

Washoe County

REGIONAL HAZARD MITIGATION PLAN

2025



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Table 1: Document Change Table

Change Number	Section	Date of Change	Individual Making Change	Description of Change
2026-01	Prioritizing Mitigation Actions	01/13/2026	IEM on Behalf of Washoe County	Adding in mitigation action prioritization scores for action 12-24

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 2025 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.

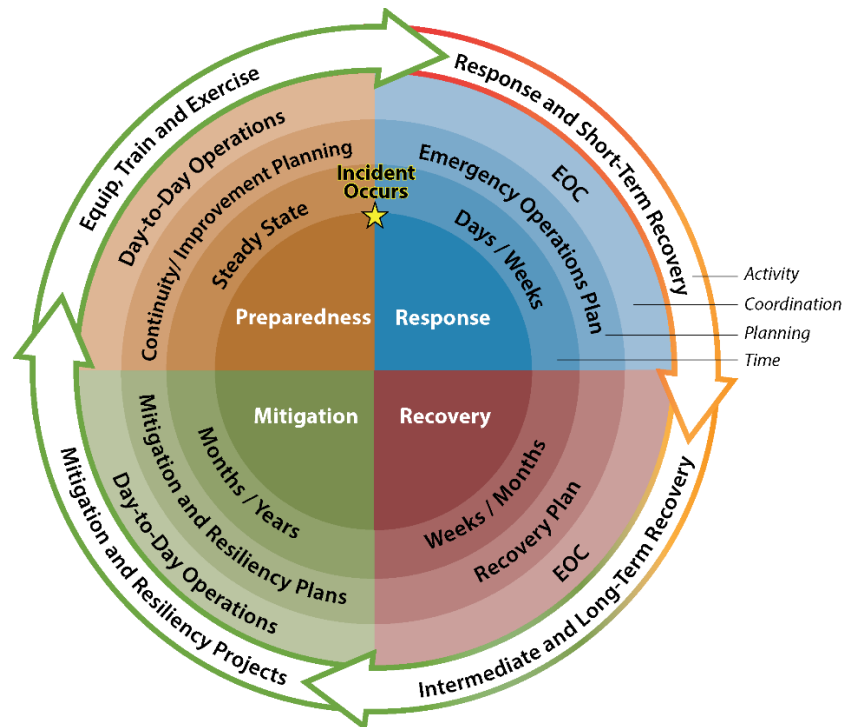


Figure 1: The Emergency Management Cycle

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 2025 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.

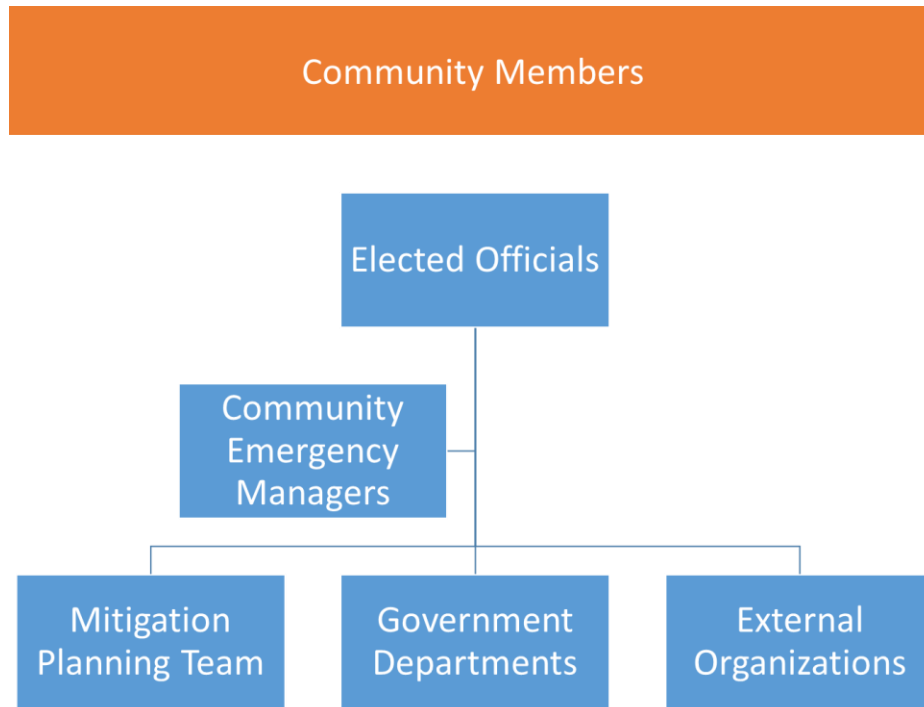


Figure 2: Organization of the Washoe County Multi-Jurisdiction Mitigation Program

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 2025 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 2025 Plan

The 2025 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 (including Appendix F, which contains redacted dam failure inundation maps that are available upon request from the Washoe County Office of Emergency Management). They are in a separate volume.

What’s New in the 2025 Update?



FEMA

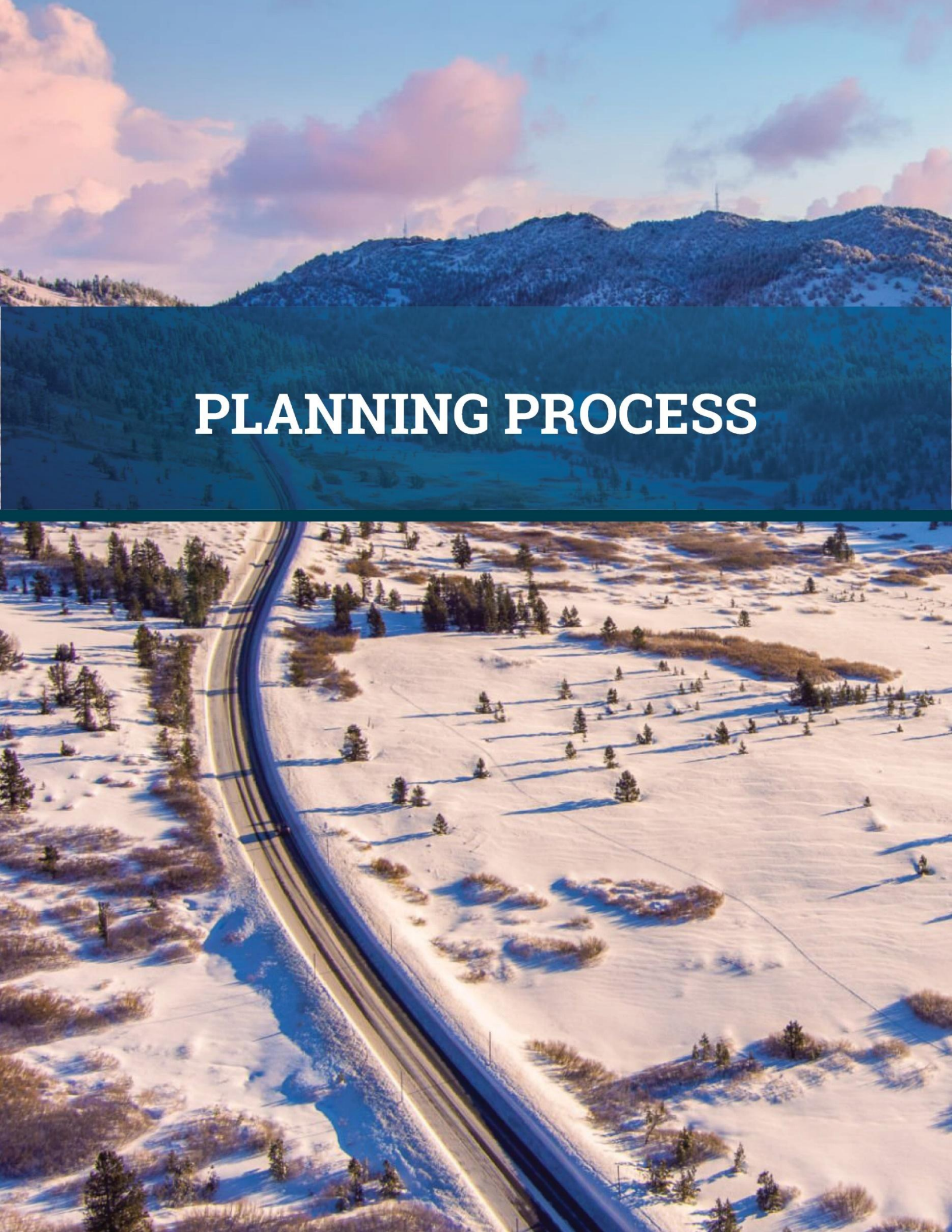
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))

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 2020HMP was the basis for the 2025 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 2025 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.

An aerial photograph of a winter landscape. In the foreground, a two-lane road curves through a snow-covered field dotted with small evergreen trees. In the background, a range of snow-capped mountains is visible under a sky with soft, pinkish clouds. A semi-transparent blue banner is overlaid across the middle of the image, containing the text 'PLANNING PROCESS' in white, bold, sans-serif capital letters.

PLANNING PROCESS

Planning Process

	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?
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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, which will be applied to the 2025 update.
- 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, which will be applied to the 2025 update.
- 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 2025. 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 2 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 2: 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 3 is the schedule of planning team meetings.

Table 3: 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 4 lists the people who attended MPT meetings.

Table 4: 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 5 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 5: Stakeholders in the Planning Process

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

Stakeholder	Type of Stakeholder
American Red Cross	Local and regional agencies involved in hazard mitigation activities
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 6 lists those additional stakeholders.

Table 6: 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 with and/or provide support to underserved communities and socially vulnerable populations

Stakeholder	Type of Stakeholder
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
Humboldt 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
Nevada Care Connection	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
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 with and/or provide support to underserved communities and socially vulnerable populations

Stakeholder	Type of Stakeholder
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
Truckee Meadows Community College – Emergency Management	Representatives of businesses, academia, and other private organizations

Stakeholder	Type of Stakeholder
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
Reno + Sparks Chamber of Commerce	Representatives of businesses, academia, and other private organizations

Stakeholder	Type of Stakeholder
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 Sheriff'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
- Wildland Fire – Reno Fire Department Fire Marshal John Beck

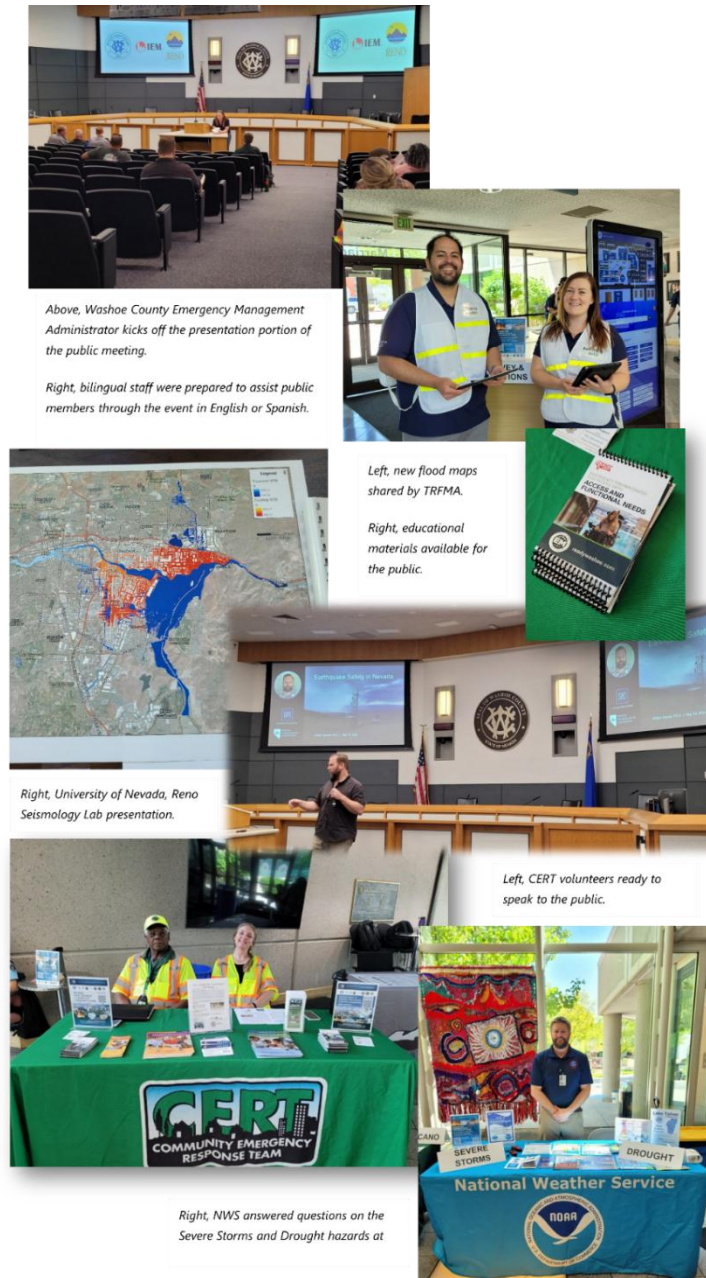


Figure 3: Photos from the Public Meeting

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 7, many of which occurred concurrently. Table 7 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 7: 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	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.
	Task 2 – Build the Planning Team		
	Task 3 – Create an Outreach Strategy		
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.

Washoe RHMP Update Development Milestones	Corresponding FEMA Recommended Mitigation Planning Task	Timeline	Updates Made
Capability Assessment	Task 4 – Review Community Capabilities	May 2024	Each participant reviewed and updated their current mitigation capabilities. 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 8 lists various characteristics of the population of Washoe County and of Nevada as a whole.¹

Table 8: 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%
American Indian, Alaskan Native	2.3%	1.7%

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
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 9 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 9: Washoe County Population Growth⁴

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 United 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>

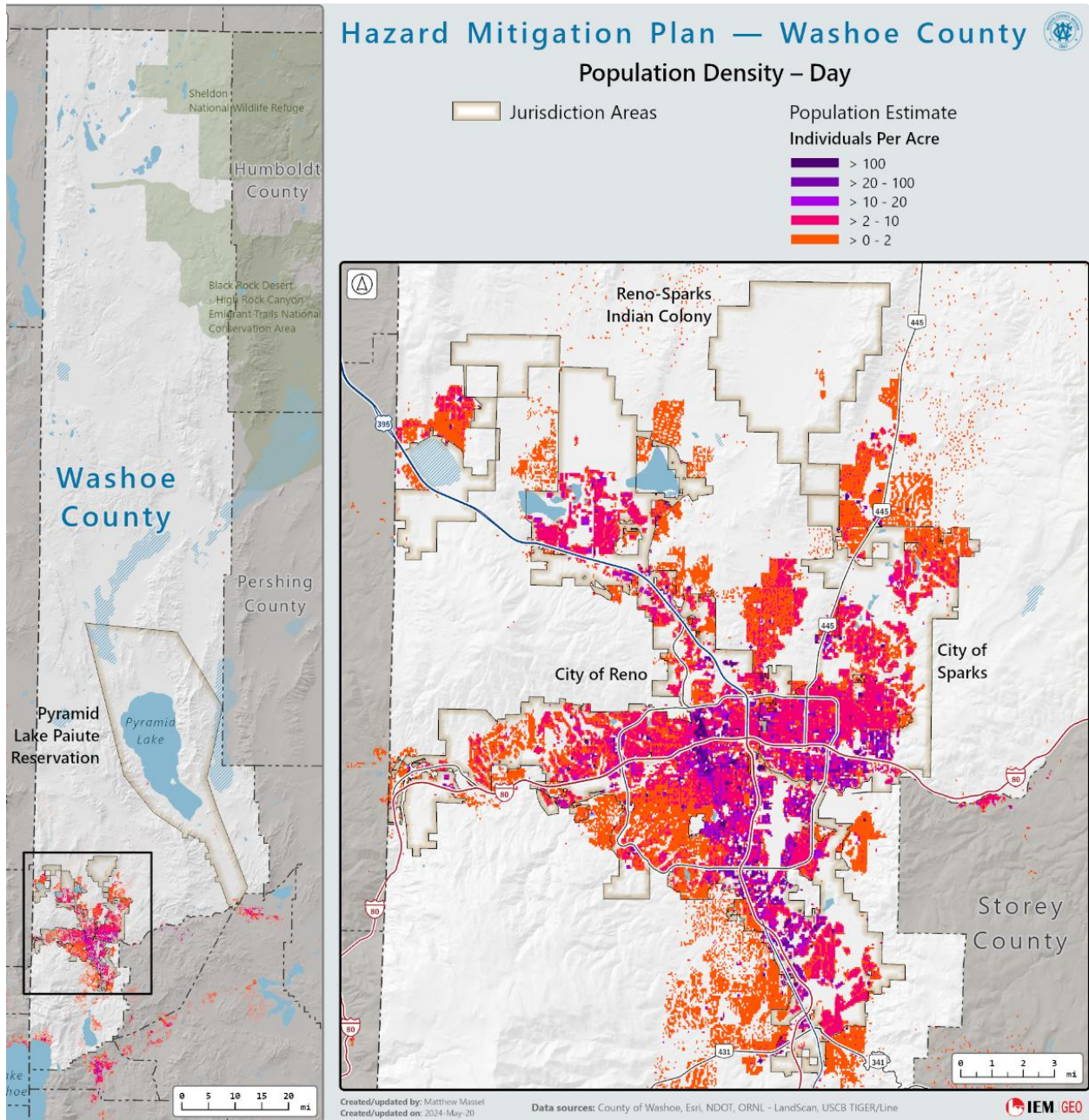


Figure 4: Washoe County Daytime Population Density

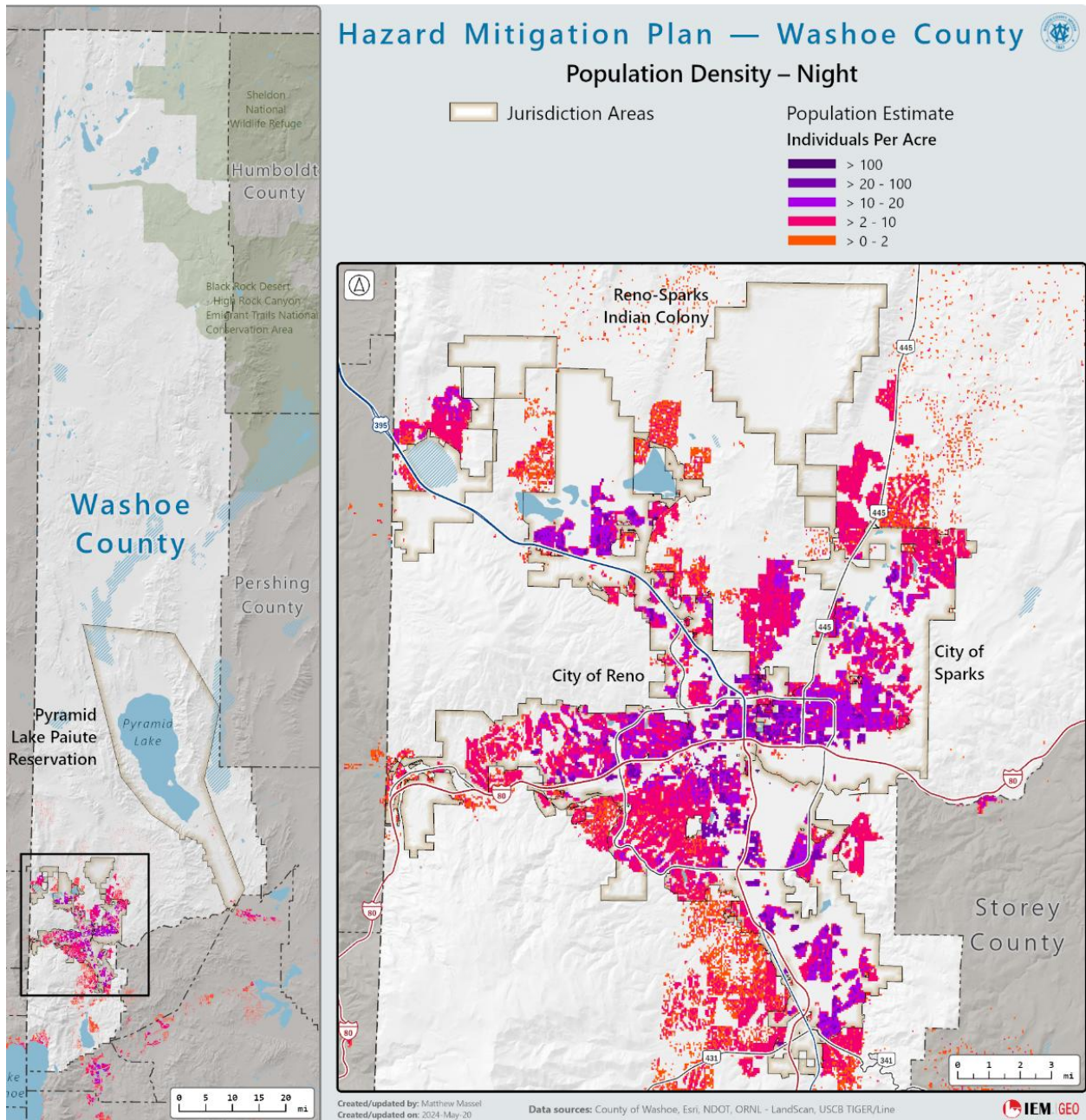


Figure 5: Washoe County Nighttime Population Density Map

Economy

Economic indicators show growth and an income increase from 2018 to 2022. Table 10 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.

Table 10: 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 11 shows the current and projected Employment Composition Totals from 2022 to 2042.

Table 11: Projected Employment Composition Totals, 2022–2042⁹

Industry Group	2022 Jobs	2042 Estimated Jobs	Percentage Growth, 2022–2042
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%

⁷ Oak Ridge National Laboratory LandScan. <https://www.ornl.gov/project/landscan>

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
Transportation, Communication, and Public Utilities	24,622	30,425	24%
Wholesale Trade	11,058	10,960	-0.9%
Totals	316,833	392,609	21.36%

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 farms¹¹ (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 Developmenthttps://goed.nv.gov/wp-content/uploads/2024/04/Washoe.pdf](https://goed.nv.gov/wp-content/uploads/2024/04/Washoe.pdf)

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 Statement¹⁸

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 Wildlife

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](https://www.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 12, 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 12: Federal Land Management²⁰

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 was 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.

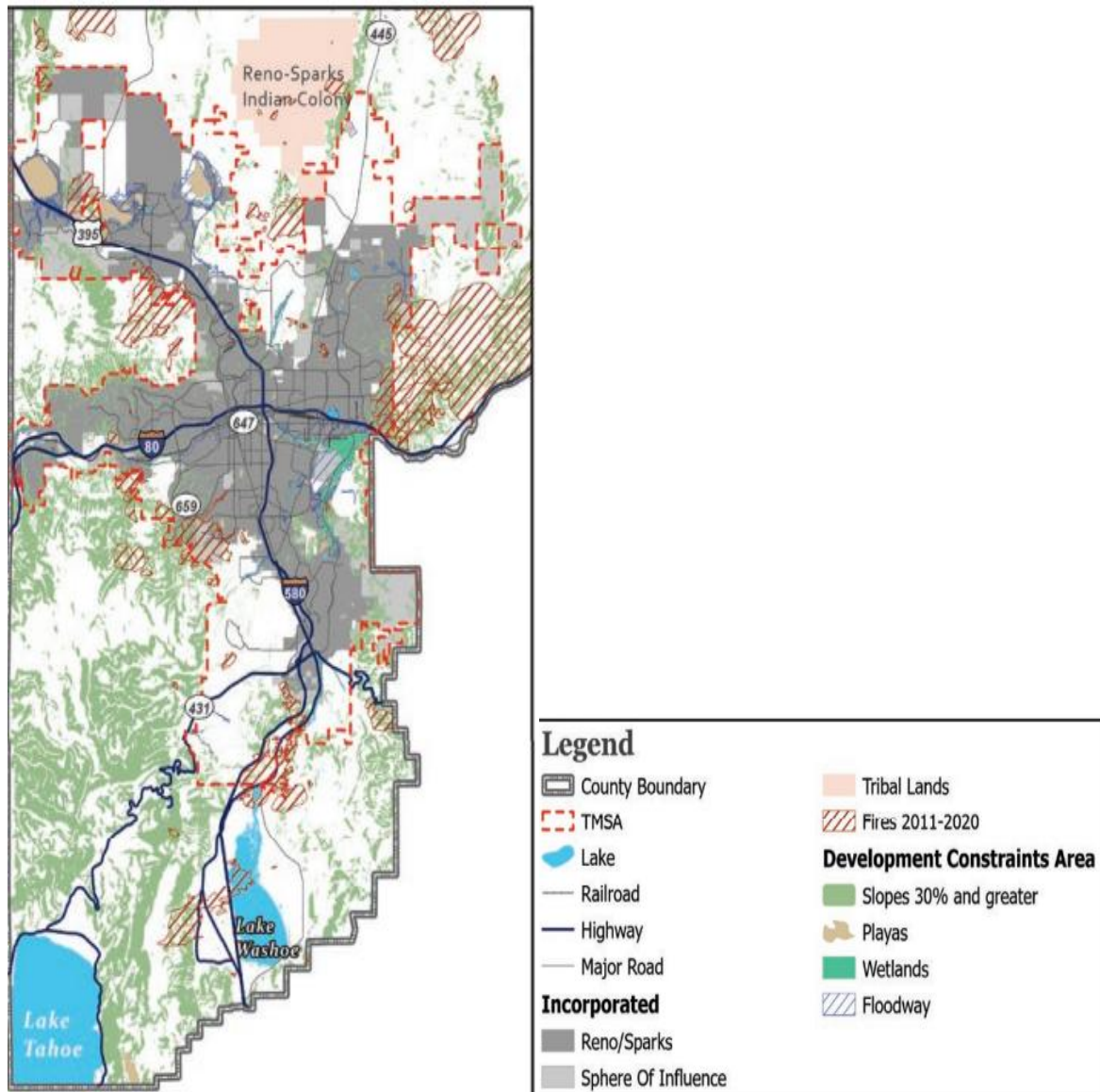


Figure 7: Development Constraints on Washoe County²⁴

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 486,492²⁶ 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 Ride²⁸ 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 13 provides NDOT Average Annual Daily Traffic (AADT) data for Washoe County from 2021, accounting for every type of vehicle.

Table 13: Average Vehicle Miles Traveled by Functional Class, Washoe County, 2021³¹

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

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

Disaster Declarations

The County has received 48 disaster declarations (including major disaster, emergency, and fire management assistance declarations) since 1965, including 15 since the previous 2020 RHMP update.

Table 14 identifies these declarations.

Table 14: FEMA Disasters and Declarations³³

Disaster Number	Individual Assistance Program	Public Assistance Program	Declaration Date	Title
FM-5602	No	Yes	08/2/2025	Peavine Fire
FM-5586	No	Yes	06/10/2025	Marie Fire
FM-5546	No	Yes	11/11/2024	Callahan Fire
FM-5533	No	Yes	09/7/2024	Davis Fire
FM-5530	No	Yes	08/12/2024	Gold Ranch Fire
FM-5495	No	Yes	06/12/2024	Sullivan Fire
FM-5494	No	Yes	06/11/2024	Trail Fire
FM-5448	No	Yes	08/14/2022	Joy Lake Fire
FM-5382	No	Yes	11/17/2020	Pinehaven Fire
FM-5328	No	Yes	08/15/2020	Loyalton Fire
FM-5326	No	Yes	08/03/2020	North Fire
FM-5322	No	Yes	07/21/2020	Rockfarm Fire
FM-5316	No	Yes	06/27/2020	Poeville Road Fire
DR-4523	Yes	No	04/04/2020	Covid 19 Pandemic
EM-3443	No	No	03/13/2020	Biological (COVID-19)
FM-5291	No	Yes	08/24/2019	Long Valley Fire
FM-5283	No	Yes	07/13/2019	Jasper Fire
FM-5190	No	Yes	07/14/2017	Cold Springs 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=II&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
DR-4307	No	Yes	3/27/2017	Severe Winter Storm, Flooding, and Mud
DR-4303	No	Yes	02/17/2017	Severe Winter Storms, Flooding (including closed-basin flooding), and Mudslides
FM-5156	No	Yes	02/17/2017	Severe Winter Storms, Flooding (including closed-basin flooding), and Mudslides
FM-5141	No	Yes	07/31/2016	Nevada Virginia Mountains Fire Complex
FM-5138	No	Yes	07/19/2016	Nevada Rock Fire
FM-2974	No	Yes	01/19/2012	Washoe Fire
FM-2973	No	Yes	11/18/2011	Caughlin Fire
FM-2822	No	Yes	07/17/2009	Red Rock Fire
FM-2713	No	Yes	07/16/2007	Hawken Fire
FM-2709	No	Yes	07/08/2007	Hungry Valley Fire
FM-2704	No	Yes	07/06/2007	Red Rock Fire
FM-2679	No	Yes	11/11/2006	Pinehaven Fire
FM-2664	No	Yes	08/12/2006	Verdi Fire
FM-2649	No	Yes	06/27/2006	Oregon Fire
DR-1629	No	Yes	02/03/2006	Extreme Weather and Flooding (including closed-basin flooding)
EM-3243	No	Yes	09/13/2005	Hurricane Katrina Evacuation
EM-3204	No	Yes	02/23/2005	Snow
EM-3202	No	Yes	02/17/2005	Record and/or Near Record Snow
FM-2550	No	Yes	08/25/2004	Andrew Wildfire
FM-2531	No	Yes	007/14/2004	Waterfall Fire
FM-2524	No	Yes	6/30/2004	Verdi Fire Complex
FM-2479	No	Yes	07/15/2003	NV-Robb Wildfire-7-14-2003
FM-2476	No	Yes	007/11/2003	NV-Red Rock Fire 7-11-03
FM-2371	No	Yes	08/09/2001	NV – Antelope Fire – 08/09/2001
FM-2316	No	Yes	08/01/2000	NV – Arrowcreek Fire
FM-2312	No	Yes	06/30/2000	Reno Fire Complex

Disaster Number	Individual Assistance Program	Public Assistance Program	Declaration Date	Title
FM-2265	No	Yes	07/03/1999	Mira Loma Fire
DR-1153	Yes	Yes	01/03/1997	Extreme Weather, Flooding (including closed-basin flooding), Mud and Landslides
DR-759	No	Yes	02/28/1986	Extreme Weather and Flooding (including closed-basin flooding)
DR-187	Yes	Yes	01/18/1965	Extreme Weather, Heavy Rains, and Flooding (including closed-basin flooding)

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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 15 lists the hazards addressed in this plan.

Table 15: 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

CALCULATED PRIORITY RISK INDEX

Table 16 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 16.

Table 16: 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	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
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.	

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

Risk Factor Equation

$$\text{RF Value} = [(\text{Probability} \times .30) + (\text{Magnitude} \times .30) + (\text{Onset} \times .10) + (\text{Duration} \times .10) + (\text{Frequency} \times .20)]$$

Table 17 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. Hazards with a risk factor value greater than or equal to 2.5 and up to 4.0 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. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 17: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

Table 18 applies the CPRI classification system to hazard events in Washoe County.

Table 18: Calculated Priority Risk Index for Hazards in Washoe County

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

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Radiological Waste Transport	3	3	4	3	3	3.1	High
Transportation Incident	3	4	4	3	3	3.4	High
Volcano	1	3	3	4	1	2.1	Medium
Wildland Fire	4	4	4	3	4	3.9	High

NATIONAL RISK INDEX

In addition to the locally calculated CPRI, the Federal Emergency Management Agency's (FEMA's) National Risk Index (NRI) was utilized to determine the combined risk for all natural hazards profiled by the county including avalanche, landslide, drought, earthquake, strong wind, winter storms, extreme heat, flood, volcanic activity, and wildland fire. For each natural hazard profiled in this plan, the vulnerability assessment incorporates three indicators—historic loss ratios, expected annual losses, and overall risk—to help illustrate the degree of risk faced by Washoe County. The NRI calculates expected annual loss and overall risk using the following equations:

Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio

Overall Risk Index = Expected Annual Loss x Social Vulnerability / Community Resilience

The NRI is limited in scope to 18 natural hazards and does not provide data or information for man-made, technological, or human-caused threats. As a result, the NRI is not applied to the evaluation of non-natural hazards.

Regional Hazard Ranking

The Regional Calculated Priority Risk Index (CPRI) in Table 19 shows the regional hazard risk ranking for the 13 hazards profiled in this plan across all participating jurisdictions. To calculate these values, the local CPRI results from Washoe County, City of Reno, City of Sparks, North Lake Tahoe Fire Protection District, Truckee Meadows Fire Protection District, Truckee River Flood Management Authority, Pyramid Lake Paiute Reservation, and Reno-Sparks Indian Colony

were averaged for each variable (probability, magnitude, onset, duration, and frequency) and across all hazards. Using these averages, the Risk Factor Value was calculated and the Overall Risk was identified.

Table 19: Regional Calculated Priority Risk Index for Hazards in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Avalanche and Landslide	1.6	1.7	3.3	2.7	1.4	1.9	Low
Criminal Acts and Terrorism	2.5	1.9	3.7	2.1	2.7	2.5	High
Drought	3.0	1.5	1.4	3.7	2.3	2.3	Medium
Earthquake	3.2	2.9	3.1	3.6	2.0	2.9	High
Energy Emergency	3.1	2.0	3.7	2.3	3.1	2.8	High
Flood	2.8	2.0	2.4	3.3	2.9	2.6	High
Hazardous Materials Incident	2.1	1.8	4.0	2.9	2.0	2.3	Medium
Infectious Disease	2.1	1.9	1.2	3.9	2.2	2.2	Medium
Radiological Waste Transport	2.1	2.7	3.6	3.3	1.5	2.4	Medium
Extreme Weather (Winter Storm, Windstorms, Extreme Heat)	3.5	1.7	1.2	3.3	3.4	2.7	High

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Transportation Incident	2.3	1.9	3.2	2.6	1.8	2.2	Medium
Volcano	1.2	1.9	2.2	3.7	1.0	1.7	Low
Wildland Fire	3.7	2.5	3.4	3.3	3.4	3.2	High

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

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>.

adaptation in many cases includes broader strategies, such as studies and policy changes 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). Increases in winter precipitation also increase the risk for avalanche and landslide risks. Some communities that have currently ranked the hazards as a low risk are still planning to mitigate the hazards due to the expectation of increased risk in the future.

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

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>

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 (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.

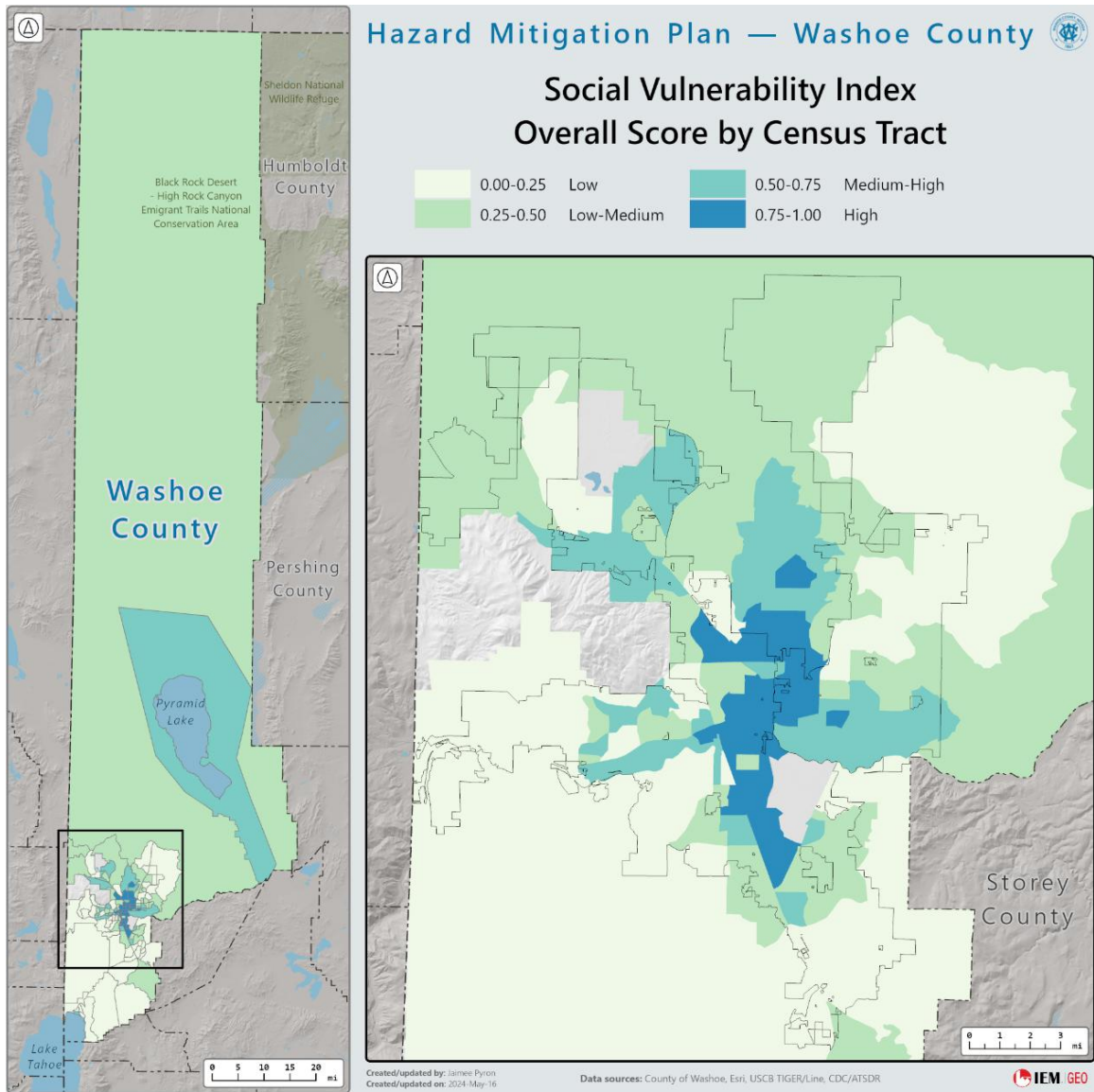


Figure 9: Washoe County Social Vulnerability Index Map

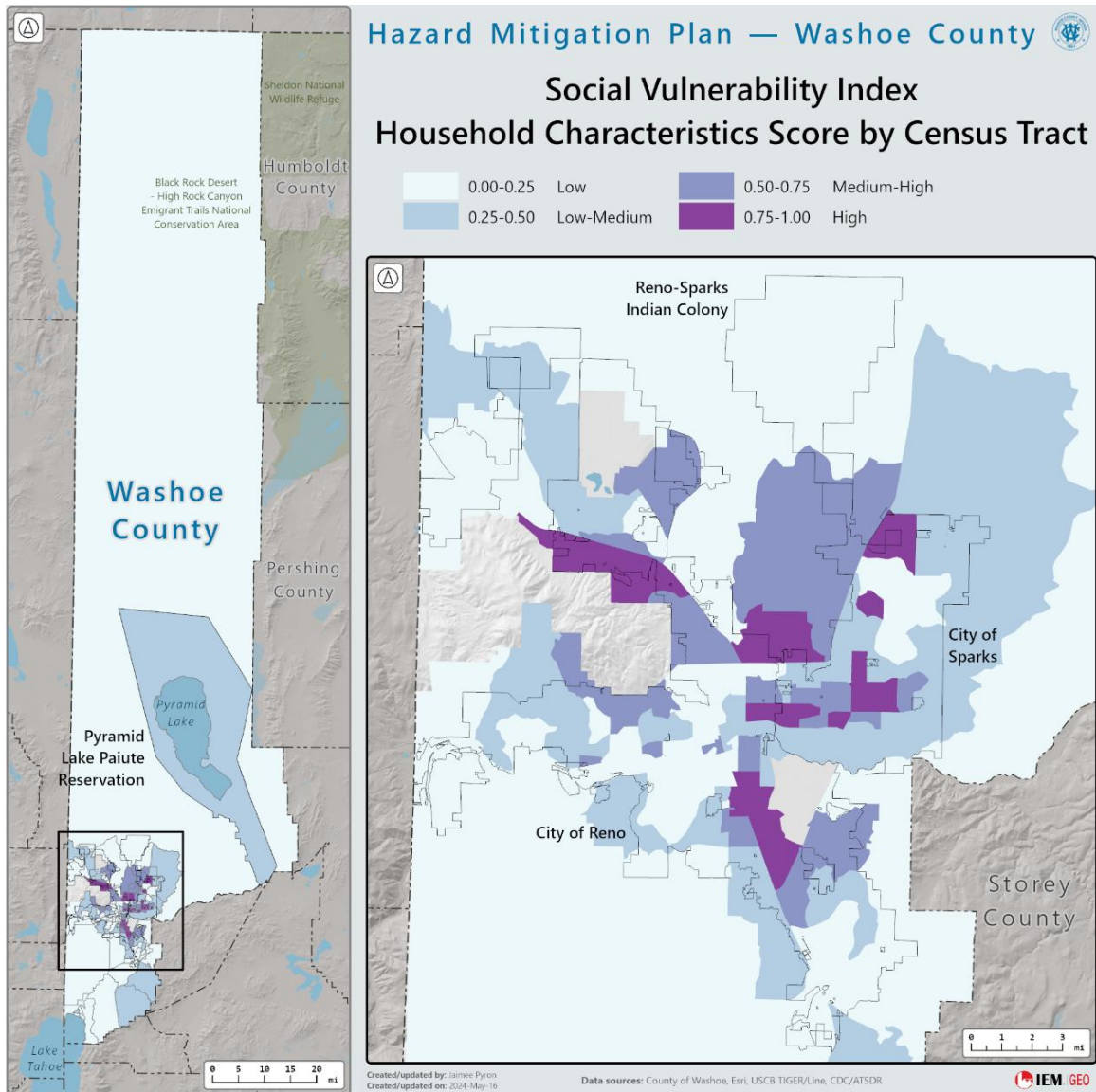


Figure 10: Washoe County Social Vulnerability Index Household Characteristics Score

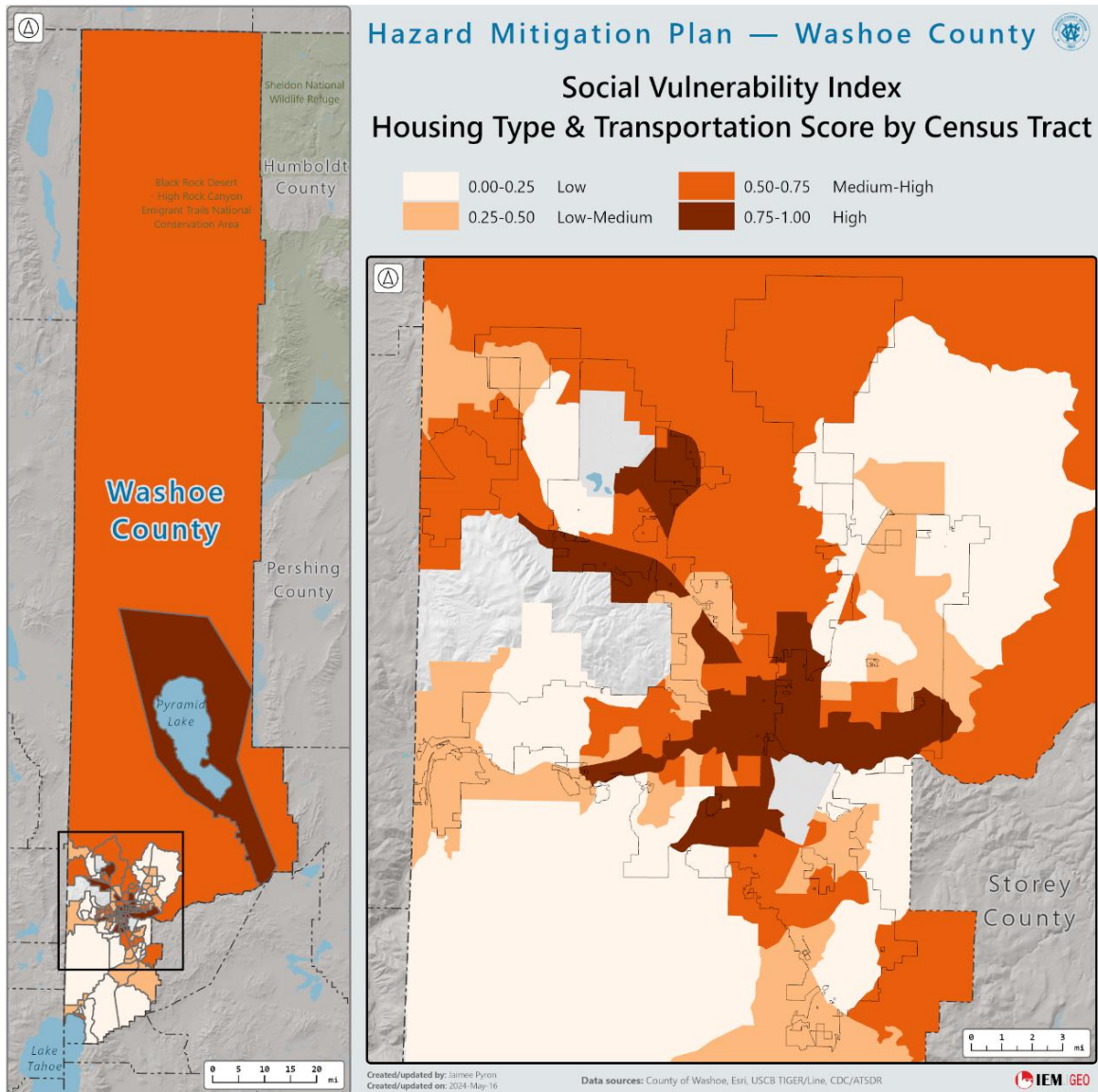


Figure 11: Washoe County Social Vulnerability Index Housing Type & Transportation Score

