low, medium, or high, based on the following definitions:

- **Low:** Based on one to two STAPLEE criteria, the action is feasible and important, with multiple potential challenges. The action should be implemented as funding becomes available.
- **Medium**: Based on three to four STAPLEE criteria, the action is feasible and important, with some potential challenges. Its implementation is not as urgent as a high priority action item and can be implemented over time.
- **High**: Based on five or more STAPLEE criteria, the action is feasible and important, with minimal to no concerns. It is very important to the jurisdiction to implement and may be prioritized in the short term.

The results are in Table 50.

Table 49: Priorities Assigned to the Mitigation Actions of the City of Sparks

Action #	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total STAPLEE Score	Priority
1	3	4	4	3	3	3	3	23	Medium
2	2	4	4	2	3	2	2	19	Medium
3	4	4	4	4	3	4	4	27	High
4	3	4	4	4	3	4	3	25	High
5	3	1	1	3	2	1	1	12	Low

Action #	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total STAPLEE Score	Priority
6	3	2	1	2	2	1	2	13	Low
7	2	3	2	2	2	4	4	19	Medium
8	4	4	4	4	4	4	4	28	High
9	1	4	3	4	4	3	3	22	High
10									
11									
12									
13									
14									
15									
16									
17									

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Acronyms

AFN	Access and Functional Needs
AQMD	Air Quality Management Division
BRIC	Building Resilient Infrastructure and Communities
CAV	Community Assistance Visit
CSD	Community Services Department
CWPP	Community Wildfire Protection Plan
DEI	Diversity, Equity, and Inclusion
EAP	Emergency Action Plan
FHA	Fire Hazards Analysis
FMAG	Fire Management Assistance Grant Program
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HR	Human Resources
I-80	Interstate 80
LE	Law Enforcement
MMI	Modified Mercalli Intensity
MPT	Mitigation Planning Team
NCEI	National Center for Environmental Information
NDOT	Nevada Department of Transportation
NNPH	Northern Nevada Public Health
NOAA	National Oceanic and Atmospheric Administration
NRI	National Risk Index
NVDEM	Nevada Division of Emergency Management

NWS	National Weather Service
PG&E	Pacific Gas and Electric Company
PROTECT	Program for Response Options and Technology Enhancements for Chemical/Biological Terrorism
RHMP	Regional Hazard Mitigation Plan
PSOM	Public Safety Outage Management
RSIC	Reno-Sparks Indian Colony
RTAA	Reno-Tahoe Airport Authority
RTC	Regional Transportation Commission
SHMP	State Hazard Mitigation Plan
SME	subject matter expert
Southern Pacific	Southern Pacific Railway Company
TMFPD	Truckee Meadows Fire Protection District
TMWA	Truckee Meadows Water Authority
TMWRF	Truckee Meadows Water Reclamation Facility
TRFMA	Truckee River Flood Management Authority
TROA	Truckee River Operating Agreement
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WC	Washoe County
WCEM	Washoe County Emergency Management
WCHD	Washoe County Health District
WRP	Water Resource Plan
WSEL	Water Surface Elevation Level
WUI	wildland–urban interface

North Lake Tahoe Fire Protection District Hazard Mitigation Program

The North Lake Tahoe Fire Protection District (NLTFPD) has a fully integrated approach to hazard mitigation planning and program implementation. Throughout the 2024 update process, the following Regional Hazard Mitigation Plan (RHMP) participation roles were recorded:

Name	Position	Department
Ryan Sommers	Fire Chief	North Lake Tahoe Fire Protection District

What's New in the 2024 Update?

With the 2024 HMP update, Washoe County and its regional partners have recognized changes in planning priorities by emphasizing incorporating actionable strategies in the mitigation implementation plan and moving away from including ongoing coordination activities. Recent disasters and emerging hazards have also influenced planning priorities and the development of mitigation actions for the 2024 HMP update.

Since the prior plan, several developments have occurred in the North Lake Tahoe Fire Protection District. These developments have included increased efforts to enhance wildfire mitigation and emergency preparedness, focusing on community engagement and education regarding fire risks.

Additionally, there has been an emphasis on creating defensible spaces around homes and properties and improving fire response capabilities. The district has also explored partnerships with local agencies to enhance equipment and resources for fire prevention efforts.

Lastly, ongoing community planning has likely involved zoning and land use changes to create more resilient communities against wildland fire hazards.

The 2024 update of the RHMP includes the following major revisions to the 2020 plan:

- Including additional stakeholders and opportunities for public participation;
- Identifying all hazards which could impact the plan participant;
- Expanding upon the capability assessment, including opportunities to expand and improve capabilities; and
- Identifying plan integration and integration opportunities.

Plan Adoption

44 CFR §201.6(c)(5) requires that an HMP be formally adopted by elected officials from each participating jurisdiction. TMFPD formally adopted the 2024 update of the Washoe County Regional RHMP.

This RHMP was approved by FEMA Region IX. A copy of the NLTFPD's adoption resolution is included in the Base Plan. Once the plan is approved and signed, a copy of NLTFPD's adoption resolution will be placed in Appendix E of the Base Plan.

District Profile

The NLTFPD provides emergency and non-emergency response services to the communities of Incline Village and Crystal Bay, Nevada, and surrounding back country areas. The mission of the district is to "protect life and property through efficient delivery of quality community services" (NLTFPD n.d.). The district's Fuels Management Division works to reduce the community's wildland fire risk and improve forest health through effective fuel management practices. The Division provides services including fuel reduction, prescribed burns, free curbside chipping for property owners, and defensible space evaluations. The Fire Prevention Division is responsible for reducing fire hazards through public education, inspection, and code enforcement.

Hazard Profiles and Vulnerability Assessments

FEMA	**B1.** Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [the City of Sparks]? (Requirement §201.6(c)(2)(i)) **B2.** Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for [the City of Sparks]? (Requirement §201.6(c)(2)(i)) **B3.** Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement 44 CFR 201.6(c)(2)(ii))

This section contains hazard profiles and vulnerability assessments to determine the potential impact of hazards on the people, economy, and built and natural environments of NLTFPD. They have been streamlined to increase the effectiveness and usability of the RHMP. Additional details are in the Base Plan.

General

Washoe County has experienced several major disaster declarations that have affected the NLTFPD's planning area. In total, the County has received 41 major disaster declarations since

05/02/1953, including eight since the previous HMP update. Table 1 identifies the declarations since 2020 that have affected the NLTFPD.

Table 50: Major Disaster Declarations in Washoe County since 2020

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard M Program Declared	Declaration Date	Title
5495	No	No	No	06/12/2024	Fire
5494	No	Yes	Yes	06/11/2024	Fire
5448	No	Yes	Yes	08/14/2022	Fire
5382	No	Yes	Yes	11/07/2020	Fire
5328	No	Yes	Yes	08/15/2020	Fire
5326	No	Yes	Yes	08/03/2020	Fire
5322	No	Yes	Yes	07/21/2020	Fire
5316	No	Yes	Yes	06/27/2020	Fire
4523	Yes	No	No	04/04/2020	Biological (COVID-19)
3443	No	No	No	03/13/2020	Biological (COVID-19)

The hazard profiles and vulnerability assessments in this annex represent a considerable amount of work performed by the Mitigation Planning Team (MPT). Planning team members ranked hazards using several key considerations, followed by activities to validate hazard analysis results and identify specific areas of risk. Listed below are the hazards it considered.

- Avalanche and Landslide
- Criminal Acts and Terrorism
- Drought
- Earthquake
- Energy Emergency
- Flood
- Hazardous Materials Incident
- Infectious Disease
- Radiological Waste Transport
- Extreme weathers (Winter Storm, Windstorms, Extreme Heat)
- Transportation Incident
- Volcano
- Wildland Fire

Hazard Ranking Methodology

The hazards identified in the RHMP were initially ranked by NLTFPD on the provided risk assessment form. A risk assessment result for the entire county does not mean that each participant has the same amount of risk for each hazard.

Hazard-Specific Profiles and Risk Assessments

The following sections profile and assess the risks associated with hazards that are high planning priorities for the NLTFPD, which are hazards that scored an average of 3.00 or higher during the hazard-ranking activity. No natural hazards potentially affecting the district were omitted from the initial hazard assessment and ranking activity. The hazard profiles and risk assessments align with EMAP standards by focusing on high-magnitude or probability hazards. Each risk assessment considers the attributes in Table 52.

Table 51: Factors for Calculating Risk

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Probability *What is the likelihood of the hazard occurring?*	1	Unlikely	Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.	30%
	2	Occasional	1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.	
	3	Likely	11 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years.	
	4	Highly Likely	91 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.	
Magnitude *What will be the overall impact?*	1	Negligible	Less than 5% of the affected area's critical and non-critical facilities and structures are damaged/destroyed. Only minor property damage and minimal	30%

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
			disruption of life. Temporary shutdown of critical facilities.	
	2	Limited	Greater than 5% and less than 25% of property in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than one day but less than one week.	
	3	Critical	Greater than 25%, but less than 50% of property in the affected area was damaged/destroyed. Complete shutdown of critical facilities for over a week but less than one month.	
	4	Catastrophic	Over 50% of critical and non-critical facilities and infrastructures in the affected area are damaged/destroyed. Complete shutdown of critical facilities for more than one month.	
Onset *How long will there be between when it is recognized the hazard is approaching and when the hazard will begin to affect the community?*	1	Self-defined	More than 24 hours	10%
	2	Self-defined	12 to 24 hours.	
	3	Self-defined	6 to 12 hours.	
	4	Self-defined	Less than 6 hours.	
Duration *What is the length of time the hazard will remain active, including how long emergency operations will have*	1	Brief	Up to 6 hours.	10%
	2	Intermediate	Up to one day.	
	3	Extended	Up to one week.	
	4	Prolonged	More than one week.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
to continue after the hazard event?				
Frequency *How often has this kind of hazard resulted in an emergency or disaster?*	1	Every 10+ years	This hazard is not frequent but may still impact the area.	20%
	2	Every 5–10 years	This hazard is not as frequently occurring, but it could occur in the next 10 years.	
	3	Every 1–5 years	This hazard is likely to occur relatively often. It might have occurred more or less frequently recently, but on average, it can be expected every 1–5 years.	
	4	Annually	This hazard is a frequent occurrence which the area actively has to respond to on an approximately annual basis.	

The following is the risk factor equation:

Risk Factor Equation

RF Value = [(Probability x .30) + (Magnitude x .30) + (Onset x .10) + (Duration x .10) + (Frequency x .20)]

The Washoe County base plan is comprehensive for regional assessments and effectively addresses the calculated risk indexes. It provides a thorough evaluation that highlights its commitment to risk management and community safety, while the annexes are specific to each jurisdiction.

Table 52: Calculated Priority Risk Index for the North Lake Tahoe Fire Protection District

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Avalanche and Landslide	2.5	3.0	4.0	3.0	2.0	2.75
Criminal Acts and Terrorism	3.0	2.0	4.0	2.0	3.0	2.7
Drought	3.0	1.0	1.0	4.0	2.0	2.1
Earthquake	4.0	3.0	4.0	3.0	3.0	3.4
Energy Emergency	4.0	2.0	4.0	3.0	3.0	3.1
Flood	2.5	2.0	2.0	3.0	4.0	2.65
Hazardous Materials Incident	3.0	2.0	4.0	2.0	3.0	2.7
Infectious Disease	2.0	2.0	1.0	4.0	2.0	2.1
Radiological Waste Transport	3.0	3.0	4.0	3.0	3.0	3.1
Extreme weathers (Winter Storm, Windstorms, Extreme Heat)	4.0	2.0	1.0	4.0	3.0	2.9
Transportation Incident	3.0	4.0	4.0	3.0	3.0	3.4

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Volcano	1.0	3.0	3.0	4.0	1.0	2.1
Wildland Fire	4.0	4.0	4.0	3.0	3.0	3.9

Wildland Fire

A wildland fire is a fire that starts in or moves into areas where there is primarily vegetation and brush and limited structures. Wildland fires can result from natural causes or human activities. The main natural cause of wildland fires is lightning. Human activities that may cause fires include campfires, the use of machinery near dry vegetation, improper disposal of ashes, and arson.

Wildland fires are not confined to forested areas; they can burn wherever vegetation is prevalent, including park areas. The term Wildland–Urban Interface (WUI) is used to describe areas where human development meets or intermixes with vegetation that can fuel fires. Fires in the WUI can cause major losses of property and structures, as well as human casualties.

Wildland fire spreads primarily by the consumption of vegetation, and the rate, area, and extent of consumption depend on three main factors: fuel, topography, and weather. These factors can sustain a wildland fire and predict a given area's fire potential and the associated damage that can occur, affecting the land, infrastructure, and people.

LOCATION

While wildland fire risk is predominantly associated with WUI areas in Washoe County, significant wildland fires can also occur in heavily populated areas. Wildland fires affect grass, forests, brushlands, and structures where there is human access to wildland areas, such as the Carson Range of the Sierra Nevada and the foothills of the Virginia Range. The risk of fire increases because of a greater chance of human carelessness.

Wildfires can vary in size, location, intensity, and duration. They are not confined to any specific geographic location, but they are most likely to occur in open grasslands. The threat to people and property from a wildfire is greater in the fringe areas, where developed areas meet open grasslands.

PREVIOUS OCCURRENCE/HISTORY

- **2021, Caldor Fire** – The fire involved evacuations from California to the Nevada side of Lake Tahoe. Impacts included the closing of Highway 28 and Highway 50

PROBABILITY OF FUTURE EVENTS

The probability of future wildfire events in the North Lake Tahoe Fire Protection District can be considered "likely." Given the high and extreme hazard ratings for certain communities, especially those categorized under high and moderate hazard communities, there is a significant chance of wildfires occurring as conditions continue to be influenced by factors like drought and vegetation fuel hazards.

VULNERABILITY ANALYSIS

Fire is a risk to all development in Washoe County because of the high desert climate and vegetation. The most at-risk type of development for wildland fires is residential subdivisions in or near the WUI, particularly in the more forested areas of the County, such as the Tahoe Basin. Based on economic trends, private land zoned for residential subdivisions in the WUI will continue to be developed, and mitigation, such as creating defensible space and managing fuels, will be required to reduce the risk as much as possible.

The NLTFPD ranked Wildland Fires as **High Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The North Lake Tahoe Fire Protection District faces significant impacts and potential losses due to wildfires, particularly in drought conditions. Increased temperatures and dryness elevate the risk of intense and unpredictable fires, complicating suppression efforts and potentially leading to extensive damage to forests, habitats, and properties.

Financially, the costs of firefighting—encompassing personnel, equipment, and resources—can escalate quickly during wildfire events. Additionally, widespread property loss can harm the local economy, especially since tourism is vital to the area. A significant wildfire can deter visitors, leading to long-term economic downturns and reduced recreational opportunities.

Moreover, wildfires can cause ecological harm, resulting in vegetation loss, soil erosion, and impacts on water quality. The recovery process often requires extensive restoration efforts, placing further strain on district resources. Addressing these multifaceted challenges will necessitate comprehensive planning and investment in fire prevention initiatives.

VULNERABLE POPULATIONS

In the North Lake Tahoe Fire Protection District, several populations are particularly vulnerable to the risks of wildland fires. These include elderly residents who may have mobility issues, making it difficult for them to evacuate quickly during an emergency. Many seniors reside in

areas that are heavily wooded or near wildland interfaces, increasing their risk during fire events.

Another vulnerable group is low-income families and individuals, as they may lack the resources or means to prepare for wildfires. This could include the inability to create defensible space around their homes, access fire-resistant materials, or even evacuate swiftly when needed. Additionally, those with disabilities may face challenges during evacuation due to physical limitations or a lack of transportation options.

Another population at risk includes seasonal residents and tourists who may not be familiar with the area's fire risks and evacuation routes. They may not receive timely information about wildfires or the necessary precautions to take, putting them at greater danger during fire incidents.

Furthermore, children are also a vulnerable group, as they depend on adults for guidance and safety measures. Educational initiatives that focus on fire safety can help mitigate some of the risks faced by these younger populations.

Lastly, communities located in the Wildland-Urban Interface (WUI) are inherently at higher risk due to their proximity to dense vegetation and potential ignition sources. These areas require heightened awareness, preparation, and community resources to ensure the safety of all residents during high-risk fire seasons.

Energy Emergency

An energy emergency is defined as an abrupt interruption in the availability of utility services. A utility failure represents any occurrence in which vital utilities or services are rendered inoperable. Electrical blackouts, equipment malfunctions or damage, or an unexpected surge in demand may cause a utility failure.

A utility failure may impact any of the following services:

- Power to homes and businesses
- Drinking water
- Wastewater or stormwater
- Telecom and information technology

Moreover, interruptions in energy services may also be planned for system repairs or maintenance. In 2019, NV Energy and the Pacific Gas and Electric Company (PG&E) began implementing extensive public safety outage management programs in areas with extreme fire risks. The planning area includes parts of the Lake Tahoe basin in Washoe County. To prevent downed power lines and damaged equipment from causing fires, these electricity providers may de-energize parts of the electrical grid during weather conditions conducive to wildland

fires (e.g., high temperatures, low humidity, high winds, lightning storms) or based on field observations or information from first responders.[141] Planned outages can affect fuel availability for Washoe County. Outages affecting PG&E's system would cut power to the equipment that controls the operation of the fuel pipeline serving the region.

LOCATION

Energy emergencies can affect any portion of the planning area. Rural and populated areas alike are known to experience power outages during winter and windstorms that can last from several hours to several weeks. The overall effects of a widespread energy emergency would be concentrated in population centers, but the condition is likely to be present throughout the planning area. The electric utility provider for the planning area is NV Energy (formerly Sierra Pacific Power Company). NV Energy owns and operates no facilities that are rated Critical per the Department of Homeland Security criteria for National Critical Facilities.

PREVIOUS OCCURRENCE/HISTORY

- **2022, Sierra Cement Snowstorm** –The NLTFPD experienced 90,000 power outages for four days.

PROBABILITY OF FUTURE EVENTS

The probability of future energy emergency events in the North Lake Tahoe Fire Protection District can be classified as likely. Given the increasing risks associated with climate change, including drought conditions and their impacts on energy infrastructure, it is reasonable to anticipate potential energy emergencies in the region. Factors such as extreme weather events, rising demand for electricity, and the strain on resources further support this likelihood.

VULNERABILITY ANALYSIS

Prolonged power outages can cause health emergencies and increased demand for emergency medical services, especially in Nevada, where vulnerable people may be exposed to extreme summer or winter weather conditions. Power outages can also disrupt utilities or damage infrastructure, such as frozen pipes, with economic impacts because of the loss of perishable food and other items. Depending on the cause, a power outage or other energy emergency can cause cascading impacts—most significantly, wildland fires—if a downed line or other physical damage causes an outage.

The NLTFPD ranked energy emergencies as **High Risk.**

[141] NV Energy, 2019, Power Safe NV, Power Safe NV | NV Energy

ESTIMATED IMPACT AND POTENTIAL LOSSES

The North Lake Tahoe Fire Protection District could face significant challenges during an energy emergency, primarily due to reduced response capability. Power outages may disrupt communication systems and the operation of fire engines, hindering the district's ability to respond effectively to emergencies and threatening public safety.

Additionally, energy emergencies can increase the risk of wildfires from downed power lines or malfunctioning systems, creating further hazards that demand immediate attention from the fire services. This heightened risk and the potential for rapid escalation can put substantial strain on resources.

Economic losses are a critical concern as businesses and property owners affected by energy disruptions may struggle financially, leading to decreased funding for the fire district. This, coupled with potential damage costs from wildfires or emergencies, can strain the district's budget.

Finally, prolonged energy emergencies can destabilize community life, creating anxiety and necessitating additional support from the fire protection district. In summary, the impacts of an energy emergency on the North Lake Tahoe Fire Protection District are significant, underscoring the need for effective planning and preparedness.

VULNERABLE POPULATIONS

In the North Lake Tahoe Fire Protection District, several populations are particularly vulnerable to energy emergencies. One of the most affected groups is the elderly population. Older adults often rely on electricity to power essential medical devices, heating, and cooling systems. During energy outages, the lack of these critical services can significantly impact their health and overall well-being, making access to reliable information and resources paramount.

Another vulnerable group includes individuals with disabilities. Many of these individuals depend on powered equipment—such as wheelchairs, oxygen machines, or refrigeration for medication. Interruptions to electrical service can severely disrupt their daily lives and pose serious health risks. Ensuring that this demographic has access to emergency support and backup power solutions is vital for their safety.

Low-income families also face unique challenges during energy emergencies. Economic constraints may prevent them from obtaining alternative power sources like generators, or from affording necessary supplies to cope during an outage. Consequently, these families can find themselves at increased risk, particularly when power outages occur during extreme weather conditions.

Seasonal residents and tourists represent another vulnerable segment of the population. The influx of visitors during peak seasons can lead to confusion regarding local emergency protocols, leaving these individuals ill-prepared. Many may not have adequate means for

heating or cooling in rental properties, making them particularly susceptible to the effects of prolonged energy shortages.

Children and infants are also groups of concern during energy emergencies. Families with young children often require stable conditions for safe food storage and comfortable living environments. Disruptions in power can pose serious challenges for caregivers, who must ensure the health and safety of their little ones.

Finally, underserved communities may experience systemic inequities that hinder their ability to respond effectively to energy crises. These neighborhoods might lack access to critical resources, emergency preparedness education, and timely information, leaving residents vulnerable.

Earthquake

An earthquake is a sudden motion or trembling of the ground caused by shifting tectonic plates. It is potentially catastrophic and can cause multiple fatalities and major structural and infrastructure damage, including the disruption of utilities, communications, and transportation systems. Secondary effects can include landslides, seiches, liquefaction, fires, and dam failure.

Earthquakes occur abruptly, with little or no warning time. However, seismic monitoring can, in certain cases, detect increases in geologic and seismic activity that precede an earthquake event. Earthquakes can last from a few seconds to a few minutes. Aftershocks can recur over hours, weeks, or months, usually with diminishing frequency and intensity.

LOCATION

According to the U.S. Geological Service (USGS), earthquakes can happen anywhere in the United States, but they occur more frequently in some places than others.

The State of Nevada is the third most seismically active state in the United States, and Washoe County is in one of the most seismically active areas in Nevada. Its likelihood of damaging shaking is 75%–95%, so any area of the County is susceptible to noticeable effects of earthquakes. The most hazardous fault zones in Washoe County are the Mount Rose fault zone, the West Tahoe fault, and the Pyramid Lake fault. Moreover, dozens of smaller faults are in developed areas throughout the County. Fault zones in the Earth's crust result from sheer motion between tectonic plates, and they are the causal locations of most earthquakes.

PREVIOUS OCCURRENCE/HISTORY

The NLTFPD has not experienced any past earthquakes.

PROBABILITY OF FUTURE EVENTS

The probability of future earthquake events in the North Lake Tahoe Fire Protection District is generally considered to be likely. This region is situated in a seismically active area, and while specific predictions for timing and magnitude are difficult to make, historical data indicates a reasonable expectation for future seismic activity. Factors such as the geological makeup and tectonic activity in the surrounding areas contribute to this assessment.

VULNERABILITY ANALYSIS

The 2023 Enhanced SHMP states that earthquakes are responsible for forming the Nevada mountain ranges, which continue to develop. Seismicity, earthquake faults, and geodetically measured deformation indicate that future large earthquakes can occur anywhere in the state. Personal preparedness, emergency response, and community recovery planning are critical in the short term. In the long term, constructing seismically resilient buildings, planning future development around earthquake faults, and developing early warning systems will help reduce injuries and damage from future earthquakes.

The NLTFPD ranked earthquakes as **High Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The North Lake Tahoe Fire Protection District (NLTFPD) faces significant earthquake risks that could impact its operations and community safety. Structural damage to fire stations and emergency response vehicles could hinder the district's ability to respond effectively in emergencies.

Additionally, earthquakes may damage water supply and distribution systems, compromising firefighting efforts during critical periods, especially in the fire season. The psychological impact on residents can also lead to concerns about safety and preparedness, which in turn affect community engagement in fire safety programs.

Furthermore, economic losses from property damage could strain budgets, diverting funds from essential fire prevention initiatives. Overall, the potential impacts of earthquakes underscore the need for comprehensive preparedness measures within the NLTFPD's fire protection and emergency response strategy.

VULNERABLE POPULATIONS

In the North Lake Tahoe Fire Protection District, several populations are particularly vulnerable to earthquakes. Elderly residents often face mobility issues and health challenges that hinder their evacuation during seismic events, putting them at greater risk. Similarly, children and youth may lack the awareness and experience to respond effectively during an earthquake, making school preparedness essential.

Individuals with disabilities may encounter barriers to evacuation due to physical, sensory, or cognitive challenges, emphasizing the need for accessible emergency planning. Low-income families are also at risk, as limited resources can hinder their ability to prepare adequately for earthquakes or evacuate when necessary.

Tourists and temporary residents face unique vulnerabilities as they may be unfamiliar with local emergency procedures and lack support networks. Additionally, communities located in high-risk areas near fault lines may experience significant damage during earthquakes.

Flooding

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. They can cause substantial damage to structures, landscapes, and utilities and jeopardize life safety. Specific health hazards also are expected in flooding events. Standing water and wet materials in structures can become breeding grounds for microorganisms, such as bacteria, mold, and viruses. When flooding occurs in populated areas, warnings and evacuation can reduce impacts on life and safety**.**

LOCATION

The geographic location of flooding is concentrated in the floodway and floodplain of the Truckee River and its tributaries, including Steamboat Creek and Dry Creek in eastern Reno and southern Sparks. The Truckee River headwaters lie in the Lake Tahoe Basin. The river drains part of the high Sierra Nevada and empties into Pyramid Lake, the sole outlet of Lake Tahoe

PREVIOUS OCCURRENCE/HISTORY

The NLTFPD has not experienced any past flooding events.

PROBABILITY OF FUTURE EVENTS

The probability of future flooding events in the North Lake Tahoe Fire Protection District can vary based on several factors, including weather patterns, rainfall amounts, and geographic features of the area. Given the challenges posed by climate change and increased precipitation in certain seasons, one could assess that flooding events might be considered "likely" in specific circumstances, especially during periods of heavy rainfall or rapid snowmelt.

VULNERABILITY ANALYSIS

The magnitude and potential severity of impacts of flooding is considered High in Washoe County. Severe floods may cause serious injuries and deaths and damage public facilities and private property. The river’s height can determine the extent of flooding flows compared with flooding stages determined by USGS stream gauges throughout the area. It can also be measured by comparing water elevations to past flooding damage. Major floods may disrupt services for weeks, and response requires state and, potentially, federal support. In closed

basins, flooding conditions may be present over an extended period, ranging from months to years, because of the lack of natural drainage.

The NLTFPD ranked flooding as **High Risk.**

VULNERABLE POPULATIONS

In the North Lake Tahoe Fire Protection District, several populations are particularly vulnerable to flooding. Residents in low-lying areas are at heightened risk due to their proximity to floodplains and bodies of water, which can lead to significant property damage and safety concerns.

Elderly residents often face mobility challenges during floods, making quick evacuation difficult. Similarly, low-income families often lack the necessary resources for flood preparedness or recovery, leaving them particularly vulnerable.

Tourists and seasonal residents may not be familiar with local flood risks or evacuation routes, increasing their risk during emergencies. Individuals with disabilities who require assistance or specialized equipment also face additional obstacles in these situations.

Lastly, families with children may struggle to evacuate quickly, adding another layer of vulnerability.

Extreme weathers (Winter Storm, Windstorms, Extreme Heat)

Winter storms can bring heavy rain or snow, high winds, extreme cold, and ice storms. In Nevada, winter storms begin with cyclonic weather systems in the North Pacific Ocean or the Aleutian Islands, which can cause massive low-pressure storm systems to sweep across the western states. Winter storms plunge southward from arctic regions and drop heavy amounts of snow and ice. The severity of winter storms is generally minor. However, a heavy accumulation of ice can create hazardous conditions. A large winter storm event can also cause exceptionally high rainfall that persists for days, resulting in heavy flooding. Lake-effect snow is possible near large bodies of water, such as Lake Tahoe. This is produced when a cold air mass moves across warmer lake water, which can produce narrow but intense bands of heavy snowfall.

A windstorm is a severe weather condition that is sometimes indicated by high winds with little or no rain. High winds can also accompany thunderstorms and can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Winds greater than 40–60 miles per hour (mph) are considered high. Winds that exceed 100 mph can overturn mobile homes, tear roofs off houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, and debris blocking streets. Windstorms can cause dust storms and can often increase the risk of wildland fires.

An emerging hazard for Washoe County is extreme heat. Extreme heat occurs when summertime temperatures are much hotter and/or more humid than average. Historically, the seasonal maximum heat index is 90.17°F, but it is expected to increase to over 96°F by mid-century.[142] Extreme heat conditions are determined by comparing temperature and humidity to average conditions for the affected location at that time of year.[143] Extreme heat can have negative health impacts, particularly on populations with underlying health risks. Extreme heat can also increase the negative impacts of drought and the probability of wildfire.

LOCATION

High elevations in the western portion of Washoe County experience the effects of winter storms, often snowstorms, with greater frequency than the rest of the County. Locations that are often affected by snowstorms include Mt. Rose Highway, Incline Village, Mt. Peavine, and I-80 near the County's border with California.[144]

Extreme wind events are experienced in every region of the United States. Windstorms may occur anywhere in Washoe County. Properties with aboveground infrastructure, utilities, and tree stands may be more damaged during windstorms.

Extreme heat also may occur anywhere in Washoe County. However, urban areas are more likely to experience extreme heat conditions because of the heat island effect, in which the impervious surfaces concentrated in cities increase the surrounding area's temperature higher than the temperatures in more rural areas.[145]

PREVIOUS OCCURRENCE/HISTORY

- **2022, Sierra Cement Snowstorm** The NLTFPD district area experienced 90,000 power outages for four days.

PROBABILITY OF FUTURE EVENTS

The probability of future severe winter storm events in the North Lake Tahoe Fire Protection District can be considered as "likely." The region typically experiences significant snowfall during the winter months, and as climate patterns shift, intense winter storms may become

[142] ClimRR Climate Projection Report, Washoe County. https://climrr.anl.gov/climateprojections
[143] Center for Disease Control and Prevention, 2024, About Extreme Heat | Natural Disasters and Severe Weather | CDC
[144] National Operational Hydrologic Remote Sensing Center, NOHRSC Interactive Snow Information (noaa.gov)
[145] United States Environmental Protection Agency, "Heat Island Effect." https://www.epa.gov/heatislands#:~:text=Heat%20islands%20are%20urbanized%20areas,as%20forests%20and%20water%20bodies.

more frequent. This assessment is based on historical weather data and trends in severe winter weather events in the area.

VULNERABILITY ANALYSIS

The County's primary vulnerability from Extreme weathers is from power outages and impairment of transportation. Because nearly all social and economic activities depend on transportation, snow can have a serious impact. Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of ice or snow, downed trees, or debris, or from increases in demand beyond the capacity of the electrical system. Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe weather events. Buildings and roofs can be damaged if large amounts of heavy snow accumulate. If prolonged low temperatures accompany a winter storm, pipes can freeze and burst.

Winter storms can lead to health concerns for unhoused populations who do not have insulated clothing or dry living conditions and are at increased risk of hypothermia. Populations who may not have sufficient heating or who lose heat due to a power outage may seek alternative heating sources. Carbon monoxide poisoning can occur if proper ventilation is not used. Home fires also occur more frequently in the winter because of inadequate safety precautions from using alternative heat sources. Exhaustion and heart attacks brought on by overexertion are two other common causes of death related to winter storms. Shoveling snow, pushing a vehicle, or even walking in heavy snow can lead to heart attacks, particularly in older individuals or those not used to high physical activity levels. Slick or icy conditions following heavy snow may lead to injuries from falls.

Most vulnerabilities to windstorms occur in the built environment. Buildings, utilities, and transportation systems are vulnerable to wind damage. Old or poorly constructed buildings or insufficiently anchored manufactured homes are more susceptible to strong winds and can be heavily damaged. Uprooted and fallen trees can damage above-ground power and other utility lines and block roads, railways, or other transportation networks. Windstorms can also generate storm-related debris that can be costly and time consuming to clear. Building damage and service interruptions also cause economic losses from business interruptions.

Falling trees or blowing debris can cause injuries or death. Power outages and transportation disruptions can also negatively impact populations.

Extreme heat is associated with more fatalities than any other severe weather event in the United States. During extreme heat events, a person's body temperature may rise faster than it can cool itself, leading to heat-related illnesses, such as heat exhaustion and heat stroke. Older adults, young children, pregnant women, and individuals with chronic diseases, such as cardiovascular or respiratory conditions, are at the highest risk. Outdoor workers and unhoused

populations also are particularly vulnerable. People who live in social isolation, including linguistic isolation or those living alone with few social relationships, also are at higher risk. Social factors, including race and ethnicity, income, and educational attainment, are correlated with many health outcomes, including heat-related illness. Lower-income individuals who do not live in air-conditioned housing may be at risk. Those living and working near urban heat islands may be more vulnerable.

The NLTFPD ranked Extreme weathers as **High Risk.**

IMPACT ON COUNTY ASSETS

The impacts of winter storms, extreme heat, and windstorms on the community assets in the North Lake Fire Protection District can be significant and far-reaching. Winter storms, characterized by heavy snowfall and ice, can lead to road closures, falling trees, and power outages. These conditions disrupt essential services, making it challenging for emergency responders to reach affected areas. In contrast, extreme heat creates its own set of challenges. Prolonged high temperatures can stress road surfaces, leading to cracks and increased maintenance needs, while also straining power systems and increasing the likelihood of outages. Windstorms can damage roofs, down power lines, and create debris that obstructs roadways, resulting in hazardous conditions that further endanger residents.

Public safety is a serious concern during these weather events. Winter storms often result in slippery roads and low visibility, increasing the risk of accidents and delaying emergency response times. Extreme heat, on the other hand, can cause heat-related illnesses to spike, particularly among vulnerable populations like the elderly, necessitating a robust response from local health services. Windstorms introduce additional risks, as high winds can send debris flying, posing dangers to both residents and emergency personnel trying to manage the situation.

Community health can also be adversely affected. Winter storms can exacerbate health concerns, particularly for individuals lacking proper heating, and isolation from snow can limit access to necessary medical care. In conditions of extreme heat, the increased occurrence of heat strokes and dehydration can overwhelm local medical facilities. Windstorms may worsen respiratory issues due to dust and debris, and the disruption of healthcare services during these events can create significant challenges for affected residents.

Economic impacts are another important aspect to consider. Winter storms can damage local businesses, leading to temporary closures and loss of income, while the costs associated with repairs can strain community budgets. Extreme heat can result in higher energy costs and reduced outdoor activity, affecting local tourism and related industries. Similarly, windstorms can cause substantial property damage, resulting in economic losses that can hinder local recovery efforts and place additional stress on community resources.

Natural resources are similarly influenced by these weather events. Heavy snowfall in winter storms can disrupt ecosystems and wildlife habitats, and the subsequent melting can lead to flooding and soil erosion. Extreme heat can foster drought conditions, stressing local water supplies and affecting agriculture as well as natural vegetation. Windstorms may cause significant tree damage, leading to habitat loss for various species and increased soil erosion due to the loss of protective canopy cover.

VULNERABLE POPULATIONS

In the North Lake Tahoe Fire Protection District, several populations are particularly vulnerable to extreme winter storms. Elderly residents often face mobility challenges and health issues, making it difficult for them to prepare or respond effectively during severe weather. They may require assistance for basic needs, putting them at greater risk.

Individuals with disabilities also struggle during these events. Those with mobility impairments may find navigating hazardous conditions challenging, while those with mental health issues may have a harder time coping with the stress of storms. Limited access to information and resources can exacerbate their vulnerability.

Low-income families may lack the financial means to adequately prepare for winter storms, impacting their ability to secure necessary supplies and heating. In contrast, tourists and seasonal residents might be unprepared for local winter conditions, increasing their risk during sudden storms.

Rural and isolated residents face additional challenges due to limited access to emergency services. When severe weather strikes, they may find themselves cut off from help. Lastly, homeless individuals without stable housing are especially at risk during winter storms, lacking access to shelter and warmth.

Criminal Acts and Terrorism

An act of violence is any situation that presents an immediate and ongoing danger to the safety of the people in the community. Besides individuals using firearms, other types of weapons and erratic behavior can create active threat situations. An active assailant scenario may include mass casualty incidents and workplace violence.

Domestic terrorism is perpetrated by individuals and/or groups inspired by or associated with primarily U.S.-based movements that espouse extremist ideologies of a political, religious, social, racial, or environmental nature. One example cited by the Federal Bureau of Investigation on its domestic terrorism website is a shooting in Las Vegas on June 8, 2014. Two police officers inside a restaurant were killed in an ambush-style attack by a married couple who held anti-government views and intended to use the shooting to start a revolution.

LOCATION

Criminal acts of terrorism can impact any populated area, including shopping structures, clinics and hospitals, schools, and government offices and buildings.

PREVIOUS OCCURRENCE/HISTORY

The NLTFPD did not report any previous occurrence in the area.

PROBABILITY OF FUTURE EVENTS

In the North Lake Tahoe Fire Protection District, the probability of criminal activity and terrorism events can generally be assessed as "unlikely." The area is typically characterized by its natural beauty and relatively low crime rates compared to urban regions.

VULNERABILITY ANALYSIS

No estimates are available to determine the potential losses associated with criminal acts and terrorism. However, if an active threat were directed at the County, schools, government buildings, other public gathering places, and social events would be top targets. Active threats could have an impact on the community in the following ways: loss of human life; damage to buildings and structures; temporary displacement during the danger and/or investigation; stress on medical, emergency response, and security services; declines in economic activity and hospitality business after the event; psychological and emotional trauma; and an increased need for emergency services and funding.

The NLTFPD ranked criminal acts and terrorism as **High Risk.**

VULNERABLE POPULATIONS

In the North Lake Tahoe Fire Protection District, several populations are particularly vulnerable to criminal acts and terrorism. Elderly residents often face risks due to physical limitations and isolation, making them targets for scams and theft. Low-income families may struggle with limited resources for safety, increasing their susceptibility to crime.

Tourists and seasonal residents are also at higher risk, as their unfamiliarity with the area can expose them to criminal activities. Additionally, children and teens can be vulnerable to exploitation, especially when unsupervised, while individuals with disabilities may find themselves at greater risk due to specific challenges they face.

Homeless individuals often experience higher rates of violence and exploitation, lacking stable housing and community support. Finally, new residents may not yet have a strong understanding of local safety issues.

Avalanche and Landslide

An avalanche is a natural disaster caused when a mass of snow, ice, or rock suddenly slides down a mountainside or slope. Different snow avalanches include slab avalanches, loose snow avalanches, gliding avalanches, powder avalanches, and wet snow avalanches.[146]

Landslides, also known as mass movements, are complex phenomena that occur due to a combination of geological, climatological, and human factors. They are defined as the downward movement of a mass of rock, debris, or earth along a slope or cliff. Heavy rainfall, snowmelt, earthquakes, volcanic activity, and human activities, such as mining or construction, can trigger landslides. The type of slope, the nature of the soil and rock, and the presence of vegetation all play a role in determining the likelihood of landslide occurrence. There are five modes of slope movement: falls, topples, slides, spreads, and flows. These are further categorized based on the type of geological material and type of movement: bedrock, debris, or earth. Movements include rotational, translational, block, rockfall, topple, debris flow, debris avalanche, earthflow, and creep. Landslides may be small or very large, and they can move at slow to very high speeds. They can be initiated by storms, earthquakes, fires, volcanic eruptions, and human modifications of the land that lead to slope instability.

LOCATION

Avalanche risk is highest in the steep, mountainous areas of the Carson Range of the Sierra Nevada in southwestern Washoe County. Incline Village and Crystal Bay are under avalanche advisories several times each winter.

PREVIOUS OCCURRENCE/HISTORY

The NLTFPD has reported no previous occurrence of avalanches or landslides.

PROBABILITY OF FUTURE EVENTS

The probability of future avalanche and landslide events in the North Lake Tahoe Fire Protection District can be considered "likely." This assessment takes into account the area's geography, snowfall patterns, and historical data on avalanches and landslides. Various factors, such as heavy snowfall, rapid melting, or geological instability, can contribute to these risks in the region.

[146] WSL Institute for Snow and Avalanche Research, “Avalanche Types.” https://www.slf.ch/en/avalanches/avalanche-science-and-prevention/avalanche-types/#:~:text=Slab%20avalanches%20are%20the%20most,and%20caught%20in%20the%20avalanche.

VULNERABILITY ANALYSIS

Mountain communities in the Lake Tahoe Basin, including Incline Village and Crystal Bay, are vulnerable to the effects of avalanches. When avalanche conditions are present, risks are highest for recreational users and others in backcountry areas who may trigger avalanches or be injured or killed by an avalanche. Besides injuries and deaths, avalanches can damage or destroy property and utilities and cover roadways in snow. Transportation disruptions caused by avalanches or area closures because avalanche risks can have economic impacts on ski resorts and other businesses in the Lake Tahoe Basin over a period of days to a week or more.

The NLTFPD ranked avalanches and landslides as **High Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The potential impacts and losses to the North Lake Tahoe Fire Protection District from avalanches and landslides are significant. One major concern is property damage, with repair costs ranging from thousands to millions of dollars for homes and infrastructure, which can strain community resources. Emergency response costs can also escalate quickly, including expenses related to search and rescue operations and medical care for the injured, placing a financial burden on local agencies.

Economically, the area relies heavily on tourism, and disruptions from avalanches or landslides can deter visitors, leading to lost revenue for local businesses and potentially jeopardizing jobs. Infrastructure, such as roads and bridges, may require costly repairs, which could delay emergency responses and further strain budgets.

Environmental impacts are also critical, as these events can disrupt local ecosystems and water quality. The ongoing threat to public safety necessitates increased measures, requiring additional funding and resources from the Fire Protection District. Finally, investing in long-term mitigation strategies, like improved drainage and controlled avalanche release systems, is essential but may entail significant upfront costs, highlighting the need for proactive management to mitigate these risks effectively.

VULNERABLE POPULATIONS

In the North Lake Tahoe Fire Protection District, several populations are particularly vulnerable to avalanches and landslides. Residents in high-risk areas, especially those near steep terrain with a history of such events, face significant danger, particularly during winter months when the risk increases.

Tourists and visitors, often unfamiliar with the local geography, may unknowingly place themselves in hazardous situations while engaging in outdoor activities like skiing or hiking. This lack of awareness heightens the chances of accidents.

Elderly individuals and those with disabilities may struggle to evacuate swiftly during emergencies, increasing their risk. Additionally, low-income families often have limited resources, making it difficult to access vital information or evacuate safely. Children, particularly those involved in winter sports, may not grasp the dangers, necessitating closer supervision.

Drought

Nevada is the driest state in the nation, and the planning area has experienced multiple droughts. Drought cycles consisting of successive years of low precipitation are a normal, recurrent phenomenon across the Great Basin. Drought differs from most other natural hazard events due to its slow onset, gradual impact, and duration. With no defined starting period and limited long-range predictability, drought is a “creeping hazard” that may be recognized only after it is well underway. The onset of drought involves many factors, but in Washoe County, it is generally caused by successive years of inadequate winter precipitation, resulting in insufficient natural supplies to meet local demand. It is critical to note that the region depends almost exclusively on winter snowpack and rainfall for its water supply. Rains from summer thunderstorms do little to recharge reservoirs and raise groundwater tables.

LOCATION

Drought affects broad regions and can include any portion of Washoe County. Historically, the southern section of the County has had less frequent droughts than the central and northern sections because of extensive stored water in reservoirs in the Truckee River basin. However, low snowpack in the Truckee River basin can cause droughts of a greater magnitude in the southern section of the County, as was experienced between 2012 and 2017. With the implementation of the Truckee River Operating Agreement, the Truckee Meadow Water Authority can store credit water in the Boca Reservoir. The reservoir is currently operated for wintertime flood control based on the 1985 US Army Corps of Engineers’ (USACE) Water Control Manual, which requires minimum specific flood space in the reservoir and prohibits the capture of springtime runoff before April. Stakeholders in the Truckee River Basin recognize that the system can be better operated for both flood control and water supply.

PREVIOUS OCCURRENCE/HISTORY

The NLTFPD has reported no previous occurrence of drought.

PROBABILITY OF FUTURE EVENTS

The probability of future drought events in the North Lake Tahoe Fire Protection District is likely. Given the current trends in climate and the assessments of community hazards, drought conditions could become more frequent, impacting the area's fire risk and overall water availability. This assessment considers the various environmental factors and ongoing changes that contribute to drought likelihood in the region.

VULNERABILITY ANALYSIS

Drought can impact surface water and groundwater availability and have direct, disastrous effects on human populations. The indirect consequences of drought, such as unemployment, reduced tax revenues, increased food prices, reduced outdoor recreation opportunities, higher energy costs as water levels in reservoirs decrease and consumption increases, and water rationing, are not often fully known. This complex web of impacts can affect people and economies well beyond the area physically experiencing the drought.

The NLTFPD ranked drought as a **Moderate Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The North Lake Tahoe Fire Protection District faces significant impacts and potential losses due to drought, which can exacerbate the risk of wildfires and affect local ecosystems. As drought conditions persist, vegetation dries out, making it highly susceptible to ignition from natural occurrences like lightning strikes or human activities. The likelihood of wildfires increases dramatically during prolonged dry spells, potentially leading to devastating losses in property, natural habitats, and the local economy.

Drought not only heightens fire risk but also stresses water resources vital for firefighting efforts. Insufficient water supply can hinder response strategies during wildfire incidents, resulting in larger, more uncontrollable fires that threaten residential areas, commercial properties, and infrastructure within the district. As the frequency and severity of droughts rise due to climate change, the potential for catastrophic wildfire events escalates, which may also lead to increased insurance costs and property value declines.

Additionally, the ecological impacts of drought can disrupt local wildlife and plant communities, affecting biodiversity and ecosystem resilience. These changes can have long-term implications for both the environment and the community, such as reduced recreational opportunities, diminished air and water quality, and a decline in tourism, which is vital for the region's economy. Consequently, the North Lake Tahoe Fire Protection District must prioritize drought preparedness and resilience strategies to mitigate these potential losses and safeguard the community’s future.

VULNERABLE POPULATIONS

In the North Lake Tahoe Fire Protection District, several populations are particularly vulnerable to drought. Elderly residents may struggle with limited mobility and access to resources, making it harder for them to manage water shortages that affect their health and wellbeing.

Low-income families face significant challenges as increased water costs can strain their already limited resources, exacerbating financial stress. Outdoor workers in construction and landscaping also experience risks due to heightened heat and reduced water availability, which can impact their health and job security.

Additionally, tourism-dependent businesses may suffer from decreased visitor numbers during droughts, affecting the local economy. Lastly, residents in wildland-urban interface areas are at greater risk for wildfires, posing dangers to life and property.

Hazardous Materials Incident

A hazardous material is any item or agent (biological, chemical, or physical) that can cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials can be present in the form of gas, solid, or liquid. Environmental or atmospheric conditions can influence hazardous materials if they are not contained.

LOCATION

The potential for contact with hazardous materials is present throughout Washoe County.

PREVIOUS OCCURRENCE/HISTORY

The NLTFPD had three incidents in which semi-trailer fuel tanks were breached and fuel flowed through the creek to Lake Tahoe.

- 2024, Barrels on highway
- 2023, Mercury spills
- 2020, Semi-trailer crash

PROBABILITY OF FUTURE EVENTS

The probability of future hazardous materials events in the North Lake Tahoe Fire Protection District is generally considered to be unlikely. This assessment is based on existing safety measures, regulations, and the nature of the surrounding environment, which may limit the occurrence of such events.

VULNERABILITY ANALYSIS

Hazardous materials incidents can be caused by a number of factors, including technological failures, natural hazards, such as earthquakes or floods, and human factors. The County and local governments maintain records of hazardous materials storage sites in the Regional Hazardous Materials Response Plan and maintain communications with Nevada Highway Patrol regarding shipments of hazardous materials on all transportation routes throughout the County. Hazardous materials incidents can be caused by a number of factors. The region's most pressing vulnerability is presented by a transportation incident occurring on the I-80 and/or I-580 highway. Many of the critical facilities and valuable assets are near I-80 and I-580, particularly in the Reno/Sparks corridor. Hazardous materials may be transported through the

Reno-Tahoe International Airport. In addition, power plants, water and wastewater treatment plants, hospitals, fire stations, and other critical facilities in Washoe County may store hazardous materials on site.

The NLTFPD ranked hazardous materials incidents as a **Moderate Risk.**

VULNERABLE POPULATIONS

The North Lake Tahoe Fire Protection District has several populations that are particularly vulnerable to hazardous materials incidents.

Elderly residents often face mobility challenges and health issues that complicate evacuation. Children in families may require additional support during emergencies, as they are more sensitive to toxic exposure.

Individuals with disabilities also encounter unique challenges, as they may have difficulties with communication and evacuation procedures. Low-income populations are at risk due to limited resources, making it harder for them to prepare for and respond to emergencies.

Seasonal residents and tourists may lack familiarity with emergency protocols and evacuation routes, heightening their vulnerability. Additionally, those living near industrial sites may need specific safety plans due to the risk of exposure.

Infectious Disease

While chronic disease has placed a lasting strain on the nation's healthcare system, acute infectious disease poses a greater immediate and severe threat to its capacity. These diseases, caused by pathogenic bacteria, viruses, fungi, or parasites, are often marked by debilitating symptoms, such as fever, diarrhea, fatigue, muscle aches, coughing, respiratory issues, and rashes.[147] An outbreak of infectious diseases can bring socioeconomic activity and critical government functions to a standstill.

LOCATION

Infectious diseases spread by humans, and vector-borne infectious diseases can occur in both urban and non-urban areas throughout the County. Areas in the county that are more susceptible to infectious diseases are typically those with higher population density, such as Reno and Sparks, and areas with poor sanitation and limited access to healthcare services. On the other hand, areas more susceptible to vector-borne diseases are often those with standing water or extensive vegetation, providing suitable habitats for disease-carrying vectors, such as mosquitoes and ticks. These are more prevalent in non-urban areas.

[147] Mayo Clinic, "Infectious Disease." https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/syc-20351173

PREVIOUS OCCURRENCE/HISTORY

- 2020–2022, COVID-19 pandemic

PROBABILITY OF FUTURE EVENTS

The probability of future infectious disease events in the North Lake Tahoe Fire Protection District can be considered as "unlikely." This is due to the area's relatively low population density, along with the existing health measures and environmental factors that might reduce the spread of infectious diseases.

VULNERABILITY ANALYSIS

Infectious diseases have been known to spread quickly through communities. Many spread through close contact, meaning that highly populated areas like Reno and Sparks are more prone to widespread outbreaks. Public gathering places where people may be together in close quarters, such as schools and childcare facilities, offices, and transportation terminals, provide more opportunities for diseases to pass from one person to another.

Land use changes can have a major impact on infectious disease numbers. This is done by changing the rate of contact between individuals and disease hosts, whether animal, insect, or fungal. Along with this change in contact rate, land use changes can also alter the composition of local species, potentially allowing vector species to become the dominant species.

Outbreaks of infectious diseases most often affect vulnerable populations. However, a worst-case scenario could overwhelm local hospitals and medical facilities and require a surge response.

The NLTFPD ranked infectious disease incidents as a **Moderate Risk.**

Radiological Waste Transport

The transportation of radiological waste and other types of radiological materials is a common practice in Washoe County. Washoe County roadways, railways, and airways ship different forms of radiological materials daily. The transportation of radioactive materials through Nevada must follow the hazardous materials regulations of the U.S. Department of Transportation. Most shipments do not require prior notification and do not follow restricted routes. If the type or quantity of radiation exceeds a “Quantity of Concern,” the shipper must notify the state of the planned time and route. Shipments of Radioactive Material in Quantities of Concern are not restricted and are not required to wait for approval. A more restricted category is Highway Route Controlled Quantity, which requires prior notification, and pursuant to a Governor’s directive, the shipment and transportation vehicle are inspected and then escorted by the Nevada Highway Patrol. These shipments occur about once every three years through Washoe County.

LOCATION

Radiological waste could be transported along rail systems, major airports, and highway corridors in Washoe County. The zones of potential impact would extend beyond these transportation facilities. The sizes and shapes of those zones are affected by the material released and atmospheric and environmental effects, such as wind speed and water flow.

PREVIOUS OCCURRENCE/HISTORY

The NLTFPD has reported no radiological waste transport incidents in its area.

PROBABILITY OF FUTURE EVENTS

The probability of future radiological waste transport events in the North Lake Tahoe Fire Protection District would likely be considered "unlikely." This assessment is based on the specific regulations and guidelines surrounding the transport of hazardous materials, which generally prioritize safety and restrict transport through populated areas.

VULNERABILITY ANALYSIS

The MPT determined that hazards from transporting radiological waste have a low probability of occurring. However, the vulnerability of the public, continuity of operations, and infrastructure to radiological waste transport are assessed below. A radiological incident on a transportation corridor could cause a fire or explosion, dispersing radiological particles that contaminate people and property. Depending on several factors, communities in the immediate vicinity of the event would be the most vulnerable. Moreover, if radioactive materials are not effectively contained, they can spread through the air, soil, and/or water. In the immediate aftermath of a radiological incident on a roadway, the materials pose a substantial risk to first responders and other emergency personnel. Due to the infrequent occurrence of these accidents, emergency personnel may not be sufficiently trained in appropriate response protocols.

The NLTFPD ranked radiological waste transport as a **High Risk.**

VULNERABLE POPULATIONS

Populations in the North Lake Tahoe Fire Protection District vulnerable to radiological waste transport incidents include several groups. High-density residential communities near transport routes face significant risks. Elderly individuals may have reduced mobility and require extra assistance during emergencies.

Children in schools and daycare facilities located close to these transport routes are also at risk and need protective measures. Additionally, tourists, unfamiliar with local emergency protocols, could be vulnerable during such incidents.

Individuals with disabilities may encounter challenges due to mobility constraints or special medical needs. Finally, low-income communities often lack access to timely information and resources, complicating evacuation efforts.

Transportation Incident (Aircraft Crash)

An aircraft crash may occur for many reasons, including mechanical failure, poor weather conditions, or criminal activity. Aircraft of varying sizes are subject to this hazard, from small single-engine aircraft and gliders to helicopters and commercial airliners. The damage from an aircraft crash depends on the location of the accident (densely versus sparsely populated area) and the potential for releasing hazardous materials.

LOCATION

Washoe County has four publicly operated airports: the Reno–Tahoe International Airport (RNO), the Reno-Stead Airport (RTS), the Spanish Springs Airport (N86) in Reno, and the Empire Airport (1A8) in Empire. Several privately operated airports in the County serve commercial, non-commercial, private commuter, and recreational aircraft. The greatest volume of commercial aircraft service passes through Reno–Tahoe International Airport. Federal agencies, such as the Bureau of Land Management, also operate and lease airports in Nevada.

PREVIOUS OCCURRENCE/HISTORY

- **2023 and 2024 Reno Air Races**: Crashes occur almost annually during this event.

PROBABILITY OF FUTURE EVENTS

The probability of future air transportation incidents in the North Lake Tahoe Fire Protection District can be viewed as unlikely. While air transportation carries inherent risks, strict regulations, pilot training, and technological advancements generally contribute to safe operation. However, factors like weather conditions and the area's mountainous terrain can influence safety. Overall, while not impossible, significant incidents would be considered unlikely in this context.

VULNERABILITY ANALYSIS

Public airports that have accepted federal assistance, including the Reno–Tahoe International Airport, must designate runway protection zones (RPZs) at each end of their runways to protect people and property on the ground if an aircraft lands or crashes beyond the runway. Reno–Tahoe International Airport owns most of the land in its RPZs in Reno.[148] Aircraft crashes are

[148] Reno-Tahoe Regional Airport, "RNO.C3_Facility Requirements_Final.docx." https://www.renoairport.com/wp-content/uploads/2022/08/RNO-MP-2018_Facility-Requirements.pdf

more likely to occur in mixed commercial, residential, and commercial–industrial development in the RPZs.

Reno–Stead Airport has designated airport-critical areas at the ends of its runways. These trapezoidal areas help ensure that land use is compatible with airport operations to reduce risks to people and property on the ground. The airport critical areas at either end of Runway 8/26 or the south end of Runway 14/32 extend beyond airport property. Residential areas in the County and industrial and recreational areas in Reno near the airport are critical areas where aircraft crashes are more likely to occur.

The NLTFPD ranked transportation incidents as a **High Risk.**

VULNERABLE POPULATIONS

In the North Lake Tahoe Fire Protection District, certain populations are particularly vulnerable to transportation incidents, including aircraft-related events. Elderly residents often have mobility limitations and rely on public transportation, making them at risk during emergencies that require quick evacuations.

Tourists and visitors are another vulnerable group. Many come to the area during peak seasons and may not be familiar with local safety procedures, complicating their response during incidents. Children and students, housed in schools and daycare facilities, also require special assistance, making their safety a priority in emergencies.

Low-income communities may struggle with access to reliable transportation, hindering their ability to evacuate efficiently. Individuals with disabilities face additional challenges, as mobility issues can make evacuating difficult. Seasonal workers, staying in temporary housing, might be less aware of local safety protocols, further heightening their risk.

Lastly, residents living near airports or major transportation routes are at increased risk due to the likelihood of incidents occurring in those areas.

Volcano

A volcano is an opening or rupture of the Earth's surface that allows ash, gases, and/or molten rock under tremendous pressure to emerge from below the surface. Volcanic activity over long periods can either form mountains, as molten rock is gradually extruded, or rapidly obliterate mountains during explosive eruptions.

LOCATION

No active volcanoes are in Washoe County.

PREVIOUS OCCURRENCE/HISTORY

There has been no previous volcanic activity in the NLTFPD area.

PROBABILITY OF FUTURE EVENTS

The probability of future volcanic events in the North Lake Tahoe Fire Protection District is considered unlikely. This area is not known for volcanic activity, as it is primarily characterized by its lake and mountainous terrain.

VULNERABILITY ANALYSIS

Volcanic hazards, particularly ashfall, have a very low probability of occurring. However, the vulnerability of the public, continuity of operations, infrastructure, and the environment to volcanic hazards.

The NLTFPD ranked volcanoes as **Moderate Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The North Lake Tahoe Fire Protection District faces several risks from volcanic activity, even though it is not near an active volcano. An eruption in a nearby area could lead to ashfall, reducing air quality and posing health risks to residents and responders, which could strain emergency resources.

If lava flows or pyroclastic flows were to reach the district, they could cause significant property damage, disrupt habitats, and complicate fire prevention efforts. The local tourism industry, crucial for the economy, might also suffer due to evacuations and damage, leading to decreased revenue for businesses and reduced funding for the fire protection district.

In summary, while not directly in a volcanic zone, a nearby eruption could have far-reaching impacts on air quality, public health, property values, and the economy, ultimately affecting the district's ability to manage emergencies effectively.

VULNERABLE POPULATIONS

In the North Lake Tahoe Fire Protection District, certain populations are particularly vulnerable to volcanic activity. Residents living near volcanic features are at risk from ash fall and lava flows, requiring timely evacuation assistance.

Tourists and visitors may lack awareness of emergency protocols, which can hinder their response in a crisis. Additionally, the elderly can face mobility challenges during evacuations, making them a vulnerable group that needs special consideration in emergency planning.

Low-income households may also struggle to evacuate quickly due to limited resources and transportation options. Individuals with respiratory health issues are particularly susceptible to the harmful effects of volcanic ash and gases.

Lastly, children require extra support during evacuations, as they might need guidance from caregivers to ensure their safety.

Vulnerability Assessment

JURISDICTION-SPECIFIC VULNERABILITIES

Vulnerable Assets	What makes this group/asset vulnerable during hazards? Have there ever been issues with recovery after an event?
People (residents, workers, visiting populations, and socially vulnerable populations like seniors, individuals with disabilities, lower-income individuals, etc.)	
	Full capacity is not uncommon in the Tahoe Area during peak season.
	More development is the planning phases for the two-lane highways out of Incline Village/Crystal Bay,
	Incline Village/Crystal Bay is becoming more of a senior or retirement community.
Structures (residential, commercial, industrial, government-owned, planned capital improvement, etc.)	
	Community is 100% in the Wildfire Urban Interface surrounded by U.S. Forest Service (USFS) land. The USFS has too many restrictions on fuel management, which hinders the ability to lower the wildfire threat. Most structures are private homes; there are few commercial structures. Power is supplied from two main transmission lines, with no backup for the community. Some large commercial structures are in the construction phase.
Economic Assets (major employers, primary economic sectors, key infrastructure like telecommunications networks, etc.)	
	N/A
Natural, Historic, and Cultural Resources (areas of conservation, beaches, parks, critical habitats, community centers, historic places, etc.)	
	Tahoe Basin is full of natural, historic and cultural resources. Most resources are on federal land.
Critical Facilities and Infrastructure (hospitals, law enforcement, water, power, transportation systems, etc.)	

Vulnerable Assets	What makes this group/asset vulnerable during hazards? Have there ever been issues with recovery after an event?
	One hospital, local general improvement district supplies water and sewer services.
	There is only one water intake for the entire community.
Community Activities (major local events, such as festivals, or economic events, like farming or fishing)	
	Very seasonal area that draws many tourists.
Are there any other assets that you can think to include?	

REPETITIVE LOSS PROPERTIES

No repetitive loss properties currently exist in the NLTFPD area.

EXPOSURE ASSESSMENT

Table 35 summarizes the exposure of critical facilities in the NLTFPD to hazards that can be mapped.

Table 53: Exposure Assessment of the North Lake Tahoe Fire Protection District

Type	Name	Address	Special Hazards District	Flood Zone	Wildland Fire Hazard Potential
Hospital	Incline Village Community Hospital	N/A	NLTFPD	500-year Flood zone	1
School	Sierra Nevada College	N/A	NLTFPD	–	1
School	Incline Middle School	N/A	NLTFPD	–	1
School	Incline Elementary School 3rd–5th School	N/A	NLTFPD	–	1
School	Incline High School	N/A	NLTFPD	–	1
School	Incline Elementary K-2nd School	N/A	NLTFPD	–	1
School	Lake Tahoe School	N/A	NLTFPD	–	1
Transfer Station	Incline Transfer Station	1076 Tahoe Boulevard	NLTFPD	–	1

Type	Name	Address	Special Hazards District	Flood Zone	Wildland Fire Hazard Potential
Dam	Mill Creek No 2	N/A	NLTFPD	–	1
Dam	Mill Creek No 1	N/A	NLTFPD	–	1
Fire Station	North Lake Tahoe Fire Protection District Station 11	875 Tanager Street	NLTFPD	–	1
Fire Station	North lake Tahoe Fire Protection District Station 12	14 Calneva Drive	NLTFPD	–	1
Fire Station	North lake Tahoe Fire Protection District Station 13	965 Mount Rose Highway	NLTFPD	–	1

Land Use and Development Trends

FEMA	**D1.** Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

Table 54: Recent Development Trends for the North Lake Tahoe Fire Protection District

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Avalanche and Landslide	No Changes	No Changes	No Changes	No Changes
Criminal Acts and Terrorism	No Changes	No Changes	No Changes	No Changes
Drought	No Changes	No Changes	No Changes	No Changes
Earthquake	No Changes	No Changes	No Changes	No Changes
Energy Emergency	No Changes	No Changes	No Changes	No Changes
Flood	No Changes	No Changes	No Changes	No Changes
Hazardous Materials Incident	No Changes	No Changes	No Changes	No Changes
Infectious Disease	No Changes	No Changes	No Changes	No Changes
Radiological Waste Transport	No Changes	No Changes	No Changes	No Changes
Extreme weathers (Winter Storm,	No Changes	No Changes	No Changes	No Changes

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Windstorms, Extreme Heat)				
Transportation Incident	No Changes	No Changes	No Changes	No Changes
Volcano	No Changes	No Changes	No Changes	No Changes
Wildland Fire	No Changes	No Changes	No Changes	No Changes

Capability Assessment

FEMA	**C1.** Does the plan document [the NLFPD's] existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))

Planning and Regulatory Capabilities

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards.

Table 55: Planning Capabilities of the North Lake Tahoe Fire Protection District

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
General Plan				
Capital Improvement Plan	Yes	Yes	Need further investigation	Annually

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
Climate Change Adaptation Plan	No	N/A	N/A	N/A
Community Wildfire Protection Plan	Yes	Yes	The Plan is written as such for the entire Basin	2020; Being Updated now for 2024 release
Economic Development Plan	No	N/A	N/A	N/A
Land Use Plan	No	N/A	N/A	N/A
Local Emergency Operations Plan	Yes	Yes	Written as such	Continually
Stormwater Management Plan	No	N/A	N/A	N/A
Transportation Plan	No	N/A	N/A	N/A
Substantial Damage Plan	No	N/A	N/A	N/A
Other? (Describe)	Washoe County has a Damage Assessment			

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
	Plan that serves the same intent and covers all jurisdictions.			

Table 56: Regulations and Ordinances of the North Lake Tahoe Fire Protection District

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
Building Code	Yes	Yes	2018 Updated July 2025
Flood Insurance Rate Maps	No	No	N/A
Floodplain Ordinance	No	No	N/A
Subdivision Ordinance	No	No	N/A
Zoning Ordinance	No	N/A	N/A
Natural Hazard Specific Ordinance (Stormwater, Steep Slope, Wildfire)	Yes	Yes	2018; Updated 2025

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
Acquisition of Land for Open Space and Public Recreation Use	No	N/A	N/A
Prohibition of Building in At-Risk Areas	No	No	N/A

Administrative and Technical Capabilities

Administrative and technical capabilities include staff and their skills. They also include tools that can help you carry out mitigation actions. Consider how state and regional partners can help if you do not have local staff.

Table 57: Administrative Capabilities of the North Lake Tahoe Fire Protection District

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	N	N/A	N/A	N/A
Civil Engineer	N	N/A	N/A	N/A
Community Planner	N	N/A	N/A	N/A
Emergency Manager	N	N/A	N/A	N/A
Floodplain Administrator	N	N/A	N/A	N/A

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Geographic Information System (GIS) Coordinator	N	N/A	N/A	N/A
Planning Commission	N	N/A	N/A	N/A
Fire Safe Council	N	N/A	N/A	N/A
CERT (Community Emergency Response Team)	N	N/A	N/A	N/A
Active VOAD (Voluntary Agencies Active in Disasters)	N	N/A	N/A	N/A
Other? (Please describe.)				

Table 58: Technical Capabilities of the North Lake Tahoe Fire Protection District

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/ mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
Mitigation Grant Writing	Y	Fuels Reduction	Same, Fuels Reduction

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/ mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
Hazard Data and Information	N	N/A	N/A
GIS	N	N/A	N/A
Mutual Aid Agreements	Y	Yes	Same
Other? (Please describe.)			

Financial Capabilities

Financial capabilities are the resources to fund mitigation actions. Talking about funding and financial capabilities is important to determine what kinds of projects are feasible given their cost. Mitigation actions like outreach programs are lower cost and often use staff time and existing budgets. Other actions, such as earthquake retrofits, could require substantial funding from local, state, and federal partners. Partnerships, including partners willing to donate land, supplies, or an in-kind match and cash, can be included.

Table 59: Financial Capabilities of the North Lake Tahoe Fire Protection District

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Capital Improvement Project Funding	N	N/A	N/A	N/A
General Fund	N	N/A	N/A	N/A

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Hazard Mitigation Grant Program (HMGP/404)	N	N/A	N/A	N/A
Building Resilient Infrastructure & Communities (BRIC)	N	N/A	N/A	N/A
Flood Mitigation Assistance (FMA)	N	N/A	N/A	N/A
Public Assistance Mitigation (PA Mitigation/406)	N	N/A	N/A	N/A
Community Development Block Grant (CDBG)	N	N/A	N/A	N/A
Natural Resources Conservation Services (NRCS) Programs	N	N/A	N/A	N/A
U.S. Army Corps (USACE) Programs	N	N/A	N/A	N/A

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Property, Sales, Income, or Special Purpose Taxes	Y	Fuels Program	Yes	Yes
Stormwater Utility Fee	N	N/A	N/A	N/A
Fees for Water, Sewer, Gas, or Electric Services	N	N/A	N/A	N/A
Impact Fees from New Development and Redevelopment	N	N/A	N/A	N/A
General Obligation or Special Purpose Bonds	N	N/A	N/A	N/A
Federal-funded Programs (Please describe)	N	N/A	N/A	N/A
Other State-funded Programs (Please describe)	Y	Fuels Reduction	Yes	No

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Private Sector or Nonprofit Programs	Y	Fuels Reduction	Yes	No
Other?				

*Note: FMAG = Fire Management Assistance Grant Program, RTC = Regional Transportation Commission

Education and Outreach Capabilities

Education and outreach capabilities are programs and methods that could communicate about and encourage risk reduction. A participant or a community-based partner may run these programs. Partners, especially those who work with underserved communities, can help identify additional education and outreach capabilities.

Table 60: Education and Outreach Capabilities of the North Lake Tahoe Fire Protection District

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Community Newsletter(s)	N	N/A	N/A
Hazard Awareness Campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, School Programs)	Y	Yes	

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Public Meetings/Events (Please Describe)	Y	Y	
Emergency Management Listserv	N	N/A	N/A
Local News	N	N/A	N/A
Distributing Hard Copies of Notices (e.g., public libraries, door-to-door outreach)	Y	N	
Insurance Disclosures/Outreach	Y	We try, but insurance does not listen	None
Organizations that Represent, Advocate for, or Interact with Underserved and Vulnerable Communities (Please Describe)	N	N/A	N/A
Social Media (Please Describe)	Y (Facebook, Instagram)		
Other? (Please Describe)			

National Flood Insurance Program Participation

FEMA	**C2.** Does the Plan address participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3))

The National Flood Insurance Program (NFIP) is a Federal Emergency Management Agency (FEMA) program that provides flood insurance to millions of policyholders across the country. The plan must describe participation in the NFIP for each participant, as applicable, in accordance with NFIP regulatory requirements. Special districts are not eligible to participate in the NFIP, but they may support floodplain management and exist in communities that participate in the NFIP.

Table 61: Floodplain Management, Mapping, and Insurance for the North Lake Tahoe Fire Protection District

Question	Notes
What communities does your special district operate in? Are you aware of any flood concerns in these communities?	Incline Village/Crystal Bay
Which of your assets are at-risk of flooding? List any of your structures in the high-risk flood zone if known, or list addresses and the IEM team will check on https://msc.fema.gov/portal/home.	Homes along our creeks
Is your organization involved in floodplain management? If so, how?	No

Opportunities to Expand and/or Improve Capabilities

Table 62: The North Lake Tahoe Fire Protection District's Opportunities to Develop Capabilities

Capability Type	Opportunity to Expand and/or Improve
Planning and Regulations	Need a better avenue to work within the regulations of the USFS on their property to mitigation the threat of wildfire
Administrative and Technical	Staffing key positions to administer the overall plan.
Financial	Partner with neighboring agencies and jurisdictions to develop funding mechanisms for wildland fire and flood mitigation projects.

Capability Type	Opportunity to Expand and/or Improve
Education and Outreach	Create a District Specific program within the Community Wildfire Protection Plan.

Plan Integration

FEMA	**C6.** Does the Plan describe a process by which it will incorporate the requirements of the mitigation plan into other planning mechanism, such as comprehensive or capital improvement plans, when appropriate?

An updated plan must explain how the plan participants incorporated the previous mitigation plan, when appropriate, into other planning mechanisms over the last 5 years. This demonstrates progress in local mitigation efforts. Planning mechanisms refer to the governance structures used to manage local land use development and community decision making, such as budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances. If the plan was integrated into another planning mechanism, list them and note how hazard mitigation was integrated. This discussion could include the following:

- The integration of the hazards to which the community is vulnerable;
- The data and analysis presented in the risk assessment;
- The goals of the mitigation plan; and
- Potential projects or actions to carry out in the future.

Table 63: Previous Plan Integration by the North Lake Tahoe Fire Protection District

Plan Name (or "none," if applicable)	Description
None	N/A

The plan must also identify the planning mechanisms for integrating the updated hazard mitigation information/actions.

Table 64: Future Plan Integration Opportunities for the North Lake Tahoe Fire Protection District

Plan Name	Description
The North Lake Tahoe Fire Protection District has no active planning mechanisms to integrate concepts from the RHMP. However, the District will monitor for future opportunities to integrate ideas from the RHMP into new planning mechanisms such as general plans, emergency operations plans, and others.	N/A

Mitigation Strategy



C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?

Review of 2020 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2020 plan were evaluated to determine the status of the action and whether any ongoing or incomplete actions should be included as actions in the 2024 plan update.

Table 65: Status of Previous Mitigation Actions by the North Lake Tahoe Fire Protection District

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
MH-11	Identify facilities in Lake Tahoe to serve as evacuation centers and potential cooling centers, harden against wildland fires and power outages, and provide back-up power (North Lake Tahoe Fire Protection District [NLTFPD])	NLTFPD	Completed – does not have to be included in the plan update.	No
MH-12	Install a regional notification system for the Tahoe Basin that would handle all hazard notifications and traffic control. System would be operated from the regional traffic control center (NLTFPD).	NLTFPD	Completed – Perimeter Mapping and Notification	No
MH-13	Construct regional dispatch center for the Tahoe Basin (NLTFPD)	NLTFPD	This was pursued and is no longer needed per NLTFPD Sommers. Will not be included in plan update.	No
MH-14	Upgrade power system at Incline High School to allow for an emergency generator to be installed, so the high school can be used as a community evacuation center and potential cooling center (NLTFPD)	NLTFPD	Oh Hold – WCSD* states that the building is too old for such a system.	No
WF-13	Adopt 2018 wildland fire code County-wide (All Partners)	Regional Fire Protection Districts	Completed – Now looking to adopt 2025 building codes	No

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
WF-16	Review and update (as needed) evacuation plans for communities in wildland fire-prone areas and hold evacuation drills at least once every two years (All Partners)	Regional Fire Protection Districts	Ongoing – with the help of WC EM and staff	No
WF-18	Harden older residential structures in the Incline Village and Crystal Bay areas against wildland fire (NLTFPD)	NLTFPD	Ongoing	No
WF-19	Maintain and improve the local fuels management program for Lake Tahoe by maintaining the fuels management area around Crystal Bay (NLTFPD)	NLTFPD	Ongoing. Conducting 3 and 4 "re-entry" into areas.	Yes
WF-20	Hire more inspectors for the NLTFPD defensible space program to conduct outreach to the community (NLTFPD)	NLTFPD	Ongoing – Have 2 DSE seasonal employees, supported by grant funds	No
WF-21	Work with NV Energy to develop a CWPP for the utility and develop a community plan for response to planned power outages (NLTFPD)	NLTFPD	Ongoing	No
WF-22	Improve fire monitoring by installing fire cameras and working with Drone America to monitor high risk areas after lightning storms (NLTFPD)	NLTFPD	Not applicable. No word from Drone America on this project	No
EQ-11	Incorporate seiche warning system into the Tahoe Basin traffic control center (NLTFPD)	NLTFPD	Ongoing. Looking to WC EM for such a system.	No

ID	Mitigation Action	Lead Department	Status For Plan Update	Should this action be retained in the plan update? (Yes/No)
EQ-14	Harden Fire Station 13 or relocate this station to mitigate earthquake risks (NLTFPD)	NLTFPD	Ongoing. Working through budget issues	Yes
SS-1	Purchase additional equipment needed to quickly access emergency water supplies during severe winter storms (NLTFPD)	NLTFPD	Ongoing. Looking at grant funds	Yes

* Note: CWPP = Community Wildfire Protection Plan, DSE = ??Defensible Space Education, WCEM = Washoe County Emergency Management, WCSD = Washoe County School District

Considered Mitigation Actions

There are four main types of mitigation actions:

- Local plans and regulations
- Structure and infrastructure projects
- Natural systems protection
- Education and awareness programs

Table 66: Considered Mitigation Actions of the North Lake Tahoe Fire Protection District

Mitigation Action	Type of Action	Selected? (Y/N)	If not selected, why not?
Create a District Specific program within the Community Wildfire Protection Plan.	Educational Awareness Program	Y	
Develop awareness programs to reach absentee homeowners on mitigation plan and projects status.	Educational Awareness Programs	Y	

2024–2029 Mitigation Implementation Plan



C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered (Requirement §201.6(c)(3)(iii))

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the District. The implementation plan includes both short-term strategies that focus on planning and assessment activities and long-term strategies that will cause ongoing capability or structural projects to reduce vulnerability to hazards.