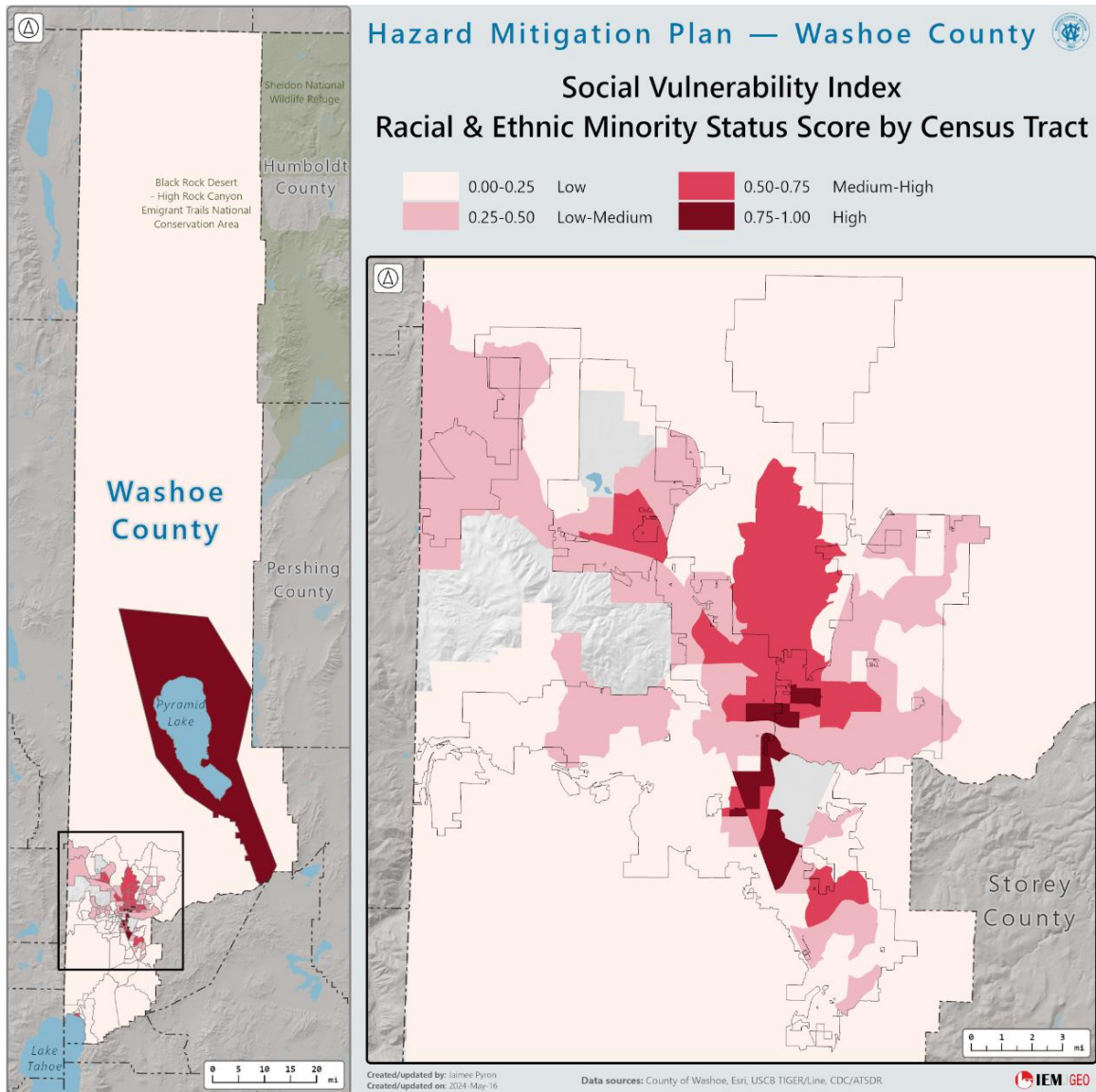


Figure 12: Washoe County Social Vulnerability Index Racial & Ethnic Minority Status Score

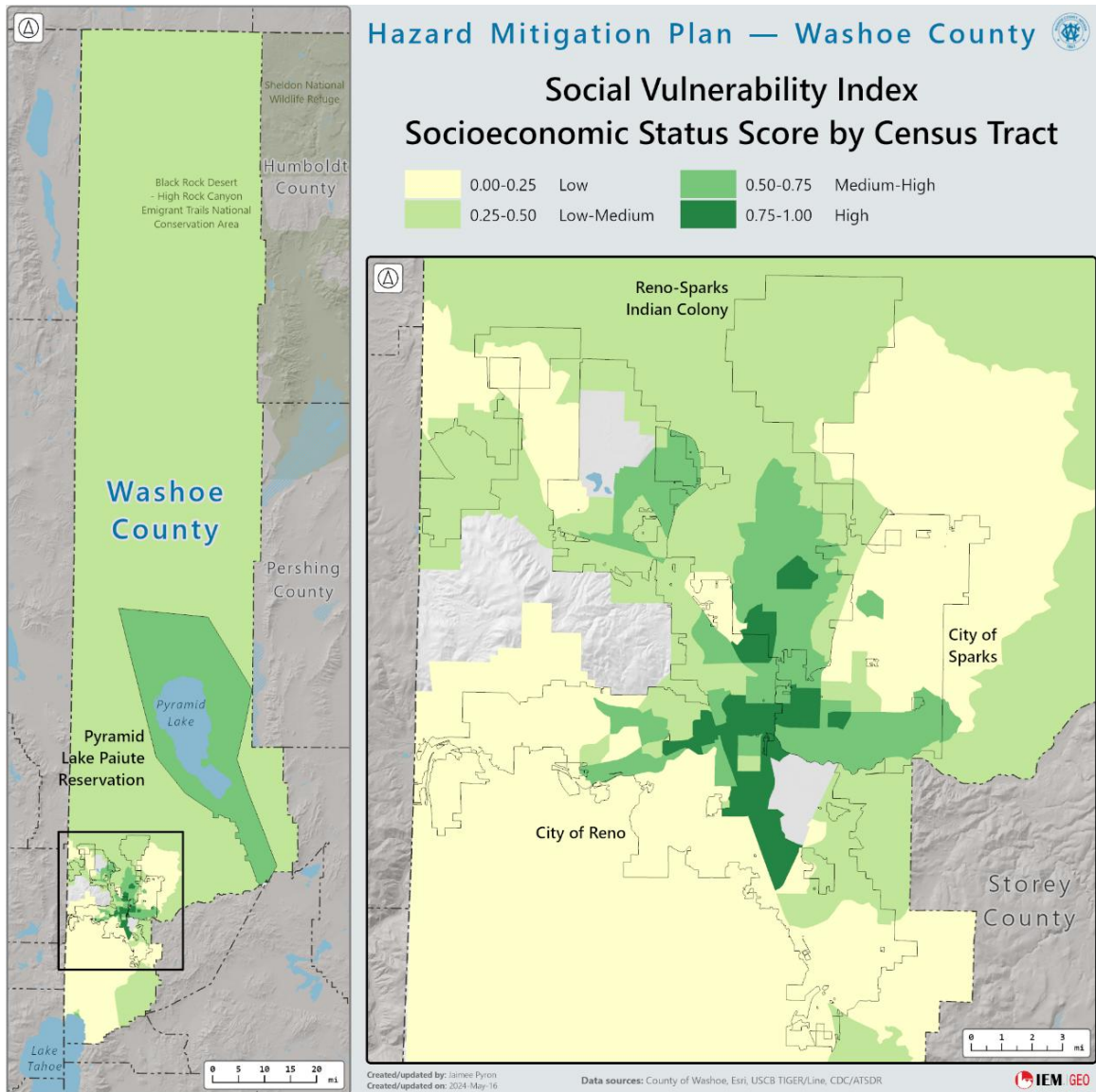


Figure 13: Washoe County Social Vulnerability Index Socioeconomic Status Score

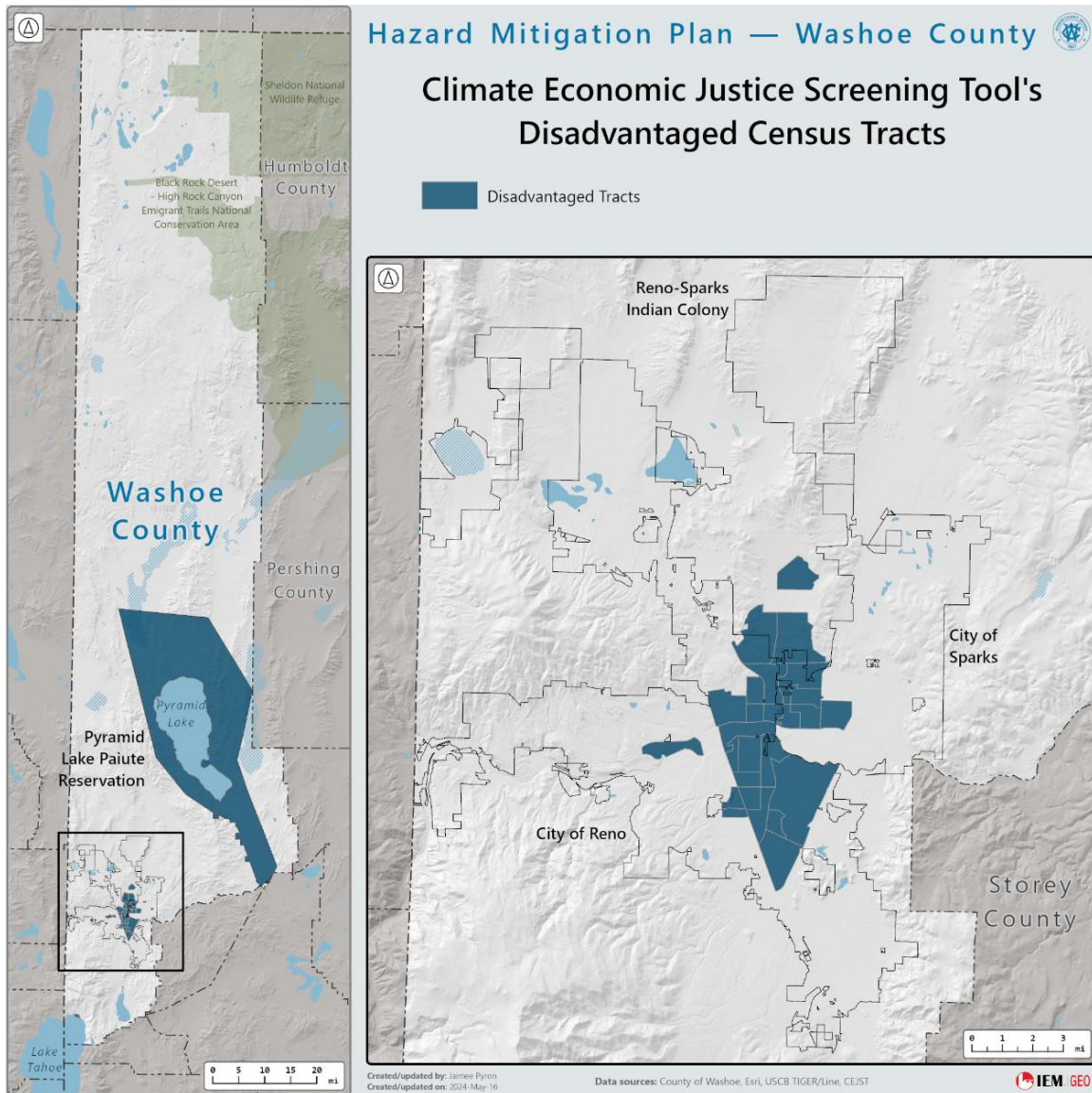


Figure 14: Washoe County CEJST Disadvantaged Census Tracts

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 15 (found in the Hazard Identification section of the plan's Hazard Ranking Methodology) 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. While high-risk areas are not countywide, efforts to inform residents across the entire county about risks and active events remain necessary. Residents of areas classified as low risk may travel into high-risk areas as part of their lifestyle, which makes avalanche awareness important for the whole county.

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.

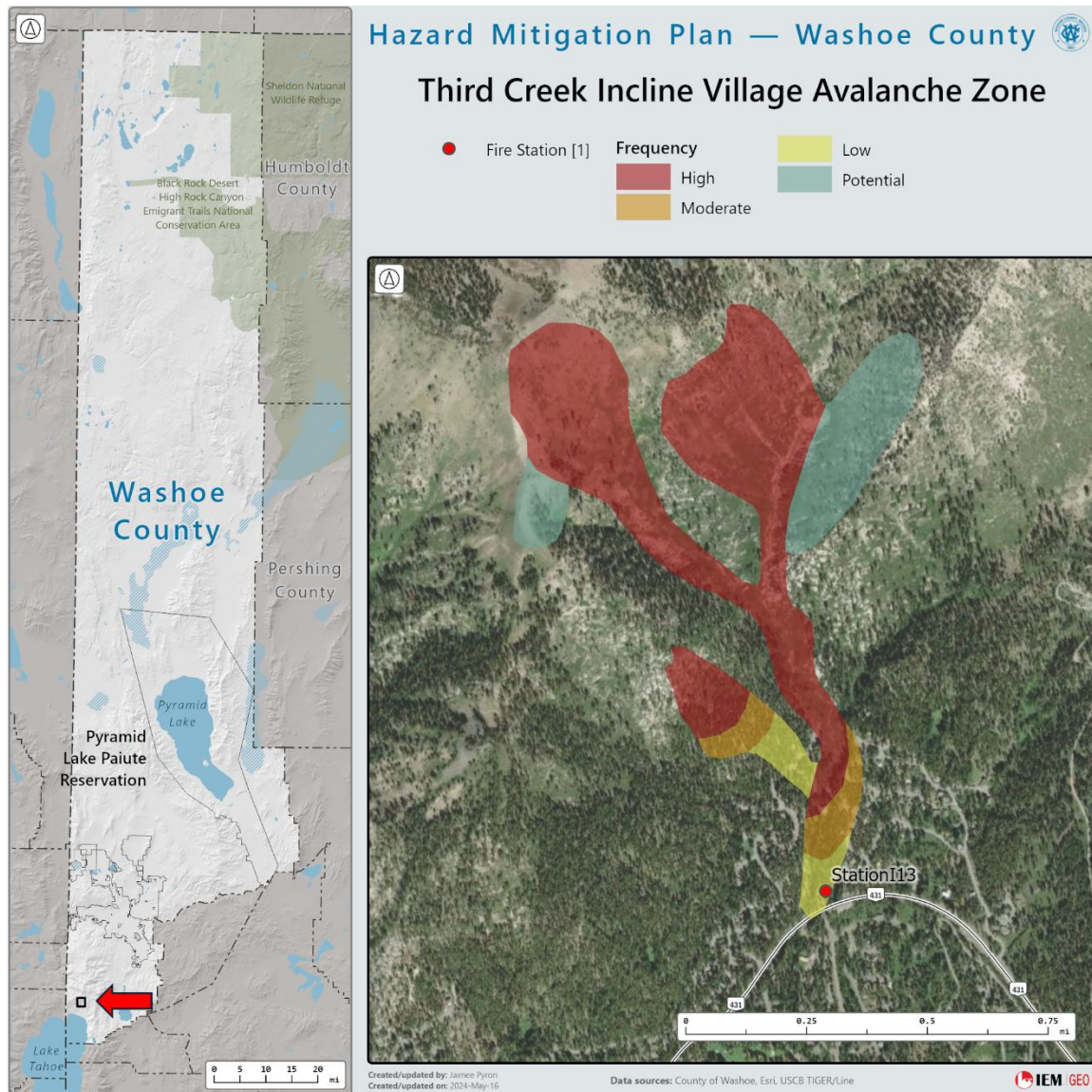


Figure 15: Third Creek Incline Village, Rose Knob Peak, and Mud Lake Avalanche Zone

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.

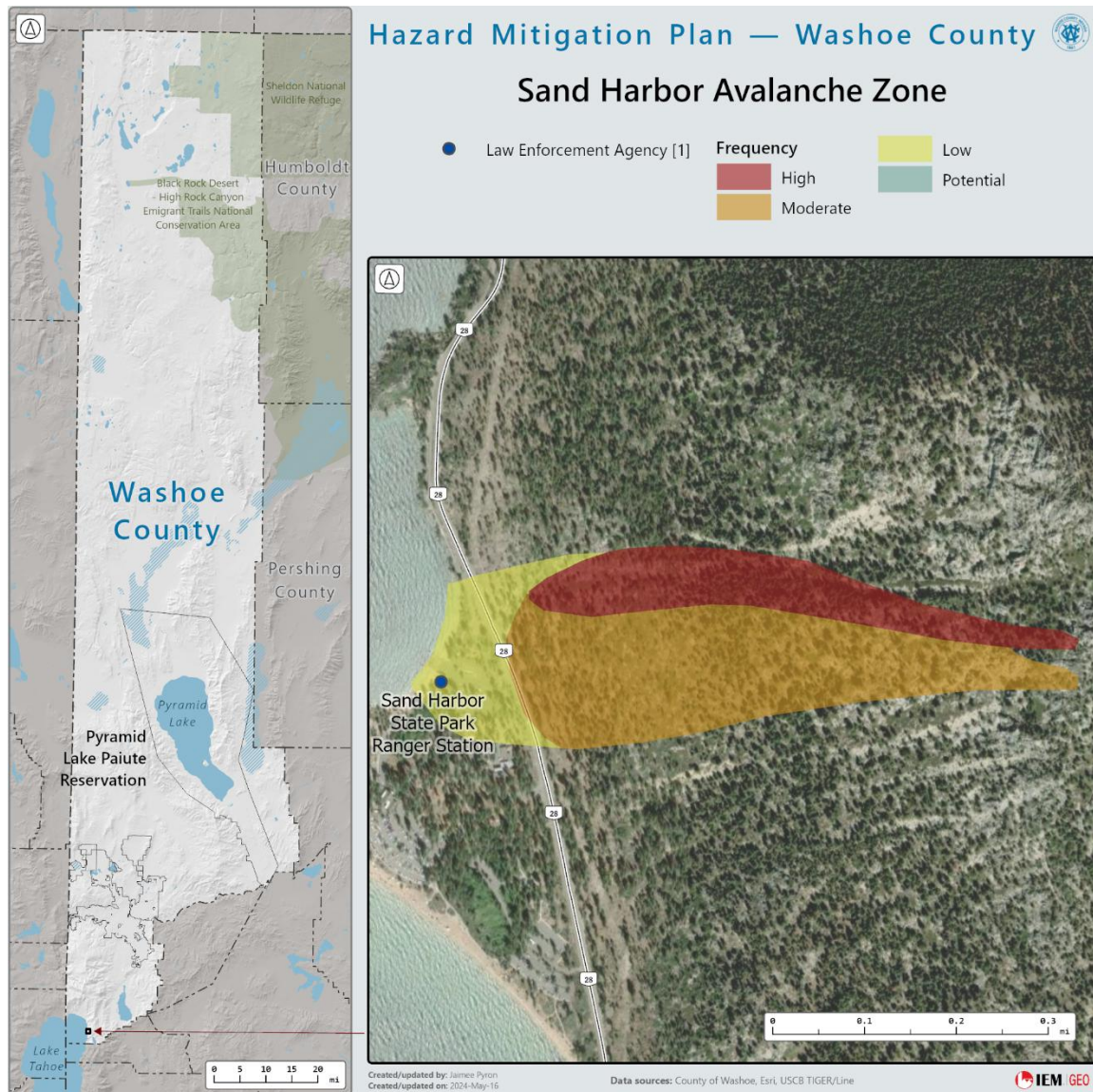


Figure 16: Sand Harbor Avalanche Zone

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.

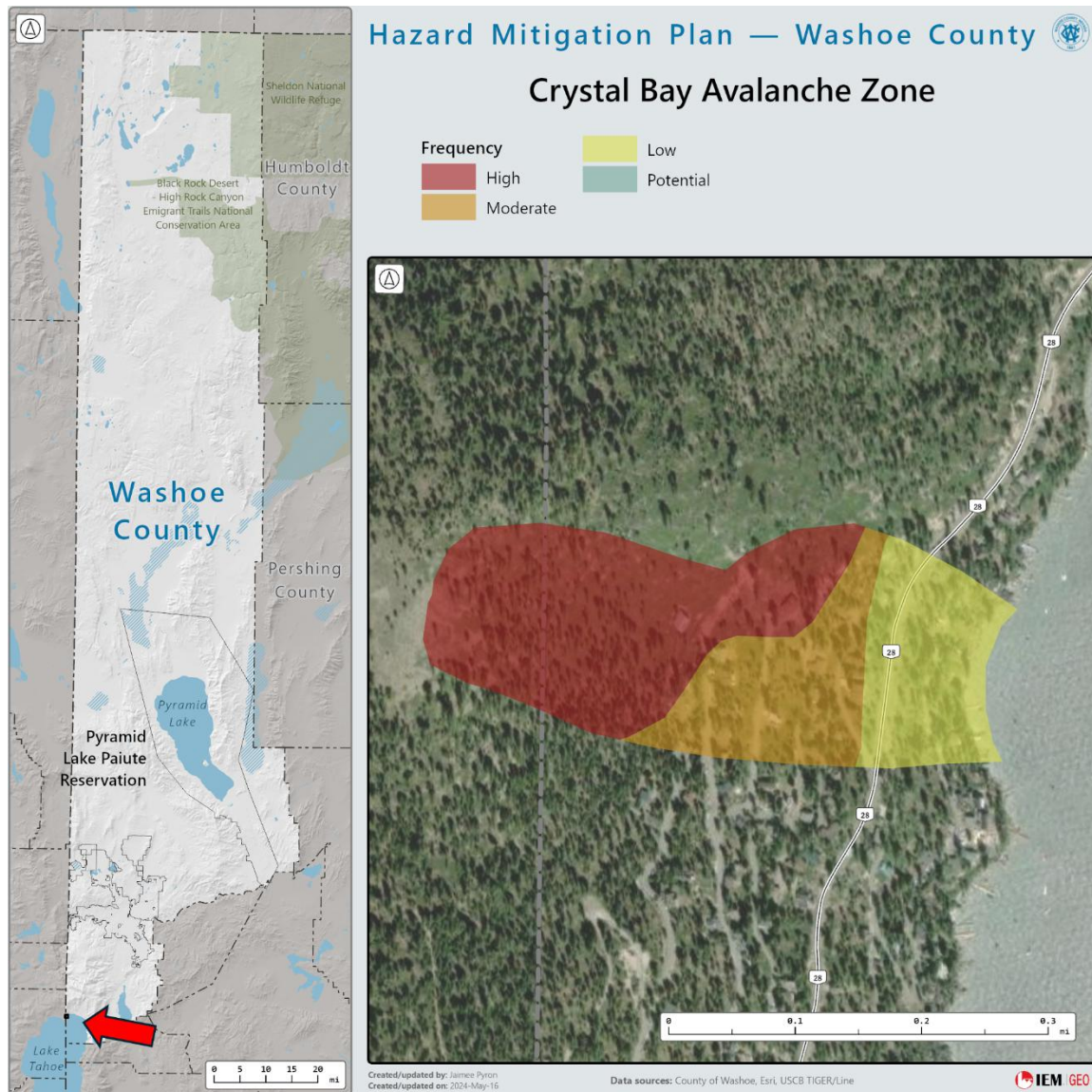


Figure 17: Crystal Bay Avalanche Zone

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.

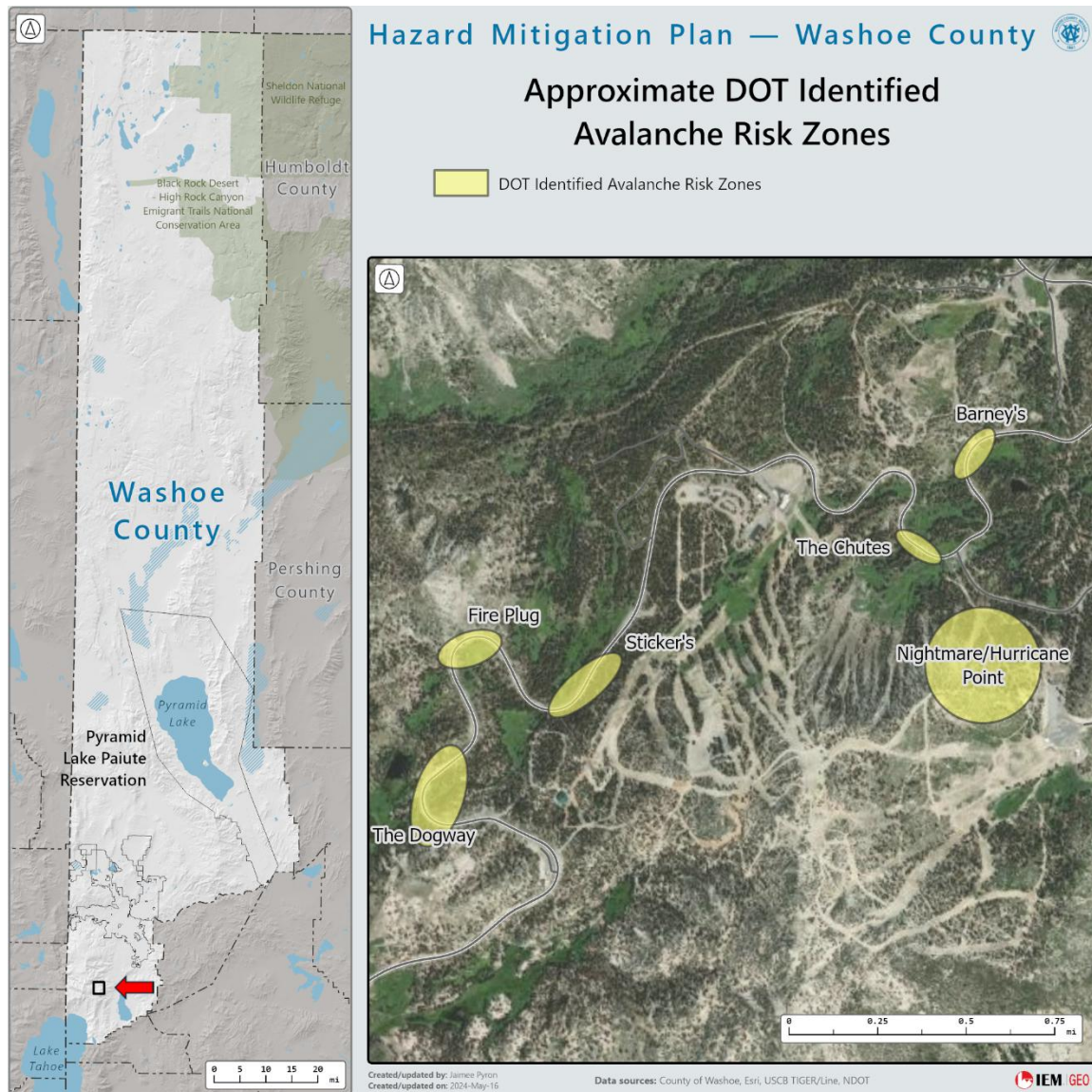


Figure 18: Approximate DOT Avalanche Risk Zones

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).

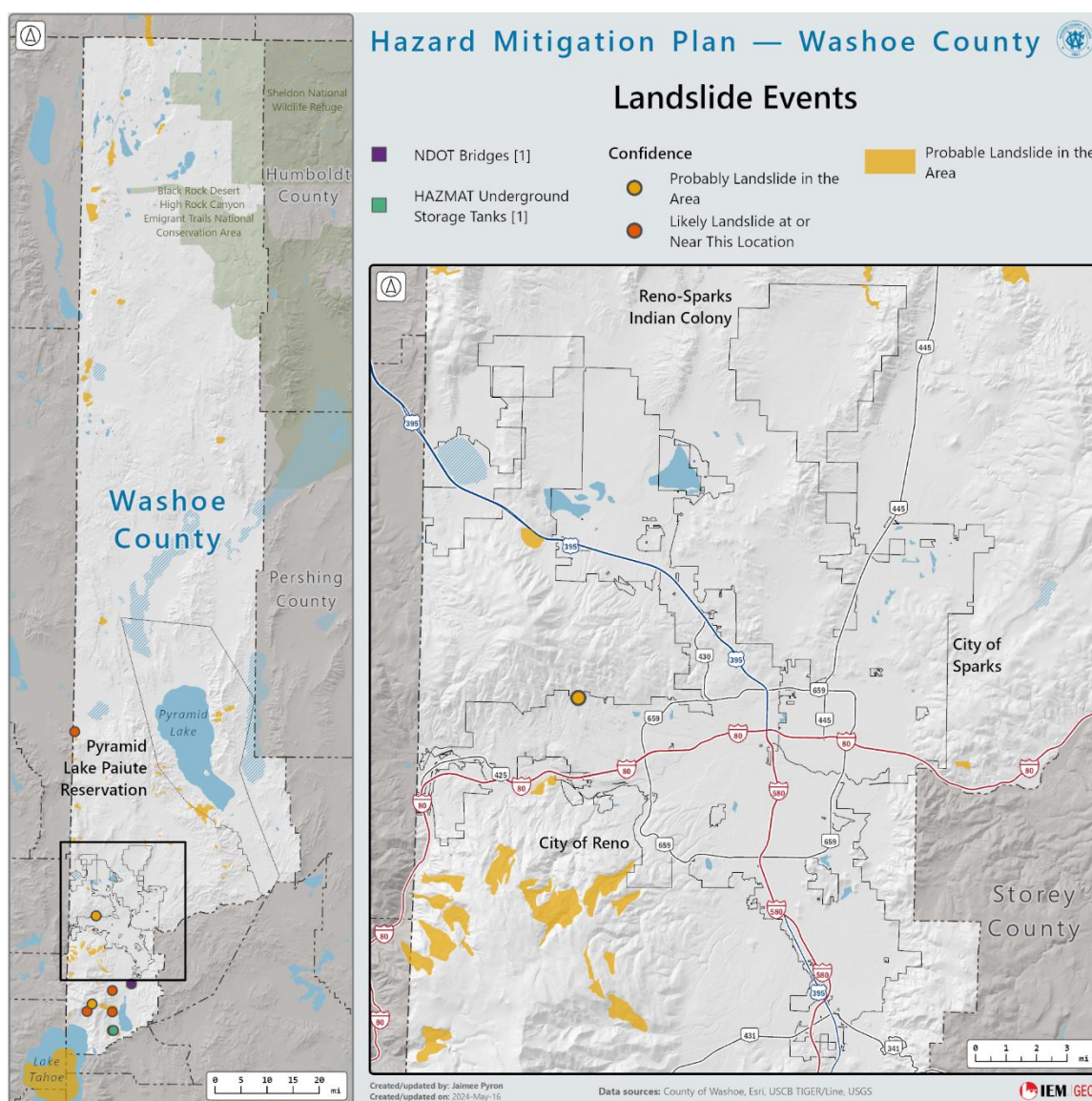


Figure 19: Landslide Hazard Areas in Washoe County

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 20). 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 20: 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 21 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, <http://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 21: 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. Table 22 lists notable landslide events in Washoe County.

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 (Figure 20). 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 22: 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, 1983⁴⁴

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/knowning-nevada/knowning-nevada-the-disaster-at-slide-mountain>

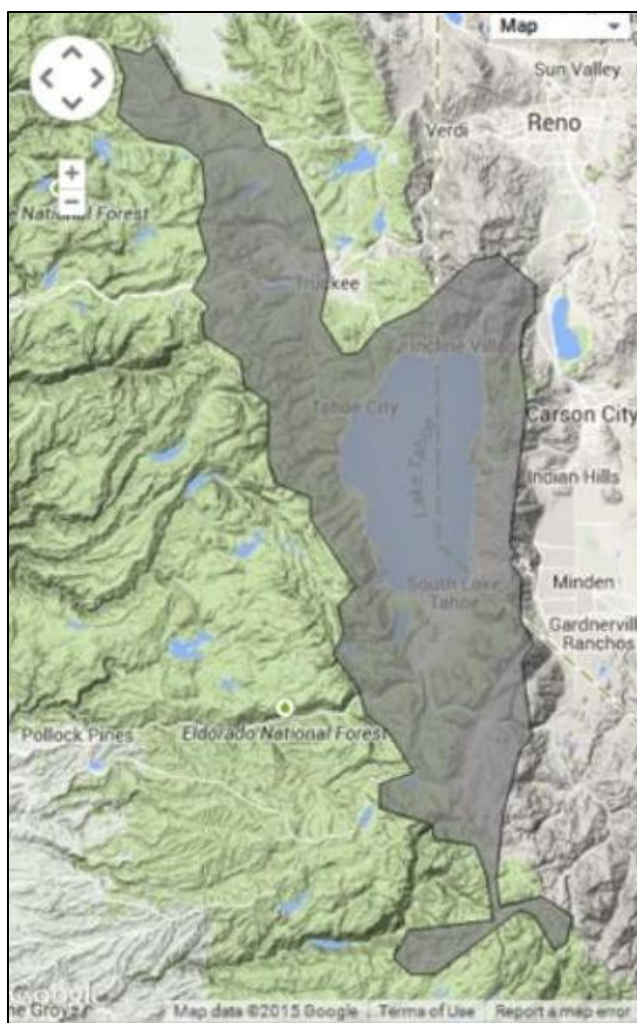


Figure 21: Map of Sierra Avalanche Center's Forecast Area⁴⁵

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.

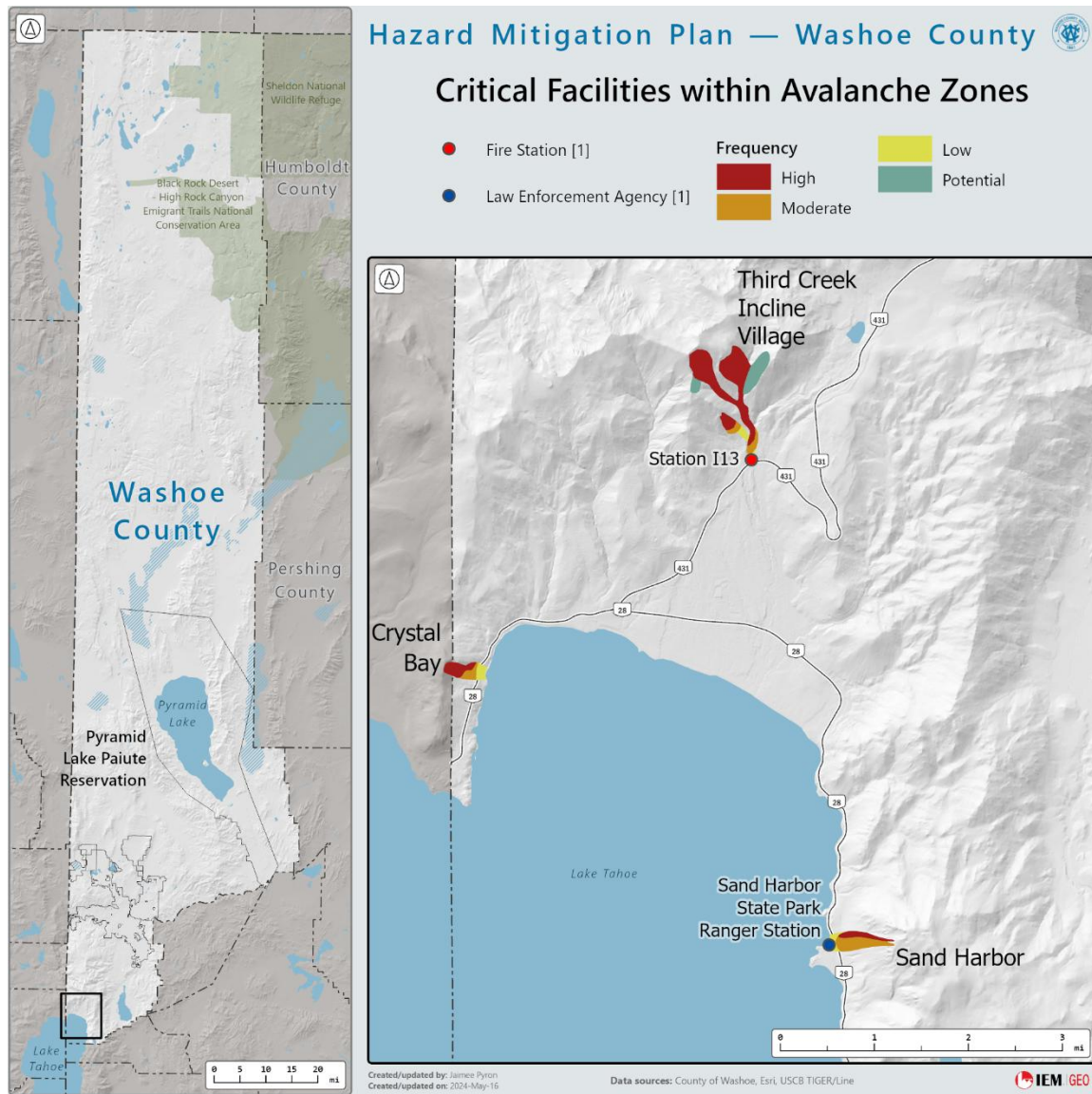


Figure 22: Critical Facilities in Avalanche Zones

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).

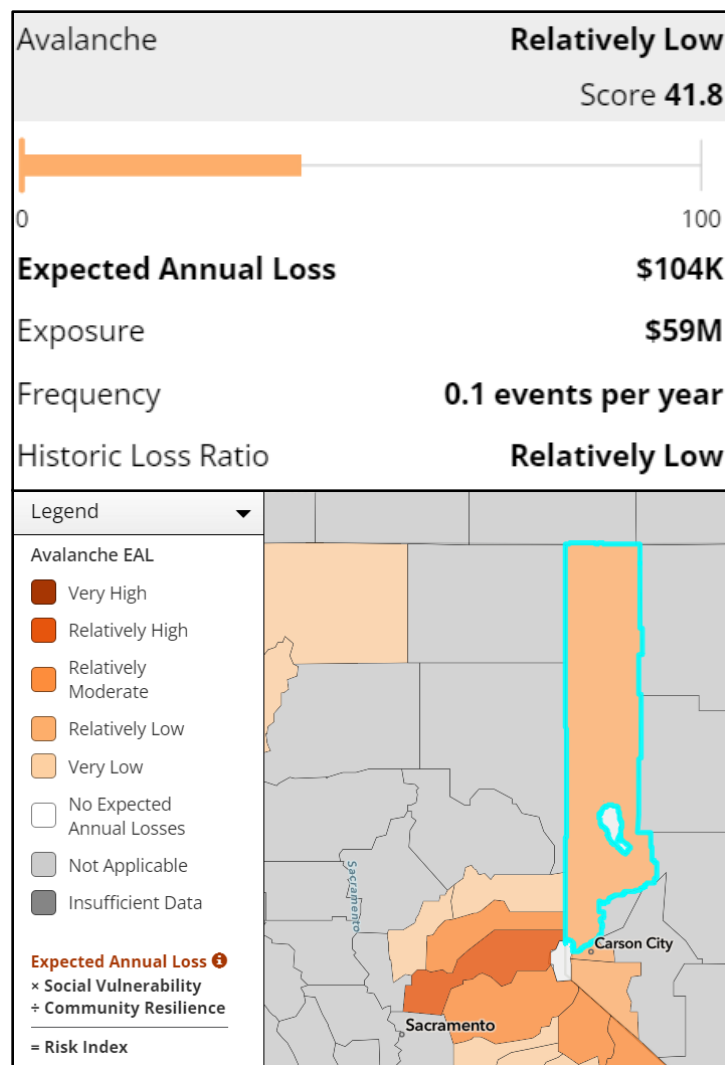


Figure 23: Washoe County Avalanche Expected Annual Loss Score, Map, and Legend⁵⁰

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

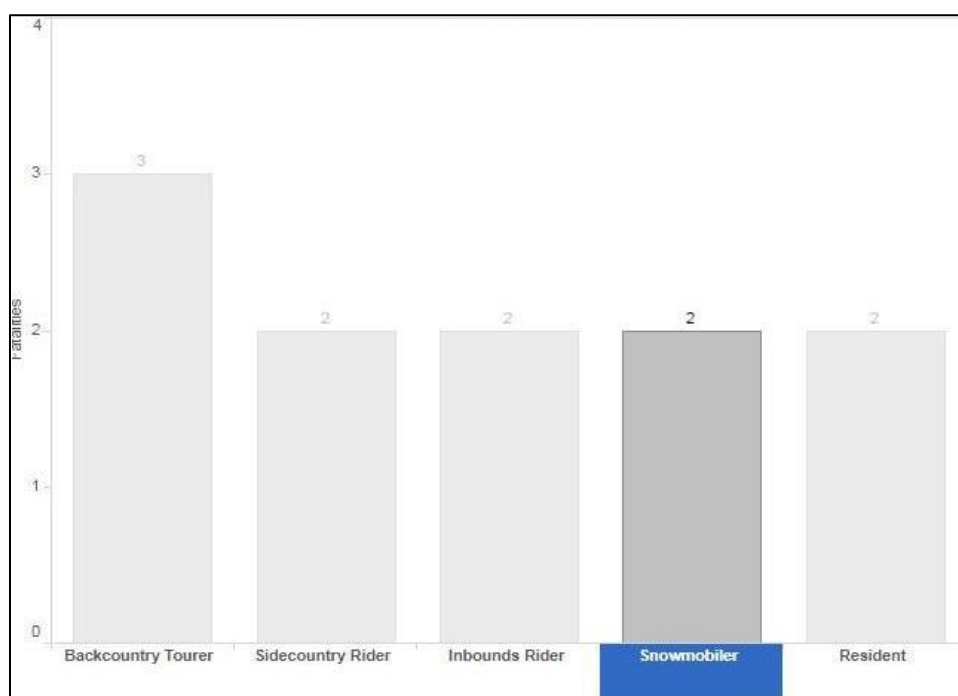


Figure 24: Avalanche Fatalities by Primary Activity in Nevada, 1951–2016

COMMUNITY LIFELINES

Community lifelines are essential systems that support public health and safety during disasters (see Figure 25). Avalanches present significant risks to safety and security, often striking

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>

suddenly. Emergency services must be prepared for rapid search and rescue operations, ensuring they have the resources to respond effectively to protect lives.



Figure 25: FEMA Community Lifelines

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

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 23 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 23: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

Table 24 provides the Calculated Priority Risk Index (CPRI) for Avalanche impact in Washoe County based on the current plan's hazard risk assessment results. Washoe County assigned Avalanche a risk factor value of 2.6, reflecting high magnitude, quick onset, and longer duration impacts. This risk factor value falls in the range of 2.5 to 4, which is considered a high-risk hazard. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 24: Calculated Priority Risk Index for Avalanche and Landslide in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Avalanche	2	3	4	3	2	2.6	High

NATIONAL RISK INDEX

The National Risk Index (NRI) contains national level data for 18 natural hazards including Avalanche. The index provides rankings for historical losses, expected annual loss, and overall risk at the county and census tract levels. Table 25 provides the NRI rankings for Avalanche in Washoe County. For this hazard, the NRI assigns scores of Relatively Low for Historical Losses, Relatively Low for Expected Annual Loss, and Very Low for Overall Risk on a scale ranging from Very Low to Very High.

Table 25: National Risk Index for Avalanche in Washoe County

Avalanche	Historical Losses	Expected Annual Loss	Overall Risk Score	Overall Risk
	Relatively Low	Relatively Low	35.1	Very Low

Based on the NRI, Washoe County has an Overall Risk value for Avalanche of Very Low compared to all other communities within the United States, with a score of **35.1** (see Figure 26).