After careful consideration, NLTFPD selected to pursue the actions in Table 58.

Table 67: 2025–2029 Mitigation Implementation Plan for the North Lake Tahoe Fire Protection District

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
1	Fuels	wildfire	Townships of IV* and CB	NLTFPD, USFS, NV State Lands	Same	MOUs and agreements with partners	LRA, USFS, NV State Lands, SNPLMA	$16M	Improve Forest Health	5–7 Yrs.	1-3 years	High
Description: Reduction of vegetation, Maintain and improve the local fuels management program for Lake Tahoe by maintaining the fuels management area around Crystal Bay (NLTFPD)												
2	Building Code	Earthquake	People and property	NLTFPD	WC Building	2018 WUI Code	NLTFPD	$2M	Safer structures	Life of structure	1-3 years	High
Description: New Construction Residential/ Commercial Buildings, Harden Fire Station 13 or relocate this station to mitigate earthquake risks (NLTFPD)												
3	Avalanche Fence	Avalanche	People and property	NLTFPD, USFS	Same	WC?	Grants	$4M	Structures and Lives	Life of the fence	1-3 years	Medium
Description: Ridge-tops 3rd Creek, Crystal Bay												
4	Hazardous Materials Training	Hazardous Materials, Radiological Waste	People and property	NLTFPD, WCHD, WCEM, USFS, NDOT	Same	Response Plan and Policies	DOT	$500K	Safe Drinking water and environmental concerns	5 years	1-3 years	Medium
Description: Chemicals in creeks or lake for Lake Tahoe (drinking water supply)												
5	Extreme weather Emergency Suppression Water Hydrant Equipment Maintenance	Winter Storms	People and property	NLTFPD, WCEM, WCSO	Same	Policies and Plans	Needs further investigation	$100,000	Life and Property	Need further investigation	1-3 years	Medium
Description: Purchase additional equipment needed to quickly access emergency water supplies during severe winter storms (NLTFPD) IV/CB Area												

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
6	Create a District Specific program within the Community Wildfire Protection Plan.	Wildfire	People and property	NLTFPD, WCHD, WCEM, USFS, NDOT	Same	Awareness and Education	Need further investigation	$100,000	Life and Property, Forest Health	10 years	1 Year	Medium
	Description: Purchase additional equipment needed to quickly access emergency water supplies during severe winter storms (NLTFPD) IV/CB Area											
7	Develop awareness programs for wildfire and flood hazards	Wildfire and flood	Absentee homeowners	NLTFPD	Local Insurance Carriers	Need further investigation	Local budget	$100,000	Life and Property	10 years	5-7 years	High
	Description: Develop awareness programs to reach absentee homeowners on mitigation plan and projects status.											
8	Special Events Working Group	Criminal Acts and Terrorism	Residents and visitors; First responders; Event promoters/ organizers	NLTFPD	None	None	Local Budget	$100,000	Previous plan had some considerations for safety. Now need to add verbiage for building an events working group to stand up and staff EOC during events in the region	Immediate and continuously	Short term	High
	Description: Develop a targeted initiative that educates and engages the public through tailored content and interactive strategies to drive understanding and positive action.											
9	Develop awareness programs for drought	Drought Awareness	People and infrastructure	NLTFPD	None	None	Local Budget	$100,000	Protection of people and property	5 years	Short Term	Medium
	Description: Develop a targeted initiative that educates and engages the public through tailored content and interactive strategies to drive understanding and positive action.											

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
10	Develop awareness programs for energy emergencies	Energy emergencies	People and infrastructure	NLTFPD	None	None	Local Budget	$100,000	Protection of people and property	5 years	1 Year	Medium
	Description: Develop a targeted initiative that educates and engages the public through tailored content and interactive strategies to drive understanding and positive action.											
11	Develop awareness programs for Infectious Diseases	Infectious Disease	People and infrastructure	NLTFPD	None	None	Local Budget	$100,000	Protection of people and property	5 years	1 Year	Medium
	Description: Develop a targeted initiative that educates and engages the public through tailored content and interactive strategies to drive understanding and positive action.											
12	Develop awareness programs for Aircraft transportation incident	Aircraft transportation incident	People and infrastructure	NLTFPD	None	None	Local Budget	$100,000	Protection of people and property	5 years	1 Year	Medium
	Description: Develop a targeted initiative that educates and engages the public through tailored content and interactive strategies to drive understanding and positive action.											
13	Develop awareness programs for Volcano	Volcano	People and infrastructure	NLTFPD	None	None	Local Budget	$100,000	Protection of people and property	5 years	1 Year	Medium
	Description: Develop a targeted initiative that educates and engages the public through tailored content and interactive strategies to drive understanding and positive action.											
14	Evacuation Routes in the area – study	All Hazards requiring persons to leave the area	Residents and visitors; LE, Fire, etc.	NLTFPD	None	None	Local Budget	$135K – cost of completed study in Nevada County tor	Loss of life, property, time spent by responders guiding	Immediate and continuous. There are always additional	Medium. Hire a contractor to complete the study,	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
								a starting point	persons out of area	persons due to tourism and general residents. Also, there is never not a time when evacuation might be necessary.	then decide based on findings	

15	Flood insurance study	Flooding	People and infrastructure	Washoe County	NLTFPD	Needs further investigation	General Fund	$50,000	Studying areas lacking flood insurance can pinpoint vulnerable regions and guide policy decisions, enhancing community preparedness and economic resilience. It raises awareness about the need for adequate coverage and supports stronger disaster mitigation efforts.	5-10 years	1-2 Years	Medium

Description: This study aims to identify gaps in flood insurance coverage in the county by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.

Notes: *Includes vulnerable populations; **Through which the action will be implemented. CB = Crystal Bay, IV = Incline Village, LRA = Local Responsible Area MOU = Memorandum of Understanding, NDOT = Nevada Department of Transportation, NLTFPD = North Lake Tahoe Fire Protection District, SNPLMA = The Southern Nevada Public Land Management Act of 1998, USFS = U.S. Forest Service, WC = Washoe County, WCEM = Washoe County Emergency Management, WCHD = Washoe County Health District, WCSO = Washoe County Sheriff's Office, WUI = Wildland–Urban Interface

Prioritizing Mitigation Actions

The identified mitigation actions were then prioritized, based on the following terms:

- **S – Social:** The public must support the overall mitigation implementation strategy and specific mitigation actions. Consider: Will the action disrupt housing or cause the relocation of people? Will the proposed action adversely affect one segment of the population? Is the action compatible with present and future community/agency values?
- **T – Technical:** It is important to determine if the proposed action is technically feasible, will help reduce losses in the long term, and has minimal secondary impacts. How effective is the action in avoiding or reducing future losses? Does the action solve the problem or only a symptom? Will the action create more problems than it solves? Consider the root cause of the issue at hand to determine whether the action is a whole or partial solution, or not a solution at all.
- **A – Administrative:** This category examines the expected staffing, funding, time, and maintenance requirements for the mitigation action to determine if the jurisdiction/special district has the personnel and administrative capabilities to implement the action or whether outside help will be necessary. Consider, a) Staffing (enough staff and training): Does the jurisdiction/special district have the capability (staff, technical experts) to implement the action? b) Funding allocated: does the jurisdiction/special district have the funding to implement the action or can it readily be obtained? c) Time: can it be accomplished in a timely manner? d) Maintenance/Operations: can the jurisdiction/special district provide the necessary maintenance? It is important to remember that most federal grants will not provide funding for maintenance.
- **P – Political:** This considers the level of political support for the mitigation action. Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far? Is there a local champion willing to help see the action to completion? Is there enough public support to ensure the success of the action? Have all stakeholders been offered an opportunity to participate in the planning process?
- **L – Legal:** The jurisdiction/special district must have the legal authority to implement the action or consider what new laws or regulations would be needed to carry out the mitigation action. Evaluate, are the proper laws, ordinances, and resolutions in place to implement the action? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?
- **E – Economic:** Economic considerations must include an evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt in a jurisdiction/special district. Consider benefits and costs at the planning level. A detailed benefit–cost analysis will be performed as project-specific funding becomes available. What financial benefits will the action provide? Does the cost seem reasonable for the size of the

problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? Does the action contribute to community economic goals, such as capital improvements or economic development? Are there currently sources of funding that can be used to implement the action?

- **E – Environmental:** The impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), must be kept in mind when using federal funds. How will this action impact land/water? Impact on endangered species: How will this action impact endangered species? How will this action impact hazardous materials and waste sites? Is this action consistent with community environmental goals? Is the action consistent with federal laws, such as NEPA?

The actions were also assigned a prioritization category of low, medium, or high, based on the following definitions:

- **Low:** Based on one to two STAPLEE criteria, the action is feasible and important, with multiple potential challenges. The action should be implemented as funding becomes available.
- **Medium**: Based on three to four STAPLEE criteria, the action is feasible and important, with some potential challenges. Its implementation is not as urgent as a high-priority action item and can be implemented over time.
- **High**: Based on five or more STAPLEE criteria, the action is feasible and important, with minimal to no concerns. It is very important to the jurisdiction to implement and may be prioritized in the short term.

The results are shown in Table 69.

Table 68: Priorities Assigned to the Mitigation Actions of the North Lake Tahoe Fire Protection District

Action #	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Priority
1	4	4	4	4	4	4	4	High
2	4	4	4	4	4	4	4	High
3	4	4	4	2	2	4	4	Medium
4	4	4	4	4	4	4	4	High
5	4	4	4	4	4	2	4	Medium
6	4	4	4	4	4	2	4	Medium
7	4	4	2	2	4	2	4	High

Pyramid Lake Paiute Reservation Hazard Mitigation Program

The Pyramid Lake Paiute Tribe (PLPT or Tribe) has a fully integrated approach to hazard mitigation planning and program implementation. Throughout the 2024 update process, the following Hazard Mitigation Plan (HMP) participation roles were recorded:

Name	Position	Department
Don Pelt	Fire Chief	Pyramid Lake Paiute Tribe Fire Department

What's New in the 2024 Update?

With the 2024 HMP update, Washoe County and its regional partners have recognized changes in planning priorities by emphasizing incorporating actionable strategies in the mitigation implementation plan and moving away from including ongoing coordination activities. Recent disasters and emerging hazards have also influenced planning priorities and the development of mitigation actions for the 2024 HMP update.

In the years since the release of the 2020 HMP, the Tribe has undergone a near-constant change. With a growing population, some vulnerabilities have increased while others have been effectively mitigated to an acceptable level. New developments have included infrastructure improvements, environmental projects, and efforts to enhance tourism and economic opportunities. Specific projects involve enhancing recreational facilities, promoting cultural events, and initiatives aimed at preserving the natural environment around Pyramid Lake.

The 2024 update of the HMP includes the following major revisions to the 2020 plan:

- Incorporation of additional hazards and more comprehensive risk assessments;
- Expanded capability assessment;
- Integration of hazard mitigation planning into existing mechanisms; and
- Comprehensive and focused mitigation strategy with prioritized mitigation actions (see Chapter 5).

Plan Adoption

44 CFR §201.6(c)(5) requires that the HMP be formally adopted by elected officials from each participating jurisdiction. The Tribal Council formally adopted the 2024 update of the Washoe County Regional HM.

This HMP was approved by FEMA Region IX on [Date]. A copy of the Tribe's adoption resolution is included in the Base Plan.

The tribal government will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR Parts 200 and 3002, and will amend its plan whenever necessary to reflect changes in tribal or Federal laws and statutes? [44 CFR § 201.7(c)(6)]

Continued Public Involvement

FEMA	D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))

Public involvement is a key component of the plan implementation and update process. As part of this plan update, an ArcGIS StoryMap website has been developed to inform the public about the hazard mitigation plan update and their local risks. The StoryMap will be made available once the plan goes out for public comment in December. This user-friendly website is intended to make the hazard mitigation plan more accessible to the general public. This website also informs the public how to leave comments on the draft plan and continue participating in the plan maintenance process. The IEM Project Manager for the Washoe County RHMP update will collect, disseminate, and integrate any public comments received, as appropriate.

Following the annual review of the RHMP, the County will prepare and make available via the Internet an Annual Mitigation Status Report providing an update on the implementation of the current mitigation plan. This report, along with specific reports for each mitigation measure being implemented and all stakeholder comments received, will be assessed to make improvements in the plan update released every five years.

In addition to the ongoing input collected and compiled during the implementation of the previous plan, the MPT, as mentioned above, will review aspects of the draft update plan. Comments received from the public will also be considered and incorporated, where appropriate, into updates of the plan.

The County and its partners, The Cities of Reno and Sparks, North Lake Tahoe Fire Protection District, Pyramid Lake Paiute Reservation, Reno-Sparks Indian Colony, Truckee Meadows Fire Protection District, and Truckee River Flood Management Authority, will also engage community members on an ongoing basis through outreach at local events and meetings to ensure that public participation is incorporated outside the five-year plan update process. The County and its partners maintain public engagement and awareness programs focused on increasing the community's awareness of hazards and promoting actions to reduce individuals' and families' exposure to hazard risks. Recognizing that these are ongoing programs, the

The County and its partners will continue to implement the following programs during this five-year planning period:

- Seasonal Multi-Hazard Public Awareness Program;
- Annual weather safety activities to maintain the County's StormReady Community accreditation;
- Community Wildfire Protection Plan preparation;
- Community evacuation plan preparation and evacuation drills;
- Community Emergency Response Team (CERT) academy training sessions;
- Washoe County Emergency Preparedness Program;
- Green waste collection events;
- Food Truck Fridays in Reno;
- Meetings with homeowners' associations and other community groups; and
- Outreach through social media.

Community Profile

Tribal Sovereignty and Governance

The following governance information is provided from the Tribe's website and in the Constitution and By-Laws of the Pyramid Lake Paiute Tribe.[149]

The Pyramid Lake Paiute Tribe is governed by 10 Tribal Council members who are elected biannually in December and on staggered two-year terms. The Tribe operates under the Indian Reorganization Act Constitution and By-Laws approved on January 26, 1936, by the Department of Interior.

The Pyramid Lake Paiute Tribe has a government-to-government relationship with the Federal Government. Therefore, the Tribe contracts with or receives grants directly from Federal Agencies or the State of Nevada to provide services to the Tribal members and residents of the Reservation. The revenue generated by the Tribe is used to support local Tribal government

[149] Pyramid Lake Paiute Tribe, "Pyramid Lake Paiute Tribe Ordinances." https://ake2fb.p3cdn1.secureserver.net/wp-content/uploads/2023/06/Consitution-ByLaws.pdf

activities and to supplement the programs that provide direct services to Tribal members or residents.

Geography and Climate

The Pyramid Lake Reservation is located 35 miles northeast of Reno in a remote desert area. The reservation contains about 475,000 acres, of which approximately 112,000 acres cover the surface of a terminal desert lake, Pyramid Lake. This lake is the geographic sink of the basin of the Truckee River and is located 40 miles northeast of Reno. It is one of the most valuable assets of the Tribe and is entirely enclosed within the boundaries of the reservation. Pyramid Lake, one of the largest natural lakes in the state of Nevada, is approximately 15 miles long and 11 miles wide. The lake measures 350 feet at its deepest point.

Based on data from 1967 to 2016 from the Western Regional Climate Center, the average precipitation based on Sutcliffe, Nevada—located on the shore of Pyramid Lake—is 7.3 inches per year, and an average of 5.5 inches of snowfall annually. Temperatures average the upper 80s and lower 60s (degrees Fahrenheit [°F]) in July and August and reach an average high and low of mid-40s (°F) and upper 20s/lower 30s (°F) in January and February.

Population and Demographics

The 2018–2022 American Community Survey 5-year estimates report a population of 1,935[150] in the Pyramid Lake County Subdivision (CCD), encompassing approximately 714 acres of land, including reservation land in Washoe County. As of February 2017, 1,300 people lived on the reservation. Approximately 10% of the reservation's population lived in Sutcliffe, 33% in Nixon, and 57% in Wadsworth. The PLPT has approximately 3,014 enrolled members.[151] The membership statistic is an approximate number, as these totals change from month to month based on membership approvals and other actions taken by the 10-member Tribal Council. Most enrolled Tribal members reside on the reservation; approximately 12% of this membership resides in other areas throughout the Western United States. Most of the reservation's resident population is over the age of 35, with 729 individuals under 35 and 823 over 35. The median age was 37.4 years.[152]

The 2018-2022 American Community Survey 5-year estimates that approximately 57.8% of the population over 16 years old in the Pyramid Lake CCD was employed, and the unemployment

[150] United States Census Bureau, "P1|Race." https://data.census.gov/table?q=Pyramid%20Lake%20CCD,%20NV%20population
[151] Pyramid Lake Paiute Tribe, "About Us." https://plpt.nsn.us/about-us/#:~:text=The%20Pyramid%20Lake%20Paiute%20Tribe%20has%20approximately%203%2C014,of%20May%202024)%20enrolled%20members. .
[152] United States Census Bureau, "SO101|Age and Sex." https://data.census.gov/table?q=Pyramid%20Lake%20CCD,%20NV%20age

rate in the CCD was approximately 8.7%. Per capita income in the Pyramid Lake CCD was approximately $23,350[153] which is about half of Washoe County's per capita income, $44,448.[154] Approximately 28.7% of people living in the CCD live below the poverty level.[155]

Tribal Enterprises

Much of the economy of the Pyramid Lake Reservation is centered on fishing and recreational activities at Pyramid Lake. The lake is fed primarily by the Truckee River and was named one of the best fisheries in the world by the *Fly Fishing and Tying Journal* in 2010. Besides permit fees for fishing, day use, and overnight camping, the Tribe also receives lease and tax revenue. Several Tribal members belong to the Pyramid Lake Cattleman's Cooperative Association, which uses the reservation's desert open range to operate and manage the individual cattle herds.

Per its website, the Tribal Council is advancing the implementation of the Tribe's Economic Development Plan and accessing the Pyramid Lake Paiute Economic Development Fund created by Public Law 101-618, signed into law under President George H. W. Bush in 1990. The $40,000,000 fund was created when Congress passed the Truckee-Carson-Pyramid Lake Water Rights Settlement Act (PL 101-618) to address legal disputes over the waters of the Truckee River and Pyramid Lake (which were significantly impacted by the construction of the Derby Dam in 1905). The Tribe's economic development plan implementation process is a long-term effort that has involved the adoption of a 2-volume Pyramid Lake Economic Development Plan (approved in 2011), coordination with the federal government, many opportunities for Tribal education and input into the process, and results in economic stimulus payments distributed directly to Tribal members.

In 2018, the Bureau of Indian Affairs approved the Tribe withdrawing 50% of its interest in the Pyramid Lake Paiute Economic Development Fund. A press release issued by Tribal Chairman Vinton Hawley in April 2018 stated that per the Economic Development Plan, Vol. 2, all living members are entitled to equal economic stimulus payment from the withdrawal, which equated to 1,875 adults and 1,042 minors.

The lump sum payment to adults from the fund is intended to stimulate Tribal enterprise over time, as referenced in the Economic Development Plan: "The purpose of the plan is to use the Pyramid Lake Paiute Economic Development Fund created by Public Law 101-618 to create long-term profit-making opportunities, to create optimum employment opportunities, and to establish a high-quality recreation area at Pyramid Lake for the Tribe and its members."

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[153] United States Census Bureau, "DP03|Selected Economic Characteristics." https://data.census.gov/table?q=Pyramid%20Lake%20CCD,%20NV%20employment

[154] United States Census Bureau, "Quick Facts Washoe County, Nevada." https://www.census.gov/quickfacts/fact/table/washoecountynevada/BPS030222

[155] United States Census Bureau, "S1701|Poverty Status in the Past 12 Months." https://data.census.gov/table?q=Pyramid%20Lake%20CCD,%20NV%20poverty

In 2018, the Tribe received funds from the U.S. Environmental Protection Agency for investment in environmental programs. Per the EPA, "The Pyramid Lake Paiute Tribe will use $203,200 to model and evaluate the impact of Truckee River nutrient loads on Pyramid Lake's water quality, ecology, and trophic status. Funds will also support the cleanup and closure of three illegal dump sites and assess the operations of several transfer stations to reduce illegal dumping."

Per a 2016 profile on the website's economic development page, 274 kilowatts of solar facilities have been installed on the reservation, and the Tribe is working with the University of Nevada, Reno, and the Desert Research Institute to develop a utility-scale geothermal project. The Tribe was also awarded a $9.5 million American Recovery and Reinvestment Act stimulus grant to build a fiber optic cable line to bring broadband internet to households and businesses.

In June 2022, the tribe received $234,881 to further develop its ability to protect Pyramid Lake and the Truckee River, safeguard endangered cui-ui sucker fish and threatened Lahontan cutthroat trout, and preserve the tribe's people from water pollution and its effects.[156]

In March 2024, the Tribe received $29,756,400 in grant funding from the U.S. Department of Transportation to develop new outdoor recreation opportunities around Pyramid Lake and connect the Sutcliffe, Nixon, and Wadsworth communities. The funding will help turn an old railroad into a safe path for biking and walking. This path will connect the communities of Sutcliffe and Nixon at Pyramid Lake and Wadsworth. It will offer opportunities for outdoor activities and help the local economy.[157]

Tourism is an important source of revenue for the Tribe; in 2015, the Tribe estimated that over 200,000 visitors visited Pyramid Lake. Much of the economy of the Pyramid Lake Reservation is centered on fishing and recreational activities at Pyramid Lake. On the left in Figure 64 is the I-80 Smokeshop Campground, and on the right is a Lahontan cutthroat trout caught in Pyramid Lake. The Paiute Tribe also operates the Big Bend RV Park.

[156] United States Environmental Protection Agency, "EPA Awards Over $700,000 to Support Wetlands Restoration in Nevada." https://www.epa.gov/newsreleases/epa-awards-over-700000-support-wetlands-restoration-nevada

[157] Catherine Cortez Masto, "Cortez Masto Announces Funding to Support Pyramid Lake Paiute Tribe Outdoor Recreation Project." https://www.cortezmasto.senate.gov/news/press-releases/cortez-masto-announces-funding-to-support-pyramid-lake-paiute-tribe-outdoor-recreation-project/





Photo credit: U.S. Fish and Wildlife Service via the Associated Press.

Figure 64: Recreational Photographs from Pyramid Lake

Tribal Lands and Ownership Trends

The reservation land was first set aside for the Northern Paiute by the request of the Bureau of Indian Affairs in 1859. The reservation was not surveyed until 1865. The status of the reservation was very uncertain until President Ulysses S. Grant affirmed its existence by Executive Order on March 23, 1874. At that time, the creation of reservations by the executive branch was novel—most previous reservations were created by treaty or congressional legislation. Subsequent court decisions have affirmed the validity of reservations created by the executive branch and set the establishment date for the Pyramid Lake Reservation in 1859, not 1874. This earlier date is important regarding the priority of Tribal water rights and the status of non-tribal claims to land in the reservation. The Tribe has fought a long series of legal battles on both of these issues.

With the passage of the Nevada Native Nations Land Act in 2016, 6,357 acres of land managed by the Bureau of Land Management were transferred to be held in trust for the Pyramid Lake Paiute Tribe. This expanded upon the nearly half-million acres already contained in the Pyramid Lake Reservation, intending to further incorporate the watershed of Pyramid Lake into Tribe ownership and for potential economic development opportunities.

Natural Resources

The Tribe's connection to its natural resources is expressed on its website. "Deeply grounded in their environment, the Paiutes believed that power (pooha) could reside in any natural object, including animals, plants, stones, water, and geographical features."

Pyramid Lake features riparian ecosystems, agricultural lands, rangelands, and wetlands. Numerous species of willows, tule, chokecherry, and elderberries grow in canyons with perennial streams and springs. Pine nuts are a traditional harvest food.

The reservation encompasses five major land resource areas and over 80 different ecological sites. The Tribe's Pyramid Lake Natural Resources Department aims to "preserve, protect, enhance, and restore land, air, and water resources, and environmental health for the longer

term sustainability of the natural resources of the Pyramid Lake Indian Reservation" through "sound administration, ecological, cultural, socioeconomic, and educational methods to ensure that our future generations can continue to enjoy the benefits of those places that are of significant historical, cultural, and of environmental importance."[158]

The Natural Resource Department runs programs related to water resources, water quality, brownfields response, air quality, and invasive species. Invasive species include saltcedar, tall whitetop, and Russian olive, displacing native cottonwoods, willows, and other riparian vegetation along the lower Truckee River.

According to the website, Pyramid Lake itself is known as North America's most beautiful desert lake. "Pyramid Lake was designated as the first National Scenic Byway entirely on an Indian reservation and has recently been named Nevada's first Preserve America Tribal Community. The lake occupies 112,000 surface acres inside the reservation boundary and has a shoreline of approximately 125 miles. The lake has no outlet and is a residual body remaining from the prehistoric Great Lake Lahontan water body that covered most of Northwestern Nevada thousands of years ago."



Figure 65: Endangered Cui-ui Fish

The lake is also home to the Anaho Island National Wildlife Refuge, which supports one of the largest breeding colonies of American white pelicans in North America. In addition, Pyramid Lake and Truckee River provide habitat for the endemic and endangered Cui-ui (in Figure 65) and threatened Lahontan Cutthroat Trout.

Pyramid Lake is home to five different species of fish: Lahontan cutthroat trout, cui-ui, Tahoe sucker, tui chub, and Sacramento perch. Pyramid Lake is the only place on earth where cui-ui can be found. In 2010, Pyramid Lake Fisheries replanted over 700,000 fish in the lake. Since 2006, Desert Terminus Lake Program funds have been used to remodel the Numana, Dunn, and Big Bend fish hatcheries. Pyramid Lake Fisheries microtagged over 120,000 fish for research in 2010. Wildlife includes jackrabbits, which were traditionally netted for food and clothing.

Cultural Resources and Values

Cultural resources can be defined as the "physical evidence or place of past human activity: site, object, landscape, structure; or a site, structure, landscape, object, or natural feature of significance to a group of people traditionally associated with it" (National Park Service 2015). Evidence of long-term human inhabitation of the Truckee Meadow region still exists in

[158] Pyramid Lake Paiute Tribe, "Natural Resources." https://plpt.nsn.us/natural-resources/#:~:text=The%20goal%20of%20the%20Pyramid,the%20Pyramid%20Lake%20Indian%20Reservation.

archaeological sites, including rock art, seasonal camps, and residential communities, and the artifacts that may be found at these sites. The region was part of the territory of the Northern Paiutes, who inhabited and moved between various habitats.

Historic buildings in the city that are older than 50 years and eligible for listing in the National Register of Historic Places also are considered cultural resources and important contributors to the city's character.

Most cultural sites in the city have not been mapped or surveyed, which can lead to the degradation of these sites if they are developed. Private development can degrade archaeological sites because federal and state regulations do not require the protection of cultural resources on private property. Unregulated use of off-road vehicles, mountain bikes, or hiking can also damage archaeological sites.

Hazard Profiles and Vulnerability Assessments

FEMA	**B1.** Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [the City of Sparks]? (Requirement §201.6(c)(2)(i)) **B2.** Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for [the City of Sparks]? (Requirement §201.6(c)(2)(i)) **B3.** Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement 44 CFR 201.6(c)(2)(ii))

This section presents hazard profiles and vulnerability assessments to determine the potential impact of hazards on the PLPT's people, economy, and built and natural environments. The profiles have been streamlined to increase the HMP's effectiveness and usability. Additional details are in the Base Plan.

General

Washoe County has experienced several major disaster declarations that might have affected the PLPT. The County has received 43 major disaster declarations since 05/02/1953, including 10 since the previous HMP update. Table 3 identifies the declarations since 2020 that have affected the Tribe.

Table 69: Major Disaster Declarations in Washoe County since 2020[159]

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard Mitigation Program Declared	Declaration Date	Title
5495	No	No	No	06/12/2024	Fire
5494	No	Yes	Yes	06/11/2024	Fire
5448	No	Yes	Yes	08/14/2022	Fire
5382	No	Yes	Yes	11/07/2020	Fire
5328	No	Yes	Yes	08/15/2020	Fire
5326	No	Yes	Yes	08/03/2020	Fire
5322	No	Yes	Yes	07/21/2020	Fire
5316	No	Yes	Yes	06/27/2020	Fire
4523	Yes	No	No	04/04/2020	Biological (COVID-19)
3443	No	No	No	03/13/2020	Biological (COVID-19)

The hazard profiles and vulnerability assessments contained in this annex represent a considerable amount of work performed by the Mitigation Planning Team (MPT). MPT members ranked hazards using several key considerations, followed by activities to validate hazard analysis results and identify specific risk areas. The Tribal representatives to the MPT identified the following hazards for further assessment. (Refer to the HMP Base Plan for regional risk assessments for moderate- and low-priority hazard profiles.)

- Avalanche and Landslide
- Criminal Acts and Terrorism
- Drought
- Earthquake
- Energy Emergency
- Flood
- Hazardous Materials Incident
- Infectious Disease
- Radiological Waste Transport
- Extreme weathers (Winter Storm, Windstorms, Extreme Heat)
- Transportation Incident
- Volcano
- Wildland Fire

[159] FEMA, "Disaster Declarations for State and Counties." https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

Hazard Ranking Methodology

The hazards identified in the HMP were initially ranked by Pyramid Lake MPT on the provided risk assessment form. A risk assessment result for the entire county does not mean that each participant has the same amount of risk for each hazard. Each plan participant should consider how they are uniquely at risk of the hazards profiled.

Hazards identified as having a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0–2.4 are considered moderate risk hazards. Hazards with a risk factor value of less than 2.0 are considered low risk. The highest possible RF value was 4. Table 30 lists the factors for calculating risk.

Table 70: Factors for Calculating Risk

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Probability *What is the likelihood of the hazard occurring?*	1	Unlikely	Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.	30%
	2	Occasional	1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.	
	3	Likely	11 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years.	
	4	Highly Likely	91 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Magnitude *What will be the overall impact?*	1	Negligible	Less than 5% of the affected area's critical and non-critical facilities and structures are damaged/destroyed. Only minor property damage and minimal disruption of life. Temporary shutdown of critical facilities.	30%
	2	Limited	Greater than 5% and less than 25% of property in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than one day but less than one week.	
	3	Critical	Greater than 25%, but less than 50% of property in the affected area was damaged/destroyed. Complete shutdown of critical facilities for over a week but less than one month.	
	4	Catastrophic	Over 50% of critical and non-critical facilities and infrastructures in the affected area are damaged/destroyed. Complete shutdown of critical facilities for more than one month.	
	1	Self-defined	More than 24 hours	10%

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Onset *How long will be there be between when it is recognized the hazard is approaching and when the hazard will begin affect the community?*	2	Self-defined	12 to 24 hours.	
	3	Self-defined	6 to 12 hours.	
	4	Self-defined	Less than 6 hours.	
Duration *What is the length of time the hazard will remain active, including how long emergency operations will have to continue after the hazard event?*	1	Brief	Up to 6 hours.	10%
	2	Intermediate	Up to one day.	
	3	Extended	Up to one week.	
	4	Prolonged	More than one week.	
Frequency *How often has this kind of hazard resulted in an emergency or disaster?*	1	Every 10+ years	This hazard is not frequent but may still impact the area.	20%
	2	Every 5–10 years	This hazard is not as frequently occurring but it could occur in the next 10 years.	
	3	Every 1–5 years	This hazard is likely to occur relatively often. It may have occurred more or less frequently recently, but on average, it can be expected every 1–5 years.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
	4	Annually	This hazard is a frequent occurrence which the area actively has to respond to on an approximately annual basis.	

The following is the risk factor equation:

Risk Factor Equation

RF Value = [(Probability x .30) + (Magnitude x .30) + (Onset x .10) + (Duration x .10) + (Frequency x .20)]

The Washoe County base plan is comprehensive for regional assessments and effectively addresses the calculated risk indexes. It provides a thorough evaluation that highlights its commitment to risk management and community safety, while the annexes are specific to each jurisdiction.

Table 71: Calculated Priority Risk Index for the Pyramid Lake Paiute Reservation

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Avalanche and Landslide	1	2	4	5	1	No hazard for avalanche; low unless there's fire activity
Criminal Acts and Terrorism	2	2	5	1	4	Low
Drought	4	1	1	5	4	High
Earthquake	4	3	5	5	1	Moderate
Energy Emergency	2	1	5	3	5	High
Flood	4	3	3	5	3	Moderate
Hazardous Materials Incident	2	1	5	5	1	High
Infectious Disease	2	2	3	4	3	Moderate

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Radiological Waste Transport	3	2	3	4	1	High
Extreme weathers (Winter Storm)	2	0	3	3	5	High (all)
Transportation Incident	3	2	2	3	3	Moderate
Volcano	3	2	3	4	1	Low
Wildland Fire	5	3	5	4	5	High
Extreme weather (Windstorm)	2	1	3	2	4	Moderate
Extreme Heat	2	1	3	2	4	Moderate

Note: Radiological waste transport and volcano hazards were not initially ranked by the MPT. In subsequent meetings, these hazards were identified as low probability but potentially high magnitude hazards. Risk assessments for both hazards are included in the basic plan. Avalanche and Landslide (Avalanche) and Transportation Incident (Aircraft Crash) were not identified as hazards for the Tribe.

Wildland Fire

LOCATION

The Tribe's three communities, Sutcliffe, Nixon, and Wadsworth, are in or near areas of moderate to very high wildland fire potential. The fire risk of Sutcliffe is a concern for the Tribe because Sutcliffe is in the Wildland–Urban Interface (WUI). The growth of cheatgrass in burn scars on the ridges west of Sutcliffe also increases the risk of fire in this community. Cheatgrass is highly flammable, and "densely growing populations [of cheatgrass] provide ample, fine-textured fuels that increase fire intensity and often decrease the intervals between fires." The topography of the ridges west of Sutcliffe also increases the risk of fire to the community; a

wildland fire that starts west of Sutcliffe is likely to run down the ridge into the community. The PLPT pre-stages fire trucks at Sutcliffe during the fire season in response to this risk.

Wildland fire potential ranges from moderate to very high along the ridges east and west of Pyramid Lake, and wildland fires can impact recreation at the lake, an important source of revenue for the Tribe, if closures are necessary to protect public safety or if visitors choose not to come to the lake due to smoke or other conditions.

PREVIOUS OCCURRENCES/HISTORY

Two wildland fires affected the Pyramid Lake Reservation between 2019 and 2024:

- **06/11/2024:** A contained fire grew out of control due to a wind shift. The fire briefly closed a portion of SR 447. Power was shut off to the Nixon area, temporarily closing the tribal administration building. [160]
- **07/13/2019:** A lightning-sparked wildfire near Nixon burned 750 acres and closed highways in the area. Firefighters from multiple agencies helped control the fire.[161]

EXTENT

The Pyramid Lake Reservation is primarily rural, with small population centers and ranchlands and farm fields near the WUI. Wildland fires can directly affect Tribal communities, destroying structures and resulting in injuries or deaths. Wildland fires on or near the reservation can also cause economic impacts if the response to incidents requires the Tribe to close the lake to fishing and recreation or if visitation declines.

Wildland fires are frequent and inevitable. In the region, most wildland fires burn from May to October. The PLPT representative to the MPT rated wildland fires as the highest probability fire likely to affect the Tribe, and the Tribe generally experiences the effects of wildland fire every one to three years.

PROBABILITY OF FUTURE OCCURRENCES

Based on projected changes in the timing and quantity of snowmelt and increases in the frequency and magnitude of drought and extreme heat, the Tribe may be impacted by an increase in the probability of future wildland fires.

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[160] 2 News Nevada, "Firefighters Work to Contain Prescribed Burn off SR-447, Power Restored in Nixon Area." https://www.2news.com/news/firefighters-work-to-contain-prescribed-burn-off-sr-447-power-restored-in-nixon-area/article_484b5420-2758-11ef-98df-8f541554f9b6.html

[161] Reno Gazette Journal, "Firefighters Contain 40% of the 7850-acre Wildfire Burning Near Nixon." https://www.rgj.com/story/news/2019/07/13/wildfire-near-nixon-40-contained-750-acres/1723807001/

The Washoe County Fire Plan[162] identified 41 communities included in the risk/hazard assessment for Washoe County. Nearly half of these areas have high and extreme fuel hazard conditions within one mile of the community boundary. In some cases, hazardous fuel conditions occur within the community boundaries. Many of the areas classified as moderate fuel hazards have a large component of cheatgrass. These areas can escalate into high fuel hazard conditions during years with above-normal precipitation and abundant growth of cheatgrass, perennial grass, and annual forbs.

VULNERABILITY

Tribal members and their assets are generally in or near the WUI. The challenges the Tribe faces mitigating wildland fires include residential and commercial properties near vegetation that provide fuel for wildland fires and large burn scars on and near the reservation that highly flammable invasive species like cheatgrass have taken over.

PROPERTY

Six identified critical facilities on the Pyramid Lake Reservation are in areas with very low wildland fire hazard potential.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the Pyramid Lake Paiute Reservation due to wildland fires can be significant and multifaceted. Wildland fires can lead to immediate destruction of land and resources that are critical to the community, including traditional hunting and gathering areas. The loss of wildlife habitats can disrupt the ecosystem, leading to long-term ecological changes that affect food sources and cultural practices tied to the land.

In addition to ecological impacts, wildfires can cause economic losses for the Pyramid Lake Paiute Tribe. These losses may stem from damages to infrastructure, such as community buildings and access roads, which can hinder emergency response efforts, tourism, and local business operations. The costs associated with firefighting efforts, rebuilding, and recovery can place a significant financial burden on the tribe.

The cultural significance of the land cannot be understated. Many areas within the reservation hold historical and spiritual importance for the Pyramid Lake Paiute people. Wildland fires that destroy these areas can also harm the community's cultural heritage and identity. The repercussions of such losses extend beyond economics and ecology, as they can affect the community's social cohesion and mental health, creating a ripple effect of challenges that may persist long after the fires are extinguished.

[162] Washoe County Fire Plan, 2004 Executive Summary – Washoe County Fire Plan – Nevada Community Wildfire Risk/Hazard Assessment – RCI (rci-nv.com)

VULNERABLE POPULATIONS

The Climate and Economic Justice Screening Tool from the U.S. Climate Resilience Toolkit was used to determine what vulnerabilities impacted Washoe County. According to this Tool, which uses 2020 U.S. Census data, Pyramid Lake in Washoe County is identified as one of 27 disadvantaged populations identified by census tract, depending on the portion of the County, because it meets the threshold for more than one of the following categories: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. According to the Climate and Economic Justice Screening Tool.

The Pyramid Lake MPT ranked wildland fire as **High Risk.**

EXISTING MITIGATION CASE STUDY

In burn scars in the Virginia mountain range, the Tribe installed landslide detection and warning devices to address the potential cascading effects of previous fires. The Tribe also educates residents about maintaining defensible space on their properties.

During April 2022, Pyramid Lake Fire Rescue EMS and the Nevada Department of Transportation conducted fuel mitigation burns to burn off heavy fuels along a two-mile stretch of SR-447 south of Nixon in an effort to prevent future wildfires. The burn area was on SR-447 between Dead Ox at mile marker 10 and Little Nixon Road at mile marker 12.

PROPERTY

Six identified critical facilities on the Pyramid Lake Reservation are in areas with very low wildland fire hazard potential.

RECENT DEVELOPMENT TRENDS

- **Economic:** Pyramid Lake Paiute Tribe will receive $29,756,400 in grant funding from the U.S. Department of Transportation to create new outdoor recreation opportunities around Pyramid Lake. The grant funding will help transform an abandoned railroad bed into a safe, sustainable multimodal recreation path for residents and visitors traveling between the tribal communities of Sutcliffe and Nixon at Pyramid Lake and Wadsworth (Increased Vulnerability).
- **Land Use:** Ridge areas south and east of Pyramid Lake, which are part of the 6,357 acres of land transferred to be held in trust for the Tribe under the Nevada Native Nations Land Act of 2016, continue to have moderate to very high potential for wildland fire (Increased Vulnerability).
- **Future Land Use**: No new development is planned in moderate to high fire-risk areas.

See the Base Plan for a complete Risk Exposure.

Energy Emergency

LOCATION

The Pyramid Lake Reservation is in a fringe area of the regional electrical grid. All Tribal properties that rely on the grid for power are vulnerable to power outages. Electrical power from the grid is supplied to the Tribe via one transmission line between the Tracy Clark and Sutcliffe communities.

PREVIOUS OCCURRENCES/HISTORY

Historically, power outages have been caused by natural events and human-caused accidents but have not been recorded in a way that is publicly accessible. Numerous power outages occur every year and may last as short as hours or as long as weeks. In 2015, the single transmission line running over the mountains from the community of Clark to supply power to Sutcliffe and the rest of the reservation (the Tribe's "extension cord") went down during a winter storm. The power outage caused by the storm lasted for about four days and affected the entire reservation. The outage occurred at an isolated and difficult-to-access point along the mountain transmission line route. The power provider used snowcats to access this point, which had difficulty passing muddy parts of the access road. These access issues delayed the repair of the line and contributed to the length of the power outage.

Interruptions in energy services may also be planned—for example, to allow for system repairs or maintenance. In 2019, NV Energy began implementing extensive public safety outage management programs in areas with extreme fire risks. To prevent downed power lines and damaged equipment from causing fires, NV Energy may de-energize parts of the electrical grid during weather conditions conducive to wildland fires (e.g., high temperatures, low humidity, high winds, lightning storms) or based on field observations or information from first responders (NV Energy 2019). Planned outages by NV Energy or Pacific Gas and Electric Company (PG&E) in California can affect fuel availability for the Tribe. Outages affecting PG&E's system would cut power to the equipment that controls the operation of the fuel pipeline serving the region.

EXTENT

It is difficult to predict the impacts of future energy emergencies, but they can impact all Tribal government and business operations, cause extensive economic losses, and increase the need for emergency medical care, among other impacts. Due to the sporadic nature of power outages and other energy emergencies, it is also difficult to estimate how frequently these emergencies will occur or their duration. The Tribe generally deals with power outages multiple times per year, with many of them only lasting a matter of hours. A large power outage is experienced every several years, primarily due to winter storms.

PROBABILITY OF FUTURE OCCURRENCES

The Tribe is not planning significant areas of new development and has been working to install solar arrays on the reservation to reduce its vulnerability to power outages. A transfer switch will have to be installed to ensure that the Tribe's solar arrays can continue to provide power if the transmission line to the reservation goes down. Based on these factors, a transfer switch may decrease the reservation's probability of longer power outages.

VULNERABILITY

A lack of redundancy in the power system presents a clear risk to Tribal members, businesses, and government operations due to the Tribe's reliance on a single transmission line that traverses remote, difficult terrain. An outage along this line affects the entire reservation, including the Tribal office, clinic, and emergency services, which have to shut down fully or partially during outages. There are few backup power generators on the installation, so Tribal elders and those dependent on medical equipment are especially vulnerable to power outages. The Tribe is taking measures to address this vulnerability through the mitigation actions outlined in Chapter 5.

The Pyramid Lake Paiute Reservation ranked energy emergency as **High Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the Pyramid Lake Paiute Reservation due to energy emergencies can be significant and multifaceted. Energy emergencies, such as fluctuations in power supply, extreme weather events affecting energy infrastructure, or disruptions in fuel supply lines, can lead to essential services being compromised. This could affect heating, cooling, and power for homes, healthcare facilities, and community centers.

In addition to immediate health and safety risks, energy disruptions could have broader economic consequences for the reservation. Many businesses rely on a stable energy supply to operate, and interruptions could lead to lost revenue and potential job losses. Traditional practices, such as fishing and hunting, could also be impacted if energy shortages affect water management or environmental conditions.

Furthermore, the cultural and social fabric of the community could be strained during energy emergencies. Access to information and communication systems may be disrupted, leading to challenges in coordination and response efforts. The reliance on modern energy systems for education, community activities, and cultural events further underscores the potential for long-lasting negative consequences.

VULNERABLE POPULATIONS

On the Pyramid Lake Paiute Reservation, certain populations are particularly vulnerable to energy emergencies due to various factors. Elderly residents often face significant challenges during power outages, as many rely on electricity for medical equipment, heating, and cooling. This demographic may also have limited mobility, making it more difficult for them to seek alternative resources during emergencies.

Low-income families are another group at risk. When energy emergencies occur, these households may struggle to absorb the financial shock, as they often have tight budgets and limited access to backup power sources. The inability to afford alternative heating options during cold spells or the extra costs associated with restoring power can create severe challenges for them.

Individuals with disabilities represent a significant vulnerable population as well. Many depend on electricity for essential medical devices, mobility aids, and adaptive technologies. Energy disruptions can severely impact their quality of life and may even pose health risks. Likewise, households with children may face heightened stress during energy emergencies, as young children are more susceptible to health risks associated with extreme temperatures and lack of basic services.

Single-parent households also encounter unique challenges in energy emergencies. Managing children and household responsibilities can become overwhelming when faced with power outages, especially without additional support from family or community resources. Furthermore, outdoor workers who depend on electricity for their jobs may experience both health risks and economic hardships during these emergencies, as their livelihood can be directly affected.

RECENT DEVELOPMENT TRENDS

- **Economic:** The Tribe has outlined mitigation actions to address electricity redundancy and decrease reliance on surrounding utilities (Decreased Vulnerability).
- **Land Use:** Construction of the planned community center will increase the overall demand for electric power (Increased Vulnerability).
- **Future Land Use:** The Tribe will continue to invest in renewable energy projects as resources become available to reduce its vulnerability to power outages.

Extreme weathers (Windstorm)

LOCATION

Extreme wind events are experienced in every region of the United States. A useful tool for determining the location of the extreme wind hazard area in a jurisdiction is depicted in Figure 66**.** This map of design windspeeds was developed by the American Society of Civil Engineers. It divides the United States into four wind zones, geographically representing the frequency and magnitude of potential extreme wind events. The figure shows that Washoe County and its jurisdictions are in Zone I, with a design windspeed for shelters of 130 miles per hour. Windstorms may occur anywhere in Washoe County. Properties with aboveground infrastructure, utilities, and tree stands may be more damaged during windstorms.

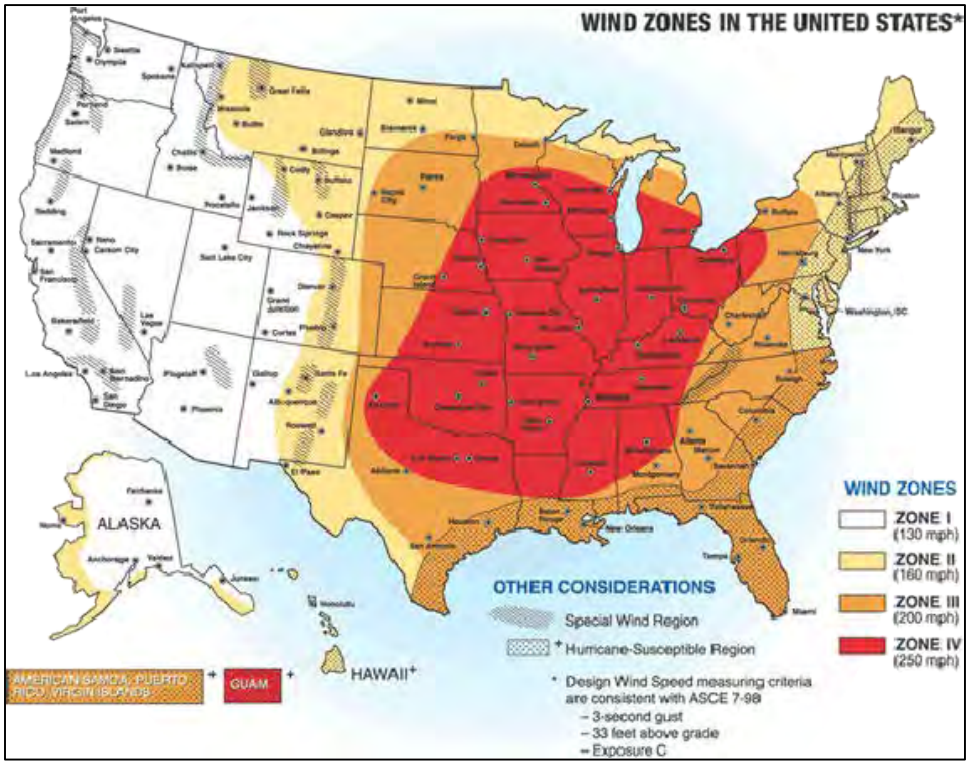

Figure 66: Wind Zones in the United States[163]

Windspeeds in Washoe County can reach high levels. In 2016, Reno was ranked as the second windiest city in the United States, and Reno has reported record-high wind gusts exceeding 80 mph.[164] Daily wind speeds were obtained from NOAA's online climate database for Washoe

[163] Resilient Action Fund, FEMA, 2022, "Wind Zones in the United States." U.S. Wind Zones Map Resilience Action Fund (buildingresilient.com)

[164] Reno Gazette Journal, "Reno Second-Windiest City in the U.S. in 2016." https://www.rgj.com/story/news/2017/01/17/reno-second-windiest-city-us-2016/96675108/

County from 2015 through 2018.[165]The data suggest that the windiest months in Washoe County are April through June. Average daily wind- speeds from 2015 to 2018 for the months of April through June ranged from 6.09 to 7.50 mph.

PREVIOUS OCCURRENCES/HISTORY

NOAA's NCEI Storm Events Database records 170 events of high wind, strong wind, and thunderstorm wind in Washoe County between 2019 and 2023. No deaths, no injuries, $5K in property damage, and $250 in crop damage were identified in the database.

The 2018 State of Nevada Enhanced HMP complied weather-related incidents and reported deaths or damage from 1995 to 2016 using data from the National Weather Service. During this period, there were over 500 incidents of high wind that accompanied winter storms, resulting in two deaths and over $7 million in damage. In addition, there were 25 reported incidents of dust storms and an associated hazard of windstorms, which led to 19 injuries and $240,000 in damage. Figure 67 illustrates how damaging high winds can be.



Figure 67: NWS Reno Radar Damage from Wind, December 2008[166]

[165] Washoe County, "Regional-HMP-2020.pdf." https://www.washoecounty.gov/em/files/Regional-HMP-2020.pdf

[166]2020 Washoe County Regional HMP, National Weather Service-Reno, Chris Smallcomb, "NWS Reno December 2008 Radar Damage from Wind."

EXTENT

Extreme wind can occur alone, such as during straight-line wind events and derechos, or it can accompany other natural hazards, including snowstorms, blizzards, and severe thunderstorms. Severe wind threatens lives, property, and vital utilities, primarily because of the effects of flying debris or downed trees and power lines. Severe wind will typically cause the greatest damage to the structures of light construction, particularly manufactured homes. Table 73 shows is the Beaufort scale of severe wind hazards and represents one measure of the magnitude or severity of the wind hazard.

Table 72: Beaufort Scale of Severe Wind Hazard[167]

Beaufort Number	Wind Speed (miles per hour)	Description	Wind Effects on Land
0	<1	Calm	Calm, smoke rises vertically.
1	1–3	Light Air	Wind motion visible in smoke.
2	4–7	Light Breeze	Wind felt on exposed skin. Leaves rustle.
3	8–12	Gentle Breeze	Leaves and smaller twigs in constant motion.
4	13–18	Moderate Breeze	Dust and loose paper are raised. Small branches begin to move.
5	19–24	Fresh Breeze	Small trees begin to sway.
6	25–31	Strong Breeze	Large branches are in motion. Whistling is heard in overhead wires. Umbrella use is difficult.
7	32–38	Near Gale	Whole trees in motion. Some difficulty experienced walking into the wind.
8	39–46	Gale	Twigs and small branches break from trees. Cars veer on the road.
9	47–54	Strong Gale	Larger branches break from trees. Light structural damage.
10	55–63	Storm	Trees broken and uprooted. Considerable structural damage.
11	64-72	Violent Storm	Widespread damage to structures and vegetation.
12	>73	Hurricane	Considerable and widespread damage to structures and vegetation. Violence.

[167] NOAA, 2024, "Beaufort Scale of Severe Wind Hazard." Beaufort Wind Scale (weather.gov)

PROBABILITY OF FUTURE OCCURRENCES

The probability of windstorms is High, based on the number of occurrences recorded in NCEI. There is no reliable data on whether Nevada windstorms will increase or decrease in frequency and intensity in the coming decades due to climate change.

VULNERABILITY

Most vulnerabilities to windstorms occur in the built environment. Buildings, utilities, and transportation systems are vulnerable to wind damage. Old or poorly constructed buildings or insufficiently anchored manufactured homes are more vulnerable to strong winds and can be heavily damaged. Uprooted and fallen trees can damage aboveground power and other utility lines and can block roads, railways, or other transportation networks. Windstorms can also generate storm-related debris that can be costly and time-consuming to clear. Building damage and service interruptions also cause economic losses from business interruptions.

Falling trees or blowing debris can cause injuries or death. Power outages and transportation disruptions can also negatively impact populations.

The Pyramid Lake Paiute Reservation ranked windstorms as **High Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

Windstorms can have significant impacts on the Pyramid Lake Paiute Reservation, affecting both the environment and local communities. One of the primary concerns is the damage to infrastructure, such as roads, buildings, and utility lines. High winds can lead to fallen trees and debris, which can obstruct access roads and disrupt power and communication services. The costs associated with repairing this infrastructure can be substantial, straining the reservation's financial resources.

Additionally, windstorms can impact the local ecosystem. Strong winds can exacerbate soil erosion, especially in areas that are already vulnerable. This erosion can lead to the loss of arable land, affecting agricultural activities and food security for the community. Moreover, windstorms can disturb wildlife habitats, leading to a decline in local biodiversity, which is vital for maintaining the ecological balance of the region.

The economic implications of windstorms are also concerning. Damage to homes and businesses can result in financial losses for residents, while a potential decline in tourism—especially if natural attractions are affected—can compromise the economic stability of the reservation. Overall, the cumulative effects of windstorms can lead to long-term challenges for the Pyramid Lake Paiute Reservation, impacting both its infrastructure and the well-being of its community.

VULNERABLE POPULATIONS

On the Pyramid Lake Paiute Reservation in Nevada, several populations are particularly vulnerable to severe windstorms. Among these, elderly residents may face the greatest risks. Many older adults experience mobility challenges and health-related issues, making it difficult for them to seek shelter or evacuate quickly during sudden storms. Their reliance on assistance from family or community members can also leave them exposed if support is not readily available.

Children represent another vulnerable group during severe windstorms. Those who are young and may not have adult supervision can find themselves in precarious situations if they are unable to understand the dangers or take appropriate safety measures.

Low-income families can also be at heightened risk, as they may live in housing that is not adequately prepared to withstand severe weather. Limited resources can prevent these households from making necessary home improvements or evacuating to safer locations during a storm, leaving them more exposed to the elements. Likewise, individuals with disabilities may require specialized support during emergencies, making them particularly vulnerable if help is not accessible.

Additionally, homeless individuals face significant dangers during windstorms, as they lack stable housing and safe shelter options. They may be unable to protect themselves from high winds and debris, which poses serious health risks. Finally, tourists and visitors to the reservation may not be familiar with the area or the potential severity of windstorms, making them vulnerable as they may not know where to seek safety.

RECENT DEVELOPMENT TRENDS

- **Economic:** Increased regional economic development continues to increase the potential for disruptions during and after severe weather events (Increased Vulnerability).
- **Land Use:** The County's upward trend in development increases the overall strain on responding to winter storm impacts at various locations (Increased Vulnerability).
- **Future Land Use:** Future development in more remote areas of the County may increase the cost of responding to snowstorms and increase the risk to residents, particularly the elderly or those with medical conditions.

Earthquake

LOCATION

The Pyramid Lake Reservation overlies a major fault, the Pyramid Lake Fault Zone, and multiple smaller faults, one of which runs beneath the lake. Another fault lies below the community of Nixon.

During an earthquake, the developed areas of the reservation may experience severe seismic ground motion hazards. These hazards are summarized below for different areas of the reservation:

- Areas of the reservation north and east of Pyramid Lake – May experience peak ground acceleration with a 2% probability of exceedance in 50 years of between 32% and 48% gravity, which would be experienced as very strong to severe shaking capable of causing moderate to heavy damage.
- Areas of the reservation west of Pyramid Lake between Sutcliffe and Wizard Cove, the western half of Sutcliffe, Nixon, and Wadsworth – May experience peak ground acceleration with a 2% probability of exceedance in 50 years of between 48 and 64% gravity, which would be experienced as severe shaking capable of causing moderate to heavy damage.
- The eastern half of Sutcliffe and most of the lake's eastern shoreline south of Sutcliffe – May experience peak ground acceleration with a 2% probability of exceedance in 50 years of over 64% gravity, which would be experienced as violent shaking with the potential to cause heavy damage.

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- The eastern half of Sutcliffe and most of the lake's eastern shoreline south of Sutcliffe – May experience peak ground acceleration with a 2% probability of exceedance in 50 years of over 64% gravity, which would be experienced as violent shaking with the potential to cause heavy damage.

Seismic ground motion hazards on the reservation are shown in the Base Plan.

PREVIOUS OCCURRENCES/HISTORY

The Base Plan includes information on previous major earthquakes in Washoe County with magnitudes greater than five on the Modified Mercalli Intensity Scale. Shaking from these earthquakes would have been felt on the Pyramid Lake Reservation and might have caused structural damage.

Members of the PLPT planning team reported multiple small earthquakes, magnitude 2 or less, on the fault running below Pyramid Lake in the past year.

While buildings survived the shock well overall, reports indicated that the violent rocking caused some structural damage, such as cracked paint and plaster along drywall seams, wall and ceiling corners, and doors and entryways.

EXTENT

A major earthquake can cause widespread and significant damage to structures on the Pyramid Lake Reservation, injuries, and deaths. Because of their potential to damage structures, roads, and utilities, earthquakes may disrupt government operations and the local economy for days to weeks, require evacuations, or create increased demand for emergency medical services. Response to and recovery from an earthquake may require federal support. In the last 150 years, 17 earthquakes with a magnitude greater than five on the Modified Mercalli Intensity Scale have occurred in Washoe County.

PROBABILITY OF FUTURE OCCURRENCES

Seventeen earthquakes with a magnitude greater than five on the Modified Mercalli Intensity Scale have occurred in Washoe County in the last 150 years. The probability of occurrence can be estimated at 10%, meaning there is roughly a 10% chance of an earthquake with magnitude >5 to occur every year. Climate, economic, and land use trends do not affect the probability of an earthquake; however, economic trends and land use patterns can affect the amount of damage caused by an earthquake. While the Tribe is not planning significant areas for new development, the increasing age of Tribal buildings increases the probability that future earthquakes will damage structures, roads, and utilities.

VULNERABILITY

None of the Tribal buildings or residences on the reservation have been retrofitted to meet seismic standards. Because of their age, it would be more cost-effective for the Tribe to demolish them and construct new facilities to meet seismic standards.

A large earthquake centered below Pyramid Lake could cause a seiche. No studies have been completed to determine which areas of the reservation may be impacted by a seiche, so the Tribe's level of vulnerability to this hazard is unknown.

The Paiute Pipeline, which carries gasoline, diesel, and jet fuel, runs through Dodge Flats and crosses the southern part of the reservation to meet Interstate 80. An earthquake centered on or near the reservation could damage the pipeline and cause additional impacts on the reservation.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the Pyramid Lake Paiute Reservation due to earthquakes can be significant, given the area's geological characteristics. Located in northwestern Nevada, the region is susceptible to seismic activity, which poses risks to both infrastructure and the community. Potential impacts include damage to buildings, roads, and utilities, which could disrupt essential services like water supply and electricity.

Additionally, the economic consequences could be substantial. Damage to local businesses and homes may lead to loss of income and increased repair costs. The reservation's cultural sites may also face risks from earthquakes, potentially leading to loss of heritage and community identity. Emergency response and recovery efforts could strain limited resources, highlighting the importance of preparedness and mitigation strategies to safeguard the community and its assets.

On a broader scale, the psychological impacts on residents, including stress and anxiety related to seismic threats, could further affect the community's well-being. Implementing early warning systems and conducting regular safety drills could help minimize these impacts and enhance resilience against future earthquakes.

VULNERABLE POPULATIONS

On the Pyramid Lake Paiute Reservation, several populations may be particularly vulnerable to the impacts of earthquakes. One of the most at-risk groups includes elderly individuals. They often face mobility issues and health conditions that could be exacerbated during such an emergency. The presence of limited mobility can hinder their ability to evacuate quickly or seek assistance when needed, making them more susceptible to harm.

Children constitute another vulnerable population. Their reliance on adults for supervision and support means that during an earthquake, their safety can be compromised if caregivers are unprepared. Ensuring a safe environment for children during emergencies is crucial, as they may not fully understand the dangers or have the capacity to respond appropriately.

Individuals with disabilities are also at high risk. Individuals with physical or cognitive disabilities may face significant challenges during evacuations or in the chaos that often accompanies an earthquake. This population requires tailored emergency procedures to ensure their safety and well-being during such events.

Low-income families on the reservation may also face additional vulnerabilities. Economic constraints can limit access to safe housing and resources for emergency preparedness, leaving these families at heightened risk during natural disasters. Without effective means of safeguarding their homes, they may not be as prepared for an earthquake when it strikes.

Lastly, tourists and visitors to the reservation are often unfamiliar with the area and its emergency protocols, which can put them in a precarious situation during an earthquake. Their

lack of knowledge about evacuation routes and safety measures can heighten their vulnerability.

PROPERTY

- Four critical facilities on the reservation, including the Pyramid Health Center, two schools, and one dam, are in areas vulnerable to seismic ground motion hazards, with a 2% probability of being exceeded in 50 years of between 48% and 64% gravity. This level of ground shaking would be experienced as severe shaking, with the potential to cause moderate to heavy damage.
- Two schools on the reservation are in areas vulnerable to seismic ground motion hazards, with a 2% probability of being exceeded in 50 years of greater than 64% gravity. This level of shaking would be experienced as violent shaking, with the potential to cause heavy damage.
- All of the identified critical facilities on the reservation are in areas vulnerable to seismic ground motion hazards, with a 10% probability of being exceeded in 50 years of 32% to 48% gravity. This level of shaking would be experienced as very strong to severe, capable of producing moderate to heavy damage.

The Pyramid Lake Paiute Reservation ranked earthquakes as a **Moderate Risk.**

RECENT DEVELOPMENT TRENDS

- **Economic:** Limited economic development has occurred in the past five years (Unchanged Vulnerability).
- **Land Use:** Construction of the proposed community center outside Wadsworth may increase the Tribe's vulnerability to earthquakes if this facility is not constructed to current seismic standards (Increased Vulnerability).
- **Future Land Use:** Future development on the reservation would be vulnerable to damage from earthquakes and secondary hazards, such as seiches.

Flood

LOCATION

The final segment of the lower Truckee River Basin lies below Wadsworth and includes a 25-mile-long broad alluvial valley stretching to Pyramid Lake. Floodplains in the Pyramid Lake Reservation have not been mapped; however, the PLPT is at risk of riverine flooding in low-lying areas along the Truckee River and the immediate shoreline of the lake. The Tribe also experiences the effects of localized flooding caused by heavy rains that flood irrigation canals and creeks or cause sheet flows across burn scars from recent wildland fires or other areas with little vegetation. Creeks impacted by recent wildland fires, including Rodero Creek, Hardscrabble Creek, Anderson Creek, and Mullens Creek, are particularly at risk of flash

flooding. An alluvial fan south of Sutcliffe is also prone to flooding, and flooding in this area can cut off access to Sutcliffe from the south due to debris or damage to Highway 446.

In 2019, the water level in Pyramid Lake rose by about 3 feet. While there is room for water levels to increase further before the Tribe experiences any impacts, higher water levels are eroding a section of the shoreline near Sutcliffe RV Park and a fish hatchery—two of the Tribe's economic enterprises. Continued erosion near Sutcliffe is a concern for the Tribe. Flooding in Pyramid Lake can also destroy docks and other infrastructure on the water that supports recreational use of the lake, resulting in economic impacts on the Tribe.

PREVIOUS OCCURRENCES/HISTORY

The PLPT planning team contributed the following information on recent floods affecting the reservation. This serves as additional information on past flooding that might have affected the Pyramid Lake Reservation, listed in the Base Plan.

There has been no additional flooding since the previous plan.

In 2017, the Truckee River and streams flowing into Pyramid Lake flooded. Flows in the Truckee River reached several feet above flood stage, affecting areas of Wadsworth and Nixon south of Pyramid Lake. The Tribe avoided some impacts by sandbagging around areas expected to flood; however, several residential areas needed to be evacuated, and ranchlands and farm fields were inundated. The affected agricultural regions were out of use for a long time, which resulted in an extended economic impact on Tribal farmers and ranchers.

Creeks on the lake's western side "turned into rivers" during the flooding. Homes in Sutcliffe that sit on Hardscrabble Creek had to be evacuated, and the alluvial fan south of Sutcliffe flooded, which caused power and water service outages and washed out Highway 446 from its junction with Highway 445 south to Popcorn Rock, cutting off access to Sutcliffe from reservation communities to the south at times. For a week, Tribal staff transported water from nearby water systems to Sutcliffe for residents' use while temporary repairs were being completed. The Tribe's Emergency Services/Fire Department also pre-positioned a mobile clinic to help homebound patients in Sutcliffe while roads were impassible.

The 2017 flooding significantly affected roads throughout the reservation. As noted above, a portion of Highway 446 was washed out, and the community of Sutcliffe could only be accessed from Wadsworth and Nixon by detouring south on Highway 447, then taking Interstate 80 to Reno and Highway 445 north to Sutcliffe. The highway was shut down for about a year, isolating this part of the reservation and affecting truck traffic through Washoe County. Two families on County land (Big Canyon and Raven Ranch) north of Sutcliffe were also cut off when Highway 446 was washed out and had to be evacuated by helicopter.

The 2017 flooding resulted in economic impacts on the Tribe that are still being felt two years later. As a result of the flooding, the Tribe had to shut down recreational use of the lake during

the prime fishing season, which affected revenues from fishing permits. Flooding washed out roads, beaches, and docks along the lake, affecting recreational access, and areas of the shoreline are still closed where access has been blocked by boulders. The Tribe does not have funding to restore access to these areas. Two docks in Sutcliffe and on the lake's southern end also have not been replaced.

In 2018, flash floods occurred along the lake's western shoreline and temporarily covered Highway 445 with mud and debris. Surface flow flooding from the burn scar from the Perry fire, which burned 51,386 acres in the Pah Rah range, also affected Tribal lands in 2018.

EXTENT

Severe floods may cause serious injuries and deaths and damage public facilities and private property. The river's height can determine the extent of flooding flows compared with flood stages determined by U.S. Geological Survey stream gauges throughout the area. Past damage from flooding can also be measured.

PROBABILITY OF FUTURE OCCURRENCES

The PLPT may experience limited, localized flooding on an annual basis. Major riverine floods occur approximately once a decade, and major alluvial fan floods occur approximately once every 20 years.

VULNERABILITY

Most flooding near Tribal properties results in the washout or flooding of roadways and infrastructure in the floodway, such as culverts or docks. Following a flood, damage to infrastructure can severely disrupt the Tribe by damaging utilities, impacting the recreational use of Pyramid Lake, or cutting communities off from one another. For example, Sutcliffe was isolated from Nixon and Wadsworth following the 2017 floods. Vulnerable members of the Tribe, such as the elderly and those with medical conditions, are at an increased risk if roadways are closed following a flood and access to emergency medical services is restricted. In addition, homes and businesses on the reservation, particularly in Sutcliffe, are at risk of flood damage.

None of the identified critical facilities on the Pyramid Lake Reservation are in the 100-year or 500-year flood zones.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the Pyramid Lake Paiute Reservation due to floods can be significant and multifaceted. Flooding can cause damage to infrastructure, including roads, buildings, and utilities, disrupting daily life and essential services for the community. The reservation's economic activities, particularly those reliant on natural resources like fishing and tourism, could suffer detrimental effects. Flooding can lead to

erosion, water quality degradation, and habitat destruction, impacting the local wildlife and the cultural practices tied to these resources.

Additionally, the financial burden of recovery and rebuilding after a flood can be substantial. Emergency response costs, repairs, and potential loss of revenue from tourism or other activities can strain the limited resources of the reservation. Furthermore, the psychological impacts on residents, including stress and displacement, can affect overall well-being and community cohesion. Long-term strategies for flood management and climate adaptation may be required to mitigate these impacts and protect the reservation's future.

VULNERABLE POPULATIONS

Vulnerable members of the Tribe, such as the elderly and those with medical conditions, are at an increased risk if roadways are closed following a flood and access to emergency medical services is restricted. In addition, homes and businesses on the reservation, particularly those in Sutcliffe, are at risk of flood damage.

The Pyramid Lake Paiute Reservation ranked flooding as **Moderate Risk.**

EXISTING MITIGATION CASE STUDY

The 2017 flood events and 2018 high Truckee River flows exposed several streambanks to erosion. The Tribe received FEMA grant funding to conduct preliminary engineering reports (PERs) for 13 high-priority streambanks identified in 2017 and 2018. CP Construction and JUB Engineering are currently completing the PERs. Once the PERs are completed, the Tribe will seek funding to complete the streambank protection construction according to the design specifications contained in the PERs.[168]

TRUCKEE RIVER FLOOD MANAGEMENT MITIGATION STUDY GRANT

The Truckee River Flood Management Authority (TRFMA), an organization created by a 2011 interlocal agreement among the Cities of Reno and Sparks and Washoe County, Nevada, is proposing to develop the Truckee River Flood Management Project in Reno and Sparks, which project can increase flood flows in the lower Truckee River, including on and in the Pyramid Lake Paiute Indian Reservation.

The Truckee River Flood Management Project, which will impact the Tribe and the Reservation, has agreed to award the Tribe a grant of up to $90,000 for the Tribe to undertake a hydrologic study and other studies to determine necessary mitigation projects on the Reservation ("TRFMA Mitigation Study Grant Agreement"). The Tribe will use information from these studies to negotiate a Mitigation Fund from TRFMA to pay for Truckee Riverbank restoration and other flood mitigation projects at the sole discretion and direction of the Tribe.

[168] PLPT, 2024, Natural Resources – Pyramid Lake Paiute Tribe (plpt.nsn.us)

RECENT DEVELOPMENT TRENDS

- **Economic**: The Truckee River Flood Management Authority, a joint powers authority created under an Interlocal Cooperative Agreement among Washoe County, the City of Reno, and the City of Sparks, is continuing to implement the Truckee River Flood Management Project by constructing, maintaining, and operating infrastructure designed to reduce flooding risks. However, this mitigation action has caused downstream flooding on Pyramid Lake, the PLPT reservation, and the fisheries (Increased Vulnerability).
- **Land Use**: Areas targeted for new development are generally outside mapped floodplains. The County requires the potential impacts of new floodplain development to be mitigated to avoid downstream flooding impacts (Increased Vulnerability).

  Lands transferred to be held in trust for the Pyramid Lake Paiute Tribe under the Nevada Native Nations Land Act are not at a significant risk of riverine flooding. However, these parcels may be at risk of sheet flow or flash flooding, especially following wildland fires (Increased Vulnerability).
- **Future Land Use:** The Tribe's planned community center would not be in known floodplains.

Extreme weathers (Winter Storm)

LOCATION

High elevations in the western portion of Washoe County experience the effects of winter storms, often snowstorms, with greater frequency than the rest of the County. Locations often affected by snowstorms include Mt. Rose Highway, Incline Village, Mt. Peavine, and I-80 near the County's border with California. [169] The National Gridded Snowfall Analysis estimates snowfall through several remote observation networks. Figure 68 Shows the seasonal snow accumulation as of March 28, 2023, a boom year for snow in the Sierra Nevada.

[169] National Operational Hydrologic Remote Sensing Center, NOHRSC Interactive Snow Information (noaa.gov)

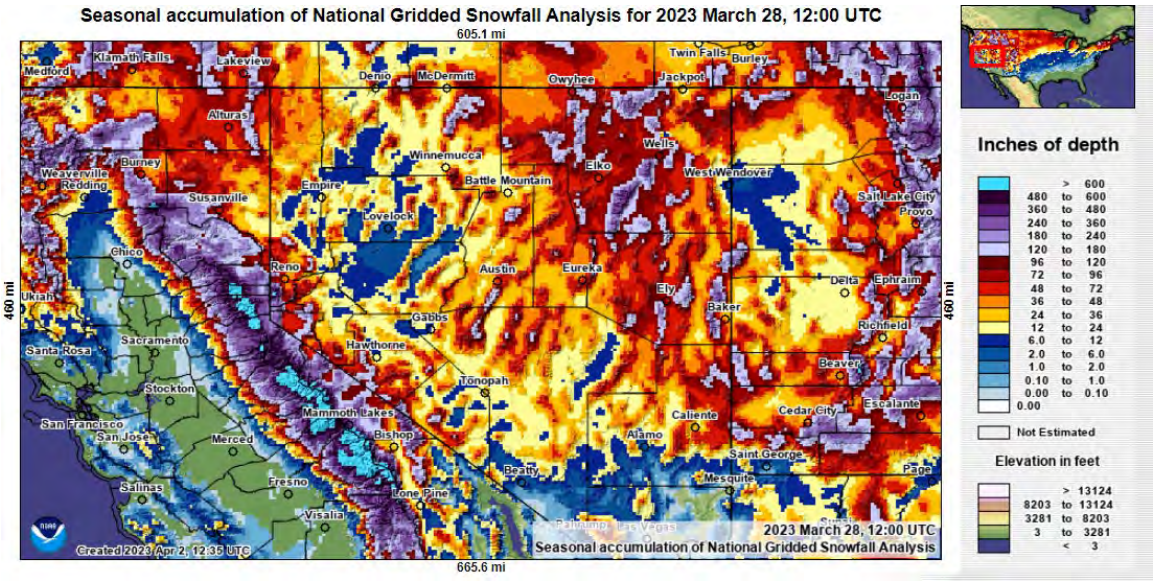

Figure 68: Seasonal National Gridded Snowfall Analysis, March 28, 2023

PREVIOUS OCCURRENCES/HISTORY

NOAA's NCEI Storm Events Database records 142 Winter Weather, Winter Storms, and Heavy Snow events in Washoe County between 2019 and 2023. No deaths, three injuries, $8M in property damage, and no crop damage were identified in the database.

The FEMA website (www.fema.gov/disasters) shows that FEMA made two major disaster declarations due to Extreme weathers in the State of Nevada since the initial plan was prepared in 2010 (See Table 74, Figure 69, and Figure 70).