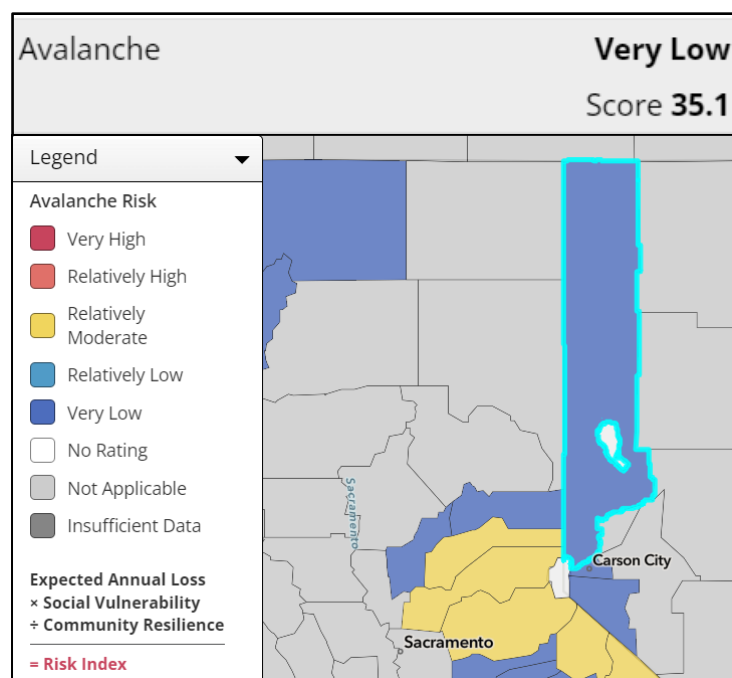


Figure 26: NRI Overall Risk Score for Avalanche in Washoe County⁵³

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 27).

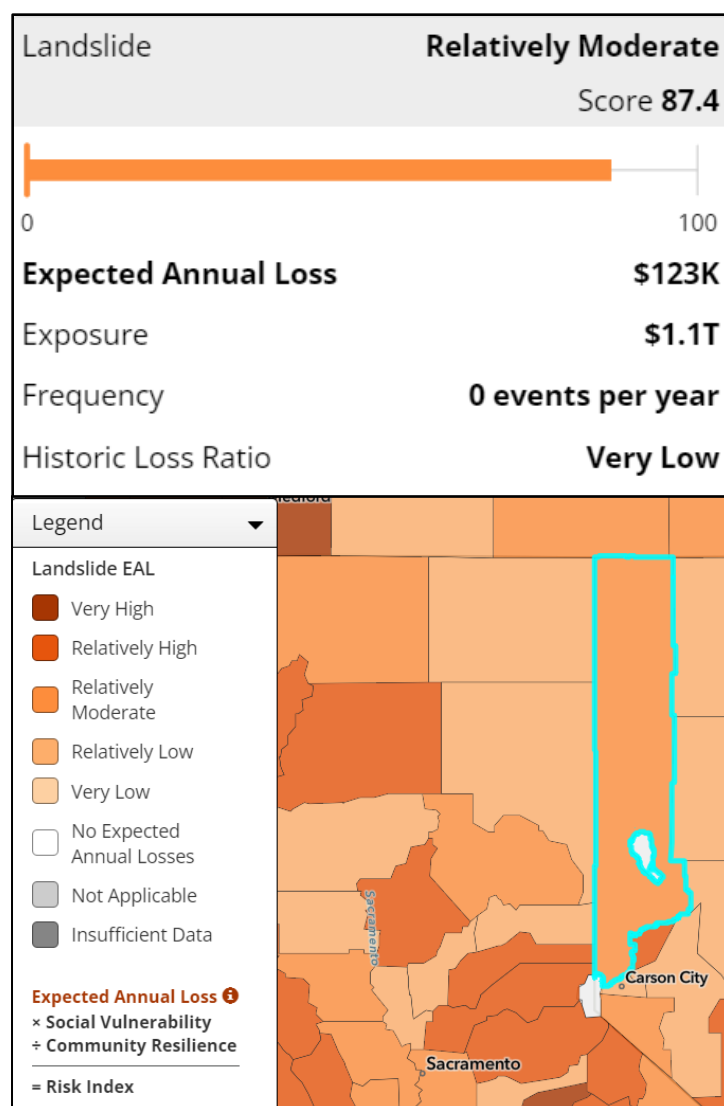


Figure 27: Washoe County Landslide Expected Annual Loss Score, Map, and Legend⁵⁴

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

Community lifelines are essential systems that support public health and safety during disasters (see Figure 28). 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.



Figure 28: FEMA Community Lifelines

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.

⁵⁵ U.S. Census Bureau Quick Facts.

<https://www.census.gov/quickfacts/fact/table/NV,US/PST045223>

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 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 County⁵⁶ 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

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/>

prone to landslides and avalanches. Consequently, the burgeoning population has significantly increased the vulnerability of both infrastructure and people compared to the previous plan.

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

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 26 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 26: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

Table 27 provides the Calculated Priority Risk Index (CPRI) for landslide impact in Washoe County based on the current plan's hazard risk assessment results. Washoe County assigned landslide a risk factor value of 2.6, reflecting high magnitude, quick onset, and longer duration impacts. This risk factor value falls in the range of 2.5 to 4, which is considered a high-risk hazard. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 27: Calculated Priority Risk Index for Avalanche and Landslide in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Landslide	2	3	4	3	2	2.6	High

NATIONAL RISK INDEX

The National Risk Index (NRI) contains national level data for 18 natural hazards including landslide. The index provides rankings for historical losses, expected annual loss, and overall risk at the county and census tract levels. Table 28 provides the NRI rankings for landslide in Washoe County. For this hazard, the NRI assigns scores of Very Low for Historical Losses, Relatively Moderate for Expected Annual Loss, and Relatively Moderate for Overall Risk on a scale ranging from Very Low to Very High.

Table 28: National Risk Index for Landslide in Washoe County

	Historical Losses	Expected Annual Loss	Overall Risk Score	Overall Risk
Landslide	Very Low	Relatively Moderate	83.6	Relatively Moderate

Based on the NRI, Washoe County has an Overall Risk value for landslide of Relatively Moderate compared to all other communities within the United States, with a score of 83.6 (see Figure 29).

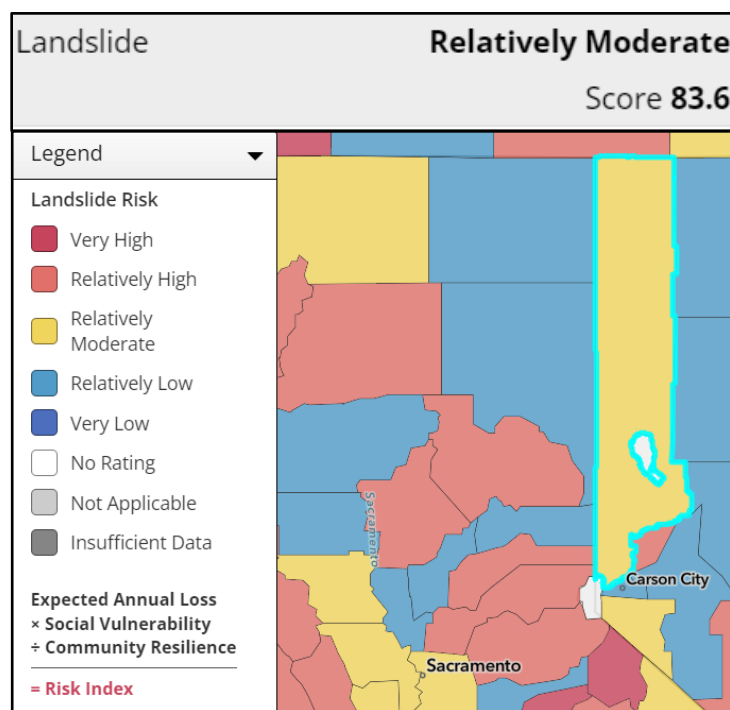


Figure 29: NRI Overall Risk Score for Landslide in Washoe County⁵⁷

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

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.

Table 29 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).

Table 29: Avalanche and Landslide Consequence Analysis

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 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

Subject	Ranking	Impacts/Avalanche and Landslide
		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 30 shows the increase in violent crimes from 2020 to 2024, and Figure 30 shows the statistics for 2023.

Table 30: Washoe County Violent Crime Data, 2020–2024⁵⁹

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

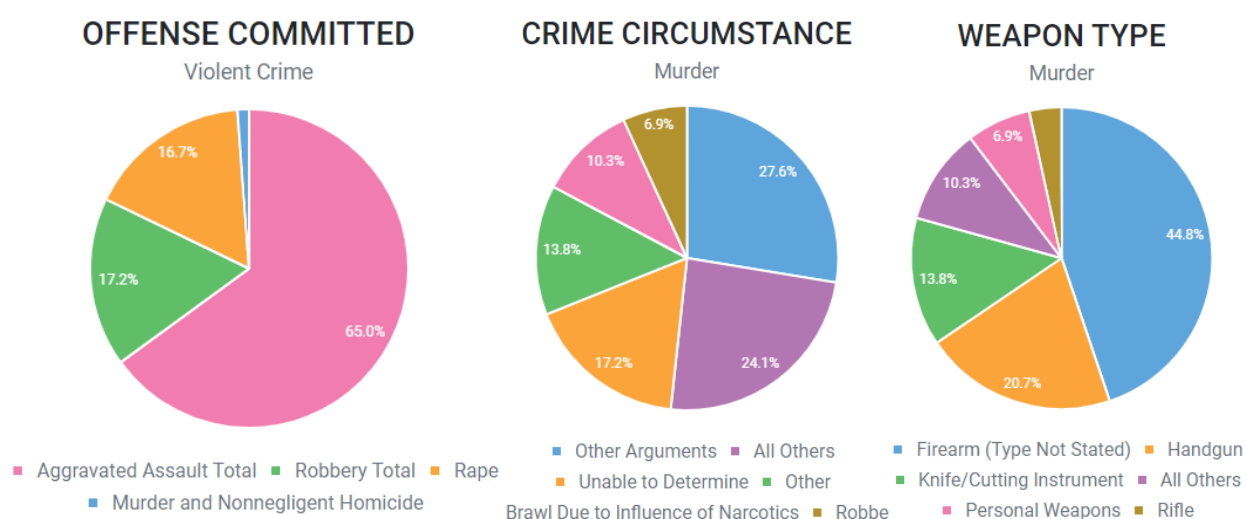

Figure 30: Washoe County Violent Crime Statistics, 2023⁶⁰

Table 31 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 32 lists four terrorism events in the County since 1995.

⁵⁹ State of Nevada, "Nevada Crime Statistics." <https://listserv.nv.gov/tops>

⁶⁰ Ibid.

Table 31: 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 32: Terrorism Events, Washoe County, Nevada, 1995–2024⁶¹

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.

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 (see Table 33).

Table 33: 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.

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

The following table provides the Calculated Priority Risk Index (CPRI) for Criminal Acts and Terrorism impact for Washoe County based on the current plan's hazard risk assessment results. Washoe County's hazard assessment shown in Table 34 identifies Criminal Acts and Terrorism as a high-risk hazard, with a CPRI value of 2.7. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 34: Calculated Priority Risk Index for Criminal Acts and Terrorism in Washoe County

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

NATIONAL RISK INDEX

There are no NRI findings for this hazard as the NRI only provides data for natural hazards.

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 agencies⁶⁵ 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 35 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 35: 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.

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
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.
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 (see Figure 31). 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.

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

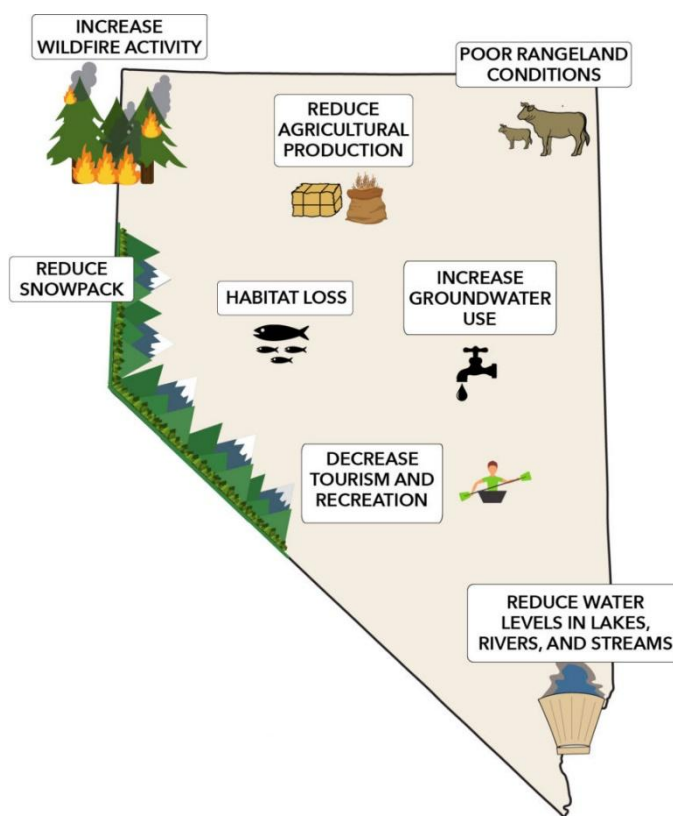


Figure 31: Impacts of Drought on Nevada

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 36.

Table 36: 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 and 2016. With the implementation of the Truckee River Operating Agreement, Truckee Meadows Water Authority can store credit water in the Boca Reservoir (Figure 32). 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 32: Boca Reservoir under Drought Conditions⁶⁷

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 37) 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 37: 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 (%)
D0	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 38) is one of the index values used to determine the USDM status indices.⁶⁸

Table 38: 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 33) 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 39 lists the numerical values for these conditions.

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

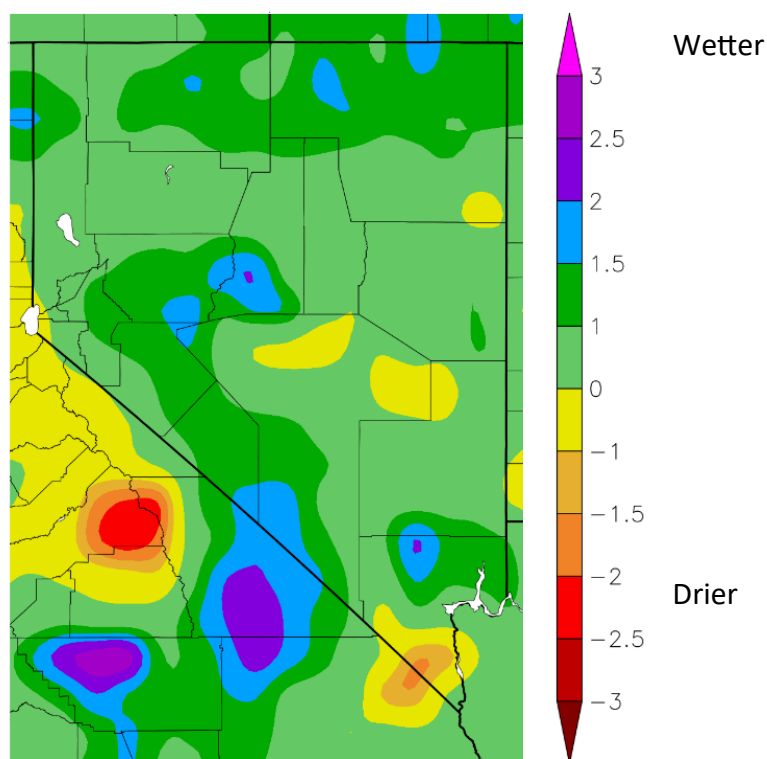


Figure 33: 12-Month Standardized Precipitation Index for Nevada, April 2023–March 2024⁶⁹

Table 39: SPI Category and Value Definitions

SPI Value	Description
-2.0 or less	Extremely Dry
-1.50 to -1.99	Very Dry
-1.0 to -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 34 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>

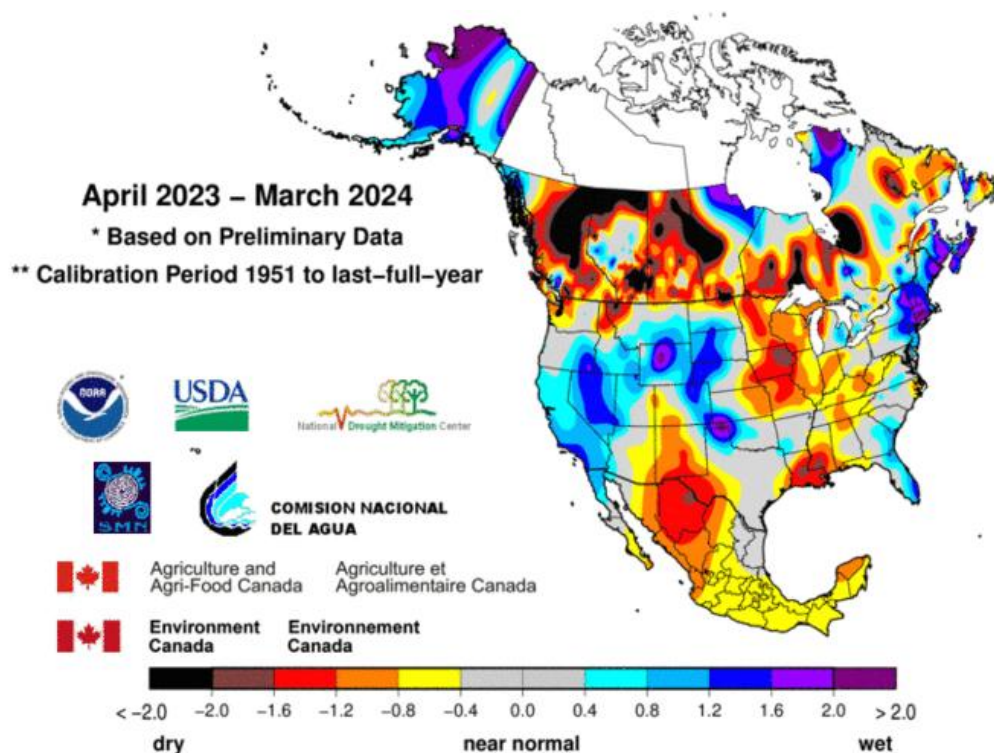


Figure 34: 12-Month Standardized Precipitation Index for the United States, April 2023–March 2024

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 37). 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) is an annual depiction of drought based on precipitation (with data going back to 1900) (see Figure 35). 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 Plan⁷² notes that 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>

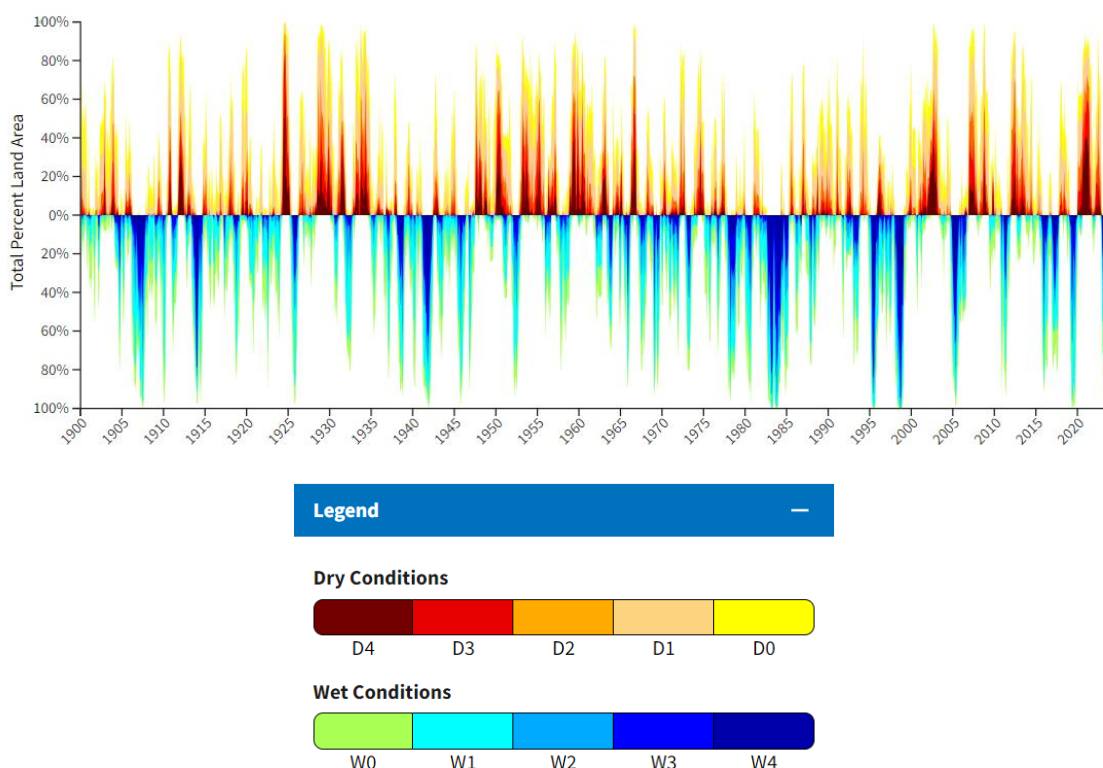


Figure 35: Standardized Precipitation Index for Washoe County, 1900–2024⁷³

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 36. 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 37 shows the intensity of drought in the western states in 2022.

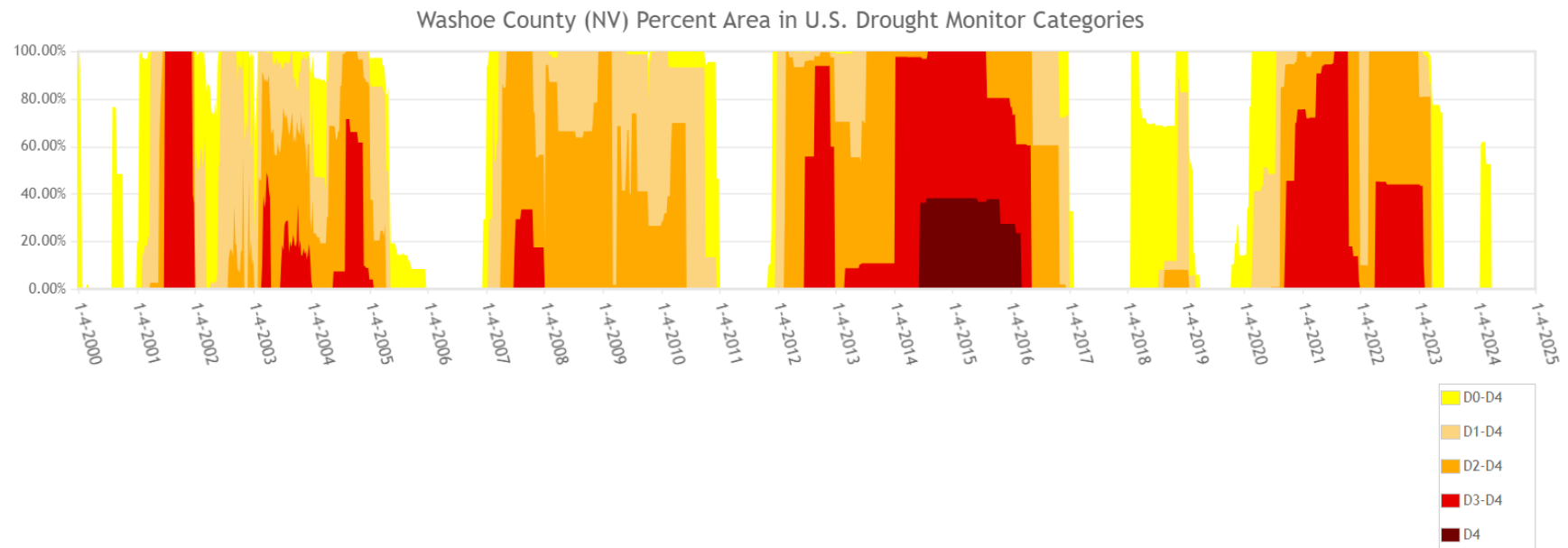


Figure 36: United States Drought Monitor Time Series for Washoe County⁷⁵

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

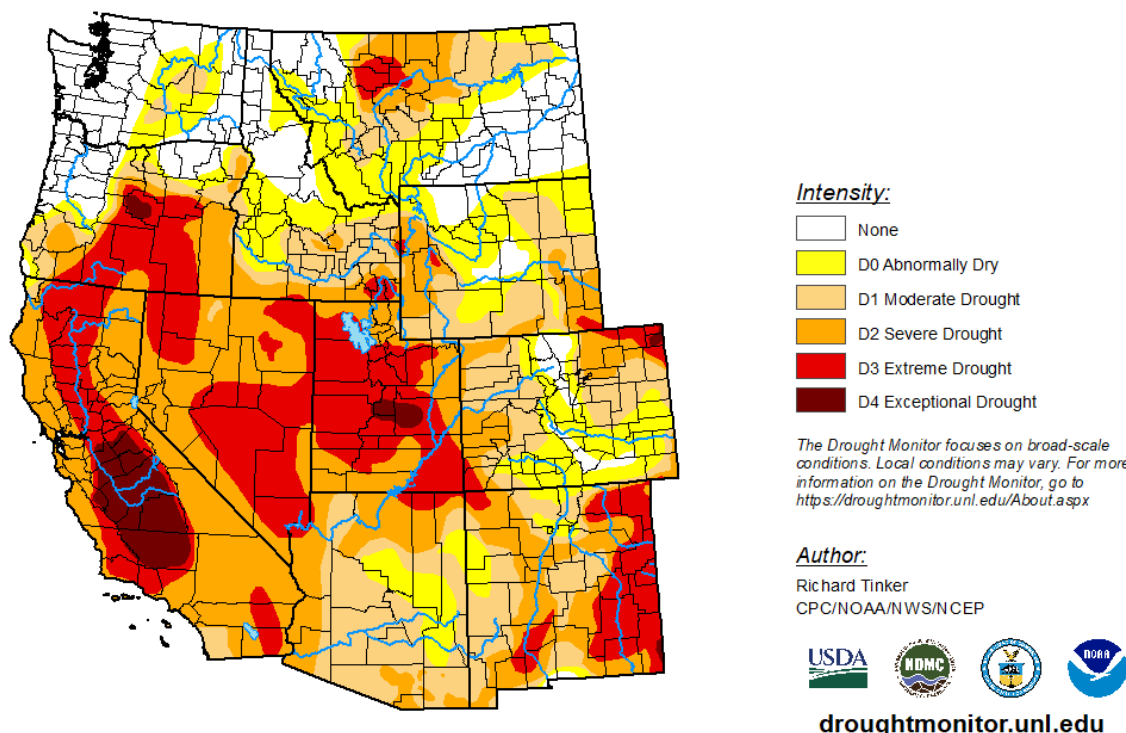


Figure 37: United States Drought Map, Western States, August 16, 2022

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/demnv.gov/content/About/NEHMP_09-22-2023\(4\).pdf](https://dem.nv.gov/uploadedFiles/demnv.gov/content/About/NEHMP_09-22-2023(4).pdf)

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 F, 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 38 shows projected climate change in Washoe County through 2040, considering a median scenario, neither particularly optimistic nor pessimistic.

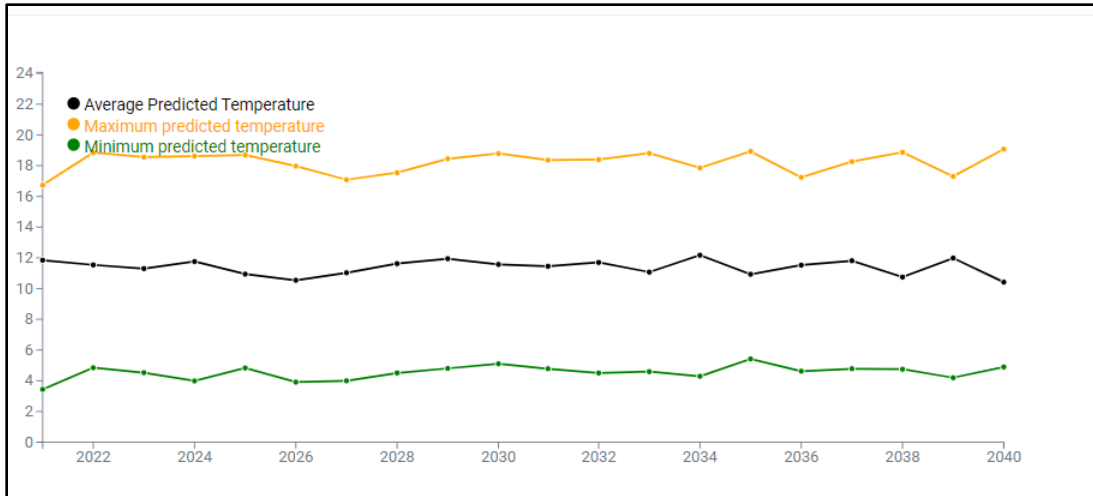


Figure 38: Washoe County Climate Change Forecast to 2040⁷⁷

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 40):

- **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 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

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>

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 40: Impacts of Climate Change on Drought⁷⁸

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 41 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.

Table 41: Washoe County Estimated Agricultural Loss Increase Due to Climate Change⁷⁹

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

⁷⁸ State of Nevada Enhanced Mitigation Plan, 2023, “Climate Strategy.”

[dem.nv.gov/uploadedFiles/demnv.gov/content/About/NEHMP_09-22-2023\(4\).pdf](https://dem.nv.gov/uploadedFiles/demnv.gov/content/About/NEHMP_09-22-2023(4).pdf)

⁷⁹ State of Nevada Enhanced Mitigation Plan, 2023, “Climate Strategy.”

[dem.nv.gov/uploadedFiles/demnv.gov/content/About/NEHMP_09-22-2023\(4\).pdf](https://dem.nv.gov/uploadedFiles/demnv.gov/content/About/NEHMP_09-22-2023(4).pdf)

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 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

⁸⁰ Truckee Meadows Water Authority, 2020. <https://tmwa.com/wp-content/uploads/2020/11/TMWA-WRP-2020-Final.pdf>

⁸¹ NOAA, NCEI, Storm Events Database: Washoe County, Nevada, 2024. <https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Drought&begin>

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 39).

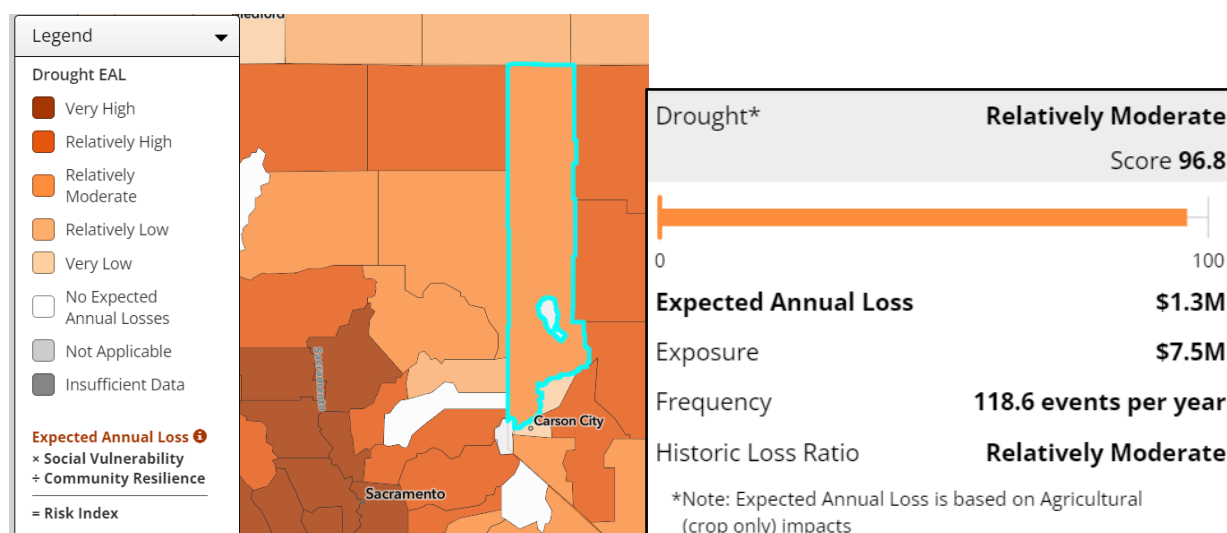


Figure 39: National Risk Index Expected Annual Loss, Map, and Legend for Drought in Washoe County⁸²

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.

Date 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

⁸² FEMA, National Risk Index. <https://hazards.fema.gov/nri/map>

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-round and begins to bring on groundwater production wells later in the spring when customer demands increase and when needed during drought situations⁸³.

COMMUNITY LIFELINES

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function (see Figure 40). 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



Figure 40: FEMA Community Lifelines

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>

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 Americans depend upon. As droughts persist for longer periods and expand into more regions, impacts on various critical infrastructure will increase.⁸⁵

- **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 hoarding 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

⁸⁵ 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>.

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.
- 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

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 42 provides the Calculated Priority Risk Index (CPRI) for Drought impact in Washoe County based on the current plan’s hazard risk assessment results. Washoe County assigned Drought a risk factor value of 2.1, reflecting high probability, medium frequency, and longer duration impacts. This risk factor value falls in the range of 2.0 to 2.4, which is considered a medium risk hazard. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 42: Calculated Priority Risk Index for Drought in Washoe County

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

NATIONAL RISK INDEX

The National Risk Index (NRI) contains national level data for 18 natural hazards including Drought. The index provides rankings for historical losses, expected annual loss, and overall risk

at the county and census tract levels. Table 43 provides the NRI rankings for Drought in Washoe County. For this hazard, the NRI assigns scores of Relatively Moderate for Historical Losses, Relatively Moderate for Expected Annual Loss, and Relatively Moderate for Overall Risk on a scale ranging from Very Low to Very High.

Table 43: National Risk Index for Drought in Washoe County

	Historical Losses	Expected Annual Loss	Overall Risk Score	Overall Risk
Drought	Relatively Moderate	Relatively Moderate	96.4	Relatively Moderate

Based on the NRI, Washoe County has an Overall Risk value for Drought of Relatively Moderate compared to all other communities within the United States, with a score of **96.4** (see Figure 41).

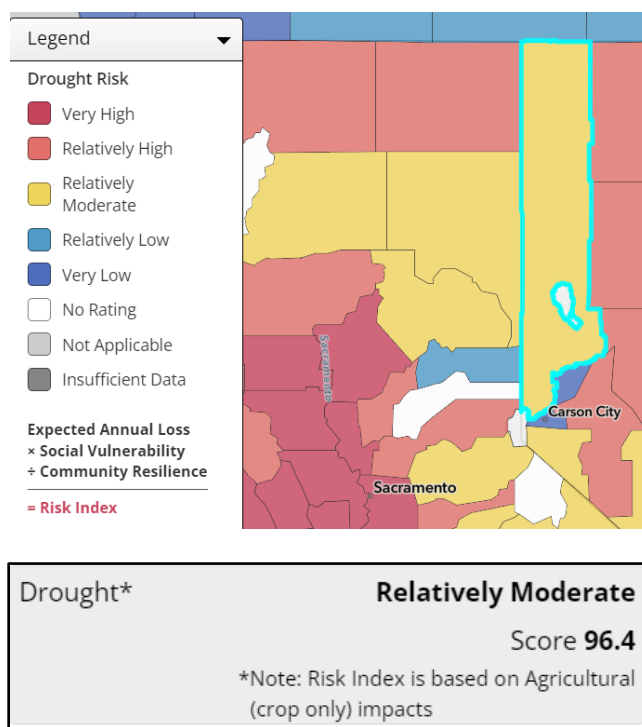


Figure 41: NRI Overall Risk Score for Drought in Washoe County⁸⁶

⁸⁶ FEMA, “National Risk Index Washoe County Drought Score, Map and Legend.”
<https://hazards.fema.gov/nri/map>

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.⁸⁷ 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. Table 44 provides additional details related to the direct and indirect impacts to communities' drought vulnerability resulting from changes in the community (man-made and natural).

Table 44: Changes to Community and their Impact on Drought Vulnerability

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.	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	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

⁸⁷ 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)
	Different types of land uses have differing rates of water consumption, with residential development usually being the most intensive.		water cycle is changing due to drought conditions and a warming climate.	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.⁸⁸

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

⁸⁸ WashoeCounty.gov, 2024.

https://washoecounty.gov/csd/engineering_capitalprojects/environmental/ctmrd/groundwater.php

Table 45: 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 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

Subject	Ranking	Impacts/Drought
		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 42 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.

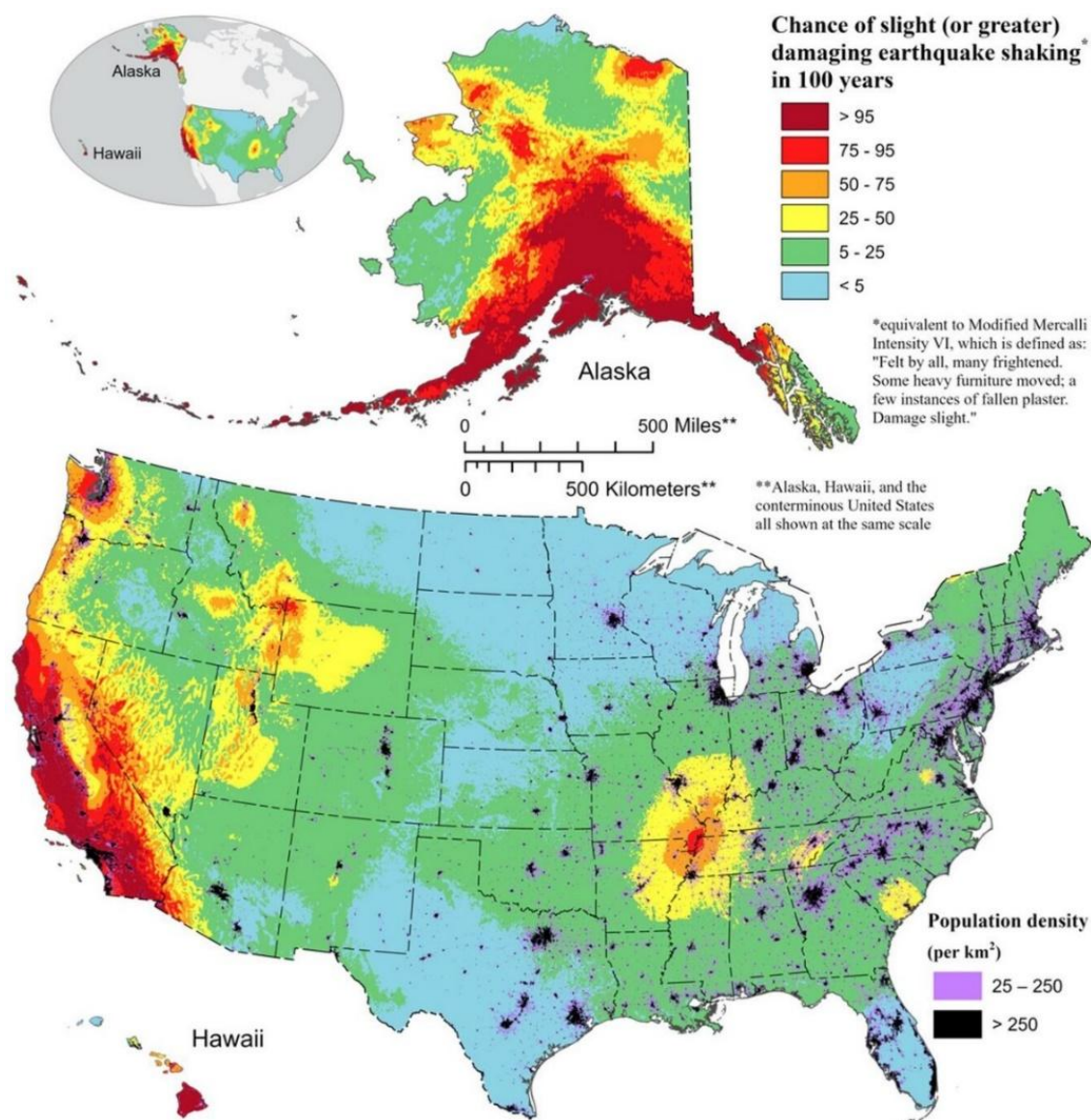


Figure 42: National Seismic Hazard Model⁸⁹

Figure 43 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

⁸⁹ 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.

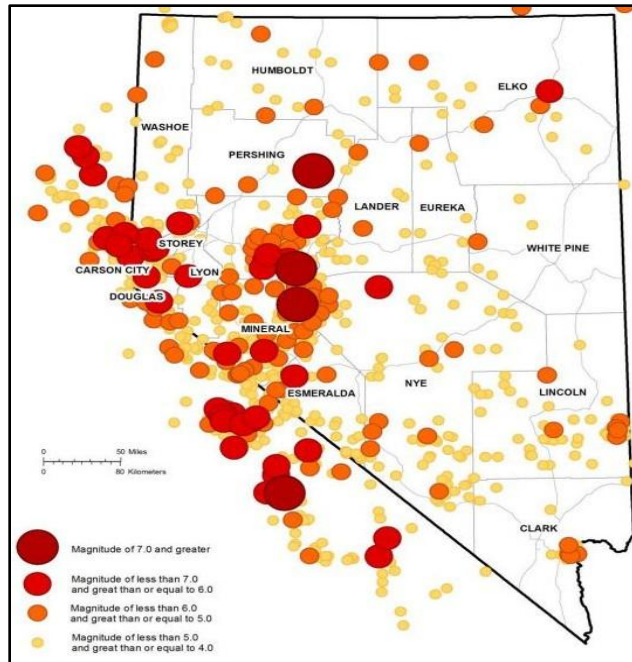


Figure 43: Earthquakes at or above Magnitude 4.0 in and near Nevada, 1840s–2015⁹⁰

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 44). 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.

⁹⁰ 2018 Nevada Enhanced SHMP, Nevada Seismological Lab, Nevada Bureau of Mines and Geology, "Earthquakes in Nevada Magnitude 4.0 or Greater, 1840–2015."

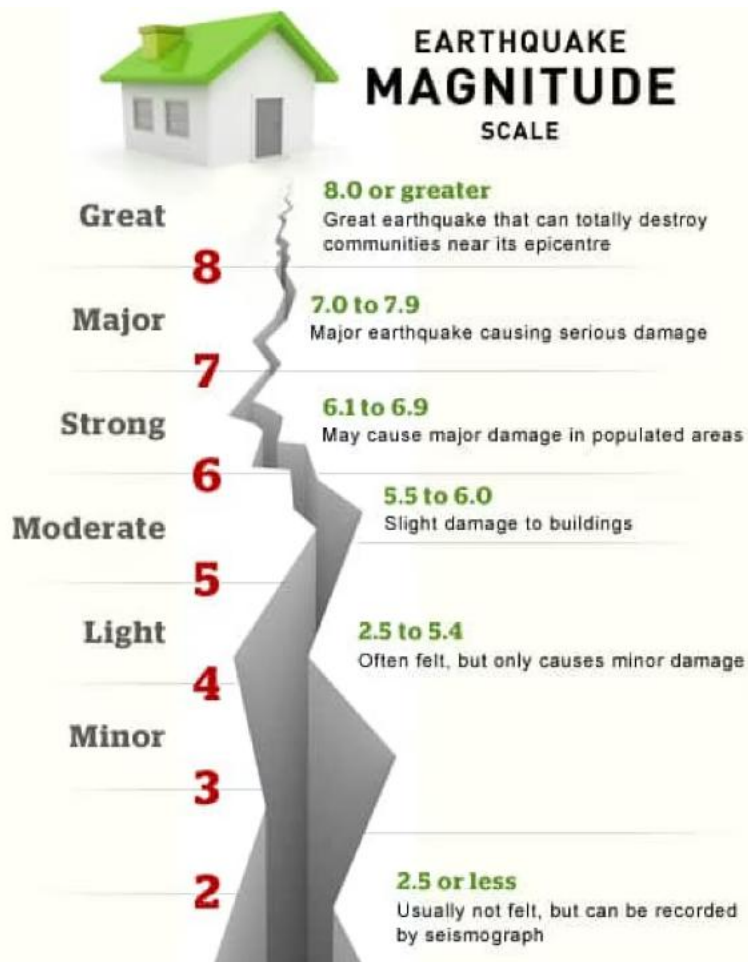


Figure 44: The Richter Magnitude Scale⁹¹

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.⁹²

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 (see Figure 45). It is typically the greatest cause of

⁹¹ CBC News, 2012, The Associated Press, "Richter Magnitude Scale Explained."

<https://www.cbc.ca/news/world/richter-magnitude-scale-explained-1.1130841>

⁹² Michigan Tech, 2024, "Earthquake Intensity."

<https://www.mtu.edu/geo/community/seismology/learn/earthquake-measure/magnitude/>

losses to structures 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.⁹³

⁹³ United 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 45: Modified Mercalli Intensity Scale⁹⁴

⁹⁴ United 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. Table 46 summarizes expected structural damage levels based on PGA thresholds.

Table 46: Structural Damage Potential by Peak Ground Acceleration Range

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.⁹⁵

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.

⁹⁵ Phys.org, February 21, 2020, "How Earthquakes Deform Gravity." <https://phys.org/news/2020-02-earthquakes-deform-gravity.html>

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 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 46 shows earthquakes in and near Reno Nevada $\geq M 5$ between 2018 and March 2024.