Table 73: FEMA Extreme weather Declarations, 2010–2023[170]

#	Declaration Type	Event	Incident Period	Eligible Assistance for Washoe County
DR-4307	Major Disaster Declaration	Severe Winter Storms, Flooding, Mudslides	February 5–22, 2017	Public Assistance
DR-4303	Major Disaster Declaration	Severe Winter Storms, Flooding, Mudslides	January 5–14, 2017	Public Assistance

[170] FEMA, 2024, "FEMA Severe Storms Declarations, 2010-2023." Designated Areas | FEMA.gov

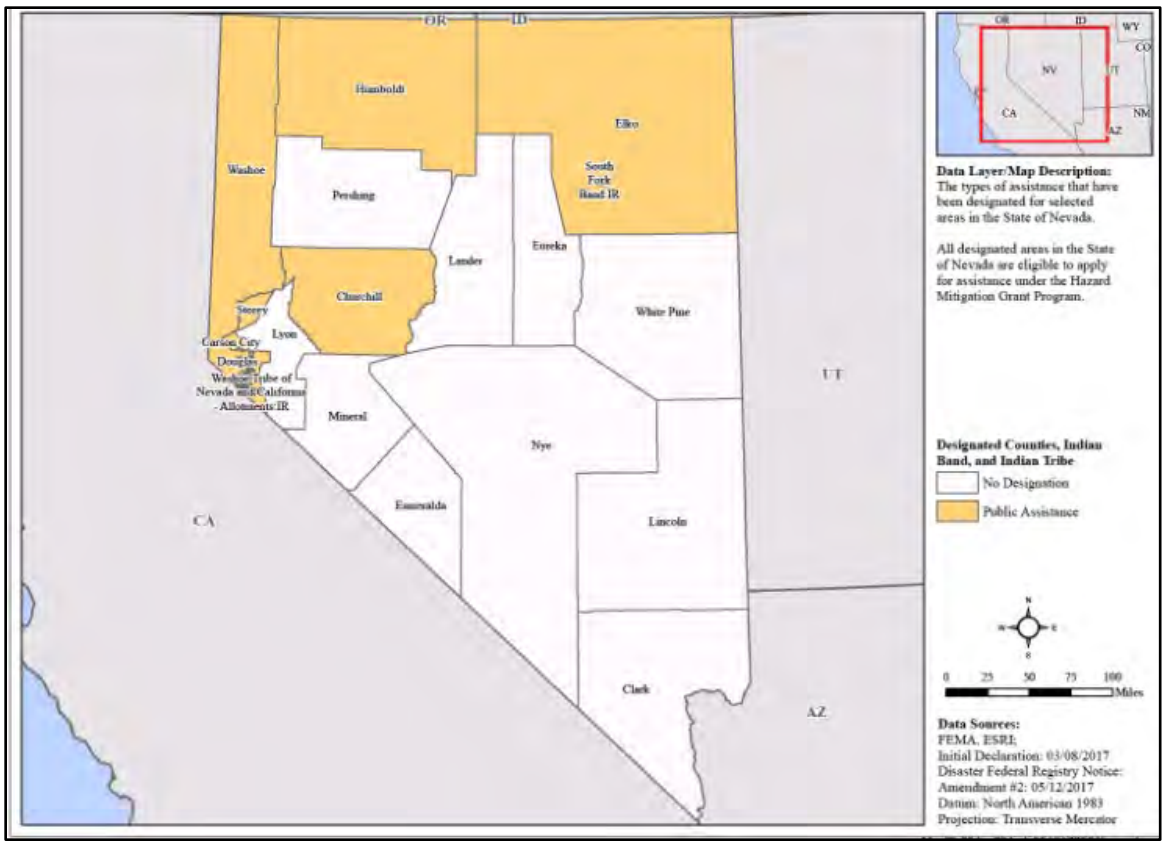

Figure 69: FEMA 4307-DR, Nevada Disaster Declaration as of 5/12/2017[171]

[171] FEMA, 2024, "FEMA 4307, Nevada Disaster Declaration as of 5/12/2017." Designated Areas | FEMA.gov

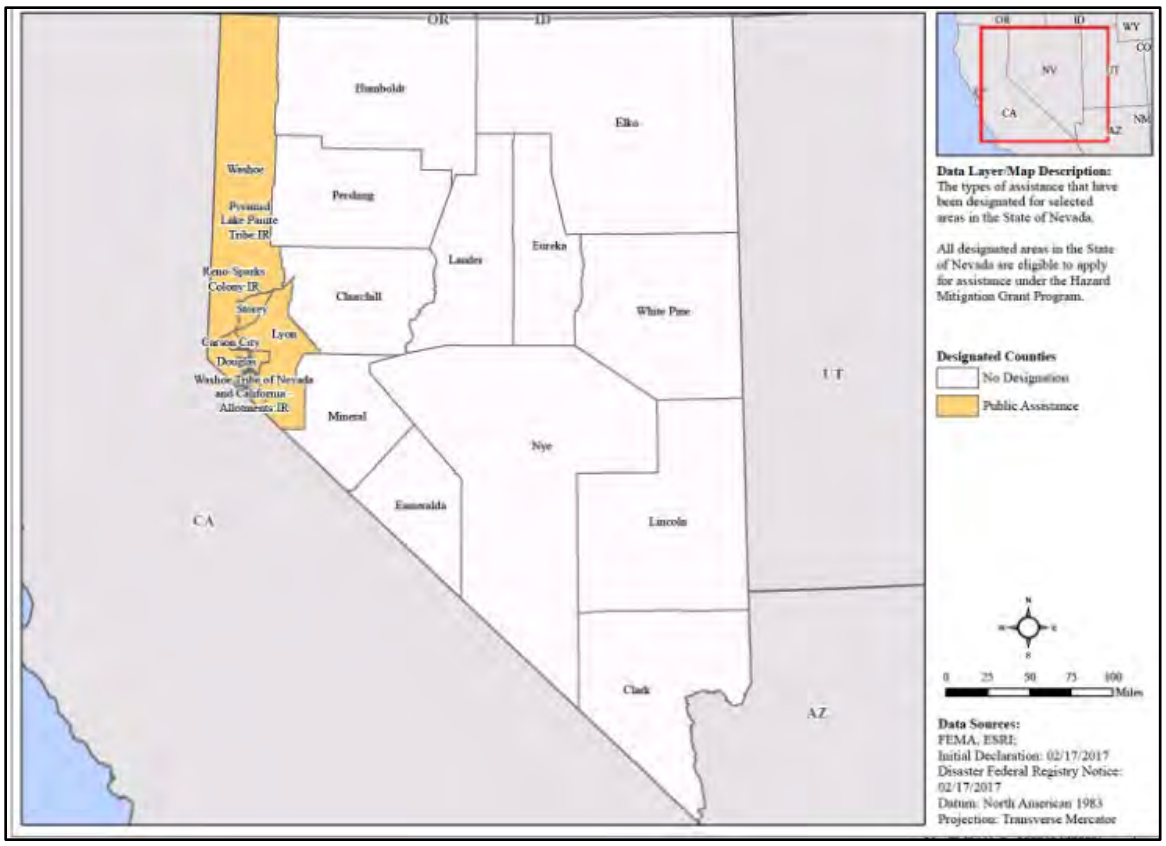

Figure 70: FEMA 4303-DR, Nevada Disaster Declaration as of 2/17/2017[172]

Historical snowfall data in Washoe County were extracted from the National Oceanic and Atmospheric Administration's (NOAA's) online climate database covering the years 2015–2023. During this period, the average daily snowfall in the winter months ranged from 0.16 to 0.28 inches, with the highest snowfall generally occurring in February.

The 2018 State of Nevada Enhanced HMP lists the following severe winter storms occurring in Washoe County over the past 15 years:

- **December 29, 2004–January 10, 2005**: Severe winter storm in Northern Nevada, prompting FEMA to designate 16 counties for federal funding to alleviate the cost of emergency protective measures.
- **February 25, 2011**: Winter storm with up 18 inches of snow and 50 mph winds, causing multiple auto accidents, two injuries, and roughly $250,000 in damage.
- **January 13–14, 2013**: Prolonged winter temperatures led Governor Sandoval to declare a state of emergency, and subzero temperatures were responsible for deaths across the state, including in Reno.

[172] FEMA, 2024, "FEMA 4303, Nevada Disaster Declaration as of 2/17/2017." Designated Areas | FEMA.gov

- **November 9–10, 2015**: A severe winter storm downed power lines because of heavy, wet snow, and over 35,000 customers were without power in Washoe County.
- **January 30–31, 2016**: Snow totals of 4 to 8 inches around the Reno-Sparks area and areas in and near the foothills west of Reno received 8 to 10 inches of snow. Whiteout conditions occurred because of heavy lake-effect snow off Pyramid Lake.

RECENT WINTER STORM EVENTS

- **February 22, 2022:** Another inside slider tracked through the region with more snow and wind. This inside slider-type system moved into the area late Sunday through Tuesday. It brought periods of snow showers, increased wind, travel difficulties, and much lower temperatures to the region through Wednesday night. Snow Monday and into Tuesday morning overperformed in some areas, with several inches of new snow falling in bands over parts of the eastern Sierra and western NV. Two vehicles crashed on Tuesday, February 22, around 6:00 am PST, and three passengers were injured. A slider-type weather system moved over the region late Sunday, February 20, into the morning of Tuesday, February 22, producing several rounds of snowfall.
- **December 10, 2022:** A stronger winter storm brought another round of heavy snow, strong winds, and travel impacts on Sierra Passes December 9-11. Peak snowfall totals occurred through the period of December 10-11 with 2-4 feet of snow widely reported in Sierra locations and northeast CA. Storm total snowfall amounts even exceeded 5 feet over parts of the Sierra crest. Several inches of new snow also fell over some western Nevada valleys, with a foot-plus falling across some eastern Sierra foothills as well. Strong winds having gusts of 65-75 mph in far western Nevada resulted in reports of $8M in damage across parts of Sparks during the early morning of December 10.
- **December 31, 2022:** Heavy snow prompted a winter storm warning for Washoe County and neighboring counties. Heavy wet snow accumulation was expected to be from 4 to 8 inches, or 12 to 18 inches above 5,000 feet. Several downed power lines caused power outages to thousands of customers throughout the region. Heavy rain in previous days had prompted a flood watch for main stem rivers, creeks, streams, and low-lying areas due to excessive runoff.

The 2018 Nevada Enhanced State Hazard Mitigation Plan (SHMP) reported that to qualify as an “extreme” event, a snowfall must be above the 15th percentile of overall snowfall for a particular county. The state complied weather- related incidents and reported deaths or damage from 1995 through 2016 using data from the National Weather Service. Over this period, Washoe County experienced one extreme cold event, 25 incidents of hail, 279 heavy snowfall events, four ice storms, and 22 winter storms. Reported damage included $128,000 due to heavy snowfall, $30,000 due to ice storms, and $600,000 due to winter storms. Winter storms also led to the deaths of three people during this period in Washoe County.

EXTENT

The severity of the effects of snowstorms increases as the amount and rate of precipitation increase. In addition, storms with a low forward velocity are in an area for longer and become more severe in their effects. Storms in full force during morning or evening rush hours tend to have their effects magnified because more people are out on the roadways and are directly exposed. Snowfall accumulation and related hazardous conditions tend to increase at higher elevations, including Incline Village and other mountainous areas. Major transportation routes, such as Interstate 80, west of Reno, State Route 431, and State Route 28, are more likely to be affected by winter storms. Heavy snowfall generally refers to snowfall accumulating to 4" or more in-depth in 12 hours or less or 6" or more in-depth in 24 hours or less.

One tool to indicate the potential severity of a winter storm is the Winter Storm Severity Index (Figure 71). Based on the official forecast, the National Weather Service forecasters use this tool to maintain situational awareness of the possible significance of weather-related impacts. It can be used to communicate societal impacts on the public.

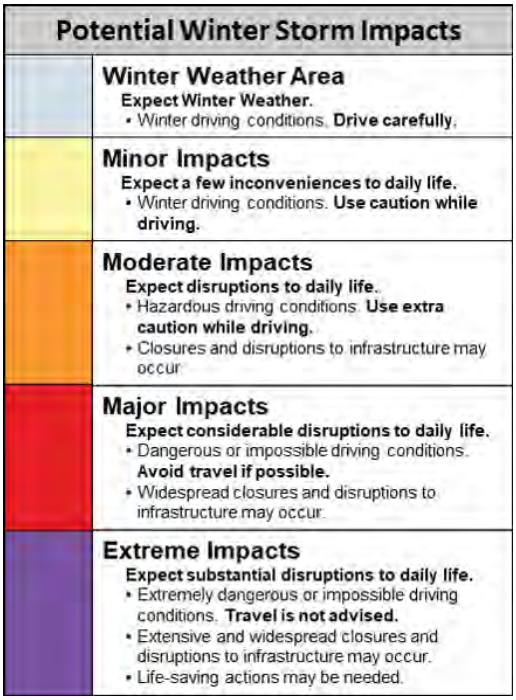

Figure 71: Winter Storm Severity Index[173]

PROBABILITY OF FUTURE OCCURRENCES

According to the NRI, the probability of a winter storm in Washoe County is High, based on an average frequency of three events per year. There has not been a significant number of historic

[173] National Weather Service, "Winter Storm Severity Index." https://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php

events, but occurrences are expected to increase in the future. The probability of a Extreme weather event is High, and the potential impact of future climate conditions could increase the risk of Extreme weather events. However, since Extreme weathers occur yearly in Washoe County, local and state jurisdictions and emergency response personnel are experienced in responding to such scenarios.

The 2018 State of Nevada Enhanced HMP provided the following statement related to future climate conditions: There are some aspects to Nevada Extreme weathers for which we have better confidence in anticipating the impacts of climate change, while for many other aspects, much is unknown. Recent observations and simulations suggest a continued rise in rain–snow elevation. This will cause more winter precipitation to fall as rain instead of snow. This scenario could lessen the frequency of lower elevation heavy snow events but increase the risk of winter floods. This scenario also means less snowpack from which to rely on for the summer water supply.

Simulations are mixed regarding winter precipitation in the coming decades, with some showing a decreasing trend for the Sierra and Great Basin and others showing an increasing trend. Most projections show more precipitation coming in fewer but larger atmospheric river-type storms. This scenario would increase the risk of severe weather impacts—heavy snow and floods. However, due to climate change, there is no reliable data on whether Nevada windstorms will increase or decrease in frequency and intensity in the coming decades.

The following represent the potential impacts of Extreme weathers on future climate conditions:

- Potential for a larger portion of winter precipitation falling as rain instead of snow.
- Potential for less frequency of heavy snow but increased risk of winter floods.
- Potential for less snowpack on which to rely for summer water supply.
- Potential for increased risk of severe weather events, such as heavy snow.
- Potential risk of increased windstorms
- Continuing increase in average temperatures across the region, along with increases in extreme heat events.

VULNERABILITY

The County's primary vulnerability from Extreme weathers is from power outages and impairment of transportation. Because nearly all social and economic activities depend on transportation, snow can have a serious impact. Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of ice or snow, downed trees, or debris, or from increases in demand beyond the capacity of the electrical system. Power outages may disrupt businesses, especially

facilities without back-up generators, potentially increasing the economic impact of severe weather events. Buildings and roofs can be damaged if large amounts of heavy snow accumulate. If prolonged cold temperatures accompany a winter storm, pipes can freeze and burst.

Winter storms can lead to health concerns for unhoused populations who do not have insulated clothing or dry living conditions and are at increased risk of hypothermia. Populations who may not have sufficient heating or who lose heat due to a power outage may seek alternative heating sources. Carbon monoxide poisoning can occur if proper ventilation is not used. Home fires also occur more frequently in the winter because of inadequate safety precautions from using alternative heat sources. Exhaustion and heart attacks brought on by overexertion are two other common causes of death related to winter storms. Shoveling snow, pushing a vehicle, or even walking in heavy snow can lead to heart attack, particularly in older individuals or those not used to high levels of physical activity. Slick or icy conditions following heavy snow may lead to injuries from falls.

Winter storms are dangerous. They can bring cold temperatures, power failures, loss of communication services, and icy roads. This can make being outside dangerous, and for this reason, the Center for Disease Control and Prevention174 recommends limiting time outside and staying indoors as much as possible to reduce the risk of car crashes and falling on the ice. However, there are hazards inside the home, such as improper heating sources due to power outages, such as the kitchen stove. Members of the community who are isolated or have disabilities may be more vulnerable, especially those who may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Power losses during winter storms have resulted in deaths from carbon monoxide poisoning if people attempt to keep warm by lighting charcoal fires or operating backup generators indoors.

The Pyramid Lake Paiute Reservation ranked winter storm as **High Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The Pyramid Lake Paiute Reservation, located in northern Nevada, is susceptible to winter storms that can have significant impacts on the community and its resources. These storms often bring heavy snowfall and strong winds, which can lead to road closures and transportation challenges. For residents, this can hinder access to essential services, including healthcare, education, and employment opportunities. Prolonged isolation can also have social implications, as community members may struggle to connect with one another.

In addition to transportation issues, winter storms can cause damage to infrastructure on the reservation. Power outages may occur due to fallen trees or ice accumulation on power lines, leaving households without electricity for heating or essential appliances. The maintenance and

[174] Center for Disease Control and Prevention, 2024, Indoor Safety|Winter Weather (cdc.gov)

repair costs for damaged roads, buildings, and utilities can strain limited financial resources within the reservation's budget.

Agricultural activities may also face setbacks during severe winter weather. Infrastructure such as irrigation systems may become impaired, affecting crop production, which is vital for food security and economic stability. Additionally, livestock can be vulnerable to extreme cold and snow, possibly leading to losses for local ranchers and further impacting the community's economy.

Overall, the estimated impacts and potential losses of winter storms at the Pyramid Lake Paiute Reservation can be significant, affecting not only the physical environment but also the economic and social well-being of the community. Preparedness and response strategies will be crucial in mitigating these effects and ensuring the resilience of the reservation against future winter storms.

VULNERABLE POPULATIONS

The Pyramid Lake Paiute Reservation is home to a diverse population, including various age groups and individuals with specific vulnerabilities, particularly during winter storms.

Elderly residents are among the most vulnerable. As they may have limited mobility or access to transportation, they can be at greater risk during severe winter weather when roads may become impassable. Additionally, health issues that are more prevalent in older populations, such as respiratory conditions or mobility challenges, can be exacerbated by cold weather and isolation.

Children are another population that may be affected by winter storms. School closures can disrupt education and access to meals that some children rely on. Furthermore, younger children may have less awareness of safety measures related to severe weather, making them more susceptible to the dangers posed by winter conditions.

Individuals with disabilities also face unique challenges during winter storms. They may rely on assistive devices that can be hindered by snow and ice, and they might need additional support in evacuating if necessary. Access to resources such as heating and food can also be more complex for this population, particularly during adverse weather.

Finally, low-income families are particularly vulnerable as they may not have the financial means to prepare for or respond to winter storms effectively. This includes the inability to purchase adequate heating, food supplies, or medical necessities that can be critical during extended periods of inclement weather.

RECENT DEVELOPMENT TRENDS

- **Economic:** Increased regional economic development continues to increase the potential for disruptions during and after severe weather events (Increased Vulnerability).
- **Land Use:** The County's upward trend in development increases the overall strain on responding to winter storm impacts at various locations (Increased Vulnerability).
- **Future Land Use**: Future development in more remote areas of the County may increase the cost of responding to snowstorms and increase the risk to residents, particularly the elderly or those with medical conditions.

Extreme weather (Extreme Heat)

LOCATION

According to FEMA, extreme heat is "a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees."[175] It may occur anywhere in Washoe County. However, urban areas are more likely to experience extreme heat conditions because of the heat island effect, in which the impervious surfaces concentrated in cities increase the surrounding area's temperature higher than in more rural areas.[176] Figure 72 shows the areas of urban heat island effects in Washoe in 2020, according to heat severity data provided by the Trust for Public Land. Landsat 8 imagery ground-level thermal sensors are used to show where certain areas of cities are hotter than the average temperature for the same city as a whole.

[175] FEMA, "Be Prepared for Extreme Heat, https://fema-community-files.s3.amazonaws.com/hazard-information-sheets/Extreme+Heat-English.pdf

[176] United States Environmental Protection Agency, "Heat Island Effect." https://www.epa.gov/heatislands#:~:text=Heat%20islands%20are%20urbanized%20areas,as%20forests%20and%20water%20bodies.

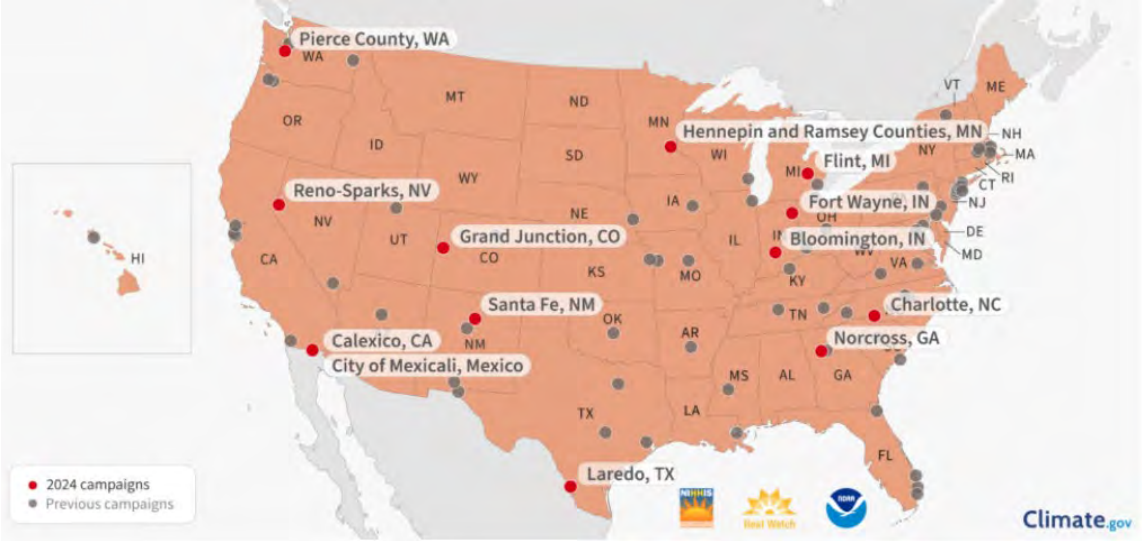

Figure 72: NOAA Urban Heat Island Mapping Identifies Reno–Sparks, NV, as Heat Island, 2017–2024[177]

PREVIOUS OCCURRENCES/HISTORY

The National Weather Service issues advisories, watches, and warnings for "Excessive Heat."[178] Heat watches and warnings were issued in Washoe County in 2021[179] and 2023.[180] These warnings included information to help individuals avoid heat-related illnesses and the locations of cooling centers.

EXTENT

The heat index is what the temperature feels like to the human body when relative humidity is combined with air temperature. There is a direct relationship between air temperature and relative humidity, and the heat index. As the air temperature and relative humidity increase, the heat index increases (see Figure 73).[181] When the heat index is high, the body has more

[177] Desert Research Institute, 2024, Reno/Sparks selected to be part of Urban Heat Mapping Campaign – DRI

[178] National Weather Service, "Heat Watch vs. Warning," https://www.weather.gov/safety/heat-ww

[179] Reno Gazette Journal, "Excessive heat Warning Issued for Reno Area Beginning Sunday." https://www.rgj.com/story/news/2021/06/26/excessive-heat-warning-reno-area-beginning-sunday/5357958001/

[180] Reno Gazette Journal, Reno Experiencing 102-Degree Temps this Weekend; Excessive heat Watch into Next Week." https://www.rgj.com/story/news/2023/07/10/reno-expecting-102-degree-temps-this-weekend-heat-watch-through-monday-july-17-evening/70398343007/

[181] National Weather Service, "What is the Heat Index?" https://www.weather.gov/ama/heatindex

difficulty cooling itself through evaporation of perspiration to maintain a comfortable temperature. The potential for adverse health consequences increases with higher heat index values.

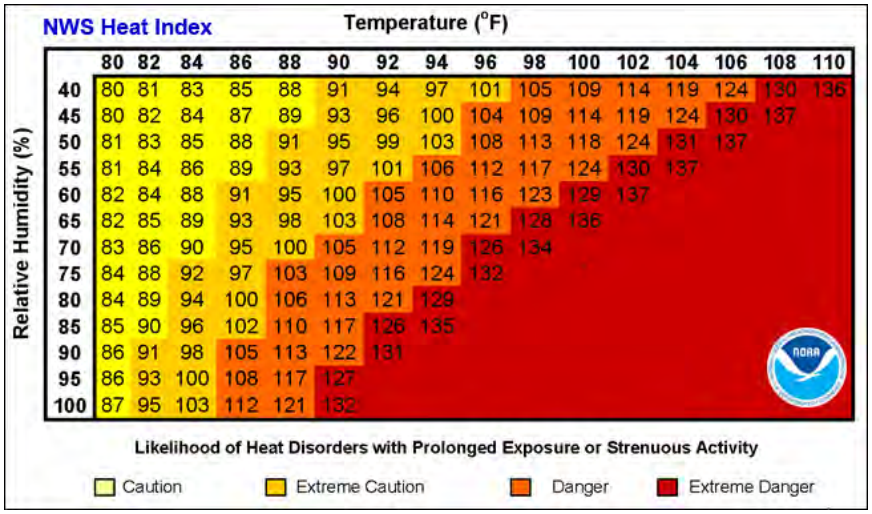

Figure 73: National Weather Service Heat Index[182]

PROBABILITY OF FUTURE OCCURRENCES

The probability of extreme heat events is considered Medium. Based on the most recent long-range simulations, climate change can be expected to lead to more episodes of extreme heat in Nevada, especially in southern Nevada. The number of 105°+ days will likely increase, making the duration and severity of heat waves more extreme. Perhaps of more importance—based on the scientific consensus and what has already been observed—average overnight low temperatures are projected to increase considerably in the coming decades. This will remove the mitigating effect of cooling off at night, which has helped northern Nevada minimize the health impacts from recent heatwaves.

Recent studies by the Desert Research Institute conclude that climate change and an intense urban heat island have made Reno the fastest-warming city in the U.S. The warming temperatures pose risks to Reno's communities, as heat is the number one weather-related cause of death in the U.S.

VULNERABILITY

Extreme heat is associated with more fatalities than any other severe weather event in the United States. During extreme heat events, a person's body temperature may rise faster than it can cool itself, which can lead to heat-related illnesses, such as heat exhaustion or heat stroke. Older adults, young children, pregnant women, and individuals with chronic diseases, such as cardiovascular or respiratory conditions, are at the highest risk. Outdoor workers and unhoused

[182] Ibid.

populations also are particularly vulnerable. People who live in social isolation, including linguistic isolation or those living alone with few social relationships, also are at higher risk. Social factors, including race and ethnicity, income, and educational attainment, are correlated with many health outcomes, including heat-related illness. Lower-income individuals may not live in housing with air-conditioning and are at risk. Those living and working near urban heat islands may be more vulnerable.

Extreme heat events can also have negative impacts on worker productivity, such as time lost on the job when people need to take more frequent or longer breaks to avoid overheating or when it is too hot to work at all. Extreme heat can also affect the agricultural sector, such as livestock health and crop yields.

Heat waves can damage transportation infrastructure and pose challenges for maintenance and construction. Higher temperatures can put stress on bridge infrastructure through thermal expansion of bridge joints and paved surfaces, and deterioration of steel, asphalt, protective cladding, coats, and sealants. When the roadway surface expands at a crack or joint, heat can cause the pavement to buckle and warp, sometimes requiring closure for urgent repairs. Extreme heat can accelerate the deterioration or threaten the integrity of some types of asphalt pavement through the softening, rutting, and migration of liquid asphalt.

Extreme heat is also related to wildfire risk. High temperatures contribute to the drying out of vegetation, which may burn more rapidly once ignited. These conditions are exacerbated if they occur during times of drought.

The Pyramid Lake Paiute Reservation ranked extreme heat as **High Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

Extreme heat poses significant challenges to the Pyramid Lake Paiute Reservation, impacting both the environment and the community's way of life. Rising temperatures can lead to decreased water levels in Pyramid Lake and its surrounding ecosystem, affecting the local wildlife and fish populations that are crucial to the tribe’s cultural and economic practices, such as fishing and hunting. As temperatures soar, the lake's evaporation rates increase, potentially leading to a reduction in water resources critical for both agricultural activities and sustaining the natural habitat.

Additionally, extreme heat impacts public health and safety. Higher temperatures can exacerbate health issues, particularly for vulnerable populations, including the elderly and those with pre-existing health conditions. Increased heat can lead to heat-related illnesses and strain healthcare resources. The community may face longer periods of heatwaves, requiring adaptations in living conditions, increased energy consumption for cooling, and more robust health programs to address heat-related risks.

Economically, the reservation may experience a decline in tourism, which is often tied to the natural beauty and recreational opportunities of Pyramid Lake. Extreme heat conditions could deter visitors, impacting local businesses that rely on tourism for their livelihoods. Furthermore, changes in traditional harvesting and fishing practices resulting from environmental heat stress can lead to economic losses for tribal members who rely on these resources for sustenance and economic stability.

In response to these challenges, the Pyramid Lake Paiute Tribe may need to invest in climate resilience strategies, such as developing sustainable water management practices, enhancing public health responses to extreme heat events, and promoting environmental protection measures to safeguard their natural resources and cultural heritage.

VULNERABLE POPULATIONS

On the Pyramid Lake Paiute Reservation, several populations may be particularly vulnerable to extreme heat.

Firstly, the elderly community is often at higher risk. Older adults can have diminished heat tolerance and may not adequately recognize or respond to heat-related stressors, making them more susceptible to heat-related illnesses such as heat exhaustion or heat stroke. Additionally, some seniors may have pre-existing health conditions that can be exacerbated by extreme heat, further increasing their vulnerability.

Children also represent a vulnerable group on the reservation. Young children are still developing their capacity to regulate body temperature and are often more active outdoors, which can increase their risk of overheating. Parents and caregivers may need to take extra precautions to ensure that children stay hydrated and cool during times of extreme heat.

Another at-risk population includes individuals with pre-existing health conditions, including cardiovascular problems or respiratory diseases. These conditions can be exacerbated by extreme heat, as high temperatures can lead to increased heart rates or respiratory distress. Furthermore, individuals experiencing homelessness may lack access to adequate shelter and cooling resources, making them particularly susceptible during heat waves.

Lastly, people with limited resources may struggle to cope with the effects of extreme heat. Those who cannot afford air conditioning or who live in poorly ventilated homes might face significant challenges during hot weather. Access to information about heat safety and cooling centers is crucial for these populations to mitigate the health and well-being impacts of extreme heat.

Overall, the convergence of age, health status, and socioeconomic factors contributes to the vulnerability of various segments of the Pyramid Lake Paiute Reservation's population to extreme heat.

EXISTING MITIGATION CASE STUDY

Several municipal, county, and tribal governments and community groups based in the Reno-Sparks area are teaming up to map the hottest parts of Reno, Sparks, and adjacent portions of Washoe County. NOAA is partnering with the U.S. Departments of Health and Human Services and Housing and Urban Development to map urban heat islands.[183]

The City of Reno has been awarded a $500,000 grant from the United States Department of Agriculture and the U.S. Forest Service as part of the federal government's efforts to plant and maintain trees, combat extreme heat, and improve access to nature in cities nationwide.[184]

RECENT DEVELOPMENT TRENDS

- **Economic:** Increased regional economic development continues to increase the potential for disruptions during and after severe weather events (Increased Vulnerability).
- **Land Use:** The County's upward trend in development increases the overall strain on responding to severe weather event impacts at various locations (Increased Vulnerability).
- **Future Land Use:** Future development in more remote areas of the County may increase the cost of responding to severe weather events and increase the risk to residents, particularly the elderly or those with medical conditions.

Drought

LOCATION

Drought affects broad regions and can affect the entire Pyramid Lake Reservation. Historically, the central and northern parts of Washoe County have experienced more frequent droughts than the southern part due to extensive stored water in reservoirs in the Truckee River basin in southern Washoe County. Low snowpack in the Truckee River basin can cause droughts of greater magnitude in the southern part of the county, as was experienced during drought conditions between 2012 and 2017.

PREVIOUS OCCURRENCES/HISTORY

Drought conditions are frequently recorded in Washoe County. According to information from the U.S. Drought Monitor, Washoe County and the PLPT have experienced several periods of drought since 2000. Since 2000, more often than not, the county has been subject to drought, which is frequently severe or worse. Three pronounced but relatively brief wet periods are noted, from 2005-2006, 2011-2012, and 2017, during which the region saw particularly

[183] Desert Research Institute, 2024, Reno-Sparks selected to be part of Urban Heat Mapping Campaign – DRI

[184] MyNews4, Alyssa Beck, September 21, 2023, Reno named fastest-warming city in the United States from Climate Center (mynews4.com)

wet/snowy winters, including significant floods in December 2005 and February and March 2017. This is a clear example of the variable climate in Washoe County.

EXTENT

The overall magnitude and potential severity of drought are considered Moderate for the PLPT. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Droughts lasting several years or more may affect the Tribe's economic enterprises, including ranching and recreation at Pyramid Lake.

PROBABILITY OF FUTURE OCCURRENCES

Drought is one of the least predictable hazards. The current state of seasonal weather prediction science is such that it is nearly impossible to predict the beginning or the ending of droughts well in advance with meaningful confidence levels. With that said, periods of drought have regularly occurred in the recent history of Washoe County and Nevada; therefore, droughts can be expected to occur with some regularity in the future. Based on the assessments in the previous sections, the probability of severe drought is considered High, with an approximately 50% chance of occurrence in a given year**.**

VULNERABILITY

The economic impacts of drought for the Tribe can range from crop losses and increased costs incurred by farmers and ranchers who need to buy additional water or feed for livestock to economic losses from decreased recreational use of Pyramid Lake or the need to close access to the lake to protect natural values. The effects of drought can last from one to multiple years, and drought's economic and social impact is likely to be compounded as more prolonged drought conditions last.

The Pyramid Lake Paiute Reservation ranked drought as **High Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The Pyramid Lake Paiute Reservation, located in northwestern Nevada, is experiencing significant challenges due to prolonged drought conditions. One of the most pressing impacts is on the reservation's water supply. The limited availability of water affects not only the community's drinking water but also agricultural activities that are vital for local food sovereignty and economic sustainability. Reduced water levels in Pyramid Lake itself, a critical habitat for Lahontan cutthroat trout, threaten both the ecological balance and the recreational opportunities associated with fishing and tourism.

Furthermore, drought can exacerbate existing socio-economic issues within the reservation. With less water available for irrigation, agricultural productivity declines, leading to potential food shortages and increased reliance on external food sources, which may not be affordable or

accessible. This can result in economic losses for local farmers and the broader community, reducing income and increasing vulnerability.

The cultural significance of the land and water resources to the Pyramid Lake Paiute Tribe is profound and cannot be overstated. Drought threatens traditional practices, rituals, and the very identity of the community, which are intricately tied to the health of the environment. The potential loss of culturally important plants and animals due to changing climate conditions may have long-term effects on the tribe's heritage and cultural practices.

Overall, the combination of ecological, economic, and cultural impacts from drought poses a significant threat to the Pyramid Lake Paiute Reservation, highlighting the urgent need for adaptive management strategies and sustainable practices to mitigate these challenges in the face of a changing climate.

VULNERABLE POPULATIONS

On the Pyramid Lake Paiute Reservation, several populations are particularly vulnerable to droughts, primarily due to their reliance on natural resources for sustenance and cultural practices. The Indigenous communities residing in this region depend heavily on available water sources for agriculture, fishing, and other traditional activities. A reduction in water supply can severely impact their ability to cultivate crops and maintain livestock, leading to food insecurity and economic challenges.

Additionally, the tribal members who fish in Pyramid Lake are affected by drought conditions, as lower water levels can diminish fish populations and disrupt traditional fishing practices. These populations often have deep cultural ties to the lake and its resources, making the effects of drought not just an economic issue but also a significant impact on their identity and heritage.

Moreover, vulnerable populations, such as the elderly and those with pre-existing health conditions, may face greater challenges during periods of drought. Water scarcity can lead to health problems associated with inadequate hydration and sanitation, exacerbating existing issues. The compounded stress of environmental changes can also affect mental health, creating a cycle of vulnerability that can be hard to break.

EXISTING MITIGATION CASE STUDY

Groundwater supplies drinking water to more than 50% of the people in the United States. On the Pyramid Lake Paiute Reservation, groundwater is vital to the community’s water supply. While much of the local water demand is met using surface water from the Truckee River, during periods of low river flow (such as during drought conditions) or when the Truckee River water is heavily sediment-laden or otherwise unavailable, the community may become entirely dependent on groundwater. On the Pyramid Lake Paiute Reservation, approximately 30% of the drinking water is sourced from groundwater annually. Groundwater wells must be protected or

abandoned in accordance with state regulations to prevent them from becoming conduits for groundwater contamination. The Washoe County Health District (WCHD) also regulates activities to protect the environment from contamination.[185]

RECENT DEVELOPMENT TRENDS

- **Economic:** The relationship between the Tribe's economic enterprises and drought has not changed in recent years (Unchanged Vulnerability).
- **Land Use:** The Tribe relies on Pyramid Lake for much of its revenue. The lake's vulnerability to drought has not changed in recent years (Unchanged Vulnerability).
- **Future Land Use:** The Pyramid Lake Economic Development Plan sets goals for new agricultural and ranching enterprises on the reservation. These enterprises would be more vulnerable to the effects of drought and may increase the Tribe's vulnerability to economic losses caused by drought.

Volcano

LOCATION

No active volcanoes are in Washoe County. The three closest, potentially active volcanoes are in California.

PREVIOUS OCCURRENCES/HISTORY

The 2023 SHMP noted that Nevada has had a long history of volcanism and, "Small eruptions from the Mono Craters area near Lee Vining and Mono Lake in eastern California have sent ash into Nevada as recently as about 260 years ago; an eruption from these volcanoes presents the most likely current volcanic hazard for Nevada. Other volcanoes that have erupted in recent history and could deposit ash in Nevada include Lassen Peak, Mount Shasta, the Long Valley Caldera in California, and volcanoes in the Cascade Mountains in Oregon."[186]

Volcanic activity from surrounding states, notably California and Oregon, has created ash clouds that have drifted over Nevada, as evidenced by many young ash beds in western Nevada. An eruption from these volcanoes presents Nevada's most likely current volcanic hazard. Other volcanoes that have erupted in recent history and could deposit ash in Nevada include Lassen Peak, Mount Shasta, the Long Valley Caldera in California, and volcanoes in the Cascade Mountains in Oregon. Ash from the 1915 eruption of Lassen Peak traveled at least 200 miles northeast to Winnemucca. The eruption of Mount St. Helens in 1980 deposited up to several

[185] WashoeCounty.gov, 2024, Groundwater & Our Local Water Supply (washoecounty.gov)
[186] 2023 Enhanced SHMP, Section Three, "Volcano (Low Risk)"

centimeters of ash several hundred kilometers away from the volcano. The biggest threat to Nevada from eruptions in California and Oregon is damage to flying aircraft.

A massive eruption from the Long Valley Caldera near Mammoth Lakes, California, about 760,000 years ago, devastated a considerable area in Owens Valley when thick, hot flows of ash were deposited as far south as Bishop. Airfall ash from these eruptions did collect as thick piles of ash in parts of Nevada, and some of the ash might have been hot enough or thick enough to devastate the local landscape. Scientists would expect strong indications from seismographs before another eruption of this magnitude. The USGS continues to monitor the area around Mammoth Lakes and will issue warnings before any subsurface changes that could precede a major eruption.

Researchers at the University of Nevada, Reno (UNR) have interpreted seismic and geodetic data at the north end of Lake Tahoe.[187] These data indicate active magma at a depth of approximately 19 miles (30 kilometers). There does not appear to be a near-term threat of volcanic eruptions from this area, partly because the last documented eruption was approximately one million years ago.

The eruption of Lassen Peak in 1915 caused localized debris flows and a pyroclastic cloud that damaged and deforested a 3-square-mile area, as well as flooding and debris flows up to 10 miles from the volcano in Hat Creek. Ash from the eruption traveled at least 200 miles northeast to Winnemucca, Nevada.

EXTENT

The magnitude and potential severity of impacts of a volcanic eruption is considered Medium for Washoe County. However, Washoe County is close enough to the Long Valley Caldera to be impacted by ashfall less than 5 centimeters thick, based on a small to moderate eruption.

PROBABILITY OF FUTURE OCCURRENCES

The 2023 Enhanced SHMP notes that Nevada's most likely volcanic hazard is an eruption from Mono Craters, Inyo Craters, and Mammoth Mountain. Active volcanoes within approximately 150 miles of Reno have erupted four times in the past 304 years. This indicates a 1.3% chance of these volcanoes erupting in a year. Therefore, the probability of occurrence with direct consequences for the planning area is considered Very Low.

Volcanic risk is Low, but it could increase if a volcano becomes active. The probability is low, but the consequences could have a severe local impact. Mitigation actions are limited to public awareness and evacuation procedures at the local level. No significant impacts of the volcanic hazard in Nevada from climate change are expected.

[187] K. D. Smith and others, 2004, Evidence for deep magma injection beneath Lake Tahoe, Nevada–California: Science, v. 305, p. 1277–1280

There are no direct connections between future climate conditions and volcanic activity.

VULNERABILITY

Volcanic hazards, particularly ashfall, have a very low probability of occurring. However, the vulnerability of the public, continuity of operations, infrastructure, and the environment to volcanic hazards are assessed below.

The Pyramid Lake Paiute Reservation ranked volcanoes as **Low Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the Pyramid Lake Paiute Reservation due to volcanic activity can be significant, considering the geological context of the region. While the reservation is not directly within a volcanic zone, it is located near the Sierra Nevada and other volcanic formations in Nevada. Potential impacts include ash fall, which can disrupt air quality, contaminate water sources, and damage crops and vegetation critical to the reservation's ecosystem and economy.

Additionally, the reservation's community could face health risks from volcanic ash inhalation, which may lead to respiratory issues. Infrastructure such as roads, buildings, and utility lines could suffer damage from ash accumulation or even from potential lava flows if they were to occur. Economic losses could arise from a decline in tourism, as visitors might avoid the area during volcanic events due to safety concerns. Overall, while the immediate threat may seem limited, the cascading effects of a volcanic event could pose substantial challenges for the Pyramid Lake Paiute Reservation and its inhabitants.

VULNERABLE POPULATIONS

Populations on the Pyramid Lake Paiute Reservation that may be vulnerable to volcanic activity include several key groups. The elderly are particularly at risk due to limited mobility and health issues, making quick evacuation challenging.

Children are also vulnerable, as they are more susceptible to health impacts from volcanic ash and require additional care during emergencies. Individuals with respiratory conditions, such as asthma, may experience aggravated symptoms from ash and toxic gases, highlighting the need for specific health considerations.

Low-income families face barriers in accessing supplies and transportation for evacuation, making them more susceptible during a volcanic event. Additionally, residents connected to culturally significant sites risk losing heritage if these areas are affected.

RECENT DEVELOPMENT TRENDS

- **Economic:** Active threats pose no new risk to economic interests (Unchanged Vulnerability).

- **Land Use:** Active threats pose no new risk to land use (Unchanged Vulnerability).
- **Future Land Use:** Development of any buildings or infrastructure where many people congregate or that has higher publicity will be somewhat vulnerable to acts of violence.

Hazardous Waste

LOCATION

The potential for contact with hazardous materials is present throughout Washoe County because of four main factors:

- The widespread distribution of hazardous materials **storage locations** (fixed facility);
- The transport of hazardous materials via motor **transportation and rail** (transportation);
- River and water ditches; and
- The transport of hazardous materials by **pipeline** (pipeline).

PREVIOUS OCCURRENCES/HISTORY

According to the Federal Pipeline and Hazardous Materials Safety Administration (PHMSA), which releases annual hazardous materials incident reports, there were 1,806 reported incidents throughout the state of Nevada from 2015 to 2023, resulting in 14 injuries, two of which required hospitalization. There were no fatalities during this time. Total damage over this time totaled approximately $2,377,408 (PHMSA 2023).

Of these incidents, 1,589 occurred on state highways, resulting in damage of approximately $1,852,621 and one hospitalization. A total of 117 incidents occurred on railways, resulting in no injuries and approximately $502,647 in damage. The remaining 100 incidents were associated with airports. No damage was reported beyond five injuries that did not require hospitalization.

According to the PHMSA, Washoe County had one reported pipeline spill along the Kinder Morgan North pipeline in October 2007, which was caused by equipment failure. The incident released 851 barrels (35,742 gallons).

Since the l950s, only one major incident has been reported. The spill was caused by damage to the pipeline by a construction crew working above it. Over the past 50 years, the pipeline has been subjected to extensive stream erosion, landslides, and tectonic activity. The fact that the pipeline has survived relatively undamaged over the years is a testament to the quality of the original construction and the ongoing efforts to maintain the pipeline.

EXTENT

The overall magnitude and potential severity of hazardous materials incidents are considered Low in Washoe County but vary based on the type of facility. The vulnerability to hazardous materials disasters at fixed facilities includes the potential for either an explosive release or insidious leaking of materials into the ground or groundwater. The impact of an accident or spill during roadway or rail transport depends largely on the spill location relative to population centers and waterways.

PROBABILITY OF FUTURE OCCURRENCES

The probability of hazardous materials events varies based on the type of accident considered. Based on the frequency of past incidents, particularly during the transportation of hazardous materials, the overall probability of hazardous materials incidents is considered Medium. As the volume of hazardous materials transport, handling, or production increases, the expected frequency of accidents involving uncontained releases increases correspondingly.

However, it is important to note that increased hazardous materials regulation will likely decrease the potential for hazardous materials releases. Due to the increased potential for human error or mechanical failure, the probability of a hazardous materials release on a roadway, rail line, or fixed facility is marginally higher than that of pipeline accidents.

VULNERABILITY

Hazardous materials incidents can be caused by a number of factors, including technological failures, natural hazards, such as earthquakes or floods, and human factors. The County and local governments maintain records of hazardous materials storage sites in the Regional Hazardous Materials Response Plan and maintain communications with Nevada Highway Patrol regarding shipments of hazardous materials on all transportation routes throughout the County. Several factors can cause hazardous materials incidents. A transportation incident on the I-80 and/or I-580 highway presents the region's most pressing vulnerability. Many of the critical facilities and valuable assets are near I-80 and I-580, particularly in the Reno/Sparks corridor. Hazardous materials may be transported through the Reno-Tahoe International Airport. In addition, power plants, water and wastewater treatment plants, hospitals, fire stations, and other critical facilities in Washoe County may store hazardous materials on site.

The Pyramid Lake Paiute Reservation ranked hazardous material incidents as **High Risk.**

PIPELINE

Any release from the pipeline might have severe consequences for the population and the environment. The pipeline's proximity to the Truckee River and its inlets and outlets signifies a potential threat to the water system. All the communities along the Truckee River draw their water supply from the river or wells directly affected by any product released from the pipeline. Environmental damage, including the potential for wildland fires, is an additional consideration.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the Pyramid Lake Paiute Reservation due to hazardous waste are significant and multifaceted. Firstly, the presence of hazardous waste can lead to severe environmental degradation. Contamination of soil and water resources can threaten local ecosystems, affecting wildlife and plant life that are crucial for the cultural and economic well-being of the Pyramid Lake Paiute people. Access to clean water is particularly vital for both consumption and recreational activities, and contamination can compromise this essential resource, leading to health issues within the community.

Economically, hazardous waste can deter tourism and hinder development projects that are vital for the reservation's growth. The area is known for its natural beauty, and any environmental damage can dissuade visitors, impacting businesses that rely on tourism. This loss of revenue can be compounded by potential legal costs associated with cleanup efforts and the long-term management of contaminated sites. Furthermore, there could be financial implications resulting from decreased property values and a burden on local government resources to address these issues.

Socially, the impacts of hazardous waste can exacerbate existing inequalities and health disparities within the community. Exposure to toxic materials can lead to various health problems, increasing healthcare costs and putting a strain on the community's resources. There is also a psychological impact to consider; the threat of hazardous waste can create anxiety and stress among residents, affecting overall community well-being.

Overall, the impacts of hazardous waste on the Pyramid Lake Paiute Reservation are complex, intertwining environmental, economic, and social factors that could lead to both immediate and long-term challenges for the community. Addressing these issues requires comprehensive planning, community engagement, and support from external stakeholders to mitigate potential losses and promote sustainability.

VULNERABLE POPULATIONS

The Pyramid Lake Paiute Reservation in Nevada is home to a diverse population that includes various groups, each with unique vulnerabilities to hazardous waste exposure. One of the primary populations at risk includes the indigenous community, particularly the elderly and children. These groups may have higher susceptibility to health issues related to environmental contaminants due to their developing or declining health status.

Additionally, individuals with pre-existing health conditions, such as respiratory illnesses, are also more vulnerable. Exposure to hazardous waste can exacerbate these conditions, leading to increased health risks. The local economy, which often relies on traditional practices such as fishing and gathering from the land, can further compound these vulnerabilities. Contaminated

water or soil can affect the safety of these traditional food sources, leading to food insecurity and health concerns.

Social factors also play a crucial role in vulnerability. Limited access to healthcare services on the reservation can mean that health issues related to hazardous waste may go unaddressed, resulting in long-term health consequences. Moreover, educational disparities may hinder the community's ability to effectively navigate and respond to environmental hazards.

Lastly, the overall socioeconomic status of the populations on the reservation can contribute to their vulnerability. Higher poverty rates often limit resources for prevention, education, and remediation efforts, making it difficult for these communities to protect themselves from the impacts of hazardous waste.

EXISTING MITIGATION CASE STUDY

KINDER MORGAN PIPELINE MITIGATION ACTIONS

There are several locations along the pipeline where leak detection can occur; the threshold of detection is about one-tenth of one percent over a period of about 15 minutes. In a catastrophic break, the pipeline can be shut down in about 30 seconds using automatic shutoff valves. Manual valves' isolation depends on weather conditions and could require 30 minutes to an hour to close. If this break is caused by a single isolated event, such as a landslide or rockslide, the damage could be detected, contained, and repaired relatively quickly, assuming fair weather conditions and transportation routes are clear.[188]

RECENT DEVELOPMENT TRENDS

- **Economic:** Increased transportation of hazardous materials in the corridor increases the probability of a release or spill of bulk hazardous materials to cause fire, explosion, toxic cloud, or direct contamination of people or property. Property damage could range from immediate destruction by explosion to permanent contamination by a persistent hazardous material (Increased Vulnerability).
- **Land Use:** Kinder Morgan operates an underground pipeline that transports approximately 13 million barrels of petroleum products (gasoline, diesel, and jet fuel) from the pump station in Rocklin, California, to the Sparks, Nevada, terminal. Jet fuel is then pumped from the Sparks terminal to the Fallon Naval Air Station. Kinder Morgan also shares a storage facility in Sparks[189] (Increased Vulnerability).

[188] Ibid.

[189] Washoe County Emergency Management and Homeland Security Program, 2020, "Regional Washoe County Hazardous Materials Emergency Response Plan" HAZMAT-Annex-D-12-17-2020.pdf (washoecounty.gov)

- **Future Land Use**: Excavation is the most likely cause of damage to the pipeline. The potential for rupture because of nearby excavation is greatest in areas where the pipeline corridor intersects highways and railroad right of ways and areas of new construction. As the area in the pipeline corridor continues to grow and expand, the potential for damage will also continue to grow[190] (Increased Vulnerability).

Criminal Acts and Terrorism

LOCATION

Criminal acts of terrorism can impact any populated area, including shopping structures, clinics and hospitals, schools, and government offices and buildings.

PREVIOUS OCCURRENCES/HISTORY

Criminal acts and violent crime have increased in Washoe County since the last plan, with a 4.33% increase from 2021 through 2022. However, from 2022 to 2023, violent crime declined by 1.08%. Table 75 Shows the number of violent crimes from 2020 to 2024.

Table 74: Crimes in Washoe County, 2020–2024

Year	Violent Crime	Criminal Homicide	Forcible Rape	Robbery Total	Aggravated Assault
2020	2302	23	410	379	1490
2021	2402	27	399	397	1579
2022	2506	26	409	467	1604
2023	2479	29	413	426	1611
2024	702	9	106	95	492

EXTENT

It is difficult to estimate the extent or probability of criminal activity or a terrorist incident. Nonetheless, these threats could affect all populated areas in Washoe County, and government facilities and schools may be the most likely targets. The magnitude and potential severity of the impacts of criminal activity or a terrorist incident are considered Medium.

[190] Washoe County Emergency Management and Homeland Security Program, 2020, "Regional Washoe County Hazardous Materials Emergency Response Plan" HAZMAT-Annex-D-12-17-2020.pdf (washoecounty.gov)

PROBABILITY OF FUTURE OCCURRENCES

Climate change can impact terrorism in several ways. For example, increasing temperatures and extreme weather events can lead to food and water shortages, contributing to social and political instability. This can create conditions favorable to the spread of extremist ideologies and recruitment by terrorist groups. Moreover, as climate change leads to the displacement of populations and competition for scarce resources, it can exacerbate existing social tensions and fuel conflicts that terrorist organizations can exploit. Climate change can also impact the geographic range of certain groups, as changing environmental conditions can affect where they operate.

Political and social unrest, economic disparities, ideological extremism, and global geopolitical developments can increase the possibility of terrorism in the United States. Moreover, the global rise of populist movements has fueled anti-immigrant and anti-minority sentiment, which can increase the chance of domestic terrorism. The explosion of advanced technologies and the potential for cyber-terrorism are also concerning factors. The probability of increased terrorism is difficult to quantify and can be influenced by domestic and international events.

Based on various factors, Washoe County could be considered a potential target for terrorism. It has several critical infrastructure sites, such as airports, major highways, and power plants. The area's significant population centers and notable events could also present attractive targets for individuals or groups seeking to cause harm. Based on the occurrence of previous incidents, the probability of an incident is considered relatively moderate.

VULNERABILITY

No estimates are available to determine the potential losses associated with criminal acts and terrorism. However, if an active threat were directed at the County, schools, government buildings, other public gathering places, and social events would be top targets. Active threats could have an impact on the community in the following ways: loss of human life; damage to buildings and structures; temporary displacement during the threat and/or investigation; stress on medical, emergency response, and security services; declines in economic activity and hospitality business after the event; psychological and emotional trauma; and an increased need for emergency services and funding.

The Pyramid Lake Paiute Reservation ranked criminal acts and terrorism as **Low Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the Pyramid Lake Paiute Reservation due to criminal acts and terrorism can be significant and multifaceted. One of the primary concerns is the threat to community safety and well-being. Criminal acts, ranging from property crimes to violent incidents, can create a climate of fear among residents, leading to decreased quality of life and increased mental health issues. Additionally, acts of terrorism, while potentially rare,

can result in devastating physical and emotional consequences, affecting not only individual lives but also the cohesion of the community as a whole.

Economically, the reservation may face substantial losses resulting from criminal activities. Increased crime rates can deter tourism and outside investments, leading to reduced revenue streams that are crucial for the local economy. Moreover, the costs associated with law enforcement and emergency response can strain the limited financial resources of the reservation. Resources that could be allocated to community development or essential services may instead be diverted to address the consequences of crime.

Infrastructure and property can also be adversely affected. Vandalism, theft, and property damage not only lead to direct financial losses but also necessitate additional expenditures on security measures and repairs. The physical environment may bear the scars of criminal activity, which can deter community pride and discourage investment in beautification projects or local businesses.

In terms of social impact, the fear of crime can lead to isolation and distrust among community members, weakening social ties and communal resilience. This erosion of social capital can hinder collective efforts to address community challenges and promote positive change. Overall, the potential impacts and losses due to criminal acts and terrorism on the Pyramid Lake Paiute Reservation highlight the importance of preventive measures, community engagement, and comprehensive safety strategies to protect both the community and its cultural heritage.

VULNERABLE POPULATIONS

The Pyramid Lake Paiute Reservation in Nevada is home to a diverse community, but certain populations may be particularly vulnerable to criminal acts and terrorism. First, the youth of the reservation can be considered at risk due to factors such as limited access to education, recreational opportunities, and positive role models. This vulnerability can increase their likelihood of being involved in or affected by criminal activities.

Additionally, the elderly population may also face higher risks. They often lack mobility and access to resources, making it difficult for them to seek help or escape dangerous situations. This demographic may be targeted more easily by individuals committing crimes, especially if they live in isolated areas.

Furthermore, individuals struggling with economic challenges are at greater risk. Economic instability can lead to a higher prevalence of crime, as individuals may resort to unlawful activities out of desperation. This population may be less likely to report crimes due to fears of repercussions or lack of trust in law enforcement.

Lastly, any marginalized groups within the community, including those facing discrimination or social exclusion, may also be more vulnerable. These populations often have fewer support

systems and resources to protect themselves from criminal acts and may be targets for hate crimes or other forms of violence.

EXISTING MITIGATION CASE STUDY

To reduce the community's vulnerability to criminal acts and terrorism, the Washoe County Sheriff's Office has developed an Emmy-nominated video and webpage describing how people can respond to an active assailant threat (https://www.washoesheriff.com/general-information/staying-safe/active-assailant-preparedness--what-you-can-do.php). WCHD has developed a Multi-Casualty Incident Plan to provide guidelines for managing multi-casualty incidents and coordinating between multiple responding agencies[191] and organizations[192] WCHD published the Washoe County EMS Strategic Plan 2023–2028 at EMS-Strategic-Plan-2023-2028-PDF.pdf.

Case studies can provide valuable insights into the specific factors and circumstances that contribute to the risk of terrorism in a particular region. By examining past incidents and their underlying causes, authorities can better understand the root causes of terrorism and the conditions that may lead to such acts. This knowledge can help develop more targeted and effective strategies to mitigate the risk of terrorism in the future. Case studies can also provide valuable lessons and best practices from successful counterterrorism efforts in other regions, which can be adapted and applied to address similar challenges elsewhere.

In 2019, the State of Nevada established the One Nevada Agreement on allocating the opioid recovery framework. In 2021, legislation was passed to create funding to help mitigate the opioid epidemic.[193]

RECENT DEVELOPMENT TRENDS

Overall, Washoe County has not seen a significant increase in criminal acts and terrorism. World events have led to increased protests. So far, these have been peaceful. There appear to be no significant development changes that have impacted the overall vulnerability of the planning area to this hazard.

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[191] Hidalgo, J. (2023, January 26). *Reno-Sparks growth: Forecast pegs housing, education as biggest challenges* [Review of *Reno-Sparks growth: Forecast pegs housing, education as biggest challenges*]. Reno Gazette Journal ; Reno Gazette Journal. https://www.rgj.com/story/news/money/business/2023/01/26/reno-sparks-growth-housing-education-are-biggest-challenge/69845214007/

[192] Rowles, L. (2023, December 15). *Northern Nevada Adds Over 1,200 Jobs in 2023 with Record Average Wage*. EDAWN. https://www.edawn.org/existing-business-update/northern-nevada-adds-over-1200-jobs-in-2023-with-record-average-wage/

[193] *Opioid Epidemic*. (n.d.). Ag.nv.gov. https://ag.nv.gov/Hot_Topics/Opioid_Epidemic/

Future development in Washoe County may be vulnerable to criminal acts and terrorism, particularly places of employment, government buildings, and public gathering places. Some types of development may be associated with an increased need for response training.

Infectious Disease

LOCATION

Infectious diseases spread by humans, and vector-borne infectious diseases can occur in both urban and non-urban areas throughout the County. Areas in the county that are more susceptible to infectious diseases are typically those with higher population density, such as Reno and Sparks, and areas with poor sanitation and limited access to healthcare services. On the other hand, areas more susceptible to vector-borne diseases are often those with standing water or extensive vegetation, providing suitable habitats for disease-carrying vectors, such as mosquitoes and ticks. These are more prevalent in non-urban areas.

PREVIOUS OCCURRENCES/HISTORY

Selected occurrences of infectious diseases as human health hazards in Washoe County from 2015 to 2024 are discussed in the following sections.

- **2024 —Shigellosis** is an infectious disease caused by bacteria of the genus Shigella. It primarily spreads through the fecal-oral route, often via contaminated food or water, and can lead to symptoms such as diarrhea (which may be bloody), fever, and stomach cramps. Shigellosis is highly contagious, and good hygiene practices, such as handwashing, are essential for prevention. In 2024, 27 cases of Shigellosis were reported in Washoe County.[194]
- **2020, COVID-19:** COVID-19, or coronavirus disease 2019, is caused by the SARS-Co-V-2 virus. It is considered a respiratory illness, but it can affect areas of the body besides the respiratory system. Respiratory symptoms range from mild to severe. COVID-19 was declared a public health emergency of international concern (PHEIC) on January 30, 2020, and a global pandemic by the World Health Organization on March 11, 2020. The United States declared COVID-19 a national emergency from March 13, 2020, to May 11, 2023. The state of Nevada declared COVID-19 a public health emergency on March 12, 2020. Additional guidance and recommendations on gatherings and closure were issued in the weeks following and are detailed in the COVID-19 timeline of the Nevada Department of Health and Human Services Division of Public and Behavioral Health.

[194] Northern Nevada Public Health, "Vol 44 No 35 12-24-2024 Epi News Shigellosis Outbreak." https://www.nnph.org/files/ephp/epi-news/2024/Vol%2044%20No%2035%2012-24-2024%20Epi%20News_Shigellosis%20Outbreak.pdf

- **2018, Measles:** One lab-confirmed case of measles was reported in the County in 2018. The WCHD activated its Incident Command System and proactively treated, quarantined, isolated, or monitored people who had had contact with the infected person.[195]
- **2018, *Escherichia coli (E. coli):*** The WCHD identified six cases of infected people with a superbug called *Klebsiella pneumoniae carbapenemase* (KPC)-producing *E. coli* in a state-licensed group home. The WCHD's response to this outbreak contributed to the CDC re-evaluating its recommendations for preventing the spread of similar bacteria in group home settings.
- **2017, Zika:** The WCHD coordinated Zika testing for 53 individuals.
- **2017, Carbapenemase-producing organisms (CPO):** The WCHD investigated six cases of CPO. CPO are bacteria, such as *Klebsiella, E. coli, Acinetobacter*, and *Pseudomonas*, found in normal human intestines that have acquired genes that make them resistant to broad-spectrum antibiotics. CPO can spread outside the intestines and cause serious conditions , such as urinary tract infections, bloodstream or wound infections, and pneumonia, which are difficult to treat because of the antibiotic resistance developed by the bacteria.[196] In 2017, one resident of the County died from an infection of *New Delhi Metalo-Beta-Lactamase-Producing Klebsiella pneumoniae* that was resistant to all antibiotics available for treatment.
- **2015–2016, Ebola:** While no Ebola cases have been confirmed in Washoe County, WCHD and partner agencies have increased infectious disease preparedness efforts in response to the international Ebola outbreak. In 2015, the WCHD monitored individuals returning from countries with Ebola outbreaks, provided training and exercises for hospitals and healthcare providers, and developed a website for point of dispensing training. The WCHD provides personal protective equipment for first responders during Ebola and other highly infectious disease responses. The WCHD, regional hospitals, and the Regional Emergency Medical Services Authority (REMSA) in Reno designed a full-scale Ebola exercise that tested responses to both a walk-in Emergency Room patient and a patient identified at a satellite medical facility.
- **2015, Norovirus:** In 2015, the WCHD investigated a large outbreak of Norovirus affecting public and private schools and daycare facilities. Over 2,000 cases were identified during this outbreak.

[195] Northern Nevada Public Health, "Vol 39 No 05 03-06-2019 Q4 2019 and 2018 State.pdf." https://www.nnph.org/files/ephp/epi-news/2019/Vol%2039%20No%2005%2003-06-2019%20Q4%202018%20and%202018%20Stats.pdf

[196] British Columbia Centre for Disease Control, "CPO Bacteria in BC_Factsheet_Feb7_2014.docx." http://www.bccdc.ca/resource-gallery/Documents/Statistics%20and%20Research/Statistics%20and%20Reports/Epid/Other/CPOBacteriainBC_factsheet_feb7_2014.pdf

- **2015, E. coli:** An outbreak of 28 cases of *E. coli* resulted in hospitalization of 13 people. Five individuals developed a serious complication known as Hemolytic Uremic.

Table 75: Reportable Cases of Selected Communicable Diseases by Year, Washoe County, 2018-2022[197]

Type	2018	2019	2020	2021	2022
Campylobacteriosis	46	48	28	92	61
Chlamydia	2729	2682	2526	2451	2448
Coccidioidomycosis	8	8	15	9	8
COVID			36,324	37,552	52,767
Cryptosporidium	18	18	5	5	12
Escherichia coli/ Shiga toxin-producing Escherichia coli (EHEC/STEC)	12	4	5	7	8
Giardiasis	20	10	20	17	15
Gonorrhea	918	864	1131	1054	824
Group A Strep, Invasive	5	2	10	5	5
Hepatitis B (Chronic)	62	65	60	48	56
Hepatitis C (past or present)	648	680	476	332	466
Human Immunodeficiency Virus (HIV)	27	37	31	24	27
Hospitalized with Influenza	542	266	11	148	348
Lyme	4	1	1	5	5
Pertussis	13	27	13	5	10
Invasive Pneumococcal Disease	70	100	67	53	79
Rotavirus	12	9	7	1	9
RSV	480	720	622	959	2141
Salmonellosis	36	30	25	31	20
Stage 3 HIV Infection (AIDS)	14	12	11	14	16
Syphilis (primary and secondary)	111	160	133	159	153
Tuberculosis	9	8	4	7	6

[197] Northern Nevada Public Health, 2024, "Total Reportable Cases of Selected Communicable Diseases by Year, Washoe County, 2018–2022." https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD_Annual_2022_Updated.pdf

EXTENT

The overall magnitude and potential severity of infectious disease outbreak impacts are considered Medium in Washoe County. Typical disease outbreaks are handled at the city or county level. Severe outbreaks may disrupt services for weeks, and economic impacts may be felt at the county level.

The Northern Nevada Public Health 2022 Annual Communicable Disease Summary reports that communicable diseases are a continuing threat to everyone, regardless of age, gender, lifestyle, ethnic background, or socioeconomic status. They cause illness, suffering, and death and place an enormous financial burden on society. Currently, over 90 diseases or conditions are reportable in Nevada. In 2022, over 60,000 cases were reported to Northern Nevada Public Health.

PROBABILITY OF FUTURE OCCURRENCES

Climate change can have significant impacts on the spread of infectious diseases. As temperatures and precipitation patterns shift, the geographic range of disease-carrying vectors, such as mosquitoes and ticks, can expand, bringing diseases like malaria, dengue fever, and Lyme disease into new areas. Warmer temperatures can also speed up the reproduction and development of these vectors, allowing them to spread diseases more quickly. In addition, changes in precipitation can create new breeding grounds for disease-carrying organisms. Overall, climate change can create more favorable conditions for the transmission and spread of infectious diseases, posing a threat to global public health.

Cases of infectious disease occur annually in Washoe County, and the probability of future events is estimated as Medium. Based on potentially changing climate patterns, an increase in the likelihood of emerging infectious diseases may impact Washoe County.

VULNERABILITY

Infectious diseases have been known to spread quickly through communities. Many spread through close contact, meaning that highly populated areas like Reno and Sparks are more prone to widespread outbreaks. Public gathering places where people may be together in close quarters, such as schools and childcare facilities, offices, and transportation terminals, provide more opportunities for diseases to pass from one person to another.

Land use changes can have a major impact on infectious disease numbers. This is done by changing the rate of contact between individuals and disease hosts, whether animal, insect, or fungal. Along with this change in contact rate, land use changes also can alter the composition of local species, potentially allowing vector species to become the dominant species.

Outbreaks of infectious diseases most often affect pockets of vulnerable populations. However, a worst-case scenario could overwhelm local hospitals and medical facilities and require a surge response.

The Pyramid Lake Paiute Reservation ranked infectious disease as **Moderate Risk.**

VULNERABLE POPULATIONS

On the Pyramid Lake Paiute Reservation in Nevada, several populations are particularly vulnerable to infectious diseases. The elderly are at high risk due to weakened immune systems and chronic health issues. Young children, especially those under five, are also susceptible because their immune systems are still developing.

Low-income families face barriers to healthcare, nutrition, and hygiene, increasing their vulnerability. Individuals with chronic illnesses, such as diabetes and respiratory conditions, have compromised health that can lead to a higher risk of infections. Furthermore, homeless individuals lack stable access to healthcare and hygiene facilities.

Residents in remote areas may struggle to obtain medical care and health information, while those dealing with substance abuse often have impaired health and limited access to services.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Vaccine hesitancy has been a public health issue for many years, and it increased during the COVID-19 pandemic. Many infectious diseases are entirely vaccine preventable (e.g., Hepatitis A) or have reduced transmission, extent, and severity (e.g., influenza, COVID-19). Vaccines are a powerful public health tool to prevent and mitigate diseases and reduce the potential for outbreaks. Increases in vaccine hesitancy are of concern, as herd immunity is necessary to help reduce the likelihood of outbreaks.

Population growth could increase the risk of infectious disease outbreaks and their impact on hazard mitigation for Nevada. The estimated population of Washoe County in 2024 was 499,064, with a growth rate of 0.21% in the past year, according to the most recent United States census data. Washoe County is the second largest county in Nevada. The 2010 population was 421,969, and it has grown 18.27% since that time. An increase in the population can impact infectious disease risk. For example, areas with higher population densities saw earlier outbreaks of COVID-19. Population density has been identified as a risk factor for the spread of infectious diseases, particularly those that spread from person to person and through food and water. Furthermore, vector-borne illnesses can also increase or change patterns with increasing population density.

Various populations are vulnerable to communicable diseases, and understanding these groups is crucial for effective public health interventions. One vulnerable population consists of infants and young children whose immune systems are still developing, making them more susceptible to infection. Their proximity to daycare centers and schools increases the risk of disease transmission.

Another vulnerable group is the elderly, particularly those with preexisting health conditions or weakened immune systems. Age-related declines in immune function can make them more

susceptible to infectious diseases and increase the severity of the illness. Long-term care facilities and nursing homes often house a significant proportion of elderly individuals, further amplifying the risk of disease outbreaks.

Individuals with compromised immune systems (such as those with HIV/AIDS), cancer, organ transplants, or autoimmune diseases are highly vulnerable. These conditions weaken their ability to fight infections, leaving them more susceptible to communicable diseases. Strict infection control measures and targeted prevention strategies are essential for protecting this group.

Homeless populations also face increased vulnerability to communicable diseases due to factors such as crowded living conditions, limited access to healthcare, poor nutrition, and higher rates of substance abuse. These circumstances can contribute to the spread of infections like tuberculosis, hepatitis, and respiratory illnesses in homeless communities.

Lastly, marginalized and socioeconomically disadvantaged populations may be at higher risk. Factors, such as limited access to healthcare, overcrowded living conditions, inadequate sanitation, and lack of education can contribute to increased vulnerability to communicable diseases.

RECENT DEVELOPMENT TRENDS

Infectious, communicable, and vector-borne diseases can significantly impact development trends in various ways. They can strain healthcare systems, lead to workforce absenteeism, and cause economic disruptions. In addition, investment in infrastructure and public services may be diverted to disease control efforts, affecting overall development. Furthermore, the fear of contracting these diseases can affect consumer behavior, tourism, and foreign investment, influencing economic growth and development. The burden of infectious diseases can hamper development's social, economic, and environmental aspects, and emerging infectious diseases can pose vulnerabilities to economic and land use trends in several ways.

- **Economic:** These diseases can increase healthcare expenditures and reduce productivity due to illness or workforce absenteeism. This can strain healthcare systems and have direct economic impacts on businesses and industries.
- **Land Use:** Emerging infectious diseases can also influence land use patterns. For instance, areas affected by outbreaks may experience changes in land development plans, shifting the focus toward healthcare infrastructure and away from other projects. Moreover, the occurrence of infectious diseases can lead to changes in travel patterns, affecting tourism and trade, which can further impact land use and economic trends.
- **Future Land Use:** Infectious diseases can affect future land use by impacting population distribution and density. An increased population can lead to more urbanization, which may lead to converting agricultural land into residential and commercial uses. In addition, the spread of infectious diseases can lead to changes in land use patterns, such as the creation

of quarantine zones or restricted areas to control the spread of the diseases. This can impact land use for agriculture, housing, and other purposes.

Radiological Waste

LOCATION

Radiological waste could be transported along rail systems, major airports, and highway corridors in Washoe County. The zones of potential impact extend beyond these transportation facilities. The sizes and shapes of those zones are affected by the material released and atmospheric and environmental effects, such as wind speed and water flow.

Figure 74 shows the locations of nuclear facilities in the United States. It is important to note the presence of Yucca Mountain in Nevada, located southeast of Washoe County, and the Lawrence Livermore National Laboratory near San Francisco. Both locations require large amounts of waste to be transported through the state, and this is expected to continue.



Figure 74: Nuclear Power Reactors in the United States[198]

PREVIOUS OCCURRENCES/HISTORY

As of now, only one radiological incident has been reported in Washoe County, while six incidents have been reported throughout Nevada. Table 77 lists these incidents.

[198] United States Nuclear Regulatory Commission, "Operating Nuclear Power Reactors (By Location or Name)." https://www.nrc.gov/info-finder/reactors/index.html

Table 76: Radiological Incidents, 2013–2020[199]

Date	City	Entry Code#	Description
04/30/2014	Reno	2012213	An IR192 source was rerouted to a hospital in Nevada. The source was then delivered to the Radiation Safety Officer at the correct address. Once delivered, it was estimated that a dose of 2 mrem was received for 10 minutes of contact.
09/26/2019	Stateline	2019124	A moisture density gauge was stolen from the open bed of a truck. The gauge was locked to the bed, and several valuables were stolen from the cabin. An investigation is underway, and corrective actions will be determined.
11/12/2013	Las Vegas	2013075	A portable gauge fell off the back of a truck because it was unsecured. An anonymous man returned the device, which appeared to be in normal working condition.
08/11/2016	Las Vegas	2016665	Desert Soils Geotechnical reported that two gauges containing AM241 and CS137 were stolen from a storage location. The Radiation Safety Officer had taken the gauges out of storage for routine maintenance. The gauges were in a lab unattended for three hours.
09/14/2018	Las Vegas	2018158	An employee of Aztech Inspection & Testing, LLC, RM secured a moisture density gauge to the steering wheel of his car at home.
11/07/2017	Las Vegas	2017165	The University of Nevada lost 1.4 grams of 90% enriched U235. The source was left beside a trash can under a professor's desk who intended to use it for research. The professor forgot about the source and believed the custodial staff accidentally threw it away.

EXTENT

The potential magnitude and severity of impacts from a radiological waste transport incident in Washoe County are categorized as Very High. Incidents involving the release of radioactive materials can necessitate federal support for response efforts, impact critical facilities, cause

[199] CNS Global Incidents and Trafficking Database, "Nuclear Trafficking 2020." https://www.nti.org/analysis/articles/2019-archive-of-the-cns-global-incidents-and-trafficking-database/

weeks-long service disruptions, and have widespread economic repercussions across the nation.