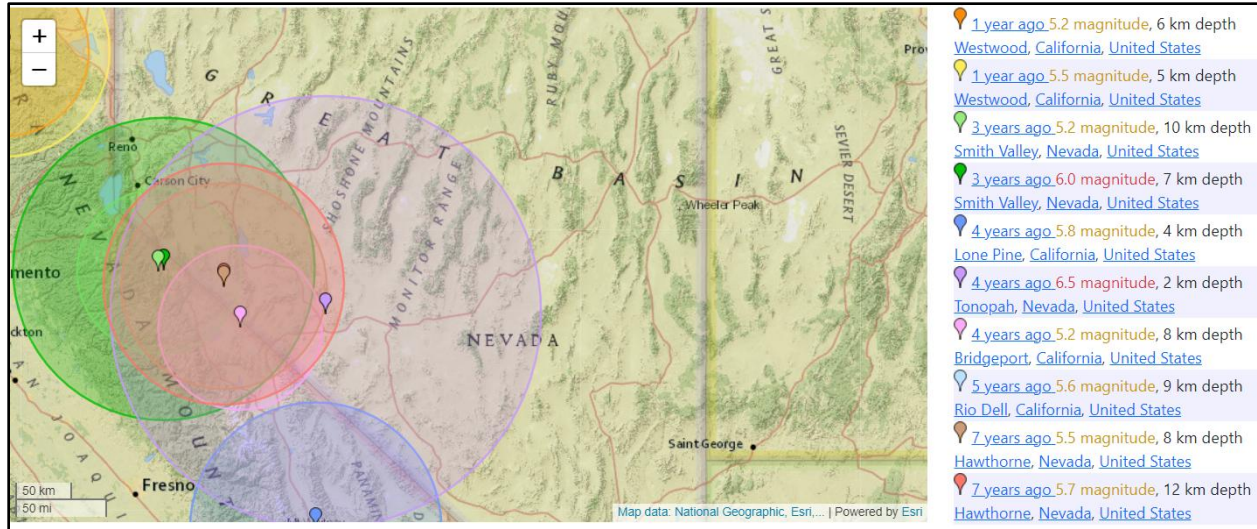


Figure 46: Earthquakes Tracked in Reno Nevada Area at $\geq M 5$, 2018–2024⁹⁶

- 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 $\geq M 3$. 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 47).

⁹⁶ Earthquaketrack.com, “Recent Earthquakes Near Reno, Nevada,” 2024.
https://earthquaketrack.com/us-nv-reno/recent?mag_filter=5



Figure 47: Water Flume Damaged by the Mogul–Somerset Earthquake, 2008⁹⁷

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.⁹⁸ Figure 48 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.

⁹⁷ 2020 Regional HMP, “2008 Mogul–Somerset Earthquake Damage Rock Fall Damage to Water Flume” (Nevada Bureau of Mines and Geology, University of Nevada, Reno; dePolo 2008)

⁹⁸ 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

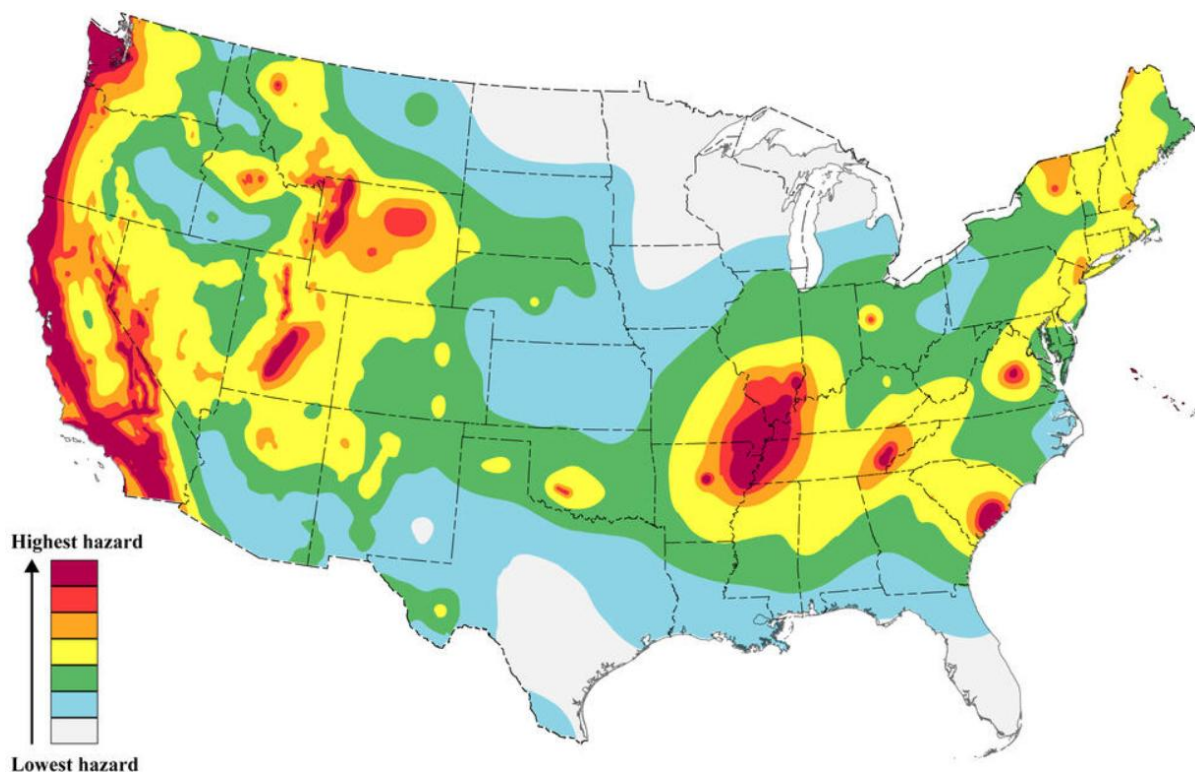


Figure 48: Peak Ground Acceleration (% g) with 2% Probability of Exceedance in 50 Years⁹⁹

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 (see Figure 49). The overall probability of future occurrence of an earthquake of $\geq 5M$ is considered Medium, with an estimated 1%–10% chance of occurrence in a given year.

⁹⁹ 2020 Regional HMP, USGS 2014, “Peak Ground Acceleration (%g) with 2% Probability of Exceedance in 50 Years.”

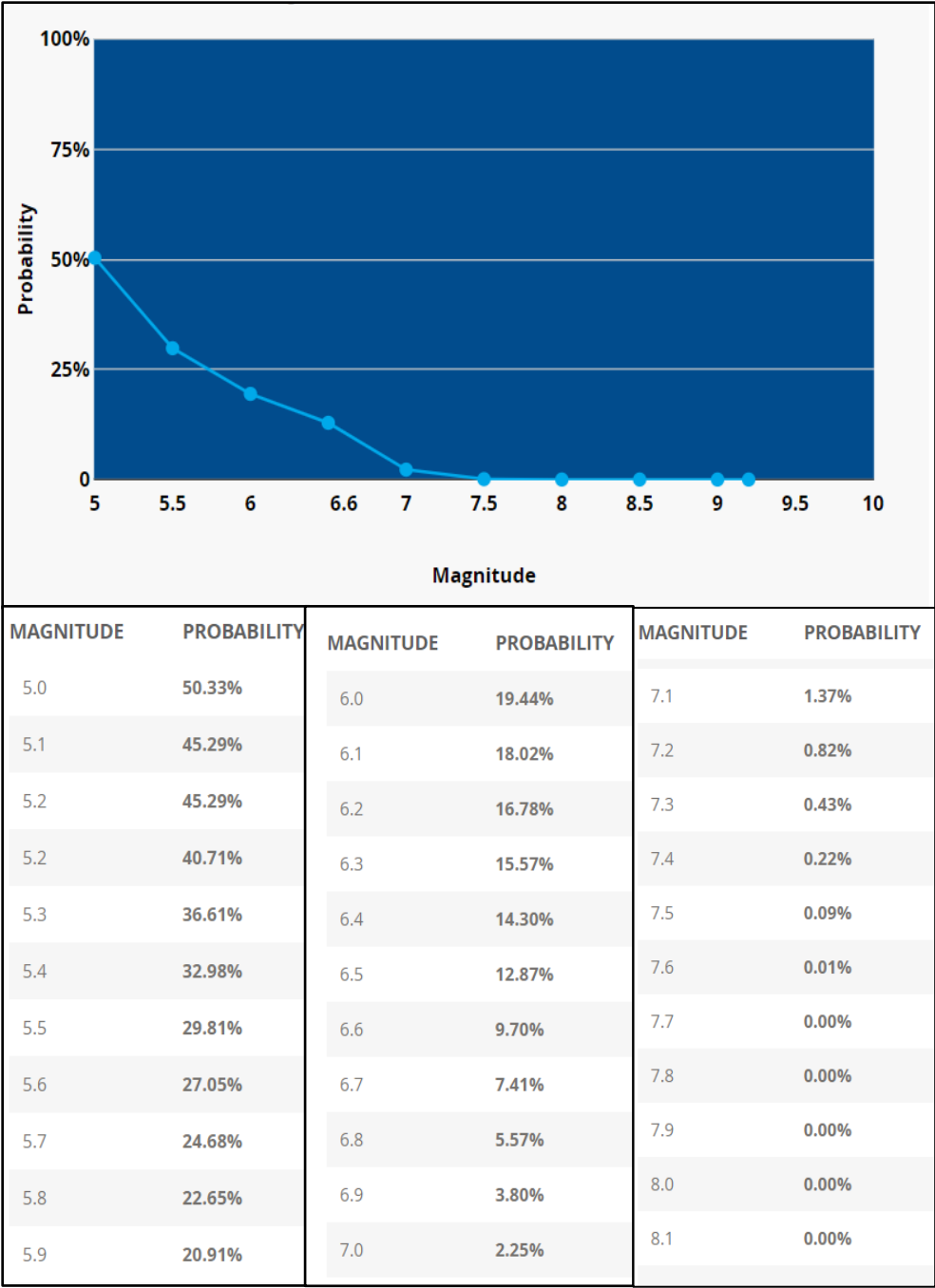


Figure 49: Probability and Magnitude of Earthquakes in Washoe County in the Next 50 Years¹⁰⁰

¹⁰⁰ Homefacts, 2024, "Washoe County Earthquake Probability and Magnitude."
<https://www.homefacts.com/earthquakes/Nevada/Washoe-County.html>

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.¹⁰¹

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:¹⁰²

- **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 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

¹⁰¹ 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>

¹⁰² Quake Busters, "Housing Vulnerable to Damage in Earthquakes." <https://qbusters.com/housing-vulnerable-to-damage-in-earthquakes/>

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:¹⁰³

- **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.”¹⁰⁴

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

¹⁰³ Washoe County, Nevada, 2024, Seismic Design.

<https://www.washoecounty.gov/building/ConstructionDesign%20Requirements.php>

¹⁰⁴ International Residential Code, 2018, “Seismic Design Category, Chapter 3 Building Planning.” <https://codes.iccsafe.org/content/IRC2018/chapter-3-building-planning>

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 50 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.

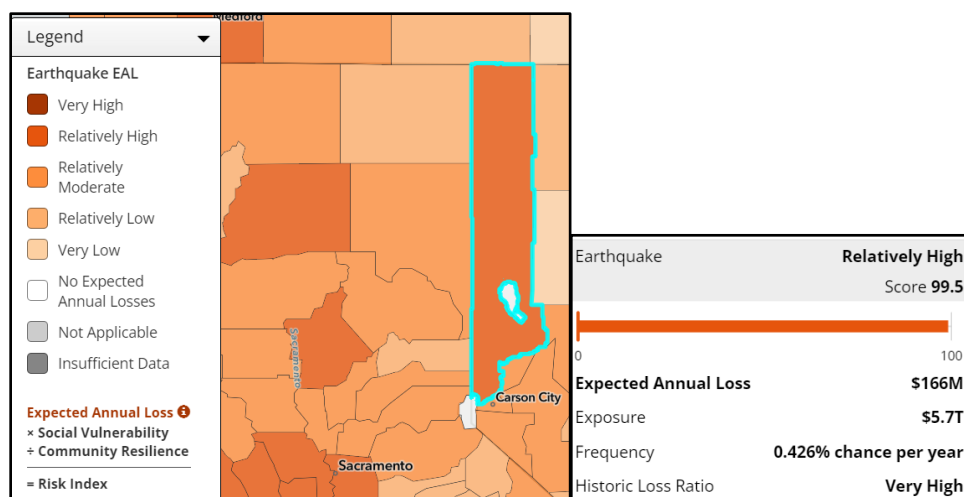


Figure 50: Washoe County Earthquake Expected Annual Loss Score, Map, and Legend¹⁰⁵

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 51 through Figure 53.

¹⁰⁵ 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

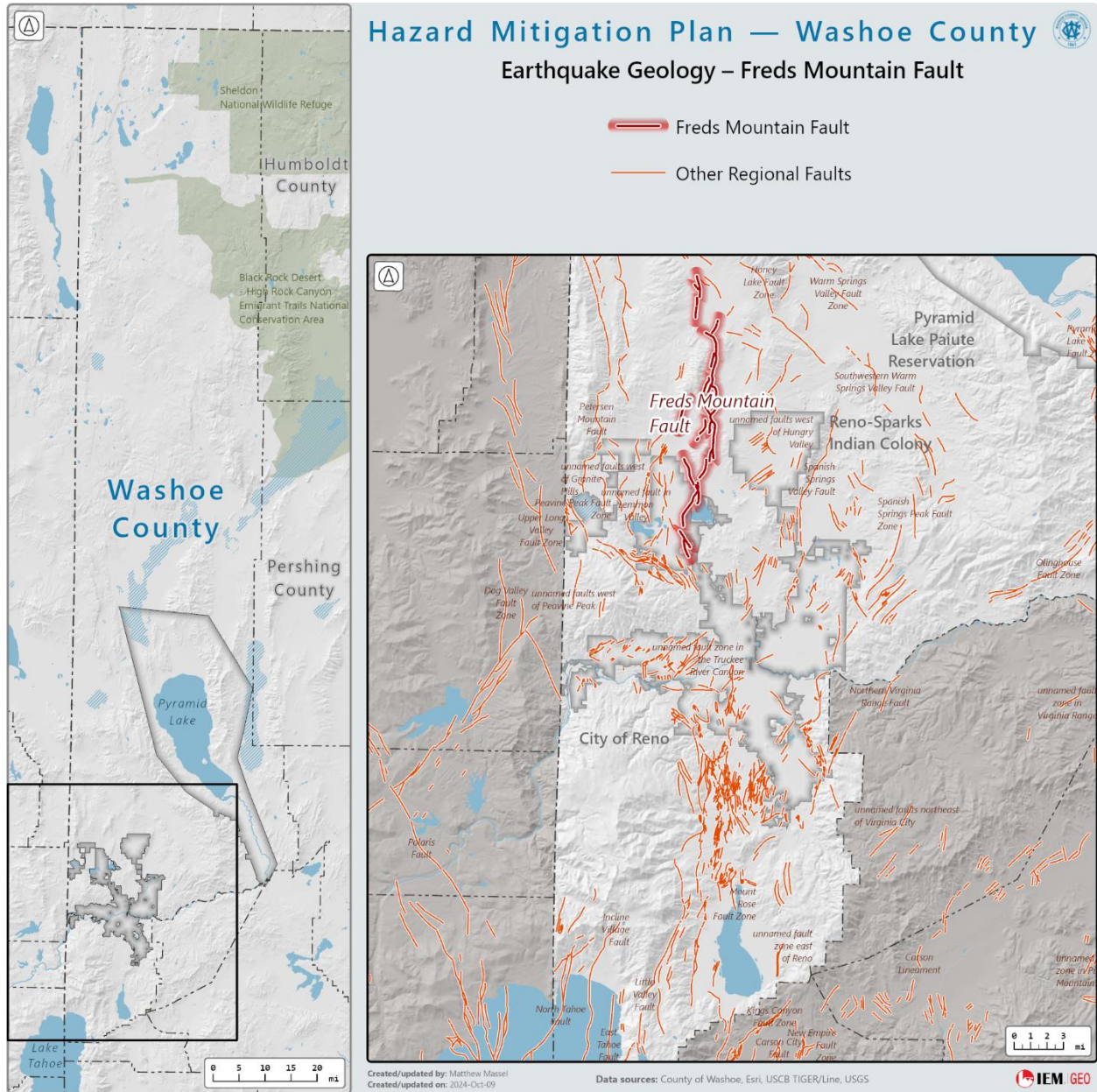


Figure 51: Freds Mountain Fault Zone

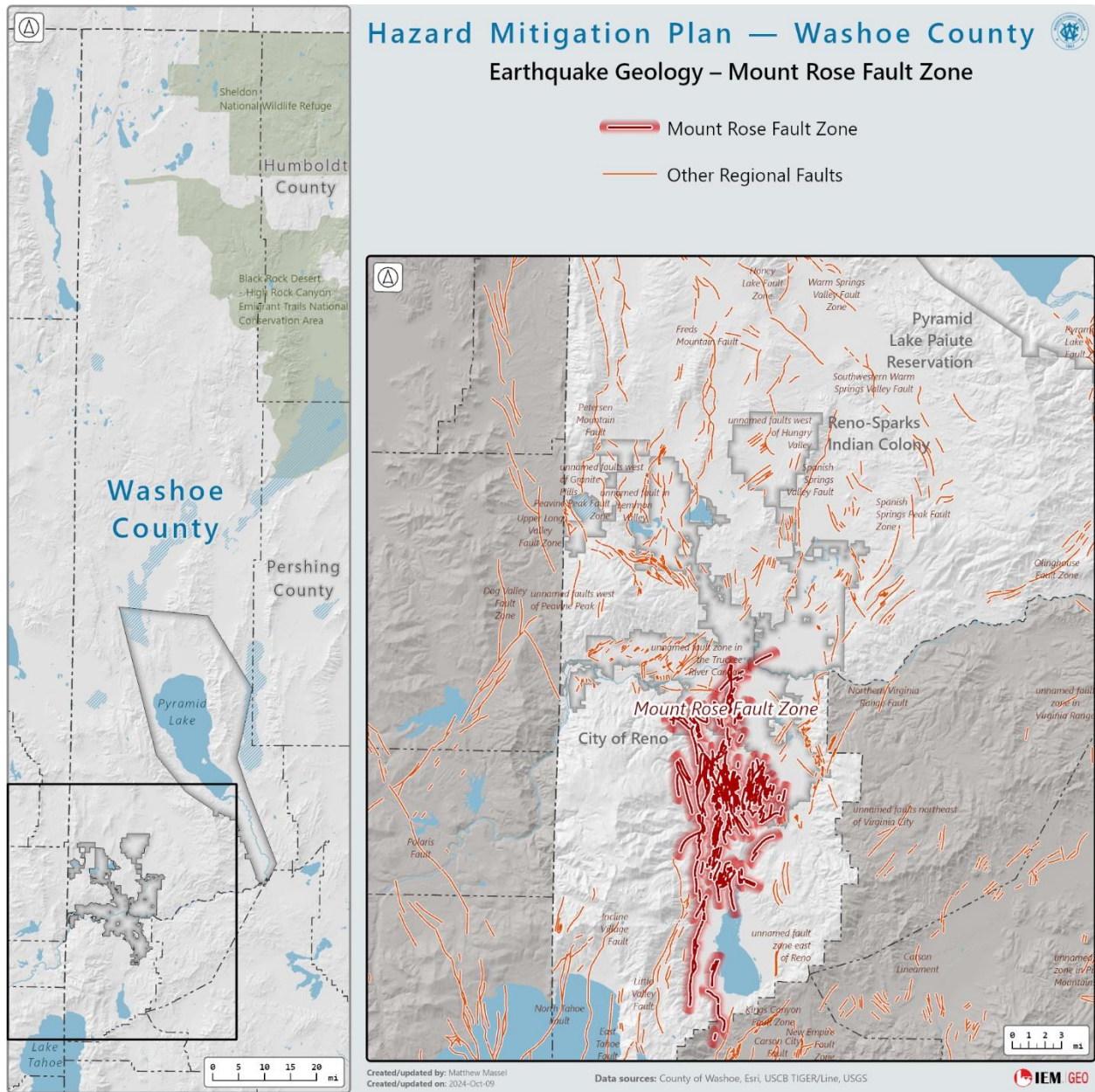


Figure 52: Mount Rose Fault Zone

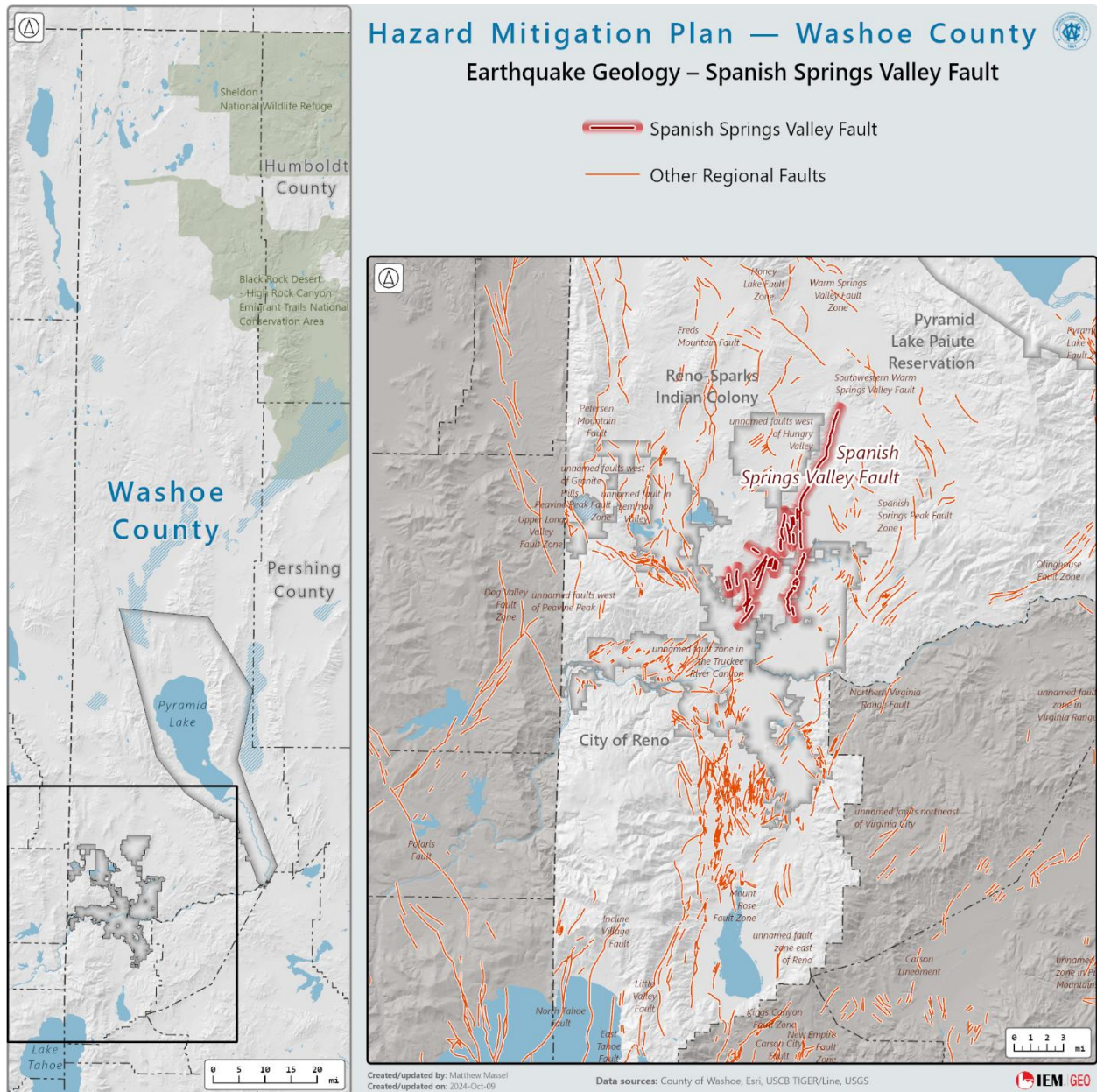


Figure 53: Spanish Fault Zone

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 47 presents descriptions of structural damage to light wood frame construction.

Table 47: 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.¹⁰⁶ About 17,508 buildings will be at least moderately damaged in this scenario, and 549 are estimated to be damaged beyond repair. The projected economic losses, by jurisdiction, for the Freds Mountain scenario are reflected in Table 48.

¹⁰⁶ M 6.8 Scenario Earthquake – Freds Mountain Fault.

https://earthquake.usgs.gov/scenarios/eventpage/bssc20141657_m6p78_se/executive

Table 48: Projected Economic Losses by Jurisdiction from the Freds Mountain Fault Zone Earthquake 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

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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 (see Table 49).

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 49: Expected Building Damage by General Occupancy Type for the Freds Mountain Fault Zone Earthquake 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 54 through Figure 58 show the locations of the critical facilities in the planning area, categorized by functionality.

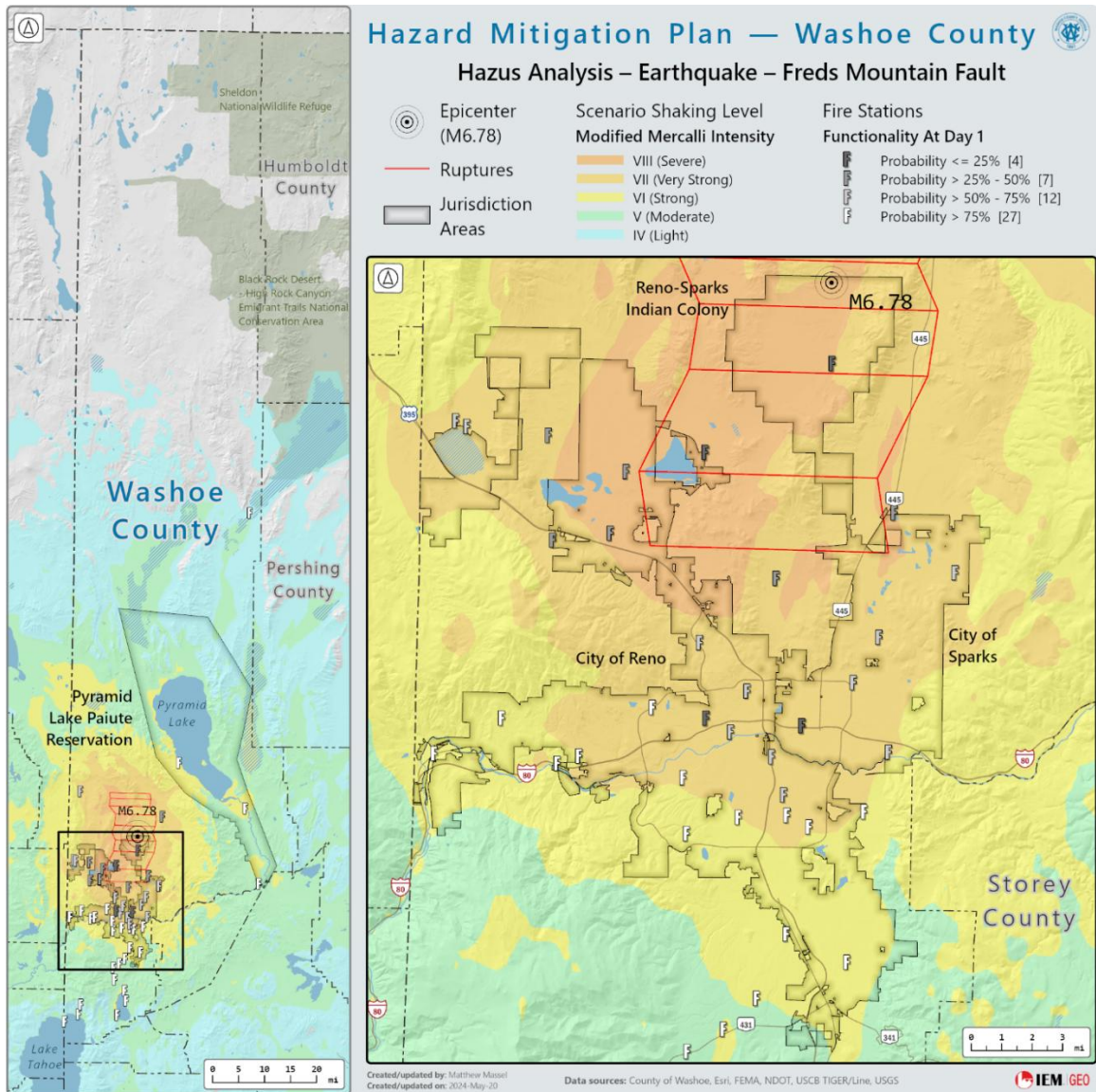


Figure 54: Freds Mountain Fault Hazus Scenario Fire Station Functionality

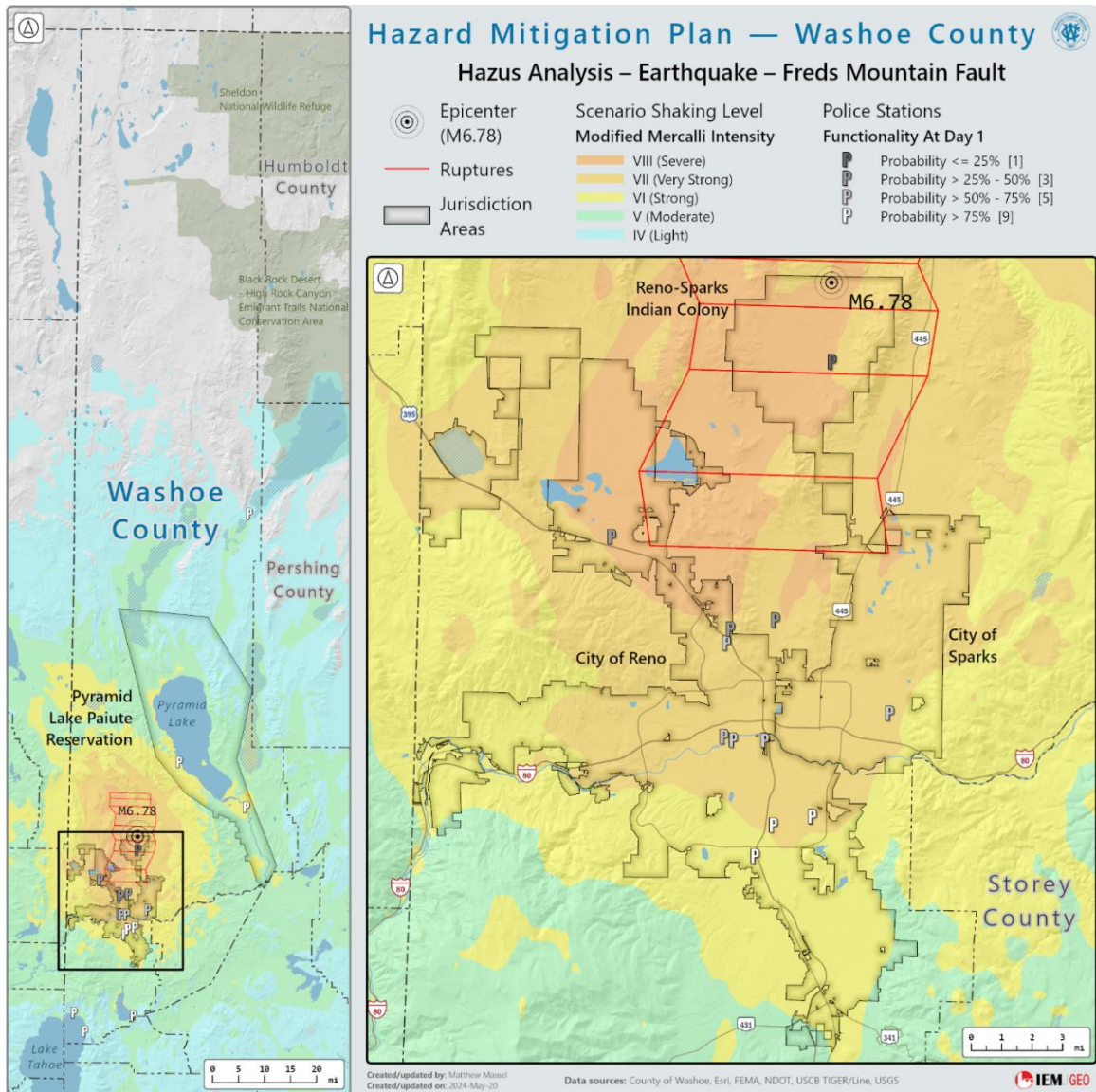


Figure 55: Freds Mountain Fault Scenario Police Station Functionality

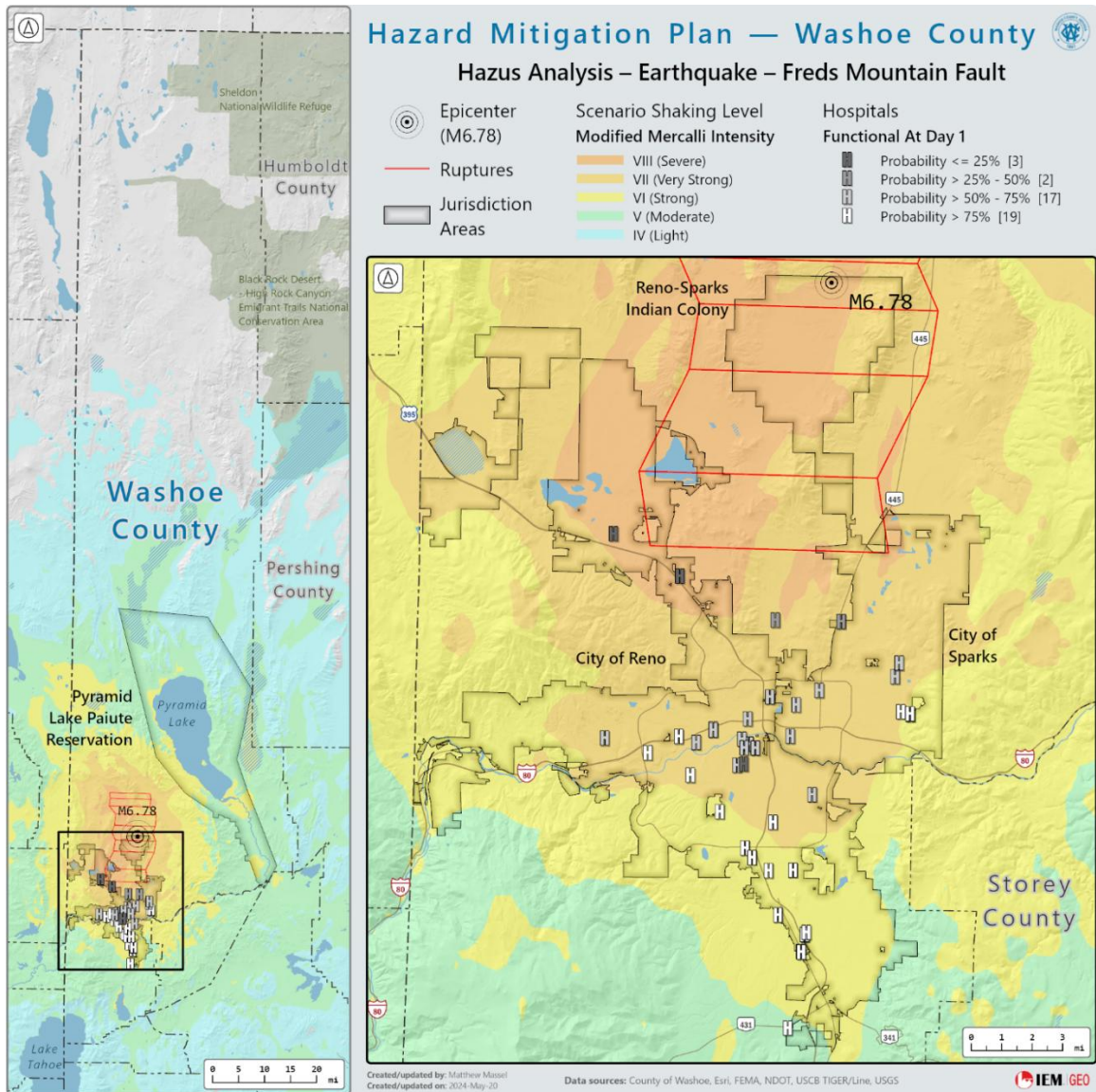


Figure 56: Freds Mountain Fault Hazus Scenario Hospital Functionality

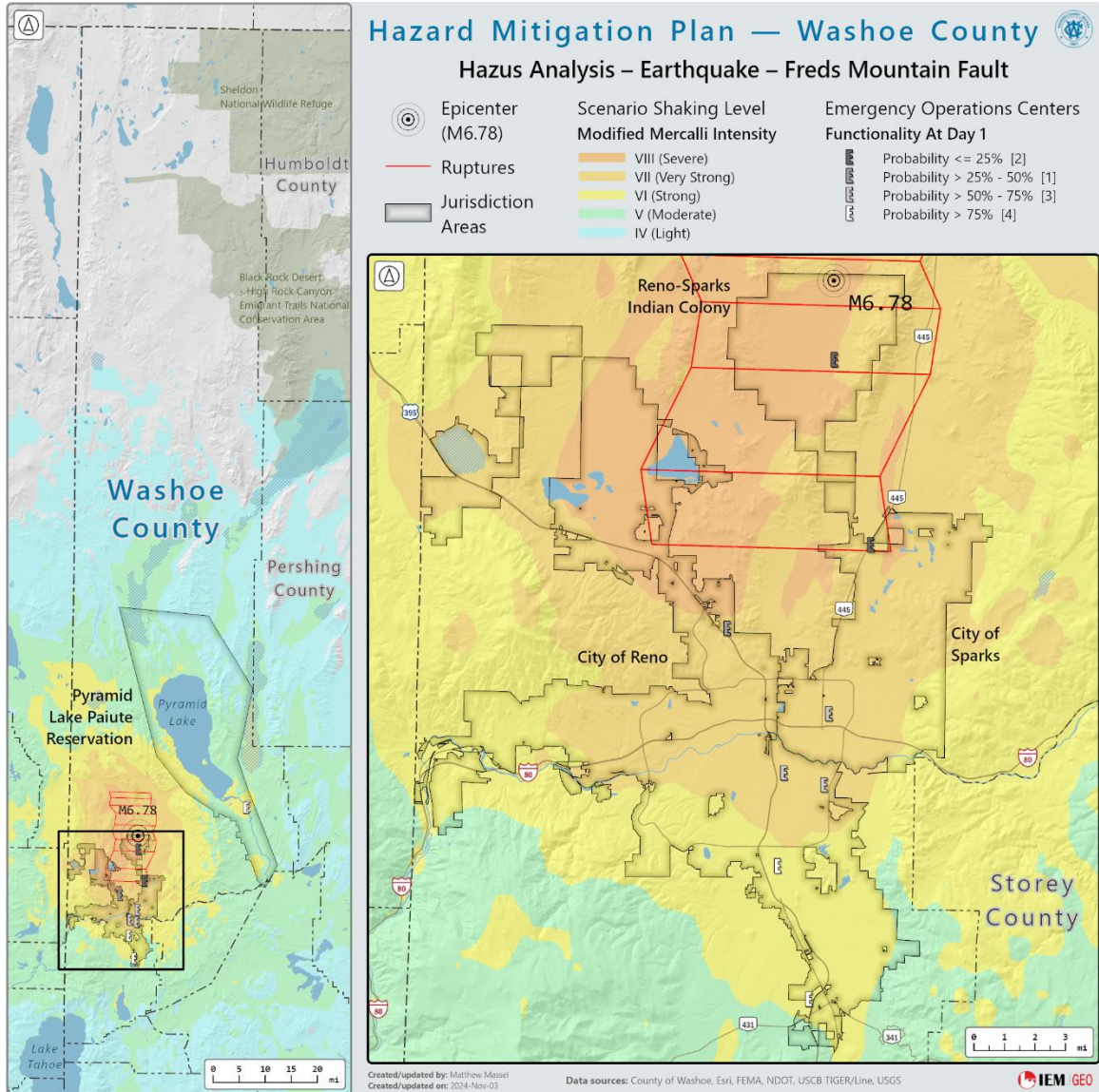


Figure 57: Freds Mountain Fault Hazus Scenario EOC Functionality

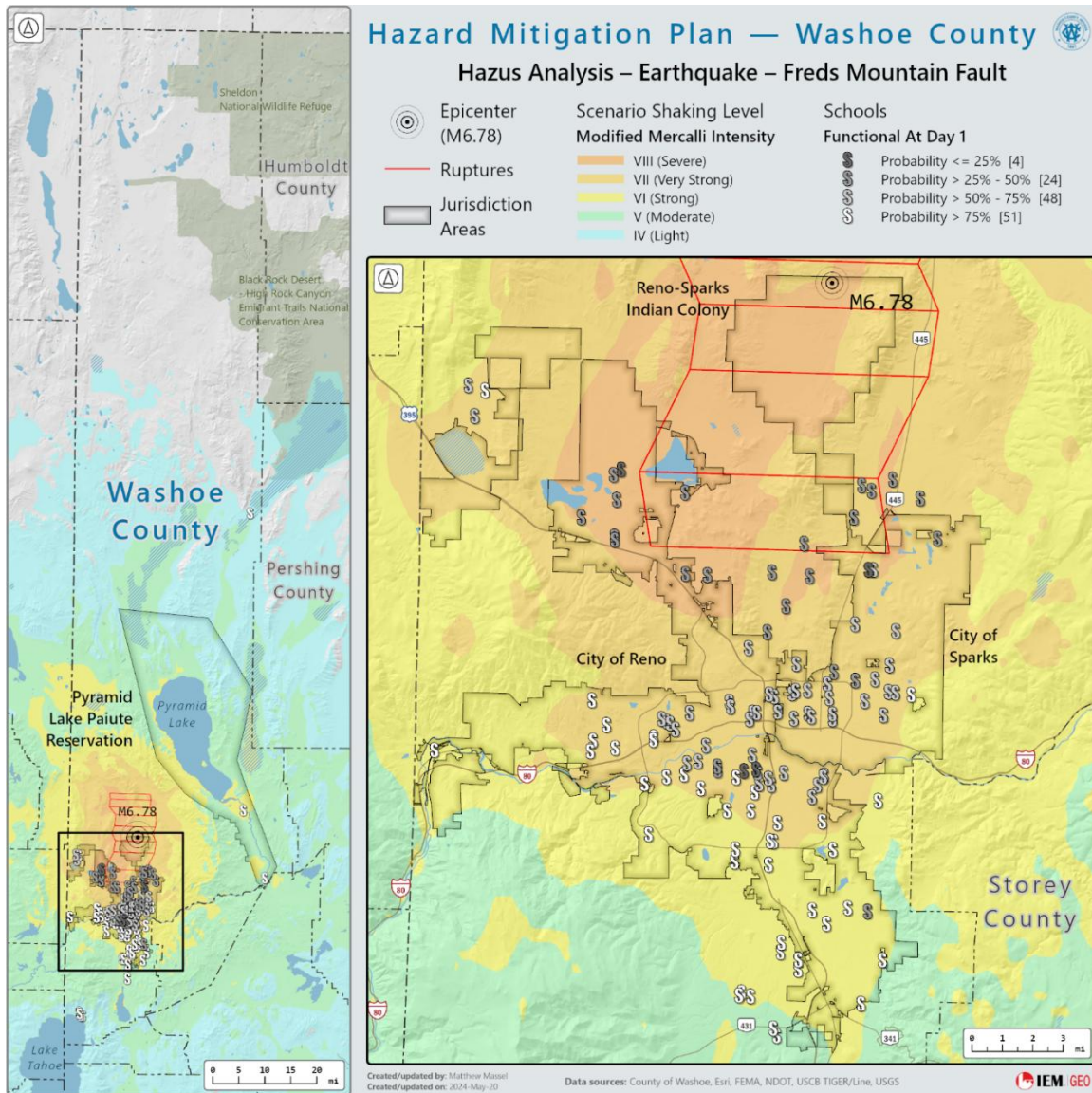


Figure 58: Freds Mountain Fault Hazus Scenario School Functionality

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.¹⁰⁷ 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 jurisdiction and by building occupancy type is summarized in Table 50 and Table 51, respectively.

¹⁰⁷ M 6.9 Scenario Earthquake – Mount Rose fault.

https://earthquake.usgs.gov/scenarios/eventpage/bssc20141647_m6p89_se/executive



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Table 50: Projected Economic Losses by Jurisdiction from the Mount Rose Fault Zone Earthquake 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

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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 51: Expected Damage by Building Occupancy Type 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
Religion/ Nonprofit	95	108	83	61	32	379

Building Occupancy Type	None	Slight	Moderate	Extensive	Complete	Total
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 59 through Figure 63 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%.

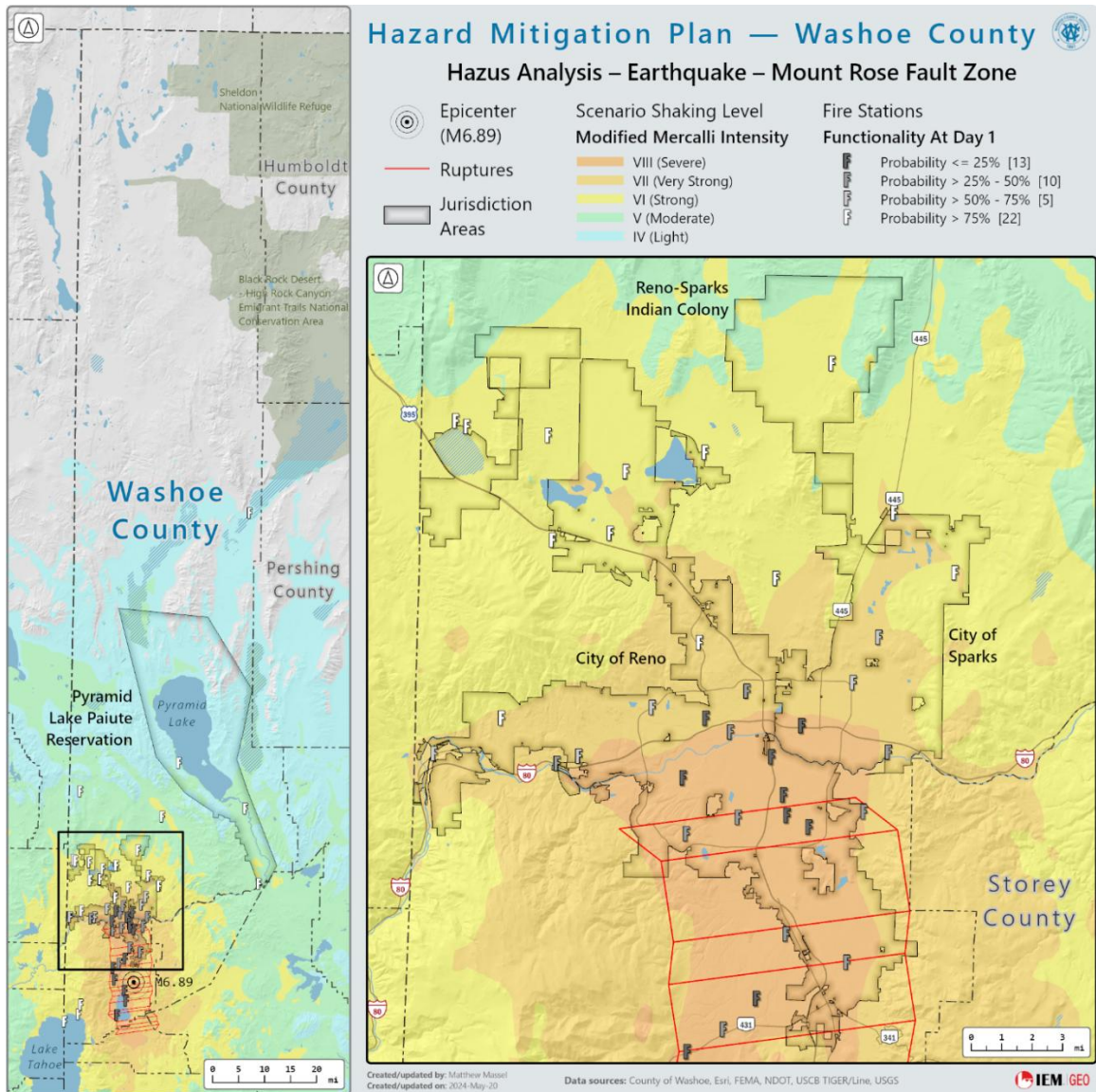


Figure 59: Mount Rose Fault Hazus Scenario Fire Station Functionality

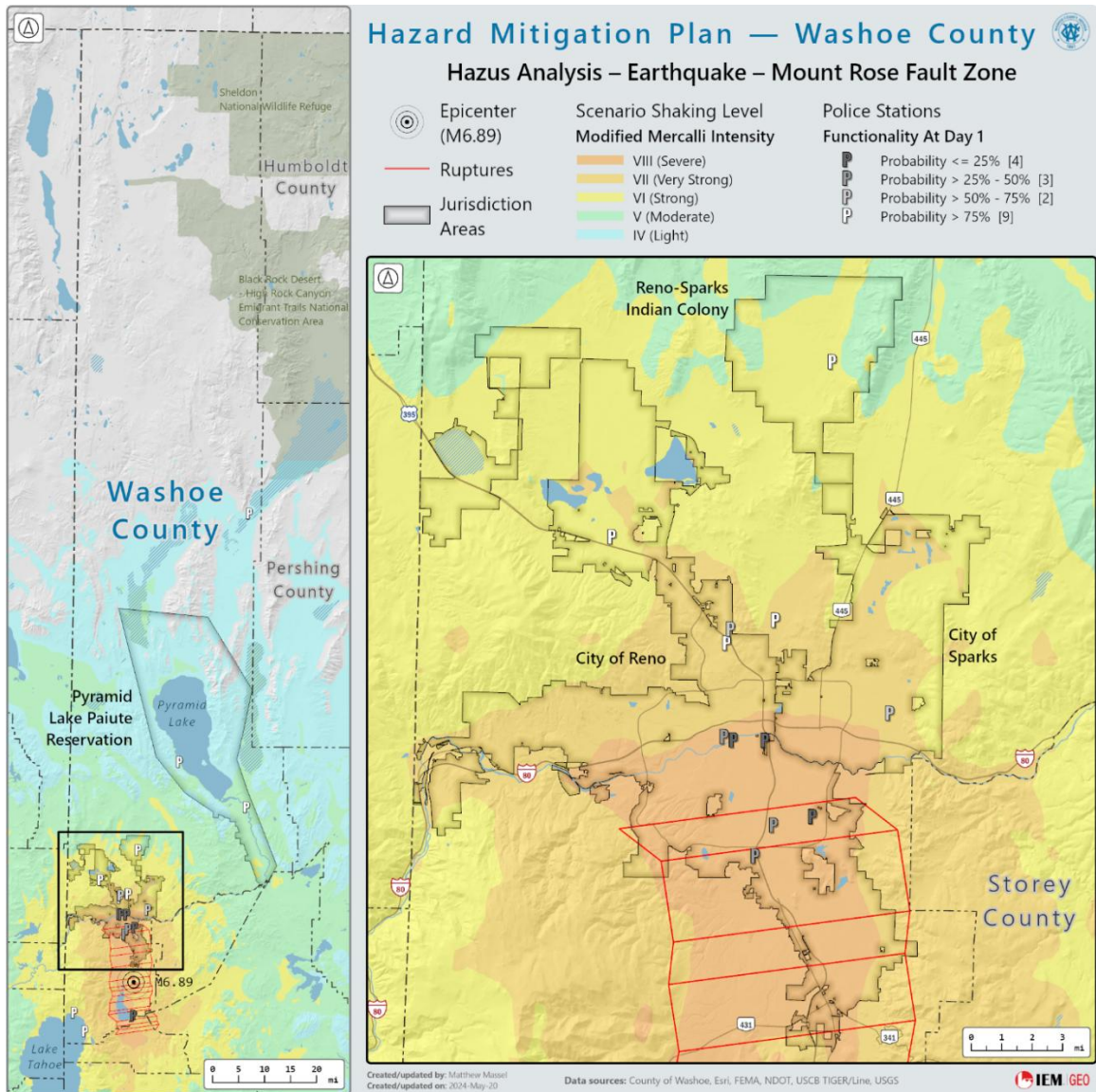


Figure 60: Mount Rose Fault Hanus Scenario Police Station Functionality

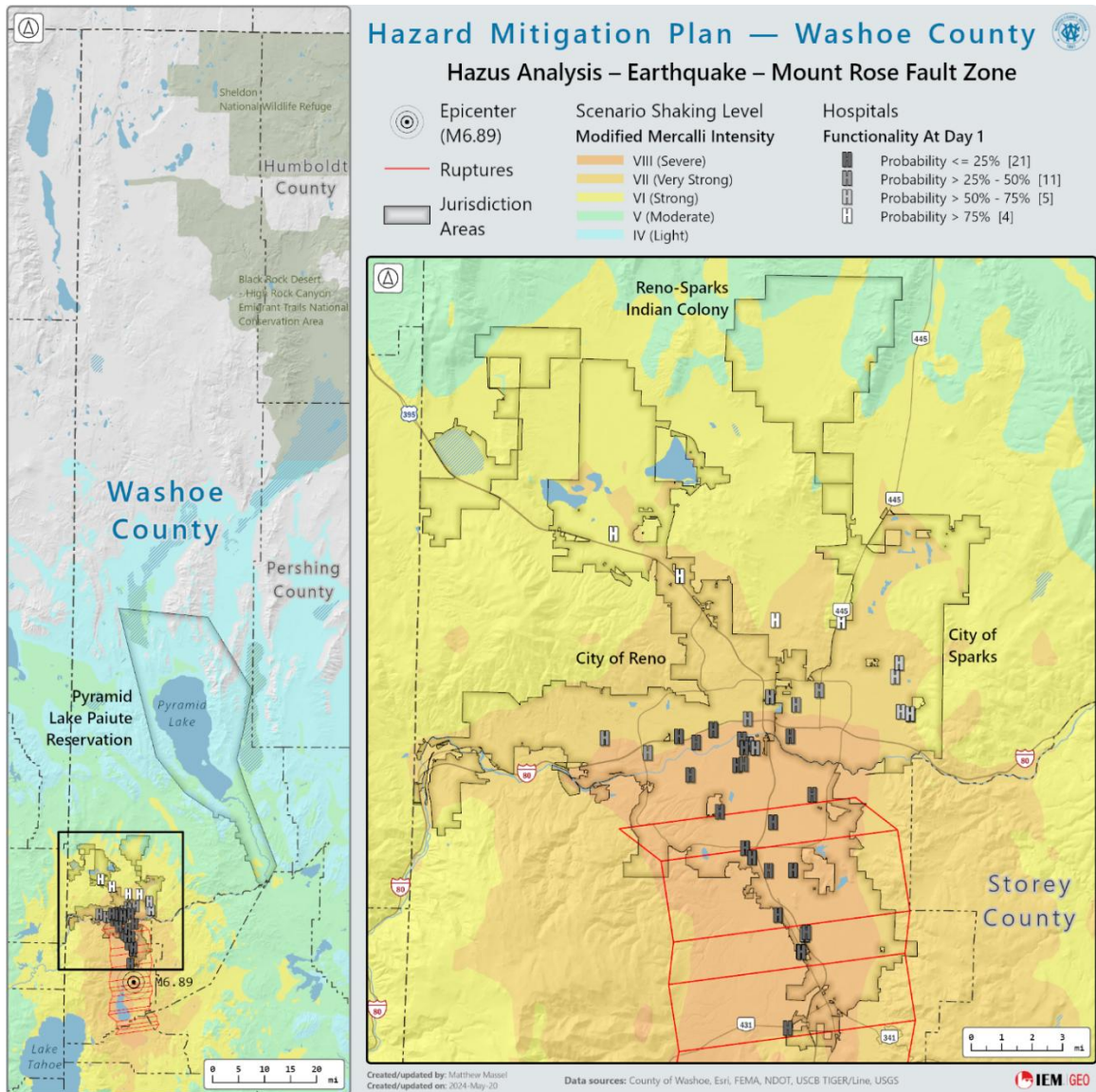


Figure 61: Mount Rose Fault Hazus Scenario Hospital Functionality

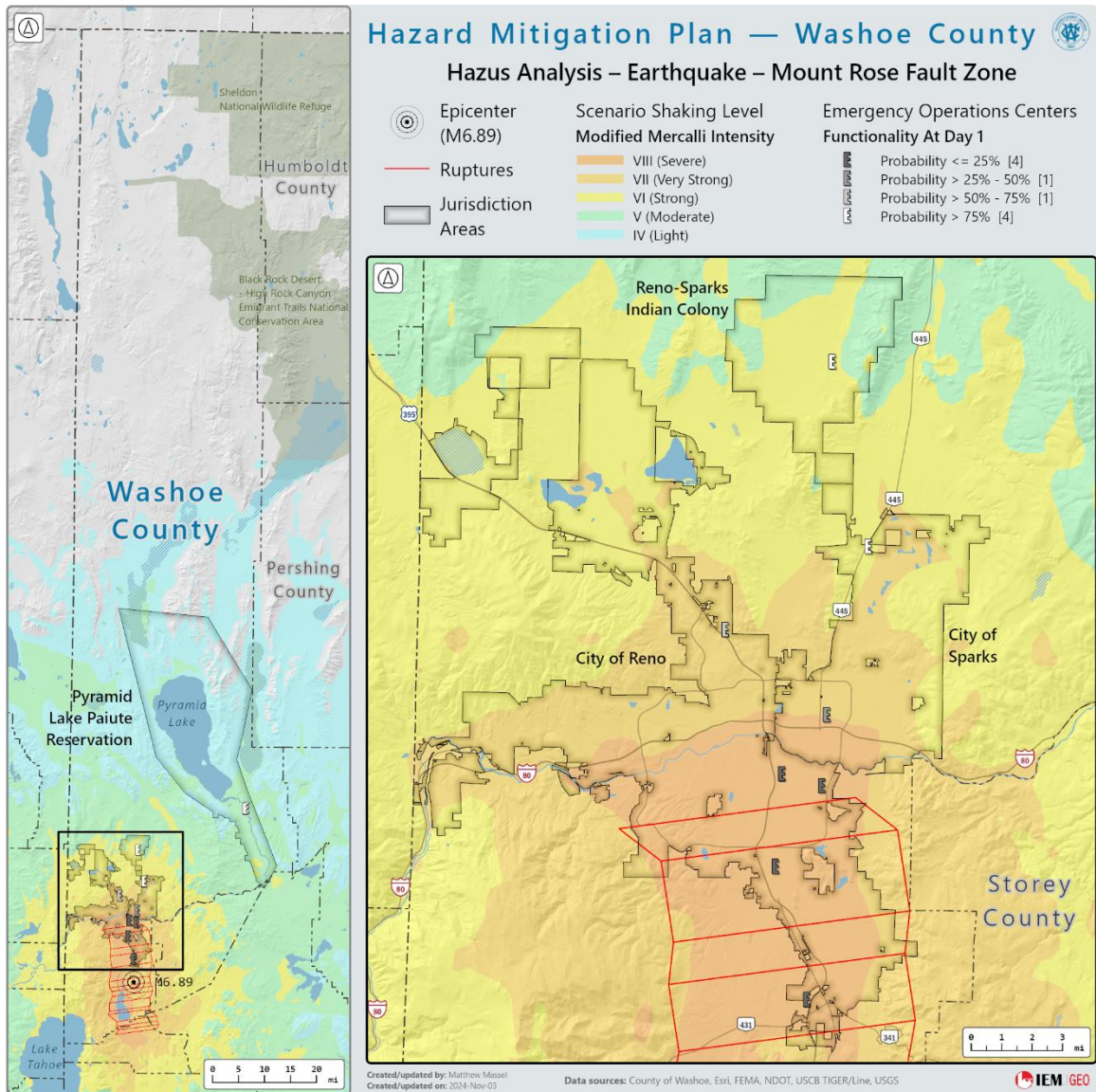


Figure 62: Mount Rose Fault Hazus Scenario EOC Functionality

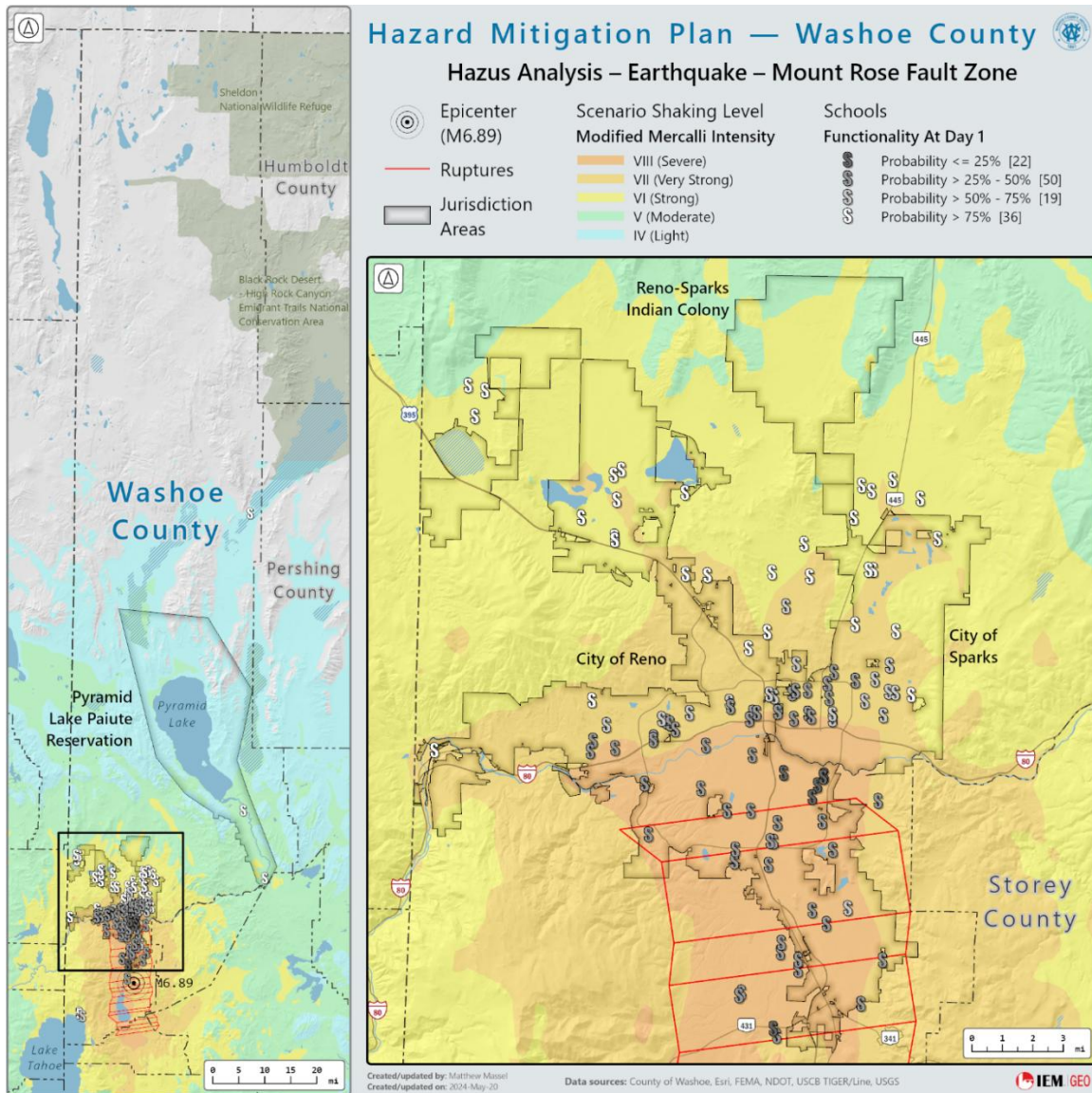


Figure 63: Mount Rose Fault Scenario School Functionality

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.¹⁰⁸

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 jurisdiction and by building occupancy type is summarized in Table 52 and Table 53, respectively.

¹⁰⁸ M 6.0 Scenario Earthquake – Spanish Springs Valley fault.

https://earthquake.usgs.gov/scenarios/eventpage/bssc20141656_m6p62_se/executive



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Table 52: Projected Economic Losses by Jurisdiction from the Spanish Springs Valley Fault Earthquake 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



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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.

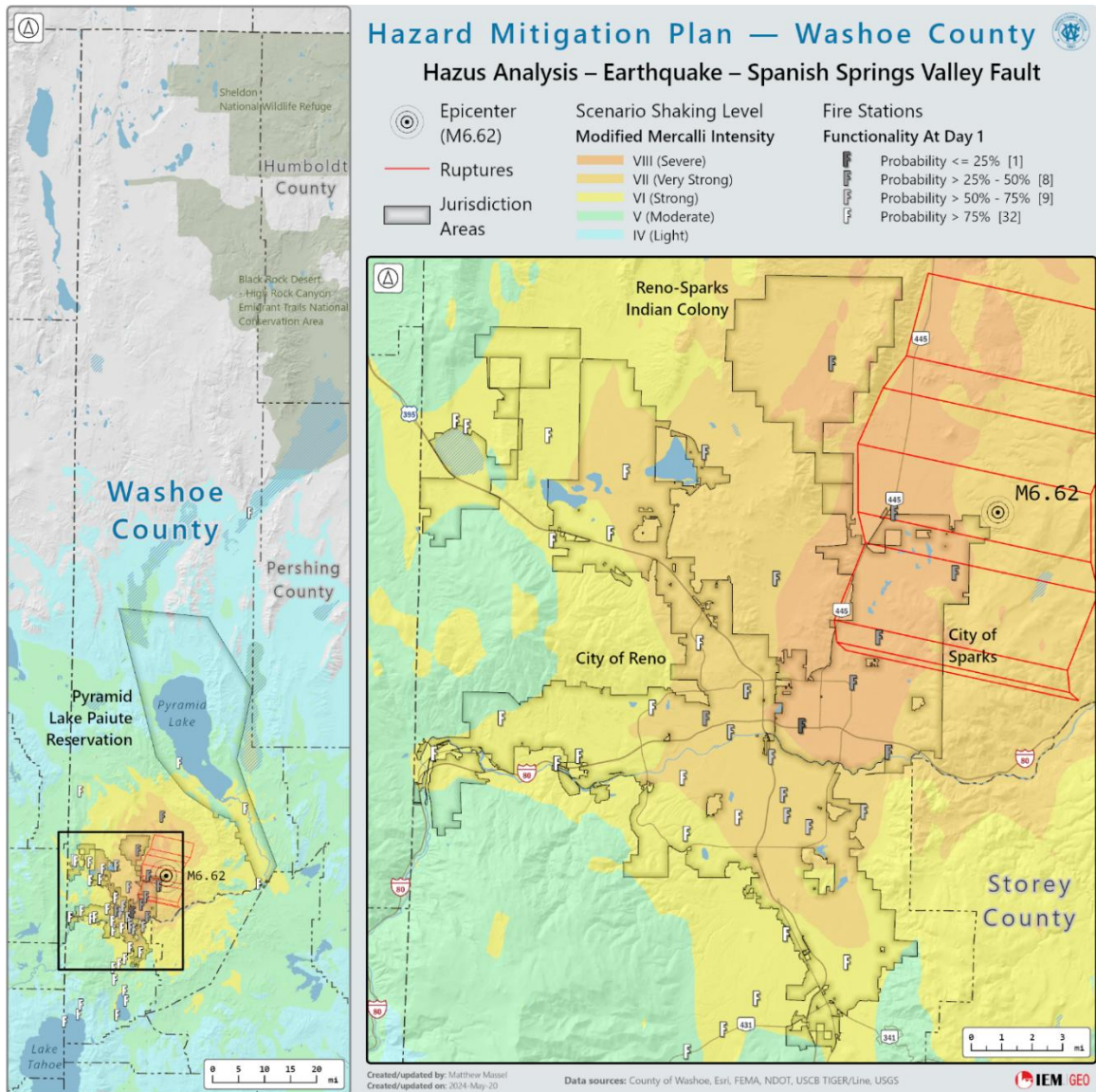
Table 53: Expected Building Damage by Occupancy Type for the Spanish Springs Valley Fault Earthquake Scenario

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 64 through Figure 68 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%.



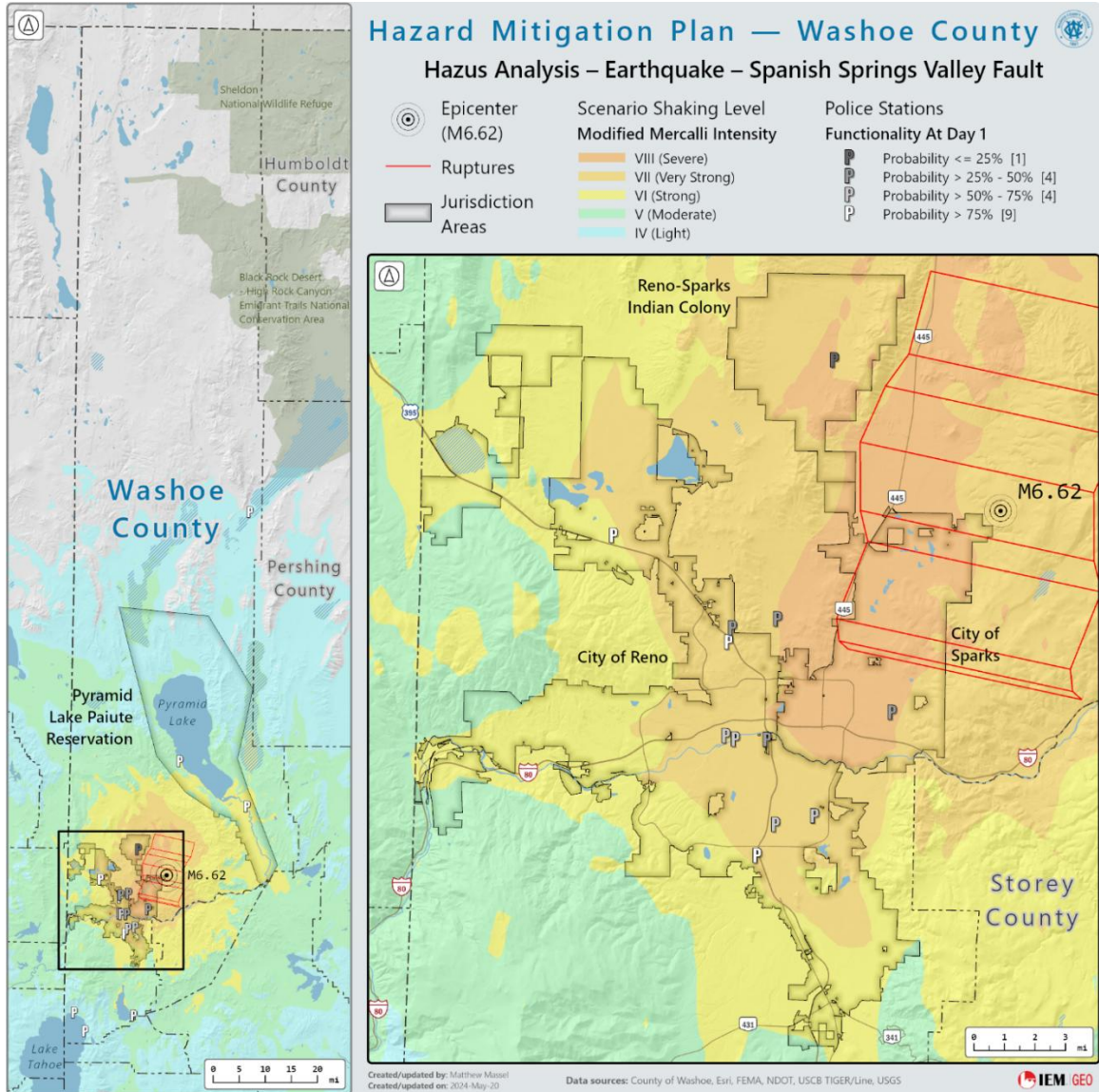
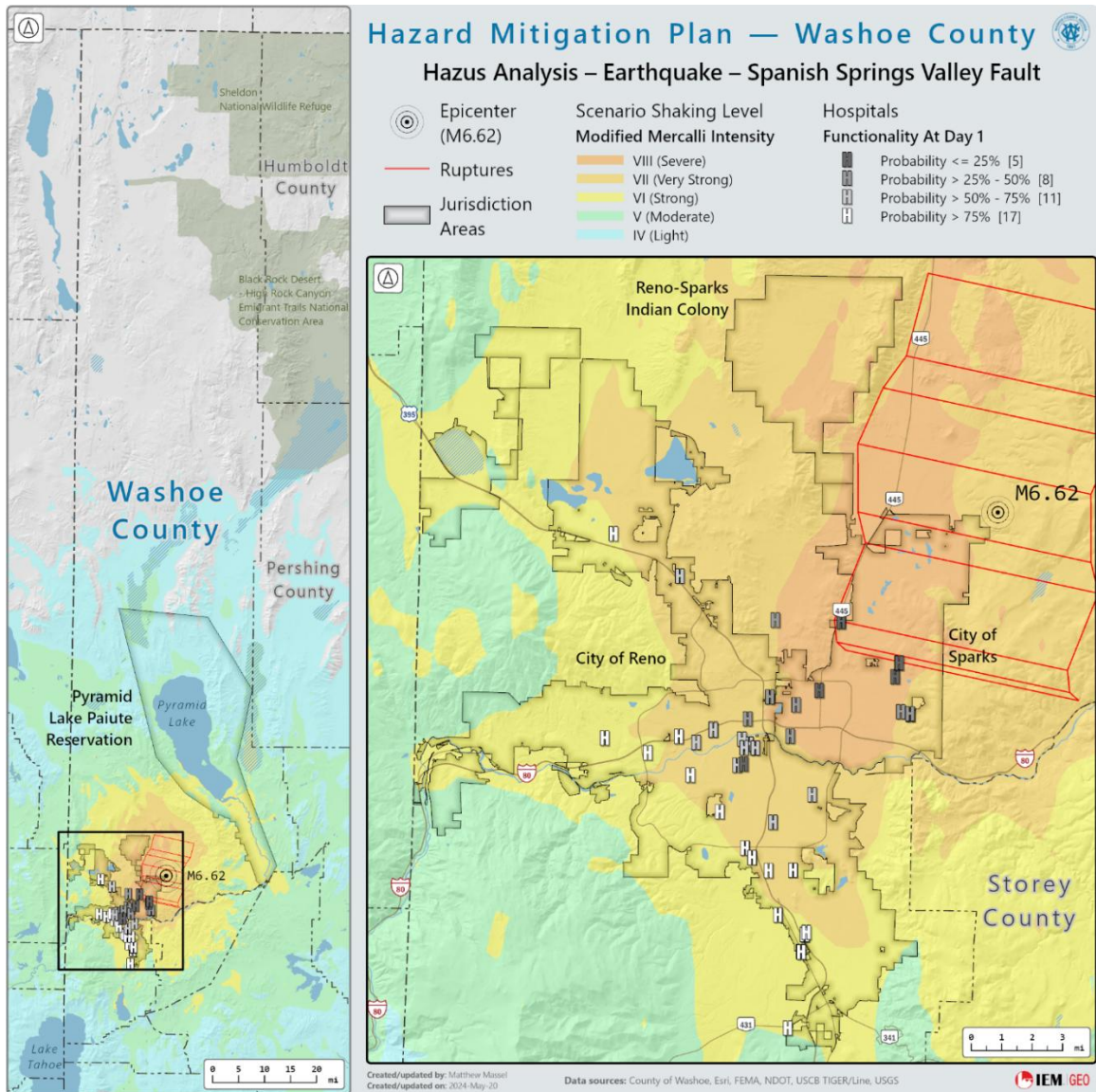


Figure 65: Spanish Springs Valley Hanus Scenario Police Station Functionality



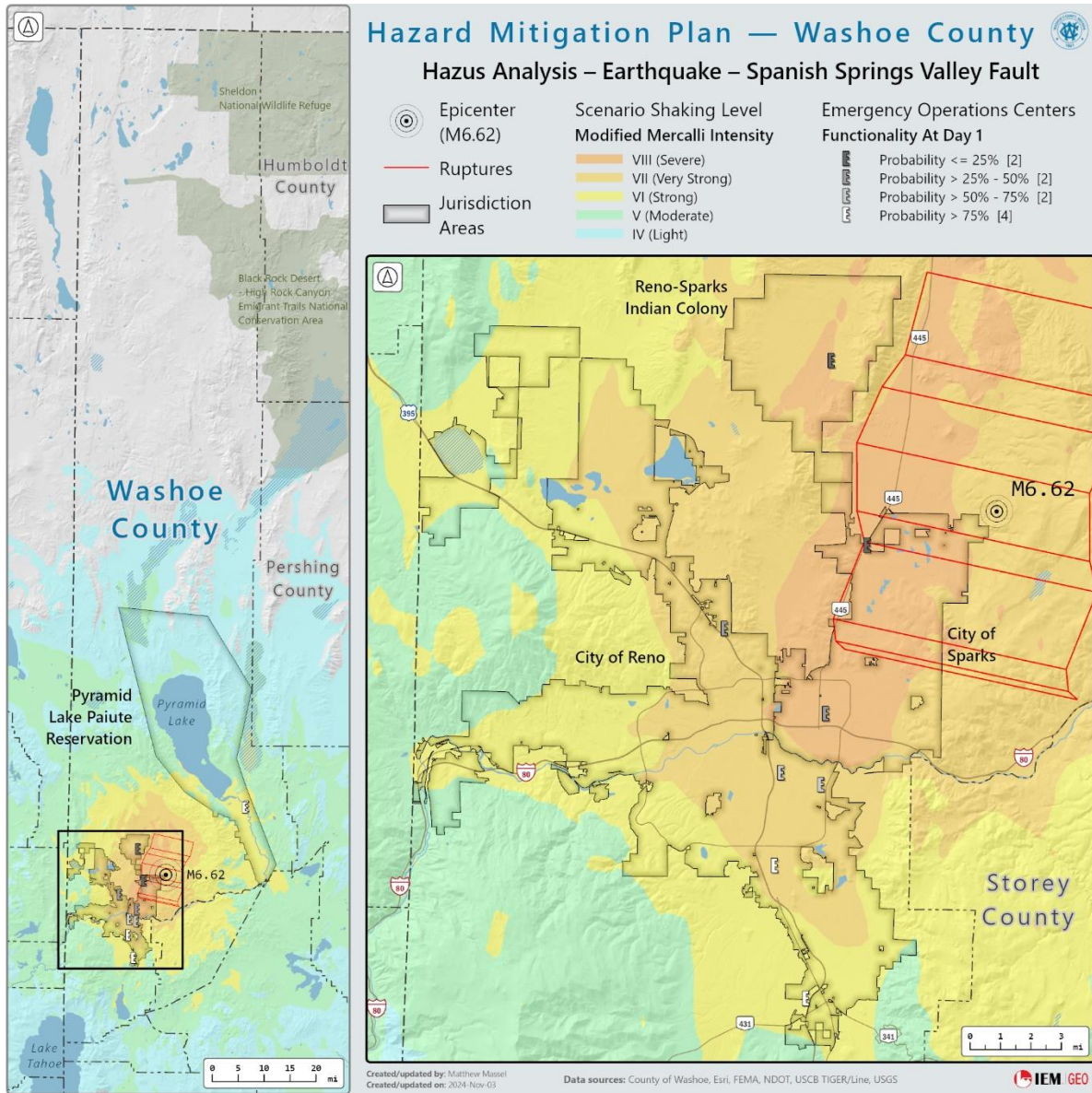


Figure 67: Spanish Springs Valley Hazus Scenario EOC Functionality

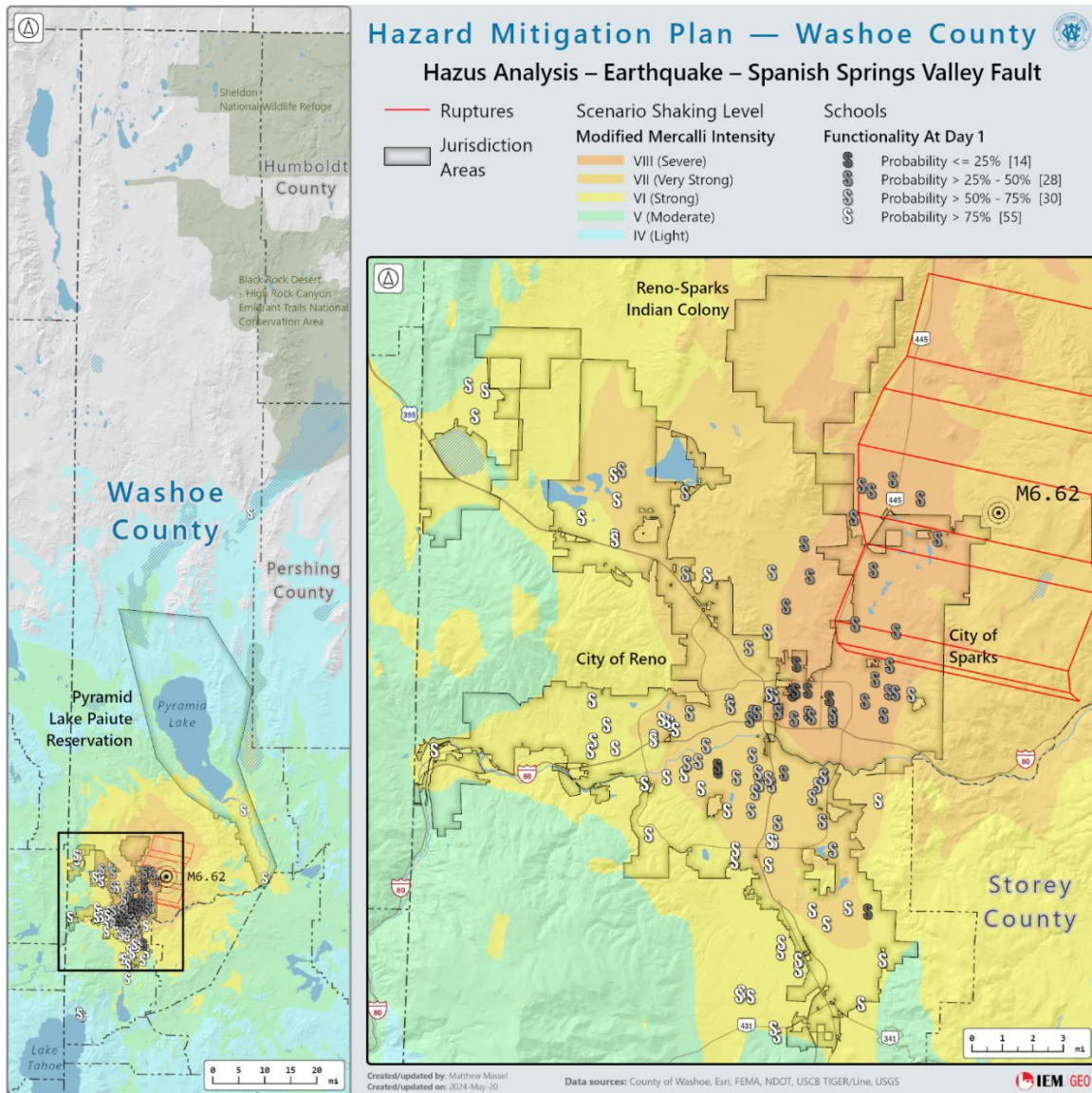


Figure 68: Spanish Springs Valley Hazus Scenario School Functionality

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 69, Figure 70, and Figure 71 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.

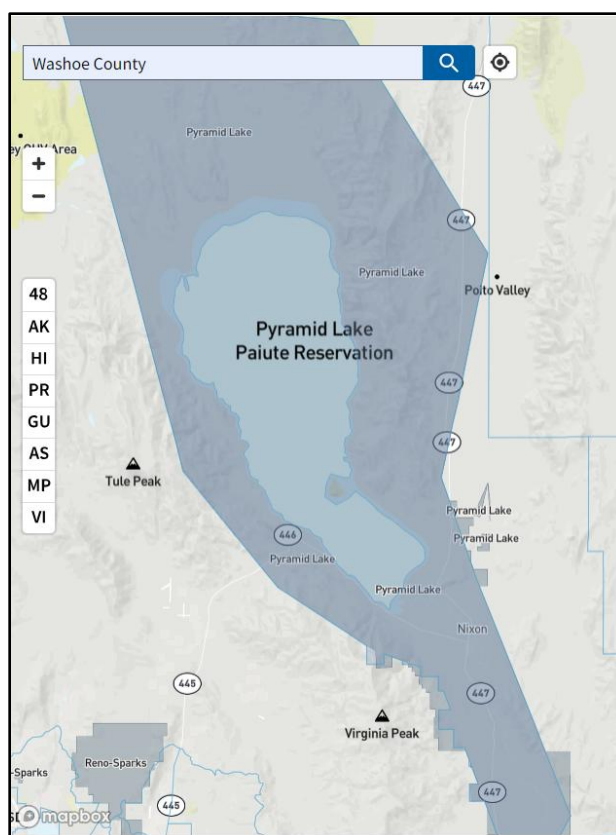


Figure 69: Census Tracts on the Pyramid Lake Paiute Reservation Identified as Disadvantaged¹⁰⁹

¹⁰⁹ Climate and Economic Justice Screening Tool, “Pyramid Lake Paiute Indian Reservation by Census Tract.” <https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5>

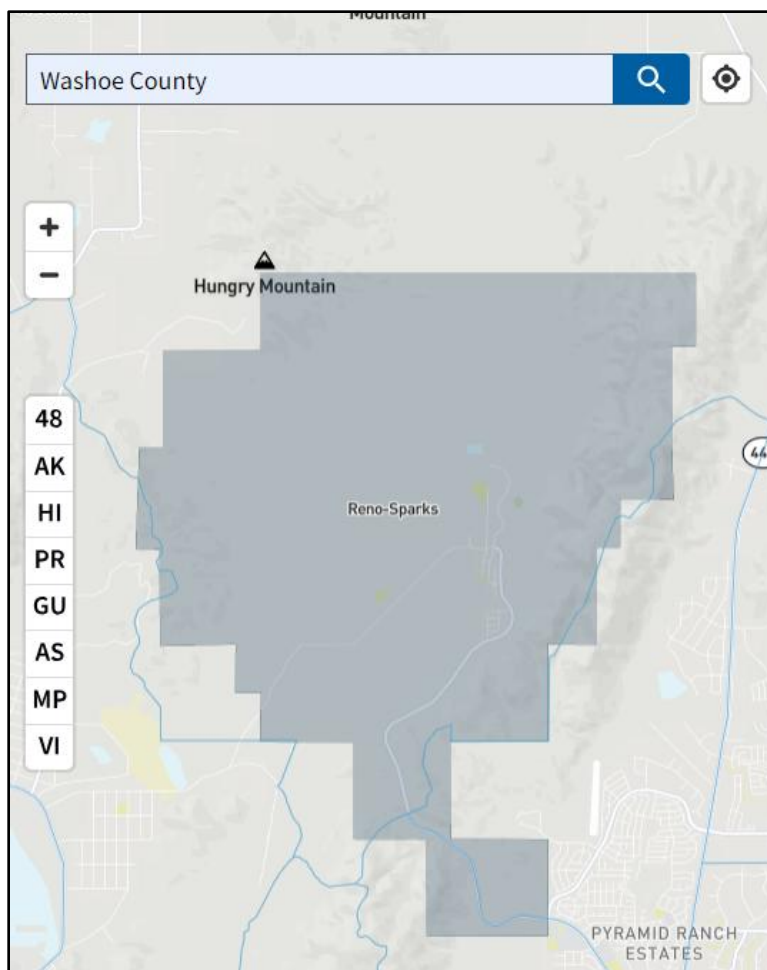


Figure 70: Census Tracts on the Reno–Sparks Reservation Designated as Disadvantaged¹¹⁰

¹¹⁰ Climate and Economic Justice Screening Tool, “Reno-Sparks Indian Colony by Census Tract.”
<https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5>

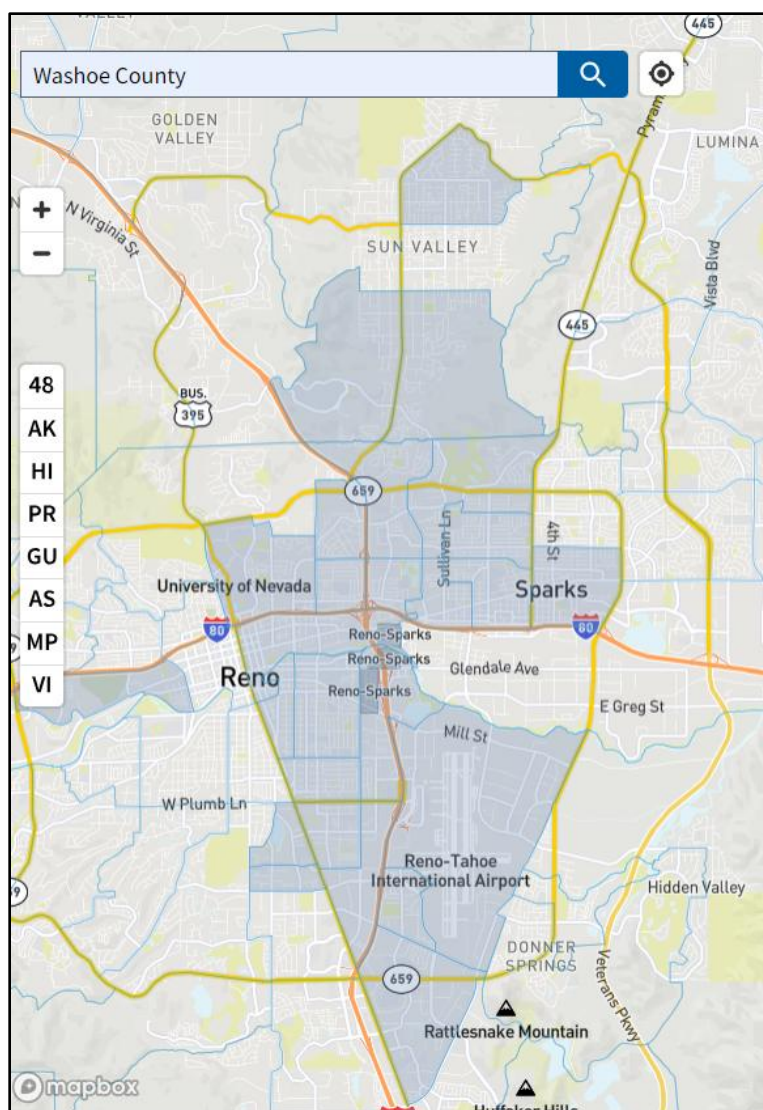


Figure 71: Census Tracts in the City of Reno and City of Sparks Designated as Disadvantaged¹¹¹

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

¹¹¹ 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 72).¹¹²



Figure 72: 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.