PROBABILITY OF FUTURE OCCURRENCES

Medical, construction, and traditional radiological materials, including waste, are commonly transported on major transportation routes through Washoe County. As traffic on these routes increases, the potential for radiological waste transport incidents increases. However, given the safety measures to prevent these incidents and that no incidents have been reported in Washoe County, the probability of future events is estimated to be Very Low.

Climate change can significantly impact the transportation of radiological waste. As extreme weather events become more frequent and intense, the risks associated with transporting radiological materials also increase. For example, extreme weather events, such as heavy storms, flooding, and hurricanes, can disrupt transportation routes and infrastructure, potentially leading to accidents or incidents involving radiological waste.

Furthermore, rising global temperatures can affect the stability and safety of transportation routes, increasing the likelihood of road and infrastructure damage. This, in turn, can pose significant challenges to the safe transport of radiological waste and increase the risk of incidents such as spills or releases of radioactive materials.

VULNERABILITY

The MPT determined that hazards from the transport of radiological waste have a very low probability of occurring. However, the vulnerability of the public, continuity of operations, and infrastructure to radiological waste transport are assessed below. A radiological incident on a transportation corridor could cause a fire or explosion, dispersing radiological particles that contaminate people and property. Depending on several factors, communities near the event would be the most vulnerable. Moreover, if radioactive materials are not effectively contained, they can spread through the air, soil, and/or water. The materials pose a substantial risk to first responders and other emergency personnel in the immediate aftermath of a radiological incident on a roadway. Due to the infrequent occurrence of these accidents, emergency personnel may not be sufficiently trained in appropriate response protocols. Radiological materials incidents on transportation corridors require extensive administrative and operational support from impacted jurisdictions. Remote communities may not have the capacity to direct a response to a radiological incident.

Radiological materials would impact jurisdictions' continuity of operations, particularly if a major transportation corridor were affected. Radiological incidents could require the mobilization of resources to evacuate and/or shelter in place. Remote communities with few resources may be limited in their ability to mobilize these resources, and larger communities would have to expend more resources to protect population centers from the impacts of a

radiological incident. Infrastructure and facilities near the radiological incident could be temporarily or permanently contaminated or physically impacted by a radiological incident.

The Pyramid Lake Paiute Reservation ranked radiological waste transport as **High Risk.**

ESTIMATED IMPACT AND POTENTIAL LOSSES

The potential impacts of radiological waste on the Pyramid Lake Paiute Reservation can be significant, affecting both the environment and the health of the local community. Firstly, contamination of soil and water resources poses a major risk. Radiological waste can leach into groundwater and surface water sources, potentially harming aquatic ecosystems and making water unsafe for consumption and traditional practices. The Pyramid Lake, an essential resource for fishing and cultural activities for the Paiute people, could experience ecological disruption, leading to declines in fish populations and loss of biodiversity.

In addition to environmental impacts, there are also serious health concerns associated with radiological exposure. Community members may face increased risks of cancer and other health issues due to contamination, particularly if they rely on local resources for food and water. These health implications can have long-term consequences for the well-being of the reservation's residents.

Economically, the presence of radiological waste could also lead to significant losses. Tourism, which may depend on the natural beauty and recreational opportunities at Pyramid Lake, could be negatively impacted if concerns about safety and contamination arise. Additionally, the costs associated with cleanup and monitoring efforts can place a financial burden on the tribe and potentially divert funds from other crucial community needs.

The overall potential losses to the Pyramid Lake Paiute Reservation from radiological waste can thus encapsulate environmental degradation, health risks, and economic setbacks, threatening the community's way of life and traditional practices. Addressing these concerns requires collaborative efforts to ensure the safety and sustainability of the reservation's resources.

VULNERABLE POPULATIONS

The Pyramid Lake Paiute Reservation is home to several populations that may be vulnerable to the effects of radiological waste. First and foremost, the tribal members residing in closer proximity to areas designated for waste disposal or potential contamination are at higher risk. These individuals often rely on traditional diets, which include fish and other wildlife from the lake and surrounding areas. Exposure to radiological contaminants through these food sources can pose significant health risks.

Additionally, children and the elderly within the community are particularly susceptible to the harmful effects of radiation. Due to their developing and sensitive systems, children can

experience more severe consequences from exposure. Similarly, older adults may have pre-existing health conditions that could be exacerbated by exposure to radiological materials.

Moreover, individuals with underlying health issues, such as respiratory or cardiovascular diseases, may also be more vulnerable to the impacts of radiation exposure. Access to medical care and education regarding the risks associated with radiological waste can be limited, compounding the challenges faced by these populations.

Finally, individuals who participate in cultural practices, such as gathering medicinal plants and hunting, may unknowingly expose themselves to radiological hazards. The intertwining of health, culture, and environmental stewardship underscores the need for protection and advocacy among vulnerable populations on the Pyramid Lake Paiute Reservation.

EXISTING MITIGATION CASE STUDY

The Operations Command Center (OCC) and Emergency Operations Center (EOC) of the Nevada National Security Site (NNSS) have dedicated time and resources to establishing essential planning partnerships with stakeholder organizations at the local, state, and national levels. By following FEMA's updated National Response Framework for collaboration between government and private sector organizations, this guidance allows emergency management officials to create integrated planning strategies and common operating objectives.[200]

RECENT DEVELOPMENT TRENDS

Despite the population growth in Washoe County, the risk of incidents during the transport of radiological waste is small. However, climate change could lead to changes in transportation routes and infrastructure development, which could impact the transportation of radiological waste. Since the last plan, vulnerability has remained unchanged.

Transportation Incident (Aircraft Crash)

LOCATION

Washoe County has four publicly operated airports: the Reno–Tahoe International Airport (RNO), the Reno-Stead Airport (RTS), the Spanish Springs Airport (N86) in Reno, and the Empire Airport (1A8) in Empire. Several privately operated airports in the County serve commercial, non-commercial, private commuter, and recreational aircraft. The greatest volume of

[200] Nevada National Security Sites, 2024, NNSS readiness featured at 2024 Nevada Emergency Preparedness Association summit – Nevada National Security Site

commercial aircraft service passes through Reno–Tahoe International Airport. Federal agencies, such as the Bureau of Land Management, also operate and lease airports in Nevada.

PREVIOUS OCCURRENCES/HISTORY

Most aircraft crashes in Washoe County are associated with small aircraft. Recent crashes that have impacted local communities are as follows:

- **September 17, 2023:** A T-6G and an AT-6B collided in the traffic pattern at the Reno Air Races, killing both pilots.
- **May 1, 2018**: An American Air Racing Thunder Mustang crash landed at Reno after the pilot declared Mayday and landed beyond the midpoint of the 9,000-ft runway at a higher rate of speed than usual. The plane overran the runway, entered a gravel area, and overturned.
- **August 30, 2016:** A single-engine Beechcraft A36 crashed into the River's Edge RV Park in Sparks. The pilot and one passenger were killed. The plane did not hit any RVs. However, a fire from the crash spread to surrounding RVs and vehicles. Residents were evacuated but could return home once the conditions were safe.
- **September 16, 2011**: The Galloping Ghost, a highly modified North American P-51D Mustang racing aircraft, crashed into spectators while competing at the Reno Air Races, killing the pilot and 10 people on the ground. An additional 69 people on the ground were injured. This was the third-deadliest airshow disaster in U.S. history, following accidents in 1972 in Sacramento, California, and 1951 in Flagler, Colorado.
- **January 21, 1985:** Galaxy Airlines Flight 203. Shortly after takeoff from Reno–Cannon International Airport (now Reno–Tahoe International Airport), the Lockheed L-188 Electra four-engine turboprop crashed about 1.5 miles from the end of the runway. It burst into flames, killing all but one of the 71 passengers on board. Figure 75 shows the memorial of this incident.

Figure 76 and Figure 77 present the Nevada statistical aviation accident and injury data from 2014 to 2024. The National Transportation Safety Board aggregates, updates, and publishes these data monthly.



Figure 75: Memorial for Galaxy Airlines Flight 203 Victims, Located at San Rafael Regional Park in Reno.[201]

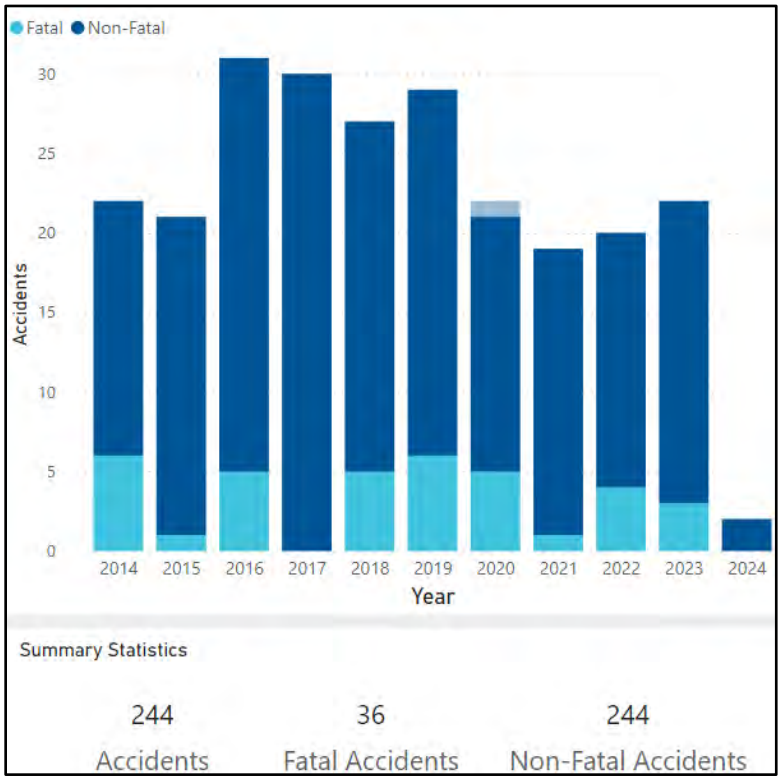

Figure 76: Aviation Accidents by Calendar Year in Nevada, 2014-2024[202]

[201] 2018 Enhanced SHMP, Reno Gazette Journal, Clifton 2015 "The memorial monument for the Galaxy Airlines Flight 203 victims, located at Rancho San Rafael Regional Park in Reno."
[202] National Transportation Safety Board, "Monthly Aviation Dashboard-Aviation Accidents by Calendar Year-Nevada." Monthly Aviation Dashboard (ntsb.gov)

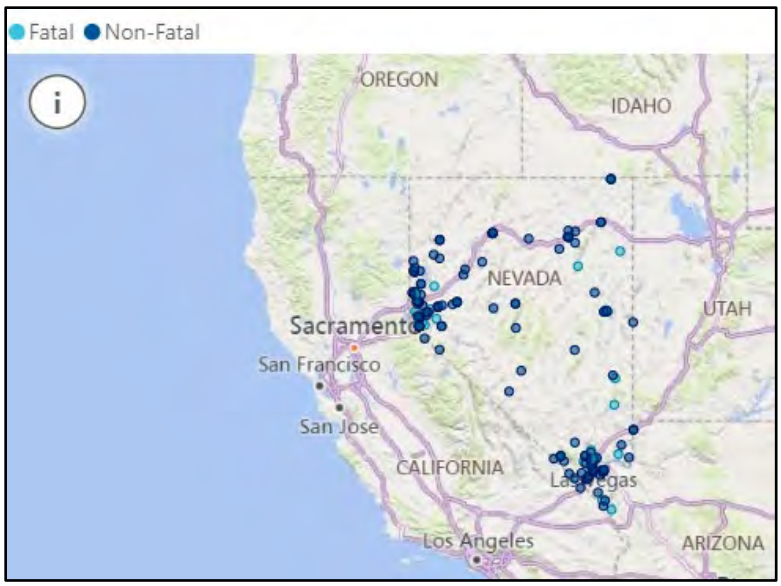

Figure 77: Locations of Aviation Accidents in Nevada, 2014-2024[203]

EXTENT

It is difficult to estimate the extent or probability that aircraft accidents will occur. This type of incident is most likely to occur during takeoff or landing. Aircraft crashes often cause injuries or death to people in the aircraft and on the ground. Crashes can also damage or destroy structures or cause secondary hazards, such as fires or the release of hazardous materials. Aircraft crashes are typically handled at the local level and can disrupt transportation and business services nearby. The magnitude and potential severity of the impact of an aircraft crash is considered Medium in Washoe County. Such events are not likely to have significant regional impacts.

PROBABILITY OF FUTURE OCCURRENCES

Statistics on airplane crashes include the following:[204]

- The chance of a large commercial airplane carrier crashing is 0.000001%.
- The odds of being involved in a commercial airplane accident are 1 in 260,256.
- The odds of you dying in a plane crash are 1 in 816,545,929.
- On-demand air taxis (e.g., private jets) had a total of 225 accidents, of which 47 resulted in at least 1 fatality.
- Between 2015 and 2019, general aviation (e.g., recreational pilots) averaged 0.88 fatalities per 100,000 flight hours. On-demand air taxis averaged just 0.23, and commuter airplanes

[203] Ibid.

[204] Flyfright.com [2023] The Real Odds of Experiencing a Plane Crash (flyfright.com)

averaged 0.21. On-demand air taxis (e.g., private jets) had a total of 225 accidents, of which 47 resulted in at least 1 fatality.

- Between 2015 and 2019, general aviation (e.g., recreational pilots) averaged 0.88 fatalities per 100,000 flight hours. On-demand air taxis averaged just 0.23, and commuter airplanes averaged 0.21.

Future weather conditions are not directly related to aircraft crashes. However, increased development and urbanization can increase the number of people on the ground who may be affected by an aircraft crash. The probability of an aircraft crash with severe consequences on the ground is considered Medium. Climate change will likely impact the occurrence, extent, or probability of aircraft crashes in Washoe County.

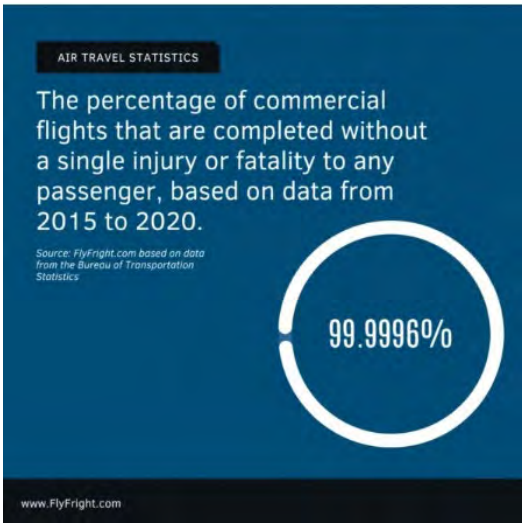

Figure 78: Air Travel Statistics, 2015–2020[205]

VULNERABILITY

Public airports that have accepted federal assistance, including the Reno–Tahoe International Airport, must designate runway protection zones (RPZs) at each end of their runways to protect people and property on the ground if an aircraft lands or crashes beyond the runway. Reno–Tahoe International Airport owns most of the land in its RPZs in Reno (Reno–Tahoe Airport Authority 2018a). Mixed commercial, residential, and commercial–industrial development in the RPZs is where aircraft crashes are more likely to occur.

Reno–Stead Airport has designated airport-critical areas at the ends of its runways. These trapezoidal areas help ensure that land use is compatible with airport operations to reduce risks to people and property on the ground. The airport-critical areas at either end of Runway 8/26 or the south end of Runway 14/32 extend beyond airport property (Reno–Tahoe Airport

[205] Ibid.

Authority 2013). Residential areas in the County and industrial and recreational areas in Reno near the airport are critical areas where aircraft crashes are more likely to occur.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the Pyramid Lake Paiute Reservation due to aircraft transportation incidents can be significant, affecting various aspects of the community, environment, and economy. One of the primary concerns is the risk of safety hazards posed by low-flying aircraft or accidents that could occur in or near the reservation. Such incidents might lead to injuries or fatalities among community members, which would not only be a tragic loss but could also result in psychological trauma that affects the wider community.

In addition to human costs, environmental impacts are a critical concern. Aircraft transportation incidents can lead to fuel spills, debris, and pollution, adversely affecting the natural resources that the reservation relies on for subsistence and cultural practices. These impacts can undermine the health of local ecosystems, disrupt wildlife habitats, and contaminate water sources, which are vital for both the community's well-being and its cultural traditions.

Economically, the reservation might face potential losses from decreased tourism and outdoor activities. Aircraft incidents could create negative perceptions of the area, deterring visitors and impacting local businesses that rely on tourism revenue. Furthermore, the costs associated with emergency response and recovery efforts could strain the reservation's financial resources, diverting funds from essential community services and projects.

Overall, the implications of aircraft transportation incidents for the Pyramid Lake Paiute Reservation encompass a complex interplay of safety, environmental health, and economic stability, warranting a thorough assessment and proactive measures to mitigate risks.

VULNERABLE POPULATIONS

Aircraft crashes, particularly those that involve small aircraft, may happen farther away from the runway near flight tracks. Buildings and aboveground infrastructure may be damaged or destroyed by an aircraft crash. Crashes are likely to cause injury or death to the pilot and passengers on a plane and can cause injuries and fatalities on the ground. Aircraft crashes are localized events that local governments can handle.

The Pyramid Lake Paiute Reservation ranked transportation incident (aircraft crash) as **Low Risk.**

RECENT DEVELOPMENT TRENDS

- **Economic:** The Reno–Tahoe Airport Authority's FY 2024–2028 Strategic Plan calls for increasing commercial air service and cargo activities at Reno–Tahoe International Airport, which may increase the risk of aircraft crashes (Increased Vulnerability).
- **Land Use:** Runway protection zones have been mapped at Reno–Tahoe International Airport, and airport critical areas have been mapped at Reno–Stead Airport. Development is directed away from these areas (Decreased Vulnerability).

VULNERABILITY ASSESSMENT

ASSET INVENTORY

Local assets that may be affected by hazards include members of the Tribe, properties, utilities, and infrastructure. Geographic information system (GIS) data from federal, state, and local databases were used to inform the vulnerability assessment and identify critical infrastructure. . Data collection for the vulnerability assessment was complicated because the region has never comprehensively identified critical infrastructure; therefore, the list of critical infrastructure on the Pyramid Lake Reservation may be incomplete. Similarly, the region still needs to compile valuation information, so valuation data were not available to be included in the vulnerability assessment. Washoe County and its partners are committed to continuing to refine and build on the list of critical infrastructure over the next five years to improve the data in the next plan update.

REPETITIVE LOSS PROPERTIES

The Tribe does not participate in the National Flood Insurance Program (NFIP), so it does not maintain a repetitive loss property inventory that meets the Repetitive Loss or Severe Repetitive Loss criteria.

EXPOSURE ASSESSMENT

Table 35 shows the exposure of the Tribe's identified critical facilities to natural hazards that can be mapped.

Table 77: Exposure Assessment from the Pyramid Lake Paiute Tribe[206]

Type	Name	Address	Seismic Ground Motion Hazards		Landslide Susceptibility	Wildland Fire Hazard Potential
			with 2% Probability	with 10% Probability		
Hospital	Pyramid Health Center	N/A	48–64	32–48	Low	1
School	Trinity Valley Elementary School	N/A	64+	32–48	Moderate	1
School	Natchez Elementary School	1 NV-447, Wadsworth, NV 89442	48–64	32–48	Low	1
School	Sutcliffe School (historical)	N/A	64+	32–48	Moderate	3
School	Pyramid Lake High School	711 State St. Nixon, NV 89424	48–64	32–48	Low	1

Note: None of the identified critical facilities on the Pyramid Lake Reservation is located in a mapped flood zone.

Land Use and Development Trends

FEMA

D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

The Tribe has no formal zoning or other land use regulations. New developments are reviewed to determine potential hazard risks and sited outside hazard areas when possible. Since 2017, the Tribe has invested resources to recover from major flooding in the Truckee River basin. The Tribe has also continued to look for opportunities to invest in renewable energy projects, economic development, and other community projects that will benefit all members of the Tribe, including the proposed community center.

The vulnerability subsection of each hazard profile in Section 3.3 outlines recent development trends to illustrate how vulnerability might have changed over the past five years. Vulnerability changes have been measured for economic interests and land use trends. Each measure has been identified as having increased, decreased, or unchanged vulnerability. Table 79 provides a snapshot of how vulnerability has changed since 2020.

[206] State of Nevada, "Washoe County Regional Hazard Mitigation Plan." https://dem.nv.gov/uploadedFiles/demnvgov/content/About/Washoe_Regional_HMP_2020.pdf

Table 78: Recent Development Trends at the Pyramid Lake Paiute Reservation

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Avalanche and Landslide	No development in the area of concern	N/A	N/A	Low
Criminal Acts and Terrorism	Increase based on population increase	Increase	N/A	Moderate
Drought	N/A	N/A	Reduction in drought	Low
Earthquake	N/A	N/A	N/A	Low
Energy Emergency	No development affecting land use	N/A	N/A	Low
Flood	Housing development has been proposed in Wadsworth and Nixon, but it will be a few years.	Increase	N/A	Low
Hazardous Materials Incident	N/A	N/A	N/A	Low
Infectious Disease	N/A	N/A	N/A	Low
Radiological Waste Transport	N/A	N/A	N/A	Low
Extreme weathers	Not at this time however with new	Increase	Higher energy use	Moderate

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
(Winter Storm, Windstorms, Extreme Heat)	development, critical infrastructure could be affected i.e., high energy use			
Transporta-tion Incident (Aircraft Crash)	N/A	N/A	N/A	Low
Volcano	N/A	N/A	N/A	Low
Wildland Fire	Livestock, wildland urban face could affect new development	Could increase	More drought	High

Capability Assessment

FEMA	**C1.** Does the plan document [PLPT's] existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))

Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards.

Table 79: Planning Capabilities of the Pyramid Lake Paiute Tribe

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
General Plan	No	N/A	N/A	N/A
Capital Improvement Plan	No	N/A	N/A	N/A
Climate Change Adaptation Plan	No	N/A	N/A	N/A
Community Wildfire Protection Plan	No	N/A	N/A	N/A
Economic Development Plan	No	N/A	N/A	N/A
Land Use Plan	No	N/A	N/A	N/A
Local Emergency Operations Plan	No	N/A	N/A	N/A
Stormwater Management Plan	No	N/A	N/A	N/A
Transportation Plan	No	N/A	N/A	N/A

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
Substantial Damage Plan	No	N/A	N/A	N/A
Other	Washoe County has a Damage Assessment Plan that serves the same intent and covers all jurisdictions	N/A	N/A	N/A
Other? (Describe)	No plans besides the hazard mitigation plan.	N/A	N/A	N/A

Table 80: Regulations and Ordinances of the Pyramid Lake Paiute Tribe

Plans	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
Building Code	N/A	N/A	N/A
Flood Insurance Rate Maps	N/A	N/A	N/A
Floodplain Ordinance	N/A	N/A	N/A

Plans	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
Subdivision Ordinance	N/A	N/A	N/A
Zoning Ordinance	N/A	N/A	N/A
Natural Hazard Specific Ordinance (Stormwater, Steep Slope, Wildfire)	N/A	N/A	N/A
Acquisition of Land for Open Space and Public Recreation Use	N/A	N/A	N/A
Prohibition of Building in At-Risk Areas	N/A	N/A	N/A
Other? (Describe)	The tribe does not enforce any ordinances.	N/A	N/A

Administrative and Technical

Administrative and technical capabilities include staff and their skills. They also include tools that can help you carry out mitigation actions.

Table 81: Administrative Capabilities of the Pyramid Lake Paiute Tribe

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	No	N/A	N/A	N/A
Civil Engineer	Sometimes – hired in as needed	No	N/A	N/A
Community Planner	No	N/A	N/A	N/A
Emergency Manager	Yes	Yes	Yes	Yes
Floodplain Administrator	No	N/A	N/A	N/A
Geographic Information System (GIS) Coordinator	No	N/A	N/A	N/A
Planning Commission	Trying to set this up through the housing authority	N/A	N/A	N/A
Fire Safe Council	No	N/A	N/A	N/A
CERT (Community Emergency Response Team)	No	N/A	N/A	N/A

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Active VOAD (Voluntary Agencies Active in Disasters)	No	N/A	N/A	N/A
Other? (Please describe.)	No	N/A	N/A	N/A

Table 82: Technical Capabilities of the Pyramid Lake Paiute Tribe

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
Mitigation Grant Writing	Yes – does pursue mitigation grants when possible	N/A	Pursue more grants to reduce risks
Hazard Data and Information	No	N/A	N/A
GIS	Yes – maps are developed through the Tribal Lands Management Office, has mapped mitigation projects before.	N/A	To mark changes in topography

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
Mutual Aid Agreements	Yes – with multiple counties (Lions County, Humbolt County, BLM) and part of the intrastate mutual aid agreement	Recently entered into the state compact for Fire and EMS	Ability to draw from additional resources
Other? (Please describe.)			

Financial

Financial capabilities are the resources to fund mitigation actions. Talking about funding and financial capabilities is important to determine what kinds of projects are feasible given their cost. Mitigation actions like outreach programs are lower cost and often use staff time and existing budgets. Other actions, such as earthquake retrofits, could require substantial funding from local, state, and federal partners. Partnerships, including partners willing to donate land, supplies, or an in-kind match and cash, can be included.

Table 83: Financial Capabilities of the Pyramid Lake Paiute Tribe

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Capital Improvement Project Funding	No	N/A	N/A	N/A

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
General Fund	No	N/A	N/A	N/A
Hazard Mitigation Grant Program (HMGP/404)	No	N/A	N/A	N/A
Building Resilient Infrastructure & Communities (BRIC)	No	N/A	N/A	N/A
Flood Mitigation Assistance (FMA)	No	N/A	N/A	N/A
Public Assistance Mitigation (PA Mitigation/406)	No	N/A	N/A	N/A
Community Development Block Grant (CDBG)	Yes, the tribe puts in for this.	Yes, parks and recreation	Yes	Yes
Natural Resources Conservation Services (NRCS) Programs	No	N/A	N/A	N/A

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
U.S. Army Corps (USACE) Programs	No	N/A	N/A	N/A
Property, Sales, Income, or Special Purpose Taxes	No	N/A	N/A	N/A
Stormwater Utility Fee	No	N/A	N/A	N/A
Fees for Water, Sewer, Gas, or Electric Services	No	N/A	N/A	N/A
Impact Fees from New Development and Redevelopment	No	N/A	N/A	N/A
General Obligation or Special Purpose Bonds	No	N/A	N/A	N/A
Federal-funded Programs (Please describe)	No	N/A	N/A	N/A
Other State-funded Programs	No	N/A	N/A	N/A

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
(Please describe)				
Private Sector or Nonprofit Programs	Yes	Yes, Public Safety from the Helen Close Foundation	Yes	No
Other?				

Education and Outreach

Education and outreach capabilities are programs and methods that could communicate about and encourage risk reduction. These programs may be run by a participant or a community-based partner. Partners, especially those who work with underserved communities, can help identify additional education and outreach capabilities.

Table 84: Education and Outreach Capabilities of the Pyramid Lake Paiute Tribe

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Community Newsletter(s)	Yes – the tribal newsletter goes out quarterly	Yes	Articles in the newsletter and social media
Hazard Awareness Campaigns (such as Firewise, Storm Ready, Severe Weather Awareness	No	N/A	N/A

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Week, School Programs)			
Public Meetings/Events (Please Describe)	No	N/A	N/A
Emergency Management Listserv	No	N/A	N/A
Local News	No	N/A	N/A
Distributing Hard Copies of Notices (e.g., public libraries, door-to-door outreach)	No	N/A	N/A
Insurance Disclosures/Outreach	No	N/A	N/A
Organizations that Represent, Advocate for, or Interact with Underserved and Vulnerable Communities (Please Describe)	No	N/A	N/A
Social Media (Please Describe)	Yes – actively use all the social media platforms	Yes	PIO actively uses social media to inform citizens of various hazards

National Flood Insurance Program Participation

FEMA	**C2.** Does the Plan address participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3))

The National Flood Insurance Program (NFIP) is a FEMA program that provides flood insurance to millions of policyholders across the country. The plan must describe participation in the NFIP for each participant, as applicable, in accordance with NFIP regulatory requirements.

The community does not participate in the NFIP.

Table 85: Floodplain Management, Mapping, and Insurance for the Pyramid Lake Paiute Tribe

Question	Response
Why does the community not participate in the NFIP?	The tribe does not participate and does not implement floodplain ordinances.
Is the community interested in joining the NFIP?	Not at this time.

Opportunities to Expand and/or Improve Capabilities

- **Planning and Regulations:** The tribe would like to adopt building codes.

Plan Integration

FEMA	**C6.** Does the Plan describe a process by which it will incorporate the requirements of the mitigation plan into other planning mechanism, such as comprehensive or capital improvement plans, when appropriate?

An updated plan must explain how the plan participants incorporated the previous mitigation plan, when appropriate, into other planning mechanisms over the last 5 years. This demonstrates progress in local mitigation efforts. Planning mechanisms refer to the governance structures used to manage local land use development and community decision making, such as budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances. If the plan was integrated into another planning mechanism, list them and note how hazard mitigation was integrated. This discussion could include the following:

- The integration of the hazards the community is vulnerable to;
- The data and analysis presented in the risk assessment;
- The goals of the mitigation plan; and
- Potential projects or actions to carry out in the future.

Table 86: Previous Plan Integration by the Pyramid Lake Paiute Tribe

Plan Name (or "none," if applicable)	Description
None	N/A

The plan must also identify the planning mechanisms where and how the updated hazard mitigation information/actions may be integrated.

Table 87: Future Plan Integration Opportunities for the Pyramid Lake Paiute Tribe

Plan Name	Description
The Pyramid Lake Paiute Tribe has no active planning mechanisms to integrate concepts from the RHMP. However, the Tribe will monitor for future opportunities to integrate concepts from the RHMP into new planning mechanisms such as general plans, emergency operations plans, and others.	N/A

Mitigation Strategy

FEMA

C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?

Mitigation Goals and Objectives

Mitigation goals are broad, policy-type statements which represent what the County and its partners seek to achieve by implementing their mitigation plan. The goals are general guidelines and provide a framework for identifying more detailed objectives and actions. In developing these goals, the MPT reviewed the goals from the 2023 SHMP and the goals and objectives from the 2020 RHMP update. Overall, the MPT thought that the goals and objectives continued to reflect its approach to hazard mitigation. There has been progress on some objectives since the last plan update, but those objectives remain important considerations which should be noted in the current plan. A few changes were identified, including clarifying the intent of Goal 1, removing Objective 1.3, and adding a new objective to Goal 4. Both long-term and short-term goals and objectives were identified. Long-term initiatives may take longer the duration of the planning cycle (five years) to completely realize, while short-term initiatives may be accomplished in the next five years.

Therefore, the County and its partners have selected the following goals and objectives for this plan update:

Goal 1: Study, maintain, upgrade, and expand transportation routes, including evacuation routes across the County, to ensure function and public awareness during emergencies. (Long-term)

- **Objective 1.1:** Study, establish, upgrade, and maintain evacuation routes. (Short-term)
- **Objective 1.2:** Plan for continuity of operations of critical transportation facilities in the county in the event of a disaster or emergency. (Short-term)

Goal 2: Maintain emergency services capabilities by providing redundancies. (Long-term)

- **Objective 2.1:** Provide redundant lifeline utilities and services to allow medical and emergency response services to continue to operate following a disaster or emergency. (Long-term)
- **Objective 2.2:** Establish evacuation centers and provide redundant lifeline utilities to serve communities at risk from all identified hazards. (Long-term)

Goal 3: Maintain key communications to ensure connectivity during and after key hazard events. (Short-term)

- **Objective 3.1:** Provide methods for notification, warning, and emergency communications. (Short-term)
- **Objective 3.2:** Establish an additional emergency operations center (EOC) to serve the RSIC community. (Long-term)
- **Objective 3.3:** Harden electrical infrastructure in moderate to high-risk areas for wildland fire. (Long-term)
- **Objective 3.4:** Establish procedures for communication between the Governor's Office on Radiological Waste and Washoe County before transport of radiological waste. (Short-term)
- **Objective 3.5:** Develop a response plan for clean-up and disposal of ash fall from a volcanic eruption. (Short-term)

Goal 4: Maintain the reliability of utilities (electricity, gas, drinking water, sewer) during and after key hazard events. (Long-term)

- **Objective 4.1:** Provide redundant or hardened utility lifelines to areas at risk of energy emergencies, loss of communications, or loss of service. (Long-term)
- **Objective 4.2:** Identify vulnerable facilities and establish procedures for clean-up and disposal of ash fall from a volcanic eruption to minimize risk to lifeline utilities. (Short-term)

- **Objective 4.3:** Protect utility infrastructure from hazards like winter storms and high winds including acquiring resources ahead of time and hardening infrastructure. (Long-term)

Goal 5: Minimize property damage and reduce repetitive losses to property from key hazards. (Long-term)

- **Objective 5.1:** Provide additional emergency services resources to reduce response times. (Short-term)
- **Objective 5.2:** Adopt current international building and fire codes. (Short-term)
- **Objective 5.3:** Develop plans and provide resources to reduce risk in moderate to high-risk areas for wildland fire. (Short-term)
- **Objective 5.4**: Update flood maps to incorporate changes in conditions and flood risk. (Short-term)
- **Objective 5.5:** Complete improvements to storm water drainage infrastructure to address areas of localized Flooding (including closed-basin flooding), or insufficient capacity. (Long-term)
- **Objective 5.6:** Standardize Emergency Action Plans for dams in the City of Sparks. (Short-term)
- **Objective 5.7:** Complete infrastructure improvements identified as part of the Truckee River Flood Management Project. (Long-term)
- **Objective 5.8:** Elevate or mitigate flood risks to homes in neighborhoods identified by the TRFMA as being at a high risk of Flooding (including closed-basin flooding). (Long-term)
- **Objective 5.9:** Identify and complete retrofits to unreinforced masonry buildings and other facilities at increased risk of damage from earthquakes. (Long-term)
- **Objective 5.10:** Implement measures to prepare first responders for active shooter incidents or acts of terrorism. (Long-term)
- **Objective 5.11:** Purchase equipment to minimize the risk of and protect emergency responders in the event of criminal acts or terrorism. (Long-term)
- **Objective 5.12:** Purchase additional equipment to perform immediate containment of hazardous materials spills. (Long-term)
- **Objective 5.13:** Address risks to properties in the runway protection zones at Reno-Tahoe International Airport and airport-critical areas at Reno-Stead Airport, and along the railway. (Long-term)

- **Objective 5.**14: Identify inundation areas for high-hazard dams in Washoe County**.**

Goal 6: Increase public participation and responsibility in reducing their risks. (Short-term)

- **Objective 6.1:** Educate members of the public on hazards that may affect their communities. (Short-term)
- **Objective 6.2:** Provide building requirements and standards to guide property owners and developers in reducing risk. (Short-term)
- **Objective 6.3:** Provide resources to involve residents in disaster preparedness, response, and recovery. (Short-term)

Review of 2020 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2020 plan were evaluated to determine their status and whether any ongoing or incomplete actions should be included in the 2024 plan update.

Prioritizing Mitigation Actions

The identified mitigation actions were then prioritized, based on the following terms:

- **S – Social:** The public must support the overall mitigation implementation strategy and specific mitigation actions. Consider, will the action disrupt housing or cause the relocation of people? Will the proposed action adversely affect one segment of the population? Is the action compatible with present and future community/agency values?
- **T – Technical:** It is important to determine if the proposed action is technically feasible, will help reduce losses in the long term, and has minimal secondary impacts. How effective is the action in avoiding or reducing future losses? Does the action solve the problem or only a symptom? Will the action create more problems than it solves? Consider the root cause of the issue at hand to determine whether the action is a whole or partial solution, or not a solution at all.
- **A – Administrative:** This category examines the expected staffing, funding, time, and maintenance requirements for the mitigation action to determine if the jurisdiction/special district has the personnel and administrative capabilities to implement the action or whether outside help will be necessary. Consider, a) Staffing (enough staff and training): Does the jurisdiction/special district have the capability (staff, technical experts) to implement the action? b) Funding allocated: does the jurisdiction/special district have the funding to implement the action or can it readily be obtained? c) Time: can it be accomplished in a timely manner? d) Maintenance/Operations: can the jurisdiction/special district provide the necessary maintenance? It is important to remember that most federal grants will not provide funding for maintenance.

- **P – Political:** This considers the level of political support for the mitigation action. Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far? Is there a local champion willing to help see the action to completion? Is there enough public support to ensure the success of the action? Have all stakeholders been offered an opportunity to participate in the planning process?
- **L – Legal:** The jurisdiction/special district must have the legal authority to implement the action or consider what new laws or regulations would be needed to carry out the mitigation action. Evaluate, are the proper laws, ordinances, and resolutions in place to implement the action? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?
- **E – Economic:** Economic considerations must include an evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt in a jurisdiction/special district. Consider benefits and costs at the planning level. A detailed benefit–cost analysis will be performed as project-specific funding becomes available. What financial benefits will the action provide? Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? Does the action contribute to community economic goals, such as capital improvements or economic development? Are there currently sources of funding that can be used to implement the action?
- **E – Environmental:** The impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), must be kept in mind when using federal funds. How will this action impact land/water? Impact on endangered species: How will this action impact endangered species? How will this action impact hazardous materials and waste sites? Is this action consistent with community environmental goals? Is the action consistent with federal laws, such as NEPA?

Table 88: Status of Previous Mitigation Actions by the Pyramid Lake Paiute Tribe

ID	Mitigation Action	Lead Department	Status For Plan Update
MH-9	Implement and/or use Community Emergency Response Teams and the Citizens Homeland Security Council, to shift burden from sworn officers, where appropriate (All Partners)	All Jurisdictions: • Emergency Managers • Police Departments	Carried forward
WF-1	Develop surge capabilities in the region to handle burn patients (All Partners)	Renown Health	Carried forward

ID	Mitigation Action	Lead Department	Status For Plan Update
WF-13	Adopt 2018 wildland fire code County-wide (All Partners)	Regional Fire Protection Districts	Complete
WF-16	Review and update (as needed) evacuation plans for communities in wildland fire-prone areas and hold evacuation drills at least once every two years (All Partners)	Regional Fire Protection Districts	Complete
FL-6	Replace and up-grade culverts and natural runoffs to reduce flooding losses (PLPT)*	PLPT Environmental Tribal Public Utilities Tribal Roads Department	Complete
FL-9	Complete drainage ditch improvements (Washoe County, City of Reno, City of Sparks, RSIC,* PLPT)	All Jurisdictions – Public Works	As of Nov 2023: Steamboat Ditch preliminary evaluation completed. Other ditches not started.
FL-14	Complete improvements to address undersized drainage ditches and systems County-wide (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: • Public Works • Engineering	As of Nov 2023: City of Sparks – in progress
MH-9	Implement and/or use Community Emergency Response Teams and the Citizens Homeland Security Council, to shift burden from sworn officers, where appropriate. (All Partners)	All Jurisdictions: • Emergency Managers • Police Departments	Carry forward
WF-1	Develop surge capabilities in the region to handle burn patients (All Partners)	Renown Health	Carry forward
WF-13	Adopt 2018 wildland fire code County-wide (All Partners)	Regional Fire Protection Districts	Complete
WF-16	Review and update (as needed) evacuation plans for communities in wildland fire-prone	Regional Fire Protection Districts	Complete

ID	Mitigation Action	Lead Department	Status For Plan Update
	areas and hold evacuation drills at least once every two years (All Partners)		
FL-6	Replace and up-grade culverts and natural runoffs to reduce flooding losses (PLPT)	PLPT Environmental Tribal Public Utilities Tribal Roads Department	complete
FL-9	Complete drainage ditch improvements (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: Public Works	As of Nov 2023: Steamboat Ditch preliminary evaluation completed. Other ditches not started.
FL-14	Complete improvements to address undersized drainage ditches and systems County-wide (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: • Public Works • Engineering	As of Nov 2023: City of Sparks – in progress
EQ-9	Complete seismic strength evaluations of critical facilities in all jurisdictions, including schools, community colleges, public infrastructure, and other critical facilities, to identify vulnerabilities for mitigation to meet current seismic standards. Mothball or demolish life-threatening buildings, particularly unreinforced masonry buildings (Washoe County City of Sparks, RSIC, PLPT)	Washoe County, City of Sparks, RSIC, PLPT –Public Works Engineering School Districts	Carry forward
EQ-10	Assess, repair, and/ or replace infrastructure that may fail during earthquakes (e.g., Keystone Ave. Bridge) (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: Public Works Engineering	In progress water infrastructure
EE-5	Install backup generators for critical infrastructure and facilities along with other measures to improve reliability (e.g., alarms, meters, remote controls, and switchgear upgrades) (All Partners)	All Jurisdictions: Emergency Management	Carry forward, only clinic has been completed

ID	Mitigation Action	Lead Department	Status For Plan Update
CA-1	Implement measures to prepare for a potential active shooter incident, including new security measures, training and exercises, improved partnerships with law enforcement agencies, and policy changes (e.g., Prohibiting open carry). (All Partners)	Law Enforcement Agencies Facility Managers	complete
DT-1	Construct new groundwater wells and water lines to provide additional water supplies. (PLPT)	PLPT Public Utilities	In progress
DT-2	Implement current TMWA* Conservation Plan including encouraging transition to less water-intensive landscaping on both public and private properties (City of Reno, City of Sparks, RSIC, PLPT)	City of Reno, City of Sparks, RSIC, PLPT: • Water Utilities • Planning Departments	Carry forward
ID-1	Implement a range of emission-reduction strategies (e.g., policies geared toward renewable energy measures and projects, reduction in vehicle miles traveled, and increased use of transit and multimodal transportation) to reduce levels of particulate matter, ozone, and other criteria pollutants (All Partners)	WCHD Air Quality Management Division	Carry forward

* Note: PLPT = Pyramid Lake Paiute Tribe, RSIC = Reno-Sparks Indian Colony, TMWA = Truckee Meadows Water Authority, WCHD = Washoe County Health District

2024–2029 Mitigation Implementation Plan

FEMA	**C5.** Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered (Requirement §201.6(c)(3)(iii))

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the Tribe. The implementation plan includes both short-term strategies that focus on planning and assessment activities, and long-term strategies that will cause ongoing capability or structural projects to reduce vulnerability to hazards.

Table 89: 2024–2029 Mitigation Implementation Plan for the Pyramid Lake Paiute Tribe

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)*	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
1	Backup generators for government facilities.	Wind-storm, Winter storm, Wildland Fire, Energy Emergency	This could put the Tribe out of business. Very important to maintain government operations.	Pyramid Lake Fire Rescue/ EMS	N/A	N/A	FEMA Hazard Mitigation Assistance funding sources	$1M	Keep critical facilities operating	Long-term	1–2 years	High
Description: Backup generators for government facilities.												
2	Study on backup water supply	Earthquake, Volcano	Drinking water supply tank is on a fault line.	Pyramid Lake Fire Rescue/ EMS	TMWA, Indian Health Service	PED	BRIC	$2–3M	Clean drinking water, hydration lifeline	Long-term	1–5 years	High
Description: Study and implement as possible options for backup drinking water supply.												
3	Fuel mitigation funding sources	Wildland Fire	Essentially, the entire area is at risk.	Pyramid Lake Fire Rescue/ EMS	BLM	Mutual aid agreements	Possibly private–public partnership, BRIC	$200K/ yr	Preservation of life and property	Long-term	1–5 years	High
Description: Identify funding sources and implement fuels mitigation projects												
4	Public information on risk reduction of wildfires	Wildland Fire	Entire community	Pyramid Lake Fire Rescue/ EMS	Living with Fire/ UNR*	Public information	Tribal funding, university support	$10K	Increase public safety through information	Medi-um	1–5 years	Medium
Description: Share information with the public on signs and at events on defensible space, fuels mitigation, dragging of chains, to reduce risk												
5	Stream banks	Flood, Landslide	Low lying areas	Pyramid Lake Fire Rescue/ EMS	Environ-mental	Monitoring	PA Mitigation (406)	$50K	Reduced flooding	Short-term	1–5 years	Low

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)*	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
					depart-ment							
Description: Stabilize stream banks												
6	Enhancing irrigation ditch and headgate function-ality for optimal water management	Drought	Agricultural irrigation	Environmental Department/ Public Utilities	Environ-mental depart-ment	Updated irrigation ditches and headgates	Local funding	$1M	Ensure proper irrigation of agricultural fields	Long-term	1–5 years	Medium
Description: Improve irrigation ditches and headgates to ensure functionality												
7	Enhancing awareness and education on extreme heat risks for vulnerable populations	Extreme Heat	Public education to reduce loss of life and health implications	Pyramid Lake Fire Rescue/ EMS	UNR	Public Information	Local funding	$20K	Increase public awareness of safety through information	Medi-um	1–5 years	Medium
Description: Promote education and awareness of extreme heat risk and opportunities to reduce risk especially with the elderly, people with medical conditions, and other vulnerable populations												
8	promoting awareness and access to vaccination for infectious disease prevention	Prevention of infectious diseases	Routine Vaccines,	Health Clinic	Pyramid Lake Health Clinic, CDC	Encourage public participation to reduce illness and death	Local funding	$30K/yr	Healthier population	Short-term	1–5 years	High
Description: Promote awareness of infectious diseases when they are a concern and provide opportunities to be vaccinated												
9	Enhancing safety: ongoing education and engagement strategies for railroad and	Hazardous Materials Incident, Radiological	To prevent HazMat spills	Pyramid Lake Fire Rescue/ EMS	Para-digm liaisons pipeline	Educational training opportunities for	National Pipeline Association	$0	Continuing education on pipeline and railroad radiological waste	Short-term	1–5 years	Medium

#	Project Title	Hazard(s) Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)*	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
	pipeline risk mitigation	Waste Transport				emergency responders			transportation safety and response			
Description: Provide continuing education and engagement with railroad and pipeline owners to reduce risk												
10	Flood insurance study	Flooding	People and infrastructure	Washoe County	PLPR	Needs further investigation	General Fund	$50,000	Studying areas lacking flood insurance can pinpoint vulnerable regions and guide policy decisions, enhancing community preparedness and economic resilience. It raises awareness about the need for adequate coverage and supports stronger disaster mitigation efforts.	5-10 years	1-2 Years	Medium
Description: This study aims to identify gaps in flood insurance coverage in the county by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.												
MH-9	CERT in CHSC to help shift the burden from law enforcement	All hazards	Assisting law enforcement to reduce vulnerabilities to hazards	All Jurisdictions: • Emergency Managers, • Police Departments	Washoe County Sheriffs	Emergency response, trained civilians to assist LEOs	Homeland Security, State Funding	$700 per trainee	Reduce the burden on LEOs to assist with other priorities	Medi-um	1–3 years	Medium

Description: This study aims to identify gaps in flood insurance coverage in the county by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.												
Description: Implement and/or utilize Community Emergency Response Teams, as well as the Citizens Homeland Security Council, to shift burden from sworn officers, where appropriate. (All Partners)												
WF-1	Surge capabilities for burn patients	Wildfire	Health of citizens and first responders	Renown Health	Fire Department	Care and transportation of victims to facilities	Local	$200K	Reduce loss of life by immediate care to victims	Medium	1–5 years	Medium
Description: Develop surge capabilities within the region to handle burn patients. (All Partners)												
FL-9	Drainage ditch improvements	Flooding	Community flooding	All Jurisdictions: • Public Works	Local roads department, NDOT	Roads, general improvement plan	Grant, existing budget	Unknown	Prevent roadway structural loss to keep roads open during evacuations	Long-term	5+ years	High
Description: Complete drainage ditch improvements. (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)												
FL-14	Expand drainage ditches and systems	Flooding	Community flooding	All Jurisdictions: • Public Works • Engineering	NDOT. local roads department	Roads, general improvement plan	Grant, existing budget	$20/ linear foot of drainage ditch	Prevent roadway structural loss	Long-term	5+ years	Medium
Description: Complete improvements to address undersized drainage ditches and systems County-wide. (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)												
EQ-9	Critical facilities seismic strength evaluations	Earthquake	Seismic	Washoe County, City of Sparks, RSIC, PLPT: • Public Works • Engineering • School Districts	UNR and USGS	Seismic mitigation	Grant, existing budget	Unknown	Reduce property loss and critical facilities by improving seismic capabilities	Long-term	1–5 years	High
Description: Complete seismic strength evaluations of critical facilities in all jurisdictions, including schools, community colleges, public infrastructure, and other critical facilities, to identify vulnerabilities for mitigation to meet current seismic standards. Mothball or demolish life-threatening buildings, particularly unreinforced masonry buildings. (Washoe County City of Sparks, RSIC, PLPT)												

Description: This study aims to identify gaps in flood insurance coverage in the county by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.												
EQ-10	Infrastructure mitigation	Earthquake	Seismic	All Jurisdictions: • Public Works • Engineering	UNR and USGS	Seismic mitigation	Grant, existing budget	Un-known	Reduce infrastructure loss	Long-term	1–5 years	High
Description: Assess, repair, and/ or replace infrastructure that may fail during earthquakes (e.g., Keystone Ave. Bridge). (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)												
EE-5	Backup generators and other measures for critical infrastructure and facilities	Energy Emergency	Loss of critical infrastructure	All Jurisdictions: • Emergency Manage-ment	Local governm ent	Maintain working government facilities during emergen-cies	Grant	$100K per design and installa-tion	Reliable services for the community	Medi-um	1–3 years	High
Description: Install backup generators for critical infrastructure and facilities along with other measures to improve reliability (e.g., alarms, meters, remote controls, and switchgear upgrades). (All Partners)												
DT-1	Additional water supplies	Hydration	Identify and support the need for additional water access	PLPT Public Utilities	TMWA and local public utilities, and Indian Health Services	Identify and provide for clean water redundan-cies	Local budget or funded through Indian Health Services	$5M	Water redundancy	Long-term	1–5 years	High
Description: Construct new groundwater wells and water lines to provide additional water supplies. (PLPT)												
DT-2	Implement TMWA Conservation Plan	Drought	Water conservation	City of Reno, City of Sparks, RSIC, PLPT: • Water Utilities • Planning Depart-ments	TMWA Indian health services and public utilities	Education on water conserva-tion. Less water for landscape uses	Grant, existing budget	$50K/ year	Conserving water	Long-term	5+ years	High

Description: This study aims to identify gaps in flood insurance coverage in the county by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.												
Description: Implement the current TMWA Conservation Plan, including encouraging the transition to less water-intensive landscaping on both public and private properties. (City of Reno, City of Sparks, RSIC, PLPT)												
ID-1	Climate adaptation and resiliency	Renewable energy and reduction in emissions	Reduce emission pollution and create a smaller carbon footprint	WCHD Air Quality Management Division	Environmental department and department of energy	Increase solar and electric vehicle usage to reduce pollution and increase renewable energy	EPA grants, existing budget, and DOE grants	Un-known	Reducing carbon footprint	Long-term	5+ years	High
Description: Implement a range of emission reduction strategies (e.g., policies geared toward renewable energy measures and projects, reduction in vehicle miles traveled, and increased use of transit and multi-modal transportation) to reduce levels of particulate matter, ozone, and other criteria pollutants. (All Partners)												

Notes: *Includes vulnerable populations; **Through which the action will be implemented.

BLM = Bureau of Land Management, BRIC = Building Resilient Infrastructure & Communities, CDC = Centers for Disease Control and Prevention, CERT = Community Emergency Response Team, CHSC = Citizens Homeland Security Council, DOE = Department of Energy, EPA = Environmental Protection Agency, LEO = Law Enforcement Organizations, NDOT = Nevada Department of Transportation, PA = Public Assistance, TMWA = Truckee Meadows Water Authority, UNR = University of Nevada, Reno, USGS = United States Geological Service, WCHD = Washoe County Health District

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Acronyms

°F	degrees Fahrenheit
BLM	Bureau of Land Management
BRIC	Building Resilient Infrastructure & Communities
CCD	County Subdivision
CDC	Centers for Disease Control and Prevention
CERT	Community Emergency Response Team
CHSC	Citizens Homeland Security Council
DOE	Department of Energy
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HMP	Hazard Mitigation Plan
LEO	Law Enforcement Organizations
MPT	Mitigation Planning Team
NCEI	National Centers for Environmental Information
NDOT	Nevada Department of Transportation
NFIP	National Flood Insurance Program
NNSS	Nevada National Security Site
NOAA	National Oceanic and Atmospheric Administration
OCC	Operations Command Center
PA	Public Assistance
PER	preliminary engineering report

PG&E	Pacific Gas and Electric Company
PHMSA	Pipeline and Hazardous Materials Safety Administration
PLPT	Pyramid Lake Paiute Tribe
RNO	Reno–Tahoe International Airport
RPZ	runway protection zone
RSIC	Reno-Sparks Indian Colony
RTS	Reno-Stead Airport
SHMP	State Hazard Mitigation Plan
TMWA	Truckee Meadows Water Authority
TRFMA	Truckee River Flood Management Authority
UNR	University of Nevada, Reno
USGS	United States Geological Service
WCHD	Washoe County Health District
WUI	Wildland–Urban Interface

Reno-Sparks Indian Colony Hazard Mitigation Program

FEMA	**A1.** Does the plan document the planning process, including how it was prepared and who was involved in the process? 44 CFR § 201.7(c)(1) **A2.** Does the plan document an opportunity for public comment during the drafting stage and prior to plan approval, including a description of how the tribal government defined "public"? 44 CFR § 201.7(c)(1)(i) **A3.** Does the plan document, as appropriate, an opportunity for neighboring communities, tribal and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, as well as other interests to be involved in the planning process? 44 CFR § 201.7(c)(1)(ii) **A4.** Does the plan describe the review and incorporation of existing plans, studies, and reports? 44 CFR § 201.7(c)(1)(iii)

The following annex represents the Reno-Sparks Indian Colony (RISC or the Colony)'s strategic approach to reducing risk and lessening disaster impacts across the Colony. RSIC actively participated in the hazard mitigation plan update process through attending planning meetings, completing planning forms, attending the public meeting in Reno, sharing the digital survey, and reviewing the draft plan. Throughout the 2024 update process, the following Regional Hazard Mitigation Plan (RHMP) participation were recorded:

Name	Title	Department
Genn Bronczyk	Assistant Planner	Community Services Department
Cameron Kramer	Emergency Services Assistant	Emergency Management
Ceira Sampson	Emergency Services Manager	Reno-Sparks Indian Colony (RSIC)
Candace Stowell	Planning & Community Development Director	Planning Department

RSIC defines the public, known as the Tribal Community, as tribal members, community members (those living on tribal land with tribal members) and employees. RSIC welcomed input from the Tribal Community on this plan update at a General Council Meeting as described in the base plan. One question on the volcano hazard was received and discussed at this meeting.

What's New in the 2024 Update?

With the 2024 RHMP update, Washoe County and its regional partners have recognized changes in planning priorities by placing an added emphasis on incorporating actionable strategies into the mitigation implementation plan and moving away from including ongoing coordination activities. Recent disasters and emerging hazards have also influenced planning priorities and the development of mitigation actions for the 2024 RHMP update.

Since the 2020 Hazard Mitigation Plan (HMP), the Reno-Sparks Indian Colony (RSIC) has continued to grow and develop its Hungry Valley location. Recent conservation efforts have focused on managing off-highway vehicle use, promoting sustainable land management, and restoring native vegetation. Biodiversity recovery has been observed, with new species of birds and small mammals identified. Community-led projects and collaborations with local tribes, environmental organizations, and government agencies have increased. Climate change impacts, such as altered precipitation patterns and more frequent extreme weather events, have made these efforts even more critical. The Planning Department provides interactive maps for effective land use management. The 2024 RHMP update includes references to new housing projects, community facilities, and economic activities through tribal enterprises and small businesses.

The 2024 update of the RHMP includes the following major revisions to the 2020 plan:

- Updating the plan in accordance with the new Local Mitigation Planning Policy Guide, including additional climate change information
- Adding additional opportunities for public and stakeholder engagement
- Expanding the capability assessment
- Updating the goals/objectives to incorporate additional tribal considerations

Plan Adoption

44 CFR §201.6(c)(5) requires that an HMP be formally adopted by elected officials from each participating jurisdiction. The Tribal Council formally adopted the 2024 update of the Washoe County RHMP.

This RHMP was approved by FEMA Region 9. Once the plan is approved and signed, a copy of the Tribe's adoption resolution will be placed in Appendix E of the Base Plan.

The tribal government will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR Parts 200 and 3002, and will amend its plan whenever necessary to reflect changes in tribal or Federal laws and statutes? [44 CFR § 201.7(c)(6)]

Continued Public Involvement

FEMA	D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))

Public involvement is a key component of the plan implementation and update process. As part of this plan update, an ArcGIS StoryMap website has been developed to inform the public about the hazard mitigation plan update and their local risks. The StoryMap will be made available once the plan goes out for public comment in December. This user-friendly website is intended to make the hazard mitigation plan more accessible to the general public. This website also informs the public how to leave comments on the draft plan and continue participating in the plan maintenance process. The IEM Project Manager for the Washoe County RHMP update will collect, disseminate, and integrate any public comments received, as appropriate.

Following the annual review of the RHMP, the County will prepare and make available via the Internet an Annual Mitigation Status Report providing an update on the implementation of the current mitigation plan. This report, along with specific reports for each mitigation measure being implemented and all stakeholder comments received, will be assessed to make improvements in the plan update released every five years.

In addition to the ongoing input collected and compiled during the implementation of the previous plan, the MPT, as mentioned above, will review aspects of the draft update plan. Comments received from the public will also be considered and incorporated, where appropriate, into updates of the plan.

The County and its partners, The Cities of Reno and Sparks, North Lake Tahoe Fire Protection District, Pyramid Lake Paiute Reservation, Reno-Sparks Indian Colony, Truckee Meadows Fire Protection District, and Truckee River Flood Management Authority, will also engage community members on an ongoing basis through outreach at local events and meetings to ensure that public participation is incorporated outside the five-year plan update process. The County and its partners maintain public engagement and awareness programs focused on increasing the community's awareness of hazards and promoting actions to reduce individuals' and families' exposure to hazard risks. Recognizing that these are ongoing programs, the

The County and its partners will continue to implement the following programs during this five-year planning period:

- Seasonal Multi-Hazard Public Awareness Program;
- Annual weather safety activities to maintain the County's StormReady Community accreditation;
- Community Wildfire Protection Plan preparation;

- Community evacuation plan preparation and evacuation drills;
- Community Emergency Response Team (CERT) academy training sessions;
- Washoe County Emergency Preparedness Program;
- Green waste collection events;
- Food Truck Fridays in Reno;
- Meetings with homeowners' associations and other community groups; and

Outreach through social media.

Community Profile

Tribal Sovereignty and Governance

The RSIC is a federally recognized Indian Tribe organized under the provisions of the Indian Reorganization Act of 1934. Its Constitution was adopted in 1936 by the residents of the Colony. A chairman and eight-member Tribal Council are elected to serve as the governing body and to act in accordance with the provisions of the constitution. To be eligible, candidates must be enrolled members of the Colony, be 21 years of age by the election date, have no felony convictions, and physically reside on Colony land for not less than one year immediately before the election, as written in the bylaws.

The constitution gives the Tribal Council authority and responsibility to raise revenues, incur expenses, enter into contracts, borrow money, administer funds, purchase land, and provide services for the general welfare and benefit of Colony members.

The RSIC's last Tribal election took place on November 4, 2023, and the next is scheduled for November 2025.207 Council seats have four-year terms, and four seats are up every two years, with staggering meant to improve continuity among the council.

The Colony is a growing organization with over 1,336 members.208 It employs approximately 300 people, including over 150 Tribal members, and is progressively taking steps to provide for the needs of its members while maintaining Tribal culture and protecting sovereignty.

[207] Reno-Sparks Indian Colony, "Tribal Government." https://www.rsic.org/228/Tribal-Government#:~:text=The%20RSIC%20held%20its%20last,up%20for%20election%20in%202027.
[208] Ibid.

"Our vision is for a strong community that promotes and encourages individual spiritual, physical and emotional health to foster a long, abundant and prosperous life, which will lead to personal, family and community responsibility and prosperity" (www.rsic.org)

The RSIC's mission is "to offer opportunities for tribal members to improve their lives and enhance tribal values by making community programs, services, and projects available."[209]

Geography and Climate

The RSIC is located near Reno and Sparks, Nevada. The reservation lands consist of the original 28-acre residential Colony in central-west Reno, the 15,426-acre Hungry Valley reservation, located 19 miles north of the Colony in a more rural setting in Eagle Canyon, west of Spanish Springs, and commercial properties near the original Colony location, in Verdi, In Spanish Spring, and in Hungry Valley. The Hungry Valley reservation is nearly 17 square miles. The total land holdings are 15,609 acres.

The area features a steppe climate, which means it is in the range between desert and humid. The Colony's climate is the same as the city of Reno's, with an average precipitation of 7.4 inches. Most rainfall and snow occur in winter and spring, with the possibility of summer thunderstorms occurring between April and October. Extreme highs have reached 104°F to 108°F, and lows range from -16°F to 17°F. Reno averages 50 days with precipitation a year. Figure 79 shows averages based on data from 1981 to 2010.

[209] Reno-Sparks Indian Colony, "About Us." https://www.rsic.org/27/About-Us

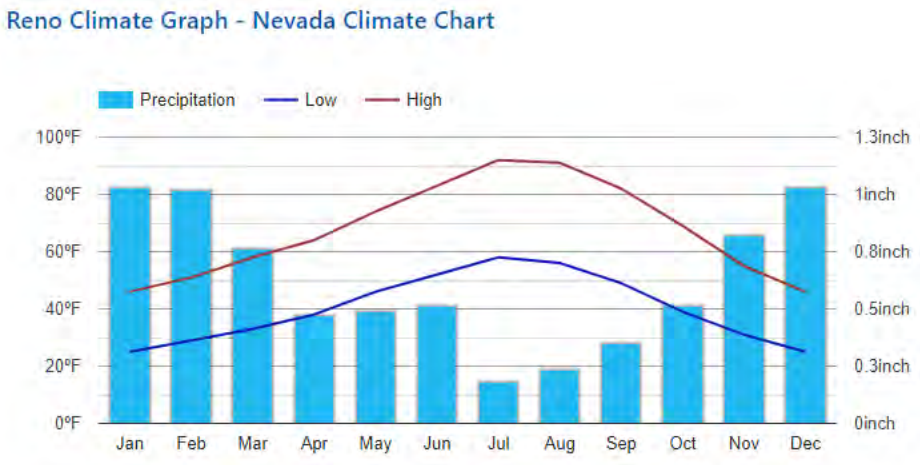

Figure 79: Temperature and Precipitation Averages for the City of Reno [210]

Population and Demographics

The RSIC comprises three Great Basin Tribes: Paiute, Shoshone, and Washoe. It is unusual in that it occupies both an urban setting and a rural land base. The RSIC records 1,336 Tribal members. The 2020 Census reported a total resident population of 916 for RSIC, with 530 residents living in Hungry Valley and 386 residents living on the Reno Colony.

The Colony's original Reno location has a smaller community than Hungry Valley due to constraints on acreage. It is located between the cities of Reno and Sparks along a four-block stretch next to a freeway. The Colony's Hungry Valley community is located 19 miles away. The Hungry Valley community consists of two Tribal housing developments, a community center, emergency services, childcare, a cemetery, and pow-wow grounds. It covers 15,426 acres adjacent to land administered by the Bureau of Land Management. All the surrounding roads are dirt, except those in the housing area and leading to the Community Center, which are paved. The Hungry Valley community has approximately 530 residents, according to the 2020 Census.

Due to a lack of housing on Tribal lands, other RSIC members live near the Colony. They receive services and participate in Tribal programs, activities, and resources. The RSIC has deemed these members eligible for services at the Tribal Clinic, education programs, social services, and other tribally funded programs, such as the Seniors Program. Many members residing off Colony lands are on the waiting list for housing on the reservation, which occasionally becomes available. Indians from other tribes residing on the reservation also receive governmental and Tribal services as community residents.

[210] U.S. Climate Data, "Climate Reno, Nevada." https://www.usclimatedata.com/climate/reno/nevada/united-states/usnv0076

The 2018–2022 American Community Survey five-year estimates report that the RSIC's population has a per capita income of $18,415[211] and a median household income of $47,500.[212] Persons living below the poverty line made up 32.2%[213] of the RSIC's population, which is more than twice the U.S. rate in 2022: 12.4%.[214] There are 299 housing units on the RSIC.[215]

Tribal Enterprises

The Tribal Council oversees Colony affairs and has final authority over all contracts, leases, and the business affairs of the Colony. The Colony created its planning and economic development department in 1975 to provide a revenue stream to pay for essential government services. The Colony attributes a positive track record of dealing with commercial tenants to its stable government, experienced staff, and consistency of purpose. The Colony's business development program is assisted by various federal incentives and a compact with the State of Nevada, which covers the collection of Tribal sales and excise taxes.

The Colony manages 4 commercial development sites, is landlord to 20 commercial tenants, and operates 6 smoke shops. For economic support, many tribes outside Nevada build casinos that have little or no competition. Nevada Tribes, however, compete in an already glutted gaming market in the state. The RSIC previously relied upon sales revenue from its six smoke shops but has leased and developed its commercial sites to diversify the Colony's general fund from sole reliance on tobacco revenues.

Revenues from the Colony's commercial real estate projects provide funds for the Colony's government, which provides essential services to Tribal members, residents, and other urban Indians. For example, the RSIC leased land to Walmart in 2003. The resulting tax revenues

[211] Census Reporter, "Reno-Sparks Indian Colony." https://censusreporter.org/profiles/25200US3130R-reno-sparks-indian-colony/
[212] United States Census Bureau, "S1903|Median Income in the Past 12 Months (In 2022 Inflation Adjusted Dollars)." https://data.census.gov/table/ACSST5Y2022.S1903?q=Reno-Sparks%20Indian%20Colony%20and%20Off-Reservation%20Trust%20Land,%20NV
[213] United States Census Bureau, "S1701|Poverty Status in the past 12 Months." https://data.census.gov/table?q=Reno-Sparks%20Indian%20Colony%20and%20Off-Reservation%20Trust%20Land,%20NV%20poverty
[214] United States Census Bureau, "Income, Poverty and Health Insurance Coverage in the United States: 2022." https://www.census.gov/newsroom/press-releases/2023/income-poverty-health-insurance-coverage.html#:~:text=Official%20Poverty%20Measure-,The%20official%20poverty%20rate%20in%202022%20was%2011.5%25%2C%20with%2037.9,was%20the%20lowest%20on%20record.
[215] United States Census Bureau, "DP04|Selected Housing Characteristics." https://data.census.gov/table?q=Reno-Sparks%20Indian%20Colony%20and%20Off-Reservation%20Trust%20Land,%20NV%20housing%20value

enabled RSIC to secure a 2006 Bond Issue to finance the design and construction of a 65,000-square-foot health center for the RSIC, which was completed in 2008.[216]

The Reno-Sparks Indian Colony owns and operates six Tribal Smoke Shops, which offer a wide variety of cigarettes and tobacco products at competitive prices. These smoke shops have continued to thrive, providing a significant source of revenue for the Colony. In addition to tobacco products, the RSIC has expanded its economic ventures by opening two cannabis dispensaries with drive-thru services in South Reno and Verdi, NV, in 2022. This expansion is part of the RSIC's strategy to diversify its economic base and create well-paying jobs for both tribal members and the public.

DEVELOPMENT HIGHLIGHTS

- Recent Development: Plans are underway to build 22 new homes in Hungry Valley with a $4.4 million grant from the Department of Housing and Urban Development. This project will provide affordable single-family homes for rent to tribal members and is expected to start construction in 2025 after infrastructure upgrades are completed.
- Recent Development: Justice Center. RSIC received a $1.6 million grant from the US Department of Justice to construct a multi-purpose Justice Center. The Justice Center will be located in Reno at 2 Sunshine Lane. This property comprises 3.69 acres and is held in trust.
- Recent Development: Pow Wow Grounds Master Plan. A Master Plan for the Pow Wow Grounds was adopted by the Tribal Council in September 2024.

Tribal Lands and Ownership Trends

The Reno-Sparks Indian Colony (RSIC) has a rich history of land ownership and development. Archeological evidence places the earliest residents of Nevada—the Paiute, Washoe, and Shoshone—at 10,000 years ago. Major land changes began with the discovery of gold in California, leading to increased settlement in the mid-1800s. This resulted in legislation around the formation of reservations, such as the Moapa River Paiute Reservation and the Walker River Paiute Indian Reservation, established by executive order in 1873. The U.S. Department of Interior recommended in 1859 that land be set aside for Indian use north of the Truckee River, including Pyramid Lake. Though an executive order was issued in 1874 to establish the Pyramid Lake Reservation, the legal year of establishment was 1859.

The RSIC was formed in response to a series of legislative actions, from the Indian Removal Act of 1830 to the Dawes Act of 1887, which resulted in disillusionment and a loss of traditional community structure. The RSIC was created to bring together Indians under their own government. In 1917, the federal government purchased 20 acres for non-reservation Indians of Nevada and for homeless Indians in what is now the Colony. In 1928, the Supreme Court

[216] Reno-Sparks Indian Colony, "Health Center." https://www.rsic.org/186/Health-Center

ruled that there is no distinction between a reservation and a colony, enabling the RSIC to procure an additional 8 acres of land.

The Colony became a federally recognized Indian Tribe under the Indian Reorganization Act of 1934, with the Constitution adopted in 1936. In 1937, the RSIC attempted to purchase an additional 1,080 acres but failed due to political challenges. In 1984, 1,920 acres were put into trust for the Tribe in Hungry Valley. The Nevada Native Nations Land Act, enacted by Congress on October 7, 2016, conveyed approximately 13,434 acres of land in Hungry Valley to the RSIC, expanding the Tribe's reservation from 1,960 acres to 15,263 acres. At present, the reservation includes 15,426 acres in Hungry Valley.

The RSIC is actively engaged in several economic development projects aimed at diversifying their revenue sources and supporting community growth. Key initiatives include commercial property development with tenants like Mercedes Benz of Reno and Walmart, generating revenue to fund essential government services. The RSIC also constructed a $20 million Tribal Health Center on Kuenzli Street, providing healthcare services to members and urban Indians in Washoe County.

Additionally, the RSIC is focusing on diversifying from reliance on tobacco revenues by developing various commercial operations and leasing land in high-growth areas. Community projects are also in the works, enhancing the quality of life for RSIC members and surrounding communities.

Natural Resources

Hungry Valley is where the western edge of the Mojave ecosystem intersects with the coastal mountain range. Hungry Valley has three shrub communities (mixed shrub, juniper shrub, and pinyon juniper-oak woodland), and major tree species in the area include cottonwood, willow, and sycamore, which provide food, nesting, and perching for a large number of birds. It hosts over 16 species of reptiles, amphibians, and diverse small mammals.

Recent conservation efforts by the Reno-Sparks Indian Colony have focused on restoring and protecting the natural resources of Hungry Valley. These initiatives include managing off-highway vehicle use to minimize environmental impact and promoting sustainable land management practices. Recent surveys have shown signs of biodiversity recovery, with new species of birds and small mammals being identified. Community-led projects aimed at restoring native vegetation and improving soil health have increased, often involving collaboration between local tribes, environmental organizations, and government agencies. Additionally, the impact of climate change on the Mojave ecosystem, including changes in precipitation patterns and increased frequency of extreme weather events, has made these conservation efforts even more critical. The Planning Department also provides interactive maps that show the boundaries of the reservation, authorized travel routes in Hungry Valley, and other important land use information, which are useful for planning and managing land use within the reservation.

Hazard Profiles and Vulnerability Assessments

FEMA	**B1.** Does the plan include a description of the type, location, and extent of all natural hazards that can affect the tribal planning area? 44 CFR § 201.7(c)(2)(i) **B2.** Does the plan include information on previous occurrences of hazard events and on the probability of future hazard events for the tribal planning area? 44 CFR § 201.7(c)(2)(i) **B3.** Does the plan include a description of [each] identified hazard's impact, as well as an overall summary of the vulnerability of the tribal planning area? 44 CFR § 201.7(c)(2)(ii)

This section presents hazard profiles and vulnerability assessments to determine the potential impact of hazards on the people, economy, and built and natural environments of the Reno-Sparks Indian Colony. They have been streamlined to increase the effectiveness and usability of the RHMP for the RSIC, while additional information in presented in the base plan.

General

The County has received 43 major disaster declarations since 05/02/1953, including 10 since the previous HMP update. Table 3 identifies the declarations since 2020 that are relevant to the RSIC.

Table 90: Major Disaster Declarations in Washoe County since 2020[217]

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard Mitigation Program Declared	Declaration Date	Title
5495	No	No	No	06/12/2024	Fire
5494	No	Yes	Yes	06/11/2024	Fire
5448	No	Yes	Yes	08/14/2022	Fire
5382	No	Yes	Yes	11/07/2020	Fire
5328	No	Yes	Yes	08/15/2020	Fire
5326	No	Yes	Yes	08/03/2020	Fire
5322	No	Yes	Yes	07/21/2020	Fire

[217] FEMA, "Disaster Declarations for State and Counties." https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard Mitigation Program Declared	Declaration Date	Title
5316	No	Yes	Yes	06/27/2020	Fire
4523	Yes	No	No	04/04/2020	Biological (COVID-19)
3443	No	No	No	03/13/2020	Biological (COVID-19)

In addition to official disaster declarations, RSIC noted the following previous hazard events:

Type of Hazard Event	FEMA Disaster #	Date(s)	Damage or Impacts	Description
Avalanche and Landslide	N/A	None	N/A	N/A
Criminal Acts and Terrorism	N/A	None	N/A	N/A
Drought	N/A	Annual	No damage, however, requires conservation of water use.	Annual droughts lead to conservation of water in the Hungry Valley and Reno Tribal community.
Earthquake	N/A	N/A	N/A	N/A
Energy Emergency	N/A	Frequent	Community members with medical devices	Intermittent power outages lasting less than 24 hours.
Flood	N/A	2017	Impacted the Tribal community by impeding travel	2017 Flood in the Reno Colony as well as road flooding in the

Type of Hazard Event	FEMA Disaster #	Date(s)	Damage or Impacts	Description
			and damaging small structures.	Hungry Valley community
Hazardous Materials Incident	N/A	N/A	N/A	N/A
Infectious Disease	N/A	N/A	N/A	N/A
Radiological Waste Transport	N/A	N/A	N/A	N/A
Extreme weathers (Winter Storm, Windstorms, Extreme Heat)	N/A	2022 and 2023	Extreme snow impacting travel and causing power outages—some lasting longer than 24 hours.	Winter storm lasting several days with record high snow pact.
Transporta-tion Incident (Aircraft Crash)	N/A	None	N/A	N/A
Volcano	N/A	None	N/A	N/A
Wildland Fire	N/A	2019	Wildland fire threatened Hungry Valley community	Wildland fire just outside RSIC Jurisdiction in area by Hungry Valley requiring multi-jurisdiction efforts.

Hazard Ranking Methodology

The hazards identified in the RHMP were initially ranked by the RSIC's representatives using the factors considered in the Calculated Priority Risk Index. After evaluating and measuring each factor, a total score for each hazard was developed.

Hazard-Specific Profiles and Risk Assessments

The following sections profile and assess the risks associated with hazards for the RSIC focusing on anything of note that differs for the RSIC from the rest of Washoe County as discussed in the base plan. Hazards identified as having as risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0-2.4 are considered moderate risk hazards. Hazards with a risk factor value less than 2.0 are considered low risk. The highest possible RF value is 4.