¹¹² 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.

EXISTING MITIGATION CASE STUDY

The City of Reno completed a city hall seismic retrofit in 2024 (see Figure 73). 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.

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.



Figure 73: Seismic Retrofitting in the City of Reno City Hall

Table 54 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 54: 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

Subject	Ranking	Impacts/Earthquake
		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.
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.

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 55 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 55: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

Table 56 provides the Calculated Priority Risk Index (CPRI) for earthquake impact in Washoe County based on the current plan’s hazard risk assessment results. Washoe County assigned earthquake a risk factor value of 3.4, reflecting high probability, quick onset, and longer duration impacts. This risk factor value falls in the range of 2.5-4.0, which is considered a high risk hazard. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 56: Calculated Priority Risk Index for Earthquake in Washoe County

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

NATIONAL RISK INDEX

The National Risk Index (NRI) contains national level data for 18 natural hazards including earthquake. The index provides rankings for historical losses, expected annual loss, and overall risk at the county and census tract levels. Table 57 provides the NRI rankings for earthquake in Washoe County. For this hazard, the NRI assigns scores of Very High for Historical Losses, Relatively High for Expected Annual Loss, and Relatively High for Overall Risk on a scale ranging from Very Low to Very High.

Table 57: National Risk Index for Earthquake in Washoe County

Earthquake	Historical Losses	Expected Annual Loss	Overall Risk Score	Overall Risk
	Very High	Relatively High	99.4	Relatively High

Based on the NRI, Washoe County has an Overall Risk value for earthquake of Relatively High compared to all other communities within the United States, with a score of **99.4** (see Figure 74).

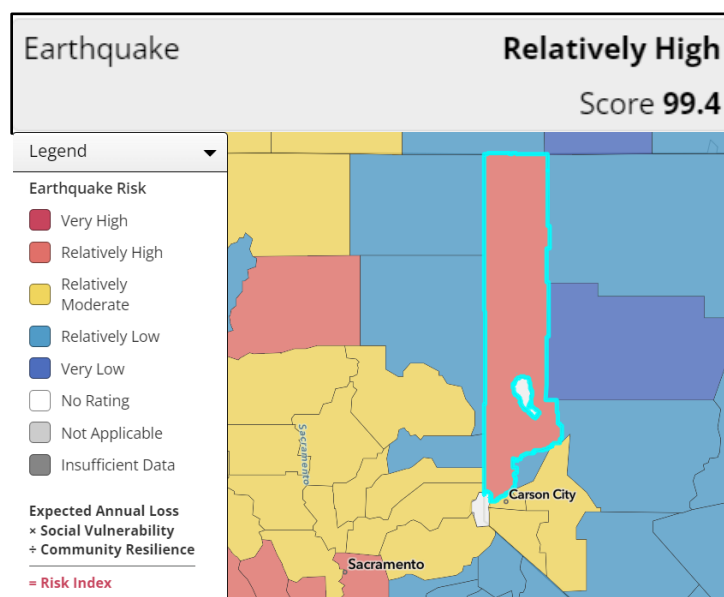


Figure 74: NRI Overall Risk Score for Earthquake in Washoe County¹¹³

Figure 75 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.

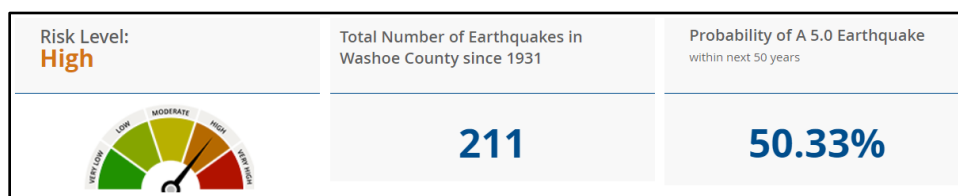


Figure 75: USGS Probability Risk Score for Washoe County¹¹⁴

¹¹³ FEMA, NRI, “National Risk Index Washoe County Earthquake Score, Map and Legend.”

<https://hazards.fema.gov/nri/map>

¹¹⁴ Homefacts, 2024, “USGS Probability Risk score for Washoe County.”

<https://www.homefacts.com/earthquakes/Nevada/Washoe-County.html>

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.¹¹⁵ 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.

¹¹⁵ 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.¹¹⁶

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

¹¹⁶ 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

Washoe County, Nevada power outages in last 15 days

Total tracked customers: 226,966

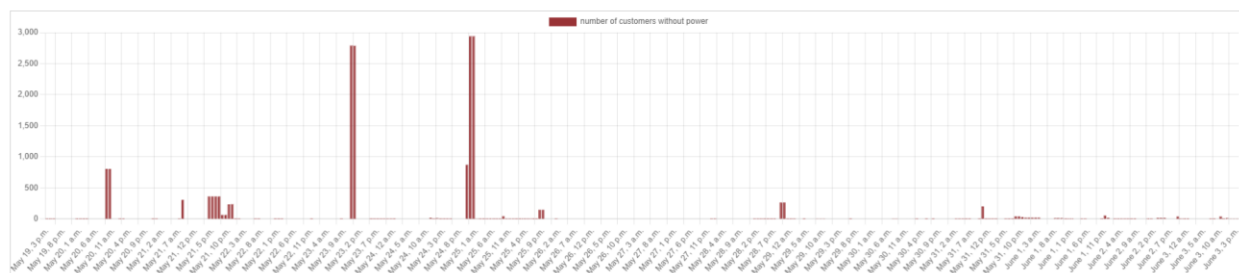


Figure 76: Washoe County Power Outages, May 19–June 3, 2024¹¹⁷

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 58). Washoe County customers experience an average of 0.93 power outages annually, lasting roughly 100.68 minutes.¹¹⁸

Table 58: 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.

¹¹⁷ 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/>

¹¹⁸ 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.¹¹⁹
- During Winter 2020, approximately 90,000 customers were affected by power outage for four days due to Sierra Mountains “cement” snowstorm downing power lines (see Figure 77).



Figure 77: Utility Pole with Power Lines and Transformers¹²⁰

- 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.¹²¹
- 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

¹¹⁹ 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

¹²⁰ Reno Gazette Journal, 2015, Jupiter Images. <http://www.jupiterimages.com>

¹²¹ 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.¹²²

- 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.¹²³ NV Energy stated that poor visibility and road conditions increased restoration times.¹²⁴

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.

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 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 (see Figure 78), 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

¹²² 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/>

¹²³ KOLO News Now, “Almost All Power Restored in Western Nevada.”

<https://www.kolotv.com/2024/03/02/widespread-power-outages-western-nevada/>

¹²⁴ 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

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.

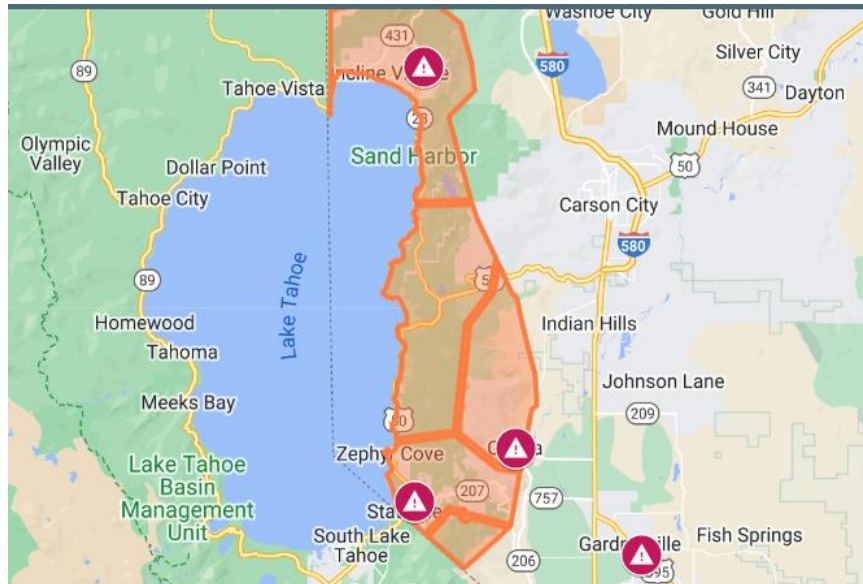


Figure 78: Northern Nevada Public Safety Outage Management Zone

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.¹²⁵

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 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

¹²⁵ 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

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.¹²⁶

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

Community lifelines are essential systems that support public health and safety during disasters (see Figure 79). 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.



Figure 79: FEMA Community Lifelines

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

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.¹²⁷

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.

Table 59 provides the Consequence Analysis of the Potential for Detrimental Impacts of Energy Emergencies, which was done for accreditation with EMAP.

Table 59: 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.

¹²⁷ Washoe County Government, Emergency Management and Homeland Security, 2024, "Energy Emergency-Mitigation."

<https://www.washoecounty.gov/em/Hazards/Energy%20Emergency.php>

Subject	Ranking	Impacts/Criminal Acts and Terrorism
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 Infrastructure	Minimal to Severe	The risk to property, facilities, and infrastructure in Washoe County due to energy emergencies could include potential 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

Subject	Ranking	Impacts/Criminal Acts and Terrorism
		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. 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.

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.¹²⁸

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 60 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 60: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

Table 61 provides the Calculated Priority Risk Index (CPRI) for energy emergency impact for Washoe County based on the current plan's hazard risk assessment results. Washoe County's hazard assessment shown in Table 61 identifies energy emergency as a high-risk hazard, with a CPRI value of 3.1. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 61: Calculated Priority Risk Index for Energy Emergency in Washoe County

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

¹²⁸ 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/>

NATIONAL RISK INDEX

There are no NRI findings for this hazard as the NRI provides data only for natural hazards.

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 62 shows the types of winter storms.

Table 62: Types of Winter Storms¹²⁹

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.

¹²⁹ 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:¹³⁰

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.¹³¹ Extreme heat conditions are determined by comparing temperature and humidity to average conditions for the affected location at that time of year.¹³² 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.

¹³⁰ National Weather Service, 2024, <https://www.weather.gov/safety/winter-ww>

¹³¹ ClimRR Climate Projection Report, Washoe County. <https://climrr.anl.gov/climateprojections>

¹³² 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.¹³³ The National Gridded Snowfall Analysis estimates snowfall through several remote observation networks. Figure 80 shows the seasonal snow accumulation as of March 28, 2023, a boom year for snow in the Sierra Nevada.

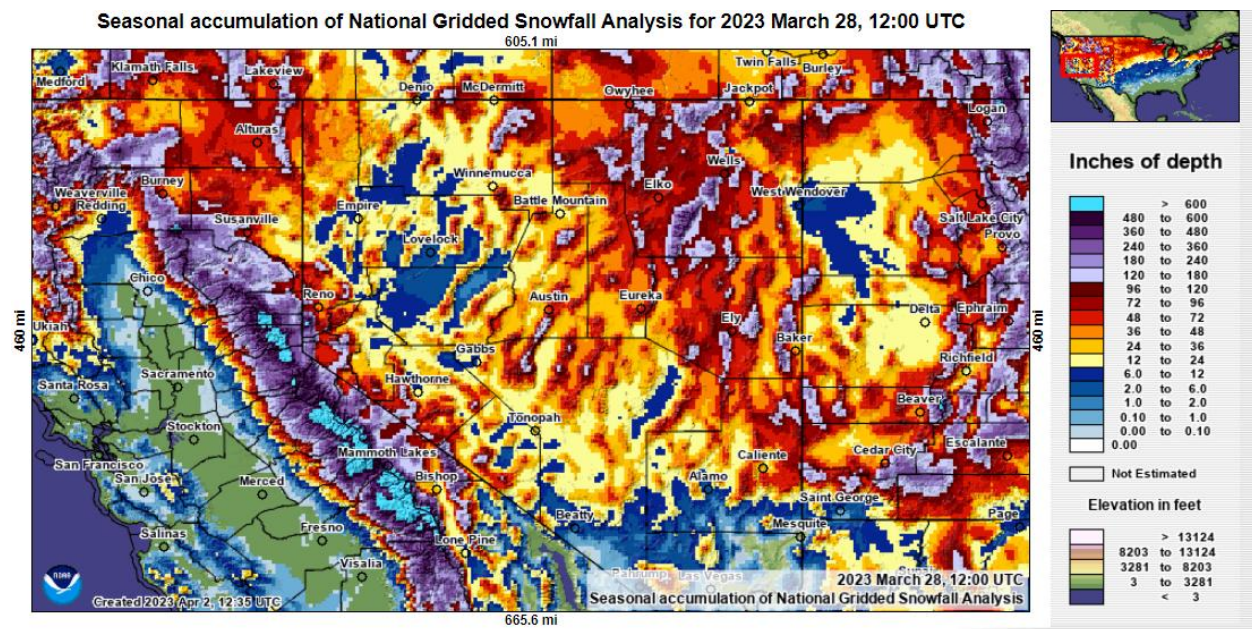


Figure 80: Seasonal National Gridded Snowfall Analysis, March 28, 2023

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

¹³³ 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=-123.216666666667&min_y=35.916666666663&max_x=-111.341666666667&max_y=42.591666666662&coord_x=-117.279166666667&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

81. 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.

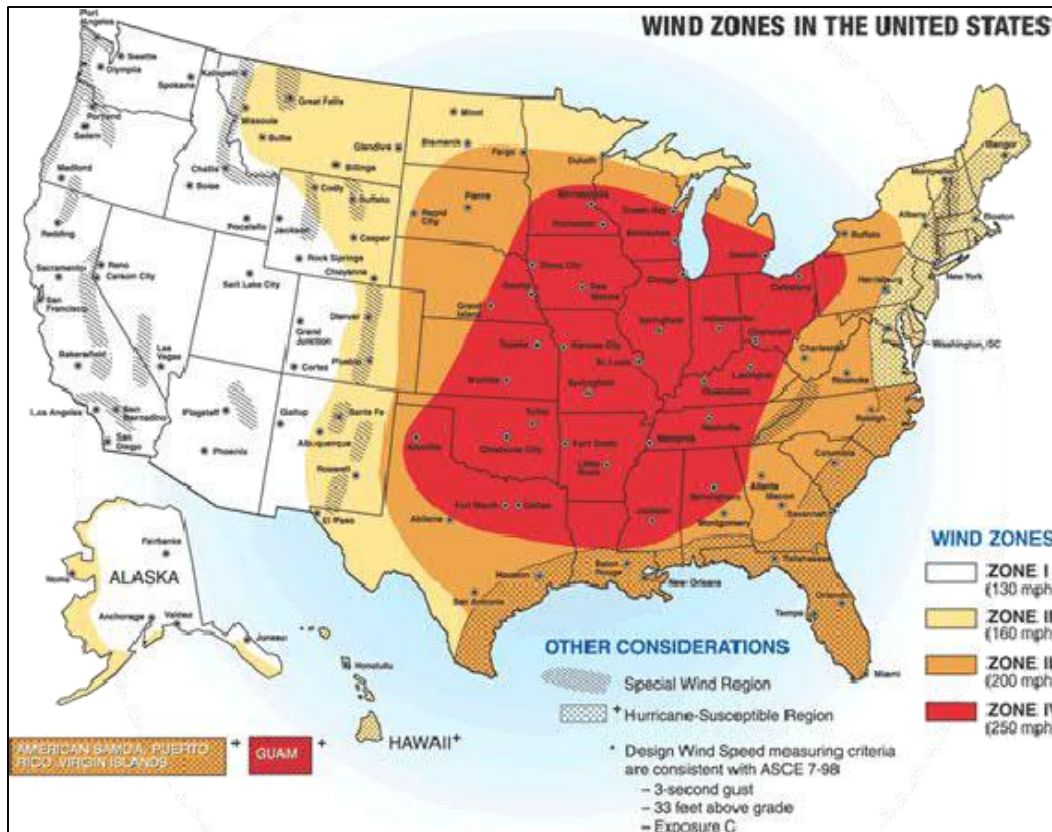


Figure 81: Wind Zones in the United States¹³⁴

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.¹³⁵ Figure 82 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

¹³⁴ Resilient Action Fund, FEMA, 2022, "Wind Zones in the United States."

<https://www.buildingresilient.com/resources/us-wind-zones-map/>

¹³⁵ United States Environmental Protection Agency, "Heat Island Effect."

<https://www.epa.gov/heatislands#:~:text=Heat%20islands%20are%20urbanized%20areas,as%20forests%20and%20water%20bodies>

use 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.

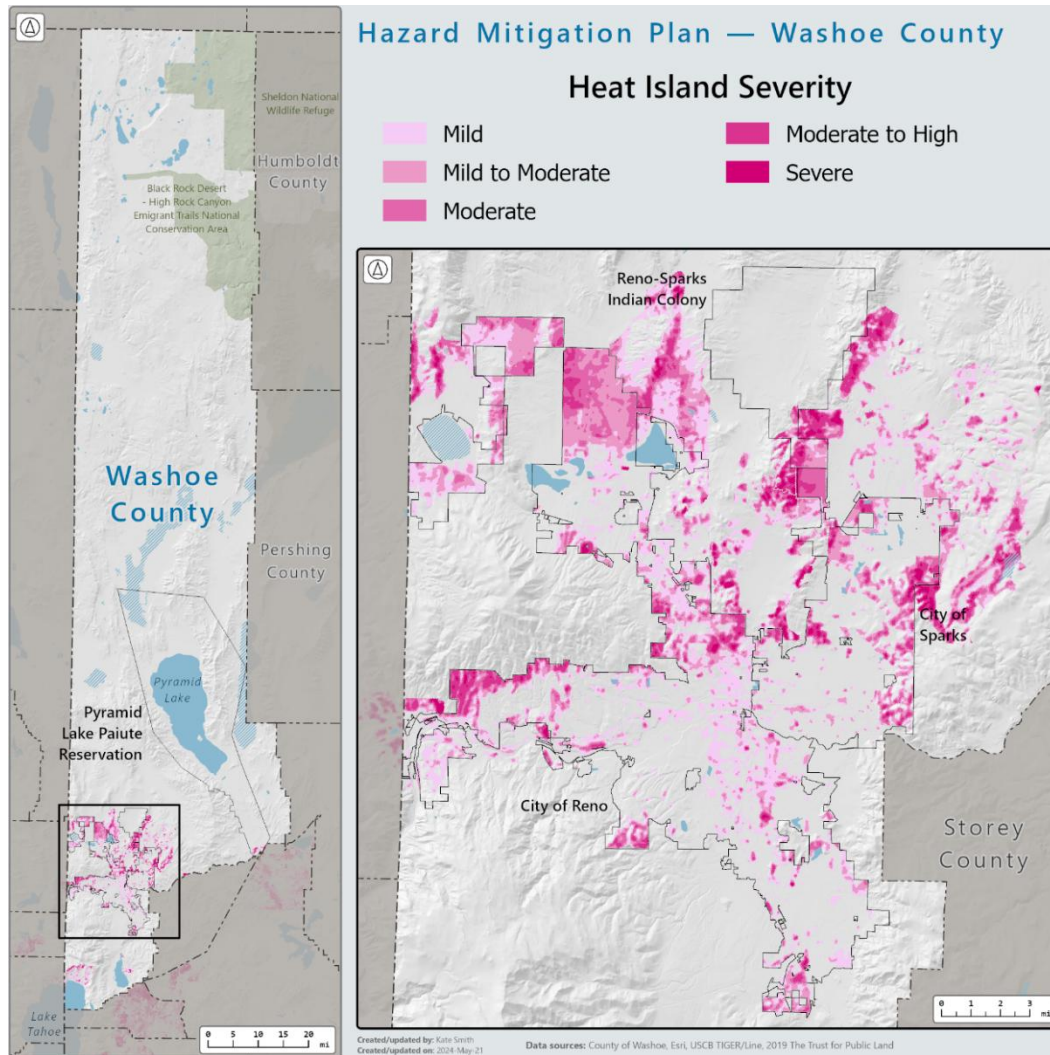


Figure 82: Heat Severity in Washoe County

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 83). 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.

Potential Winter Storm Impacts	
	Winter Weather Area Expect Winter Weather. • Winter driving conditions. Drive carefully.
	Minor Impacts Expect a few inconveniences to daily life. • Winter driving conditions. Use caution while driving.
	Moderate Impacts Expect disruptions to daily life. • Hazardous driving conditions. Use extra caution while driving. • Closures and disruptions to infrastructure may occur.
	Major Impacts Expect considerable disruptions to daily life. • Dangerous or impossible driving conditions. Avoid travel if possible. • Widespread closures and disruptions to infrastructure may occur.
	Extreme Impacts Expect substantial disruptions to daily life. • Extremely dangerous or impossible driving conditions. Travel is not advised. • Extensive and widespread closures and disruptions to infrastructure may occur. • Life-saving actions may be needed.

Figure 83: Winter Storm Severity Index¹³⁶

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

¹³⁶ 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. Table 63 is the Beaufort Scale of severe wind hazard and represents one measure of the magnitude or severity of the wind hazard.

Table 63: Beaufort Scale of Severe Wind Hazard¹³⁷

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

¹³⁷ NOAA, 2024, “Beaufort Scale of Severe Wind Hazard.”

<https://www.weather.gov/mfl/beaufort>

heat index increases.¹³⁸ 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 (see Figure 84).

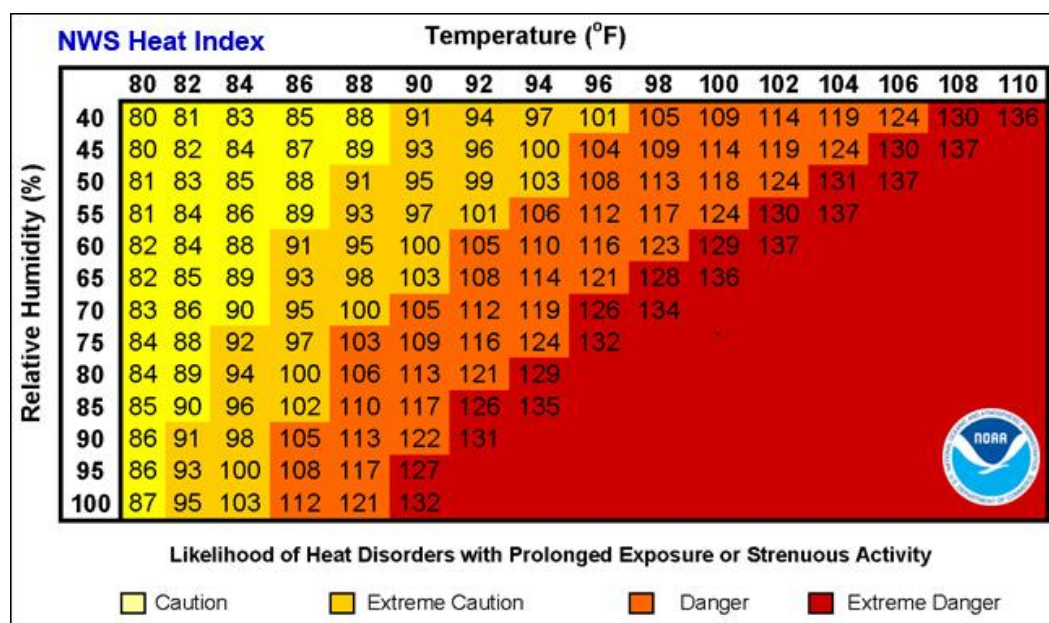


Figure 84: National Weather Service Heat Index¹³⁹

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 64, Figure 85, and Figure 86).¹⁴⁰

¹³⁸ National Weather Service, "What is the Heat Index?"

<https://www.weather.gov/ama/heatindex>

¹³⁹ National Weather Service, "What is the Heat Index?"

<https://www.weather.gov/ama/heatindex>

¹⁴⁰ FEMA, "Disasters and Other Declarations" [Disasters and Other Declarations | FEMA.gov](#)

Table 64: FEMA Extreme Weather Declarations, 2010–2023¹⁴¹

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

¹⁴¹ Ibid.

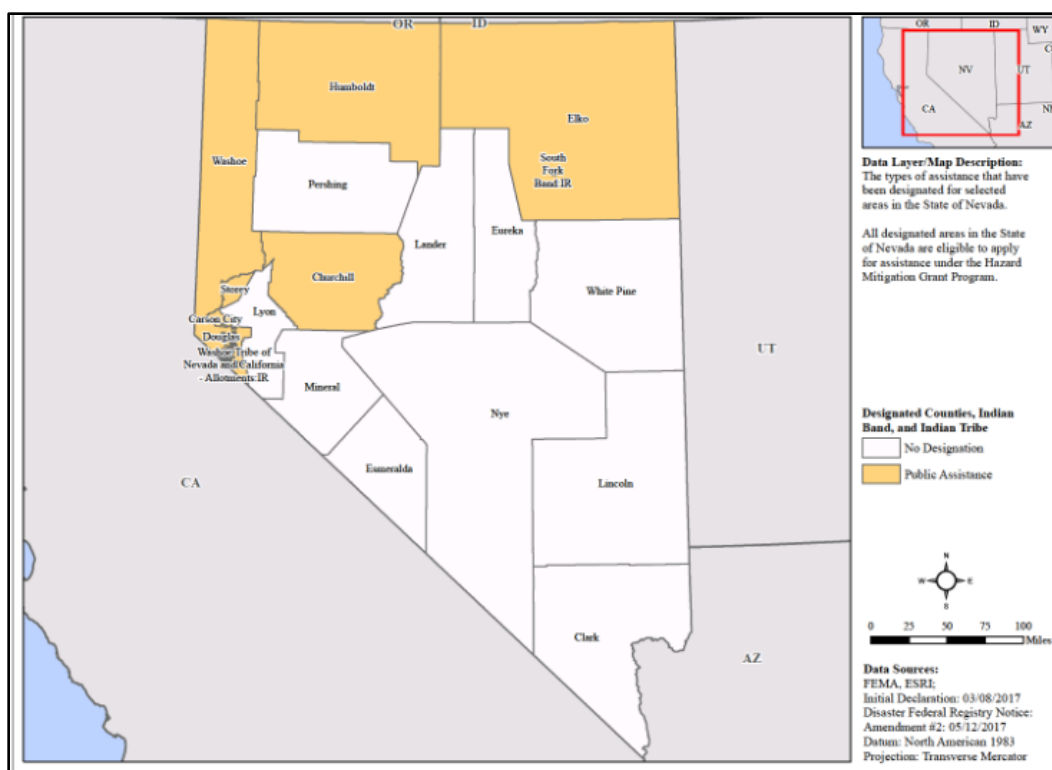


Figure 85: FEMA 4307-DR, Nevada Disaster Declaration as of 5/12/2017¹⁴²

¹⁴² FEMA, 2024, "FEMA 4307, Nevada Disaster Declaration as of 5/12/2017."
<https://www.fema.gov/disaster/4307/designated-areas>

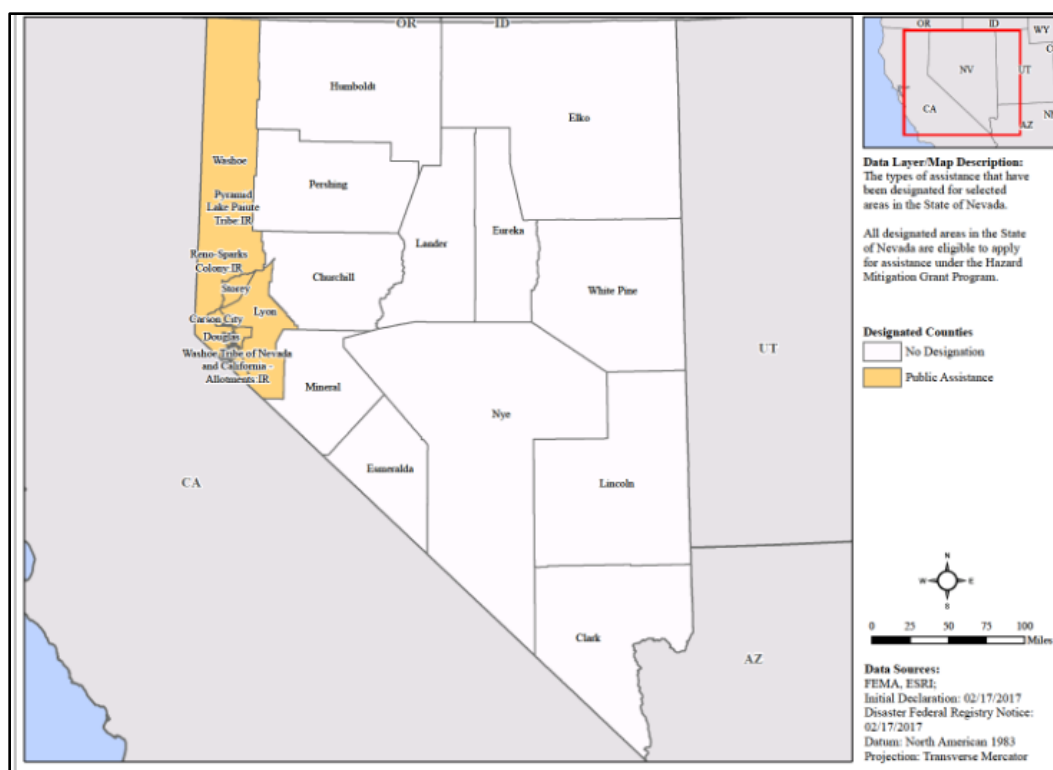


Figure 86: FEMA 4303-DR, Nevada Disaster Declaration as of 2/17/2017¹⁴³

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.

¹⁴³ 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 compiled 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.¹⁴⁴ Daily wind speeds were obtained from NOAA's online climate database for Washoe County from 2015 through 2018.¹⁴⁵ 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 compiled 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 87 shows how damaging high winds can be.

¹⁴⁴ 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/>

¹⁴⁵ Washoe County, "Regional-HMP-2020.pdf."

<https://www.washoecounty.gov/em/files/Regional-HMP-2020.pdf>



Figure 87: NWS Reno Radar Damage from Wind, December 2008¹⁴⁶

HUMAN EFFECTS OF DISASTER: 2002 WASHOE COUNTY 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 forecaster¹⁴⁷

Figure 88 maps historic wind events across Washoe County from 1955 to 2022, highlighting areas most affected by severe windstorms.

¹⁴⁶ Washoe County, NV, “Regional-HMP-2020.pdf.”

<https://www.washoecounty.gov/em/files/Regional-HMP-2020.pdf>

¹⁴⁷ 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/>

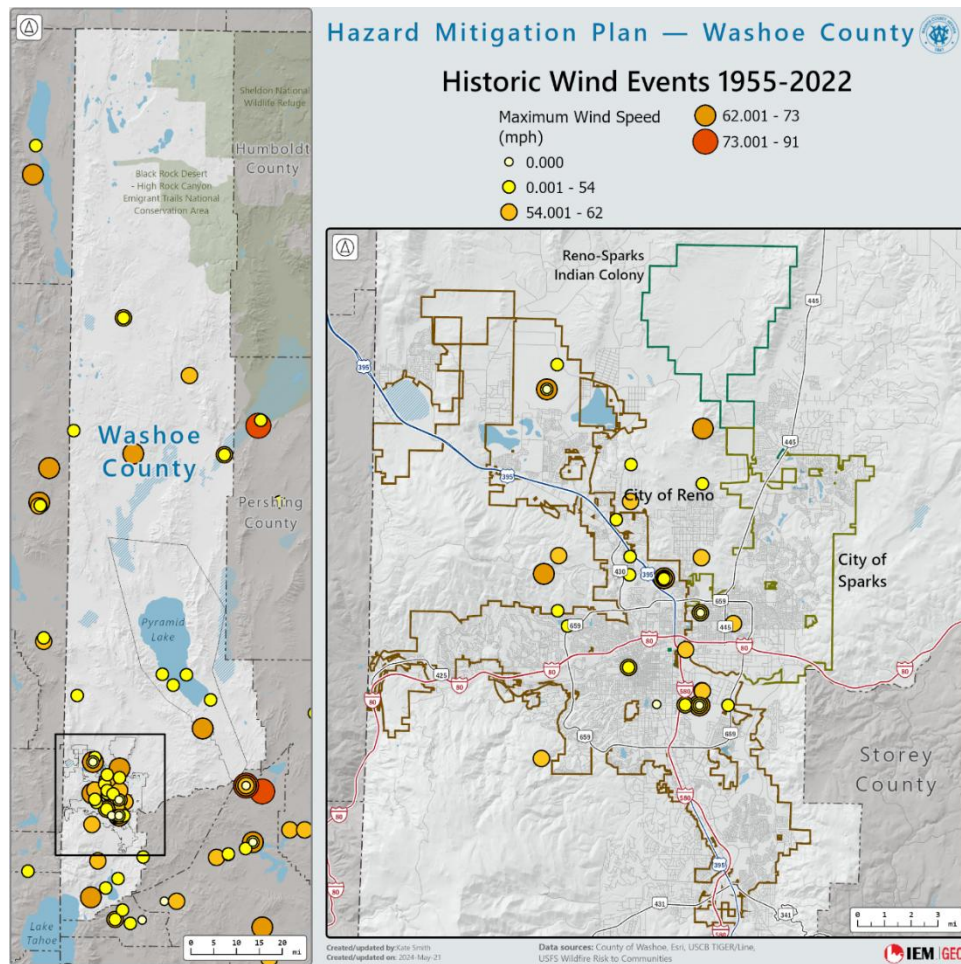


Figure 88: Historic Wind Events in Washoe County, 1955–2022¹⁴⁸

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 2021¹⁴⁹ and 2023.¹⁵⁰ These warnings included information to help individuals avoid heat-related illness and the locations of cooling centers.

¹⁴⁸ National Weather Service Storm Prediction Center Severe Weather Database.

<https://www.spc.noaa.gov/gis/svrgis/>

¹⁴⁹ 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/>

¹⁵⁰ 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 89 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.

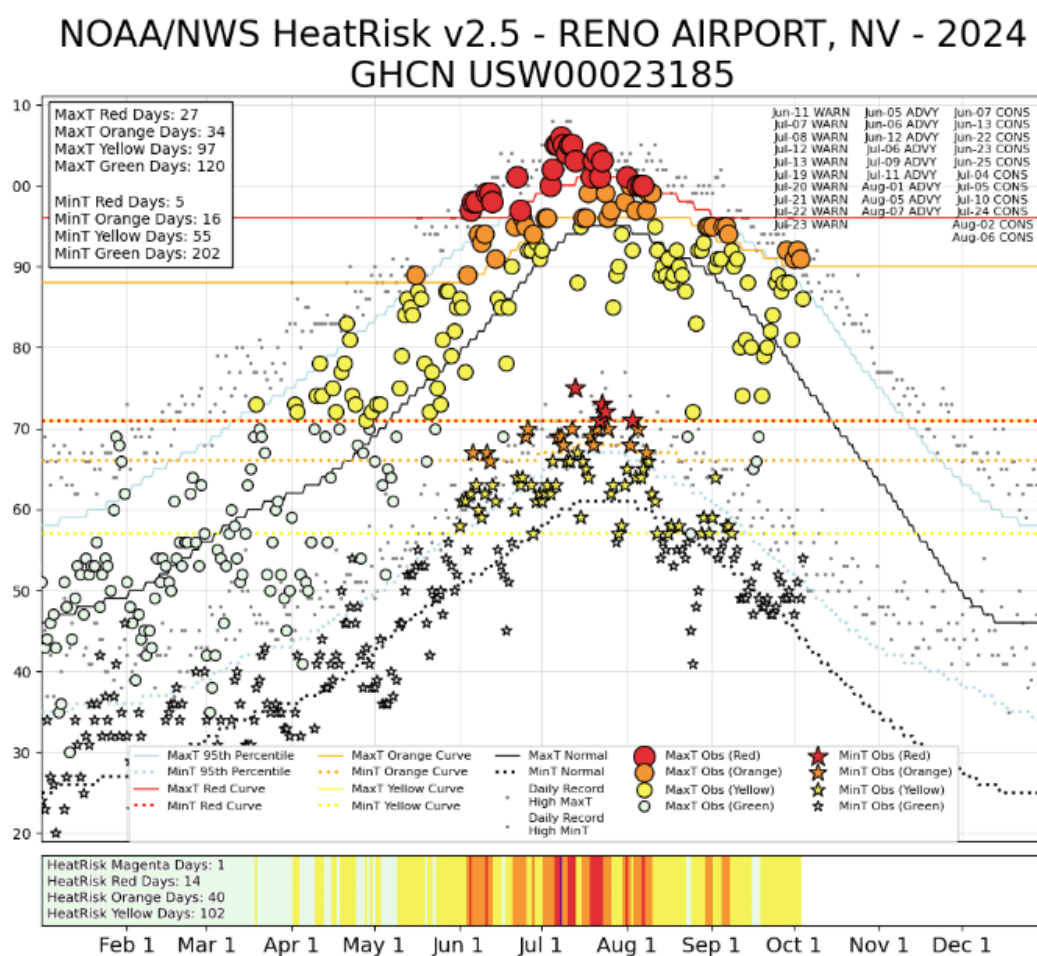


Figure 89: NOAA/NWS Heat Risk Graph, 2024 Reno Airport¹⁵¹

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

¹⁵¹ 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.

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 90 shows NOAA’s mapping of urban heat islands in the Reno–Sparks area.



Figure 90: NOAA Mapping of Heat Islands, Including Reno–Sparks, Nevada¹⁵²

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.

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

¹⁵² 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/>

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 Prevention¹⁵³ 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.

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

¹⁵³ 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

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 91 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.

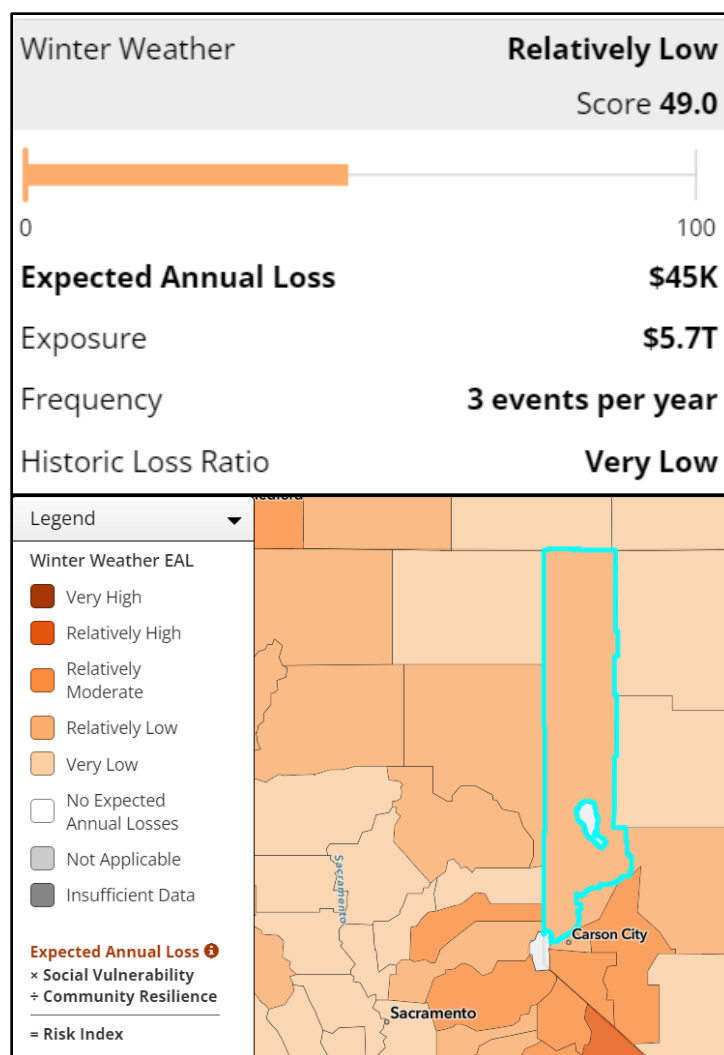


Figure 91: Washoe County Winter Weather Expected Annual Loss Score, Map, and Legend¹⁵⁴

Figure 92 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.

¹⁵⁴ FEMA, National Risk Index, "Washoe County Winter Storm Expected Annual Loss Score, Map, and Legend." <https://hazards.fema.gov/nri/map>

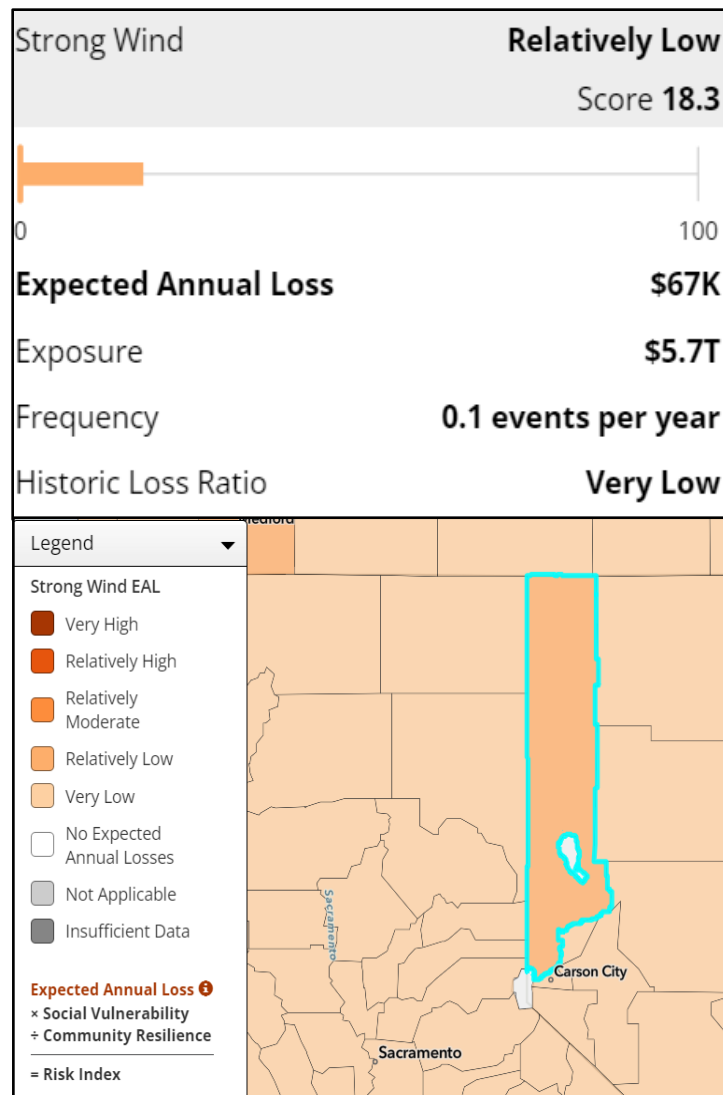


Figure 92: Washoe County Windstorm Expected Annual Loss Score, Map, and Legend¹⁵⁵

Figure 93 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.

¹⁵⁵ FEMA, "National Risk Index Washoe County Heat Wave Score, Map, and Legend." <https://hazards.fema.gov/nri/map>

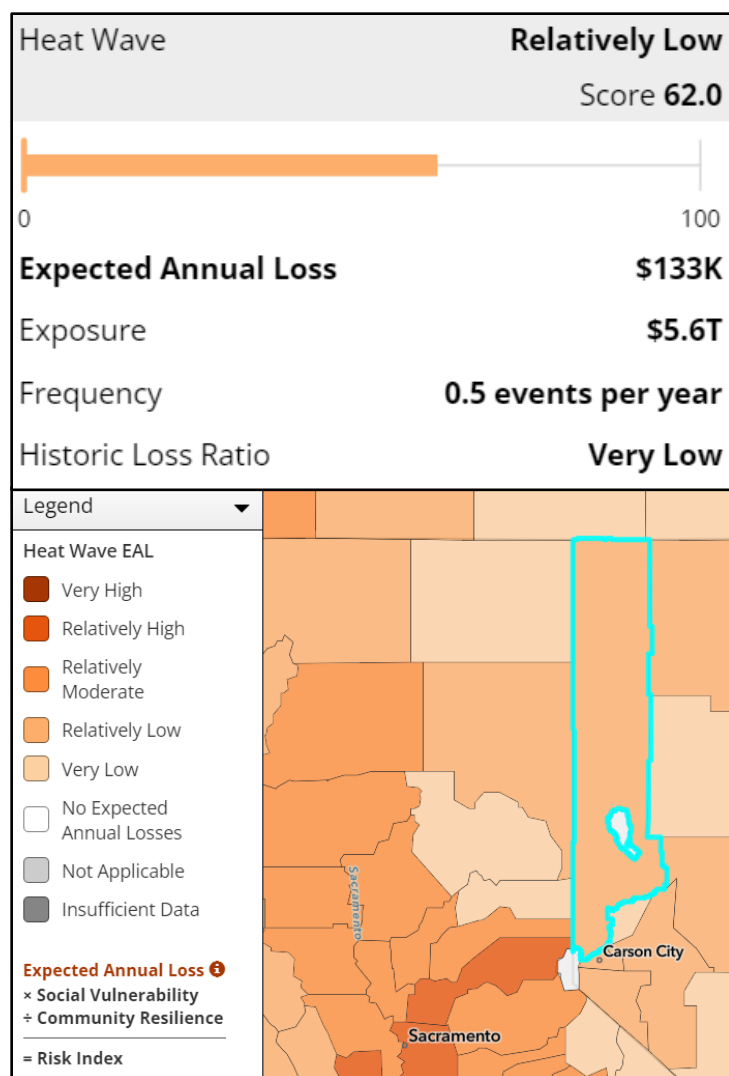


Figure 93: Washoe County Windstorm Expected Annual Loss Score, Map, and Legend¹⁵⁶

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

¹⁵⁶ 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.¹⁵⁷

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.¹⁵⁸

COMMUNITY LIFELINES

Community lifelines are essential systems that support public health and safety during disasters (see Figure 94). 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.