Table 91: Factors for Calculating Risk

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Probability *What is the likelihood of the hazard occurring?*	1	Unlikely	Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.	30%
	2	Occasional	1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.	
	3	Likely	11 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years.	
	4	Highly Likely	91 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.	
Magnitude *What will be the overall impact?*	1	Negligible	Less than 5% of the affected area's critical and non-critical facilities and structures are damaged/destroyed. Only minor property damage and minimal	30%

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
			disruption of life. Temporary shutdown of critical facilities.	
	2	Limited	Greater than 5% and less than 25% of property in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than one day but less than one week.	
	3	Critical	Greater than 25%, but less than 50% of property in the affected area was damaged/destroyed. Complete shutdown of critical facilities for over a week but less than one month.	
	4	Catastrophic	Over 50% of critical and non-critical facilities and infrastructures in the affected area are damaged/destroyed. Complete shutdown of critical facilities for more than one month.	
Onset *How long will be there be between when it is recognized the hazard is approaching and when the hazard will begin affect the community?*	1	Self-defined	More than 24 hours	10%
	2	Self-defined	12 to 24 hours.	
	3	Self-defined	6 to 12 hours.	
	4	Self-defined	Less than 6 hours.	
Duration *What is the length of time the hazard will remain active, including how long emergency operations will have*	1	Brief	Up to 6 hours.	10%
	2	Intermediate	Up to one day.	
	3	Extended	Up to one week.	
	4	Prolonged	More than one week.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
to continue after the hazard event?				
Frequency *How often has this kind of hazard resulted in an emergency or disaster?*	1	Every 10+ years	This hazard is not frequent but may still impact the area.	20%
	2	Every 5–10 years	This hazard is not as frequently occurring, but it could occur in the next 10 years.	
	3	Every 1–5 years	This hazard is likely to occur relatively often. It might have occurred more or less frequently recently, but on average, it can be expected every 1–5 years.	
	4	Annually	This hazard is a frequent occurrence which the area actively has to respond to on an approximately annual basis.	

The following is the risk factor equation:

Risk Factor Equation

RF Value = [(Probability x .30) + (Magnitude x .30) + (Onset x .10) + (Duration x .10) + (Frequency x .20)]

The Washoe County base plan is comprehensive for regional assessments and effectively addresses the calculated risk indexes. It provides a thorough evaluation that highlights its commitment to risk management and community safety, while the annexes are specific to each jurisdiction.

Table 92: Calculated Priority Risk Index for the Reno-Sparks Indian Colony

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Avalanche and Landslide	1	1	4	3	1	1.5
Criminal Acts and Terrorism	2	3	2	3	3	2.8
Drought	3	3	1	4	4	3.1
Earthquake	2	4	1	4	3	2.9
Energy Emergency	4	3	4	2	4	3.5
Flood	2	2	4	3	3	2.5
Hazardous Materials Incident	2	2	4	3	2	2.3
Infectious Disease	3	2	1	4	4	2.8
Radiological Waste Transport	3	2	3	4	1	3
Extreme weathers (Winter Storm, Windstorms, Extreme Heat)	4	3	1	4	4	3.8

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
Transporta-tion Incident (Aircraft Crash)	2	1	4	3	1	1.8
Volcano	1	1	4	4	1	1.6
Wildland Fire	3	2	3	4	1	3.7

Wildland Fire

LOCATION

According to the USFS Wildfire Risk to Communities, RSIC has low, moderate, or high risk area depending on the exact location. Fires are a high risk in the Hungry Valley reservation; the entire reservation is in a high-risk area for wildland fires. The majority of the area surrounding the RSIC is considered moderate risk, except for the urban areas around the City of Reno, which are low risk.

PREVIOUS OCCURRENCES/HISTORY

The following recent wildland fires have occurred near Tribal assets:

IMPACTING THE HUNGRY VALLEY RESERVATION

- **September 9, 2019, the Hungry Fire** burned a total of 305 acres. The fire threatened structures on the Hungry Valley reservation, including the water tank and communications tower, but it was contained without damaging any structures. This fire also threatened areas of Spanish Springs. No known cultural sites were damaged.
- **July 2019, the Big Dog Fire** in Hungry Valley burned 5 acres.
- **July 2019, the Jasper Fire** burned 1,165 acres before it was fully contained on Tuesday, July 16, 2019. It started Saturday, July 13, around 3 p.m. in the area of Chimney Drive and Leon Drive in Sun Valley, burning in grass and sagebrush, and then spread into Spanish Springs. This fire resulted in a temporary closure of Eagle Canyon Road, the main paved route leading into and out of the RSIC Hungry Valley land base.
- **July 2017** – The Hungry Valley Fire Department contained a 13.62-acre fire on the reservation.

- **July 11, 2017, the Long Valley Fire** took 10 days of intense firefighting against unpredictable winds, extremely high temperatures, and saturating humidity. The blaze burned 83,733 acres, or about 131 square miles. It started near Doyle, California, and burned into the north end of Spanish Springs Valley toward Pyramid Lake. It could be seen by Hungry Valley residents.
- **July 4, 2017, the Winnemucca Ranch Fire** east of Pyramid Highway and in Palomino Valley burned around 4800 acres. Although 58 structures were threatened at the fire's onset, it destroyed only one mobile home and two outbuildings on Amy Road. The fire was human-caused. This fire did not directly impact the Hungry Valley community but was nearby.

IMPACTING THE RSIC IN RENO

While there is no record of the following fires directly damaging the Colony, smoke from nearby fires could have adversely impacted residents.

- **October 24, 2023**: Hill Fire near Verdi area fire broke out at 11:00 pm, and homes were evacuated on both sides of the Nevada–California state line near Dog Valley Road. Truckee Meadows Fire and Protection crews worked to stop the brush fire burning in the Verdi area that ultimately burned 47 acres of land due to erratic winds and threatened to encroach on an estimated 40-60 homes on Hill Road from Bridge Street to Dog Valley Road neighborhoods.
- **August 23, 2021:** California Dixie and Caldor Fires – Dense smoke from massive wildfires burning in neighboring California created hazardous air quality in the Reno–Tahoe area, canceling flights and forcing schools, parks, and popular summer beaches to be closed. Government air monitors recorded some of the region's most hazardous conditions in years. The National Weather Service issued an air quality alert for parts of northeast Nevada's Elko County, more than 300 miles (482 kilometers) east of the closest California fires. Smoke blowing from the Dixie and Caldor fires in California blanketed northern Nevada on and off for weeks, leaving particulate matter in the air and causing ash to rain on cars in some areas.
- **November 17, 2020, Greater Reno/Carson City** – Powerful Pacific jet stream, rain shadowing, and mountain waves yielded some of the highest winds the region has seen in a few years. Still, dry vegetation and high winds contributed to several major wildfires near Reno, NV, and Walker, CA. A brief period of spillover rain and snow occurred that night into the morning of November 18.
- **November 17, 2020, the Pinehaven Fire** in the Caughlin Ranch area of SW Reno with wind gusts 72-77 MPH measured in the vicinity. On Tuesday, November 17, at approximately 1 p.m., a fire started on the hillside just south of Pinehaven Road and Sierra Pine Drive. Five homes were destroyed, three homes were heavily damaged, and 21 homes suffered minor damage from the fire.

- **October 4, 2024: The Baccarat Fire** started near Red Rock Road north of Reno on the 4th before being contained on the 8th. The fire burned 10,500 acres, but no structures were destroyed. However, the fire threatened 75 to 100 homes. Mandatory evacuations were ordered for some residents in the path of the fire. Firefighting costs were approximately $2.4M, according to the Carson City District Office, Nevada Bureau of Land Management. October was dry and warm, with much of the area reporting no measurable monthly precipitation.
- **August 24, 2019: The Long Valley Fire** started near the Red Rock exit along US Highway 395 and spread across the California/Nevada border into northwestern Nevada on the 24th before being contained on the 27th. The fire burned 2,438 acres, and one structure was destroyed. FEMA stated that the fire threatened 250-300 homes in and around Rancho Haven, Nevada. The fire also threatened five buildings, infrastructure, utilities, equipment, farms, ranches, and a watershed in the area. Mandatory evacuations were ordered for approximately 800 people before containment was reached. Firefighting costs were approximately $600K, according to the Nevada Bureau of Land Management. The fire was caused by warm temperatures and dry conditions and occurred from the 23rd through the end of the month. Breezy conditions occurred on the 24th and 25th, but the combined effects of winds and humidity did not reach critical fire weather criteria.
- **July 13, 2019: The Jasper Fire** in northern Sun Valley burned 1,165 acres from July 13 to July 16. Sierra Front Dispatch Center stated that one home and two outbuildings were destroyed. At one point, more than 100 homes were threatened, and the Washoe County Sheriff's Office was going door to door, urging people to evacuate. Firefighting costs were approximately $769K, according to the Nevada Bureau of Land Management. The fire was caused by a longwave trough that moved across the northwestern US and brought breezy conditions each afternoon to western Nevada and eastern California.
- **2016: The Little Valley Fire** resulted from an escaped prescribed burn, causing a blaze that consumed 2,300 acres in Washoe Valley, just south of Reno.
- **2012:** Careless disposal of hot ashes ignited brush that destroyed 26 homes and closed US Highway 395. The fire occurred along the southern outskirts of Reno, blackening 2,000 acres of suburban scrubland and causing the death of one elderly man.
- **2011: The Coughlin Fire** was a wildland–urban interface fire started in the low Sierra Nevada foothills at the west edge of Reno, Nevada. Strong winds contributed to the fire, which burned 1,935 acres, destroyed 28 homes, and damaged an additional 15 homes. Forty-three homes were destroyed or damaged by this fire, and an estimated 4,500 homes were threatened. The estimated market value of the property lost was over $10,400,000. About 445 personnel on 59 firefighting apparatuses, hand crews, and support vehicles responded to this incident. The 2000-acre fire resulted in the evacuation of 9,000+ people, the death of 1 man during the evacuation, and the admittance of 17 to the hospital for smoke inhalation and burns (one firefighter).

EXTENT

Tribal assets on the RSIC urban campus are better positioned for support from Reno's many fire stations. However, Hungry Valley is poised to develop over 100 new homes in a region rated as a high fire risk, with just one volunteer fire department in proximity.

Weather conditions greatly influence the impact and extent of wildland fires. Drought, high temperatures, and wind contribute to the dynamics and changing conditions of wildland fires. Fuel load and vegetation contribute to the size and intensity of wildland fires. As weather conditions change due to climate change, wildland fire may become more frequent and intense.

PROBABILITY OF FUTURE EVENTS

Based on projected changes including reduced snowpack and earlier snowmelt, aridification, and more frequent and prolonged drought and heat the RSIC may be impacted by an increase in the probability of wildland fires.

VULNERABILITY

Hungry Valley is especially vulnerable to fire risk because it is located in a High-Risk fire area and due to the limited road infrastructure. This vulnerability is demonstrated by the closure of the main paved route in and out of Hungry Valley from the 2019 Jasper Fire. The Hungry Valley community is located in a rural mountainous area surrounded by dry vegetation susceptible to wildfire with volatile fuels, such as cheatgrass, sagebrush, and juniper, which can easily start a fire. Another vulnerability is that Hungry Valley's evacuation routes are in High-Risk fire areas. Further, wildfire smoke can impact the area. Where wildfires do not directly impact the tribal community, wildfire smoke could potentially impact vulnerable populations within the tribal community.

ESTIMATED IMPACT AND POTENTIAL LOSSES

According to the Climate and Economic Justice Screening Tool (CEJST), the Hungry Valley portion of the Colony is in the 90th percentile for projected wildfire risk to properties. The Internal Fire Code, 2018 edition was recently adopted in 2024, indicating that structures built prior to the adoption of this code may be at an increased risk of wildland fire damage. Members of the Tribe are vulnerable to the effects of fire and may be displaced by fires that spread to residential areas of the reservation. Wildfire could also impact business operations and commercial businesses including structural impacts as well as reduction of customers or closure of businesses during or following an event. Community events such as the Annual Numaga Powwow, which is usually held in the summer, could also be impacted by a wildland fire event.

Carports in new residential developments in Hungry Valley continue to pose a fire risk due to the potential for blown embers to cause a fire. Flammable materials may be stored in carports,

and fuels such as dead leaves and other debris might collect in carports, making them pose a fire risk.

VULNERABLE POPULATIONS

Diminished air quality is an environmental impact that can result from a wildfire and pose a potential health risk. The smoke plumes from wildfires can contain potentially inhalable carcinogenic matter. Fine particles of invisible soot and ash too small for the respiratory system to filter can cause immediate and possibly long-term health effects. The elderly and individuals with compromised respiratory systems may be more vulnerable to the effects of diminished air quality after a wildfire event. Fires outside the RSIC may also affect Tribal members by worsening air quality. Tribal elders and those with existing medical conditions such as asthma would be most at risk of experiencing health effects due to smoke from wildland fires; however, during very poor air quality periods, all Tribal members may be at risk of very poor air quality.

EXISTING MITIGATION CASE STUDY

Ongoing mitigation efforts are being conducted by the RSIC Hungry Valley Fire Department which include the mowing and creation of fire breaks in the valley. The evacuation routes are also graded by RSIC Public Works throughout the year.

Energy Emergency

LOCATION

A power outage or other energy emergency may impact any area of the RSIC. Hungry Valley, at the edge of the regional electrical grid, is more vulnerable than the Tribe's Reno campus to power outages. Hungry Valley receives power via a single transmission line from Lemmon Valley.

PREVIOUS OCCURRENCES/HISTORY

The Tribe experiences frequent power outages on an annual basis, particularly intermittent power losses lasting less than 24 hours. Historically, power outages have been caused by natural events and human-caused accidents. NV Energy also noted that regional heatwaves and the adaptation rate of EVs could influence the occurrence of rolling blackouts.

Interruptions in energy services may also be planned—for example, to allow for system repairs or maintenance. In 2019, NV Energy began implementing extensive public safety outage management programs in areas with extreme fire risks. To prevent downed power lines and damaged equipment from causing fires, NV Energy may de-energize parts of the electrical grid during weather conditions conducive to wildland fires (e.g., high temperatures, low humidity, high winds, lightning storms) or based on field observations or information from first

responders.[218] Planned outages by NV Energy or Pacific Gas and Electric Company (PG&E) in California can affect fuel availability for the Tribe. Outages affecting PG&E's system would cut power to the equipment that controls the operation of the fuel pipeline serving the region.

Based on the NV Energy Red Rock PSOM Zone Map (Figure 80), residents in Reno-Sparks Indian Colony would be affected by the scheduled power outages. NV Energy will monitor weather patterns 7 to 10 days ahead for any concerning weather patterns. By the 72-hour mark, NV Energy will begin communicating with local emergency management officials and discussing where they see risks.

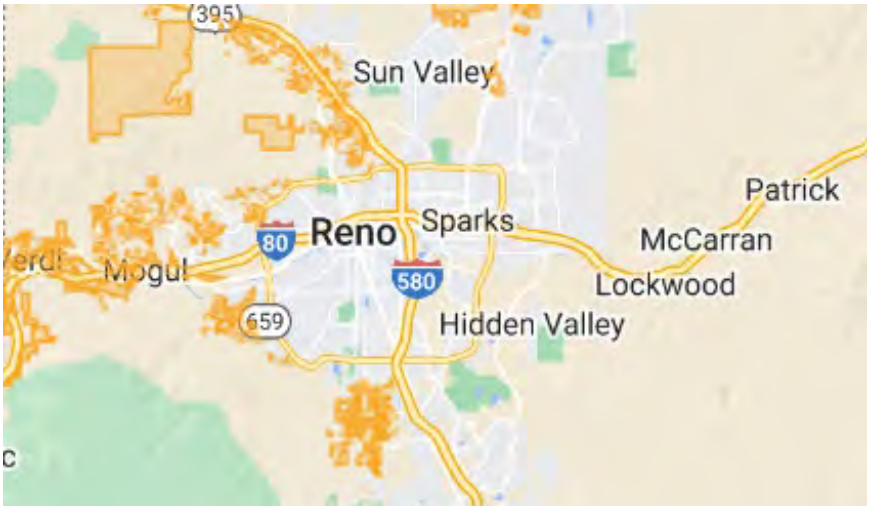

Figure 80: NV Energy Red Rock Public Safety Outage Management Zone Map[219]

EXTENT

It is difficult to predict the impacts of future power outages, but they can impact all government and business operations and cause extensive economic losses, among other impacts. Due to the sporadic nature of power outages, it is difficult to estimate how frequently such failures will occur or their duration. The city's electricity provider, NV Energy, generally deals with power outages multiple times per year, with many of them lasting only hours. Every several years, more significant power outages are experienced.

PROBABILITY OF FUTURE OCCURRENCES

Given the historic occurrences, it can be assumed that the RSIC will experience energy emergencies on an annually basis. Based on potential increases in heat waves, increasing

[218] NV Energy, "Emergency De-Energization|NV Energy." https://www.nvenergy.com/publish/content/dam/nvenergy/brochures_arch/safety/Emergency-De-Energization-Infosheet-2024-07-02.pdf
[219] NV Energy, "Power Safe NV." https://www.nvenergy.com/safety/wildfire

regional development resulting in greater demand, and the adoption rate of EV vehicles, the RSIC may be impacted by an increase in the probability of power outages.

VULNERABILITY

NV Energy has provided electric power to northern Nevada for over 150 years. Customers in the Reno-Sparks area are served by multiple power generation facilities and a transmission system with built-in redundancy, which decreases the risk of widespread and longer-duration power outages.

However, power outages can disrupt government and business operations over time periods ranging from several hours to several days. The Colony has installed solar panels on a few of its government buildings. The solar panels installed at Hungry Valley facilities are connected to the electric grid and would not be able to provide power in the event of a grid outage.

Electricity customers in areas on the fringes of the electric system may be some of the last to have service restored, as repairs to urban areas with more customers are prioritized. Elderly Tribal members and those who are sick or economically disadvantaged are more vulnerable to the effects of extended power outages. Community members with medical devices are a notable concern for the tribe when there is an energy emergency.

Depending on the season, if a power outage occurs, the Colony will activate incident command. The Fire Department and Tribal Clinic perform welfare checks for vulnerable residents in Hungry Valley and at the Reno campus to ensure that they have enough food and critical supplies.

VULNERABLE POPULATIONS

The Reno-Sparks Indian Colony has several vulnerable populations during energy emergencies. Elderly residents often depend on stable energy for heating, cooling, and medical devices, making them particularly at risk. Low-income families may struggle to afford energy costs, heightening their vulnerability during crises.

Individuals with disabilities also face challenges, as many rely on electric medical equipment. Children and infants require consistent living conditions for health and safety, which can be jeopardized during energy outages. Single-parent households may experience added stress due to limited resources.

Finally, community members with chronic health conditions depend on energy for essential treatments and can suffer serious health risks when outages occur.

EXISTING MITIGATION CASE STUDY

The Tribal Energy Development Capacity Grant Program is a competitive, discretionary grant program that seeks to develop the Tribal management, organizational, and technical capacity

that Tribes need to maximize the economic impact of energy resource development on Indian land. Each year, the program awards funding that provides Tribes with the necessary resources to develop or enhance Tribal policies, codes, regulations, or ordinances related to energy resources, including land-lease regulations for energy development purposes in accordance with the Helping Expedite and Advance Responsible Tribal Homeownership Act, also known as the HEARTH Act. Reno-Sparks Indian Colony was awarded $150,000 for the Hungry Valley Tribal Utility Authority and the Reno Government Complex Energy Infrastructure Feasibility Project in 2023.[220]

Extreme weathers (Windstorm)

LOCATION

Extreme wind events are experienced in every region of the United States. A useful tool for determining the location of the extreme wind hazard area in a jurisdiction is depicted in Figure 81**.** The map shows RSIC is in Zone I, with a design windspeed for shelters of 130 miles per hour. Windstorms may occur anywhere in Washoe County.

PREVIOUS OCCURRENCES/HISTORY

Windspeeds in Washoe County can reach high levels. In 2016, Reno was ranked as the second windiest city in the United States, and Reno has reported record wind gusts exceeding 80 mph. Daily wind speeds were obtained from NOAA's online climate database for Washoe County from 2015 through 2018. The data suggest that the windiest months in Washoe County are April through June. Average daily wind- speeds from 2015 to 2018 for the months of April through June ranged from 6.09 to 7.50 mph.

NOAA's NCEI Storm Events Database records 170 events of high wind, strong wind, and thunderstorm wind in Washoe County between 2019 and 2023. No deaths, no injuries, $5K in property damage, and $250 in crop damage were identified in the database. No specific records of windstorm damages to the RSIC has been recorded.

[220] U.S. Department of Interior, Indian Affairs, February 2023, "Indian Affairs Announces Tribal Energy Development Capacity Grants." Indian Affairs announces Tribal Energy Development Capacity grants | Indian Affairs (bia.gov)

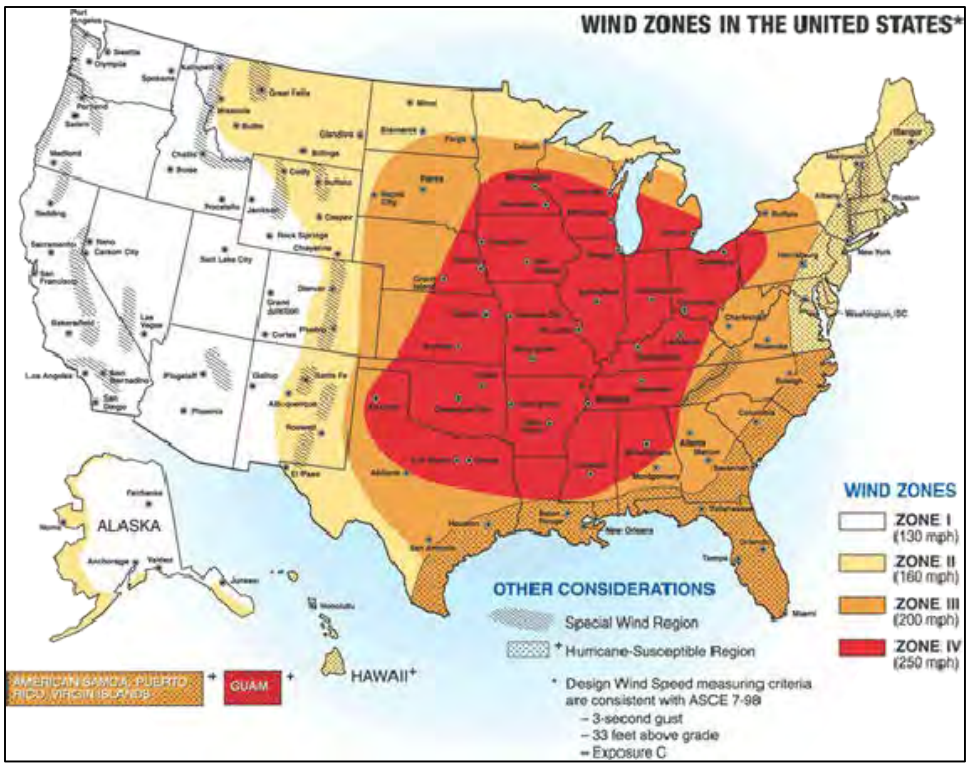

Figure 81: Wind Zones in the United States[221]

EXTENT

Extreme wind can occur alone, such as during straight-line wind events and derechos, or it can accompany other natural hazards, including snowstorms, blizzards, and severe thunderstorms. Severe wind threatens lives, property, and vital utilities, primarily because of the effects of flying debris or downed trees and power lines. Properties with aboveground infrastructure, utilities, and tree stands may be more damaged during windstorms. Severe wind will typically cause the greatest damage to structures of light construction, particularly manufactured homes. An additional 22 manufactured homes are expected to be built in Hungry Valley.

PROBABILITY OF FUTURE OCCURRENCES

The probability of windstorms is high, based on the number of occurrences recorded in NCEI. There is no reliable data on whether Nevada windstorms will increase or decrease in frequency and intensity in the coming decades due to climate change.

[221] Resilient Action Fund, FEMA, 2022, "Wind Zones in the United States." U.S. Wind Zones Map Resilience Action Fund (buildingresilient.com)

VULNERABILITY

Most vulnerabilities to windstorms occur in the built environment. Buildings, utilities, and transportation systems are vulnerable to wind damage. Old or poorly constructed buildings or insufficiently anchored manufactured homes are more vulnerable to strong winds and can be heavily damaged. Uprooted and fallen trees can damage aboveground power and other utility lines and can block roads, railways, or other transportation networks. Windstorms can also generate storm-related debris that can be costly and time consuming to clear. Building damage and service interruptions also cause economic losses from business interruptions.

Falling trees or blowing debris can cause injuries or death. Power outages and transportation disruptions can also negatively impact populations.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated losses and potential impacts to the Reno Sparks Indian Colony due to windstorms can be significant, affecting both the community's infrastructure and natural resources. High winds can lead to property damage, including the destruction of homes and damage to public buildings, such as schools and community centers. The cost of repairs and rebuilding can strain the Colony's finances, especially if federal or state assistance is limited. Additionally, windstorms can cause disruptions to essential services like electricity and water supply, impacting the daily lives of residents and increasing the burden on local resources.

Moreover, the environmental impact of windstorms can also be profound. Severe winds can uproot trees and damage the local ecosystem, leading to long-term consequences for wildlife habitats and the natural landscape. This loss not only affects biodiversity but can also have cultural implications for the community, as many Indigenous cultures are deeply connected to their natural surroundings. Furthermore, such weather events can make it more challenging for the community to engage in cultural practices and activities, thereby affecting the social fabric of the Reno Sparks Indian Colony.

VULNERABLE POPULATIONS

The Reno Sparks Indian Colony is home to diverse populations, some of which are particularly vulnerable to the impacts of windstorms. Among them, elderly residents stand out as a significant group at risk. Many older adults may face mobility challenges or health conditions that hinder their ability to evacuate quickly or find safe shelter when severe weather strikes. This demographic often requires additional support and planning to ensure their safety during emergencies.

Additionally, low-income families within the colony may also be at heightened risk during windstorms. Limited financial resources can make it difficult for these families to prepare adequately for such events, leaving them without essential supplies or safe housing. This economic vulnerability can exacerbate the effects of a windstorm, as recovery efforts become more challenging in the aftermath.

Individuals with disabilities represent another group vulnerable to windstorm impacts. Those with physical or cognitive disabilities might struggle with evacuation procedures or comprehending emergency instructions, making timely responses to severe weather even more difficult.

Furthermore, the presence of children and infants in the community adds another layer of concern. Young children often require close supervision and special care during emergencies, and their safety becomes a paramount concern for families facing extreme weather conditions.

Lastly, the homeless population in the area faces severe risks during windstorms, as they typically lack a safe place to seek shelter. Without access to adequate protection from the elements, individuals experiencing homelessness are particularly susceptible to the dangers associated with severe weather.

Earthquake

LOCATION

The State of Nevada is the third most seismically active state in the U.S. and Washoe County is in one of the most seismically active areas in Nevada. Most occurrences of earthquakes are small enough to be nearly undetectable by people, but larger magnitude earthquakes can cause significant damage to homes and infrastructure. At least two faults are running through the region that may be capable of a large, damaging earthquake of magnitude 7 or more, larger than the Northridge earthquake in January 1994. There are many more, smaller faults which could also impact the RSIC.

During an earthquake, the developed areas of the reservation and its commercial districts including the northern half of the original RSIC colony, Hungry Valley VSIC, and smoke shops may experience seismic ground motion hazard of a 2% probability in 50 years.

PREVIOUS OCCURRENCES/HISTORY

Section 4 of the Base Plan includes information on previous major earthquakes in Washoe County, with magnitudes greater than 5 on the Modified Mercalli Intensity (MMI) Scale. Shaking from these earthquakes would have been felt in Reno and might have caused structural damage.

The largest earthquake in the past 50 years in Washoe County occurred on April 25, 2008. Small earthquakes began in the western Reno, Nevada, region in February 2008 and grew in size and frequency until mid-April. On April 15, 2008, seismic activity greatly increased, producing four events of magnitude 3 and above. The earthquake swarm increased again on April 24, 2008, with two magnitude 4 events. The mainshock occurred on April 25, 2008, with a magnitude of 5, and caused violent shaking at Mogul and Somersett (see Figure 11). A vigorous aftershock sequence followed into the summer of 2008.

While buildings overall survived the shock well, reports indicated that the violent rocking of buildings caused some structural damage, such as cracked paint and plaster along drywall seams, wall and ceiling corners, and doors and entryways. Although the greater Reno area has experience earthquake losses, there are no specific previous occurrences of note which impacted the RSIC.



Figure 82: Water Flume Damaged by the 2008 Mogul–Somersett Earthquake[222]

EXTENT

A major earthquake can cause widespread and significant damage to structures in the RSIC communities, as well as injuries and deaths. Because of their potential to damage structures, roads, and utilities, earthquakes may disrupt government operations and the local economy for days to weeks, require evacuations, or create increased demand for emergency medical services. Response to and recovery from an earthquake may require federal support.

PROBABILITY OF FUTURE OCCURRENCES

Seventeen earthquakes with a magnitude greater than 5 on the MMI scale have occurred in Washoe County in the last 150 years. The probability of future occurrence can be estimated at 10%, meaning there is roughly a 10% chance of an earthquake with magnitude >5 to occur every year. Climate, economic, and land use trends do not affect the probability of an earthquake; however, economic trends and land use patterns can affect the amount of damage caused by an earthquake. This increases the probability that future earthquakes will damage structures, roads, utilities, and any new development.

[222] 2020 Regional HMP, "2008 Mogul-Somersett Earthquake Damage Rock fall damage to water flume (Nevada Bureau of Mines and Geology, University of Nevada, Reno; dePolo 2008)

VULNERABILITY

Earthquakes can cause significant, widespread structural damage throughout the region. The Tribe recently adopted the International Building Code, 2018 Edition in 2024. The majority of the Reno Colony's housing stock was built before 1990, while the majority of the Hungry Valley housing stock was built before 2000. Prior housing stock may not meet current seismic standards. The Tribal Health Center, the Tribe's newest government facility, meets seismic standards as of 2008. However, several other government facilities, including the Reno gym, Reno Health Clinic, Hungry Valley gym, and Hungry Valley community center, are cinderblock construction and have not been retrofitted. Existing homes at the Reno campus and Hungry Valley reservation have not been retrofitted to meet current seismic standards. The Tribe's Housing Department plans to construct additional homes in Hungry Valley, which will be constructed according to current seismic standards.

Additional tribal assets which may be impacted include:

- The Tribe identified the Cultural Resources Department building as more vulnerable to earthquake damage.
- The Reno gym—a cinderblock building—has also been identified as at risk of earthquake damage, an additional vulnerability, as the gym is a shelter facility for residents of the RSIC urban campus. The Tribe has identified retrofitting this facility as a priority.
- Other cinderblock facilities owned by the Tribe include the Reno Health Clinic, Hungry Valley gym, and all buildings in the Hungry Valley community center.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The Reno-Sparks Indian Colony is at risk of several significant impacts and potential losses in the event of an earthquake. One of the primary concerns is the damage to infrastructure. Buildings, roads, and utility systems could be severely compromised, leading to high repair costs and disruptions in essential services.

Economic losses would likely be substantial as well. Business interruptions due to physical damage or safety concerns can result in reduced revenue and employee layoffs, ultimately affecting the local economy. Additionally, if businesses are forced to close for repairs or face decreased customer traffic due to fear of aftershocks, the longer these disruptions persist, the more pronounced the economic impact will be.

The displacement of residents is another critical concern. An earthquake could force individuals and families to evacuate their homes, leading to both temporary and potentially long-term homelessness. This situation can strain local resources, as the community may not be fully equipped to handle an influx of displaced individuals seeking shelter and support.

In terms of health and safety, earthquakes pose direct risks to personal well-being. Injuries and fatalities can occur during seismic events, and the demand for medical assistance may surge.

Local healthcare facilities, already operating under considerable strain, may struggle to provide adequate support in the aftermath of a significant earthquake.

Moreover, cultural and historical impacts cannot be overlooked. The colony may contain important cultural sites and historical landmarks that could be damaged or lost in an earthquake, leading to a detrimental effect on the community's heritage and identity.

Environmental effects are another consideration. Earthquakes often cause land shifts that can lead to soil erosion or alter water flow, impacting local ecosystems and wildlife. These changes can have both immediate and long-term repercussions for the area's natural resources.

Finally, the costs associated with emergency response and recovery can be considerable. Local governments may face a financial burden as they mobilize emergency services and resources to address the aftermath of an earthquake. This financial strain could affect their budgets, limiting available funding for other community needs and long-term recovery efforts.

VULNERABLE POPULATIONS

In the Reno-Sparks Indian Colony in Nevada, several populations are particularly vulnerable to earthquakes. One of the most at-risk groups is the elderly. Older adults often face mobility challenges and may have health conditions that make it more difficult for them to respond quickly to an emergency. Their need for assistance during such events highlights the importance of establishing support systems within the community.

Children are another vulnerable demographic. In the event of an earthquake, young children may not have the understanding or ability to respond effectively on their own. Having proper safety measures and clear communication tailored to their needs can help protect this group during seismic events.

Individuals with disabilities also require special consideration. Those with physical or cognitive impairments might face significant challenges during an evacuation or when attempting to find safe shelter. Ensuring that emergency plans are inclusive and accessible is essential for safeguarding their well-being.

Low-income families represent another population that can be disproportionately affected by earthquakes. Limited financial resources may hinder their ability to secure safe housing or access to necessary emergency supplies. This economic vulnerability can greatly increase their risk and susceptibility to disaster impacts.

Additionally, non-English speakers may struggle to comprehend emergency instructions or alerts. Language barriers can inhibit their ability to respond effectively, making it crucial for the community to provide resources and information in multiple languages.

Finally, residents living in substandard or older housing are at heightened risk during seismic events. Structures that do not meet safety standards can collapse or incur significant damage, leading to injury or loss of life.

Flood

LOCATION

RSIC owns several parcels along the Truckee River and some of these parcels are located within the 500-year flood hazard zone.

The Hungry Valley community is not located in a flood zone. However, rainstorms and flash flooding can make Hungry Valley's evacuation routes impassable.

The Colony owns a 24-acre parcel in Spanish Springs at 7655 Pyramid Way. A stormwater ditch was constructed along the site's western boundary, directing stormwater flows into the Washoe County stormwater channel at the parcel's north end. The stormwater channel is in the 100-year floodplain. Culverts installed where these drainage ditches cross over roads are substantially undersized for water that drains to this area, resulting in recurring flooding.

The burn scar from the Hungry Fire in September 2019 represents an area of increased flood risk until vegetation is re-established. The burn scar is in a canyon in the Hungry Range above the Colony's cemetery. The Colony plans to install signage warning the public that the area is a burn scar and flooding is a possibility and to install concrete barriers to divert runoff back into natural areas. When storms are forecasted, the Colony will monitor drainage areas to ensure they are debris-free.

PREVIOUS OCCURRENCES/HISTORY

In January 2017, northern Nevada experienced significant flooding from a storm that dropped 3 to 6.5 inches of rain in the region and snow in the mountains. The combination of heavy rain and mountain snow led to flood conditions in the valleys of the Reno-Sparks area, impacting local travel and causing small structure damage. There was also localized flooding in places near irrigation ditches designed to carry water from the Truckee River to agricultural areas south of Reno.

RSIC members have also mentioned incidents of flooding near the Eagle Canyon smoke shop and road flooding in the Hungry Valley community.

EXTENT

Severe flooding may cause serious injuries and deaths and damage public facilities and private property. The river's height can determine the extent of flooding flows compared with flood stages determined by U.S. Geological Survey stream gauges throughout the area. Reno may experience limited localized flooding on an annual basis. Anywhere it rains it can flood so all areas of the RSIC may be at risk but risk would likely be limited.

PROBABILITY OF FUTURE EVENTS

Based on a potential increase in high-intensity precipitation events and an increased probability of wildland fires, Reno may be impacted by an increase in the probability of flooding and flash flooding particularly following wildfires. Hungry Valley may experience an increase in flash flooding due to changing conditions.

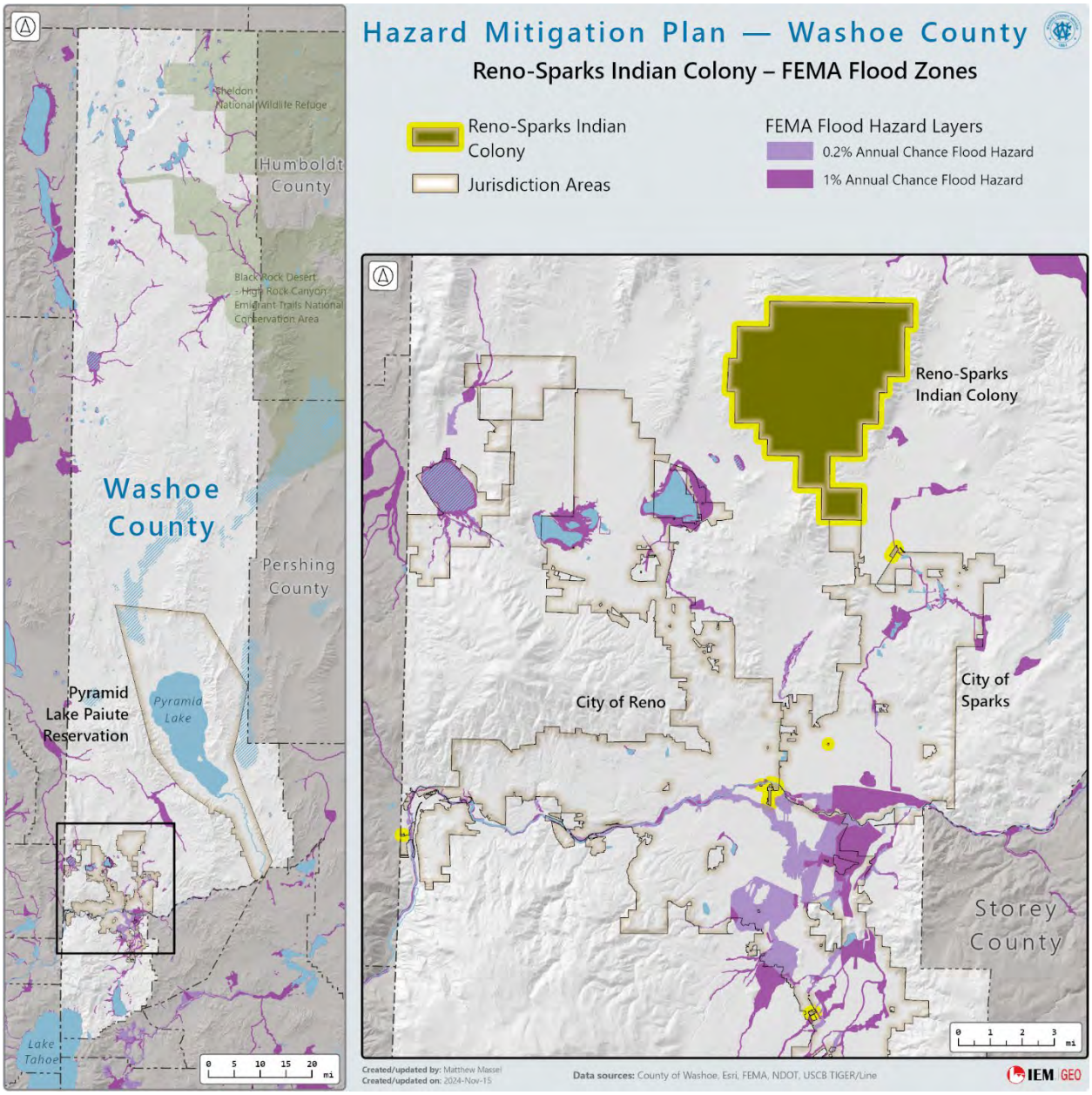

Figure 83: Reno-Sparks Indian Colony Flood Map

VULNERABILITY

The probability of flooding risk is low because the Colony is not located in a 100-year flood zone. However, given the proximity of the Reno RSIC campus to the Truckee River, the Colony should be prepared for a flooding event. The Colony's Public Works Department has a weekly, monthly, and annual preventative maintenance program for infrastructure maintenance and repair. Part of this is cleaning out drainage ditches monthly, which reduces flooding risk.

The evacuation route for Hungry Valley is vulnerable, as rainstorms and snowstorms can make the route impassable. The RSIC is considering paving an all-weather road to help address this issue.

REPETITIVE LOSS PROPERTIES

The Colony does not maintain a repetitive loss property inventory that meets the Repetitive Loss or Severe Repetitive Loss criteria. There are no NFIP insured structures.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The impacts of flooding on the Reno-Sparks Indian Colony can be significant, affecting both the physical environment and the community's overall well-being. One of the most immediate consequences is property damage, which can range from structural destruction of homes to the loss of personal belongings and community facilities. These damages can lead to prolonged displacement for affected families and disrupt the fabric of daily life within the colony.

In addition to property impacts, infrastructure damage can severely hinder movement and access to essential services. Flooded roads and damaged utilities can impede emergency response efforts and complicate recovery processes. Economic loss is also a significant concern, as local businesses may suffer due to operational interruptions and decreased patronage, potentially leading to job losses and a decline in overall community economic activity.

The environmental implications of flooding cannot be overlooked. Erosion and contamination may threaten local ecosystems and water sources, undermining the community’s reliance on these resources for both sustenance and cultural practices. Health risks are also heightened in flooded areas, with standing water posing threats such as waterborne diseases and increasing stress factors that can impact mental health.

Cultural loss is another poignant aspect, as flooding can endanger culturally significant sites and artifacts, erasing vital elements of the community's heritage. Recovery from such events can be financially taxing and time-consuming, often requiring substantial investments in rebuilding and restoration efforts. Many community members may face challenges with insurance claims, which can result in additional financial strain. This multifaceted impact highlights the importance of community resilience planning in enhancing preparedness and response to future flooding events.

VULNERABLE POPULATIONS

The Reno-Sparks Indian Colony in Nevada has several populations that may be vulnerable to floods, particularly those living in low-lying areas near rivers. Elderly residents are at risk due to mobility challenges that complicate evacuation during flooding.

Children are also vulnerable, as they rely on adults for safety and guidance during emergencies. Individuals with disabilities face additional difficulties, and emergency plans should specifically address their needs.

Low-income families may lack safe housing and resources, increasing their vulnerability, while transient populations might not be fully aware of local flood risks. Additionally, single-parent households face unique challenges during evacuations, as one adult manages multiple children.

EXISTING MITIGATION CASE STUDY

RSIC participated in developing the floodwall and levee along the south bank of the Truckee River before the construction of Walmart on East Second Street in Reno. That undertaking involved the RSIC partnering with the Washoe County Flood Control Project, the Washoe County Public Works Department, the Nevada Department of State Lands, and Walmart.

At the Colony's expense, the RSIC completed a $1.3 million environmental cleanup of the site, assisted by a Brownfields Loan administered by the Nevada Division of Environmental Protection.

In 2017, the RSIC completed an abatement project—a flood wall protecting the Glendale Avenue and I-580 area—to mitigate potential rising waters in the Truckee River.

Extreme weather (Extreme Heat)

LOCATION

Extreme heat occurs when summertime temperatures are much hotter and/or more humid than average. Historically, the seasonal maximum heat index is 90.17 degrees. It may occur anywhere in Washoe County. However, urban areas are more likely to experience extreme heat conditions because of the heat island effect, in which the impervious surfaces concentrated in cities increase the surrounding area's temperature higher than in more rural areas.[223] The areas with the highest heat island severity in Washoe County include Reno and parts of the Hungry Valley area where heat island severity can range from mild to severe.

[223] United States Environmental Protection Agency, "Heat Island Effect." https://www.epa.gov/heatislands#:~:text=Heat%20islands%20are%20urbanized%20areas,as%20forests%20and%20water%20bodies

PREVIOUS OCCURRENCES/HISTORY

The National Weather Service issues advisories, watches, and warnings for "Excessive Heat."[224] Heat watches and warnings were issued in Washoe County in 2021[225] and 2023.[226] These warnings included information to help individuals avoid heat-related illnesses and the locations of cooling centers. No specific impacts were reported for RSIC for this hazard, but extreme heat coupled with an energy emergency or planned power outage would be of concern, especially for seniors.

EXTENT

The heat index is what the temperature feels like to the human body when relative humidity is combined with air temperature. There is a direct relationship between air temperature and relative humidity and the heat index. As air temperature and relative humidity increase, the heat index increases (see Figure 73).[227] When the heat index is high, the body has more difficulty cooling itself through evaporation of perspiration to maintain a comfortable temperature. The potential for negative health consequences increases with higher heat index values.

PROBABILITY OF FUTURE OCCURRENCES

While there have not been a significant number of historic events, the probability of extreme heat events is considered medium as they do happen and will likely continue to happen at an increased rate in the future. Climate projections indicate that there will be more incidents of extreme heat in Nevada. In particular, recent studies conducted by the Desert Research Institute conclude that climate change and an intense urban heat island have made Reno the fastest-warming city in the United States. As the duration and severity of heat waves become more extreme, extreme heat may become a greater concern for the RSIC in the future.

[224] National Weather Service, "Heat Watch vs. Warning." https://www.weather.gov/safety/heat-ww

[225] Reno Gazette Journal, "Excessive heat Warning Issued for Reno Area Beginning Sunday." https://www.rgj.com/story/news/2021/06/26/excessive-heat-warning-reno-area-beginning-sunday/5357958001/

[226] Reno Gazette Journal, Reno Experiencing 102-Degree Temps this Weekend; Excessive heat Watch into Next Week." https://www.rgj.com/story/news/2023/07/10/reno-expecting-102-degree-temps-this-weekend-heat-watch-through-monday-july-17-evening/70398343007/

[227] National Weather Service, "What is the Heat Index?" https://www.weather.gov/ama/heatindex

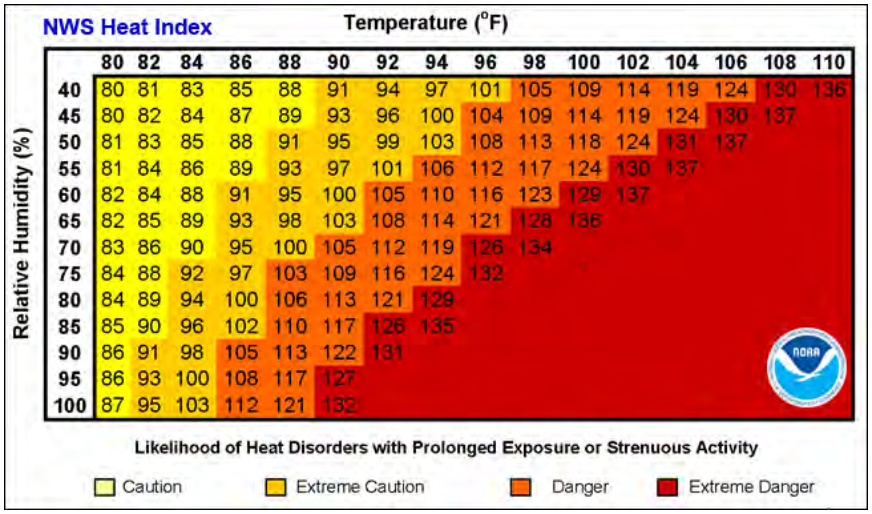

Figure 84: National Weather Service Heat Index[228]

VULNERABILITY

Extreme heat is associated with more fatalities than any other severe weather event in the United States. During extreme heat events, a person's body temperature may rise faster than it can cool itself, leading to heat-related illnesses such as heat exhaustion or heat stroke. Older adults, young children, pregnant women, and individuals with chronic diseases, such as cardiovascular or respiratory conditions, are at the highest risk. Outdoor workers and unhoused populations are also particularly vulnerable. People who live in social isolation are also at higher risk. Social factors, including race and ethnicity, income, and educational attainment, are correlated with many health outcomes, including heat-related illness. Lower-income individuals who live in housing without air conditioning may be at risk. Those living and working near urban heat islands may be more vulnerable.

Extreme heat is also related to wildfire risk. High temperatures contribute to the drying out of vegetation, which may burn more rapidly once ignited. These conditions are exacerbated if they occur during times of drought. This could worsen the risk in already wildfire-susceptible areas, such as Hungry Valley.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The Reno-Sparks Indian Colony is likely to face significant impacts due to extreme heat, which can pose various challenges and potential losses for the community. One major concern is health risks, particularly for vulnerable populations such as the elderly, children, and individuals with pre-existing health conditions. Higher temperatures can lead to heat-related illnesses, such as heat exhaustion and heat stroke, straining medical resources and increasing healthcare costs for the community.

[228] Ibid.

Extreme heat can also have detrimental effects on local agriculture. Prolonged high temperatures may damage crops and reduce yields, thereby threatening food security for the community. Those who rely on farming for their livelihood could experience substantial economic losses, which could ripple throughout the local economy. Additionally, water supply issues may arise as high temperatures exacerbate water scarcity, increasing competition for limited resources. This situation can impact both the availability of drinking water and irrigation, further straining agricultural efforts.

Moreover, the infrastructure of the Reno-Sparks Indian Colony may experience increased stress due to extreme heat. As temperatures rise, demand for electricity for cooling is expected to surge, potentially leading to power outages if the existing infrastructure is inadequate to handle peak demands. Such outages not only disrupt the comfort and safety of residents but can also have broader implications for community services and emergency responses.

On an economic level, extreme heat may deter tourism and outdoor activities, leading to decreased revenue for local businesses. The costs incurred in adapting community infrastructure to cope with heat—such as establishing cooling centers or upgrading energy sources—can also strain budgets. Environmental changes, including shifts in local ecosystems, may further disrupt traditional practices and cultural values tied to the land, challenging the community's connection to its heritage.

Finally, the mental health effects of prolonged extreme heat should not be overlooked. Increased stress and anxiety can stem from the hardships associated with rising temperatures, particularly in communities already dealing with socioeconomic challenges. Addressing these multifaceted impacts will require a coordinated effort that emphasizes planning, resource management, and community engagement to build resilience against the ongoing threats posed by climate change.

VULNERABLE POPULATIONS

Vulnerable populations on the Reno-Sparks Indian Colony in Nevada facing risks from extreme heat include the elderly and young children. Older adults may have reduced physiological responses to heat, while young children struggle to regulate their body temperature, making both groups susceptible to heat-related illnesses.

Individuals with chronic health conditions, such as diabetes or heart disease, are also at higher risk due to exacerbated symptoms during extreme heat. Low-income families often lack access to essential resources, such as air conditioning, making them particularly vulnerable.

Homeless individuals face significant risks without access to safe, cool environments, while people with disabilities may encounter barriers that limit their ability to cope with high temperatures. Additionally, outdoor workers are exposed to extreme heat for extended periods, thereby increasing their risk of heat-related injuries.

EXISTING MITIGATION CASE STUDY

Several municipal, county, and tribal governments and community groups based in the Reno-Sparks area are teaming up to map the hottest parts of Reno, Sparks, and adjacent portions of Washoe County. The National Oceanographic and Atmospheric Administration (NOAA) is partnering with the U.S. Departments of Health and Human Services and Housing and Urban Development to map urban heat islands.229

The City of Reno has been awarded a $500,000 grant from the United States Department of Agriculture and the U.S. Forest Service as part of the federal government's efforts to plant and maintain trees, combat extreme heat, and improve access to nature in cities nationwide.[230]

Drought

LOCATION

Nevada is the driest state in the nation. The RSIC has experienced near annual droughts. These long periods of droughts have led to conservation of water in both the Hungry Valley and Reno Tribal community.

PREVIOUS OCCURRENCES/HISTORY

Drought conditions occur frequently in Washoe County and impacts the RSIC. On average over the last five years, severe drought has occurred every two years. While drought has not resulted in any reported damages to the RSIC, it does require consistent conservation of water use.

EXTENT

The overall magnitude and potential severity of drought could range from an abnormally dry to exceptional drought. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Long-term drought could impact RSIC infrastructure.

PROBABILITY OF FUTURE OCCURRENCES

Drought is one of the least predictable hazards. In the current state of seasonal weather prediction, it is nearly impossible to predict the beginning or the ending of droughts with meaningful confidence levels. Climate projections suggest that there is potential for greater

[229] Desert Research Institute, 2024, Reno-Sparks selected to be part of Urban Heat Mapping Campaign – DRI

[230] MyNews4, Alyssa Beck, September 21, 2023, Reno named fastest-warming city in the United States from Climate Center (mynews4.com)

year-to-year variability in precipitation. This may further complicate drought planning in the future. With that said, periods of drought have regularly occurred in the recent history of Washoe County and Nevada; therefore, drought can be expected to occur with some regularity in the future with an approximately 50% chance of occurrence in a given year.

VULNERABILITY

Rural communities typically rely on groundwater resources for municipal Although groundwater sources tend to be more resilient to short-term droughts than surface water sources, the intensity and length of droughts may increase under changing climate conditions. Under these conditions, rural water supplies may be more vulnerable to drought conditions. The most significant impact to the RSIC may be to the environment, including through the secondary hazard of wildfire. Water resources are also considered a vital cultural resource of the tribe. The effects of drought can last from one to multiple years, and the economic and social impacts of drought are likely to be compounded as prolonged drought conditions persist.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The impacts of drought on the Reno-Sparks Indian Colony could be significant, affecting various aspects of life and the environment. One of the most immediate concerns is the reduction in water supply, which is crucial for both drinking water and agricultural irrigation. This limitation could severely impact the community's ability to sustain crops and livestock, resulting in food insecurity and economic hardship for families that rely on agriculture for their livelihoods.

Economic losses from drought can extend beyond the agricultural sector. If farming yields decline, families may face financial challenges, which could, in turn, affect local businesses that depend on the community's purchasing power. As residents struggle to make ends meet, overall economic activity within the colony could decline, creating a cycle of hardship and reduced resilience.

Drought conditions can also have a profound cultural impact on the Reno-Sparks Indian Colony. Many Native American communities emphasize their connection to the land and natural resources, which are integral to traditional practices and ceremonies. A decrease in available resources can lead to a disconnection from these cultural practices, affecting the community's identity and heritage.

Health risks associated with drought are another critical concern. Limited access to clean water can lead to health issues, including dehydration and the spread of waterborne diseases. Additionally, dry air conditions may contribute to respiratory problems, further exacerbating health challenges within the community.

The ecological consequences of drought cannot be overlooked either. Reduced water availability can lead to habitat loss for various species, negatively impacting local biodiversity.

This, in turn, can disrupt traditional hunting and foraging practices that are vital for cultural sustainability.

Finally, drought may place additional strain on existing infrastructure. Effective management of water resources becomes increasingly essential during these times, which may require costly updates and repairs.

VULNERABLE POPULATIONS

In the Reno-Sparks Indian Colony in Nevada, several populations are particularly vulnerable to drought. Elderly residents often face mobility challenges and health issues that impede their access to essential resources, such as water and food. Low-income families also struggle during drought conditions, as they may not be able to afford bottled water or other essential supplies, which creates significant stress.

Young children are at higher risk for dehydration and heat-related illnesses, making their protection a priority during such times. Individuals with pre-existing health conditions, including chronic illnesses, face greater dangers due to limited access to healthcare and resources under drought conditions.

Moreover, populations dealing with substance use disorders may find it even harder to access care during droughts, adding to their vulnerability. Lastly, those tied to traditional agricultural practices may see their cultural traditions threatened by water shortages.

EXISTING MITIGATION CASE STUDY

Groundwater is used for drinking water by more than 50% of people in the United States. In Truckee Meadows, groundwater is a vital component of the community's water supply. Much of the local water demand is met using surface water from the Truckee River. However, during times of low river flows (such as under drought conditions) or times when Truckee River water is heavy with sediment or otherwise unavailable, the community may be entirely dependent on groundwater. In Truckee Meadows, up to 30% of drinking water is currently derived from groundwater in a given year. Groundwater wells must be protected or abandoned per State regulations to keep them from becoming conduits for groundwater contamination. The Washoe County Health District (WCHD) also regulates activities to protect the environment from contamination.[231]

[231] WashoeCounty.gov, 2024, Groundwater & Our Local Water Supply (washoecounty.gov)

Volcano

LOCATION

No active volcanoes are in Washoe County. The three closest, potentially active volcanoes are in California.

PREVIOUS OCCURRENCES/HISTORY

The 2023 Enhanced SHMP noted that Nevada has had a long history of volcanism and, "Small eruptions from the Mono Craters area near Lee Vining and Mono Lake in eastern California have sent ash into Nevada as recently as about 260 years ago; an eruption from these volcanoes presents the most likely current volcanic hazard for Nevada. Other volcanoes that have erupted in recent history and could deposit ash in Nevada include Lassen Peak, Mount Shasta, the Long Valley Caldera in California, and volcanoes in the Cascade Mountains in Oregon."[232]

Volcanic activity from surrounding states, particularly California and Oregon, has created ash clouds that have drifted over Nevada, as evidenced by many young ash beds in western Nevada. An eruption from these volcanoes presents the most likely current volcanic hazard for Nevada. Other volcanoes that have erupted in recent history and could deposit ash in Nevada include Lassen Peak, Mount Shasta, the Long Valley Caldera in California, and volcanoes in the Cascade Mountains in Oregon. Ash from the 1915 eruption of Lassen Peak traveled at least 200 miles northeast to Winnemucca. The eruption of Mount St. Helens in 1980 deposited up to several centimeters of ash several hundred kilometers away from the volcano. The biggest threat to Nevada from eruptions in California and Oregon is damage to flying aircraft.

A massive eruption from the Long Valley Caldera near Mammoth Lakes, California, about 760,000 years ago devastated a considerable area in Owens Valley when thick, hot flows of ash were deposited as far south as Bishop. Air fall ash from these eruptions did collect as thick piles of ash in parts of Nevada, and some of the ash might have been hot enough or thick enough to devastate the local landscape. Scientists would expect strong indications from seismographs before another eruption of this magnitude. The USGS continues to monitor the area around Mammoth Lakes and will issue warnings before any subsurface changes that could precede a major eruption.

Seismic and geodetic data at the north end of Lake Tahoe have been interpreted by researchers at the University of Nevada, Reno (UNR).[233] These data indicate active magma at a depth of approximately 19 miles (30 kilometers). There does not appear to be a near-term threat of

[232] 2023 Enhanced SHMP, Section Three, "Volcano (Low Risk)"
[233] K. D. Smith and others, 2004, Evidence for deep magma injection beneath Lake Tahoe, Nevada–California: Science, v. 305, p. 1277–1280

volcanic eruptions from this area, partly because the last documented eruption in the area was approximately one million years ago.

The eruption of Lassen Peak in 1915 caused localized debris flows and a pyroclastic cloud that caused damage and deforestation in a 3-square-mile area and flooding and debris flows up to 10 miles from the volcano in Hat Creek. Ash from the eruption traveled at least 200 miles northeast to Winnemucca, Nevada.

EXTENT

The magnitude and potential severity of impacts of a volcanic eruption is considered Medium for Washoe County. However, Washoe County is close enough to the Long Valley Caldera to be impacted by ashfall less than 5 centimeters thick, based on a small to moderate eruption.

PROBABILITY OF FUTURE OCCURRENCES

The 2023 Enhanced SHMP notes that Nevada's most likely volcanic hazard is an eruption from Mono Craters, Inyo Craters, and Mammoth Mountain. Active volcanoes within approximately 150 miles of Reno have erupted four times in the past 304 years. This indicates a 1.3% chance of these volcanoes erupting in a year. Therefore, the probability of occurrence with direct consequences for the planning area is considered Very Low.

Volcanic risk is Low, but it could increase if a volcano becomes active. The probability is low, but the consequences could have a severe local impact. Mitigation actions are limited to public awareness and evacuation procedures at the local level. No significant impacts are expected of the volcanic hazard in Nevada from climate change.

There are no direct connections between future climate conditions and volcanic activity.

VULNERABILITY

Volcanic hazards, particularly ashfall, have a very low probability of occurring. If they were to occur, the RSIC may experience some ashfall. Given the limited evacuation routes particularly around Hungry Valley, the tribal community may have to shelter in place.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Estimating the impacts and potential losses to the Reno-Sparks Indian Colony due to volcanic activity encompasses several important considerations. First, health impacts could be significant. Volcanic eruptions often release ash, gases, and other pollutants into the air, which can lead to respiratory problems and other health complications. Vulnerable populations within the community, including the elderly and individuals with pre-existing health conditions, may face heightened risks, which adds a layer of concern for the well-being of residents.

Property damage is another critical issue. Should an eruption occur nearby, it could result in damage to residential and commercial properties within the colony. Ashfall, lava flows, and mudflows can wreak havoc, leading to substantial financial losses for both homeowners and local businesses. The cost of repairs and rebuilding could strain resources and significantly impact the community's economic stability.

Displacement is a potential consequence of a major volcanic event. In the face of such an emergency, evacuation may be necessary, which could displace residents temporarily or even permanently. This disruption has the potential to affect community cohesion, cultural practices, and the economic activities that sustain livelihoods. Additionally, the strain on local infrastructure, including roads, utilities, and emergency services, is a concern. Volcanic activity could compromise these essential services, requiring costly repairs and upgrades that could take considerable time and resources to implement.

The broader economic impacts should also be considered. The local economy may suffer as industries like tourism and agriculture are adversely affected by volcanic activity. Businesses might face temporary closures, leading to job losses and reduced income for residents, further exacerbating financial challenges within the community. Lastly, the cultural implications are significant; volcanic eruptions can alter sacred sites, traditional lands, and cultural heritage, impacting the community's identity and practices in profound ways.

VULNERABLE POPULATIONS

Populations on the Reno-Sparks Indian Colony in Nevada that may be vulnerable to volcanic activity include elderly residents, children, and those with pre-existing health conditions. Elderly individuals often have mobility challenges that complicate evacuation during emergencies, while young children are particularly at risk from health issues related to volcanic ash and gases.

Individuals with chronic conditions, such as asthma, may face serious complications from ash inhalation. Low-income families may struggle to access necessary resources and safe housing during a crisis, heightening their vulnerability. Additionally, the cultural significance of the land adds another layer of concern, as volcanic activity can threaten both safety and heritage.

Criminal Acts and Terrorism

LOCATION

Any populated area can be impacted by acts of violence or terrorism. These areas include shopping centers, business centers, financial districts, clinics and hospitals, schools, and government offices and buildings. Tribal economic facilities, tribal government buildings, the Reno health clinic, water treatment plant, other government buildings, and the Tuscarora pipeline that runs across approximately 6 miles of Tribal property are the primary concerns for

the Colony in preventing criminal acts and acts of terrorism. In particular, those assets that are available to the public may be at greater risk to criminal acts and terrorism.

PREVIOUS OCCURRENCES/HISTORY

While there have not been any recent active threat events that have directly impacted the Colony, there have been several active shooter events in the Reno-Sparks area, including the following:

- **March 29, 2024** – Three officers in the City of Spark, NV, were shot by a gunman in a standoff that lasted for hours.
- **April 8, 2024** – Three people were killed, including the gunman, in an office building shooting in Summerlin, Nevada.
- **November 28, 2017** – A 30-year-old male gunman rained gunfire down onto Sierra Street from the eighth floor of the Montage condominiums in downtown Reno and barricaded himself and a hostage inside of an apartment. The suspect died after being taken into custody after the Reno Police Department and the Washoe County Sheriff's Office SWAT team breached the room. The hostage was uninjured, but one minor injury was reported from a passerby.
- **October 29, 2015** – A Reno Walmart employee shot and wounded three Walmart employees.
- **September 6, 2011**: A gunman opened fire at an International House of Pancakes Restaurant (IHOP), killing four people and wounding seven others.
- **October 21, 2013**: A 12-year-old student opened fire with a semi-automatic handgun at Sparks Middle School, injuring two students and killing a teacher.
- **December 17, 2013**: A gunman entered the Center for Advanced Medicine and accessed Urology Nevada. He shot two doctors and a patient. One of the doctors later died of their injuries.
- **November 28, 2013**: A gunman was shot and killed by police in downtown Reno after he fired multiple shots from a hotel. A bystander reported a minor injury.

EXTENT

With no existing records of recent active threats directly impacting the Tribe, it is difficult to estimate the extent or probability of its occurrence. Nonetheless, it can be deduced that active threats could affect all areas of the RSIC; government facilities and schools may be most likely targeted.

PROBABILITY OF FUTURE OCCURRENCES

Future weather conditions have no direct connection to active threats. However, increased development and urbanization can increase the probability of an active threat in the future.

VULNERABILITY

No estimates are available to determine the potential losses associated with active threats. However, we can assume that schools and government buildings would likely be a top target if an active threat were directed at the Colony. Active threats could impact the community in the following ways: loss of human life; damage to buildings and structures; temporary displacement during the threat and/or investigation; stress on medical, emergency response, and security services; declines in economic activity and hospitality; loss of commercial business after the event; and an increased need for emergency services and funding.

VULNERABLE POPULATIONS

The Reno-Sparks Indian Colony in Nevada has several populations that are particularly vulnerable to criminal acts and terrorism. Elderly residents often face physical limitations that make them targets for scams and abuse, as they may struggle to seek help or escape danerous situations.

Children and youth are also at risk, as they may lack awareness of their surroundings and not know how to report suspicious activities. Low-income families experience economic hardships that can lead to desperation, increasing their risk of both perpetration and victimization due to limited resources.

Individuals with disabilities are another vulnerable group, as their challenges can make them easy targets for exploitation. Furthermore, marginalized community members, such as those facing discrimination, may be more susceptible to hate crimes and violence.

Lastly, those dealing with substance abuse face heightened risks of victimization due to their circumstances.

EXISTING MITIGATION CASE STUDY

The Reno-Sparks Indian Colony received support from the Congressional delegation, including Senator Rosen, Senator Cortez Masto, and Congressman Amodei, for the award of $265,000 in the federal 2024 spending package to be used to replace outdated patrol vehicles and improve the radio and computer systems in these vehicles to better support emergencies on tribal land. All tribal communities and the Reno, Sparks, and Washoe County communities surrounding

tribal lands will benefit from the improvement in policing supported by the much-needed funds.[234]

The goal of the RSIC Police Outreach Program is to create a partnership with community members and citizens through collaborative programs and work with service providers and other agencies to reduce crime rates, protect police officers, and protect the community. Active programs include the Public Safety Cadet Program, D.A.R.E. Program, and Senior Safe Awareness Program.

Extreme weather (Winter Storms)

LOCATION

Winter storms could impact the entire Colony.

PREVIOUS OCCURRENCES/HISTORY

NOAA's NCEI Storm Events Database records 142 Winter Weather, Winter Storms, and Heavy Snow events in Washoe County between 2019 and 2023. In 2022 and 2023, RSIC reported travel impacts as well as power outages with some outages lasting longer than 24 hours due to winter storms lasting several days with record high snow pact.

EXTENT

Overall, the possible extent of this hazard is considered low. While winter storm do occur, they are typically taken care at the local or county level. Major transportation routes, such as I-80, are more likely to be impacted by winter storm events.

PROBABILITY OF FUTURE OCCURRENCES

The probability of a winter storm in Washoe County is High, based on an average frequency of three events per year according to the NRI. There is mixed research on whether winter precipitations are likely to increase or decrease in the coming decades due to climate change. However, it can be assumed the RSIC will be impacted by winter weather again in the future.

VULNERABILITY

RSIC's vulnerability to winter storms includes disruption of transport routes, power outages, and potential infrastructure impacts. Residential homes, Tribal health center, Tribal senior center, and recreational facilities may not be equipped to withstand extreme weather events or

[234] Jack Rosen US Senator for Nevada, March 2024, Law Enforcement Leaders Across Nevada Praise Critical Project Funding Secured by Senators Rosen, Cortez Masto – Jacky Rosen (senate.gov)

long-term power outages due to winter weather. Winter storms are dangerous and could potentially result in the loss of life of injury, especially to community members who are elderly, have a disability, or are unprepared for power outages. Additionally, community activities including annual craft years, annual tribal health fairs, and the New Year Powwow could be impacted by winter conditions.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The Reno-Sparks Indian Colony faces various potential impacts and losses due to winter storms, which can significantly disrupt the community's daily life and economy. One of the primary concerns is infrastructure damage, as heavy snowfall and ice can affect roads, buildings, and essential utilities. This disruption can lead to costly repairs and limit access to necessary services, such as water and electricity, potentially leaving residents vulnerable during harsh winter conditions.

Economic losses are another critical consideration, as local businesses may experience temporary closures or diminished customer traffic during severe storms. The effects can ripple through the community, impacting employment and local revenue. Additionally, the costs associated with emergency response—such as snow removal, healthcare access, and community support services—can strain the colony's budget, especially if storms are frequent or particularly severe.

Health and safety risks increase with winter storms, as residents may face hazards such as slips and falls or difficulties in accessing medical care due to transportation challenges. Vulnerable populations, including the elderly or those with mobility issues, are particularly at risk during these conditions. Agriculture, if present in the colony, can also be affected, with potential damage to crops and livestock that could lead to food insecurity.

Lastly, winter storms can place additional strain on social services, leading to increased demand for food assistance, shelter, and other forms of support.

VULNERABLE POPULATIONS

Populations on the Reno-Sparks Indian Colony in Nevada vulnerable to winter storms include elderly residents, low-income families, individuals with disabilities, single-parent households, homeless individuals, and children.

Elderly residents face risks due to mobility and health concerns, making it difficult for them to evacuate or access services during harsh weather. Low-income families may struggle to prepare adequately for storms due to financial constraints, limiting their ability to stock supplies or ensure safe heating.

Individuals with disabilities rely on caregivers and may encounter challenges during emergencies if support systems are disrupted. Single-parent households often lack the resources and support needed to navigate the difficulties posed by winter storms.

Homeless individuals are particularly vulnerable, lacking safe shelter and proper clothing to protect against the cold, while children depend on adults for guidance and protection during severe weather.

Avalanche and Landslide

LOCATION

Reginal transportation routes, including over the Sierra Nevadas, could be impacted by avalanches and landslides. There are no avalanche risk zones within the RSIC. Therefore, it can be assumed this hazard is not one the RSIC needs to profile further. There are areas where landslides may occur, particularly to the north of Hungry Valley. Landslides in Nevada are typically confined to specific areas and generally result in less severe economic consequences than hazards that affect larger regions. Landslide hazard areas include foothills and mountain areas with fractured and steep slopes.

PREVIOUS OCCURRENCES/HISTORY

While there is no records of damages to RSIC due to landslides, at least once landslide may have occurred in the northern section of the Colony.

EXTENT

With no existing records of recent impacts to the Tribe, it is difficult to estimate the extent or probability of its occurrence. Nonetheless, it can be deduced that landslides may have the RSIC. Most impacts would likely be limited to transportation routes or natural resources.

PROBABILITY OF FUTURE OCCURRENCES

The probability of future occurrence of landslides is Medium. The County may be impacted by an increase in the probability of future landslides, based on potential increases in drought and wildland fires and changes in winter precipitation. `

VULNERABILITY

RSIC does not have a great vulnerability to landslides to note. Of RSIC's assets, the Verdi Smoke Shop (Smoke Shop IV) is slightly more at risk to this hazard than others with moderate instead of low susceptibility.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The Reno-Sparks Indian Colony faces significant risks from both avalanches and earthquakes, given its geographic and geological context. Areas near mountainous terrain are particularly vulnerable to avalanche activity, especially during the winter months. The potential impacts of avalanches can be profound, leading to substantial property damage as homes and

infrastructure may be destroyed or severely compromised. Additionally, such events can block vital roads, isolating the community and hindering access for emergency services and essential supplies. This disruption can result in high economic costs associated with cleanup efforts and repairs, alongside the potential loss of revenue for local businesses.

In terms of earthquakes, the Reno-Sparks area is located near several fault lines, making it susceptible to seismic activity. Like avalanches, earthquakes can lead to significant structural damage. Buildings and infrastructure could be destroyed, necessitating extensive repairs or even complete relocations. The human safety aspect cannot be overlooked, as earthquakes pose risks to residents, which may lead to injuries or loss of life. The economic impact of an earthquake can be staggering, straining local resources, affecting employment, and resulting in long-term financial losses for the community.

Estimating potential losses from these natural disasters can be challenging without detailed analysis from professionals in emergency management or geology. However, it's not uncommon for the economic losses from major events to run into millions of dollars, especially if critical structures are affected. Beyond direct damages, there are also indirect costs, such as disruptions to businesses and impacts on tourism, which can further exacerbate financial challenges faced by the community.

To mitigate these risks, it is crucial for the Reno-Sparks Indian Colony to implement comprehensive preparedness strategies. This includes adopting stringent building codes to ensure structures can withstand earthquakes and are less vulnerable to avalanche threats. Developing thorough emergency response plans and conducting regular drills can significantly enhance the community's ability to respond effectively to disasters. Moreover, educating residents about the risks and preparing them for potential emergencies is vital in building resilience against avalanches and earthquakes. Overall, proactive measures and community awareness will be critical in minimizing the potential impacts and losses from these natural hazards.

VULNERABLE POPULATIONS

Certain populations on the Reno-Sparks Indian Colony in Nevada are particularly vulnerable to avalanches and landslides. Elderly residents may struggle with mobility, making quick evacuation difficult during emergencies. Children, who may not fully understand the dangers, also face increased risks without proper guidance.

Individuals with disabilities often require additional assistance, and their vulnerability can heighten in emergencies. Low-income families may lack resources for effective disaster preparedness, while those living in high-risk areas, such as steep terrains, are directly threatened by these natural events.

Transient populations, like seasonal workers or visitors, might be unaware of local hazards, leaving them unprepared.

Infectious Disease

LOCATION

The entire Colony is at-risk from infectious disease. Many potentially devastating diseases are spread through physical contact, ingestion, insect bites, and inhalation. Airborne diseases and those spread through physical contact pose higher risks to the community because they are difficult to isolate and control. Some diseases can spread quickly through food and water source or be transmitted through animal vectors. Areas in the county that are more susceptible to infectious diseases are typically those with higher population density, such as Reno, and areas with poor sanitation and limited access to healthcare services.

PREVIOUS OCCURRENCES/HISTORY

Multiple cases of various infectious diseases have been reported in Washoe County, as described in the base plan. In March 2020, the RSIC officially declared a State of Emergency due to the COVID-19 pandemic. In order to reduce the spread of the disease, the Tribal Council enacted a mandatory curfew and stay at home order limiting unnecessary social gatherings.

EXTENT

The overall magnitude and potential severity of infectious disease outbreak impacts are considered Medium in Washoe County. Typical disease outbreaks are handled at the city or county level. Severe outbreaks may disrupt services for weeks, and economic impacts may be felt at the county level. COVID-19 was a unique exception which had worldwide impacts. While the impacts were felt globally, the reality of the pandemic was also felt close to home for the RSIC, demonstrating the need for things like additional on-reservation housing and support for multi-generational households.

PROBABILITY OF FUTURE OCCURRENCES

Climate change can have significant impacts on the spread of infectious diseases. As temperatures and precipitation patterns shift, the geographic range of disease-carrying vectors, such as mosquitoes and ticks, can expand, bringing diseases like malaria, dengue fever, and Lyme disease into new areas. Warmer temperatures can also speed up the reproduction and development of these vectors, allowing them to spread diseases more quickly. In addition, changes in precipitation can create new breeding grounds for disease-carrying organisms. Overall, climate change can create more favorable conditions for the transmission and spread of infectious diseases, posing a threat to global public health.

Cases of infectious disease occur annually in Washoe County, and the probability of future events is estimated as Medium. Based on potentially changing climate patterns, an increase in the likelihood of emerging infectious diseases may impact the RSIC. In particular, the Reno Colony may be at higher risk due to its more urban setting.

VULNERABILITY

Infectious diseases have been known to spread quickly through communities. Many spread through close contact, meaning that highly populated areas like Reno more prone to widespread outbreaks. Public gathering places where people may be together in close quarters, such as schools and childcare facilities, offices, and transportation terminals, provide more opportunities for diseases to pass from one person to another.

Vulnerable populations, including the elderly and those living with preexisting medical conditions, are at the greatest risk from an infectious disease. During the COVID-19 pandemic, the Senior Center supported vulnerable populations including elders, elders living alone, elders with grandkids living with them, disabled adult clients, elders who are not normally seen on a daily/weekly basis, and youth recommended as in need of food.

Infrastructure is unlikely to be impacted be an infectious disease, but worker productivity could be impacted by another widespread event like COVID-19 and businesses may close.

VULNERABLE POPULATIONS

Vulnerable populations on the Reno-Sparks Indian Colony in Nevada face increased risks for infectious diseases, particularly the elderly, who often have weakened immune systems and chronic health conditions. Children, especially those who are not fully vaccinated, are also at higher risk due to their developing immune systems.

Individuals with chronic illnesses, such as diabetes or respiratory diseases, and pregnant women are similarly vulnerable, as their health can be compromised by infections. Limited access to healthcare services further exacerbates these risks, preventing timely vaccinations and treatments for those in need.

Additionally, individuals who engage in substance use and the homeless population face unique challenges that heighten their susceptibility to infections. Low-income families encounter barriers related to healthcare access and nutrition, which can increase their vulnerability.

EXISTING MITIGATION CASE STUDY

The Reno-Sparks Tribal Health Center (RSTHC) is a tribally-owned and operated clinic in the Reno Colony which provides health care services to American Indians and Alaska Natives. The Tribal Council is the governing body of RSTHC. During the COVID-19 pandemic in 2020, the RSTHC was the first Tribal Health Clinic in Nevada to give Tribal Health Care Workers the vaccine. As of 2023, it was offering incentives to help encourage enrolled tribal members to get the COVID vaccine and booster. The RSTHC also received a grant from FEMA for preparedness training and equipment to help prepare the RSTHC for a disaster in order to be able to maintain operations and reduce the impacts when a disaster event occurs.

Hazardous Waste

In general, the RSIC's risk of Hazardous Waste incidents does not vary significantly from the other plan participants, as described in the base plan. Within the RSIC, the Reno tribal community is a greater risk due to the close proximity of I-180.

Radiological Waste Transport

In general, the RSIC's risk of Radiological Waste Transport incidents does not vary significantly from the other plan participants, as described in the base plan. Within the RSIC, the Reno tribal community is at greater risk due to the close proximity of I-180.

Transportation Incident (Aircraft Crash)

In general, the RSIC's risk of Radiological Waste Transport incidents does not vary significantly from the other plan participants, as described in the base plan. Within the RSIC land, the Reno tribal community is at greater risk due to the close proximity of the Reno-Tahoe International Airport which has the greatest volume of commercial aircraft services pass through as well as the Spanish Springs Airport.

EXPOSURE ASSESSMENT

Table 35 shows the exposure of the Tribe's identified critical facilities to natural hazards that can be mapped. (Note: Address and location information for some Tribal facilities are not publicly available. Hazard risks for these facilities are not included in the table.)

Table 93: Exposure Assessment of the Reno-Sparks Indian Colony

Type	Name	Address	Flood Zone	Seismic Ground Motion Hazards		Landslide Susceptibility	Wildland Fire Hazard Potential
				with 2% Probability	with 10% Probability		
Hospital	Tribal Health Center	1715 Kuenzli St, Reno, NV 89502	–	48–64	32–48	Low	1
Police Station	Tribal Police Station	405 Golden Ln, Reno, NV 89502	–	48–64	48–64	Low	1
Fire Station	Hungry Valley Fire Station	9075 Eagle Canyon Dr, Sparks, NV 89441	–	48–64	32–48	Low	1
School	Hungry Valley Gym/Rec Center	9055 Eagle Canyon Dr,	–	48–64	32–48	Low	1–2

Type	Name	Address	Flood Zone	Seismic Ground Motion Hazards		Landslide Susceptibility	Wildland Fire Hazard Potential
				with 2% Probability	with 10% Probability		
		Sparks, NV 89441					
School	Reno Gym	34 Reservation Rd, Reno, NV 89502	–	48–64	48–64	Low	1
Social Services	Hungry Valley Child Care Center	9055 Eagle Canyon Dr, Sparks, NV 89441	–	48–64	32–48	Low	1–2
Social Services	Reno Child Care Center	34 Reservation Rd, Reno, NV 89502	–	48–64	48–64	Low	1
School	Hungry Valley Head Start Center	9055 Eagle Canyon Dr, Sparks, NV 89441	–	48–64	32–48	Low	1–2
School	Reno Head Start Center	34 Reservation Rd, Reno, NV 89502	–	48–64	48–64	Low	1
Social Services	Reno Senior Center	34 Reservation Rd, Reno, NV 89502	–	48–64	48–64	Low	1
Government Building	Tribal Administration	34 Reservation Road, Reno, NV 89502	–	48–64	48–64	Low	1
Government Building	Records and Archives	15 Reservation Rd, Reno, NV 89502	–	48–64	48–64	Low	1
Government Building	Enrollment Office	1933 Prosperity St, Reno, NV 89502	–	48–64	48–64	Low	1
Government Building	Public Works	400 Sunshine	–	48–64	48–64	Low	1

Type	Name	Address	Flood Zone	Seismic Ground Motion Hazards		Landslide Susceptibility	Wildland Fire Hazard Potential
				with 2% Probability	with 10% Probability		
		Ln, Reno, NV 89502					
Government Building	Planning/Rentals	1925-1939 Prosperity St, Reno NV 89502	–	48–64	48–64	Low	1
Government Building	Housing	9055 Eagle Canyon Rd, Sparks, NV 89441	–	48–64	32–48	Low	1
Government Building	Tribal Court	1900 Prosperity St, Reno, NV 89502	–	48–64	48–64	Low	1
Water Treatment Plant	Hungry Valley Water Treatment Plant	272 Loop Rd, Sparks, NV 89441	–	48–64	32–48	Low	1–2
Wastewater Treatment Plant	Wastewater Lagoons	272 Loop Rd, Sparks, NV 89441	–	48–64	32–48	Low	1
Water	Water Storage Tank	272 Loop Rd, Sparks, NV 89441	–	48–64	32–48	Low	1
Enterprise	Smoke Shop I	2001 E. 2nd St, Reno, NV 89502	–	48–64	48–64	Low	1
Enterprise	Smoke Shop II	901 Golden Ln, Reno, NV 89502	–	64+	48–64	Low	1
Enterprise	Smoke Shop III	90 Auto Center Dr, 89511	–	48–64	32–48	Low	1
Enterprise	Verdi Smoke Shop (Smoke Shop IV)	420 Old Hwy 40, Verdi, NV 89439	–	48–64	32–48	Moderate	1
Enterprise	Smoke Shop V	1962 Pyramid Way, Sparks, NV 89431	–	48–64	32–48	Low	1
Enterprise	Smoke Shop (Smoke Shop VI)	7655 Pyramid Hwy, Spanish	–	48–64	32–48	Low	1

Type	Name	Address	Flood Zone	Seismic Ground Motion Hazards		Landslide Susceptibility	Wildland Fire Hazard Potential
				with 2% Probability	with 10% Probability		
		Springs, Sparks, NV 89441					
Enterprise	Walmart Site	2425 East Second St, Reno, NV 89502	500-year flood zone	48–64	48–64	Low	1
Social Services	Hungry Valley Community Center	9055 Eagle Canyon Rd, Sparks, NV 89441	–	48–64	32–48	Low	1–2
Government Building	Facility Building – Reno	357 Golden Ln, Reno, NV 89502	–	48–64	48–64	Low	1
Enterprise	Vacant	2A Sunshine Lane, Reno, NV 89502	–	48–64	48–64	Low	1
Enterprise	Joe Scalia Motors, Car Dealership	690 Sunshine Lane, Reno, NV 89502	–	64+	48–64	Low	1

Key: N/A = Information not available, – = Critical facility is not in a mapped flood zone

Note: Hazard exposure for assets on the Hungry Valley reservation has been estimated based on hazards present within the reservation boundary.

Land Use and Development Trends

FEMA

D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

The RSIC has no commercial development intentions for its Hungry Valley community; however, residential development will increase, including plans for an RV park. This growing residential population will be at an increased risk of wildland fire and faces concerns about the impact of weather events on seasonal roads that may become impassable during an emergency.

The vulnerability subsection of each hazard profile in Section 3.3 outlines recent development trends to illustrate how the vulnerability might have changed over the past five years. Vulnerability changes have been measured for cultural resources, economic interests, and land

use trends. Each measure has been identified as having increased, decreased, or unchanged vulnerability. Table 94 provides a snapshot of how recent vulnerability has changed.

Table 94: Recent Development Trends

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Avalanche and Landslide	N/A	N/A	N/A	Same
Criminal Acts and Terrorism	N/A	N/A	N/A	Same
Drought	N/A	N/A	N/A	Same
Earthquake	N/A	N/A	N/A	Same
Energy Emergency	N/A	N/A	N/A	Same
Flood	N/A	N/A	N/A	Same
Hazardous Materials Incident	N/A	N/A	N/A	Same
Infectious Disease	N/A	N/A	N/A	Same
Radiological Waste Transport	N/A	N/A	N/A	Same
Extreme weathers (Winter Storm, Windstorms, Extreme Heat)	N/A	N/A	N/A	Same
Transportation Incident	N/A	N/A	N/A	Same
Volcano	N/A	N/A	N/A	Same
Wildland Fire	N/A	N/A	N/A	Same

Capability Assessment

FEMA	**C1.** Does the plan include a discussion of the tribal government's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including an evaluation of tribal laws and regulations related to hazard mitigation as well as to development in hazard-prone areas? 44 CFR §§ 201.7(c)() and 201.7(c)(3)(iv) **C2.** Does the plan include a discussion of tribal funding sources for hazard mitigation projects and identify current and potential sources of Federal, tribal or private funding to implement mitigation activities?

Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. Table 96 lists the RSIC's human and technical capabilities to engage in and improve mitigation planning and program implementation.

Table 95: Planning Capabilities of the Reno-Sparks Indian Colony

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
General Plan	Yes	Yes	Strengthen infrastructure, improve communications equipment, public education and awareness, policy regulation changes	2000, 2040 Comprehensive Plan Underway
Capital Improve-ment Plan	Yes	yes	resilient construction designs, upgrade sewer infrastructure, implementation of green infrastructure	Thorough research revealed a lack of sufficient information to evaluate or categorize this,

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
				indicating a need for further investigation.
Climate Change Adaptation Plan	No	N/A	N/A	N/A
Community Wildfire Protection Plan	No	N/A	N/A	N/A
Economic Develop-ment Plan	No	N/A	N/A	N/A
Land Use Plan	Yes	Yes	With the adoption of the 2018 building codes	In draft form, January 2024
Local Emergency Operations Plan	Yes	Yes	Qualitative and quantitative risk assessment plans, emergency response resources and multi-agency coordination	2017, working on updating the current plan
Storm-water Manage-ment Plan	No	N/A	N/A	N/A
Transporta-tion Plan	Yes	Yes	The tribe has 2 collaborative plans of Reno and BIA (Bureau	Adopted in 2021, Must be updated in 2025

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it be updated next?
			of Indian Affairs) to secure safe and secure passages on roadways and evacuation routes by addressing an all need for an all-weather road for evacuation routes.	
Substantial Damage Plan	No	N/A	N/A	N/A
Other? (Describe)	Washoe County has a Damage Assessment Plan that serves the same intent and covers all jurisdictions	N/A	N/A	N/A

Table 96: Regulations and Ordinances of the Reno-Sparks Indian Colony

Plan	Does this regulation/ ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
Building Code	Yes, when adopted	Not yet.	Tribal Council adopted the 2018 Model Codes in June 2024
Flood Insurance Rate Maps	Not Adopted	N/A	N/A
Floodplain Ordinance	Not Adopted	N/A	N/A
Subdivision Ordinance	Not Adopted	N/A	N/A
Zoning Ordinance	Not Applicable	N/A	N/A
Natural Hazard Specific Ordinance (Stormwater, Steep Slope, Wildfire)	Not Adopted	N/A	N/A
Acquisition of Land for Open Space and Public Recreation Use	Not Applicable	N/A	N/A
Prohibition of Building in At-Risk Areas	No	N/A	N/A

Plan	Does this regulation/ ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it be updated next?
Other? (Describe)			

Administrative and Technical

Administrative and technical capabilities include staff and their skills. They also include tools that can help you carry out mitigation actions.

Table 97: Administrative Capabilities of the Reno-Sparks Indian Colony

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	Yes, on contract	Yes	No	Interdepartmental is effective, unsure about outside agencies, they are trained for hazards but not mitigation
Civil Engineer	No	N/A	N/A	N/A
Community Planner	Yes	No	Yes	Yes
Emergency Manager	Yes	No	Yes	Yes
Floodplain Administrator	No			
Geographic Information	Yes	Yes	Yes	Yes

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
System (GIS) Coordinator				
Planning Commission	No	N/A	N/A	N/A
Fire Safe Council	No	N/A	N/A	N/A
CERT (Community Emergency Response Team)	Yes	No	No	Interdepartmentally yes, no coordination with outside tribal agencies
Active VOAD (Voluntary Agencies Active in Disasters)	No	N/A	N/A	N/A
Other? (Please describe)				

Table 98: Technical Capabilities of the Reno-Sparks Indian Colony

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
Mitigation Grant Writing	Yes	Through identified risks and applying for grant funding to mitigate hazards	Through interdepartmental collaboration to strengthen

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
			community resilience and address known hazards
Hazard Data and Information	Yes	Identified geographical areas and potential hazards	Allowing the tribe to mitigate new hazards has allowed them to reduce hazards in new geographical areas.
GIS	Yes	Prior GIS didn't focus on in the past	The current GIS coordinator is versed in hazard mitigation and has collaborated with emergency management to identify and update known hazards and engaged in information sharing between departments.
Mutual Aid Agreements	Yes	For additional emergency resources	Area-wide community collaboration and unified response during a disaster

Financial Resources

Financial capabilities are the resources to fund mitigation actions. Talking about funding and financial capabilities is important to determine what kinds of projects are feasible, given their cost. Mitigation actions like outreach programs are lower cost and often use staff time and existing budgets. Other actions, such as earthquake retrofits, could require substantial funding from local, state, and federal partners. Partnerships can be included, including partners willing to donate land, supplies, or an in-kind match and cash. The RSIC maintains many fiscal and financial resources to support its mitigation program. Table 100 identifies the specific resources accessible for use.

Table 99: Financial Capabilities of the Reno-Sparks Indian Colony

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Capital Improvement Project Funding	Yes	Yes, for tribal department improvements	Yes, but has to be a buy-in with tribal leadership	Yes, as long as there is a buy-in
General Fund	Yes	Yes, for tribal-wide improvements and contracts	No	No
Hazard Mitigation Grant Program (HMGP/404)	No	N/A	N/A	N/A
Building Resilient Infrastructure & Communities (BRIC)	No	N/A	N/A	N/A

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Flood Mitigation Assistance (FMA)	No	N/A	N/A	N/A
Public Assistance Mitigation (PA Mitigation/ 406)	No	N/A	N/A	N/A
Community Development Block Grant (CDBG)	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Natural Resources Conservation Services (NRCS) Programs	Yes	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a	Thorough research revealed a lack of sufficient information to evaluate or categorize	Thorough research revealed a lack of sufficient information to evaluate or

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
		need for further investigation.	this, indicating a need for further investigation.	categorize this, indicating a need for further investigation.
U.S. Army Corps (USACE) Programs	No	N/A	N/A	N/A
Property, Sales, Income, or Special Purpose Taxes	Yes	No	No	No
Stormwater Utility Fee	No	N/A	N/A	N/A
Fees for Water, Sewer, Gas, or Electric Services	No	No	No	No
Impact Fees from New Development and Redevelopment	N/A	N/A	N/A	N/A
General Obligation or Special Purpose Bonds	No	No	No	No

Funding Resource	Do you have this?	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Federal-funded Programs (Please describe)	No	No	No	No
Other state-funded Programs (Please describe)	No	No	No	No
Private Sector or Nonprofit Programs	No	No	No	No
Other?	Bureau of Indian Affairs (BIA) (e.g., BIA's Emergency Management Program or Tribal Climate Resilience Program)	Yes, Police, and Judicial services and road maintenance	No	No

Education and Outreach

Education and outreach capabilities are programs and methods that could communicate about and encourage risk reduction. These programs may be run by a participant or a community-based partner. Partners, especially those who work with underserved communities, can help identify additional education and outreach capabilities.

Table 100: Education and Outreach Capabilities of the Reno-Sparks Indian Colony

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Community Newsletter(s)	Yes – Camp News	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	N/A
Hazard Awareness Campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, School Programs)	Yes	Yes	They provide training specific to severe weather awareness, fire risk, HazMat, and Health Preparedness.
Public Meetings/Events (Please Describe)	Yes – Senior Center, UNITY Youth Council	No	Primarily, do tribal community engagement events only
Emergency Management Listserv	Yes – RAVE	Yes	Utilized during emergency events as well as public health events
Local News	No	No	Do have a PIO
Distributing Hard Copies of Notices (e.g., public libraries, door-	Yes	No	Door to Door outreach is focused on special events for the tribe

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
to-door outreach)			
Insurance Disclosures/ Outreach	No	No	No
Organizations that Represent, Advocate for, or Interact with Underserved and Vulnerable Communities (Please Describe)	Yes, Senior Center	No	The senior center is the elderly designated lunch area for seniors
Social Media (Please Describe)	Yes	No	Public awareness, office uses for cultural awareness, tribal activities, and education

National Flood Insurance Program Participation

The National Flood Insurance Program (NFIP) is a FEMA program that provides flood insurance to millions of policyholders across the country. The mitigation plan describes each participant's participation in the NFIP, as applicable, in accordance with NFIP regulatory requirements. The RSIC currently does not participate in the NFIP.

Table 101: Floodplain Management, Mapping, and Insurance for the Reno-Sparks Indian Colony

Question	Response
Why does the tribe not participate in the NFIP?	No, the tribe does not currently participate in the NFIP; however, we are interested and have reached out to FEMA.
Is the tribe interested in joining the NFIP?	Yes, Reno-Sparks Indian Colony is interested and has contacted FEMA Region 9 to set up a meeting.

Plan Integration

FEMA	**C6.** Does the plan describe a process by which the tribal government will incorporate the requirements of the mitigation plan into other planning mechanisms, when appropriate? 44 CFR § 201.7(c)(4)(iii)

An updated plan must explain how participants incorporated the previous mitigation plan, when appropriate, into other planning mechanisms over the last 5 years. This demonstrates progress in local mitigation efforts. Planning mechanisms refer to the governance structures used to manage local land use development and community decision-making, such as budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances. Additional FEMA programs could be cited, but we were not applicable during this plan update.

Table 102: Plan Integration by the Reno-Sparks Indian Colony

Plan Name (or "none," if applicable)	Description
None	N/A

The plan must also identify the planning mechanisms where and how the updated hazard mitigation information/actions may be integrated.

Table 103: Future Plan Integration Opportunities for the Reno-Sparks Indian Colony

Plan Name	Description
The Reno-Sparks Indian Colony has no active planning mechanisms to integrate concepts from the RHMP. However, the Colony will monitor for future opportunities to integrate ideas from the RHMP into new planning mechanisms such as general plans, emergency operations plans, and others.	Do not have a Transportation, Comprehensive, or Emergency Operations Plan.

Mitigation Strategy

C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?

Mitigation Goals and Objectives

Mitigation goals are broad, policy-type statements which represent what the County and its partners seek to achieve by implementing their mitigation plan. The goals are general guidelines and provide a framework for identifying more detailed objectives and actions. In developing these goals, the MPT reviewed the goals from the 2023 SHMP and the goals and objectives from the 2020 RHMP update. Overall, the MPT thought that the goals and objectives continued to reflect its approach to hazard mitigation. There has been progress on some objectives since the last plan update, but those objectives remain important considerations which should be noted in the current plan. A few changes were identified, including clarifying the intent of Goal 1, removing Objective 1.3, and adding a new objective to Goal 4. Both long-term and short-term goals and objectives were identified. Long-term initiatives may take longer the duration of the planning cycle (five years) to completely realize, while short-term initiatives may be accomplished in the next five years.

Therefore, the County and its partners have selected the following goals and objectives for this plan update:

Goal 1: Study, maintain, upgrade, and expand transportation routes, including evacuation routes across the County, to ensure function and public awareness during emergencies. (Long-term)

- **Objective 1.1:** Study, establish, upgrade, and maintain evacuation routes. (Short-term)
- **Objective 1.2:** Plan for continuity of operations of critical transportation facilities in the county in the event of a disaster or emergency. (Short-term)

Goal 2: Maintain emergency services capabilities by providing redundancies. (Long-term)

- **Objective 2.1:** Provide redundant lifeline utilities and services to allow medical and emergency response services to continue to operate following a disaster or emergency. (Long-term)
- **Objective 2.2:** Establish evacuation centers and provide redundant lifeline utilities to serve communities at risk from all identified hazards. (Long-term)

Goal 3: Maintain key communications to ensure connectivity during and after key hazard events. (Short-term)

- **Objective 3.1:** Provide methods for notification, warning, and emergency communications. (Short-term)
- **Objective 3.2:** Establish an additional emergency operations center (EOC) to serve the RSIC community. (Long-term)
- **Objective 3.3:** Harden electrical infrastructure in moderate to high-risk areas for wildland fire. (Long-term)
- **Objective 3.4:** Establish procedures for communication between the Governor's Office on Radiological Waste and Washoe County before transport of radiological waste. (Short-term)
- **Objective 3.5:** Develop a response plan for clean-up and disposal of ash fall from a volcanic eruption. (Short-term)

Goal 4: Maintain the reliability of utilities (electricity, gas, drinking water, sewer) during and after key hazard events. (Long-term)

- **Objective 4.1:** Provide redundant or hardened utility lifelines to areas at risk of energy emergencies, loss of communications, or loss of service. (Long-term)
- **Objective 4.2:** Identify vulnerable facilities and establish procedures for clean-up and disposal of ash fall from a volcanic eruption to minimize risk to lifeline utilities. (Short-term)
- **Objective 4.3:** Protect utility infrastructure from hazards like winter storms and high winds including acquiring resources ahead of time and hardening infrastructure. (Long-term)

Goal 5: Minimize property damage and reduce repetitive losses to property from key hazards. (Long-term)

- **Objective 5.1:** Provide additional emergency services resources to reduce response times. (Short-term)
- **Objective 5.2:** Adopt current international building and fire codes. (Short-term)
- **Objective 5.3:** Develop plans and provide resources to reduce risk in moderate to high-risk areas for wildland fire. (Short-term)
- **Objective 5.4**: Update flood maps to incorporate changes in conditions and flood risk. (Short-term)

- **Objective 5.5:** Complete improvements to storm water drainage infrastructure to address areas of localized Flooding (including closed-basin flooding), or insufficient capacity. (Long-term)
- **Objective 5.6:** Standardize Emergency Action Plans for dams in the City of Sparks. (Short-term)
- **Objective 5.7:** Complete infrastructure improvements identified as part of the Truckee River Flood Management Project. (Long-term)
- **Objective 5.8:** Elevate or mitigate flood risks to homes in neighborhoods identified by the TRFMA as being at a high risk of Flooding (including closed-basin flooding). (Long-term)
- **Objective 5.9:** Identify and complete retrofits to unreinforced masonry buildings and other facilities at increased risk of damage from earthquakes. (Long-term)
- **Objective 5.10:** Implement measures to prepare first responders for active shooter incidents or acts of terrorism. (Long-term)
- **Objective 5.11:** Purchase equipment to minimize the risk of and protect emergency responders in the event of criminal acts or terrorism. (Long-term)
- **Objective 5.12:** Purchase additional equipment to perform immediate containment of hazardous materials spills. (Long-term)
- **Objective 5.13:** Address risks to properties in the runway protection zones at Reno-Tahoe International Airport and airport-critical areas at Reno-Stead Airport, and along the railway. (Long-term)
- **Objective 5.**14: **Identify inundation areas for high hazard dams in Washoe County.**

Goal 6: Increase public participation and responsibility in reducing their risks. (Short-term)

- **Objective 6.1:** Educate members of the public on hazards that may affect their communities. (Short-term)
- **Objective 6.2:** Provide building requirements and standards to guide property owners and developers in reducing risk. (Short-term)
- **Objective 6.3:** Provide resources to involve residents in disaster preparedness, response, and recovery. (Short-term)

Review of 2020 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2020 plan were evaluated to determine the status of the action and whether any ongoing or incomplete actions should be included as actions in the 2024 plan update.

Prioritizing Mitigation Actions

The identified mitigation actions were then prioritized based on the following terms:

- **S – Social:** The public must support the overall mitigation implementation strategy and specific mitigation actions. Consider, will the action disrupt housing or cause the relocation of people? Will the proposed action adversely affect one segment of the population? Is the action compatible with present and future community/agency values?
- **T – Technical:** It is important to determine if the proposed action is technically feasible, will help reduce losses in the long term, and has minimal secondary impacts. How effective is the action in avoiding or reducing future losses? Does the action solve the problem or only a symptom? Will the action create more problems than it solves? Consider the root cause of the issue at hand to determine whether the action is a whole or partial solution, or not a solution at all.
- **A – Administrative:** This category examines the expected staffing, funding, time, and maintenance requirements for the mitigation action to determine if the jurisdiction/special district has the personnel and administrative capabilities to implement the action or whether outside help will be necessary. Consider, a) Staffing (enough staff and training): Does the jurisdiction/special district have the capability (staff, technical experts) to implement the action? b) Funding allocated: does the jurisdiction/special district have the funding to implement the action or can it readily be obtained? c) Time: can it be accomplished in a timely manner? d) Maintenance/Operations: can the jurisdiction/special district provide the necessary maintenance? It is important to remember that most federal grants will not provide funding for maintenance.
- **P – Political:** This considers the level of political support for the mitigation action. Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far? Is there a local champion willing to help see the action to completion? Is there enough public support to ensure the success of the action? Have all stakeholders been offered an opportunity to participate in the planning process?
- **L – Legal:** The jurisdiction/special district must have the legal authority to implement the action or consider what new laws or regulations would be needed to carry out the mitigation action. Evaluate, are the proper laws, ordinances, and resolutions in place to implement the action? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?

- **E – Economic:** Economic considerations must include an evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt in a jurisdiction/special district. Consider benefits and costs at the planning level. A detailed benefit–cost analysis will be performed as project-specific funding becomes available. What financial benefits will the action provide? Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? Does the action contribute to community economic goals, such as capital improvements or economic development? Are there currently sources of funding that can be used to implement the action?
- **E – Environmental:** The impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), must be kept in mind when using federal funds. How will this action impact land/water? Impact on endangered species: How will this action impact endangered species? How will this action impact hazardous materials and waste sites? Is this action consistent with community environmental goals? Is the action consistent with federal laws, such as NEPA?

Table 104: Status of Previous Mitigation Actions by the Reno-Sparks Indian Colony

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
MH-6	Adopt current International Building Code (2018) (Reno-Sparks Indian Colony [RSIC])	RSIC Planning Department	Tribal Council approved a first reading, and a second reading of the Building Code Ordinance is scheduled for June 12, 2024	Complete
MH-7	Install audible community warning system (sirens) (RSIC)	RSIC Emergency Manager	Project is still ongoing	Yes
MH-8	Implement and activate a Tribal Emergency Operations Center (EOC). Provide emergency generators for the designated EOC and alternate facilities (RSIC)	RSIC Emergency Manager	Tribal Emergency Operations Center (EOC) was established in Hungry Valley, but a second location is still TBD. Emergency generators for the designated EOC facilities will be an ongoing project.	Yes
MH-10	Improve electric and broadband service (by installing fiber optic cable from Spanish Springs) to the RSIC's Hungry Valley reservation to support emergency communications (RSIC)	RSIC Emergency Manager	Tribal IT Department completed the installation for broadband to Hungry Valley Reservation. However, the Tribal IT Department stated that bandwidth and internet speed were at capacity and might have a need for improvement.	Yes

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
WF-13	Adopt 2018 wildland fire code County-wide (All Partners)	Regional Fire Protection Districts	The 2018 WUI was adopted with the Building Code Ordinance in June 2024.	No
WF-17	Create a fuels mitigation and management program to create and incentivize defensible space in housing developments by increasing community space between homes and managing/encouraging management of fuels (RSIC)	RSIC Emergency Manager Hungry Valley Fire	Coordinating and collaborating with Hungry Valley Fire for this ongoing project.	Yes
FL-9	Complete drainage ditch improvements (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: • Public Works	As of Nov 2023: Steamboat Ditch preliminary evaluation completed. Other ditches not started.	Yes
FL-14	Complete improvements to address undersized drainage ditches and systems County-wide (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: • Public Works • Engineering	As of Nov 2023: CoS – in progress	Yes
FL-16	Replace/improve culvert near the Eagle Canyon Smoke Shop on Eagle Canyon Road to increase capacity and address recurring flooding (RSIC)	RSIC Public Works	RSIC to meet in March/ April of 2024 and discuss. Project is ongoing due to a funding issue.	Yes
EQ-9	Complete seismic strength evaluations of critical facilities in all jurisdictions, including schools, community colleges, public infrastructure, and other critical facilities, to identify vulnerabilities for mitigation to	Washoe County, City of Sparks, RSIC, PLPT – Public	No seismic evaluations completed for RSIC.	Yes

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
	meet current seismic standards. Mothball or demolish life-threatening buildings, particularly unreinforced masonry buildings (Washoe County City of Sparks, RSIC, PLPT)	Works Engineering School Districts		
EQ-10	Assess, repair, and/ or replace infrastructure that may fail during earthquakes (e.g., Keystone Ave. Bridge) (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	All Jurisdictions: • Public Works • Engineering	Nothing completed within the last 5 years.	Yes
EQ-12	Improve evacuation routes out of the Hungry Valley reservation (Winnemucca Ranch and Chickity roads) to ensure that they are passable in all weather conditions (RSIC)	RSIC Public Works RSIC Emergency Manager	Planning department has addressed this in the draft 2040 comprehensive plan under public safety. Ongoing project [*can you clarify what does ongoing mean?]*	Yes
EQ-13	Continue to provide straps and related tools to encourage non-structural mitigation of earthquake hazards and provide assistance to help property owners install these improvements (RSIC)	RSIC Public Works RSIC Housing Department	This is a continuous project and is provided when requested and during new tenant walk-throughs.	No
EE-5	Install back-up generators for critical infrastructure and facilities along with other measures to improve reliability (e.g., alarms, meters, remote controls, and switchgear upgrades). (All Partners)	All Jurisdictions: • Emergency Management	In progress/ongoing	Yes

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
CA-1	Implement measures to prepare for a potential active shooter incident, including new security measures, training and exercises, improved partnerships with law enforcement agencies, and policy changes (ex. prohibiting open carry). (All Partners)	• Law Enforcement Agencies • Facility Managers	In progress, working with vendor	Yes
DT-2	Implement current TMWA Conservation Plan including encouraging transition to less water-intensive landscaping on both public and private properties (City of Reno, City of Sparks, RSIC, PLPT)	City of Reno, City of Sparks, RSIC, PLPT – Water Utilities Planning Departments	No progress since last plan update.	No
DT-3	Identify alternate water supplies for Tribal properties and housing in Hungry Valley, potentially including a tie-in to the County's water system in Lemmon Valley and new water tanks (RSIC)	RSIC Public Works	Research is ongoing, but it is not a priority.	Yes

2024–2029 Mitigation Implementation Plan

FEMA	**C4.** Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? 44 CFR § 201.7(c)(3)(ii) (Requirement §201.6(c)(3)(ii)) **C5.** Does the plan contain an action plan that describes how the actions identified will be prioritized, implemented, and administered by the tribal government? **D3.** Was the plan revised to reflect changes in priorities? 44 CFR § 201.7(d)(3) 44 CFR § 201.7(c)(2)(ii)

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the Tribe. The implementation plan includes both short-term strategies that focus on planning and assessment activities and long-term strategies that will cause ongoing capability or structural projects to reduce vulnerability to hazards.

Updated Mitigation Action Plan

Table 106 presents the mitigation action plan for the next five years.

Table 105: 2024–2029 Mitigation Implementation Plan of the Reno-Sparks Indian Colony

#	Project Title	Hazard Addressed	Vulnerability Addressed*	Responsible Agency	Potential Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
1	Fuel Reduction	Wildland Fire	Fire, the community at large	RSIC	WCEM, RFD, Living with Fire	Hungry Valley Fire Department	Needs further investigation	$1M	Fuel reduction in an area challenging to control with any other means. Focus on Hungry Valley Dr/Chickadee Dr. In RSIC area due to large amounts of cheatgrass and high fire hazard.	Long term	Annually	High*
Description: Complete Wildland Fire Fuels Reduction through efforts such as grazing goats/sheep.												
2	Flood insurance study	Flooding	People and infrastructure	Washoe County	RSIC	Needs further investigation	General Fund	$50,000	Studying areas lacking flood insurance can pinpoint vulnerable regions and guide policy decisions, enhancing community preparedness and economic resilience. It raises awareness about the need for adequate	5-10 years	1-2 Years	Medium

#	Project Title	Hazard Addressed	Vulnerability Addressed*	Responsible Agency	Potential Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
									coverage and supports stronger disaster mitigation efforts.			
Description: This study aims to identify gaps in flood insurance coverage in the county by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.												
MH-7	Warning Systems	All Hazards	Community at large	RSIC Emergency Manager	RSIC Tribal Council	Emergency services	Existing Budget Grant	$50,000	Early warning system for the community	Long-term	Upon funding availability	Medium
Description: Install audible community warning system (sirens) (RSIC)												
MH-8	Tribal EOC	All Hazards	Community	RSIC Emergency Manager	•RSIC Tribal Council •RSIC Public Works	Emergency management	Existing Budget Grant	$1 million	Resource acquisition and multi-agency response	Long-term	Current	High
Description: Implement and activate a Tribal Emergency Operations Center (EOC). Provide emergency generators for the designated EOC and alternate facilities. (RSIC)												
MH-9	RSIC tribal CERT	All Hazards	Community	All Jurisdictions: • Managers • Police Departments	Washoe County CERT	Emergency Management	Existing Budget	Minimal, administrative staff already budgeted for	Additional personnel to respond in a disaster	Long-term	1–5 years	medium
Description: Implement and/or utilize Community Emergency Response Teams, as well as the Citizens Homeland Security Council, to shift burden from sworn officers, where appropriate. (All Partners)												

#	Project Title	Hazard Addressed	Vulnerability Addressed*	Responsible Agency	Potential Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
MH-10	Broadband	All Hazards	community	RSIC Emergency Manager	RSIC Tribal Council NV Energy Broadband providers	Emergency management and IT	Hazard Mitigation Grant Program, Existing Budget	$1,000/1,000 linear feet	To continue open communication during emergencies	Long-term depending on additional funding sources	1–5 years	medium
Description: Improve electric and broadband service (by installing fiber optic cable from Spanish Springs) to the RSIC's Hungry Valley reservation to support emergency communications. (RSIC)												
WE-13	County wide fire code	Wildland Fire	community	Regional Fire Protection Districts	N/A	Emergency management and fire department	Existing Budget	No/minimal cost	Wildfire protection	Long-term	1–5 years	medium
Description: Adopt 2018 wildland fire code County-wide. (All Partners)												
WF-16	Wildland evacuation drills	Wildland Fire	Community	Regional Fire Protection Districts	Washoe County Emergency Management and Homeland Security	Emergency management and fire department, tribal health center	Existing Budget	$10,000/plan. $50,000/year	Community awareness , reliable transportation of community members and in furtherance of building resilience	Long-term	1–5 years	medium
Description: Review and update (as needed) evacuation plans for communities in wildland fire-prone areas and hold evacuation drills at least once every two years. (All Partners)												
WF-17	Create and incentivize defensible space	Wildland Fire	community	RSIC Emergency Manager	• RSIC Planning Department	Emergency management	Grant Existing Budget	$1,000,000	Community resilience	Long-term	1–5 years	medium

#	Project Title	Hazard Addressed	Vulnerability Addressed*	Responsible Agency	Potential Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
					• RSIC Public Works Department RSIC Housing Department							
Description: Create a fuels mitigation and management program to create and incentivize defensible space in housing developments by increasing community space between homes and managing/encouraging the management of fuels. (RSIC)												
FL-9	Draining Improvements	Flooding	Community	All Jurisdictions: • Public Works	N/A	RSIC Public works and emergency management	Grant Existing Budget	$1M	Mitigate flooding threat to RSIC infrastructure	Long-term	5+ years	high
Description: Complete drainage ditch improvements. (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)												
FL-14	Area-wide drainage improvement	Flooding	Community	All Jurisdictions: • Public Works • Engineering	N/A	RSIC Public works and emergency management	Grant Existing Budget	$20/linear foot of drainage ditch	Mitigate flooding threat to RSIC infrastructure	Long-term	5+ years	high
Description: Complete improvements to address undersized drainage ditches and systems Countywide. (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)												
FL-16	Culvert Enlargement	Flooding	Community	RSIC Public Works	RSIC Emergency Manager	RSIC Public works and emergency management	Grant Existing Budget	$200,000	Mitigate flooding threat to RSIC infrastructure	Long-term	5+ years	high

#	Project Title	Hazard Addressed	Vulnerability Addressed*	Responsible Agency	Potential Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
					RSIC Tribal Council							
Description: Replace/improve culvert near the Eagle Canyon Smoke Shop on Eagle Canyon Road to increase capacity and address recurring flooding. (RSIC)												
EQ-9	Seismic Infrastructure improvement	Earthquake	Community	All Jurisdictions: • Public Works • Engineering • School Districts	N/A	UNR seismic department, emergency management	Grant Existing Budget	$2M	Mitigate seismic threat to RSIC infrastructure	Long-term	5+ years	high
Description: Complete seismic strength evaluations of critical facilities in all jurisdictions, including schools, community colleges, public infrastructure, and other critical facilities, to identify vulnerabilities for mitigation to meet current seismic standards. Mothball or demolish life-threatening buildings, particularly unreinforced masonry buildings. (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)												
EQ-10	Seismic infrastructure enhancement	Earthquake	Community	All Jurisdictions: • Public Works • Engineering	N/A	UNR seismic department, emergency management	Long-term	5+ years	Mitigate seismic threat to RSIC infrastructure	Long-term	5+ years	high
Description: Assess, repair, and/or replace infrastructure that may fail during earthquakes (e.g., Keystone Ave. Bridge). (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)												
EQ-12	Evacuation Routes	all hazards	Community	RSIC Public Works	N/A	Emergency management, planning, and public works	Grant Existing Budget	Grant Existing Budget	Community resilience and protection of life and safety	Long-term	5+	high
Description: Improve evacuation routes out of the Hungry Valley reservation (Winnemucca Ranch and Chickity Roads) to ensure they are passable in all weather conditions. (RSIC)												

#	Project Title	Hazard Addressed	Vulnerability Addressed*	Responsible Agency	Potential Partners	Existing Planning Mechanism(s)**	Potential Funding Source	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
CA-1	Prevention of active shooter incident	Criminal Acts and Terrorism	Community	Law Enforcement Agencies Facility Managers	Local Elected Officials Federal Agencies	Emergency management, tribal police, FBI	Existing Budget Grant	$50,000/year. $120,000/officer	Protection of community life and safety from malicious threat	Medium	1–5 years	high
Description: Implement measures to prepare for a potential active shooter incident, including new security measures, training and exercises, improved partnerships with law enforcement agencies, and policy changes (ex. prohibiting open carry). (All Partners)												
DT-3	Alternate tribal water supplies	Drought	Community	RSIC Public Works	RSIC Tribal Council	Emergency management, county emergency management, and public works	Grant Existing Budget	$25,000 (identifying alternative water supplies). $1,000,00 (tie-in and install new water tanks)	Critical infrastructure resilience through redundant water source	Long-term	5+ years	medium
Description: Identify alternate water supplies for Tribal properties and housing in Hungry Valley, potentially including a tie-in to the County's water system in Lemmon Valley and new water tanks. (RSIC)												

Notes: *Includes vulnerable populations; **Through which the action will be implemented.

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Acronyms

EOC	Emergency Operations Center
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HMP	Hazard Mitigation Plan
MPT	Mitigation Planning Team
NCEI	National Centers for Environmental Information
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
PG&E	Pacific Gas and Electric Company
PHMSA	Pipeline and Hazardous Materials Safety Administration
PLPT	Pyramid Lake Paiute Tribe
RHMP	Regional Hazard Mitigation Plan
RNO	Reno–Tahoe International Airport
RPZ	runway protection zone
RSIC	Reno-Sparks Indian Colony
RTS	Reno-Stead Airport
SHMP	State Hazard Mitigation Plan
TMWA	Truckee Meadows Water Authority
TRFMA	Truckee River Flood Management Authority
UNR	University of Nevada, Reno
WCHD	Washoe County Health District
WUI	Wildland–Urban Interface
RV	recreational vehicle

Truckee Meadows Fire Protection District Annex

Introduction

The Truckee Meadows Fire Protection District (TMFPD) has a fully integrated approach to hazard mitigation planning and program implementation. Throughout the 2024 update process, the following Regional Hazard Mitigation Plan (RHMP) participation roles were recorded:

Name	Position	Department
August Isernhagen	Division Chief, Wildland Fuels	Truckee Meadows Fire Protection District
Joseph R. Kammann	Division Chief, EMS	Truckee Meadows Fire Protection District
Adam Mayberry	Fire Communications Officer, Public Information Outreach	Truckee Meadows Fire Protection District
Derek T. Reid	Battalion Chief	Truckee Meadows Fire Protection District
Ryan Rizzuto	Battalion Chief	North Lake Tahoe Fire Protection District
Joe Schum	Division Chief, Operations	Truckee Meadows Fire Protection District
Brett Taylor	Community Coordinator, Wildland Urban Interface	Truckee Meadows Fire Protection District

What's New in the 2024 Update?

Since the prior plan, the Truckee Meadows Fire Protection District (TMFPD) has implemented several significant changes to enhance its operations and address the growing fire risks in the region. One primary focus has been on improving firefighting resources. This includes acquiring new firefighting apparatus and equipment to enhance response times and overall effectiveness during emergencies. Such upgrades ensure the district is better equipped to handle structural fires and wildfires, which have become increasingly prevalent.

In addition to resource improvements, TMFPD has strongly emphasized community engagement and education. The district has expanded its outreach programs to educate residents about fire safety, the importance of creating defensible space around properties, and strategies for home hardening against wildfires. These initiatives are crucial for fostering a

community preparedness culture and helping residents understand their role in fire risk reduction.

Another significant area of focus has been wildfire risk mitigation. In response to rising wildfire incidents, TMFPD has adopted more robust strategies to prevent and mitigate fires, including fuel reduction projects and active collaboration with local and state agencies. This proactive approach addresses fire hazards before they escalate into more significant threats, ultimately protecting both lives and property.

Finally, TMFPD has improved its training programs for firefighters, ensuring that staff are well-prepared to tackle contemporary challenges. Updated training protocols incorporate new firefighting techniques and address emerging hazards, enabling a more effective response to diverse situations. The district has also strengthened collaborations with neighboring agencies and emergency management organizations, facilitating coordinated efforts during crises. These comprehensive changes reflect TMFPD's commitment to enhancing community resilience and safety amidst increasing fire risks in the area. The 2024 update of the RHMP includes the following significant revisions to the 2020 plan:

- Includes additional stakeholders and opportunities for public participation.
- Identifies all hazards that could impact the plan participant.
- Expands upon the capability assessment, including opportunities to expand and improve capabilities.
- Identifies plan integration and integration opportunities.

Plan Adoption

44 CFR §201.6(c)(5) requires that an HMP be formally adopted by elected officials from each participating jurisdiction. TMFPD formally adopted the 2024 update of the Washoe County RHMP on [Date].

This RHMP was approved by FEMA Region 9 on [Date]. Once the plan is approved and signed, a copy of TMFPD’s adoption resolution will be placed in Appendix E of the Base Plan.

District Profile

The TMFPD serves most of the unincorporated areas of Washoe County south of Pyramid Lake (see Figure 85). The TMFPD provides fire suppression and advanced life support (paramedic) fire rescue service and responds to other types of emergencies. The TMFPD supports the County’s hazard mitigation program by reviewing plans for new construction for compliance with fire codes, conducting public outreach and education campaigns, assisting with community risk reduction planning, and pursuing federal hazard fuels reduction grants on behalf of communities. The district includes 200 career employees, 45 volunteers, 10 stations staffed

24/7, and 5 volunteer stations. The jurisdiction is approximately 6,000 square miles and includes unincorporated parts of Washoe County.[235]

Interstate 580/U.S. 395 (North and South) and I-80 (East and West) are major economic transportation hubs for trucking and rail. A mishap involving hazardous materials or radiological waste would cause significant economic loss and have widespread effects. If a hazard threatens life safety along these thoroughfares, closing them and redirecting traffic is the most rational response. Depending on the direction of traffic, detours could add hours or days to travel. The most common impact on these assets is wildfire, which doesn't cause considerable damage but ensures that public safety and emergency stabilization prolong the time for recovery after an event.

[235] Truckee Meadows Fire District, "About TMFR." https://tmfpd.us/about/#:~:text=The%20Truckee%20Meadows%20Fire%20Protection,square%20miles%20across%20Northern%20Nevada.

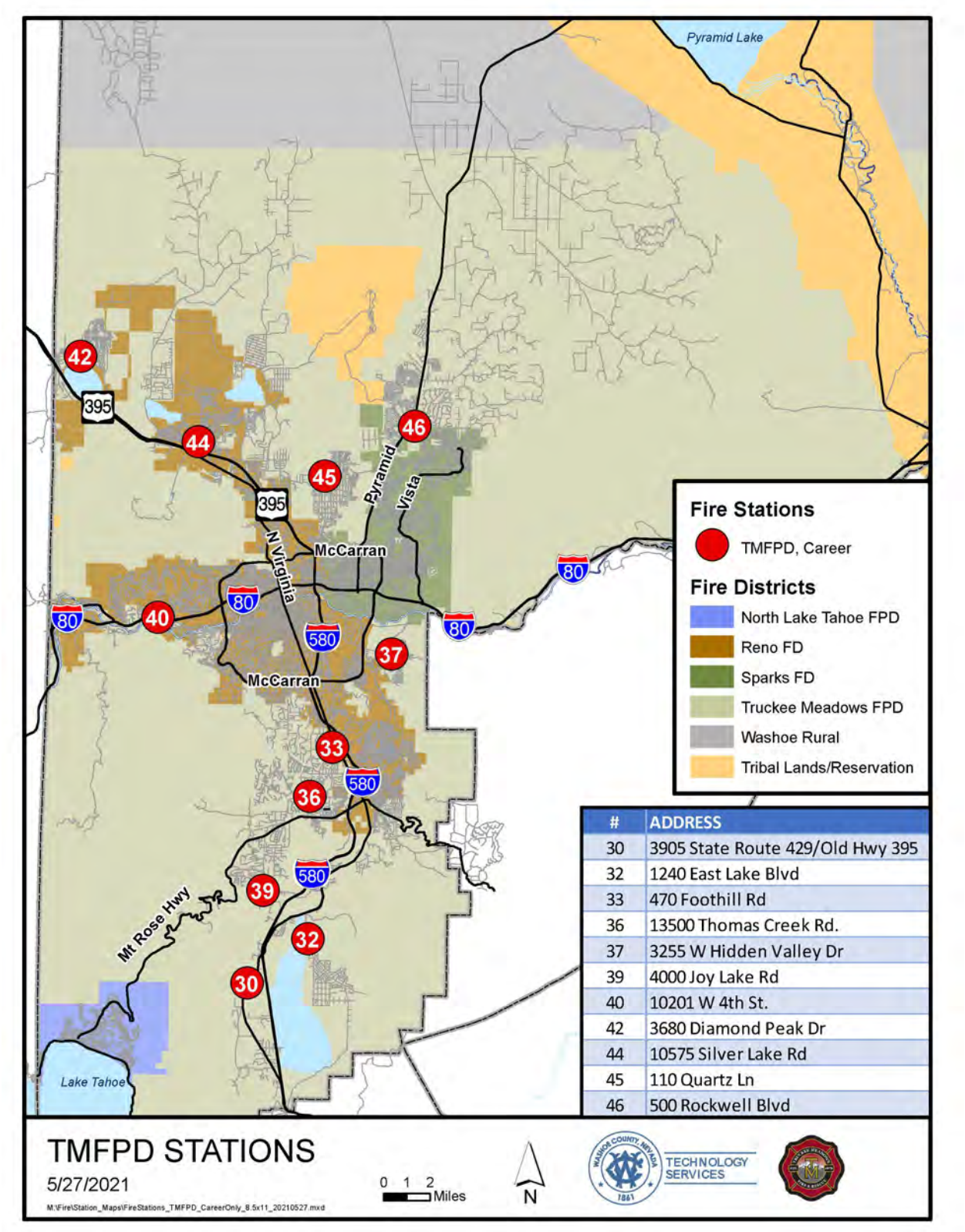

Figure 85: Fire Districts South of Pyramid Lake

Hazard Profiles and Vulnerability Assessments

This section contains hazard profiles and vulnerability assessments to determine the potential impact of hazards on the people, economy, and built and natural environments of the TMFPD. They have been streamlined to increase the effectiveness and usability of the RHMP. Additional details are contained in Appendix A of the Base Plan.

General

Washoe County has experienced several major disaster declarations that have affected TMFPD's planning area. It has received 41 major disaster declarations since May 1953, including 8 since the previous HMP update. Table 3 identifies the declarations since 2020 that have affected the TMFPD.

Table 106: Major Disaster Declarations in Washoe County since 2020[236]

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard Mitigation Program Declared	Declaration Date	Title
5448	No	Yes	Yes	08/14/2022	Fire
5382	No	Yes	Yes	11/07/2020	Fire
5328	No	Yes	Yes	08/15/2020	Fire
5326	No	Yes	Yes	08/03/2020	Fire
5322	No	Yes	Yes	07/21/2020	Fire
5316	No	Yes	Yes	06/27/2020	Fire
4523	Yes	No	No	04/04/2020	Biological (COVID-19)
3443	No	No	No	03/13/2020	Biological (COVID-19)

The hazard profiles and vulnerability assessments contained in this annex represent a considerable amount of work performed by the Mitigation Planning Team (MPT). Planning Team members ranked hazards using several key considerations, followed up by activities to validate hazard analysis results and identify specific areas of risk. Taking into consideration the

[236] FEMA, "Disaster Declarations for States and Counties." https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

missions of the special hazard districts participating in the 2024 RHMP update, this chapter includes hazard profiles and vulnerability assessments for the following hazard types:

- Avalanche and Landslide
- Criminal Acts and Terrorism
- Drought
- Earthquake
- Energy Emergency
- Flood
- Hazardous Materials Incident
- Infectious Disease
- Radiological Waste Transport
- Extreme weathers (Winter Storm, Windstorms, Extreme Heat)
- Transportation Incident
- Volcano
- Wildland Fire

Hazard Ranking Methodology

The hazards identified in the RHMP were initially ranked by TMFPD on the risk assessment form. A risk assessment result for the entire County does not mean that each participant has the same amount of risk for each hazard. Each plan participant has considered how it is uniquely at risk for the hazards profiled. The following factors were considered when evaluating TMFPD's unique risks and vulnerabilities:

- **Probability:** Likelihood of the hazard occurring.
- **Magnitude:** Areas potentially impacted, the overall impacts, and the chance of one hazard triggering another hazard, thus causing a cascading effect.
- **Onset:** The time between the recognition of an approaching hazard and when the hazard begins to affect the community.
- **Duration:** The length of time the hazard remains active, the length of time emergency operations continue after the hazard event, and the length of time that recovery will take.
- **Frequency:** How often a hazard has resulted in an emergency or disaster.

Hazards with a risk factor greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with a risk factor less than 2.0 are considered low risk. The highest possible risk factor is 4. Table 108 shows TMFPD's risk factors.

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Probability *What is the likelihood of the hazard occurring?*	1	Unlikely	Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.	30%
	2	Occasional	1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.	
	3	Likely	11 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years.	
	4	Highly Likely	91 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.	
Magnitude *What will be the overall impact?*	1	Negligible	Less than 5% of the affected area's critical and non-critical facilities and structures are damaged/destroyed. Only minor property damage and minimal disruption of life. Temporary shutdown of critical facilities.	30%
	2	Limited	Greater than 5% and less than 25% of property in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than one day but less than one week.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
	3	Critical	Greater than 25%, but less than 50% of property in the affected area was damaged/destroyed. Complete shutdown of critical facilities for over a week but less than one month.	
	4	Catastrophic	Over 50% of critical and non-critical facilities and infrastructures in the affected area are damaged/destroyed. Complete shutdown of critical facilities for more than one month.	
Onset *How long will be there be between when it is recognized the hazard is approaching and when the hazard will begin affect the community?*	1	Self-defined	More than 24 hours	10%
	2	Self-defined	12 to 24 hours.	
	3	Self-defined	6 to 12 hours.	
	4	Self-defined	Less than 6 hours.	
Duration *What is the length of time the hazard will remain active, including how long emergency operations will have to continue*	1	Brief	Up to 6 hours.	10%
	2	Intermediate	Up to one day.	
	3	Extended	Up to one week.	
	4	Prolonged	More than one week.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
after the hazard event?				
Frequency *How often has this kind of hazard resulted in an emergency or disaster?*	1	Every 10+ years	This hazard is not frequent but may still impact the area.	20%
	2	Every 5–10 years	This hazard is not as frequently occurring but it could occur in the next 10 years.	
	3	Every 1–5 years	This hazard is likely to occur relatively often. It may have occurred more or less frequently recently, but on average, it can be expected every 1–5 years.	
	4	Annually	This hazard is a frequent occurrence which the area actively has to respond to on an approximately annual basis.	

The Washoe County base plan is comprehensive for regional assessments and effectively addresses the calculated risk indexes. It provides a thorough evaluation that highlights its commitment to risk management and community safety, while the annexes are specific to each jurisdiction.

Table 107: Risk Factors for Hazards in the Truckee Meadows Fire Protection District

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor
Avalanche and Landslide	3	1	3	1	2	2
Criminal Acts and Terrorism	3	1	4	2	2	2.2
Drought	3	1	1	2	2	1.9
Earthquake	3	4	4	3	1	3
Energy Emergency	3	1	4	1	3	2.3
Flood	3	1	1	3	2	2
Hazardous Materials Incident	1	3	4	4	1	2.2
Infectious Disease	2	1	1	4	2	1.8
Radiological Waste Transport	1	4	4	4	1	2.5
Extreme weathers (Winter Storm, Windstorms, Extreme Heat)	3	1	1	3	3	2.2
Transportation Incident	2	1	4	2	1	1.7
Volcano	1	3	1	4	1	1.9

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor
Wildland Fire	4	2	4	3	4	3.3

Hazard-Specific Profiles and Risk Assessment

The following risk assessment relates to TMFPD. Additional information, including general descriptions of the hazard events, is included in the Base Plan. The TMFPD indicated that no priorities for its hazard mitigation plan had changed since the last plan update. Certain hazards TMFPD has elected not to profile due to the focus and legal authority of the district. Avalanche, landslide, drought, energy emergency, hazardous materials incident, infectious disease, radiological waste transport, Extreme weathers (winter storms, windstorms, extreme heat), and volcano. These hazards are best addressed by another organization.

CRIMINAL ACTS AND TERRORISM

Criminal acts of terrorism can impact any populated area, including shopping structures, clinics and hospitals, schools, and government offices and buildings. These threats could affect all populated areas in Washoe County, and government facilities and schools may be the most likely targets.

EARTHQUAKE

The State of Nevada is the third most seismically active state in the U.S., and Washoe County is in one of the most seismically active areas in Nevada. Most earthquakes are small enough to be nearly undetectable by people, but larger-magnitude earthquakes can cause significant damage to homes and infrastructure.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the Truckee Meadows Fire Protection District due to earthquakes can be considerable. Infrastructure damage, including fire stations and emergency vehicles, may hinder response capabilities, leaving communities vulnerable during crises.

Service demand can surge following an earthquake as multiple incidents co-occur, overwhelming available resources and personnel. This increased workload is compounded by the potential for secondary fires from gas leaks and electrical failures, further stretching the district's capacity.

Communication systems may also be disrupted, impacting coordination among fire crews and complicating emergency responses. Additionally, the district might need to facilitate evacuations and establish temporary shelters, adding to its responsibilities.

Investing in training and preparedness is essential for effectively managing earthquake scenarios. This requires careful allocation of funding and resources, which can affect the district's budget.

Long-term, the community's trust in fire protection services may wane if residents feel unprepared for seismic events. Thus, ongoing efforts to ensure readiness are crucial for maintaining public safety and confidence.

PROBABILITY OF FUTURE EVENTS

The probability of future earthquake events in the Truckee Meadows Fire Protection District can be considered as likely. The region is situated near fault lines, making it susceptible to seismic activity.

FLOODING

TMFPD itself has no history of flooding. Riverine or flash flooding in the County often results in washed-out or flooded roadways and infrastructure, such as bridges or culverts. Due to the concentration of urban development in Reno and Sparks along the Truckee River, many critical facilities in the County are located in the 100-year or 500-year mapped floodplains and are vulnerable to riverine flooding. Flash flooding can affect smaller creeks and streams and areas near burn scars, and critical facilities outside mapped floodplains may be affected.

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the North Truckee Meadows Fire Protection District due to flooding can be significant. One major concern is damage to infrastructure, as flooding can compromise fire stations and critical facilities, hindering the district's emergency response capabilities.

Increased response times are another serious issue, as inundated roads may block access to affected areas, which is crucial during emergencies. Additionally, personnel may be stretched thin, as they could be diverted to manage rescues and evacuations.

Loss of equipment is a further concern; fire trucks submerged in floodwaters can lead to costly repairs and operational downtime. Insurance premiums may also rise, impacting the district's budget for resources and training.

Ultimately, flooding may require the fire protection district to invest in flood mitigation strategies and develop comprehensive emergency plans. The potential impacts create significant challenges, highlighting the need for proactive measures and preparedness.

VULNERABILITY ASSESSMENT

The Truckee Meadows Fire Protection District in Washoe County, Nevada, is at risk for earthquakes due to its seismic history. A vulnerability assessment is essential to identify at-risk populations and develop mitigation strategies.

Key vulnerable groups include elderly residents, who may need assistance during evacuations and often live in homes that lack modern seismic standards. Low-income individuals are also particularly at risk, as they tend to reside in older, less stable structures and may not afford retrofitting or insurance. Additionally, individuals with disabilities face challenges in accessing emergency services, while schools housing children need to ensure structural safety, as they are often used as shelters during disasters. The homeless population is especially vulnerable due to their lack of immediate access to shelter and support.

Geographic factors contribute to vulnerability. Areas near fault lines face higher seismic risks, and many older buildings do not comply with current safety codes. Urban areas generally have better infrastructure compared to rural communities, which can struggle with slower emergency response times.

To address these vulnerabilities, community education programs on earthquake preparedness are vital, along with routine building inspections to ensure safety standards. Emergency response plans must prioritize the needs of vulnerable populations, ensuring accessibility and support. Additionally, enhancing community shelters to accommodate diverse groups is crucial.

PROBABILITY OF FUTURE EVENTS

The probability of future flooding events in Truckee Meadows Fire Protection District can vary based on several factors, including weather patterns, land use, and watershed management practices. However, in general terms:

- Flooding events can be considered **unlikely** to **likely**, depending on specific conditions such as heavy rainfall or rapid snowmelt.

- Areas closer to rivers or in low-lying regions may have a **higher likelihood** of flooding, while more elevated or well-drained areas might see flooding as less probable.

TRANSPORTATION INCIDENTS (AIRCRAFT CRASH)

Washoe County has four publicly operated airports: the Reno–Tahoe International Airport (RNO), the Reno–Stead Airport (RTS), the Spanish Springs Airport (N86) in Reno, and the Empire Airport (1A8) in Empire. Aircraft crashes are typically handled at the local level and can disrupt transportation and business services nearby. The magnitude and potential severity of the impact of an aircraft crash is considered Medium in Washoe County.

WILDLAND FIRE

LOCATION

Wildland fires are frequent natural occurrences in the arid ecosystems of the Truckee Meadows region and the alpine forests surrounding Lake Tahoe. The risks from fires are highest for development in the WUI, which in Washoe County includes areas outside the urban centers of Reno and Sparks in the jurisdiction of the TMFPD and the communities of Incline Village and Crystal Bay on the shores of Lake Tahoe. Wildland fire potential in the TMFPD's service area ranges from Moderate to Very High. Historic suppression of fires and buildup of fuels in the forests around Lake Tahoe have made these communities high-risk areas for fires, with wildland fire potential ranging from Moderate to Very High.

- **Sun Valley –** Sun Valley is an area for concern for TMFPD, as it is surrounded by unmanaged Bureau of Land Management (BLM) jurisdiction in alignment with southwest winds and aspects contributing to faster, more extreme wildland fires. Low-income people and the elderly generally populate the area. Many properties have accumulated vegetation and debris, which will spread fire rapidly between structures.
- **Galena Forest—**Galena Forest is another area of concern for TMFPD, as it has heavy contiguous wildland fuel from adjacent Forest Service properties. Under ideal conditions, wildfire could spread uninhibited through tree canopies, making defending structures untenable. Evacuations in a fast-moving wildfire event would be considerable difficulties.
- **Addition areas of wildland fire risk-** Verdi, Caughlin Ranch, Virginia Foothills, Spanish Springs sprawl
- **General risk to older structures –** Structures built before the County adopted the 2012 International WUI Code in Sept. 2013 could be built to lower standards of resilience to wildland fire. Characteristics that lead to higher ignitability include the materials used for roofing, siding, eave coverings, windows and doors; vent meshes; and deck/balcony enclosures.
- **Bowers Mansion Regional Park –** Bowers Mansion Regional Park is an at-risk historic resource for the region. The adjacent land is unmanaged for wildfire and is susceptible to a catastrophic wildfire event. Apart from the physical damage to human improvements, the alterations to the landscape are generational, long-term effects that, apart from emergency stabilization and rehabilitation (ESR), cannot be recovered from quickly.

PREVIOUS HISTORY/OCCURRENCES

In addition to the declared events, the following events are of note to TMFPD:

- **08/14/2022: Joy Lake Fire FM-5448-NV –** this fire burned two acres and destroyed one home. The fire threatened 2000 homes. A Fire Management Assistance Declaration was made on 8/15/2022.

- **09/07/2021: Brady Fire –** This fire in the Cold Springs area burned 15 acres but was no threat to structures.
- **07/02/2021: The Sugar Fire** started in CA, part of the Beckwourth Complex, which caused 107,075 acres to burn. The fire impacted travel on US-395 north at N. Red Rock Rd. It destroyed 33 structures in CA and threatened structures in Rancho Haven and North Red Rock.
- **06/22/2021: Petrilla Fire –** This fire in the Steamboat Hills area burned 528 acres, and 4000 homes experienced power outages. The geothermal plant was threatened. This fire was human caused.
- **11/17/2020: Pinehaven Fire FM-2973-NV** burned 512 acres, destroyed 5 homes, and damaged 3 others. A total of 1300 homes were evacuated, and power to customers was interrupted.
- **Caughlin Ranch Area:** A Fire Management Assistance Declaration was issued on 11/17/2020, releasing $162,385.01 in federal emergency work funds, related $785,047.27 Total Public Assistance Grant Dollars Obligated
- **10/06/2020: The Baccarat Fire,** West of the Red Rock fire, burned 10,456 acres and threatened 75 homes.
- **09/07/2020: The W-5 Cold Springs Fire** started in CA and spread to Nevada; 84,817 acres were burned, and over 20 structures and ranches were threatened.
- **08/16/2020: Poodle Fire,** Northwest of Gerlach: 13,600 acres were burned and energy and transportation infrastructure was threatened.
- **08/15/2020: Loyalton Fire FM-5328-NV** began ire Northwest of Bordertown and extended into the TMFPD response area. 47,029 acres burned in CA and NV. There was no damage to Nevada's interests, but in California, 5 homes and 29 outbuildings were destroyed. Nevada residents were issued an evacuation advisory, and a Management Assistance Declaration was issued on 08/15/2020.
- **08/02/2020: North Fire FM-5326-NV** occurred in Red Rock and Rancho Haven with 6300 acres burned. A federal Management Assistance Declaration was issued on 08/03/20.
- **07/21/2020: Rock Farm Fire** in the Galena Foothills/Arrowcreek area burned 120 and destroyed 2 homes, with threats to 1000+ homes, public infrastructure, roads, bridges, and power. 800 homes were evacuated. A federal Management Assistance Declaration was approved on 07/21/2020.

PROBABILITY OF FUTURE EVENTS

The probability of future wildfire events in the Truckee Meadows Fire Protection District can be categorized based on various risk assessments, taking into consideration factors such as vegetation type, weather conditions, and historical data. Given the increasing concerns around

drought and climate change, it is generally expected that the likelihood of wildfires may be rated as "likely" or "highly likely," particularly in areas with moderate to high hazard ratings.

VULNERABILITY ASSESSMENT

The Truckee Meadows Fire Protection District (TMFPD), located in the Reno-Sparks metropolitan area of Washoe County, Nevada, is at significant risk from wildland fires due to its diverse ecosystems and urban development. This assessment highlights the populations and areas particularly vulnerable to these hazards.

Vulnerable populations include elderly residents who may struggle with mobility, low-income communities lacking resources for fire prevention, and individuals with disabilities who may need additional support during evacuations. Children may not fully understand evacuation procedures, while homeless populations often lack access to safe shelter during emergencies.

Geographically, the wildland-urban interface areas, where residential neighborhoods meet wildlands, are at increased risk. Regions with dense vegetation and poorly maintained properties pose additional threats due to higher fuel loads. Infrastructure vulnerabilities, such as limited access routes and inadequate water supply for firefighting, further complicate the situation. Inadequate communication systems can leave some residents uninformed about fire risks and evacuation plans.

Socioeconomic factors also contribute to vulnerability, as communities with limited access to information and resources may be ill-prepared for wildland fire events. Homeowners without sufficient insurance might hesitate to invest in critical mitigation measures, increasing their risk.

To mitigate these vulnerabilities, TMFPD should implement community education programs on fire prevention and emergency preparedness. Developing clear evacuation routes, encouraging defensible space around properties, and improving communication systems will also enhance overall preparedness.

TMFPD Strategic Action Plan

Goals and Impacts:

1. Serving the needs of the community.
2. Building a safer, more resilient community and workforce.

3. Creating a sustainable future for the Truckee Meadows Fire District.[237]

RCI 2005 WASHOE COUNTY FIRE PLAN (OLD COMMUNITY WILDFIRE PROTECTION PLAN [CWPP])

Resource Concepts, Inc. (RCI), a Carson City consulting firm, was selected to conduct community risk/hazard assessments systematically for each community. The RCI Project Teams observed and recorded the factors that significantly influenced the risk of wildfire ignition along the WUI and inventoried features that could have an influence on hazardous conditions in the event of a wildfire.[238]

LANDSCAPE-SCALE WILDLAND FIRE RISK/HAZARD/VALUE ASSESSMENT

The Landscape-Scale Wildland Fire Risk/Hazard/Value Assessment was used as a companion document to the Nevada Community Wildfire Risk/Hazard Assessment Project for Washoe County. These two documents are important sources of information and can help with setting priorities, completing plans, and implementing effective fuel-reduction projects both in and outside the WUI in Washoe County.

Vulnerability Assessment

Jurisdiction-Specific Vulnerabilities

REPETITIVE LOSS PROPERTIES

No repetitive loss properties currently exist in the TMFPD area.

EXPOSURE ASSESSMENT

Table 109 summarizes the exposure of critical facilities in the TMFPD area to hazards that can be mapped.

[237] Truckee Meadows Fire District, "Truckee Meadows Fire Protection District FY 25-27 Strategic Plan." https://tmfpd.us/wp-content/uploads/2023/12/Item-7-2025-2027-Strategic-Plan-ENTIRETY.pdf

[238] Resource Concepts Inc, "Washoe County Fire Plan." https://www.rci-nv.com/reports/washoe/section01.html#s1-1

Table 108: Exposure Assessment for the Truckee Meadows Fire Protection District

Type	Name	Address	Special Hazards District	Flood Zone	Wildland Fire Hazard Potential
Wastewater Treatment Plant (WWTP)	Lemmon Valley WWTP	11000 Lemmon Dr	TMFPD	100-year flood zone	1
Wastewater Treatment Plant	National Wild Horse and Burro Center	15780 SR 445	TMFPD	–	1
Power Plant	Steamboat Hills LP	20590 Wedge Parkway	TMFPD	–	1
Power Plant	Galena 2 Geothermal Power Plant	20590 Wedge Parkway	TMFPD	–	1
Hospital	Saint Mary's Medical Center Sun Valley Clinic	N/A	TMFPD	–	1
School	University of Nevada Farm	N/A	TMFPD	500-year flood zone	1
School	Natchez Elementary School	N/A	TMFPD	–	1
School	Hidden Valley Elementary School	N/A	TMFPD	–	1
School	Lois Allen Elementary School	N/A	TMFPD	–	1
School	Lemmon Valley Elementary School	N/A	TMFPD	–	1
School	Sun Valley Elementary School	N/A	TMFPD	–	1
School	Galena Creek School (historical)	N/A	TMFPD	–	1
School	Alice L Smith Elementary School	N/A	TMFPD	100-year flood zone	1
School	Virginia Palmer Elementary School	N/A	TMFPD	–	1

Type	Name	Address	Special Hazards District	Flood Zone	Wildland Fire Hazard Potential
School	Elizabeth Lenz Elementary School	N/A	TMFPD	–	1
School	Picollo Special Education School	N/A	TMFPD	–	1
School	Alyce Savage Taylor Elementary School	N/A	TMFPD	–	1
School	Pleasant Valley Elementary School	N/A	TMFPD	100-year flood zone	1
School	Verdi Elementary School	N/A	TMFPD	–	1
School	Brown Elementary School	N/A	TMFPD	–	1
School	Galena High School	N/A	TMFPD	–	1
School	North Valleys High School	N/A	TMFPD	–	1
School	Spanish Springs High School	N/A	TMFPD	–	1
School	Yvonne Shaw Middle School	N/A	TMFPD	–	1
School	Ester Bennett Elementary School	N/A	TMFPD	–	1
School	Ted Hunsberger Elementary School	N/A	TMFPD	–	1
School	Spanish Springs Elementary School	N/A	TMFPD	–	1
School	Bishop Manogue High School	N/A	TMFPD	–	1
School	Lighthouse Baptist Academy	N/A	TMFPD	100-year flood zone	1
School	Mountain View Montessori School	N/A	TMFPD	100-year flood zone	1
School	New Beginnings Child Development Center	N/A	TMFPD	–	1
School	Sage Ridge School	N/A	TMFPD	–	1
School	Teen Challenge of Nevada	N/A	TMFPD	–	1

Type	Name	Address	Special Hazards District	Flood Zone	Wildland Fire Hazard Potential
Dam	Hobart Creek Reservoir Dam	N/A	TMFPD	–	1
Dam	Marlette Lake Dam	N/A	TMFPD	–	1
Dam	Greil Dam	N/A	TMFPD	–	1
Dam	Incline Lake Dam	N/A	TMFPD	–	1
Dam	Herman Dam	N/A	TMFPD	–	1
Dam	Huffaker Effluent Storage Reservoir	N/A	TMFPD	–	1
Dam	Hidden Lake Dam	N/A	TMFPD	–	1
Dam	Lightning W Ranch Dams	N/A	TMFPD	–	1
Dam	Pagni Dam	N/A	TMFPD	100-year flood zone	1
Dam	Washoe Lake Dam	N/A	TMFPD	–	1
Dam	Home Ranch Canyon Dam	N/A	TMFPD	–	1
Dam	Wilcox Canyon Dam #1	N/A	TMFPD	–	1
Dam	Wilcox Canyon Dam #3	N/A	TMFPD	–	1
Dam	Jones Canyon Dam	N/A	TMFPD	–	1
Dam	Sidehill Detention Basin	N/A	TMFPD	–	1
Dam	Verdi Meadows Wastewater Disposal Dam	N/A	TMFPD	–	1
Dam	North Spanish Springs Flood Sediment Basin	N/A	TMFPD	100-year flood zone	1
Dam	North Spanish Springs Flood Detention Facility	N/A	TMFPD	100-year flood zone	1

Type	Name	Address	Special Hazards District	Flood Zone	Wildland Fire Hazard Potential
Fire Station	LTMFPD Department Station 440	130 Nectar Street	TMFPD	100-year flood zone	1
Fire Station	TMFPD Station 430 – Silver Lake Volunteers	11525 Red Rock Road	TMFPD	–	1
Fire Station	TMFPD Station 46 – Spanish Springs	500 Rockwell Boulevard	TMFPD	–	1
Fire Station	TMFPD Station 45 – Sun Valley	110 Quartz Lane	TMFPD	–	1
Fire Station	TMFPD Station 37 – Hidden Valley	3255 West Hidden Valley Drive	TMFPD	100-year flood zone	1
Fire Station	Wadsworth Volunteer Fire Department 225	400 Stampmill Road	TMFPD	–	1
Fire Station	TMFPD Station 32 – East Washoe Valley	1240 Eastlake Boulevard	TMFPD	100-year flood zone	1
Fire Station	TMFPD – BLM leased	White Lake Parkway	TMFPD	–	1
Fire Station	TMFPD Station 320 – Washoe Valley Volunteers	Lakeshore Drive	TMFPD	–	1
Fire Station	Nevada Department of Forestry Station 1 – Headquarters/ Fire Station 32	885 Eastlake Boulevard	TMFPD	–	1
Fire Station	Not a Fire Station	United States Highway 395	TMFPD	500-year flood zone	1
Fire Station	Nevada Division of Forestry – Bowers/ Fire Station 30	3905 Old United States Highway 395 South	TMFPD	–	1
Fire Station	USFS – Galena	16255 Mount Rose Highway	TMFPD	–	1
Fire Station	TMFPD Station 381 – Galena	16133 Mountain Ranch Road	TMFPD	–	1

Type	Name	Address	Special Hazards District	Flood Zone	Wildland Fire Hazard Potential
Fire Station	Historical Society – Not a Fire Station	165 Bridge Street	TMFPD	–	1
Fire Station	TMFPD Station 460 – Peavine	11005 Longview Lane	TMFPD	–	1
Fire Station	Not a Fire Station	250 South Avenue	TMFPD	–	1
Fire Station	Not a Fire Station	16175 Callahan Road	TMFPD	–	1
Fire Station	TMFPD Station 300 – Washoe Valley	345 Bellevue Road	TMFPD	100-year flood zone	1
Fire Station	TMFPD Station 39 – Joy Lake	4000 Joy Lake Road	TMFPD	–	1
Fire Station	Palomino valley Volunteer Fire Department Station 450	6015 Ironwood Road	TMFPD	–	1
Fire Station	TMFPD Station 33	470 Foothill Road	TMFPD	–	1
Fire Station	Hungry Valley Volunteer Fire Department Station 244	Eagle Canyon Drive	TMFPD	–	1

ESTIMATED IMPACT AND POTENTIAL LOSSES

The estimated impacts and potential losses to the Truckee Meadows Fire Protection District due to wildfire are considerable and varied. A primary concern is the destruction of infrastructure, which can lead to the loss of homes, commercial properties, and critical services, creating significant financial burdens for the district and its residents.