¹⁵⁷ 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/>

¹⁵⁸ 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>



Figure 94: FEMA Community Lifelines

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.

Table 65 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 65: 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, 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

Subject	Ranking	Impacts/Extreme Weather (Winter Storm, Windstorm, and Extreme Heat)
		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.
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.

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 66 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 66: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

Table 67 provides the Calculated Priority Risk Index (CPRI) for extreme weather (winter storm, windstorms, and extreme heat) impact in Washoe County based on the current plan's hazard risk assessment results. Washoe County assigned extreme weather a risk factor value of 2.9, reflecting high probability, medium frequency, and longer duration impacts. This risk factor value falls in the range of 2.5 to 4.0, which is considered a high-risk hazard. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 67: Calculated Priority Risk Index for Extreme Weather in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Extreme Weather	4	2	1	4	3	2.9	High

NATIONAL RISK INDEX

The National Risk Index (NRI) contains national level data for 18 natural hazards including winter weather, windstorms, and extreme heat, the three components of extreme weather in this plan. The index provides rankings for historical losses, expected annual loss, and overall risk at the county and census tract levels. Table 68 provides the NRI rankings for winter weather in Washoe County. For this hazard, the NRI assigns scores of Very Low for Historical Losses,

Relatively Low for Expected Annual Loss, and Relatively Low for Overall Risk on a scale ranging from Very Low to Very High.

Table 68: National Risk Index for Winter Weather in Washoe County

Winter Weather	Historical Losses	Expected Annual Loss	Overall Risk Score	Overall Risk
	Very Low	Relatively Low	45.9	Relatively Low

Based on the NRI, Washoe County has an Overall Risk value for winter weather of Relatively Low compared to all other communities within the United States, with a score of **45.9** (see Figure 95).

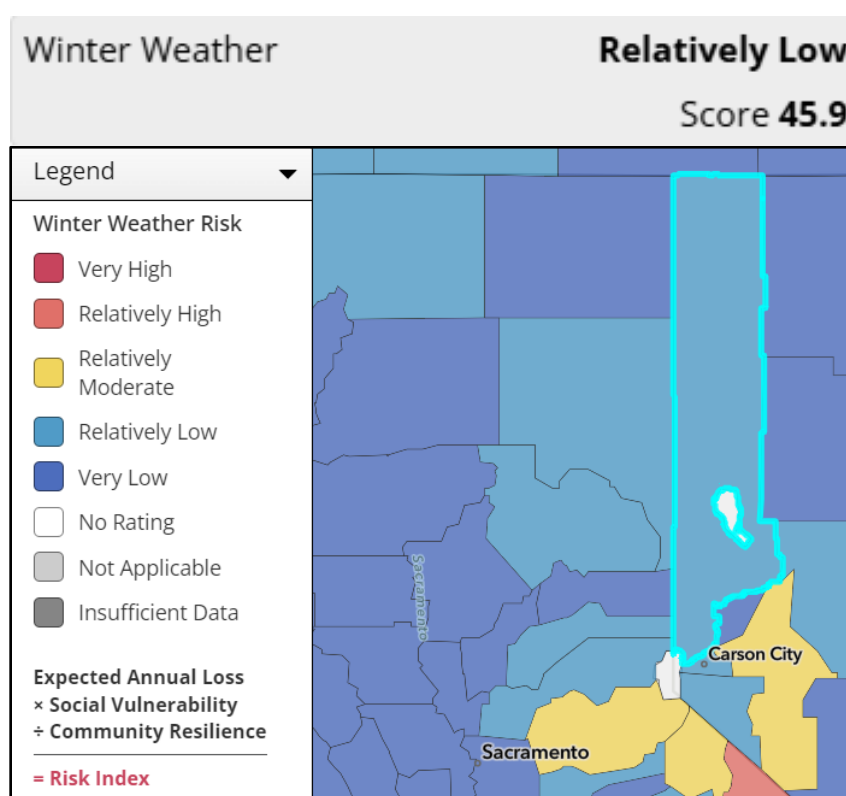


Figure 95: NRI Overall Risk Score for Winter Weather in Washoe County¹⁵⁹

Table 69 provides the NRI rankings for windstorms in Washoe County. For this hazard, the NRI assigns scores of Very Low for Historical Losses, Relatively Low for Expected Annual Loss, and Very Low for Overall Risk on a scale ranging from Very Low to Very High.

¹⁵⁹ FEMA, "National Risk Index Washoe County Heat Wave Score, Map, and Legend."

<https://hazards.fema.gov/nri/map>

Table 69: National Risk Index for Windstorm in Washoe County

Windstorm	Historical Losses	Expected Annual Loss	Overall Risk Score	Overall Risk
	Very Low	Relatively Low	15.7	Very Low

Based on the NRI, Washoe County has an Overall Risk value for windstorm of Very Low compared to all other communities within the United States, with a score of **15.7** (see Figure 96).

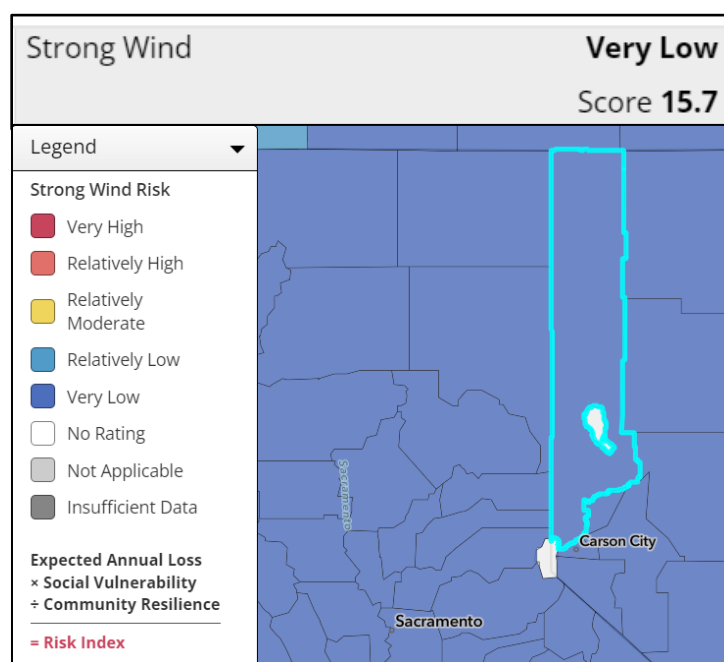

Figure 96: NRI Overall Risk Score for Windstorm in Washoe County¹⁶⁰

Table 70 provides the NRI rankings for extreme heat in Washoe County. For this hazard, the NRI assigns scores of Very Low for Historical Losses, Relatively Low for Expected Annual Loss, and Relatively Low for Overall Risk on a scale ranging from Very Low to Very High.

Table 70: National Risk Index for Extreme Heat in Washoe County

Extreme Heat	Historical Losses	Expected Annual Loss	Overall Risk Score	Overall Risk
	Very Low	Relatively Low	60.3	Relatively Low

¹⁶⁰ FEMA, "National Risk Index Washoe County Heat Wave Score, Map, and Legend." <https://hazards.fema.gov/nri/map>

Based on the NRI, Washoe County has an Overall Risk value for extreme heat of Relatively Low compared to all other communities within the United States, with a score of **60.3** (see Figure 97).

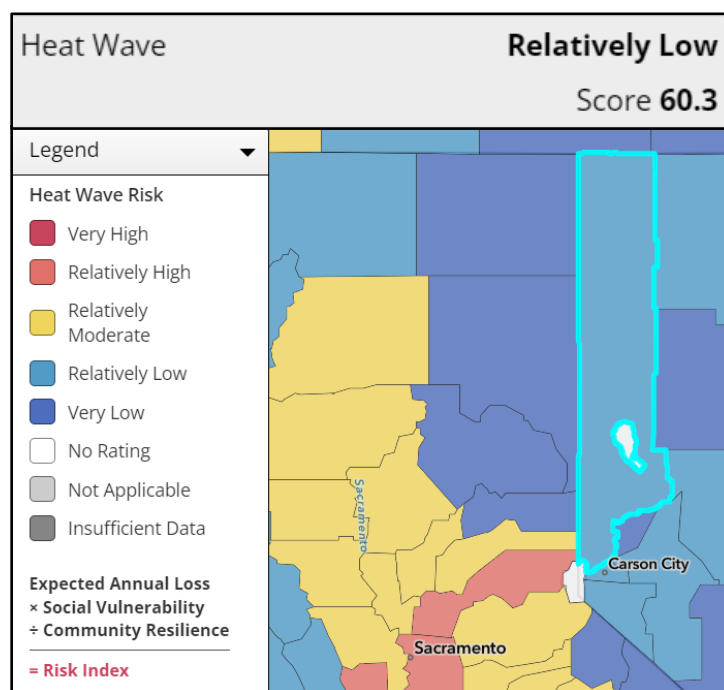


Figure 97: NRI Overall Risk Score for Extreme Heat in Washoe County¹⁶¹

¹⁶¹ FEMA, "National Risk Index Washoe County Heat Wave Score, Map, and Legend," <https://hazards.fema.gov/nri/map>

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 71 provides descriptions of these categories.

Table 71: 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

FLOODING

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.

WASHOE COUNTY DAMS

Information about the dams in Washoe County can be found in Appendix F: Dam Inundation Data (available upon request at the discretion of the Washoe County Office of Emergency Management).

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 2017.¹⁶²

Figure 98 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.¹⁶³ A base flood has, on average, a 1% chance of occurring in a given year.¹⁶⁴ 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.

¹⁶² Truckee Meadow Water Authority Water Resource Plan. <https://tmwa.com/wrp2020/>

¹⁶³ Nebraska Department of Natural Resources, https://www.bing.com/search?q=nebraska+department+of+natural+resources+floodway+schematic&gs_lcrp=EgZjaHJvbWUqBwgBEEUYwgMyBwgAEEUYwgMyBwgBEEUYwgMyBwgCEEUYwgMyBwgDEEUYwgMyBwgEEEUYwgMyBwgFEEUYwgMyBwgGEEUYwgMyBwgHEEUYwgPSAQs4NzM2NDQwajBqNKgCCLACaQ&FORM=ANAB01&PC=U531 Microsoft Word - 2001 Newsletter-DRAFT5a.doc

¹⁶⁴ Douglas County Nevada, “Flood Protection Information.” https://www.douglascountynv.gov/government/departments/community_development/storm_water_and_flood_management/flood_protection_information#:~:text=The%201%25%20annual%20chance%20flood,%2C%20AH%2C%20and%20AE

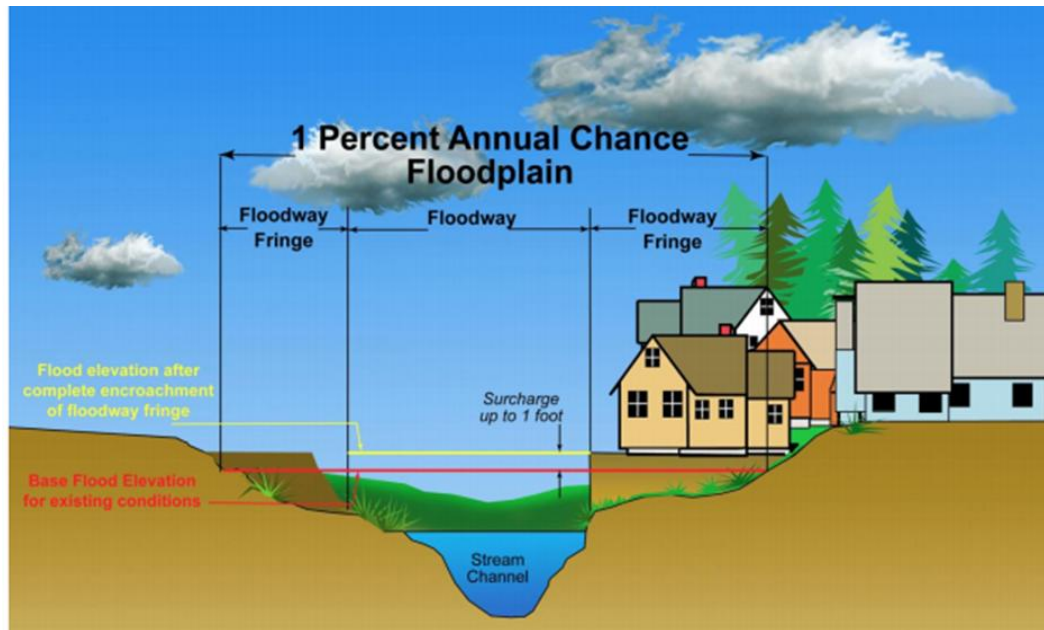


Figure 98: Schematic of 100-year Floodplain

A map series of potential flood extents is available from the Truckee River Flood Management Authority.¹⁶⁵ 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 99 shows the 100-year scenario.

¹⁶⁵ Truckee River Flood Map Series. <https://trfma.org/resources/flood-map-series/>

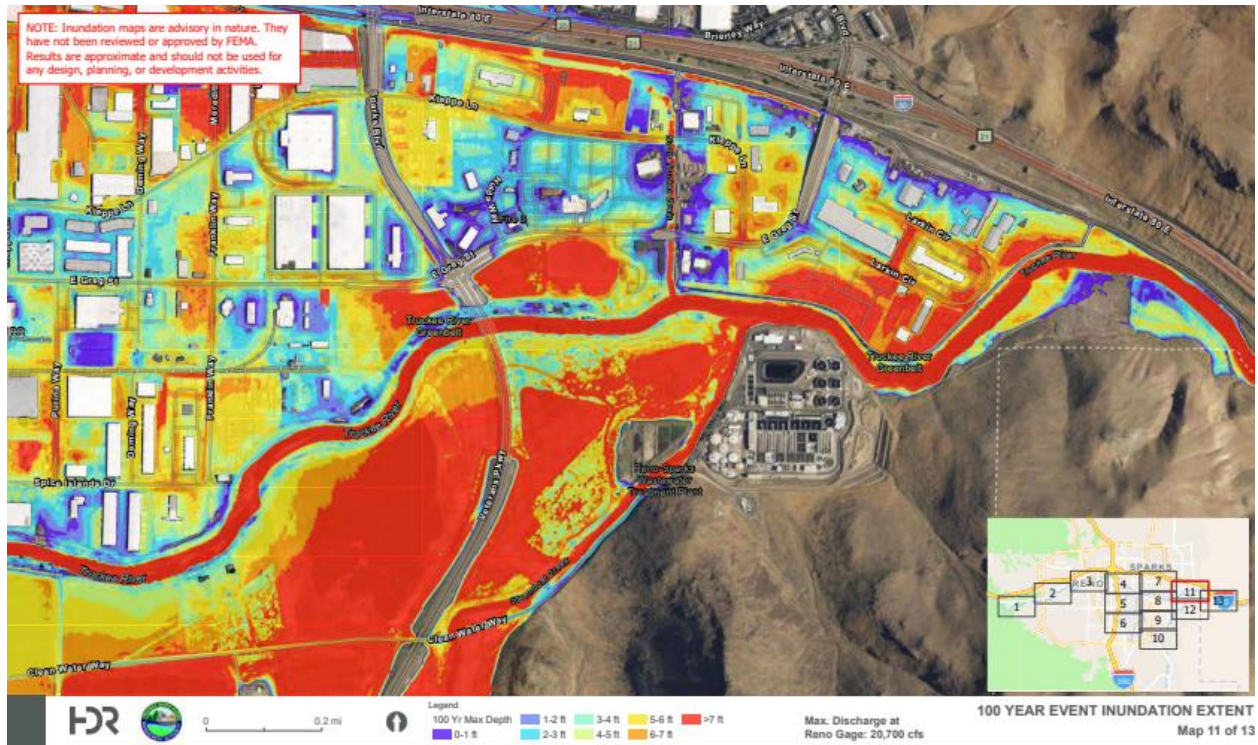


Figure 99: Map of the TRFMA 100-Year Flood Scenario

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 72.

Table 72: Flooding (including closed-basin flooding) Events, Washoe County, 2018–2024¹⁶⁶

Location	Date	Type
Steamboat	05/21/2023	Debris Flow
Steamboat	03/09/2023	Flood
Steamboat	03/09/2023	Flood
Huffaker Hills	08/05/2022	Flash Flood

¹⁶⁶ National Centers for Environmental Information, "Storm Events Database."
<https://www.ncdc.noaa.gov/stormevents/>

Location	Date	Type
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 73.

Table 73: FEMA Flood Declarations¹⁶⁷

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.
- **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

¹⁶⁷ FEMA, "Disasters and other Declarations" [Disasters and Other Declarations | FEMA.gov](https://www.fema.gov/disasters)

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 nurse, 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 100 shows efforts by Washoe County to control the Flooding (including closed-basin flooding), while Figure 101 is an aerial photograph of the Flooding (including closed-basin flooding).



Figure 100: Flood Barriers Being Set Up on the Edge of Swan Lake by Washoe County¹⁶⁸



Figure 101: Aerial Photograph of Swan Lake Flooding (including closed-basin flooding), March 23, 2017¹⁶⁹

¹⁶⁸ 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/>

¹⁶⁹ Reno Gazette Journal, March 5, 2018, photo credit Tech Sgt. Emerson Marcus/Nevada National Guard. <https://www.rgj.com/story/news/2018/03/05/rji-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 SRL loss properties are in the planning area:

- City of Sparks – 0 SRL
- City of Reno – 1 SRL
- Unincorporated Washoe County – 2 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).

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.¹⁷⁰ 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) 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

¹⁷⁰ University of Nevada, College of Agriculture Extension Program, "Climate Change Impacts in Nevada," 2024. <https://extension.unr.edu/publication.aspx?PubID=3957>

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 74).

Table 74: 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 75).

Table 75: 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 76 provides a summary of the expected damage to each of these facility types for the 100-year scenario. Figure 102 through Figure 106 show the locations of each of these facilities and indicate whether they will be functional on Day 1.

Table 76: 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 77.

Table 77: 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 78 shows the number of buildings in the 100-year floodplain, including those with substantial damage.

Table 78: Count of Buildings in 100-Year Flood Area by Occupancy Type

Buildings	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

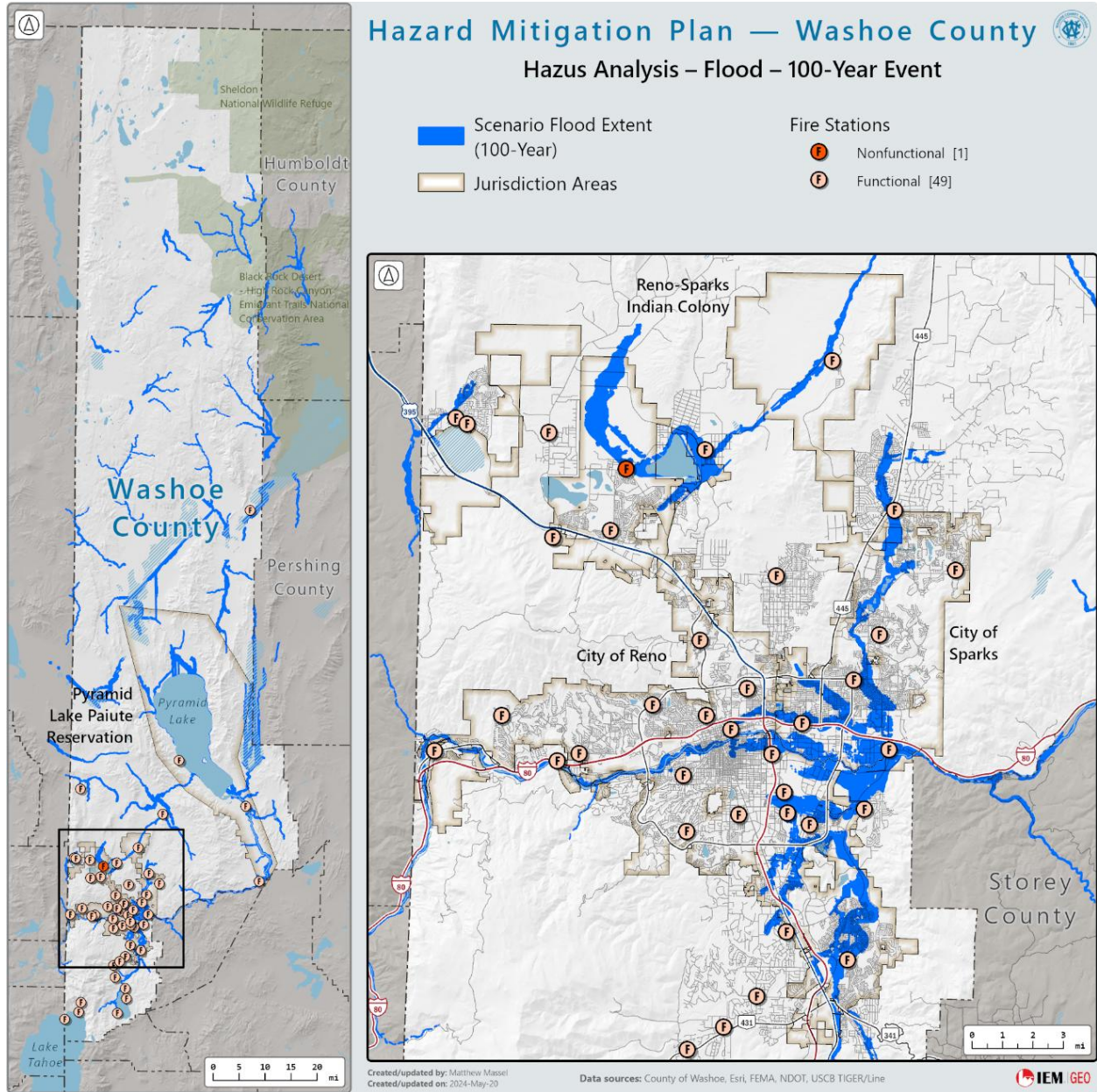


Figure 102: Washoe County Hazus 100-Year Flood Scenario, Fire Station Functionality

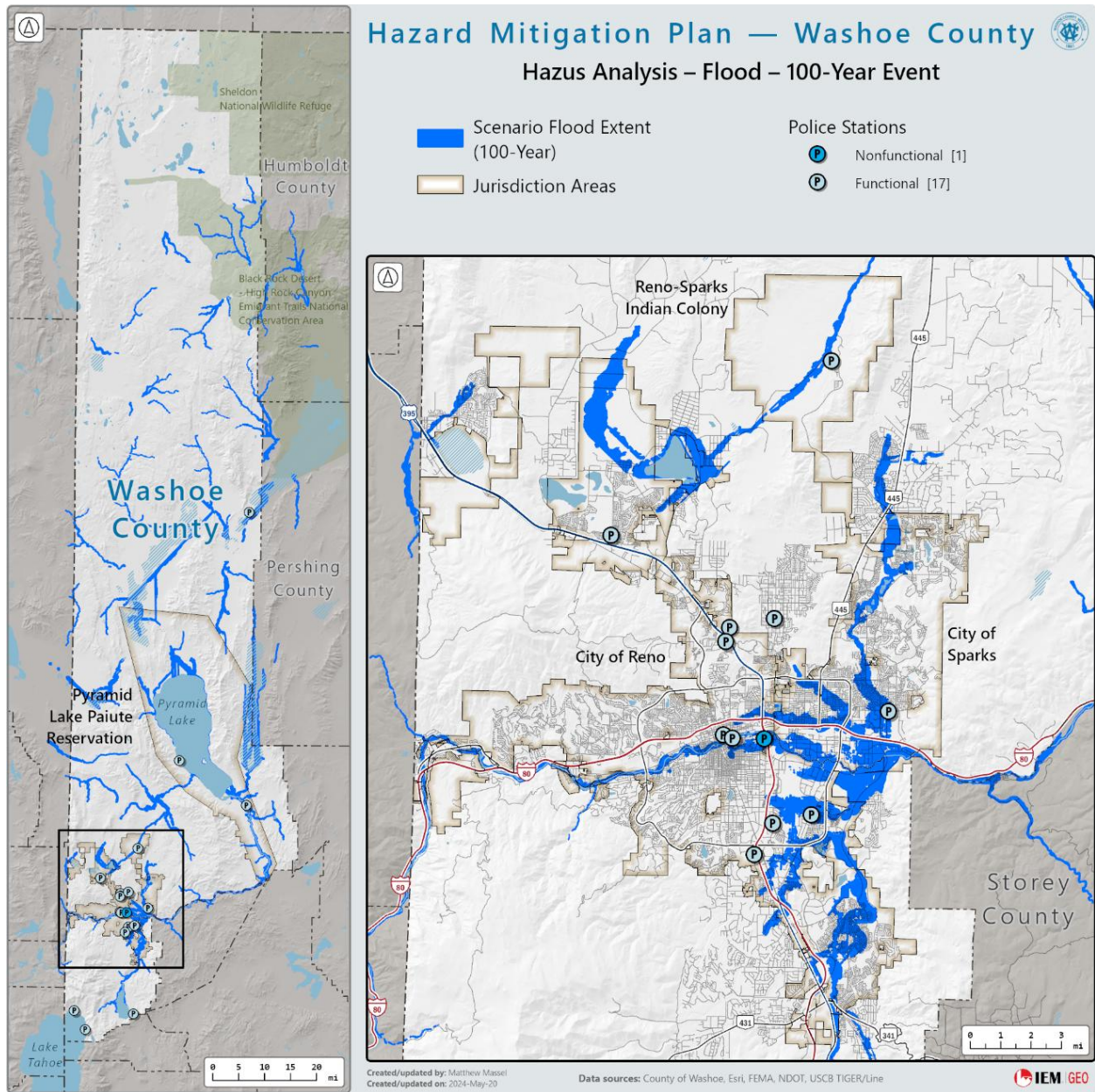


Figure 103: Washoe County Hazus 100-Year Flood Scenario, Police Station Functionality

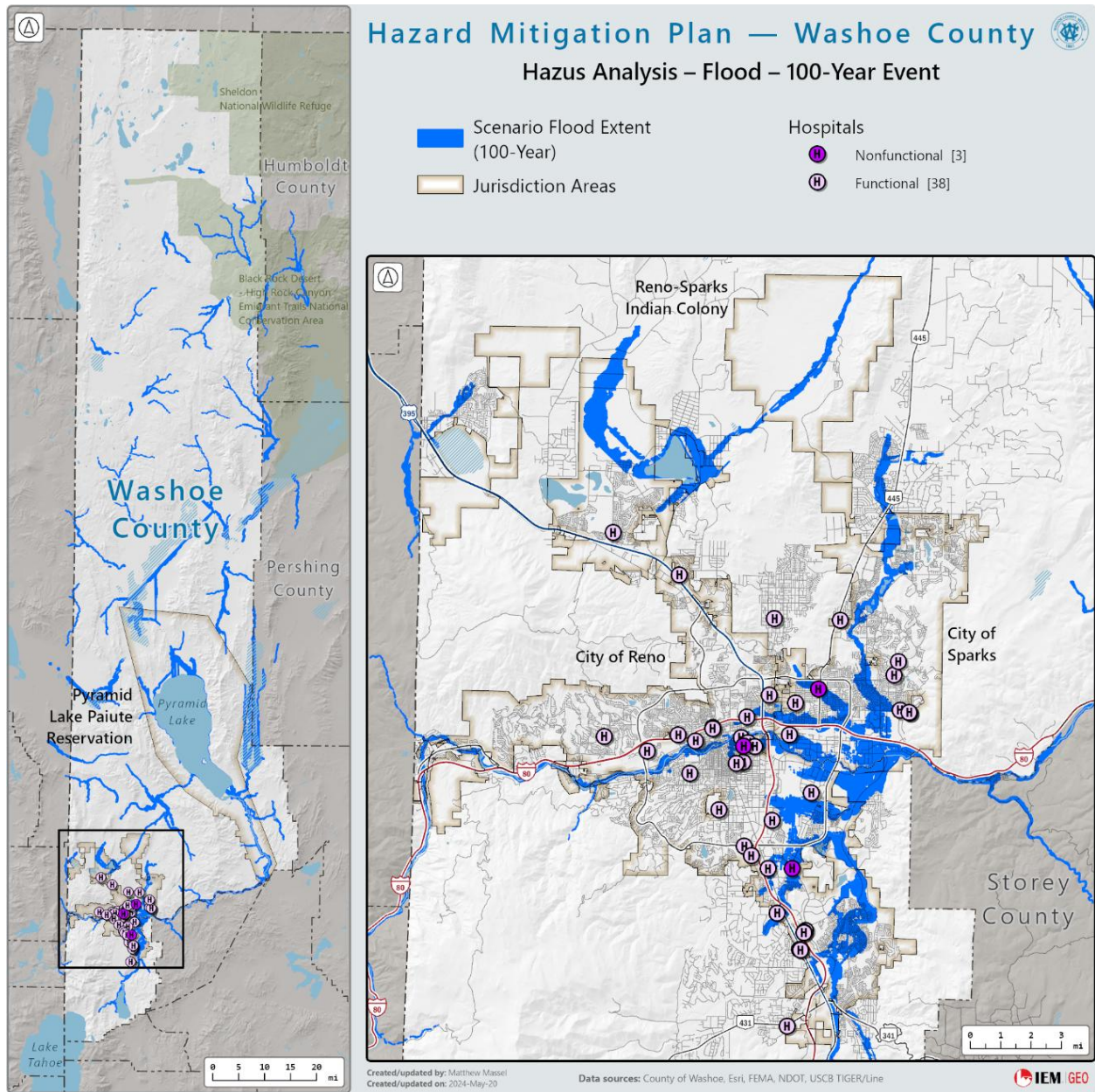
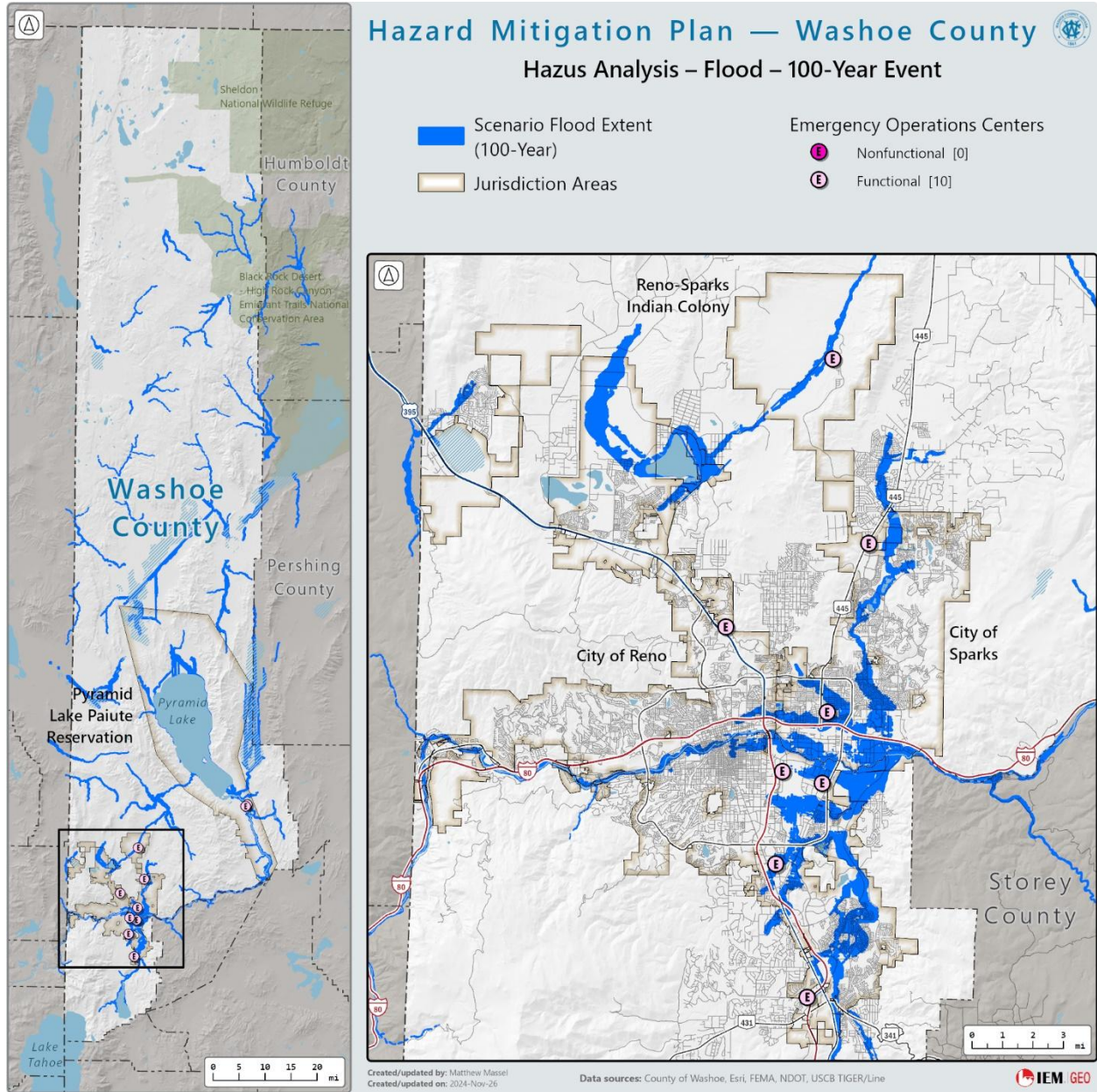


Figure 104: Washoe County Hazus 100-Year Flood Scenario, Hospital Functionality



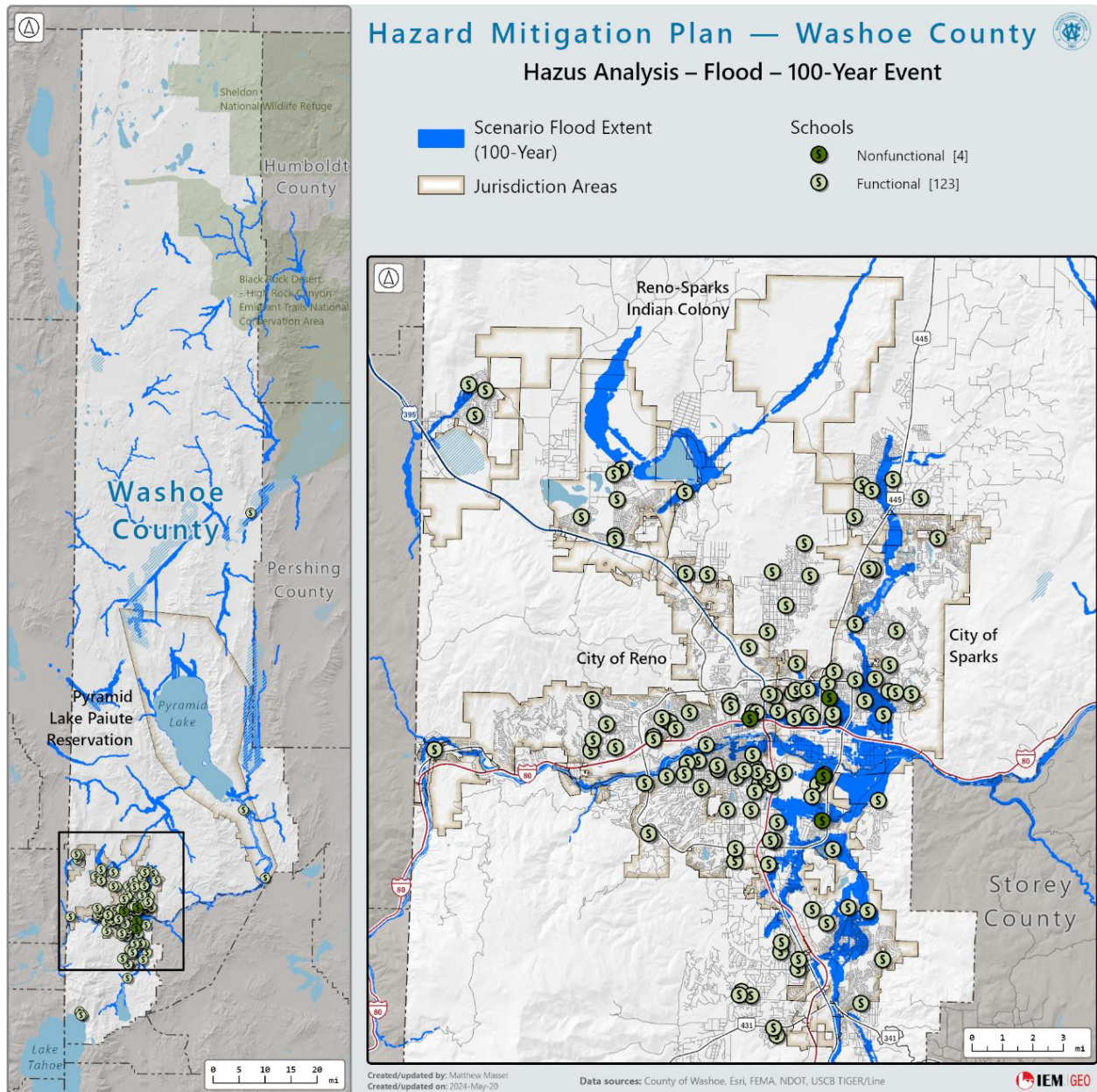


Figure 106: Washoe County Hazus 100-Year Flood Scenario, School Functionality

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 79. Economic losses by jurisdiction in a 500-year scenario are shown in Table 80. The number of buildings within the 500-year floodplain, categorized by occupancy type and extent of damage, is shown in Table 81.