Emergency response costs are likely to rise as wildfire activity increases, requiring more resources for firefighting efforts. Furthermore, wildfires can cause long-term environmental damage, affecting local ecosystems and resulting in loss of vegetation and wildlife habitat recovery that can take years.

Economically, the tourism sector—a vital part of the local economy—may suffer due to perceived fire risks, leading to decreased visitation and revenue for businesses. Additionally, health risks from poor air quality can increase healthcare costs for residents, particularly those with respiratory issues.

The surge in insurance claims after a wildfire can create financial stress for insurers and lead to higher premiums. To reduce future risks, the district may also need to invest in proactive wildfire mitigation efforts, such as controlled burns and community education.

Lastly, the emotional and psychological impacts on residents can be significant, increasing stress and anxiety about future wildfires. These factors underscore the critical challenges facing the Truckee Meadows Fire Protection District and the need for proactive planning and resource allocation to mitigate potential losses.

Development Trends

Changes in development in hazard-prone areas can increase or decrease the vulnerability of plan participants. Since the previous plan was approved, there has been recent development (for example, construction completed since the last plan was approved), potential development (for example, development planned or under consideration by the jurisdiction), conditions that may affect the risks and vulnerabilities of the jurisdictions (for example, climate change, declining populations or projected increases in population, or foreclosures), shifts in the needs of underserved communities, or gaps in social equity. This can also include changes in local policies, standards, codes, regulations, land-use regulations, and other conditions. For example, as Reno and Sparks continue to expand beyond city limits and into the service area of the TMFPD, the demand for fire protection services will increase as vulnerable community assets increase. Table 110 Indicates how changes in development have increased, decreased, or not affected TMFPD's overall vulnerability to the hazards profiled.

Table 109: Changes in Development at Truckee Meadows Relative to Hazards

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Avalanche and Landslide	N/A	N/A	N/A	Same
Criminal Acts and Terrorism	N/A	N/A	N/A	Same
Drought	Increased land use can cause water scarcity in a prolonged drought. There is no potential for this in the near term.	Increased population demand can cause water scarcity in a prolonged drought. There is no potential for this in the near term.	The recent record-setting winter and the following average winter have recharged groundwater and surface water, taking the region out of the latest drought (U.S. Drought Monitor). However, 1 or 2 dry winters can cause another widespread drought.	Decreased
Earthquake	N/A	N/A	N/A	Same
Energy Emergency	New developments in WUI areas are adopting underground energy utilities. This reduces the chances of local energy disruption	Increased	In 2019, the NV Legislature passed SB 329 requiring electric utilities to submit natural disaster protection plans (NDPPs), required them to mitigate the risk of infrastructure to wildfires. This involves new	Decreased

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
	or wildfires from downed wires or electrical arcing.		hardening practices, such as vegetation management, insulated conductors, improved fault fuses, and underground wiring. The 2022–2023 winter exposed a potential for shortages in heating oil and propane. Weather stressed supply chains and regional shortages/high-prices led to excessive demand and potential deleterious consequences for vulnerable populations.	
Flood	N/A	N/A	N/A	Same
Hazardous Materials Incident	N/A	N/A	N/A	Same
Infectious Disease	Northern Nevada Sierra Medical Center opened in 04/2022. An additional regional hospital could reduce the strain on existing medical services.	Increased population will lead to more demand for medical services, leading to a potential shortages of available government services.	The COVID-19 pandemic has exposed the region's areas of vulnerability, such as impacted medical facilities, broken supply chains, and conflicting state and federal policies.	Increased

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
Radiological Waste Transport	N/A	N/A	N/A	Same
Extreme weathers (Winter Storm, Windstorms Extreme Heat)	N/A	N/A	N/A	Same
Transporta-tion Incident (Aircraft Crash)	N/A	N/A	N/A	Same
Volcano	N/A	N/A	N/A	Same
Wildland Fire	New communities that have developed around old ones have shifted wildfire risk outward across TMFPD jurisdictions. The adoption of the	Increased	Continued development and urban sprawl will increase jurisdictions' wildfire-prone areas. Cancellation of insurance because of wildfire risk is a new issue, which increases the vulnerability of certain populations.	Increased

Type of Hazard Event	Changes in Land Use	Changes in Population	Changes in Conditions (e.g., climate change)	Overall Vulnerability
	2018 International WUI building code should provide increased resilience to wildfire.			

Capability Assessment

Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. Table 111 lists TMFPD's planning capabilities, and Table 112 details the regulations and ordinances used for hazard mitigation.

Table 110: Planning Capabilities of the Truckee Meadows Fire Protection District

Plan Type	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	Can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
General plan	Y	N	Provide a strategic and fiscal path to make mitigation actions sustainable	2024
Capital improvement plan	Y	N	Would help with Mitigation Action # 7 to improve building security and Mitigation Action # 8 seismic impact study.	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.
Climate change adaptation plan	N	N/A	N/A	N/A
Community wildfire protection plan	Y	Y	Old Washoe County Plan from 2005, mostly irrelevant information	Will be updated 2024/2025
Economic development plan	N	N/A	N/A	N/A
Land use plan	N	N/A	N/A	N/A
Local emergency operations plan	N	N/A	N/A	N/A

Plan Type	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	Can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
Stormwater management plan	N	N/A	N/A	N/A
Transportation plan	N	N/A	N/A	N/A
Substantial damage plan	N	N/A	N/A	N/A
Other?	Washoe County has a Damage Assessment Plan that serves the same intent and covers all jurisdictions			

Table 111: Regulations and Ordinances Used by the Truckee Meadows Fire Protection District

Regulation or Ordinance	Does this regulation/ ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it next be updated?
Building code	Y	Y	2018 International Wildland-Urban Interface Code updated in Jan. 2019
Flood insurance rate maps	N	N/A	N/A
Floodplain ordinance	N	N/A	N/A
Subdivision ordinance	N	N/A	N/A
Zoning ordinance	N	N/A	N/A

Regulation or Ordinance	Does this regulation/ ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it next be updated?
Natural hazard-specific ordinance (stormwater, steep slope, wildfire)	Y	Y	Wildfire hazard map dictates level of fire rating construction to be used. Needs updating described in Mitigation Action # 6
Acquisition of land for open space and public recreation use	N	Y	Washoe County Open Space does not have adequate funding to manage the owned land for wildfire hazard
Prohibition of building in at-risk areas	N	N/A	N/A
Other? (Describe)			

Administrative and Technical

The district's human and technical capabilities to engage in and improve mitigation planning and program implementation.

Administrative Capabilities

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	Y	Y	Y	Y
Civil Engineer	N	N/A	N/A	N/A
Community Planner	N	N/A	N/A	N/A
Emergency Manager	N	N/A	N/A	N/A
Floodplain Administrator	N	N/A	N/A	N/A

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Geographic Information System (GIS) Coordinator	N	N/A	N/A	N/A
Planning Commission	N	N/A	N/A	N/A
Fire Safe Council	N	N/A	N/A	N/A
CERT (Community Emergency Response Team)	N	N/A	N/A	N/A
Voluntary Agencies Active in Disasters (VOAD)	Y	N	Somewhat. Volunteer firefighters are trained for only some kinds of emergencies.	Yes
Other? (Describe)				

Technical Capabilities

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/ mitigate risk in the past?	How can the capability be used to assess/ mitigate risk in the future?
Mitigation grant writing	Y	Grants are actively pursued at TMFPD	Can multiply productivity if awarded.
Hazard data and information	Y	Currently using old 2005 data to understand fire risk. Existing risk assessment platforms are insufficient to gauge risk parcel by parcel.	With updated data and more robust analytics, we can more adequately determine wildfire risk.
GIS	N	N/A	N/A
Mutual aid agreements	Y	Working with our neighboring agencies helps make mitigation actions contiguous	Improved relationships and agreements help existing units be more productive.

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/ mitigate risk in the past?	How can the capability be used to assess/ mitigate risk in the future?
Other? (Describe)			

Financial Resources

Financial Capabilities refer to potential funding sources for mitigation actions. They are shown in Table 113.

Table 112: Financial Resources of the Truckee Meadows Fire Protection District

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Capital improvement project funding	Y	Building new fire stations	Thorough research revealed a lack of sufficient information to evaluate or categorize this, indicating a need for further investigation.	Yes
General funds	Y	All department operations	Y	Yes
Hazard Mitigation Grant Program (HMGP/404)	Y	Jasper and Long Valley HMGP fire mitigation projects	More applications are pending for HMGP.	No
Building Resilient	Y	Being used to install solar panels	Will continue with similar plan	No

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Infrastructure & Communities (BRIC)		on 4 TMFPD facilities	across all fire stations	
Flood Mitigation Assistance	N	N/A	N/A	N/A
Public Assistance Mitigation	N	N/A	N/A	N/A
Community Development Block Grant	N	N/A	N/A	N/A
Natural Resources Conservation Services Programs	N	N/A	N/A	N/A
U.S. Army Corps of Engineers Programs	N	N/A	N/A	N/A
Property, sales, income, or special purpose taxes	N	N/A	N/A	N/A
Stormwater utility fee	N	N/A	N/A	N/A

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Fees for water, sewer, gas, or electric services	N	N/A	N/A	N/A
Impact fees from new development and re-development	N	N/A	N/A	N/A
General obligation or special purpose bonds	N	N/A	N/A	N/A
Federally funded programs	N	N/A	N/A	N/A
Other state-funded programs	N	N/A	N/A	N/A
Private sector or nonprofit programs	Y	NV Energy funded hazard mitigation for power infrastructure	Yes	Yes
Other?				

Education and Outreach

Education and outreach capabilities are programs and methods that could communicate about and encourage risk reduction. Those for TMFPD are listed in Table 114.

Table 113: Education and Outreach Resources of the Truckee Meadows Fire Protection District

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Community newsletter(s)	N	N/A	N/A
Hazard awareness campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, school programs)	Y	Yes, focused on Wildfire	None
Public meetings/events (Please Describe)	Y	Community events/ presentation, Citizen Advisory Board (CAB) meetings	None
Emergency Management Listserv	N	N/A	N/A
Local news	N	N/A	N/A
Distributing hard copies of notices (e.g., public libraries, door-to-door outreach)	Y	Yes, focused on wildfire and smoke detectors	In coordination with the Red Cross
Insurance disclosures/ outreach	N	N/A	N/A
Organizations that represent, advocate for, or interact with underserved and vulnerable communities (Please Describe)	N	N/A	N/A

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Social media (Please Describe)	Y	Yes	All social media platforms. Some posts reference hazards and mitigation actions when necessary.
Other? (Describe)			

Participation in the National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a FEMA program that provides flood insurance to millions of policyholders nationwide. Special districts like TMFPD are not eligible to participate in the NFIP but may support floodplain management and exist in communities that participate in the NFIP. Information on TMFPD's participation in NFIP is in Table 115.

Table 114: Responses to Questions about the National Flood Insurance Program

Question	Notes
What communities does your special district operate in? Are you aware of any flood concerns in these communities?	TMFPD responds to flood emergencies when required.
Which of your assets are at-risk of flooding? List any of your structures in the high-risk flood zone if known, or list addresses, and the IEM team will check on https://msc.fema.gov/portal/home	None
Is your organization involved in floodplain management? If so, how?	No

Opportunities to Expand and/or Improve Capabilities

The capability assessment provides an opportunity to assess gaps in capabilities and to consider where additional measures could be taken to expand current mitigation capabilities.

Table 115: The Truckee Meadows Fire Protection District's Opportunities to Develop Capabilities

Capability Type	Opportunity to Expand and/or Improve
Planning and Regulations	Hiring a consulting agency with proper analytical software can help our region accurately identify

Capability Type	Opportunity to Expand and/or Improve
All communities with wildfire risk will have individual Community Wildfire Protection Plans (CWPPs) developed in the next 2 years and will have a plan update every 5 years.	risk areas which will improve CWPPs and priorities.
Administrative and Technical	Nothing additional is needed.
Financial	More county funds could be allocated to hazard mitigation actions. TMFPD Wildland Fuels Division, which exclusively does all department fuels mitigation work, is 85% externally funded (contracts, grants, etc.) Internally funding that program will allow department or county priorities to take precedence.
Education and Outreach	More communities adopting the Firewise program will make education and outreach more effective. New avenues to incentivize Firewise sites are being investigated.

Plan Integration

Plan integration is the process by which information from the hazard mitigation plan is incorporated into other planning mechanisms. Planning mechanisms refer to the governance structures used to manage local land-use development and community decision-making, such as budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances. TMFPD reported the following:

- **Previous Plan Integration** – TMFPD did not integrate prior hazard mitigation into any planning mechanisms specifically. However, individual mitigation actions have been adopted in the strategic direction of the Wildfire and Fuels Division.
- **Future Plan Integration** – All county CWPPs must be updated and can include additional information from the current RHMP. TMFPD, including the participants in this update, will be responsible for supporting CWPP and helping to incorporate relevant information/ actions.

Mitigation Strategy

Review of 2020 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2020 plan were evaluated to determine the status of the action and whether any ongoing or incomplete actions should be included as actions in the 2024 plan update (see Table 117).

Table 116: Previous Mitigation Actions by the Truckee Meadows Fire Protection District

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
WF-13	Adopt 2018 wildland fire code County-wide (All Partners).	Regional Fire Protection Districts	Completed	N
WF-14	Manage fuels to mitigate wildland fire risk along the Mt. Rose corridor. (TMFPD)	TMFPD	In process. Awaiting implementation of Southern Nevada Public Land Management Act-funded project at Sky Tavern/ pursuing more funds and projects around Galena.	N
WF-15	Continue County chipping program and "junk the juniper" program, offering free chipping to property	TMFPD	Continuing program/"Junk the Junipers" has been replaced by the GreenWaste Program/ Pursuing more grant funding to expand Curbside Chipping program	Y

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
	owners (TMFPD).			
WF-16	Review and update (as needed) evacuation plans for communities in wildland fire-prone areas and hold evacuation drills at least once every two years (All Partners).	Regional Fire Protection Districts	WCEM adopted Perimeter Map application to coordinate all evacuations in case of disasters. All gated access roads in the district have had locks removed, and their signage was changed to stating that they are not evacuation routes. Rather, they are designated as "Emergency Vehicle Access Only." These roads are not considered evacuation routes in emergency planning. Evacuation drills and tabletop events are held by request from communities, as resources and scheduling allow.	y
EQ-11	Incorporate seiche warning system into the Tahoe Basin traffic control	TMFPD	Ongoing. Looking to WC EM for such a system.	No

ID	Mitigation Action	Lead Department	Status for Plan Update	Should this action be retained in the plan update? (Yes/No)
	center. (NLTFPD)			

Considered Mitigation Actions

TMFPD considered a broad range of actions, including those that benefit vulnerable populations and current and new development, as a part of this plan update. There are four main types of mitigation actions:

- Local Plans and Regulations
- Structure and Infrastructure Projects
- Natural Systems Protection
- Education and Awareness Programs

Additional actions, such as those related to preparedness, response, recovery, and prevention, were discussed as possibilities during this plan update.

Table 117: Mitigation Actions Considered by the Truckee Meadows Fire Protection District

Mitigation Action	Type of Action	Selected? (Y/N)	If not selected, why not?
Develop new Community Wildfire Protection Plans (CWPPs) for the entire county	Local Plans and Regulations	Y	N/A
Retrofit structures to harden against wildland fires	Structure and Infrastructure	Y	N/A
Firewise Community Development	Education and Awareness	Y	N/A
Crisis Landscapes Risk Reduction	Natural Systems Protection	Y	N/A
Apply the wildland–urban interface (WUI) code to older properties	Local Plans and Regulations	N	Politically unpopular/ unable to regulate

Mitigation Action	Type of Action	Selected? (Y/N)	If not selected, why not?
Establish post-fire rehabilitation policy	Local Plans and Regulations	N	Too variable and must include federal agencies
Community Hazard Fuels Reduction	Natural Systems Protection	Y	N/A
Establish GreenWaste Renewable Energy Digestion Facility	Structure and Infrastructure	N	Exorbitant cost with not enough need
Update county wildfire risk database/profile	Local Plans and Regulation	Y	N/A
Improve infrastructure security and access at fire stations	Structure and Infrastructure	Y	N/A
Examine and plan for seismic resiliency in public safety facilities	Local Plans and Regulations	Y	N/A
Improve the Truckee River and irrigation ditches to prevent flooding with increased runoff	Structure and Infrastructure	Y	Truckee River Flood Management Authority responsibility
Improve first responders' knowledge, skills, and abilities concerning aircraft crashes/emergencies	Local Plans and Regulations	Y	N/A

2024–2029 Mitigation Action Plan

Prioritizing Mitigation Actions

The identified mitigation actions were then prioritized, based on the following terms:

- **S – Social:** The public must support the overall mitigation implementation strategy and specific mitigation actions. Consider, will the action disrupt housing or cause the relocation of people? Will the proposed action adversely affect one segment of the population? Is the action compatible with present and future community/agency values?
- **T – Technical:** It is important to determine if the proposed action is technically feasible, will help reduce losses in the long term, and has minimal secondary impacts. How effective is the action in avoiding or reducing future losses? Does the action solve the problem or only a symptom? Will the action create more problems than it solves? Consider the root cause of the issue at hand to determine whether the action is a whole or partial solution, or not a solution at all.

- **A – Administrative:** This category examines the expected staffing, funding, time, and maintenance requirements for the mitigation action to determine if the jurisdiction/special district has the personnel and administrative capabilities to implement the action or whether outside help will be necessary. Consider, a) Staffing (enough staff and training): does the jurisdiction/special district have the capability (staff, technical experts) to implement the action? b) Funding allocated: does the jurisdiction/special district have the funding to implement the action or can it readily be obtained? c) Time: can it be accomplished in a timely manner? d) Maintenance/Operations: can the jurisdiction/special district provide the necessary maintenance? It is important to remember that most federal grants will not provide funding for maintenance.
- **P – Political:** This considers the level of political support for the mitigation action. Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far? Is there a local champion willing to help see the action to completion? Is there enough public support to ensure that the success of the action? Have all stakeholders been offered an opportunity to participate in the planning process?
- **L – Legal:** The jurisdiction/special district must have the legal authority to implement the action or consider what new laws or regulations would be needed to carry out the mitigation action. Evaluate, are the proper laws, ordinances, and resolutions in place to implement the action? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?
- **E – Economic**: Economic considerations must include evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt in a jurisdiction/special district. Consider benefits and costs at a planning level. A detailed benefit-cost analysis will be performed as project-specific funding becomes available. What financial benefits will the action provide? Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? Does the action contribute to community economic goals, such as capital improvements or economic development? Are there currently sources of funding that can be used to implement the action?
- **E – Environmental:** The impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), have to be kept in mind when using federal funds. How will this action impact land/water? Impact on endangered species: how will this action impact endangered species? How will this action impact hazardous materials and waste sites? Is this action consistent with community environmental goals? Is the action consistent with federal laws, such as the National Environmental Policy Act (NEPA)?

The actions were also assigned a prioritization category of low, medium, or high, based on the following definitions:

- **Low:** Based on one to two STAPLEE criteria, the action is feasible and important, with multiple potential challenges. The action should be implemented as funding becomes available.
- **Medium**: Based on three to four STAPLEE criteria, the action is feasible and important, with some potential challenges. Its implementation is not as urgent as a high priority action item and can be implemented over time.
- **High**: Based on five or more STAPLEE criteria, the action is feasible and important, with minimal to no concerns. It is very important to the jurisdiction to implement and may be prioritized in the short term.

The results are in Table 119.

After careful consideration, TMFPD chose to pursue the actions in Table 120, based on the priorities in Table 119.

Table 118: Truckee Meadows Fire Protection District Mitigation Action Prioritization

Action #	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Priority
1	3	3	4	4	4	4	4	High
2	2	3	3	3	2	2	4	Medium
3	2	2	3	4	4	3	4	Medium
4	3	3	4	3	2	2	2	High
5	2	3	4	3	3	2	3	High
6	3	2	2	3	3	1	3	Low
7	3	3	4	3	2	2	3	Medium
8	4	2	3	3	3	2	3	Low
9	4	3	2	3	3	2	4	Medium
10	2	2	2	3	1	2	2	Medium

Table 119: Truckee Meadows Fire Protection District 2024–2029 Mitigation Action Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source(s)	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
1	County-wide CWPP	Wildland Fire	Lack of planning, lost ability to get federal funding	TMFPD	WCEM, RFD, SFD	TMFPD wildland fuels division priority	Internal, federal grants	$100k	Evaluates community-level risk, establishes project priority	10 years	Medium term (2 years)	High
Description: Develop Community Wildfire Protection Plans (CWPPs) for all areas with wildland fire risk to establish risk profile and prioritize mitigation projects.												
2	Home Retrofit Improvement	Wildland Fire	Underserved, low-income communities	TMFPD	WCEM, WC Building and Safety	Washoe County Adopted Building Code	Haz Mit Grants	$5M	Reduced damage/ insurance claims to homes	15+ years	Long term (5+ years)	Medium
Description: Provide funding to low income underserved communities to make retrofit changes to homes to bring older homes up to code to lower risk to wildland fire.												
3	Firewise Communities	Wildland Fire	Community wildfire risk	TMFPD	NDF	TMFPD wildland fuels division priority	Internal	$5k	Promotes community engagement, reduces wildland fire risk	10 years	Long term (5+ years)	Medium
Description: Develop Firewise communities in areas of high fire risk.												
4	Crisis Landscapes Risk Reduction	Wildland Fire	Risk to structures and infrastructure	TMFPD	RFD, SFD, NDF, FS, BLM	Ongoing action from previous HMP and CWPP	Federal grants	$2M	Protects communities/ infrastructure, creates sustainable landscapes	5 years	Long term (3 years)	High
Description: Apply targeted fuel reduction treatments to landscapes at high risk to wildland fire. Identified through CWPPs, existing HMGPs, and SNPLMA grants.												
5	Community Wildfire Risk Reduction	Wildland Fire	Risk to structures and infrastructure	TMFPD	RFD, SFD, NDF, FS, BLM	CWPPs	Federal grants, Limited internal	$2M	Protects communities/infrastructure	5 years	Long term (3 years)	High

#	Project Title	Hazard Addressed	Vulnerability Addressed*	Responsible Agency	Partners	Existing Planning Mechanism(s)**	Potential Funding Source(s)	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
Description: Apply targeted treatments to improve defensible space among homes and open space in communities with high fire risk.												
6	County Wildfire Risk Update	Wildland Fire	Risk to structures. Improve building planning	TMFPD/WC Building and Safety	RFD, SFD	Washoe County Regional Mapping,	Grants, county budgets	$250k	Establishes accurate risk profile	10 years	Medium term (2 years)	Low
Description: Investigate new product to reassess wildfire risk to individual parcels and expanded to communities taking into account mitigation actions.												
7	Infrastructure Security	Criminal Acts and Terrorism	Protect critical infrastructure	TMFPD	WCEM	TMFPD Strategic Plan	Grants, internal sources	$10M	Maintains emergency services	15+ years	Long term (5 years)	Medium
Description: Provide fencing, gates and limited access to fire/police stations to protect against criminal acts and terrorism												
8	Seismic Study	Earthquake	Protect critical infrastructure	TMFPD/ WC Building and Safety		ICC, Washoe County Building Code	Grant	$100k	Maintains emergency services	15+ years	Short term (2 years)	Medium
Description: Commission study of TMFPD buildings (or all critical infrastructure) to assess seismic resilience. Make recommendations for seismic retrofit and future design consideration.												
9	ARFF Training	Transporta-tion Incident (Aircraft Crash)	Life safety, structures, infrastructure	TMFPD	RFD, SFD	TMFPD Strategic Plan, SFD/TMFPD Joint Operational Efforts	Grant (FAA or Homeland Security)	$200k	Improves emergency services	5-8 years	3 years	Medium
Description: Train firefighters on the Knowledge Skills and Abilities to improve response, strategies and tactics on Aircraft Rescue Firefighting (ARFF) to assist with transportation incidents along with Reno–Tahoe Airport firefighters.												
10	Stormwater Management	Flooding	Structures and infrastructure	TMFPD, WCEM, TRFMA	RFD	Needs further investigation	FEMA grants	$1M	Less potential for stormwater damage	10 years	Long term (5 years)	Medium
Description: Improve management of ditches that run through Reno to prevent overflow in flood conditions. Provide resources to nonprofits to allow for bank management, dredging, obstruction removal, etc.												

11	Flood insurance study	Flooding	People and infrastructure	Washoe County	TMFPD	Needs further investigation	General Fund	$50,000	Studying areas lacking flood insurance can pinpoint vulnerable regions and guide policy decisions, enhancing community preparedness and economic resilience. It raises awareness about the need for adequate coverage and supports stronger disaster mitigation efforts.	5-10 years	1-2 Years	Medium
Description: This study aims to identify gaps in flood insurance coverage in the county by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.												

Notes: *Includes vulnerable populations; **Through which the action will be implemented.

MITIGATION SUCCESS STORY

COMMUNITY CURBSIDE CHIPPING PROGRAM, GREEN WASTE PROGRAM

The successful program allowed residents to be engaged in reducing the wildfire hazard fuel on their properties. This program is intended to assist residents who cannot travel to chipping locations. This program accommodates Washoe County residents to dispose of their green, dry, and dead vegetation, shrubs, tree branches, etc. (see Figure 86).



Figure 86: Pictures from the Truckee Meadows Curbside Chipping Program

Truckee River Flood Management Authority Hazard Mitigation Program Annex

The Truckee River Flood Management Authority (TRFMA) has a fully integrated approach to hazard mitigation planning and program implementation. Throughout the 2024 update process, the following Regional Hazard Mitigation Plan (RHMP) participation roles were recorded:

Name	Position	Department
Danielle Henderson	Natural Resource Manager	TRFMA
George Robison	Executive Director	TRFMA

What's New in the 2024 Update?

Since the prior plan update, the Truckee River Flood Management Authority has made several significant changes to enhance flood resilience in the region. One of the primary focuses has been on improved floodplain management. This includes adjusting zoning regulations and land-use policies to account for updated flood risk data, ensuring that development does not exacerbate flooding issues. By integrating these considerations into planning, the authority aims to protect the community and the environment.

In addition to revised management practices, the authority has prioritized infrastructure improvements. Key projects involve upgrading levees, flood control channels, and drainage systems to better accommodate increased water volumes. These enhancements are crucial for minimizing flood risk, especially in areas historically vulnerable to flooding during severe weather events.

Furthermore, the Truckee River Flood Management Authority has developed actionable mitigation strategies informed by recent disasters and emerging hazards. These strategies focus on risk reduction and aim to create a more resilient community. Community engagement has also taken on greater importance in the planning process, with efforts to gather local input and foster collaboration on flood management initiatives.

Lastly, there is a growing emphasis on environmental sustainability within the flood management framework. The authority is aiming to restore natural habitats that can absorb excess floodwaters, integrating ecological considerations into their flood resilience efforts. These combined changes reflect a comprehensive approach to managing flood risks and enhancing the overall safety and well-being of the community. The 2024 update of the RHMP includes the following major revisions to the 2020 plan:

- Including additional stakeholders and opportunities for public participation.

- Identifying all hazards that could impact the plan participant.
- Expanding upon the capability assessment, including opportunities to expand and improve capabilities.
- Identifying plan integration and integration opportunities.

Plan Adoption

44 CFR §201.6(c)(5) requires that an HMP be formally adopted by elected officials from each participating jurisdiction. TRFMA formally adopted the 2024 update of the Washoe County RHMP.

This RHMP was approved by FEMA Region IX. A copy of the TRFMA's adoption resolution is included in Appendix F of the Base Plan.

District Profile

The TRFMA is a joint effort established under an Interlocal Cooperative Agreement between Washoe County and the cities of Reno and Sparks to reduce the impacts of flooding in the Truckee Meadows region. The TRFMA's primary mission is "to plan, design, build, operate, and maintain infrastructure to reduce flood damage, safeguard public health, and create a more resilient community." The agency is responsible for oversight and implementation of the Truckee River Flood Management Project, which includes mitigation projects along 33 miles of the Truckee River from downtown Reno to the town of Wadsworth near Pyramid Lake. The agency also operates and maintains a network of stream gages that are part of a regional flood warning system; provides educational resources on flood preparedness; and administers a program that provides financial assistance for home elevation.[239]

Hazard Profiles and Vulnerability Assessments

Section 4 contains hazard profiles and vulnerability assessments to determine the potential impact of hazards on the people, the economy, and the built and natural environments of the TRFMA. They have been streamlined to increase the effectiveness and usability of the RHMP.

General

Washoe County has experienced several major disaster declarations that may have affected the TRFMA. In total, the county has received 41 major disaster declarations since 05/02/1953, including eight since the previous HMP update. Table 1 identifies the declarations since 2020 that have affected the Washoe County area.

[239] Truckee River Flood Management Authority, 2024, https://trfma.org/our-work/our-projects/

Table 120: Disaster Declarations in Washoe County since 2020 That Affected TRFMA

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard Mitigation Program Declared	Declaration Date	Title
5448	No	Yes	Yes	08/14/2022	Fire
5382	No	Yes	Yes	11/07/2020	Fire
5328	No	Yes	Yes	08/15/2020	Fire
5326	No	Yes	Yes	08/03/2020	Fire
5322	No	Yes	Yes	07/21/2020	Fire
5316	No	Yes	Yes	06/27/2020	Fire
4523	Yes	No	No	04/04/2020	Biological (COVID-19)
3443	No	No	No	03/13/2020	Biological (COVID-19)

Source: Disaster Declarations for States and Counties n.d.

The hazard profiles and vulnerability assessments contained in this annex represent a considerable amount of work performed by the Mitigation Planning Team (MPT). Planning Team members ranked hazards using several key factors, followed up by activities to validate hazard analysis results and identify specific areas of risk. Taking into account the missions of the special hazard districts participating in the 2024 RHMP update, this chapter includes hazard profiles and vulnerability assessments. The plan addresses the hazard of Flooding.

Hazard Ranking Methodology

The hazards identified in the RHMP were initially ranked by TRFMA on the provided risk assessment form. A risk assessment result for the entire county does not mean that each participant has the same amount of risk for each hazard. Each plan participant should consider how they are uniquely at risk of the hazards profiled. Based on TRFMA's mission to reduce damage caused by Truckee River floods and create more resilient communities, TRFMA evaluated this riverine flooding hazard only as that is the hazard they are legally responsible for addressing.

Hazards identified as having a risk factor value greater than or equal to 2.5 are considered high risk. Risk factors ranging from 2.0–2.4 are considered moderate risk hazards. Hazards with a risk factor value of less than 2.0 are considered low risk. The highest possible RF value is 4. Table 122 lists the factors for calculating risk.

Table 121: Factors for Calculating Risk

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Probability *What is the likelihood of the hazard occurring?*	1	Unlikely	Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.	30%
	2	Occasional	1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.	
	3	Likely	11 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years.	
	4	Highly Likely	91 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.	
Magnitude *What will be the overall impact?*	1	Negligible	Less than 5% of the affected area's critical and non-critical facilities and structures are damaged/destroyed. Only minor property damage and minimal disruption of life. Temporary shutdown of critical facilities.	30%
	2	Limited	Greater than 5% and less than 25% of property in the affected area is damaged/destroyed. Complete shutdown of critical	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
			facilities for more than one day but less than one week.	
	3	Critical	Greater than 25%, but less than 50% of property in the affected area was damaged/destroyed. Complete shutdown of critical facilities for over a week but less than one month.	
	4	Catastrophic	Over 50% of critical and non-critical facilities and infrastructures in the affected area are damaged/destroyed. Complete shutdown of critical facilities for more than one month.	
Onset *How long will be there be between when it is recognized the hazard is approaching and when the hazard will begin affect the community?*	1	Self-defined	More than 24 hours	10%
	2	Self-defined	12 to 24 hours.	
	3	Self-defined	6 to 12 hours.	
	4	Self-defined	Less than 6 hours.	
Duration *What is the length of time the hazard will remain active, including how long emergency*	1	Brief	Up to 6 hours.	10%
	2	Intermediate	Up to one day.	
	3	Extended	Up to one week.	
	4	Prolonged	More than one week.	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
operations will have to continue after the hazard event?				
Frequency *How often has this kind of hazard resulted in an emergency or disaster?*	1	Every 10+ years	This hazard is not frequent but may still impact the area.	20%
	2	Every 5–10 years	This hazard is not as frequently occurring but it could occur in the next 10 years.	
	3	Every 1–5 years	This hazard is likely to occur relatively often. It may have occurred more or less frequently recently, but on average, it can be expected every 1–5 years.	
	4	Annually	This hazard is a frequent occurrence which the area actively has to respond to on an approximately annual basis.	

Risk factor values for Truckee River flooding were calculated using information from the Flood Inundation Map Series produced by TRFMA. Note that the duration factor estimates include the period of rising floodwaters, receding floodwaters, emergency response, and cleanup (e.g., flood debris, mud, damaged property). The drainage of floodwaters varies throughout the Truckee Meadows. Some areas drain more quickly than others. Modeled hydrographs at various locations and discharge levels are available from TRFMA upon request.

The following is the risk factor equation:

Risk Factor Equation

RF Value = [(Probability x .30) + (Magnitude x .30) + (Onset x .10) + (Duration x .10) + (Frequency x .20)]

Table 123 lists the hazard rankings for TRFMA.

The Washoe County base plan is comprehensive for regional assessments and effectively addresses the calculated risk indexes. It provides a thorough evaluation that highlights its commitment to risk management and community safety, while the annexes are specific to each jurisdiction.

Table 122: Calculated Priority Risk Index of the Truckee River Flood Management Authority

Type of Hazard Event	Annual Chance of Exceedance	Maximum Discharge at Reno Gage (cfs)	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value
10-Yr Flood	10%	7,500	3	1	2	2	3	2.2
20-Yr Flood	5%	9,150	2	2	2	2	3	2.2
50-Yr Flood	2%	13,700	2	2	2	3	3	2.3
75-Yr Flood	1.33%	17,300	2	3	2	4	2	2.5
100-Yr Flood	1%	20,700	2	3	2	4	2	2.5
150-Yr Flood	0.85%	23,000	1	4	2	4	2	2.5
200-Yr Flood	0.5%	35,800	1	4	2	4	1	2.3
500-Yr Flood	0.2%	63,500	1	4	2	4	1	2.3
Averages	2.61%	23,831.25	1.75	2.88	2	3.38	1.75	2.35

FLOODING

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. They can cause substantial damage to structures, landscapes, and utilities; and jeopardize life and safety. Specific health hazards are also expected in flooding events. Standing water and wet materials in structures can become breeding grounds for microorganisms, such as bacteria, mold, and viruses. When flooding occurs in populated areas, warnings and evacuation can reduce impacts on life and safety. TRFMA helps mitigate flooding along the Truckee River.

From 2019 to the present (July 2024), no significant flooding has occurred on the Truckee River or its main tributaries. Information on Truckee River flow is available online from the United States Geological Survey (USGS). Key streamflow gages monitored by TRFMA as part of its Flood Warning Plan include:

- Reno Gage (USGS 10348000)
  https://nwis.waterdata.usgs.gov/usa/nwis/peak/?site_no=10348000
- Vista Gage (USGS 10350000)
  https://nwis.waterdata.usgs.gov/nwis/peak?site_no=10350000&agency_cd=USGS&format=gif

Through a cooperative joint funding agreement with the USGS, TRFMA monitors streamflow at a number of other locations along the Truckee River and on its main tributaries, including Steamboat Creek.

The TRFMA is a joint effort among the cities of Reno and Sparks, Washoe County, and numerous other stakeholders to reduce the devastating impacts of flooding along the Truckee River in Washoe County, Nevada. TRFMA accomplishes this goal by planning, designing, and constructing flood impact reduction projects, maintaining existing flood infrastructure, providing information about flooding for planning and development, and providing logistical support to our first responders during actual flood events.

The agency is responsible for implementing the Truckee River Flood Management Project (Flood Project). The Flood Project has evolved over decades of study, consideration, and community involvement. The current plan represents the outcomes of countless meetings, community input, and local and federal planning. The Flood Project extends approximately 33 miles along the Truckee River, from downtown Reno (near Jones Street) to the town of Wadsworth, Nevada (near Pyramid Lake). Major elements of the Flood Project are summarized below and grouped according to project reach. Detailed information is available in the Flood Project Map Book.

The Flood Project is divided into three reaches:

Downtown & West Reno Reach

The Truckee River upstream of the I-580 Bridge consists of a confined channel with a series of bridges, floodwalls, and berms crossing and confining the river. The Flood Project elements in this reach consist of both new flood protection projects as well as maintenance for existing infrastructure. These project elements will be prioritized based on targeting (if there is a cooperative agency constructing a related project where the project element can be added and built in a cooperative fashion). For instance, TRFMA provided significant funding for the rebuilding of the Virginia Street Bridge in this reach in 2015-2016.



Figure 87: Downtown and West Reno Reach Flood Project Elements[240]

Booth Street Area

Booth Street Bridge is low to the water and gets inundated during high floods causing water to back up upstream. There is flooding along the north bank of the river with breakouts both upstream and downstream of the Booth Street Bridge.

- Upstream of the bridge a small berm or flood wall may be installed to about 1,500 feet upstream. The bridge ramp on the north side will tie in to the upstream as well as the downstream berm or floodwall.
- Downstream of the bridge a low berm is now proposed along the river that only gives partial protection up to perhaps only 14,000 cfs instead of a full 20,500 cfs flood but allows the river and the neighborhood to remain connected to the river.

[240] Truckee River Flood Management Authority, "TRFMA-Mapbook-Flood-Project-Elemnts-Board-Approved-July-2023.pdf." https://trfma.org/wp-content/uploads/2023/12/TRFMA-Mapbook-Flood-Project-Elements-Board-Approved-July-2023.pdf



Figure 88: Map of Booth Street Area[241]

Booth to Arlington

Along Riverside Drive there is a natural or small manmade berm that keeps water from overtopping into the neighborhood just north of the bank until around 11,000 cfs, which unfortunately is a common flood event.

- The alternative being advocated here is to protect the river from smaller more frequent floods but not have the large, tall walls necessary to fully protect the river up to the 100-year flood. This low floodwall will allow almost all trees to remain and will not be so intrusive to the river view and trail. The final height of the small wall will be determined in design after full community input.
- Closer to Arlington there is an existing floodwall that will be replaced and made slightly higher to protect to a higher flood level but not 100-year flood level.

[241] Ibid.



Figure 89: Map of Booth to Arlington[242]

Arlington Area

This area has floodwalls on both banks and on the island as well. There are several bridges including the North and South Arlington Bridge and walking bridges.

- TRFMA's role is to provide advice and hydraulic models and data on river hydraulic conditions for redesign/rebuild that Regional Transportation Commission (RTC) is undergoing for Bridges.
- There are also numerous floodwalls; TRFMA may assist technically or even financially in the future depending on the timing and situation of the improvement.

[242] Ibid.



Figure 90: Map of Arlington Area[243]

Sierra to Lake Street Bridges

This reach includes the Sierra Street, Virginia Street, Center Street, and Lake Street bridges. The area is very tight to the river, and this can cause flooding into large buildings.

- Virginia Street Bridge was replaced in 2016.
- Sierra Street Bridge is under design for replacement by RTC.
- TRFMA's main role is to advise and provide technical assistance for design (e.g., models, data). TRFMA may help with future floodwall replacement projects as a cooperating agency.

[243] Ibid.

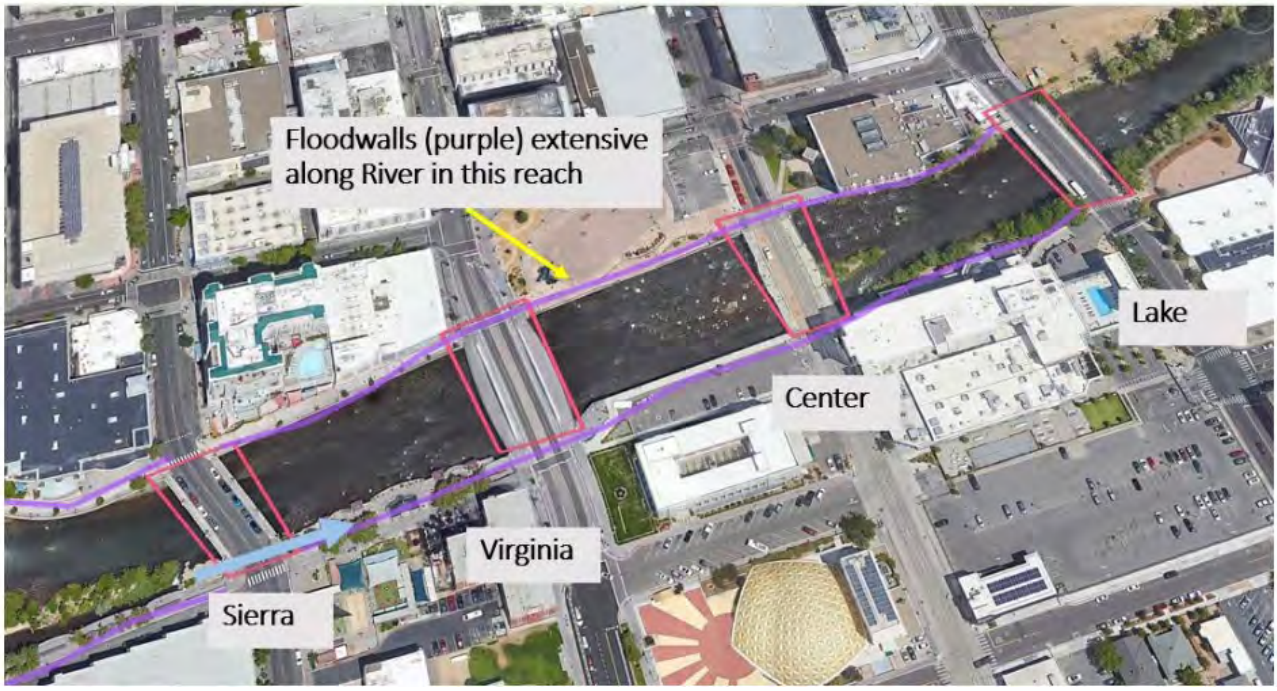

Figure 91: Map of Sierra to Lake Street Bridge Reach[244]

Lake Street to I-580

From Lake Street to I-580 the river is less constrained but there are still buildings near the river.

- The only major project slated in this reach is the removal of the old Wells Bridge underneath the Wells Avenue overpass. The Bridge is extremely low to the river and backs up water.

[244] Ibid.

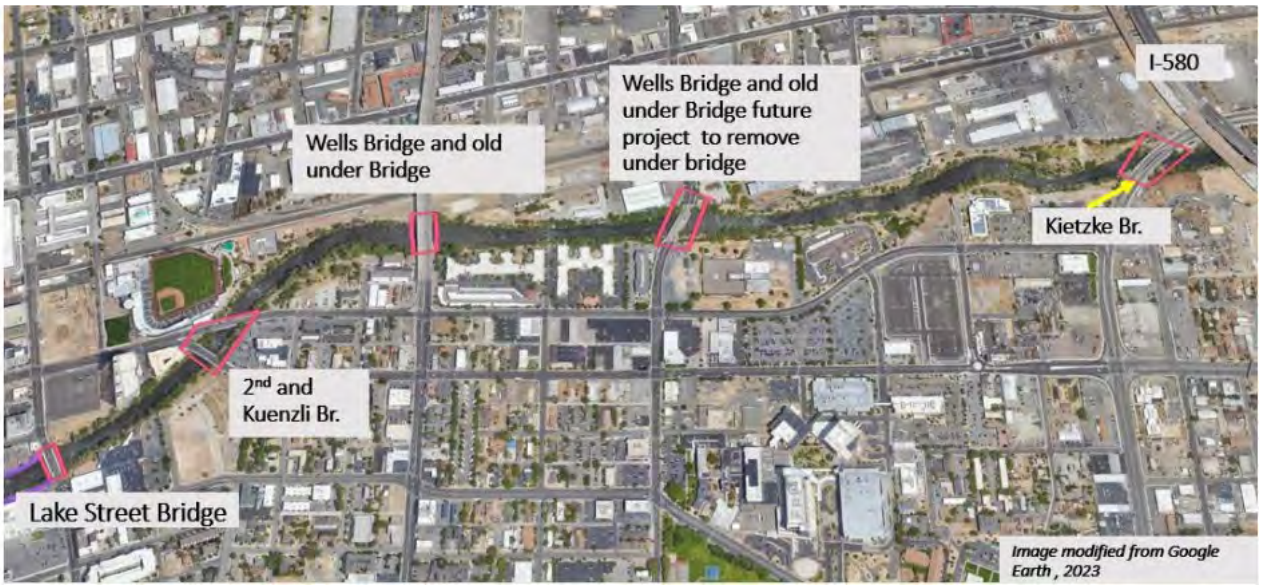

Figure 92: Map of Lake Street Bridge to I-580[245]

The Meadows Reach (Meadows Flood Project)

This reach extends from I-580 down to Vista Narrows east of Sparks. The Meadows Flood Project includes levee, floodwalls, berms, terracing, bank stability, and stream and riparian restoration activities. The Meadows Flood Project can be broken into phases or segments which include:

- The Reno Sparks Indian Colony Levee and Floodwall – Completed in 2009
- Grand Sierra Resort – Berm and Levee (planned construction 2024-25)
- Truckee Meadows Water Authority Levee (planned construction 2026)
- Reno Tahoe International Airport Berm and terracing (planned construction 2024-25)
- Additional Levee Work North Bank Glendale to Rock (planned construction 2026)
- Mill/McCarran Levees, Terracing, Channel and Riparian Restoration (planned construction 2027-28)
- North Levee and Flood Wall – McCarran to Vista (planned construction 2029-30)
- Vista Narrows Floodplain Terracing (in permitting planned construction 2024 and/or 2025)

The cost to complete the Meadows Project was estimated to be $185 million in 2021. The Meadows Project has tremendous benefit from reducing flooding vs. cost of implementation. In an evaluation done in 2021, the Meadows Project in its entirety (not just cost to complete) has

[245] Ibid.

a beneficial cost ratio near $1.6 and over $10 million per year in net economic benefit. In terms of "cost to complete," benefit cost ratio and annual net economic benefit are even greater.

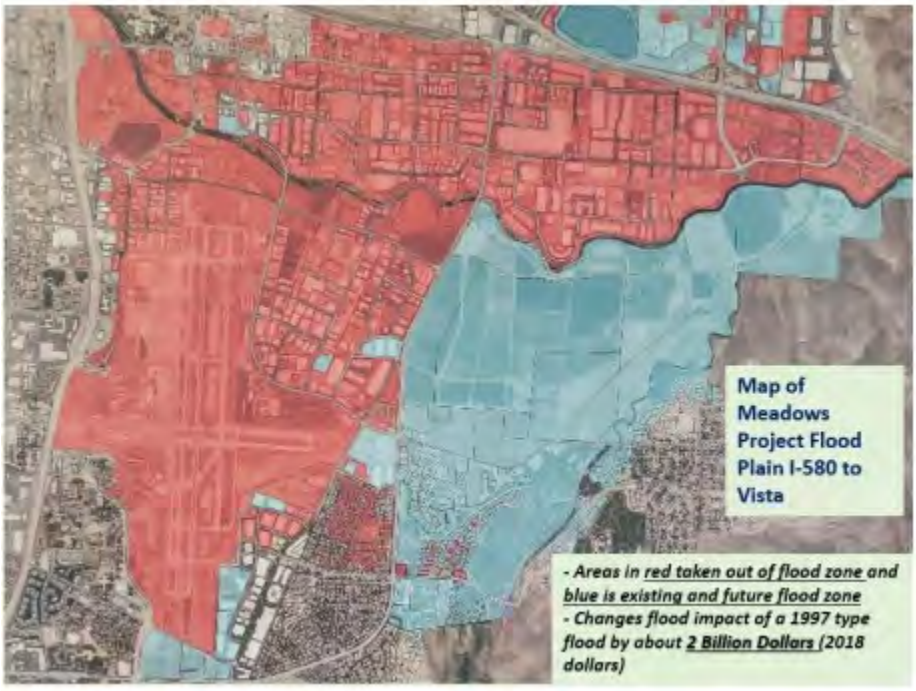

Figure 93: Map of Meadows Flood Project[246]



Figure 94: Map of Meadows Reach[247]

Reno Sparks Indian Colony Levee & Floodwall

The Reno Sparks Indian Colony Levee and Floodwall project is complete and represents nearly one-half mile (2,240 feet) of levee and floodwall. The levee section is approximately 1,170 feet

[246] Ibid.
[247] Ibid.

while the floodwall was 1,070 feet. The project cost $5.8 million and was shared between the Flood Project ($1.72 million), Walmart ($2.28 million) and the Reno-Sparks Indian Colony ($1.7 million in land value). The project features a meandering trail along the river side that can be used for recreation.

Grand Sierra Resort Berm & Levee (Glendale Ave to Greg St Bridge)

The Grand Sierra Resort (GSR) Berm and Levee Project has been converted from a floodwall to a berm and levee after discussions between GSR and TRFMA staff.

- The berm allows for a gradual outslope that better connects the GSR with the river. The upstream part of the berm consists of approximately 45,000 cubic yards of material with a cost of $1.35 million in 2021 dollars. The berms will be compacted and paved back over or used for other needs. Much of the current berm area has been used for parking.
- The downstream levee across from the pond is larger and involves about 52,000 cubic yards of material with a cost of $1.56 million in 2021 dollars. The GSR levee is in a narrow area between the two berms and requires about 7-8 feet of gain in elevation. The levee section in this estimate is 350 feet long with an estimated cost of $700,000. There is another narrow area between pond and River that may require a short levee section.

Truckee Meadows Water Authority Levee

In previous plans, this was proposed as a wall. After on field discussion between TRFMA staff and in discussion with TMWA staff this was changed back to a setback levee in one section and a regular levee downstream. The reason for this change is the area that needed the wall the most was where the setback section was. There appeared to be plenty of room for a levee considering the needed elevation gains were less than 10 feet and in some cased only 5 feet.

- The length of the levee is approximately 3000 feet with a cost estimate of $4.5 million in 2021 dollars.
- In discussion it was apparent the TRFMA could get help with access if TRFMA helped TMWA with fencing and security measures, which would drive down the cost.

Reno Tahoe International Airport Berm & Terracing

The berm is an alternative to the earlier idea of a levee. Levees represent an abrupt obstacle to landing aircraft; berms can be more gradual but need to be wider.

- The amount of elevation gains necessary averages between zero and eight feet in this area to protect from a 100-year flood. The estimated fill would be approximately 90,000 cubic yards but may be lower when more detailed design done. At a cost of $30 per yard (brought from Vista Narrows excavation) this would add up to $2.7 million in 2021 dollars.

- This project also has some considerable terracing with a cost of close to $2.4 million in 2021 dollars. Plant species used for terrace need to be low growing because of aircraft safety concerns.

Mill & McCarran Levees, Terracing, River Channel and Riparian Restoration

The Mill/McCarran properties represent by far the largest investment by TRFMA; to date, this investment is over $48 million to acquire 110 acres of land along the river.

- Past plans called for mostly a floodwall on the north bank of the river and a levee on the south with considerable terracing. The new concepts call for moving the river, providing restoration instream as well as terracing and riparian restoration and the use of levees exclusively. This may attract outside funding.
- The current cost estimate for construction of the three (North, South, Intermediate South) levees is $20.4 million. The terracing and river restoration will have an approximate construction cost of near $20 million. When all work is said and done the total investment of this stretch may reach nearly $100 million dollars.
- The outcome will be a fully protected area for the North and South Industrial areas and the Reno Tahoe International Airport. In addition, this area will be ideal for both a nature and conventual park post construction. There will be grading and construction to help facilitate various forms of recreation. We anticipate transferring this area to Reno Parks or another regional park authority for recreational management.

McCarran to Vista – North Bank Levee & Floodwall

- The North Bank Levee and floodwall stretches almost 3.2 miles from the McCarran Bridge downstream to Vista.
- Past plans have had this stretch at about 70% floodwall. Going forward TRFMA staff is looking at working with stakeholders and creating plans to make most if not all of this levee. Using levee vs floodwall should reduce costs, avoid seepage problems, and allow for bike paths to be put on top of levee.
- The total cost for this based on 16,600 feet of Levee is $33 .2 million in 2021 dollars. (This part of project is the least studied and researched so cost data is most unsure.)
- The North Truckee Drain's outlet is along this stretch and represents a completed project, partially funded by TRFMA.
- No work is proposed by TRFMA on Steamboat Creek.

Vista Narrows Terracing

The Vista Narrows Floodplain terracing project as currently proposed, consists of excavating floodplain terraces at three locations just East of Sparks, Nevada on the Truckee River. Vista Narrows is key to the entire Truckee Meadows Project as it lowers water levels caused by other

elements of the Meadows Project. It provides the water level lowering that allows for the project to be built while avoiding expensive mitigation in South Reno.

- It does increase peak flows downstream on the order of 730 cfs because of the opening up of the narrows which prevents some of the backwatering into South Reno and UNR farms. The larger Truckee Meadows Project which eliminates flood storage in industrial areas and the airport increases peak flows by another 1,669 cfs. This creates an increase of approximately 2,400 cfs peak flow increase.
- TRFMA has been in discussions with stakeholders downstream about mitigation because of these increased flows. It appears there are several projects in and around Wadsworth that may be useful for mitigation. TRFMA has also discussed this matter with Storey County and have a mitigation project planned for the Lockwood area.
- The cost for the terracing is approximately $42 million in 2021 dollars. Costs for downstream mitigation have not been fully worked out yet.
- These terraces are on both sides of the river and are a total of 8,600 feet long. They create low floodplain and wetlands that provide flow conveyance. The terracing occurs just above the ordinary high-water mark so that the river itself is only marginally impacted along the banks. Because of the height of the banks this means approximately 450,000 cubic yards of materials are to be removed.

Voluntary Home Elevation Program

There are three primary areas that qualify for the home elevation program: 1. Eastside subdivision, 2. Rosewood Lakes, and parts of 3. Hidden Valley Estates. (Not all homes in these subdivisions qualify for the program.)

- Home elevation makes sense only when the costs of other mitigation methods is prohibitive such as when the number of homes protected is not enough to warrant a community flood wall or levee. It also can make sense when the cost to buy out and set aside is too great.
- The current program if in and qualified for a FEMA grant allows the homeowner to get significant home benefit without having to pay income tax. FEMA pays 50-90% of base costs and TRFMA pays the remaining match.
- Currently four homes have been completed since the inception of the program in 2011. The program has delays in getting grants, difficulty in finding qualified engineers and subcontractors.

Lower Truckee River Reach

This reach extends from Vista Narrows to downstream of Wadsworth. Flood project elements in this reach consist of ecosystem restoration and mitigation of downstream impacts.

Goals for the Lower Truckee River Reach

The aim of TRFMA with the downstream reach is that any effects from the Meadows Flood Project are fully mitigated. That is the residents and habitat along the river are at least as well off as they were before the project started. This means all possible impacts of the Meadows Flood Project need to be minimized and mitigated. The Meadows Project increases peak flow during 100-year and to a lesser degree 50-year events on the Truckee River at Vista. The idea is to study these increases to evaluate what possible impacts are and then propose mitigation for any that may be significant. Mitigation in the downstream reach may consist of restoration projects such as floodplain restoration that can in some cases lower peak flows at least minimally. Mitigation also consists of traditional protection such as levees, floodwalls, and flood proofing vulnerable infrastructure. Other mitigation options include restoring fish passage along the lower reach of the Truckee.

ECOSYSTEM RESTORATION PROJECTS

Ecosystem restoration is a series of actions taken to reestablish the general structure, function, and dynamic but self-sustaining behavior of the ecosystem. The primary purpose of riverine ecosystem restoration projects is to restore the physical and biological functions of the river channel and floodplains; thereby improving water quality and enhancing habitat for native species of fish and wildlife. Other benefits include flood attenuation, decreased risk of developed property damage (floodplain preservation), riverbank stability, sediment retention (water quality improvement). The community's vision for the Truckee River Flood Project is to achieve flood protection goals through a combination of set-back levees, floodwalls, river terracing, bridge replacements, floodplain land acquisitions, instream and riparian restoration, and urban parkways.

- TRFMA has partnered with The Nature Conservancy and numerous other local, state, and federal agencies and non-profit organizations to restore the lower Truckee River ecosystem (from Vista to Pyramid Lake). Partners include US Fish & Wildlife, US Bureau of Land Management, Nevada Division of Environmental Protection, Washoe County, City of Reno, City of Sparks, and Pyramid Lake Paiute Tribe.
- Several high-priority restoration projects have already been completed: 1. Lockwood, 2. Lower Mustang Ranch, 3. Tracy Power Plant, and 4. 102 Ranch (total of 8 miles of river restoration and 450 acres of habitat created in/along the river). Monitoring is ongoing to ensure the projects are functioning as designed.
- To date, the partners have invested more than $28 million to create more than 450 acres of habitat and restore more than 8 miles of the lower Truckee River. An estimated 216 jobs were created because of this work (full-time equivalents).
- TRFMA has contributed about $2.1 million in sales tax funds for land acquisition, planning, and construction—less than 8% of the overall cost of restoration project implementation. In addition, TRFMA transferred through $4.775 million in State of Nevada grant funds to

implement ecosystem restoration projects via Assembly Bill No. 5 (AB-5), passed by the Nevada State Legislature in 2007.

- Similar ecosystem restoration features are planned in the Truckee Meadows reach of the Flood Project. Future work may include a partnership with the Pyramid Lake Paiute Tribe to implement another Truckee River ecosystem restoration project at Wadsworth.

Lockwood & Rainbow Bend

Rainbow Bend is a small community on the south bank of the Truckee River in Storey County. The community is plagued by flooding from Long Valley Creek and to a lesser degree the Truckee River.

- To understand impacts of the Meadows Flood Project a detailed 2-dimensional model was developed by TRFMA. The model showed that the Project and the increase in peak flows could lead to some nuisance street flooding. A small wall/berm was proposed to prevent this problem. The floodwall will be pushed forward as mitigation when the Permit for Vista Narrows is obtained.
- Another major issue is flooding from Long Valley Creek which is not related to the Meadows Project. Long Valley Creek is a large watershed prone to flash flooding. TRFMA assisted Storey County in getting a grant from FEMA regarding a feasibility study on how to control or prevent flooding from the creek.

Wadsworth Bridge Mitigation

On the east bank of the Truckee River in the center of Wadsworth the Truckee River during floods breaks out of its bank during significant flood events. It often floods into a mobile home park and floods mobile homes and some other homes nearby. It also flows downstream and floods a quarry. Because of this known problem a detailed 2-dimensional model was commissioned to supplement other modeling that was done in the area.

- The Meadows Project increases in peak flow exacerbates the problem putting more water down the side channel. A preliminary design was commissioned to look at solutions including possible levee, floodwall, and a bridge replacement to see if this helps mitigate the problem. After an alternatives study, it was found that simply replacing the bridge mitigates the difference in flow levels between the existing conditions and flows with the new project.
- The TRFMA Board of Directors has authorized the Wadsworth Bridge Mitigation to move forward immediately without waiting for the Vista Narrows permitting. The project is in design and permitting and may be let out for construction later this year if permitting gets done.



Figure 95: Map of the Truckee River from Pyramid Lake to Vista Narrows Sparks[248]

TRFMA is now in the design and implementation phases of the Flood Project; no additional mitigation actions are being considered.

Vulnerability Assessment

No repetitive loss properties currently exist in the TRFMA area. Table 35 summarizes the exposure of critical facilities in the TRFMA area to hazards that can be mapped. All of these facilities are in TRFMA's special hazards district, and the wildland fire potential is 1.

[248] Ibid.

Table 123: Exposure Assessments of the Truckee River Flood Management Authority

Type	Name	Address	Flood Zone
Wastewater Treatment Plant	Lemmon Valley WWTP	11000 Lemmon Dr	100-year flood zone
Hospital	Incline Village Community Hospital	N/A	500-year flood zone
Hospital	Eastern Sierra Medical Group	N/A	500-year flood zone
Hospital	Renown Medical Group Urgent Care Center Ryland	N/A	500-year flood zone
Hospital	Life Care Center of Reno	N/A	500-year flood zone
Hospital	Willow Springs Center	N/A	500-year flood zone
Hospital	ARC Med Center	N/A	500-year flood zone
Hospital	Regent Care Center of Reno	N/A	500-year flood zone
Hospital	Saint Mary's Family Walk-In Center	N/A	500-year flood zone
School	University of Nevada Farm	N/A	500-year flood zone
School	Alice L Smith Elementary School	N/A	100-year flood zone
School	Pleasant Valley Elementary School	N/A	100-year flood zone
School	Lighthouse Baptist Academy	N/A	100-year flood zone
School	Mountain View Montessori School	N/A	100-year flood zone
School	Home Garden School (historical)	N/A	500-year flood zone
School	Sierra Vista Children's Academy	N/A	500-year flood zone
School	Brookfield School	N/A	500-year flood zone
School	A Plus Learning Center	N/A	500-year flood zone
School	Libby C Booth Elementary School	N/A	500-year flood zone
School	Roger Corbett Elementary School	N/A	500-year flood zone
School	McKinley Park School (historical)	N/A	100-year flood zone
School	Edward L Pine Middle School	N/A	500-year flood zone
School	Huffaker Elementary School	N/A	500-year flood zone
School	Smithridge Elementary School	N/A	500-year flood zone
School	Regional Technical Institute	N/A	500-year flood zone
School	Early Basics Learning Academy	N/A	500-year flood zone
School	Koinonia Day Treatment Center	N/A	500-year flood zone
School	Little Hearts Preschool and Kindergarten	N/A	500-year flood zone

Type	Name	Address	Flood Zone
School	Truckee Meadows Christian Academy	N/A	500-year flood zone
School	Stepping Stones Children's Center	N/A	500-year flood zone
School	I Can Do Anything Charter High School	N/A	500-year flood zone
School	Team A School	N/A	500-year flood zone
School	Halima Academy	N/A	500-year flood zone
Airport	Reno/Tahoe International Airport	N/A	500-year flood zone
Dam	Pagni Dam	N/A	100-year flood zone
Dam	North Spanish Springs Flood Sediment Basin	N/A	100-year flood zone
Dam	North Spanish Springs Flood Detention Facility	N/A	100-year flood zone
Dam	IXL Ranch Dam	N/A	100-year flood zone
Dam	Captain Johnson Reservoir	N/A	100-year flood zone
Dam	Carter Reservoir	N/A	100-year flood zone
Dam	Frog Pond	N/A	100-year flood zone
Dam	Hill Dam Number 1	N/A	100-year flood zone
Dam	Wall Creek Dam Lower	N/A	100-year flood zone
Dam	Wall Creek Dam Upper	N/A	100-year flood zone
Dam	Little High Rock	N/A	100-year flood zone
Dam	Peavine Creek Upper Dam	N/A	100-year flood zone
Dam	Upper Holy Lake Reservoir	N/A	100-year flood zone
Dam	Sevier Lake	N/A	100-year flood zone
Dam	Spanish Springs Stormwater Detention Facility	N/A	100-year flood zone
Dam	Catnip Dam	N/A	100-year flood zone
Dam	Double Diamond	N/A	100-year flood zone
Dam	Rancho Haven Dam #4	N/A	100-year flood zone
Dam	Damonte Ranch Flood Control Diversion	N/A	100-year flood zone
Dam	Damonte Ranch Flood Detention Basin	N/A	100-year flood zone
Dam	Damonte Ranch Wetlands Detention Basin	N/A	100-year flood zone

Type	Name	Address	Flood Zone
Dam	Virginia Lake	N/A	100-year flood zone
Dam	IXL Ranch Dam Lower	N/A	100-year flood zone
Fire Station	Lemmon Valley Volunteer Fire Department Station 223	130 Nectar Street	100-year flood zone
Fire Station	Hidden Valley Volunteer Fire Department Station 226	3255 West Hidden Valley Drive	100-year flood zone
Fire Station	Reno Fire Department Station 16	1240 Eastlake Boulevard	100-year flood zone
Fire Station	Pleasant Valley Volunteer Fire Department 227	United States Highway 395	500-year flood zone
Fire Station	Sierra Fire Protection District Station 101 – Washoe Valley	345 Bellevue Road	100-year flood zone
Fire Station	City of Reno Fire Department Station 14	12300 Old Virginia Road	500-year flood zone
Fire Station	City of Reno Fire Department Station 6	3970 Mira Loma Drive	500-year flood zone
Fire Station	Sparks Fire Department Station 3	1750 East Greg Street	100-year flood zone
Fire Station	City of Reno Fire Department Station 18	3680 Diamond Peak Drive	100-year flood zone
Fire Station	Reno-Tahoe Airport Authority Fire Department	1802 Riley Avenue	500-year flood zone
Police Station	Reno-Tahoe Airport Authority Police Division	2001 East Plumb Lane	500-year flood zone
Police Station	Nevada Department of Public Safety – Nevada Highway Patrol – Reno Station	357 Hammill Lane	500-year flood zone
Police Station	Reno Municipal Court Marshals Division	1 South Sierra Street	500-year flood zone

Land Use and Development Trends

FEMA

D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

The Truckee River Floodplain Management Authority has not provided any recent development trends related to floodplain management in the area; therefore, none are included in the plan update.

Capability Assessment

FEMA	**C1.** Does the plan document [RSIC's] existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))

Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. Table 125 describes TRFMA's human and technical capabilities to engage in and improve mitigation planning and program implementation.

Table 124: Planning Capability of the Truckee River Flood Management Authority

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
General Plan	Yes. It is a conceptual plan known as the Truckee River Flood Management Project. Details are captured in the Map Book on TRFMA's website.	A series of infrastructure elements are proposed for construction to address 100-year-type flooding in the Truckee Meadows.	The plan calls for construction of more than 30 project elements that serve as mitigation actions for flood hazards.	The Map Book was approved by the TRFMA Board of Directors in July 2023. It will be updated on an as-needed basis (determined by staff & the board).
Capital Improvement Plan	Yes. A 5-year CIP for FY 2024–2025 through FY 2028–2029.	The CIP includes a list of prioritized projects and budget line items for implementation in the next 5 fiscal years.	The CIP is a guide for prioritizing projects (mitigation actions) and allocating funds from TRFMA's budget for project implementation.	The latest CIP was approved May 2024. An updated version (FY 2025–2026 through FY 2029–2030) will be prepared for approval in May 2025.
Climate Change Adaptation Plan	No	N/A	N/A	N/A
Community Wildfire Protection Plan	No	N/A	N/A	N/A

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
Economic Development Plan	No	N/A	N/A	N/A
Land Use Plan	No	N/A	N/A	N/A
Local Emergency Operations Plan	Yes, a Truckee River Flood Response Plan and a Flood Warning Plan.	These plans include information to assist TRFMA and regional emergency managers with flood preparedness and response actions.	These plans can be used to assess potential flood threats and to issue flood alerts/ warnings to emergency managers and the public. Decisions on deploying resources, activating the EOC, and evacuations can be made using information on flooding potential and lead times.	These plans are outdated. TRFMA hopes to work with the County, Reno, Sparks, the National Weather Service, and other partners to update the plans in late 2024 or in 2025.
Stormwater Management Plan	No	N/A	N/A	N/A
Transportation Plan	No	N/A	N/A	N/A

Plan	Do you have this? (Y/N)	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
Substantial Damage Plan	No	N/A	N/A	N/A
Other? (Describe)	Washoe County has a Damage Assessment Plan that serves the same intent and covers all jurisdictions.	N/A	N/A	N/A

Table 125: Regulations and Ordinances of the Truckee River Flood Management Authority

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it next be updated?
Building Code	Not TRFMA's jurisdiction.	TRFMA relies on its member entities (Washoe County [WC], Reno, and Sparks) to administer/ enforce applicable regulations and ordinances. TRFMA is notified of various building plan proposals and permit applications. It provides technical review and comments to	N/A

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it next be updated?
		the planning agencies but does not have any administrative or enforcement authority.	
Flood Insurance Rate Maps	Not TRFMA's jurisdiction. At the request of its member entities (WC, Reno, and Sparks), TRFMA has been working on an updated hydraulic model and series of floodplain maps for the Truckee River. If approved, this Physical Map Revision (PMR) would update the FEMA floodplain modeling and mapping for the Truckee River, Steamboat Creek, and North Truckee Drain in the Greater Truckee Meadows Region and the Truckee River Lower Reach, which extends from Vista to Wadsworth, Nevada.	TRFMA relies on its member entities (WC, Reno, and Sparks) to administer/ enforce applicable regulations and ordinances.	Documentation was submitted to FEMA in March 2023 (reports and materials available on TRFMA's website). In May 2024, FEMA's technical team notified TRFMA that it had concluded its review and that TRFMA had satisfactorily addressed its comments for the Lower Truckee River, Truckee Meadows, and Steamboat Creek hydrology & hydraulics analysis. The next step is a public review process that should take about 1 year.

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it next be updated?
Floodplain Ordinance	Not TRFMA's jurisdiction.	TRFMA relies on its member entities (WC, Reno, and Sparks) to administer/ enforce applicable regulations and ordinances.	N/A
Subdivision Ordinance	Not TRFMA's jurisdiction.	TRFMA relies on its member entities (WC, Reno, and Sparks) to administer/ enforce applicable regulations and ordinances. TRFMA is notified of various building plan proposals and permit applications. It provides technical review and comments to the planning agencies but does not have any administrative or enforcement authority.	N/A
Zoning Ordinance	Not TRFMA's jurisdiction	TRFMA relies on its member entities (WC, Reno, and Sparks) to administer/ enforce applicable regulations and ordinances. TRFMA is notified of various building plan proposals and permit applications. It provides technical review and comments to the planning agencies but does not have any administrative or enforcement authority.	N/A
Natural Hazard Specific	Not TRFMA's jurisdiction.	TRFMA relies on its member entities (WC, Reno, and Sparks) to administer/ enforce applicable regulations and ordinances.	N/A

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it next be updated?
Ordinance (Stormwater, Steep Slope, Wildfire)			
Acquisition of Land for Open Space and Public Recreation Use	Not TRFMA's jurisdiction. TRFMA has acquired a series of flood-prone properties located along the Truckee River. These lands (about 126 acres) were acquired for constructing the Flood Project. More than 40 tenants were relocated out of the FEMA flood zone & floodway. Demolition was completed on 6 repetitive loss structures. (Note that acquisition of the property, relocation, and demolition occurred prior to 2020.) TRFMA has proposed recreational use of the Flood Project lands during non-flood emergency periods.	N/A	N/A

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it next be updated?
Prohibition of Building in At-Risk Areas	Not TRFMA's jurisdiction.	TRFMA relies on its member entities (WC, Reno, and Sparks) to administer/ enforce applicable regulations and ordinances. TRFMA is notified of various building plan proposals and permit applications. It provides technical review and comments to the planning agencies but does not have any administrative or enforcement authority.	N/A
Other? (Describe)	TRFMA actively participates in and provides input on various regional planning efforts, including the Regional Plan Update and the Public Infrastructure Plan Update being managed by the Truckee Meadows Regional Planning Agency (TMRPA). TRFMA also serves on regional boards and committees, including the Northern Nevada Water Planning Commission and the One Truckee River Board of Directors. These activities	N/A	N/A

Plan	Does this regulation/ordinance effectively reduce hazard impacts?	Is it adequately administered and enforced?	When was it last updated? When will it next be updated?
	help TRFMA stay informed about local and regional efforts related to flood hazard mitigation and floodplain management.		

Administrative and Technical

Administrative and technical capabilities include staff and their skills. They also include tools that can help you carry out mitigation actions. If you do not have local staff, consider how state and regional partners can help.

Table 126: Administrative Capabilities of the Truckee River Flood Management Authority

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	No	N/A	N/A	N/A
Civil Engineer	Yes. The Executive Director is a	Yes. TRFMA also uses consultants as needed. In addition, TRFMA	Yes	Yes

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
	licensed professional engineer.	coordinates with public works managers from its member entities (Washoe County [WC], Reno, and Sparks).		
Community Planner	Yes. The Natural Resource Manager works on planning projects.	Yes. TRFMA also uses consultants as needed. In addition, TRFMA coordinates with planners from its member entities (WC, Reno, and Sparks) and other planning agencies.	Yes. However, more training would be helpful, and the staff hope to make time for this soon.	Yes
Emergency Manager	Not exactly. TRFMA coordinates with regional emergency managers at the REOC during flood emergencies. TRFMA's role is to	Maybe/yes. TRFMA staff attend monthly coordination meetings (e.g., Emergency Preparedness Council) and can be deployed to the REOC upon activation during a flood emergency. TRFMA is a small	Yes. However, more training would be helpful, and staff hope to make time for this soon.	Yes. Updating the Flood Warning Plan and Truckee River Response Plan would help clarify the current roles and responsibilities of the partner agencies.

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
	provide technical expertise and resources to assist in emergency planning and response efforts.	agency (5 full-time staff members) with a somewhat limited capacity to take on additional work.		
Floodplain Administrator	No	N/A	N/A	Yes
Geographic Information System (GIS) Coordinator	No	TRFMA uses consultants as needed. The agency also coordinates with WC's GIS department.	N/A	Yes
Planning Commission	Not exactly. TRFMA serves on regional boards and committees, including the Northern Nevada Water Planning Commission and the One Truckee	N/A	N/A	Yes

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
	River Board of Directors. These activities help TRFMA stay informed about local and regional efforts related to flood hazard mitigation and floodplain management.			
Fire Safe Council	No	N/A	N/A	N/A
CERT (Community Emergency Response Team)	Yes. Staff recently participated in CERT training to learn more about operating CB radios and flood emergency response.	Yes	Yes	Yes
Active VOAD (Voluntary Agencies Active in Disasters)	No	N/A	N/A	N/A

Administrative Capability	Do you have this? (Y/N)	Is staffing adequate?	Is staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Other? (Please describe)	See above			

Table 127: Technical Capabilities of the Truckee River Flood Management Authority

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
Mitigation Grant Writing	Yes. TRFMA staff works as a team to write grants.	TRFMA has secured funding to elevate certain high-risk homes in the Truckee Meadows, conduct environmental site assessments on flood prone properties, and restore natural floodplains.	TRFMA will continue to apply for grant funding to supplement the agency's own funding source. Flooding remains a major hazard, and continued development in the floodplain has increased the risk of property damage caused by large floods. Grant funding awards would allow TRFMA to leverage its funding (as a match) to build more elements of the Flood Project in a shorter timeframe. TRFMA intends to apply for grant funding

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
			for the design of the Rock-McCarran project reach, construction of the Vista Narrows project (floodplain terraces), property acquisition, ecosystem restoration, and recreational amenities.
Hazard Data and Information	Yes	TRFMA has several robust hydrologic & hydraulic models that were developed to better understand Truckee River flood dynamics. The agency also operates and maintains a network of streamflow and precipitation gages to monitor flood conditions. A variety of technical studies/reports have been completed on Truckee River flooding, floodplain restoration, flood damage, and downstream impacts (deposition, erosion, etc.). This technical	TRFMA has prioritized this technical work and will continue to develop and share results to increase the region's capacity for resilience. Models will be refined in the future as needed; model results will inform Flood Project designs. TRFMA plans to continue monitoring flood conditions and coordinating with emergency managers to plan/respond to flood emergencies.

Technical Capability	Do you have this? (Y/N)	How has the capability been used to assess/mitigate risk in the past? (Answer or N/A)	How can the capability be used to assess/mitigate risk in the future?
		information is shared with local governments, resource agencies, developers, businesses, and the public to better understand and prepare for flood emergencies.	
GIS	Yes. TRFMA uses consultants as needed. The agency also coordinates with WC's GIS department.	GIS data are used to develop hydrologic and hydraulic models that simulate the extent and depth of Truckee River flooding. These models have been used to design Flood Project elements (mitigation actions), prepare the Physical Map Revision documentation for FEMA, and create the flood map series for emergency responders.	Models will be refined in the future as needed; model results will inform Flood Project designs.
Mutual Aid Agreements	N/A	N/A	N/A
Other? (Please describe)	N/A	N/A	N/A

Financial Capabilities

Financial capabilities are the resources to fund mitigation actions. Talking about funding and financial capabilities is important for determining what kinds of projects are feasible given their cost. Mitigation actions like outreach programs are lower cost and often use staff time and existing budgets. Other actions, such as earthquake retrofits, could require substantial funding from local, state, and federal partners. Partnerships, including partners willing to donate land, supplies, or an in-kind match and cash, can be included.

Table 128: Financial Capabilities of the Truckee River Flood Management Authority

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Capital Improvement Project Funding	Yes. Funding for TRFMA and the Flood Project comes from a 1/8-cent infra-structure sales tax authorized by NRS Chapter 377B imposed by Washoe County in December 1998 under Ordinance 1048 (Washoe	The CIP serves as a guide for prioritizing projects (mitigation actions) and for allocating funds from TRFMA's budget for project implementation. Funding has been used to construct elements of the Flood Project, including replacement of the Virginia Street Bridge, a levee/ floodwall at the Reno-Sparks Indian Colony,	Yes – it is intended to fund capital improvement projects (i.e., Flood Project construction).	Yes, because these funds come from Washoe County (a local, nonfederal funding source).

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
	County Code 20.914). The initial Infra-structure Tax Plan was adopted by the Washoe County Commission in 1998 to finance a regional emergency dispatch facility, a public safety training facility, and the Flood Project. The 5-year CIP for FY 2024–2025 through FY 2028–2029 includes a list of prioritized projects and budget line items for	relocation of the North Truckee Drain, and restoration of floodplains in the Lower Truckee River. CIP funding has been used for the design and permitting of the Vista Narrows project (currently at 65% design). Funds have also been used for home elevation.		

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
	implementation in the next 5 fiscal years.			
General Funds	Yes. The Infrastructure Sales Tax, as above.	Besides CIP projects, TRFMA funds related efforts, such as hydraulic model development, Flood Warning System operation and maintenance, technical studies, and flood awareness education and outreach.	Yes – that is the intent of the sales tax.	Yes, because these funds come from Washoe County (a local, nonfederal funding source).
Hazard Mitigation Grant Program (HMGP/404)	No	N/A	N/A	N/A
Building Resilient Infrastructure & Communities (BRIC)	Yes	This funding has been used to implement TRFMA's voluntary Home Elevation Program.	Yes. It could be used to continue implementation of TRFMA's voluntary	No, because it comes from a federal funding source (FEMA).

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
			Home Elevation Program.	
Flood Mitigation Assistance (FMA)	No	N/A	N/A	N/A
Public Assistance Mitigation (PA Mitigation/406)	No	N/A	N/A	N/A
Community Development Block Grant (CDBG)	No	N/A	N/A	N/A
Natural Resources Conservation Services (NRCS) Programs	No	N/A	N/A	N/A
U.S. Army Corps (USACE) Programs	No	N/A	N/A	N/A
Property, Sales, Income, or Special Purpose Taxes	The Infrastructure Sales Tax, as above.	Yes. This funding has been used to design and build portions of the Flood Project, operate and maintain the Flood	Yes – that is its intent.	Yes

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
		Warning System, and develop hydrologic and hydraulic models of Truckee River flooding dynamics.		
Stormwater Utility Fee	No	N/A	N/A	N/A
Fees for Water, Sewer, Gas, or Electric Services	No	N/A	N/A	N/A
Impact Fees from New Development and Redevelopment	No	N/A	N/A	N/A
General Obligation or Special Purpose Bonds	No	N/A	N/A	N/A
Federal-funded Programs (Please describe)	No	N/A	N/A	N/A

Funding Resource	Do you have this? (Y/N)	Has this funding resource been used in the past and for what types of activities?	Could this resource be used to fund future mitigation actions?	Can this be used as the local cost match for a federal grant?
Other State-funded Programs (Please describe)	No	N/A	N/A	N/A
Private Sector or Nonprofit Programs	No	N/A	N/A	N/A
Other?	N/A	N/A	N/A	N/A

Education and Outreach

Education and outreach capabilities are programs and methods that could communicate about and encourage risk reduction. These programs may be run by a participant or a community-based partner. Partners, especially those who work with underserved communities, can help identify additional education and outreach capabilities.

Table 129: Education and Outreach Capabilities of the Truckee River Flood Management Authority

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Community Newsletter(s)	Yes	Yes, as related to implementation of the Flood Project.	N/A
Hazard Awareness Campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, School Programs)	Yes. Each year, TRFMA helps to plan and participates in the Flood Awareness Week public outreach campaign.		N/A
Public Meetings/Events (Please Describe)	Yes. TRFMA holds regular public meetings: Board of Directors meetings, Technical Advisory Committee meetings, and Community Working Group meetings. The agency also hosts/ participates in public events related to Flood Project implementation and public outreach.	Yes	N/A

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
Emergency Management Listserv	No	N/A	N/A
Local News	TRFMA is periodically featured in local news stories (newspaper, television, radio). The agency routinely compiles flood-related newspaper clippings and includes them in its monthly board meeting packet (available on TRFMA's website).	Yes	N/A
Distributing Hard Copies of Notices (e.g., public libraries, door-to-door outreach)	Yes. TRFMA posts meeting notices for public meetings. TRFMA also holds specific outreach meetings and distributes flyers to residents/ stakeholders as applicable.	Yes	N/A
Insurance Disclosures/Outreach	N/A	N/A	N/A
Organizations that Represent, Advocate for, or Interact with Underserved and Vulnerable Communities (Please Describe)	TRFMA has reached out to the Pyramid Lake Paiute Tribe, the Reno-Sparks Indian Colony, the Rainbow Bend neighborhood association, and other groups to provide information on specific Flood Project elements	Yes. TRFMA met with the Pyramid Lake Paiute Tribe (PLPT) on downstream mitigation for the Flood Project (Vista Narrows). TRFMA met with Reno-Sparks Indian Colony about the levee/floodwall project	

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
	that may impact the group(s).	and RSIC's health center. TRFMA recently held a community meeting in Wadsworth to discuss the replacement of the Wadsworth Bridge. TRFMA also met with the Rainbow Bend community (near Lockwood, NV) to discuss options for a floodwall/berm to protect homes in the area. TRFMA received feedback from the communities that helped inform the designs for these Flood Project elements.	
Social Media (Please Describe)	Yes. TRFMA has social media accounts with Facebook, Instagram, and YouTube.	Yes	N/A
Other? (Please Describe)	N/A	N/A	N/A

National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a Federal Emergency Management Agency (FEMA) program that provides flood insurance to millions of policyholders across the country. The plan must describe participation in the NFIP for each participant, as applicable, in accordance with NFIP regulatory requirements.

Special districts are not eligible to participate in the NFIP but may support floodplain management and exist in communities that participate in the NFIP.

Table 130: Questions about the National Flood Insurance Program

Question	Notes
What communities does your special district operate in? Are you aware of any flood concerns in these communities?	TRFMA's member entities (Washoe County, Reno, Sparks) participate in the NFIP.
Which of your assets are at-risk of flooding? List any of your structures in the high-risk flood zone if known, or list addresses, and the IEM team will check on https://msc.fema.gov/portal/home.	N/A
Is your organization involved in floodplain management? If so, how?	Not directly. See above for information on the FEMA Physical Map Revision effort currently underway.

Opportunities to Expand and/or Improve Capabilities

Both pre- and post-disaster mitigation capabilities change over time. The intent of this Pre-Hazard Mitigation Plan is to evaluate current mitigation capabilities and identify gaps which could be addressed. TRFMA's capability assessments identified the following capabilities which could be expanded upon.

- **Administrative and Technical:** TRFMA may hire additional staff and/or consultants to assist with increasing work related to Flood Project implementation. Several large elements of the Flood Project are in the design phase, with construction planned to begin in the next few years.
- **Financial:** TRFMA plans to apply for grant funding as opportunities arise. Last year, TRFMA applied for Bureau of Reclamation funding but was not selected. TRFMA will use this as a learning opportunity to improve future application packages.
- **Education and Outreach:** TRFMA plans to increase its public outreach efforts in the coming years. The agency recently made improvements to its website (performance and security). TRFMA plans to add real-time gage data to the website for the public to view. The agency intends to increase posting on social media to engage with the public. TRFMA also has plans to create several high-quality videos to educate the public about Truckee River flooding hazards and the goals and benefits of the Flood Project.

Plan Integration

FEMA	**C6.** Does the Plan describe a process by which]will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?

An updated plan must explain how the plan participants incorporated the previous mitigation plan, when appropriate, into other planning mechanisms over the last 5 years. This demonstrates progress in local mitigation efforts. Planning mechanisms refer to the governance structures used to manage local land use development and community decision making, such as budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances. Table 132 lists the previous plans that have been integrated into this one.

Table 131: Integration of Previous Plans by the Truckee River Flood Management Authority

Plan Name	Description
Comprehensive Regional Water Management Plan (2021–2040 Update)	Developed by the Western Regional Water Commission
2019 Truckee Meadows Regional Plan (TMRP)	Developed by the Truckee Meadows Regional Planning Agency
Natural Resources Plan (incorporated into the 2019 TMRP)	Developed by the Truckee Meadows Regional Planning Agency

A plan must also identify the local planning mechanisms where the updated hazard mitigation information or actions may be integrated and how. Table 133 lists opportunities for future plan integration.

Table 132: Future Plan Integration Opportunities for the Truckee River Flood Management Authority

Plan Name	Description
Plans listed in Table 132	These plans are all undergoing updates (now or in the next few years). TRFMA will participate in these updates and provide input on flood hazards and the Flood Project.
Public Infrastructure Plan	Under development by the TMRPA (2024).
Truckee River Flood Response Plan & Flood Warning Plan	TRFMA intends to work with Washoe County and other partners to update these plans in the next few years.

Mitigation Strategy

FEMA	**C4.** Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?

The mitigation strategy serves as the regional partner's blueprint for the long-term reduction of disaster losses. The strategy is developed based upon a review of the planning area's risks and vulnerabilities, stakeholder and public input, and the mitigation capabilities or resources available to address those risks. It has three main required components: mitigation goals and objectives, mitigation actions, and a mitigation action plan for implementation. These components provide the framework for identifying, prioritizing, and implementing actions to reduce the risk of hazards.

Mitigation Goals and Objectives

Mitigation goals are broad, policy-type statements which represent what the County and its partners seek to achieve by implementing their mitigation plan. The goals are general guidelines and provide a framework for identifying more detailed objectives and actions. In developing these goals, the MPT reviewed the goals from the 2023 SHMP and the goals and objectives from the 2020 RHMP update. Overall, the MPT thought that the goals and objectives continued to reflect its approach to hazard mitigation. There has been progress on some objectives since the last plan update, but those objectives remain important considerations which should be noted in the current plan. A few changes were identified, including clarifying the intent of Goal 1, removing Objective 1.3, and adding a new objective to Goal 4. Both long-term and short-term goals and objectives were identified. Long-term initiatives may take longer the duration of the planning cycle (five years) to completely realize, while short-term initiatives may be accomplished in the next five years.

Therefore, the County and its partners have selected the following goals and objectives for this plan update:

Goal 1: Study, maintain, upgrade, and expand transportation routes, including evacuation routes across the County, to ensure function and public awareness during emergencies. (Long-term)

- **Objective 1.1:** Study, establish, upgrade, and maintain evacuation routes. (Short-term)
- **Objective 1.2:** Plan for continuity of operations of critical transportation facilities in the county in the event of a disaster or emergency. (Short-term)

Goal 2: Maintain emergency services capabilities by providing redundancies. (Long-term)

- **Objective 2.1:** Provide redundant lifeline utilities and services to allow medical and emergency response services to continue to operate following a disaster or emergency. (Long-term)
- **Objective 2.2:** Establish evacuation centers and provide redundant lifeline utilities to serve communities at risk from all identified hazards. (Long-term)

Goal 3: Maintain key communications to ensure connectivity during and after key hazard events. (Short-term)

- **Objective 3.1:** Provide methods for notification, warning, and emergency communications. (Short-term)
- **Objective 3.2:** Establish an additional emergency operations center (EOC) to serve the RSIC community. (Long-term)
- **Objective 3.3:** Harden electrical infrastructure in moderate to high-risk areas for wildland fire. (Long-term)
- **Objective 3.4:** Establish procedures for communication between the Governor's Office on Radiological Waste and Washoe County before transport of radiological waste. (Short-term)
- **Objective 3.5:** Develop a response plan for clean-up and disposal of ash fall from a volcanic eruption. (Short-term)

Goal 4: Maintain the reliability of utilities (electricity, gas, drinking water, sewer) during and after key hazard events. (Long-term)

- **Objective 4.1:** Provide redundant or hardened utility lifelines to areas at risk of energy emergencies, loss of communications, or loss of service. (Long-term)
- **Objective 4.2:** Identify vulnerable facilities and establish procedures for clean-up and disposal of ash fall from a volcanic eruption to minimize risk to lifeline utilities. (Short-term)
- **Objective 4.3:** Protect utility infrastructure from hazards like winter storms and high winds including acquiring resources ahead of time and hardening infrastructure. (Long-term)

Goal 5: Minimize property damage and reduce repetitive losses to property from key hazards. (Long-term)

- **Objective 5.1:** Provide additional emergency services resources to reduce response times. (Short-term)
- **Objective 5.2:** Adopt current international building and fire codes. (Short-term)

- **Objective 5.3:** Develop plans and provide resources to reduce risk in moderate to high-risk areas for wildland fire. (Short-term)
- **Objective 5.4**: Update flood maps to incorporate changes in conditions and flood risk. (Short-term)
- **Objective 5.5:** Complete improvements to storm water drainage infrastructure to address areas of localized Flooding (including closed-basin flooding), or insufficient capacity. (Long-term)
- **Objective 5.6:** Standardize Emergency Action Plans for dams in the City of Sparks. (Short-term)
- **Objective 5.7:** Complete infrastructure improvements identified as part of the Truckee River Flood Management Project. (Long-term)
- **Objective 5.8:** Elevate or mitigate flood risks to homes in neighborhoods identified by the TRFMA as being at a high risk of Flooding (including closed-basin flooding). (Long-term)
- **Objective 5.9:** Identify and complete retrofits to unreinforced masonry buildings and other facilities at increased risk of damage from earthquakes. (Long-term)
- **Objective 5.10:** Implement measures to prepare first responders for active shooter incidents or acts of terrorism. (Long-term)
- **Objective 5.11:** Purchase equipment to minimize the risk of and protect emergency responders in the event of criminal acts or terrorism. (Long-term)
- **Objective 5.12:** Purchase additional equipment to perform immediate containment of hazardous materials spills. (Long-term)
- **Objective 5.13:** Address risks to properties in the runway protection zones at Reno-Tahoe International Airport and airport-critical areas at Reno-Stead Airport, and along the railway. (Long-term)
- **Objective 5.**14: **Identify inundation areas for high hazard dams in Washoe County.**

Goal 6: Increase public participation and responsibility in reducing their risks. (Short-term)

- **Objective 6.1:** Educate members of the public on hazards that may affect their communities. (Short-term)
- **Objective 6.2:** Provide building requirements and standards to guide property owners and developers in reducing risk. (Short-term)

- **Objective 6.3:** Provide resources to involve residents in disaster preparedness, response, and recovery. (Short-term)

Review of 2020 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2020 plan were evaluated to determine the status of the action and whether any ongoing or incomplete actions should be included as actions in the 2024 plan update. Table 134 lists those previous actions. For all these actions, TRFMA was the lead department.

Table 133: Status of Previous Mitigation Actions by the Truckee River Flood Management Authority

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
FL-1	Update flood maps to incorporate recently completed flooding mitigation projects along the Truckee River in Sparks. (Washoe County, City of Reno, City of Sparks, Truckee River Flood Management Authority [TRFMA])	Washoe County Emergency Management and Homeland Security, Reno Fire Department, Sparks Fire Department	TRFMA is not the lead for this action.	No
FL-2	Update FEMA Flood Insurance Rate Maps to incorporate recent Letter of Map Revision, Conditional Letter of Map Revision, and changes in topography and impervious surfaces using regional LiDAR data. (Washoe County, City of Reno, City of Sparks).	TRFMA	This mitigation action remains a high priority for TRFMA and its member jurisdictions (Washoe County, Sparks, and Reno). Much work has been completed since 2019. A new hydraulic modeling effort produced a series of updated floodplain maps that were submitted to FEMA for review as part of the Physical Map Revision process. The original package was submitted March 2023. In May 2024, FEMA's technical team notified TRFMA that it had concluded its review and that TRFMA had satisfactorily addressed its comments for the Lower Truckee River, Truckee Meadows, and Steamboat Creek hydrology & hydraulics	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
			analysis. The next step is a public review process that should take about 1 year.	
FL-20	New floodwalls: Provide a berm with a buried floodwall, with the top of the floodwall set to the 100-year water surface elevation (TRFMA).	City of Reno	This mitigation action is confusing and should be revised to include specific location(s). Booth St to Arlington Ave: TRFMA's 2023 Map Book includes a description of a low floodwall or berm along Riverside Dr to reduce flood damages during smaller, more frequent flood events. The goal is to contain 14,000 cfs in the river channel per requirements of the Martis Creek Agreement, the Carson-Truckee Water Conservancy District (CTWCD) and the US Army Corps of Engineers (USACE). TRFMA's 377B infrastructure tax plan was recently amended by the board of directors to include "levees and floodwalls on the north bank of the Truckee River from approximately 1,000 ft upstream of Booth St to north Arlington Ave as needed to contain flood flows." The City of Reno is the lead agency for this work. TRFMA is coordinating with Reno and CTWCD on preliminary designs for the wall/berm. Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
			partner with other entities and leverage funding.	
FL-21	Booth Street Bridge: Remove Booth Street Bridge, which constricts flows and increases flood water elevations (TRFMA, City of Reno).	City of Reno	Booth Street Area: TRFMA's 2023 Map Book includes the raising or removal of Booth St Bridge, as well as the potential installation of a new pedestrian bridge just upstream of the Booth St Bridge. Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.	Yes
FL-22	Jones Street Signal Improvements: Construct signal at Jones and Keystone Avenue (TRFMA, City of Reno).	City of Reno	This mitigation action is confusing and should be removed from the list (it does not specifically address flooding hazards and City of Reno would likely be the lead agency on this work).	No
FL-23	New Floodwalls (Geotechnical Recommendations): Drain trench along portions of the new floodwalls per Geo-technical Report (TRFMA).	TRFMA	This mitigation action is confusing and should be removed from the list. Drainage trenches required for new floodwalls would be included as part of the floodwall construction project(s).	No
FL-24	Pumping Station: Construct pumping station along Riverside Drive (TRFMA, City of Reno).	City of Reno	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book and may no longer be necessary. City of Reno is	No

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
			the lead agency for work proposed along Riverside Drive. Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.	
FL-25	Pedestrian Closure Gate Structures: Pedestrian gates are needed along the length of the floodwall to maintain the current pedestrian access points. A product, such as a flood break or approved equivalent (TRFMA, City of Reno).	City of Reno	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book and may no longer be necessary. City of Reno would likely be the lead agency for this action. Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.	No
FL-26	Raise pedestrian bridge upstream and downstream of Arlington Ave (TRFMA).	City of Reno	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book. City of Reno would likely be the lead agency for this action. Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.	No

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
FL-27	Floodproofing: Miscellaneous structures in downtown Reno require flood-proofing—for example, the Post Office, Masonic building, courthouse and parking garage, Promenade assisted living home, and Methodist church (TRFMA).	City of Reno	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book. The City of Reno would likely be the lead agency for this action. Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.	No
FL-28	Provide bridge protection at Arlington Ave. Bridge (TRFMA).	Regional Transportation Commission	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book. In this section of the Truckee River, TRFMA's role is to provide technical support to the project lead (i.e., provide hydraulic models and data to aid in the design process). RTC is contemplating some bridge work in this area. RTC and/or City of Reno would likely be the lead agency for this action.	No
FL-29	Replace Floodwalls: Replace old, inadequate floodwalls from Arlington St. to Lake St.	Regional Transportation Commission	Arlington Ave Area: TRFMA's 2023 Map Book identifies existing floodwalls from Arlington Ave to Lake St, and states that TRFMA may provide technical or possibly financial assistance to the project lead agency in the future. Note: Construction of Downtown & West Reno Flood Project elements will be	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
			prioritized based on future opportunities to partner with other entities and leverage funding.	
FL-30	Sierra Street Bridge: Replace Sierra Street Bridge, which constricts flows and increases flood water elevations, with a new bridge that is hydraulically efficient and capable of passing the 100-year flood (TRFMA, City of Reno).	Regional Transportation Commission	Sierra St Bridge Replacement: This mitigation action is included in TRFMA's 2023 Map Book. However, TRFMA's role is to provide technical support to the project lead (i.e., provide hydraulic models and data to aid in the design process). The Sierra St Bridge replacement project is being led by RTC (currently under design as of 2023). Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.	Yes
FL-31	Center Street Bridge: Replace Center Street Bridge, which constricts flows and increases flood water elevations, with a new bridge that is hydraulically efficient and capable of passing the 100-year flood (TRFMA, City of Reno).	City of Reno	Center St Bridge Replacement: This mitigation item is included in TRFMA's 2023 Map Book. However, TRFMA's role is to provide technical support to the project lead (i.e., provide hydraulic models and data to aid in the design process). Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
			partner with other entities and leverage funding.	
FL-32	Lake Street Bridge: Replace Lake Street Bridge, which constricts flows and increases flood water elevations, with a new bridge that is hydraulically efficient and capable of passing the 100-year flood (TRFMA, City of Reno).	City of Reno	Lake St Bridge Replacement: This mitigation item is included in TRFMA's 2023 Map Book. Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.	Yes
FL-33	Remove existing pedestrian bridge at Wells Ave. Install new pedestrian bridge upstream of Wells Ave (TRFMA, City of Reno).	City of Reno	Lake St Bridge to I-580 Reach: This mitigation action now includes the removal of the existing Wells Ave Bridge (as well as any required bank stabilization and/or protection for the Wells Ave overpass), but not installation of a new pedestrian bridge. Previous plans included installation of a pedestrian bridge to replace the Wells Ave Bridge; however, the property on the north bank of the river has changed ownership and because the Kuenzli St Bridge is only a few hundred feet upstream, TRFMA has determined that replacing the Wells Ave Bridge is not necessary.	Yes
FL-34	Bank stabilization and bridge protection around Wells Avenue at	City of Reno	Same as FL-33	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
	Wells Ave. Bridge (TRFMA, City of Reno).			
FL-35	Grand Sierra Floodwall: On the south (right) bank of the Truckee River a 3,000-foot-long, 6-foot-high floodwall would be built from Glendale to Greg Street. (Costs included in Element 19 Sparks Levees and Floodwalls: Glendale to Greg) (TRFMA, City of Reno).	TRFMA	Grand Sierra Resort Berm & Levee (Glendale Ave Bridge to Greg St Bridge): Construct an earthen berm and levee along the south bank of the Truckee River at the Grand Sierra Resort location (Glendale Ave Bridge to Greg St Bridge). The proposed upstream berm would consist of approximately 45,000 cubic yards of compacted material; estimated cost is $1.35 million in 2021 dollars. The proposed downstream berm would consist of approximately 52,000 cubic yards of compacted material; estimated cost is $1.56 million in 2021 dollars. The berms would be connected by a levee section approximately 350 feet long (estimated cost $700,000 in 2021 dollars). This design concept is a shift from previous plans, which included a floodwall. The berms would be designed with gentle slopes that would allow better connection between the GSR and the river. This would also allow more options for use of the berm area (such as parking) during non-flooding conditions. Planned construction: 2026-2027 or 2027-2028.	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
FL-36	Sparks Levees and Floodwalls Glendale to Greg: Replacement of the existing levee on the north bank with on-bank floodwalls to minimize construction and right-of-way impacts on the Truckee Meadows Water Authority's (TMWA's) Glendale Water Treatment Plant. Trail can be incorporated into floodwall maintenance road (TRFMA, City of Sparks)	TRFMA	Truckee Meadows Water Authority (TMWA) Levee (Glendale Ave Bridge to Greg St Bridge): Construct a levee approximately 3,000 ft long along the north bank of the Truckee River with one portion set back from the riverbank (as space allows). Estimated cost is $4.5 million in 2021 dollars. TRFMA plans to work collaboratively with TMWA on site access, fencing, and security. This design concept is a shift from the previous (2016) version of the Flood Project plan, which included a floodwall. Planned construction: 2026-2027 or 2027-2028.	Yes
FL-37	Mill Street Levee – Greg to Rock: Reduced south bank floodplain terracing with the associated levee move closer to the Truckee River. Reduces excavation costs and reduces impacts on the existing Pioneer Ditch. (Costs included in Element 19 Sparks Levees and Floodwalls: Glendale to Greg.) (TRFMA, City of Sparks)	TRFMA	Reno-Tahoe International Airport Berm & Terracing (Greg St Bridge to Rock Blvd Bridge): Excavate a floodplain terrace and construct an earthen berm along the south bank of the Truckee River near the airport (Greg St Bridge to Rock Blvd Bridge). The floodplain terrace would be revegetated with low-growing plant species because of airport safety regulations. The estimated cost to construct the floodplain terrace is $2.4 million in 2021 dollars. The amount of fill material required for the berm would be approximately 90,000 cubic yards or less; construction cost is estimated at $2.7	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
			million in 2021 dollars. Cost savings may be achieved by using spoil material from the Vista Narrows Floodplain Terracing Project. If necessary to alleviate a minor rise in water level due to the airport berm, construct a small berm on the north bank of the Truckee River. This design concept is a shift from earlier plans, which included a levee. A wide berm with a gentle slope is now the preferred alternative because a levee would be more of an obstacle to landing aircraft, and therefore a safety concern. Planned construction: 2026-2027 or 2027-2028.	
FL-38	Terracing Greg to Rock: Reduced terracing to stabilize the riverbank, reduce the amount of excavation, and avoid the existing Pioneer Ditch. The terracing and associated levee are moved northward toward the Truckee River and levee ties into the McCarran Blvd. bridge (TRFMA, City of Sparks).	TRFMA	Same as FL-37	Yes
FL-39	Abutment, pier, and bank scour protection measures (as required) from Rock Blvd Bridge to Vista Narrows.	TRFMA	This mitigation action requires further analysis to determine exactly what is required along the reach.	No

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
	Includes East McCarran Blvd Bridge (TRFMA, City of Reno, City of Sparks).			
FL-40	Mill Street Levee – Rock to McCarran: Reduced south bank floodplain terracing with the associated levee move closer to the Truckee River. Reduces excavation costs and reduces impact on the existing Pioneer Ditch. Pioneer Ditch will be piped to allow for use of the fill disposal area (TRFMA, City of Sparks).	TRFMA	Mill/McCarran Levees & Terracing (Rock Blvd Bridge to McCarran Blvd Bridge): Currently in 60% design phase (June 2024). Planned construction: 2027-2028. Between the Rock Blvd Bridge and the McCarran Blvd Bridge, relocate the Truckee River channel and increase its sinuosity, excavate floodplain terraces, and construct levees to reduce flood risk, restore the ecosystem, and enhance recreational opportunities. The updated conceptual design omits floodwalls and includes higher levees on both the north and south banks of the Truckee River, as well as a lower "intermediate" levee on the south side. The intermediate levee would be designed to contain a 50-year flood event. Ecosystem restoration is proposed to improve instream and riparian habitat for fish and wildlife species. Recreational enhancements may include nature-based activities along the river corridor and improved river access, as well as sports fields and park facilities on the south side in between the intermediate levee and	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
			the outer, high levee. The estimated cost to construct the levees (north, south, south intermediate) is $20.4 million. Excavation of the floodplain terraces and ecosystem restoration is estimated to cost $20 million. TRFMA has already invested more than $48 million to acquire 110 acres of land in this area (more than 1.2 miles of river frontage on the south bank of the river). Implementation of this flood project element will significantly reduce flood risk for the north and south industrial areas and the airport.	
FL-41	Terracing Rock to McCarran: Reduced terracing to reduce the amount of excavation and avoid the existing Pioneer Ditch. The terracing and associated levees are moved northward toward the Truckee River and levee ties into the Rock Blvd. bridge. The land between Mill Street and the relocated levee can be used as a fill disposal site and reserved for future recreational use (TRFMA, City of Reno).	TRFMA	Same as FL-40	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
FL-42	Sparks Levees and Floodwalls – Rock to McCarran: Replacement of the north bank levee with on-bank floodwalls to minimize impacts on existing properties and railroad spurs. Some minor terracing on the north bank. Fill localized low-lying areas on the landside of the floodwall. Trail can be incorporated into floodwall maintenance road (TRFMA, City of Sparks).	TRFMA	Same as FL-40	Yes
FL-43	Terracing – Rock to Steamboat: Benching on north bank at Living River Parkway. Minimized terracing on south bank along treatment plant. Remove existing buildings, as necessary (TRFMA, City of Sparks).	TRFMA	Same as FL-40	Yes
FL-44	Main Station Farm Protection: Will flood-proof select buildings and elevate the existing pads under the hay storage barns to keep hay dry. Main processing building is sufficiently elevated above flood waters (TRFMA).	TRFMA	The proposed mitigation action (described in the 2020 HMP) requires further analysis to determine what exactly is needed at UNR Main Station Farm.	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
FL-45	Sparks Levees and Floodwalls – McCarran to Vista: Replacement of existing levee with on-bank floodwalls for approximately 20,000 feet east of McCarran to reduce overall footprint. Construction of levees for most of the remainder of the reach. Floodwall will be used near Larkin Circle to eliminate impacts on the roadway (TRFMA, City of Sparks).	TRFMA	North Bank Levee & Floodwall (McCarran Blvd Bridge to east edge of Sparks Industrial Area at Vista): Construct a levee and floodwall (where necessary) on the north bank of the Truckee River from the McCarran Blvd Bridge to the eastern edge of the Sparks Industrial Area at Vista. This section of levee and floodwall is approximately 3.2 miles long. Previous conceptual plans included mostly floodwall; the latest plan prioritizes levee construction to reduce costs, avoid seepage problems, and allow for recreational trail access on the levee crown (for example, a bike path). The cost of this project element is roughly estimated at $33.2 million in 2021 dollars (this portion of the flood project requires additional study). Note that this reach includes the North Truckee Drain Realignment Project, a flood hazard mitigation project partially funded by TRFMA and completed in 2018 (refer to past plans or visit trfma.org for more information). Planned construction: 2029-2030.	Yes
FL-46	Vista Narrows Widening: Expanded benching of the Narrows extending to the first railroad bridge (TRFMA).	TRFMA	Vista Narrows Floodplain Terracing (East Sparks to Truckee River canyon downstream location near the first railroad bridge):	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
			Currently in permitting phase at 65% design (July 2024). Start of construction: 2025 if possible. Construct three floodplain terraces along the Truckee River from a location east of Sparks (Vista Narrows) downstream in the Truckee River canyon to a location near the first railroad bridge. This flood project element is designed to reconnect the Truckee River to a restored floodplain, thereby reducing flood risk and improving the riverine and riparian ecosystem. The Vista Narrows project is the key element of the entire Flood Project because it lowers flood water levels caused by flood risk reduction elements upstream in the Truckee Meadows reach. By constructing the floodplain terraces at Vista Narrows, the rest of the Flood Project can be implemented while avoiding the need for costly mitigation measures in south Reno. Approximately 450,000 cubic yards of material would be excavated to create the floodplain terraces, at an estimated construction cost of $42 million in 2021 dollars. The Vista Narrows project does increase peak flows downstream by approximately 2,400 cfs; TRFMA is working	

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
			with downstream stakeholders to mitigate the increased flows.	
FL-47	Hidden Valley: Voluntary home elevation. An alternative may include floodproofing for certain residences in Hidden Valley. The method of flood-proofing would probably vary from structure to structure, but all would be raised to at least the 100-year flood elevation (TRFMA).	TRFMA	The voluntary home elevation program is active for certain eligible homes in the Eastside Subdivision, Rosewood Lakes, and Hidden Valley Estates areas. A total of four homes have been elevated since the program's inception in 2011. The program has experienced delays in receiving grant funding and difficulties in finding qualified engineers and subcontractors to perform the work. The program is ongoing but not a high priority for TRFMA.	Yes
FL-48	Sparks Levees and Floodwalls – Rock to McCarran: Replacement of the north bank levee with on-bank floodwalls to minimize impacts on existing properties and railroad spurs. Some minor terracing on the north bank. Fill localized low-lying areas on the landside of the floodwall. Trail can be incorporated into floodwall maintenance roads (TRFMA).	TRFMA	Same as FL-41	Yes
FL-49	Eastside Subdivision: Voluntary home elevation. Elevation of the	TRFMA	Same as FL-47	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
	buildings in the East Subdivision south of the Main Station Farm to above the 100-year floodwater event level (TRFMA).			
FL-50	Non-Voluntary Home Elevation/Mitigation: as required dependent upon further analysis (TRFMA).	TRFMA	This might be an option (perhaps a last-resort option) to consider in the future if other mitigation strategies are not effective.	No
FL-51	Rainbow Bend Home Elevation: Non-Voluntary Home Elevation/Mitigation: as required dependent upon further analysis (TRFMA).	TRFMA	The proposed mitigation action is now construction of a small wall or berm to alleviate nuisance flooding in the streets at Rainbow Bend. After performing a detailed hydraulic analysis and studying several alternatives, TRFMA determined that constructing a small decorative wall or berm would effectively mitigate the increased flows from Flood Project construction upstream. At this time, no home elevation projects are anticipated.	Yes
FL-52	Wadsworth Non-Voluntary Home Elevation/Mitigation: as required dependent upon further analysis (TRFMA).	TRFMA	This mitigation action is now a bridge replacement project. Currently at 100% design and in process of finalizing bid documents. Planned construction: 2025. After performing a detailed hydraulic analysis and studying mitigation alternatives, TRFMA determined that replacing the existing	Yes

ID	Mitigation Action	Lead Department	Status for plan update	Should this action be retained in the plan update? (Yes/No)
			pedestrian bridge at Wadsworth would effectively mitigate the increased flows from Flood Project construction upstream. At this time, no home elevation projects are anticipated.	
FL-53	Update Truckee River Flood Inundation Maps (TRFMA).	TRFMA	This mitigation action was completed in 2024. TRFMA produced a static flood frequency map series to assist emergency management agencies with planning and response during Truckee River Flood events. Maps were developed representing the extent and depth of flooding along the Truckee River during the following flood events: 10-yr, 20-yr, 50-yr, 75-yr, 100-yr, 117-yr (1997 flood of record), 150-yr, 200-yr, and 500-yr. Maps are available to the public on TRFMA's website at: https://trfma.org/resources/flood-map-series/ .	No

Considered Mitigation Actions

TRFMA considered a broad range of actions, including actions that benefit vulnerable populations and current and new development, as a part of this plan update. There are four main types of mitigation actions:

- Local plans and regulations
- Structure and infrastructure projects
- Natural systems protection
- Education and awareness programs

Additional actions, such as those related to preparedness, response, recovery, and prevention, were discussed as a possibility during this plan update. However, TRFMA primarily considered public input and FEMA's Mitigation Ideas document, which contain additional suggestions for mitigation actions, during this plan update.

In the 2020 Hazard Mitigation Plan, TRFMA's priorities were described under the following goals and objectives:

Goal 1: Maintain and expand transportation routes across the County, during and after key hazard events.

Objective 1.3: Address risks of damage to high-priority bridges identified by TRFMA from flooding through stabilization, repair, or replacement.

Goal 3: Maintain key communications to ensure connectivity during and after key hazard events.

Objective 3.1: Provide methods for notification, warning, and emergency communications.

Goal 5: Minimize property damage and reduce repetitive losses to property from key hazards (top priority in 2024).

Objective 5.4: Update flood maps to incorporate changes in conditions and flood risk.

Objective 5.7: Complete infrastructure improvements identified as part of the Truckee River Flood Management Project.

Objective 5.8: Elevate or mitigate flood risks to homes in neighborhoods identified by the TRFMA as being at a high risk of flooding.

Goal 6: Increase public participation and responsibility in reducing their risks.

Objective 6.1: Educate members of the public on hazards that may affect their communities.

These goals and objectives remain top priorities for TRFMA. However, since the last HMP update, some mitigation actions (FL-1, FL-2, and FL-20 through FL-53) have been refined and/or completed. The agency's board of directors approved an updated version of the Truckee River Flood Management Project in July 2023. Some elements of the project have been revised and reorganized based on the latest hydraulic modeling results provided by TRFMA's consultants. Please refer to the text below for a revised list of Flood Project elements. A copy of TRFMA's FY2025 5-year capital improvement plan is available upon request.

Table 134: Changes to Previous Plans by the Truckee River Flood Management Authority

2020 Plan Priorities	Any change in priority? (Yes/No)	Description
FL-1	No	This mitigation action for the North Truckee Drain is in-progress.
FL-2	No	This mitigation action remains a high priority for TRFMA and its member jurisdictions (Washoe County, Sparks, and Reno). Much work has been completed since 2019. A new hydraulic modeling effort produced a series of updated floodplain maps that were submitted to FEMA for review as part of revising the Physical Map. The original package was submitted in March 2023. In May 2024, FEMA's technical team notified TRFMA that had concluded its review and that TRFMA had satisfactorily addressed its comments for the Lower Truckee River, Truckee Meadows, and Steamboat Creek hydrology & hydraulics analysis. The next step is a public review process that should take about 1 year.
FL-20	Yes	**Booth St to Arlington Ave:** TRFMA's 2023 Map Book includes a description of a low floodwall or berm along Riverside Dr to reduce flood damage during smaller, more frequent flood events. The goal is to contain 14,000 cfs in the river channel per the requirements of the Carson–Truckee Water Conservancy District (CTWCD) and the US Army Corps of Engineers (USACE). TRFMA's 377B infrastructure tax plan was recently amended by the board of directors to include "levees and floodwalls on the north bank of the Truckee River from approximately 1,000 ft upstream of Booth St to North Arlington Ave., as needed, to contain flood flows." The City of Reno is the lead agency for this work. TRFMA is coordinating with Reno and CTWCD on preliminary designs for the wall/berm. **Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.**
FL-21	Yes	**Booth Street Area:** TRFMA's 2023 Map Book includes the raising or removal of Booth St Bridge and the potential installation of a new pedestrian bridge just upstream of the Booth St Bridge. **Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.**

2020 Plan Priorities	Any change in priority? (Yes/No)	Description
FL-22	Yes	This mitigation action is confusing and should be removed from the list (it does not specifically address flooding hazards and the City of Reno would likely be the lead agency on this work).
FL-23	Yes	This mitigation action is confusing and should be removed from the list. Drainage trenches required for new floodwalls would be included as part of the floodwall construction project(s).
FL-24	Yes	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book and may no longer be necessary. The City of Reno is the lead agency for work proposed along Riverside Drive. **Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.**
FL-25	Yes	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book and may no longer be necessary. The City of Reno would likely be the lead agency for this action. **Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.**
FL-26	Yes	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book. The City of Reno would likely be the lead agency for this action. **Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.**
FL-27	Yes	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book. City of Reno would likely be the lead agency for this action. **Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.**
FL-28	Maybe?	This mitigation action is not specifically mentioned in TRFMA's 2023 Map Book. In this section of the Truckee River, TRFMA's role is to provide technical support to the project lead (i.e., to provide hydraulic models and data to aid in the design process). The Regional Transportation Commission (RTC) is contemplating some bridge work in this area. RTC and/or City of Reno would likely be the lead agency for this action.

2020 Plan Priorities	Any change in priority? (Yes/No)	Description
FL-29	Yes	**Arlington Ave Area:** TRFMA's 2023 Map Book identifies existing floodwalls from Arlington Ave to Lake St, and states that TRFMA may provide technical or possibly financial assistance to the project lead agency in the future. **Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.**
FL-30	Yes	**Sierra St Bridge Replacement:** This mitigation action is included in TRFMA's 2023 Map Book. However, TRFMA's role is to provide technical support to the project lead (i.e., to provide hydraulic models and data to aid in the design process). The Sierra St Bridge replacement project is being led by RTC (currently under design as of 2023). **Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.**
FL-31	Yes	**Center St Bridge Replacement:** This mitigation item is included in TRFMA's 2023 Map Book. However, TRFMA's role is to provide technical support to the project lead (i.e., to provide hydraulic models and data to aid in the design process). **Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.**
FL-32	No	**Lake St Bridge Replacement:** This mitigation item is included in TRFMA's 2023 Map Book. **Note: Construction of Downtown & West Reno Flood Project elements will be prioritized based on future opportunities to partner with other entities and leverage funding.**
FL-33, FL-34	Yes	**Lake St Bridge to I-580 Reach:** This mitigation action now includes the removal of the existing Wells Ave Bridge (and any required bank stabilization and/or protection for the Wells Ave overpass), but not installation of a new pedestrian bridge. Previous plans included installing a pedestrian bridge to replace the Wells Ave Bridge. However, the property on the north bank of the river has changed ownership, and because the Kuenzli St Bridge is only a few hundred feet upstream, TRFMA has determined that replacing the Wells Ave Bridge is not necessary.
FL-35	Yes	**Grand Sierra Resort Berm & Levee (Glendale Ave Bridge to Greg St Bridge):** Construct an earthen berm and levee along the south bank of the Truckee River at the Grand Sierra Resort

2020 Plan Priorities	Any change in priority? (Yes/No)	Description
		location (Glendale Ave Bridge to Greg St Bridge). The proposed upstream berm would consist of approximately 45,000 cubic yards of compacted material; the estimated cost is $1.35 million in 2021 dollars. The proposed downstream berm would consist of approximately 52,000 cubic yards of compacted material; the estimated cost is $1.56 million in 2021 dollars. The berms would be connected by a levee section approximately 350 feet long (the estimated cost is $700,000 in 2021 dollars). This design concept is a shift from previous plans, which included a floodwall. The berms would be designed with gentle slopes that would allow a better connection between the GSR and the river. This would also provide more options for using the berm area (such as parking) during non-flooding conditions. Planned construction: 2026–2027 or 2027–2028.
FL-36	Yes	**Truckee Meadows Water Authority (TMWA) Levee (Glendale Ave Bridge to Greg St Bridge):** Construct a levee approximately 3,000 ft long along the north bank of the Truckee River with one portion set back from the riverbank (as space allows). The estimated cost is $4.5 million in 2021 dollars. TRFMA plans to work collaboratively with TMWA on site access, fencing, and security. This design concept is a shift from the previous (2016) version of the Flood Project plan, which included a floodwall. Planned construction: 2026–2027 or 2027–2028.
FL-37, FL-38	Yes	**Reno-Tahoe International Airport Berm & Terracing (Greg St Bridge to Rock Blvd Bridge):** Excavate a floodplain terrace and construct an earthen berm along the south bank of the Truckee River near the airport (Greg St Bridge to Rock Blvd Bridge). The floodplain terrace would be revegetated with low-growing plant species because of airport safety regulations. The estimated cost of constructing the floodplain terrace is $2.4 million in 2021 dollars. The amount of fill material required for the berm would be approximately 90,000 cubic yards or less; construction cost is estimated at $2.7 million in 2021 dollars. Cost savings may be achieved by using spoil material from the Vista Narrows Floodplain Terracing Project. If necessary, to alleviate a minor rise in water level because of the airport berm, construct a small berm on the north bank of the Truckee River. This design concept is a shift from earlier plans, which included a levee. A wide berm with a gentle slope is now the preferred alternative because a levee would

2020 Plan Priorities	Any change in priority? (Yes/No)	Description
		be more of an obstacle to landing aircraft, and therefore a safety concern. Planned construction: 2026–2027 or 2027–2028.
FL-39	No	This mitigation action requires further analysis to determine exactly what is required along the reach.
FL-40, FL-41, FL-42, FL-43, FL-48	Yes	**Mill/McCarran Levees & Terracing (Rock Blvd Bridge to McCarran Blvd Bridge):** Currently in 60% design phase (June 2024). Planned construction: 2027–2028. Between the Rock Blvd Bridge and the McCarran Blvd Bridge, relocate the Truckee River channel and increase its sinuosity, excavate floodplain terraces, and construct levees to reduce flood risk, restore the ecosystem, and enhance recreational opportunities. The updated conceptual design omits floodwalls and includes higher levees on both the north and south banks of the Truckee River and a lower "intermediate" levee on the south side. The intermediate levee would be designed to contain a 50-year flood event. Ecosystem restoration is proposed to improve instream and riparian habitats for fish and wildlife species. Recreational enhancements may include nature-based activities along the river corridor and improved river access and sports fields and park facilities on the south side between the intermediate levee and the outer high levee. The estimated cost of constructing the levees (north, south, south intermediate) is $20.4 million. Excavating the floodplain terraces and restoring the ecosystem is estimated to cost $20 million. TRFMA has already invested more than $48 million to acquire 110 acres of land in this area (more than 1.2 miles of river frontage on the south bank of the river). Implementation of this Flood Project element will significantly reduce flood risk in the north and south industrial areas and the airport.
FL-44	No	The proposed mitigation action (described in the 2020 HMP) requires further analysis to determine what exactly is needed at the University of Nevada, Reno (UNR) Main Station Farm.
FL-45	Yes	**North Bank Levee & Floodwall (McCarran Blvd Bridge to east edge of Sparks Industrial Area at Vista):** Construct a levee and floodwall (where necessary) on the north bank of the Truckee River from the McCarran Blvd Bridge to the eastern edge of the Sparks Industrial Area at Vista. This section of levee and floodwall is approximately 3.2 miles long. Previous conceptual plans included mostly floodwalls; the latest plan prioritizes levee construction to reduce costs, avoid

2020 Plan Priorities	Any change in priority? (Yes/No)	Description
		seepage problems, and allow for recreational trail access on the levee crown (for example, a bike path). The cost of this project element is roughly estimated at $33.2 million in 2021 dollars (this portion of the Flood Project requires additional study). Note that this reach includes the North Truckee Drain Realignment Project, a flood hazard mitigation project partially funded by TRFMA and completed in 2018 (refer to past plans or visit trfma.org for more information). Planned construction: 2029–2030.
FL-46	Yes	**Vista Narrows Floodplain Terracing (East Sparks to Truckee River canyon downstream location near the first railroad bridge):** Currently in permitting phase at 65% design (July 2024). Start of construction: 2025, if possible. Construct three floodplain terraces along the Truckee River from a location east of Sparks (Vista Narrows) downstream in the Truckee River canyon to a location near the first railroad bridge. This Flood Project element is designed to reconnect the Truckee River to a restored floodplain, thereby reducing flood risk and improving the riverine and riparian ecosystems. The Vista Narrows project is the key element of the entire Flood Project because it lowers flood water levels caused by flood risk reduction elements upstream in the Truckee Meadows reach. By constructing the floodplain terraces at Vista Narrows, the rest of the Flood Project can be implemented while avoiding the need for costly mitigation measures in South Reno. Approximately 450,000 cubic yards of material would be excavated to create floodplain terraces, at an estimated construction cost of $42 million in 2021 dollars. The Vista Narrows project increases peak flows downstream by approximately 2,400 cfs. TRFMA is working with downstream stakeholders to mitigate increased flows.
FL-47, FL-49	No	The **voluntary** home elevation program is active for certain eligible homes in the Eastside Subdivision, Rosewood Lakes, and Hidden Valley Estates areas. A total of four homes have been elevated since the program's inception in 2011. The program has experienced delays in receiving grant funding and difficulties finding qualified engineers and subcontractors to perform the work. The program is ongoing but not a high priority for TRFMA.
FL-50	No	This might be an option (perhaps a last-resort option) to consider in the future if other mitigation strategies are not effective.

2020 Plan Priorities	Any change in priority? (Yes/No)	Description
FL-51	Yes	The proposed mitigation action is now construction of a small wall or berm to alleviate nuisance flooding in the streets at Rainbow Bend. After performing a detailed hydraulic analysis and studying several alternatives, TRFMA determined that constructing a small decorative wall or berm would effectively mitigate the increased flows from Flood Project construction upstream. At this time, no home elevation projects are anticipated.
FL-52	Yes	This mitigation action is now a bridge replacement project. Currently at 100% design and in the process of finalizing bid documents. Planned construction: 2025. After performing a detailed hydraulic analysis and studying mitigation alternatives, TRFMA determined that replacing the existing pedestrian bridge at Wadsworth would effectively mitigate the increased flows from Flood Project construction upstream. At this time, no home elevation projects are anticipated.
FL-53	Yes	This mitigation action was completed in 2024. TRFMA produced a static flood frequency map series to assist emergency management agencies with planning and response during Truckee River flood events. Maps were developed representing the extent and depth of flooding along the Truckee River during the following flood events: 10-yr, 20-yr, 50-yr, 75-yr, 100-yr, 117-yr (1997 flood of record), 150-yr, 200-yr, and 500-yr. Maps are available to the public on TRFMA's website at: https://trfma.org/resources/flood-map-series/.

The 2024–2029 Mitigation Action Plan

After careful consideration, TRFMA has selected to pursue the actions listed in Table 136. In that table, Community Lifelines are defined at Lifelines Toolkit v2.0 (fema.gov) and include the new Water Systems lifeline. Timeframes are defined as follows:

- Short term: Less than 1 year
- Medium term: 1-3 years
- Long term: 3–5 years

Table 135: 2024–2029 Mitigation Action Plan of the Truckee River Flood Management Authority

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
1	Flood insurance study	Flooding	People and infrastructure	Washoe County	TRFM	Needs further investigation	General Fund	$50,000	Studying areas lacking flood insurance can pinpoint vulnerable regions and guide policy decisions, enhancing community preparedness and economic resilience. It raises awareness about the need for adequate coverage and supports stronger disaster mitigation efforts.	5-10 years	1-2 Years	Medium
Description: This study aims to identify gaps in flood insurance coverage in the county by assessing accessibility, awareness, and mitigation efforts. Through data analysis and community engagement, it highlights areas lacking insurance and offers recommendations to improve community resilience against flooding.												
FL-2	FEMA Truckee River Physical Map Revision Effort	Flooding	People/ Structures/ Economic Assets/ Critical Facilities & Infra-structure	TRFMA	Washoe County, City of Reno, City of Sparks, Storey	TRFMA Flood Management Project Plan (2023 Map Book) and the NRS 377B Infra-structure	Existing TRFMA funds	$100,000	If approved by FEMA, effort would revise the regulatory floodway, the 1% annual chance water	TBD	Currently in progress. Next phase of work is public outreach, expected to take about 1 year.	High

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
					County, FEMA	Tax Plan (administered by TRFMA)			surface elevations, and the 1% annual chance floodplain in the study area. Previous mapping from 1984 is outdated and inaccurate. Updating the Flood Insurance Rate Maps (FIRMs) will facilitate a better under-standing of current flood risk and potential flood damage in the study area.		Short term to medium term to complete	
FL-2 Description: Develop new hydraulic models and create new floodplain maps to update the FEMA floodplain designations for the Truckee River, Steamboat Creek, and North Truckee Drain in the Greater Truckee Meadows Region, NV, and the Truckee River Lower Reach, which extends from Vista downstream to Wadsworth, NV.												
FL-20, FL-21	Booth St to Arlington Ave Floodwall/ Berm	Flooding	People/ Structures/ Economic Assets/ Natural,	City of Reno	TRFMA, CTWCD,* RTC	TRFMA Flood Management Project Plan (2023 Map Book) and the	Funds from CTWCD for design Construc-tion funds	Prelimin-ary cost estimates prepared by J-U-B	Would provide a minimum flow conveyance of ~14,000 cfs	30 years	1-3 years	Medium/ low (for TRFMA)

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
			Historic, & Cultural Resources/ Community Activities			NRS 377B Infra-structure Tax Plan (administered by TRFMA)	from City of Reno & possibly TRFMA (not yet approved)	range from ~$2.2 million to $5.5 million to contain 14,000 cfs (~50-yr flood event). The cost to contain the 100-yr flow is estimated at $13.9 million. (TRFMA staff report, July 12, 2024)	(~50-yr flood event), protecting the adjoining neighbor-hoods while maintaining the community's connection to the Truckee River.			
FL-20, FL-21 Description: Construct a small berm or floodwall (approximately 1,000 long) on the north bank of the Truckee River upstream of Booth St Bridge. Construct a low berm on the north bank of the Truckee River (along Riverside Drive) downstream of the Booth St Bridge to North Arlington Ave. Project goal is to contain a minimum of 14,000 cfs in the Truckee River channel per the Martis Creek Agreement and requirements of the Carson–Truckee Water Conservancy District (CTWCD) and the US Army Corps of Engineers (USACE). The design and construction of berms or floodwalls would include additional elements, such as pumping stations and/or drainage trenches if required. Note that recent hydraulic modeling results have indicated that removing and/or raising the Booth St Bridge is not an effective solution for improving flow conveyance and reducing water levels upstream. Construction would be prioritized based on future opportunities to partner with other entities and leverage funding.												
FL-29	Replace Existing Floodwalls (Arlington Ave to Lake St)	Flooding	People/ Structures/ Economic Assets/ Natural,	City of Reno	TRFMA	TRFMA Flood Management Project Plan (2023 Map Book), the NRS	Capital funds from City of Reno, grant funds,	$1M	Would protect the local area from smaller, more frequent flood events	30 years	3-5 years	Low (for TRFMA)

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
			Historic, & Cultural Resources/ Community Activities			377B Infra-structure Tax Plan (administered by TRFMA) City of Reno CIP	possibly some funds from TRFMA (not yet approved)		while maintaining the community's connection to the Truckee River.			
FL-29 Description: TRFMA's 2023 Map Book identifies existing floodwalls from Arlington Ave to Lake St, and states that TRFMA may provide technical or possibly financial assistance to the project lead agency in the future. Construction would be prioritized based on future opportunities to partner with other entities and leverage funding.												
FL-30	Sierra St Bridge Replacement	Flooding	People/ Structures/ Economic Assets	RTC	City of Reno, TRFMA	Under design by RTC (as of July 2023)	Capital funds from RTC	$1M	Protection of people and property	30 years	1-3 years	Low
FL-30 Description: Replace Sierra St Bridge with a new bridge that improves hydraulic conditions and reduces flooding in this area. This mitigation action is included in TRFMA's 2023 Map Book. However, TRFMA's role is to provide technical support to the project lead (i.e., to provide hydraulic models and data to aid in the design process). Construction would be prioritized based on future opportunities to partner with other entities and leverage funding.												
FL-31	Center St Bridge Replacement	Flooding	People/ Structures/ Economic Assets	City of Reno	TRFMA, RTC, NDOT*	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA) City of Reno CIP	Capital funds from City of Reno, grant funds, possibly some funds from TRFMA (not yet approved)	$1M	Protection of people and property	30 years	3-5 years	Low

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
FL-31 Description: Replace Center St Bridge with a new bridge that improves hydraulic conditions and reduces flooding in this area. This mitigation action is included in TRFMA's 2023 Map Book. However, TRFMA's role is to provide technical support to the project lead (i.e., to provide hydraulic models and data to aid in the design process). Construction would be prioritized based on future opportunities to partner with other entities and leverage funding.												
FL-32	Lake St Bridge Replacement	Flooding	People/ Structures/ Economic Assets	City of Reno, RTC	TRFMA	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA) City of Reno CIP	Capital funds from City of Reno, grant funds, possibly some funds from TRFMA (not yet approved)	$1M	Protection of people and property	30 years	3-5 years	Medium/ low (for TRFMA)
FL-32 Description: Replace Lake St Bridge with a new bridge that improves hydraulic conditions and reduces flooding in this area. This mitigation action is included in TRFMA's 2023 Map Book. TRFMA may take a more active role in this mitigation action, similar to its role in the Virginia St Bridge Replacement Project (completed in 2016). Construction would be prioritized based on future opportunities to partner with other entities and leverage funding.												
FL-33, FL-34	Wells Ave Bridge Removal (Lake St Bridge to I-580 Reach)	Flooding	People/ Structures	TRFMA or City of Reno	City of Reno, RTC?	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA) City of Reno CIP	Capital funds from City of Reno, grant funds, possibly some funds from TRFMA?	$1M	Would remove the obstruction (the old Wells Ave Bridge), thereby improving flow conveyance and reducing local breakout flooding.	Lifetime	3-5 years	Medium/Low (for TRFMA)

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
FL-33, FL-34 Description: This mitigation action now includes the removal of the existing Wells Ave Bridge (and any required bank stabilization and/or protection for the Wells Ave overpass), but not installation of a new pedestrian bridge. The goal is to improve hydraulic conditions and reduce flooding in this area because the old Wells Ave Bridge is so low over the river that it is an obstruction to flow. Previous plans included the installation of a pedestrian bridge to replace the Wells Ave Bridge. However, the property on the north bank of the river has changed ownership and because the Kuenzli St Bridge is only a few hundred feet upstream, TRFMA has determined that replacing the Wells Ave Bridge is not necessary.												
FL-35	Grand Sierra Resort Berm & Levee (Glendale Ave Bridge to Greg St Bridge)	Flooding	People/ Structures/ Economic Assets/ Communities	TRFMA	GSR,* City of Sparks, City of Reno, Washoe County, Reno-Sparks Indian Colony	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	Existing TRFMA funds Possible funding or in-kind contribu-tion from GSR, such as easements?	Cost for design assistance to GSR and construc-tion dirt = $2.7 million (from TRFMA's FY2024–2025 CIP)	Would provide 100-yr flood protection for the GSR and surrounding area.	30 years	Planned construction: FY2026–2027 or FY2027–2028. 1-3 years	Medium
FL-35 Description: Construct an earthen berm and levee along the south bank of the Truckee River at the Grand Sierra Resort location (Glendale Ave Bridge to Greg St Bridge). The proposed upstream berm would consist of approximately 45,000 cubic yards of compacted material. The proposed downstream berm would consist of approximately 52,000 cubic yards of compacted material. The berms would be connected by a levee section approximately 350 feet long. This design concept is a shift from previous plans, which included a floodwall. The berms would be designed with gentle slopes that would allow better connections between the GSR and the river. This would also allow more options for use of the berm area (such as parking) during non-flooding conditions. TRFMA will coordinate with GSR to provide technical design support as GSR upgrades its property/infrastructure. Construction of the flood hazard mitigation elements will be dependent on when GSR moves forward with its upgrades.												
FL-36	TMWA* Levee (Glendale Ave Bridge to Greg St Bridge)	Flooding	People/ Structures/ Economic Assets/ Critical Facilities & Infra-structure	TRFMA	TMWA	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax	Existing TRFMA funds Possible funding or in-kind contribution	Total for design, permit-ting, constructio n, and contin-gency =	Would provide 100-yr flood protection for TMWA's Glendale Water Treatment	30 years	Planned construction: FY2026–2027 or FY2027–2028. 1-3 years	Medium

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
						Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	from TMWA, such as site access/ ease-ments, fencing?	$5.7 million (from TRFMA's FY2024–2025 CIP)	Plant and surrounding area.			
FL-36 Description: Construct a levee approximately 3,000 ft long along the north bank of the Truckee River with one portion set back from the riverbank (as space allows). The estimated cost is $4.5 million in 2021 dollars. TRFMA plans to work collaboratively with TMWA on site access, fencing, and security. This design concept is a shift from the previous (2016) version of the Flood Project plan, which included a floodwall.												
FL-37, FL-38	Reno-Tahoe Inter-national Airport Berm & Terracing (Greg St Bridge to Rock Blvd Bridge)	Flooding	People/ Structures/ Economic Assets/ Critical Facilities & Infra-structure/ Community Activities	TRFMA	RTAA,* City of Reno	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	Existing TRFMA funds Possible funding or in-kind contribu-tion from RTAA, such as easements?	Total for design, construc-tion, and contin-gency = $6.1 million (from TRFMA's FY2024–2025 CIP)	Would provide 100-yr flood protection for the Reno-Tahoe International Airport and surrounding area.	30 years	Planned construction: FY2026–2027 or FY2027–2028. 1-3 years	Medium
FL-37, FL-38 Description: Excavate a floodplain terrace and construct an earthen berm along the south bank of the Truckee River near the airport (Greg St Bridge to Rock Blvd Bridge). The floodplain terrace would be revegetated with low-growing plant species because of airport safety regulations. The amount of fill material required for the berm would be approximately 90,000 cubic yards or less. If necessary, to alleviate a minor rise in water level because of the airport berm, construct a small berm on the north bank of the Truckee River. This design concept is a shift from earlier plans, which included a levee. A wide berm with a gentle slope is now the preferred alternative because a levee would be more of an obstacle to landing aircraft, and therefore a safety concern. Cost savings may be achieved by using spoil material from the Vista Narrows Floodplain Terracing Project.												

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
FL-40–43, FL-48	Mill/ McCarran Levees & Terracing (Rock Blvd Bridge to McCarran Blvd Bridge)	Flooding	People/ Structures/ Economic Assets/ Natural, Historic, and Cultural Resources/ Critical Facilities & Infra-structure/ Community Activities	TRFMA	Washoe County, City of Reno, City of Sparks, USFWS,* NDOW*	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	Existing TRFMA funds Possible grant funding through USBR, USFWS, FEMA	Property acquisition (~$6 million) + design, permit-ting, contin-gency (~$7.8 million) + construc-tion of levees, terraces, channel realign-ment, eco-system restoration (~$32.2 million) =Total of $46.5 million (from TRFMA's FY2024–2025 CIP)	Would provide 100-yr flood protection for extensive industrial areas in the north and south, and for RTIA.* It would restore the Truckee River ecosystem, creating habitat for federally listed fish species and improving water quality (for example, TMDL* for temperature and dissolved oxygen). It would also provide the local community (and tourists) with open space/park amenities and various	30 years	Currently in 60% design phase (June 2024). Planned construction FY2027–2028 or FY2028–2029 3-5 years	High

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
									outdoor recreational opportunities.			
FL-40, FL-41, FL-42, FL-43, FL-48 Description: Between the Rock Blvd Bridge and the McCarran Blvd Bridge, relocate the Truckee River channel and increase its sinuosity, excavate floodplain terraces, and construct levees to reduce flood risk, restore the ecosystem, and enhance recreational opportunities. The updated conceptual design omits floodwalls and includes higher levees on both the north and south banks of the Truckee River and a lower "intermediate" levee on the south side. The intermediate levee would be designed to contain a 50-year flood event. Ecosystem restoration is proposed to improve instream and riparian habitats for fish and wildlife species. Recreational enhancements may include nature-based activities along the river corridor and improved river access and sports fields and park facilities on the south side between the intermediate levee and the outer, high levee. TRFMA has already invested more than $48 million to acquire 110 acres of land in this area (more than 1.2 miles of river frontage on the south bank of the river). Implementation of this Flood Project element will significantly reduce flood risk in the north and south industrial areas and the airport.												
FL-44	UNR Main Station Field Lab (UNR Farm) Levee	Flooding	People/ Structures/ Economic Assets/ Natural, Historic, and Cultural Resources/ Community Activities	TRFMA	UNR	Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	Existing TRFMA funds	Total cost estimated at $900,000(from TRFMA's FY2024–2025 CIP, March 2024 staff report)	Would protect existing structures (such as Wolf Pack Meats) at UNR Farm from flood damage.	30 years	3-5 years	Low
FL-44 Description: Construct a small levee or berm to protect existing structures from flooding. This is currently the preferred solution based on the most recent modeling results.												
FL-45	North Bank Levee & Floodwall (McCarran Blvd Bridge to east edge of Sparks	Flooding	People/ Structures/ Economic Assets/ Critical Facilities & Infra-structure/	TRFMA	City of Sparks, Washoe County	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan	Existing TRFMA funds	Estimate for design, construc-tion, and contin-gency = $48.8 million	Would provide 100-yr flood protection for the Sparks Industrial Area, a warehousing and manu-	30 years	Planned construction: FY2029–2030 and FY2030–2031. Note: construction may be split into smaller projects	High

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
	Industrial Area at Vista)		Community Activities			(administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)		(includes an estimate for inflation until actual construction) (from TRFMA's FY2024–2025 CIP)	facturing district that is significant to the region's economic growth and stability.		that are prioritized based on what sections are most vulnerable. 3-5 years	
FL-45 Description: Construct a levee and floodwall (where necessary) on the north bank of the Truckee River from the McCarran Blvd Bridge to the eastern edge of the Sparks Industrial Area at Vista. This section of levee and floodwall is approximately 3.2 miles long. Previous conceptual plans included mostly floodwalls. The latest plan prioritizes levee construction to reduce costs, avoid seepage problems, and allow for recreational trail access on the levee crown (for example, a bike path). This portion of the Flood Project requires additional study to refine designs and cost estimates. Note that this reach includes the North Truckee Drain Realignment Project, a flood hazard mitigation project partially funded by TRFMA and completed in 2018 (refer to past plans or visit trfma.org for more information).												
FL-46	Vista Narrows Floodplain Terracing (East Sparks to Truckee River canyon down-stream location near the first railroad bridge)	Flooding	People/ Structures/ Economic Assets/ Natural, Historic, and Cultural Resources/ Critical Facilities & Infra-structure/ Community Activities	TRFMA	Needs further investigation	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	Existing TRFMA funds	Total for design, permitting, terrace construction, ecosystem restoration, construction management and contingency = $43.7 million (This	This action is the key element of the Flood Project because it allows floodwaters to be quickly and effectively conveyed from the Truckee Meadows. The overall functionality of the Flood Project relies	30 years	Currently in permitting phase at 65% design (July 2024). Start of construction: FY2025–2026, if possible. 1-3 years	High

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
								estimate is valid as of March 2024. Inflation until construc-tion may increase the total cost to ~$46.5 million) (from TRFMA's FY2024–2025 CIP)	on the Vista Narrows element. Would improve hydraulic conditions, reduce flooding, and restore the Truckee River ecosystem, creating approximately 13 acres of wetlands.			
FL-46 Description: Construct three floodplain terraces along the Truckee River from a location east of Sparks (Vista Narrows) downstream in the Truckee River canyon to a location near the first railroad bridge. This Flood Project element is designed to reconnect the Truckee River to a restored floodplain, thereby reducing flood risk and improving the riverine and riparian ecosystems. The Vista Narrows project is the key element of the entire Flood Project because it lowers flood water levels caused by flood risk reduction elements upstream in the Truckee Meadows reach. By constructing the floodplain terraces at Vista Narrows, the rest of the Flood Project can be implemented while avoiding the need for costly mitigation measures in South Reno. Approximately 450,000 cubic yards of material would be excavated to create the floodplain terraces, at an estimated construction cost of $32.6 million in 2024 dollars (note that the total cost estimate above includes additional costs for design, permitting, construction management, and inflation). The Vista Narrows project does increase peak flows downstream by approximately 2,400 cfs. TRFMA is working with downstream stakeholders to mitigate the increased flows.											
FL-47, FL-49	Voluntary Home Elevation Program for Eastside Subdivision, Rosewood	Flooding	People/ Structures	TRFMA	Washoe County, FEMA, State of Nevada	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax	Existing TRFMA funds, FEMA grant funds	Less than $240,000 annually. Total program cost = $1.35	This program reduces flood damage for individual home-owners in high flood risk areas.	30 years	Ongoing; scheduled to end after FY2026–2027. 1-3 years	Low

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
	Lakes, and Hidden Valley Estates					Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)		million (from TRFMA's FY2024–2025 CIP)				
FL-47, FL-49 Description: The voluntary home elevation program is active for certain eligible homes in the Eastside Subdivision, Rosewood Lakes, and Hidden Valley Estates areas. Four homes have been elevated since the program's inception in 2011. The program has experienced delays in receiving grant funding and difficulties finding qualified engineers and subcontractors to perform the work. The program is ongoing but not a high priority for TRFMA.												
FL-51	Rainbow Bend Hydraulic Mitigation Project	Flooding	People/ Structures	TRFMA	Storey County, Rainbow Bend Home Owners Associa-tion	TRFMA Flood Management Project Plan (2023 Map Book), the NRS 377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)	TRFMA existing funds	Total cost estimated at $825,000 (from TRFMA's FY2024–2025 CIP)	Effectively mitigates the increased flows from Flood Project construction upstream and alleviates nuisance flooding in the streets at Rainbow Bend.	30 years	Planned construction: FY2025–2026 through FY2027–2028. 1-3 years	Medium
FL-51 Description: Construct a small floodwall or berm to alleviate nuisance flooding in the streets at Rainbow Bend. After performing a detailed hydraulic analysis and studying several alternatives, TRFMA determined that constructing a small decorative wall or berm would effectively mitigate the increased flows from Flood Project construction upstream. At this time, no home elevation projects are expected.												
FL-52	Wadsworth Pedestrian Bridge Replacement Project	Flooding	People/ Structures/ Critical Facilities & Infra-structure/	TRFMA	Washoe County, Pyramid Lake	TRFMA Flood Management Project Plan (2023 Map Book), the NRS	Existing TRFMA funds	Total cost estimated at $1.8 million (from	Effectively mitigates increased flows caused by Flood	30 years	Planned construction: FY2024–2025. 1 year	High

#	Project Title	Hazard Addressed	Vulnerability Addressed	Responsible Agency	Potential Partners	Mechanism(s) to Implement the Action	Potential Funding	Cost Estimate	Benefits	Project Useful Life	Timeframe	Priority
			Community Activities		Paiute Tribe	377B Infra-structure Tax Plan (administered by TRFMA), and TRFMA's 5-Year CIP (FY2024–2025)		TRFMA's FY2024–2025 CIP)	Project construction upstream. It would also improve the safety of residents who cross the bridge to attend school/work.			
FL-52 Description: Replace existing pedestrian bridge at Wadsworth, NV, to effectively mitigate increased flows caused by Flood Project construction upstream.												

*Note: CTWCD = Carson–Truckee Water Conservancy District, RTC = Regional Transportation Commission, NDOT = Nevada Department of Transportation, GSR = Grand Sierra Resort, TMWA = Truckee Meadows Water Authority, RTAA = Reno-Tahoe Airport Authority, USFWS = United States Fish and Wildlife Service, NDOW = Nevada Department of Wildlife, TMDL = Total maximum daily load, UNR = University of Nevada, Reno, RTIA = Reno–Tahoe International Authority

Prioritizing Mitigation Actions

Once TRFMA's mitigation actions were identified, they were evaluated and prioritized to identify the most suitable actions. The actions were prioritized based on FEMA's Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) criteria listed below.

- **S – Social:** The public must support the overall mitigation implementation strategy and specific mitigation actions. Consider, will the action disrupt housing or cause the relocation of people? Will the proposed action adversely affect one segment of the population? Is the action compatible with present and future community/agency values?
- **T – Technical:** It is important to determine if the proposed action is technically feasible, will help reduce losses in the long term, and has minimal secondary impacts. How effective is the action in avoiding or reducing future losses? Does the action solve the problem or only a symptom? Will the action create more problems than it solves? Consider the root cause of the issue at hand to determine whether the action is a whole or partial solution, or not a solution at all.
- **A – Administrative:** This category examines the expected staffing, funding, time, and maintenance requirements for the mitigation action to determine if the jurisdiction/special district has the personnel and administrative capabilities to implement the action or whether outside help will be necessary. Consider, a) Staffing (enough staff and training): does the jurisdiction/special district have the capability (staff, technical experts) to implement the action? b) Funding allocated: does the jurisdiction/special district have the funding to implement the action or can it readily be obtained? c) Time: can it be accomplished in a timely manner? d) Maintenance/Operations: can the jurisdiction/special district provide the necessary maintenance? It is important to remember that most federal grants will not provide funding for maintenance.
- **P – Political:** This considers the level of political support for the mitigation action. Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far? Is there a local champion willing to help see the action to completion? Is there enough public support to ensure that the success of the action? Have all stakeholders been offered an opportunity to participate in the planning process?
- **L – Legal:** The jurisdiction/special district must have the legal authority to implement the action or consider what new laws or regulations would be needed to carry out the mitigation action. Evaluate, are the proper laws, ordinances, and resolutions in place to implement the action? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?
- **E – Economic:** Economic considerations must include evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring

general obligation bonds or other instruments that would incur long-term debt in a jurisdiction/special district. Consider benefits and costs at a planning level. A detailed benefit-cost analysis will be performed as project-specific funding becomes available. What financial benefits will the action provide? Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? Does the action contribute to community economic goals, such as capital improvements or economic development? Are there currently sources of funding that can be used to implement the action?

- **E – Environmental:** The impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), have to be kept in mind when using federal funds. How will this action impact land/water? Impact on endangered species: how will this action impact endangered species? How will this action impact hazardous materials and waste sites? Is this action consistent with community environmental goals? Is the action consistent with federal laws, such as the National Environmental Policy Act (NEPA)?

The actions were also assigned a prioritization category of low, medium, or high, based on the following definitions:

- **Low:** Based on one to two STAPLEE criteria, the action is feasible and important, with multiple potential challenges. The action should be implemented as funding becomes available.
- **Medium**: Based on three to four STAPLEE criteria, the action is feasible and important, with some potential challenges. Its implementation is not as urgent as a high priority action item and can be implemented over time.
- **High**: Based on five or more STAPLEE criteria, the action is feasible and important, with minimal to no concerns. It is very important to the jurisdiction to implement and may be prioritized in the short term.

Table 136: Priorities of Mitigation Actions for TRFMA

Action #	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total STAPLEE Score	Priority
FL-2	3	4	4	4	4	3	4	26	High
FL-20, FL-21	2	2	2	2	3	2	2	15	Medium/ Low (for TRFMA)
FL-29	2	2	2	2	3	2	2	15	Low

Action #	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total STAPLEE Score	Priority
FL-30	Discuss with RTC*	Discuss with RTC	Discuss with RTC	Discuss with RTC	Discuss with RTC	Discuss with RTC	Discuss with RTC	Discuss with RTC	Discuss with RTC
FL-31	1	2	2	2	3	1	2	13	Low
FL-32	1	2	2	2	3	1	2	13	Medium/ Low
FL-33, FL-34	2	2	2	2	3	2	2	15	Medium/ Low
FL-35	2	4	4	3	3	4	3	23	Medium
FL-36	3	4	4	3	3	3	3	23	Medium
FL-37, FL-38	2	4	4	2	3	2	2	19	Medium
FL-40, FL-41, FL-42, FL-43, FL-48	4	4	4	4	3	4	4	27	High
FL-44	2	4	4	1	3	3	1	18	Low
FL-45	3	4	4	4	3	4	3	25	High
FL-46	4	4	4	4	3	4	4	27	High
FL-47, FL-49	3	3	4	3	3	3	4	23	Low
FL-51	3	4	4	4	3	3	3	24	Medium
FL-52	4	4	4	4	3	4	3	26	High

* Note: RTC = Regional Transportation Commission