Figure 107 through Figure 111 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 79: Expected Damage to Critical Facilities for a 500-Year Flood Scenario

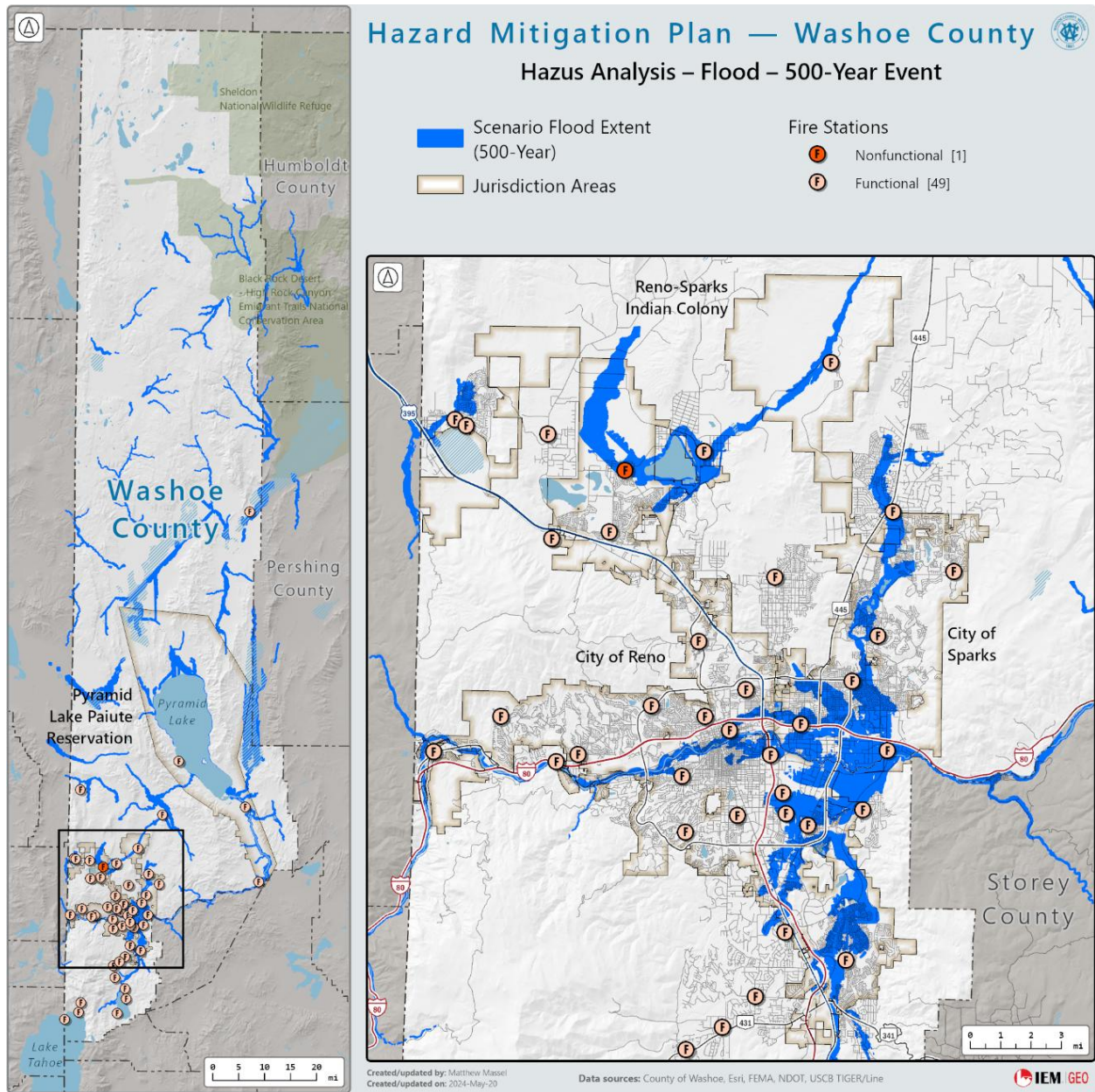
Facility Type	Total Count	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Center	10	2	0	2
Fire Station	50	3	0	1
Hospital	41	8	0	5
Police Station	18	3	0	2
School	127	15	0	14
TOTAL	246	31	0	24

Table 80: 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 81: Count of Buildings in 500-Year Flood Area by Occupancy Type

Buildings	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



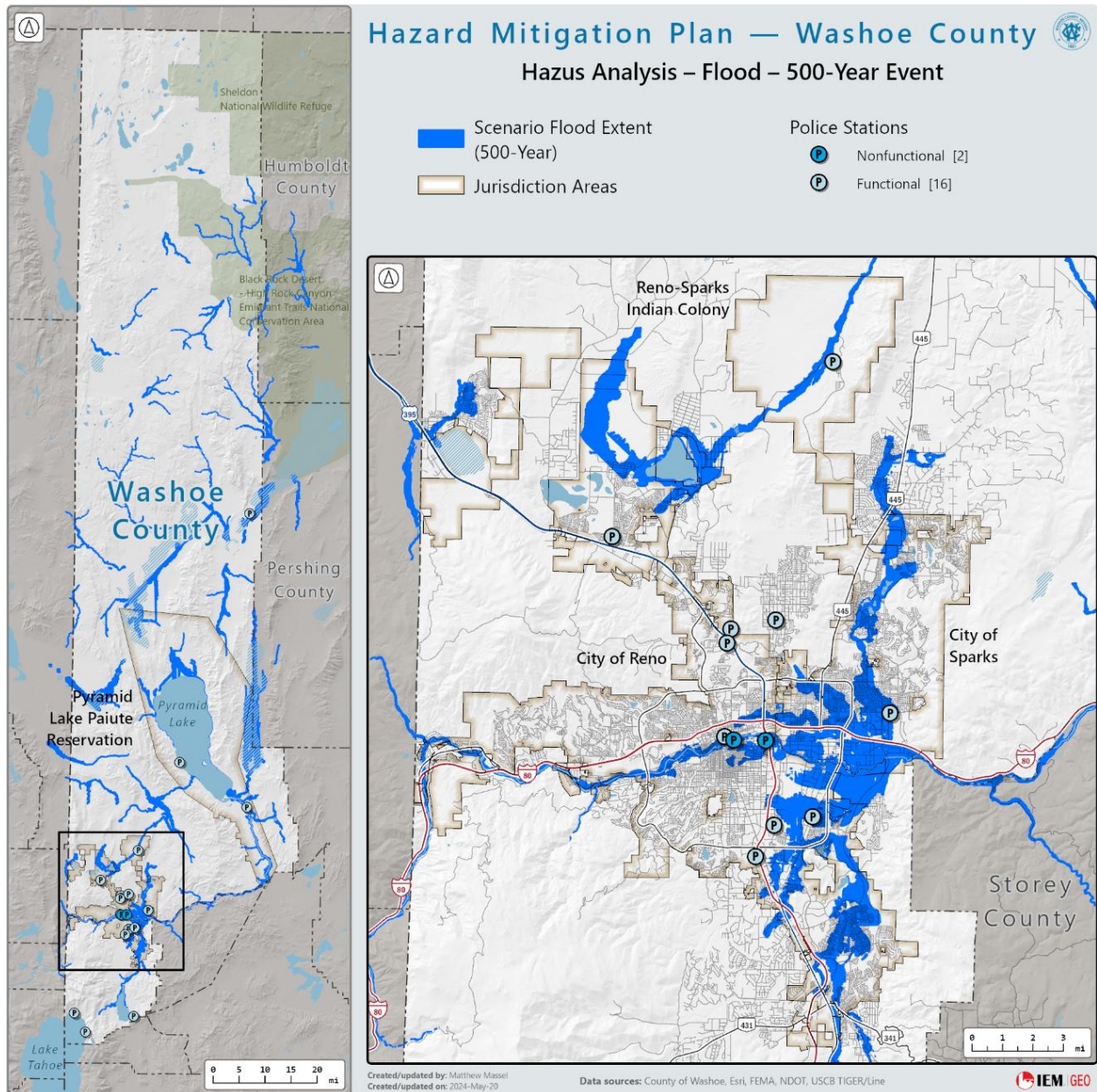


Figure 108: Washoe County 500-Year Flood Hazus Scenario, Police Station Functionality

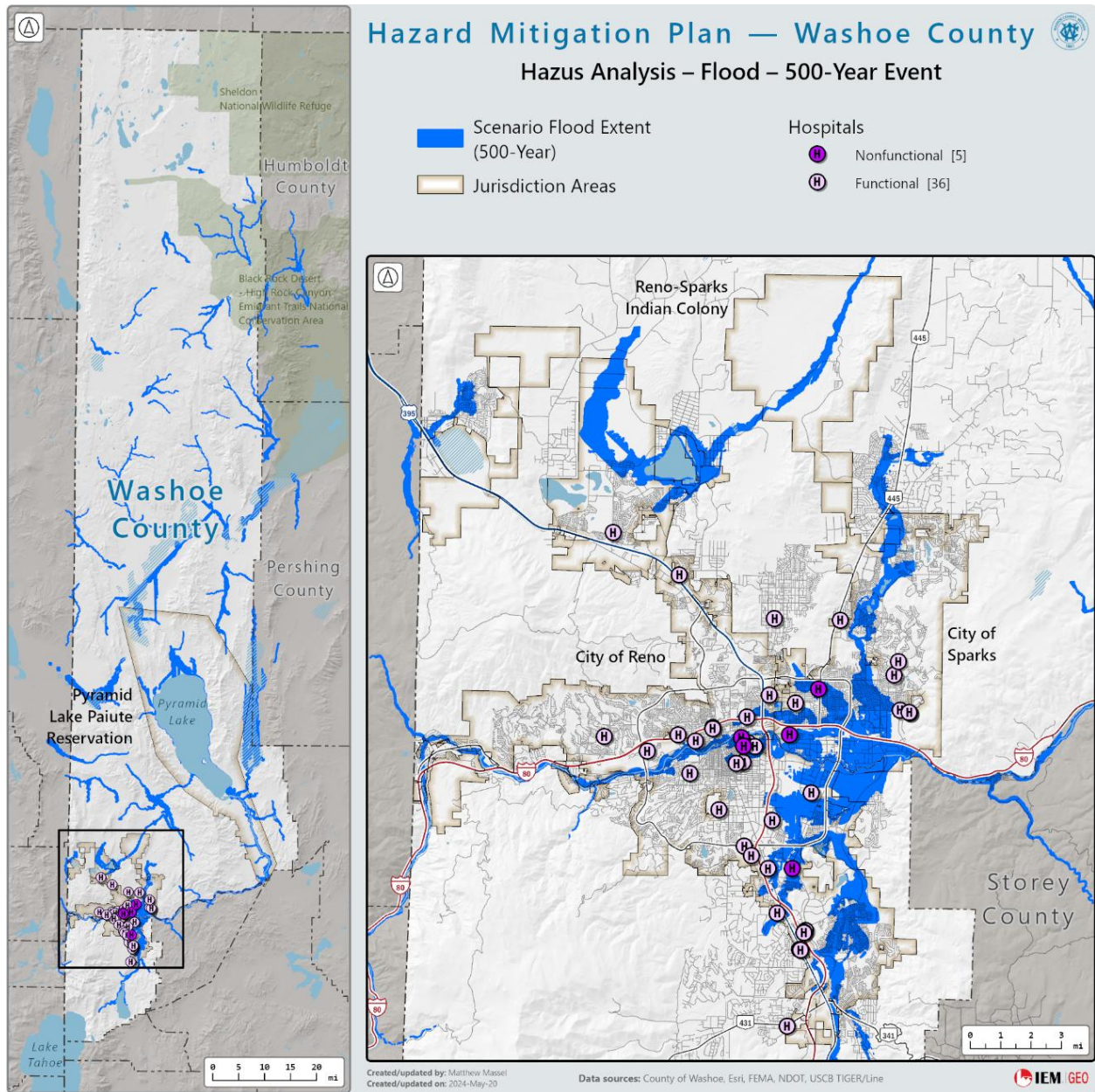


Figure 109: Washoe County 500-Year Flood Hazus Scenario, Hospital Functionality

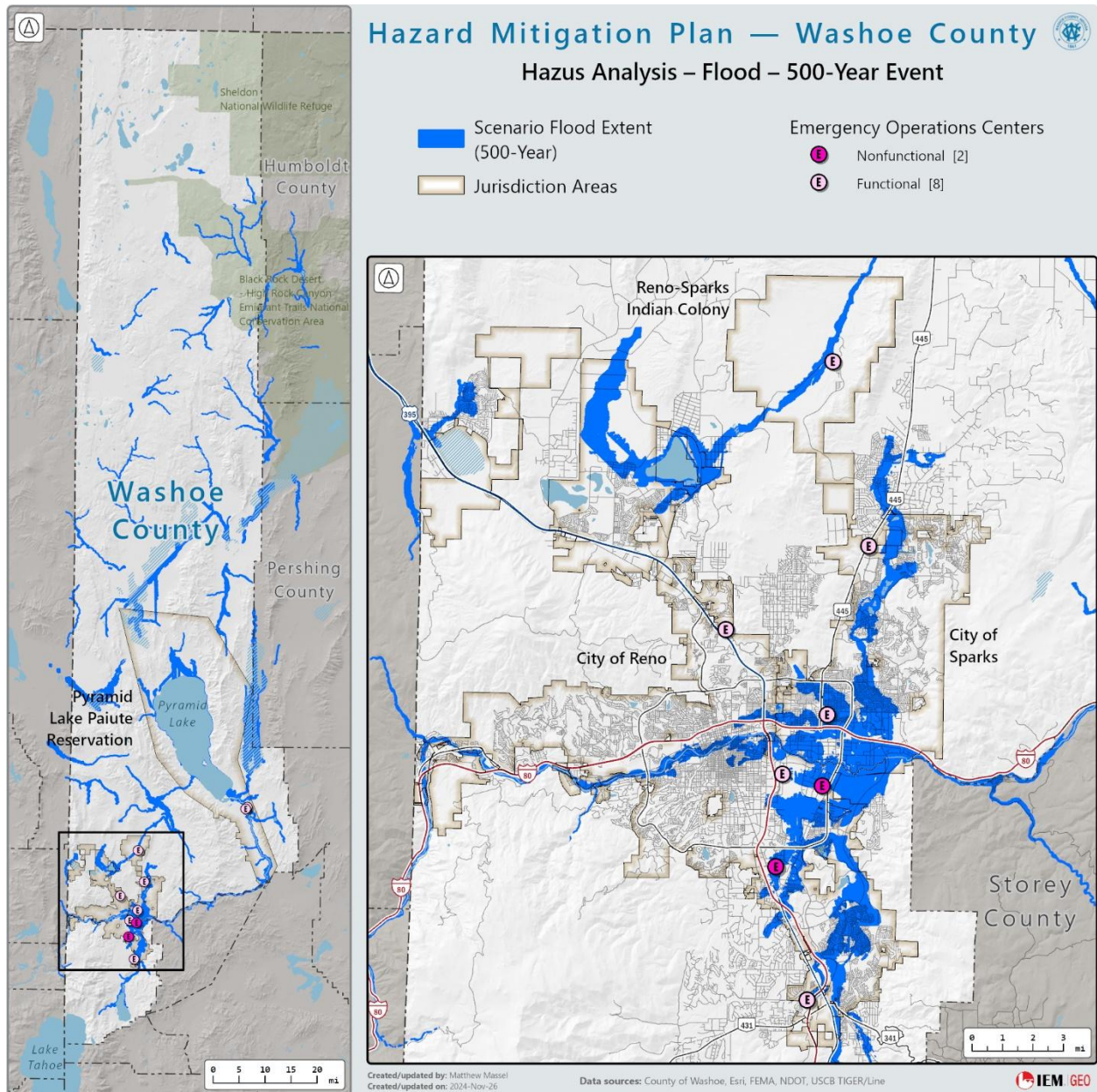


Figure 110: Washoe County 500-Year Flood Hazus Scenario, EOC Functionality

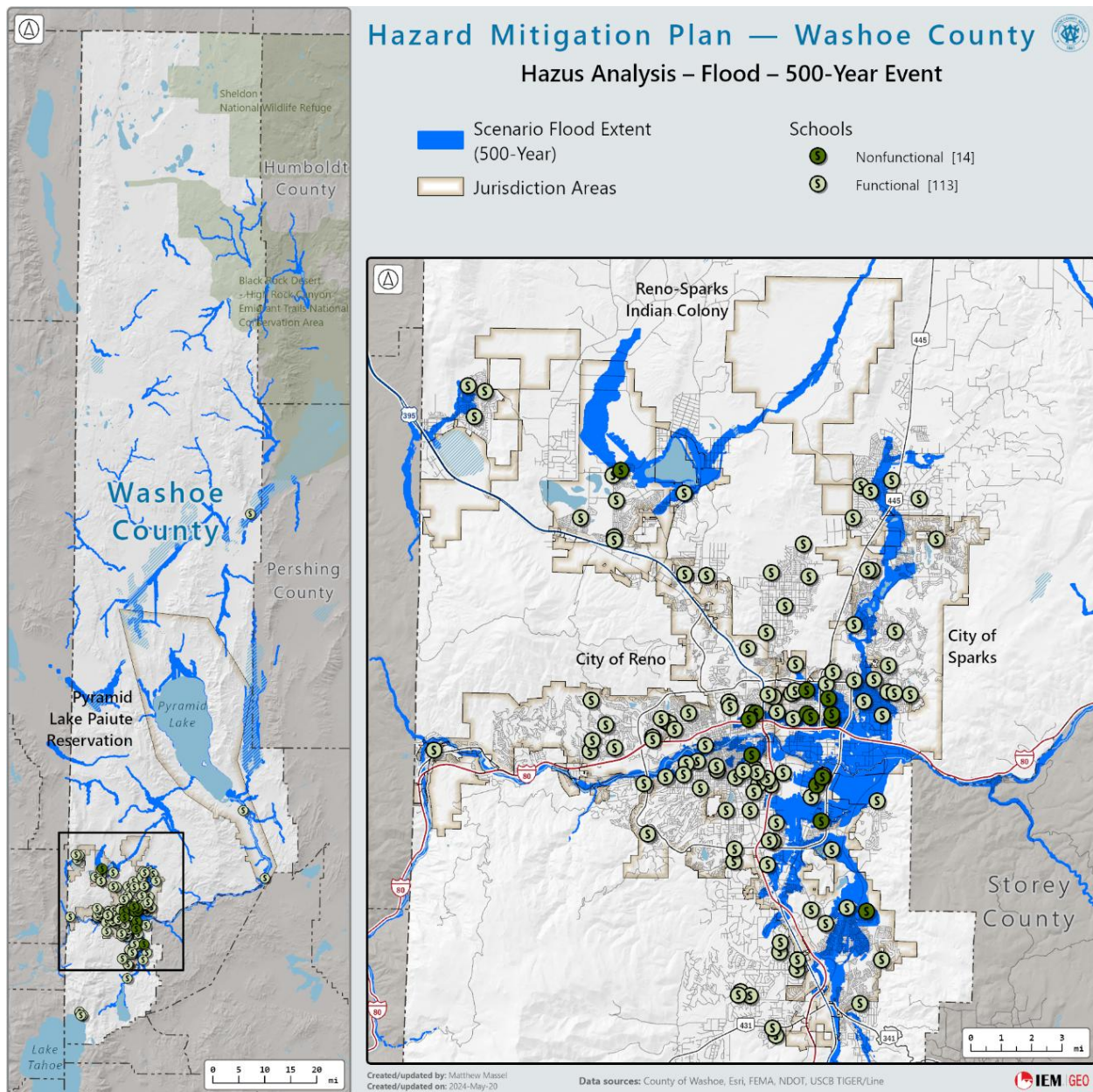


Figure 111: Washoe County 500-Year Flood Hazus Scenario, School Functionality

Figure 112 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.

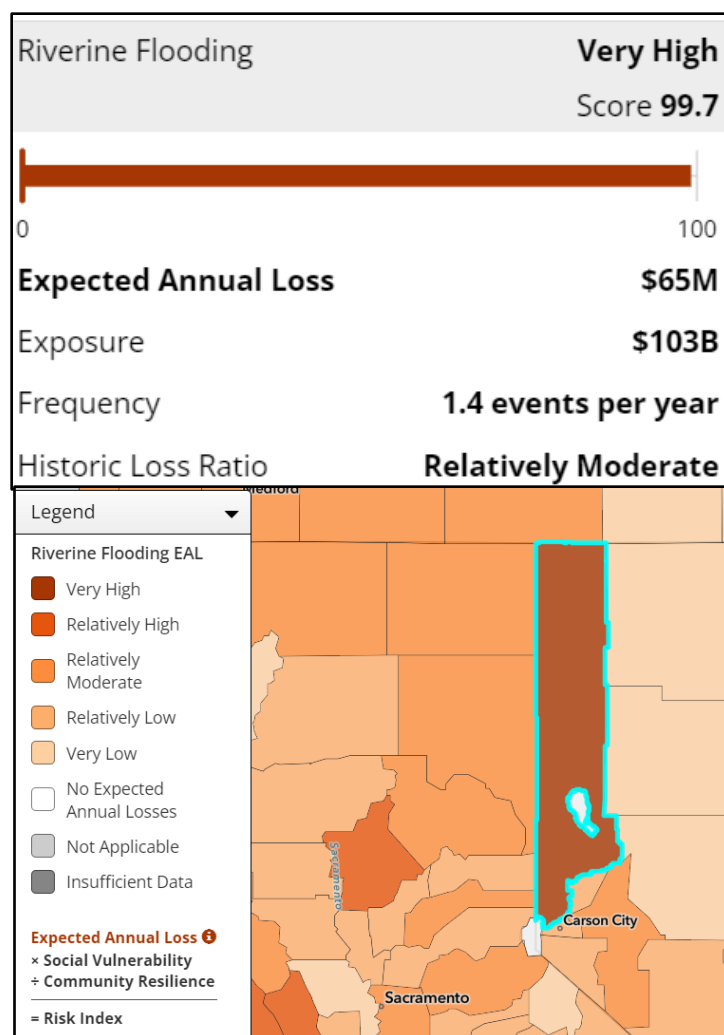


Figure 112: National Risk Index Washoe County Riverine Flooding (including closed-basin flooding) Expected Annual Loss Score, Map, and Legend¹⁷¹

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.

¹⁷¹ 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).¹⁷² 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 all¹⁷³ (Decrease vulnerability).

Table 82 outlines how land use, population, and environmental conditions have changed in flood-prone areas, and the resulting impact on overall vulnerability.

¹⁷² Truckee River Flood Management Authority, 2024, "The Flood Project."

<https://trfma.org/our-work/our-projects/>

¹⁷³ Washoe County.gov, Emergency Management and Homeland Security, 2024.

<https://www.washoecounty.gov/em/Hazards/Flooding.php>

Table 82: Changes in Community that Affects Flood Vulnerability

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 113).



Figure 113: FEMA Community Lifelines

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.¹⁷⁴ 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

¹⁷⁴ 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>

caused more runoff to reach Swan Lake.¹⁷⁵ 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 around the lake and installing high-flow pumps to manage water that flows down from the surrounding areas.¹⁷⁶ 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.¹⁷⁷

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.

¹⁷⁵ 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

¹⁷⁶ WashoeLife, Bethany Drysdale, “Lemmon Valley and Swan Lake flood prevention measures,” 2023. <https://washoelife.washoecounty.gov/washoe-county/lemmon-valley-and-swan-lake-flood-prevention-measures/>

¹⁷⁷ 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

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 83 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).

Table 83: 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

Subject	Ranking	Impacts/Flood
		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 (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 oversaturated 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.

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 84 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 84: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

Table 85 provides the Calculated Priority Risk Index (CPRI) for flood impact in Washoe County based on the current plan's hazard risk assessment results. Washoe County assigned flood a risk factor value of 2.8, reflecting medium probability, high frequency, and medium duration impacts. This risk factor value falls in the range of 2.5 to 4.0, which is considered a high-risk hazard. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 85: Calculated Priority Risk Index for Flood in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Flood	3	2	2	3	4	2.8	High

NATIONAL RISK INDEX

The National Risk Index (NRI) contains national level data for 18 natural hazards including flood. The index provides rankings for historical losses, expected annual loss, and overall risk at the county and census tract levels. Table 86 provides the NRI rankings for flood in Washoe County. For this hazard, the NRI assigns scores of Relatively Moderate for Historical Losses, Very High for Expected Annual Loss, and Very High for Overall Risk on a scale ranging from Very Low to Very High.

Table 86: National Risk Index for Flood in Washoe County

Flood	Historical Losses	Expected Annual Loss	Overall Risk Score	Overall Risk
	Relatively Moderate	Very High	99.7	Very High

Based on the NRI, Washoe County has an Overall Risk value for flood of Relatively Moderate compared to all other communities within the United States, with a score of **96.4** (see Figure 114).

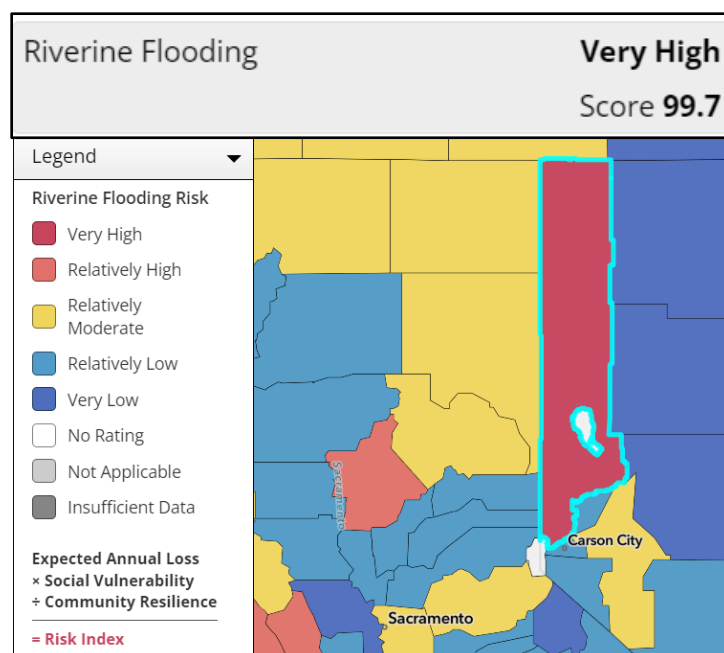


Figure 114: NRI Overall Risk Score for Flooding in Washoe County¹⁷⁸

¹⁷⁸ FEMA, “National Risk Index Washoe County Flood Score, Map, and Legend.”

<https://hazards.fema.gov/nri/map>

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.¹⁷⁹

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.¹⁸⁰ 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

¹⁷⁹ Institute of Hazardous Materials Management, 2012, “What are Hazardous Materials?” https://www.leg.mn.gov/docs/2015/other/150681/PFEISref_1/IHMM%202012.pdf

¹⁸⁰ 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 115 illustrates the nine hazard classes defined by the Federal Motor Carrier Safety Administration.



Figure 115: Federal Motor Carrier Safety Administration Nine Classes of Hazardous Materials¹⁸¹

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).¹⁸² Releases of EHS must be reported to the National Response Center.

¹⁸¹ 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](https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/docs/Nine%20Classes%20of%20Hazardous%20Materials-4-2013_508CLN.pdf)

¹⁸² Code of Federal Regulations 355. <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-J/part-355>

- **Highly Hazardous Substance** – Hazardous substance, as used by the Nevada State Emergency Response Commission, encompasses every chemical regulated by both the U.S. 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.¹⁸³

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.

¹⁸³ Washoe County LEPC Hazardous Materials Emergency Plan, 2020.

https://www.washoecounty.gov/lepc/hazardous_materials_emergency_plan.php

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.
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 116. 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.¹⁸⁴

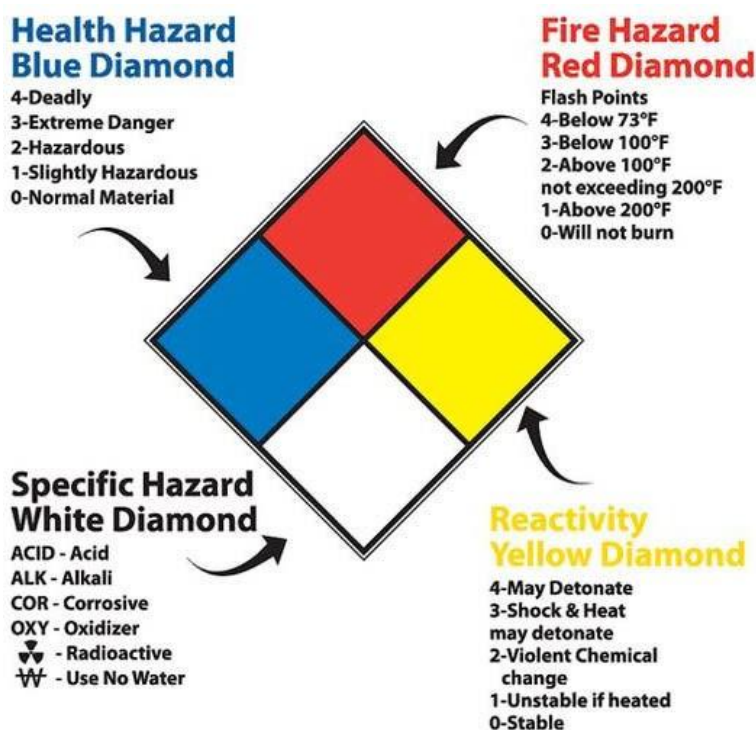


Figure 116: Hazard Materials Placard¹⁸⁵

¹⁸⁴ Washoe County LEPC Hazardous Materials Emergency Plan, 2020.

https://www.washoecounty.gov/lepc/hazardous_materials_emergency_plan.php

¹⁸⁵ 2018 Nevada Enhanced SHMP, Environmental Safety Services 2019, "Hazard Materials Placard."

NEVADA DEPARTMENT OF TRANSPORTATION (NDOT) STUDY

The information in Table 87 was taken from the Nevada Hazardous Commodity Flow Study published in October 2018 through February 2019, prepared by Cambridge Systematics, Inc. for 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 87: HAZMAT Trucks Identified at Four Survey Locations in Washoe County¹⁸⁶

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 87 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 88 indicates that the greatest HAZMAT transported is gasoline and other flammable gas or liquids over the most heavily traveled routes.

¹⁸⁶ 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 88: Hazard Class Percentages¹⁸⁷

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 89). This report is for a two-year period. The total number of loads is both westbound and eastbound freight. The loads in Table 89 are for *all* hazardous materials passing through Washoe County.

Table 89: Union Pacific Railroad Hazardous Materials Commodity Flow Report¹⁸⁸

2019–2020	Westbound and Eastbound
Carloads	38,212

¹⁸⁷ Washoe County LEPC Hazardous Materials Emergency Plan, 2020.

https://www.washoecounty.gov/lepc/hazardous_materials_emergency_plan.php

¹⁸⁸ 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.¹⁸⁹

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.¹⁹⁰

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).

¹⁸⁹ Union Pacific, 2024.

<https://www.up.com/aboutup/community/safety/hmm/preparedness/index.htm>

¹⁹⁰ 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 OVERVIEW¹⁹¹

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-10-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 90). 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 90: Location of Pipeline Isolation Valves¹⁹²

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 of 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.

¹⁹¹ Washoe County LEPC Hazardous Materials Emergency Plan, 2020, "Kinder Morgan Pipeline Overview." https://www.washoecounty.gov/lepc/hazardous_materials_emergency_plan.php

¹⁹² 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 117 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.

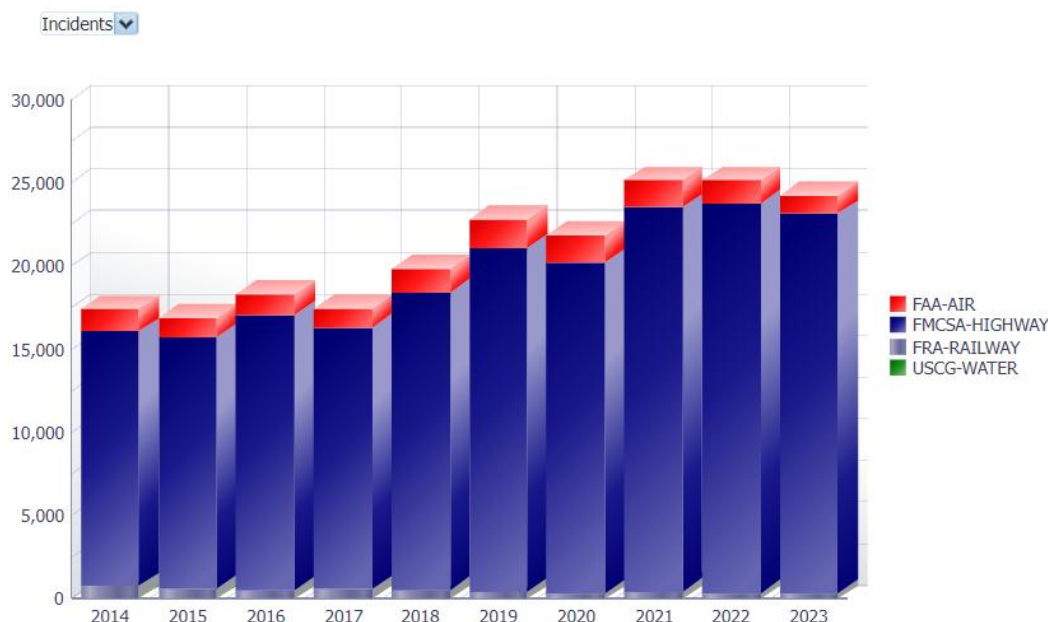


Figure 117: US DOT Pipeline and Hazardous Materials Safety Administration Statistics, 2014–2023¹⁹³

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).¹⁹⁴

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

¹⁹³ 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

¹⁹⁴ 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 \$2,377,408.¹⁹⁵

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.

¹⁹⁵ 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.

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 Sparks¹⁹⁶ (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 grow¹⁹⁷ (Increased Vulnerability).

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

¹⁹⁶ 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>

¹⁹⁷ 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>

or rockslide, the damage could be detected, contained, and repaired relatively quickly, assuming fair weather conditions and transportation routes are clear.¹⁹⁸

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.

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 91 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 91: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

The following table provides the Calculated Priority Risk Index (CPRI) for hazardous materials incident impact for Washoe County based on the current plan's hazard risk assessment results. Washoe County's hazard assessment shown in Table 92 identifies hazardous materials incident

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>

as a high-risk hazard, with a CPRI value of 2.7. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 92: Calculated Priority Risk Index for Hazardous Materials Incident in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Hazardous Materials Incident	3	2	4	2	3	2.7	High

NATIONAL RISK INDEX

There are no NRI findings for this hazard as the NRI only provides data for natural hazards.

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.¹⁹⁹ 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 93 defines key terms used to describe the scale and frequency of disease occurrence, from sporadic outbreaks to global pandemics.

¹⁹⁹ Mayo Clinic, "Infectious Diseases." <https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/syc-20351173>

Table 93: Levels of Disease²⁰⁰

Term	Definition
Sporadic	Refers to a disease that occurs infrequently and irregularly.
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.

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;

²⁰⁰ CDC Archive, "Introduction to Epidemiology."

https://archive.cdc.gov/www_cdc_gov/csels/dsepd/ss1978/lesson1/section11.html

- 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.²⁰¹

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.²⁰² 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

²⁰¹ 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

²⁰² 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

Health. The numbers dramatically decreased from the 2022 report due to COVID-19 not being as prevalent (see Figure 118).²⁰³

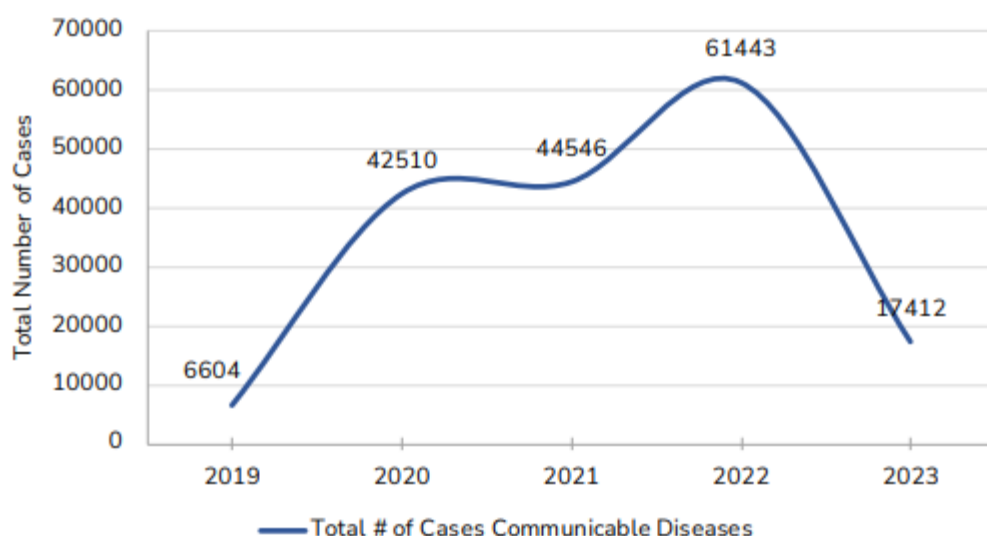


Figure 118: Northern Nevada Annual Communicable Disease Total, 2019–2023²⁰⁴

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.

²⁰³ 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

²⁰⁴ 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

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.

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 119 shows the status in the County as of April 2024.

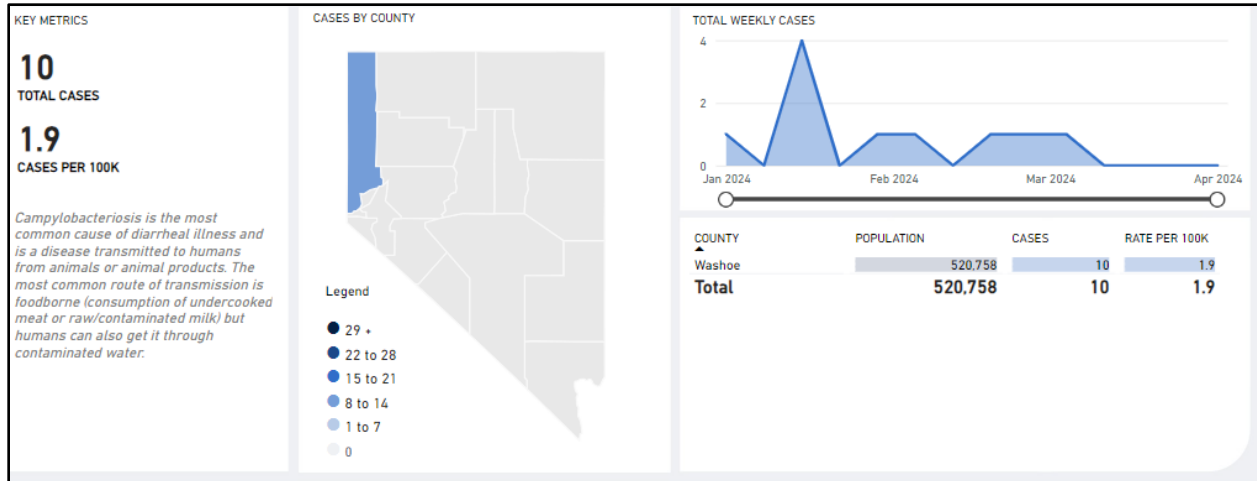


Figure 119: Status of Campylobacteriosis Cases, Washoe County, April 5, 2024²⁰⁵

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

²⁰⁵ Nevada Department of Health and Human Services, Office of Analytics, 2024, "Infectious Disease Data Portal."

<https://app.powerbigov.us/view?r=eyJrIjoiaNTNjYWU0M2ltMWI5My00NGRjLTg2ZWQtMmU5NmY1ZGQxNDVhliwidCI6ImU0YTMT0MGU2LWI4OWUtNGU2OC04ZWZhLTE1NDRkMjcwMzk4MCI9>

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 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 with objects or materials that a person with Mpox has used. Hands should be washed with soap and water or alcohol-based hand sanitizers. Figure 120 shows the status in the County as of April 2024.

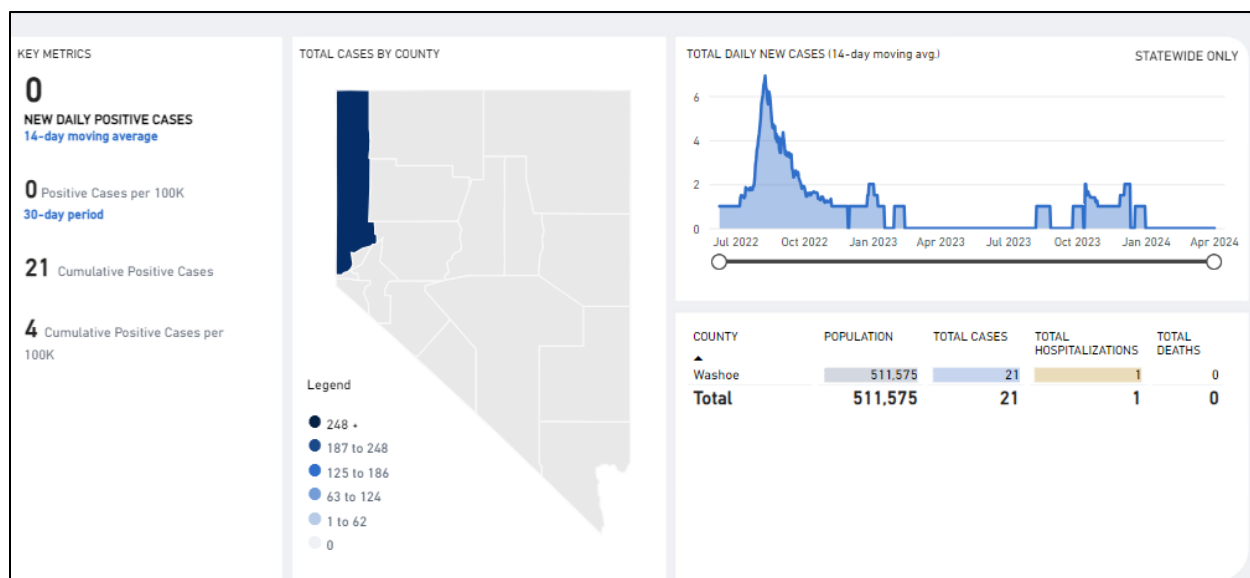


Figure 120: Status of Mpox (formerly Monkey Pox) Cases, Washoe County, April 5, 2024²⁰⁶

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.²⁰⁷
- 2020 – COVID-19:** COVID-19, or coronavirus disease 2019, is caused by the SARS-CoV-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

²⁰⁶ Nevada Department of Health and Human Services, Office of Analytics, 2024, “Infectious Disease Data Portal.”

<https://app.powerbigov.us/view?r=eyJrIjoiaNTNjYWU0M2ItMWI5My00NGRjLTg2ZWQtMmU5NmY1ZGQxNDVhliwidCI6ImU0YTM0MGU2LWI4OWUtNGU2OC04ZWZhLTE1NDRkMjcwMzk4MCI9>

²⁰⁷ 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

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 121 shows the status in the County as of April 2024.

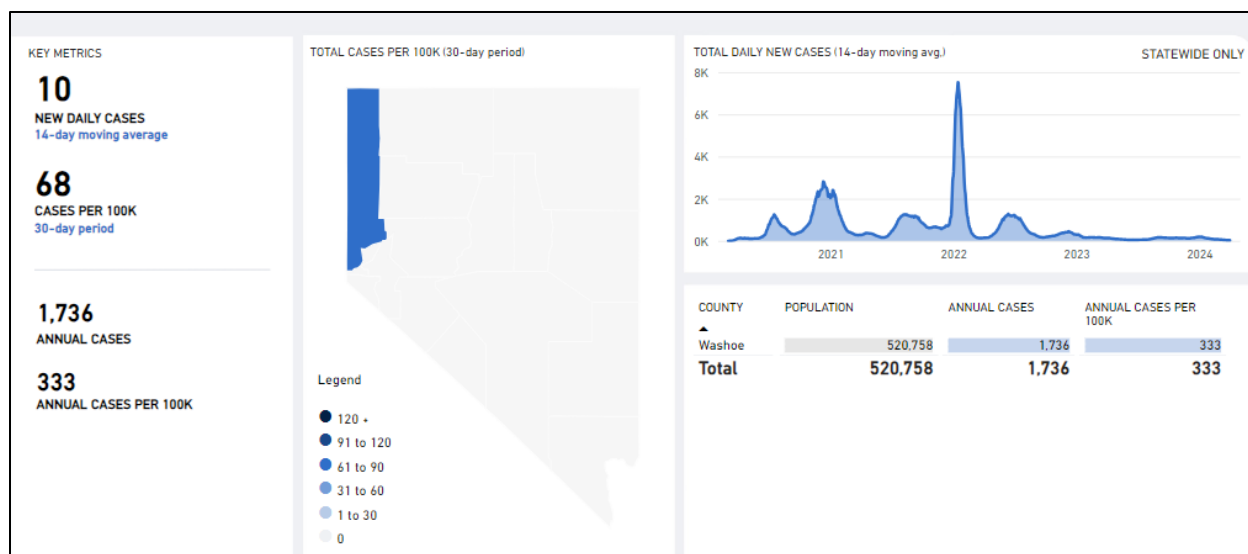


Figure 121: Status of COVID-19 Cases, Washoe County, April 5, 2024²⁰⁸

- **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.²⁰⁹

²⁰⁸ Nevada Department of Health and Human Services, Office of Analytics, 2024, "Infectious Disease Data Portal."

<https://app.powerbigov.us/view?r=eyJrIjoiaNTNjYWU0M2ItMWI5My00NGRjLTg2ZWQtMmU5NmY1ZGQxNDVhliwidCI6ImU0YTM0MGU2LWI4OWUtNGU2OC04ZWZhLTE1NDRkMjcwMzk4MCI9>

²⁰⁹ 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>

- **2017 – Zika:** NNPH coordinated Zika testing for 53 individuals.²¹⁰
- **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 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 Metallo-Beta-Lactamase-Producing Klebsiella pneumoniae* that was resistant to all antibiotics available for treatment.²¹¹
- **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.²¹²
- **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.²¹³
- **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.²¹⁴

Figure 122 displays information regarding infectious disease cases in Washoe County in 2022.

²¹⁰ Ibid.

²¹¹ Ibid.

²¹² Ibid.

²¹³ Ibid.

²¹⁴ Ibid.

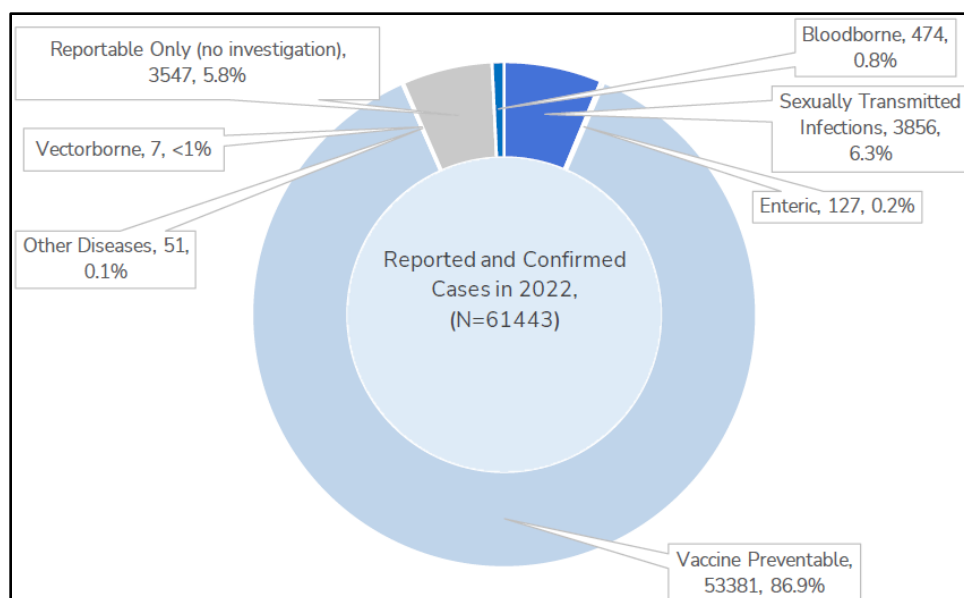


Figure 122: Cases Reported by Type, Washoe County, 2022²¹⁵

Table 94 lists the numbers of communicable diseases, by type, reported in Washoe County from 2018 to 2023.

Table 94: Reportable Cases of Selected Communicable Diseases by Year, Washoe County, 2018–2023²¹⁶

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	37,552	52,767	10,048
Cryptosporidium	18	18	5	5	12	10
Escherichia coli/ Shiga toxin-producing Escherichia coli (EHEC/STEC)	12	4	5	7	8	12

²¹⁵ 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

²¹⁶ 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 95 lists cases, by type, reported in Washoe County in 2023.

Table 95: 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 123 through Figure 127 show the rates of reported cases for five illnesses in recent periods.

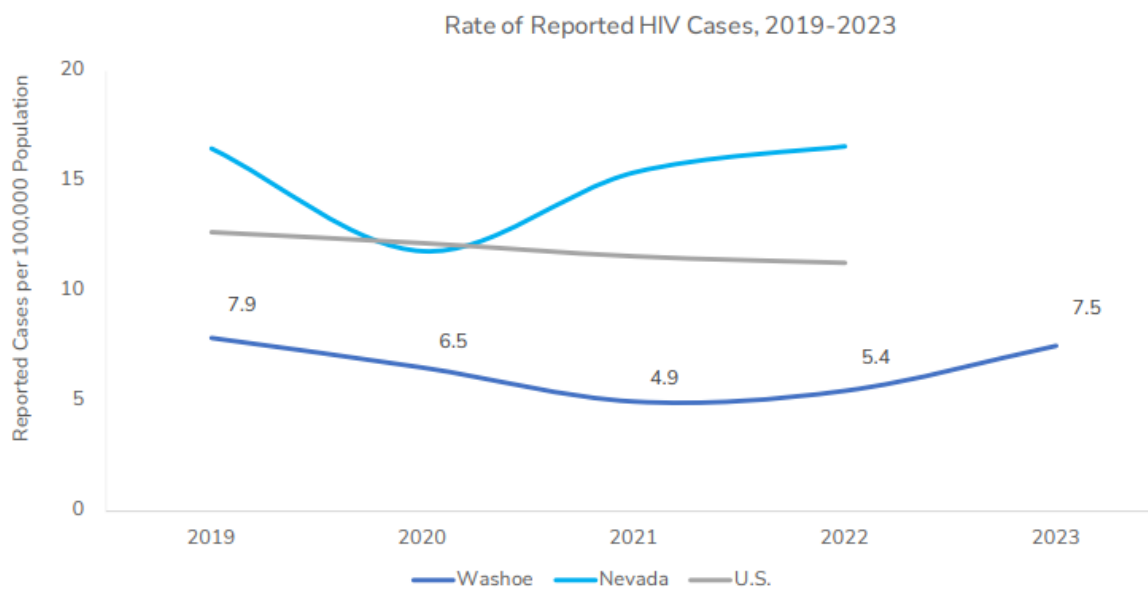


Figure 123: Rate of Reported HIV Cases, 2019–2023²¹⁷

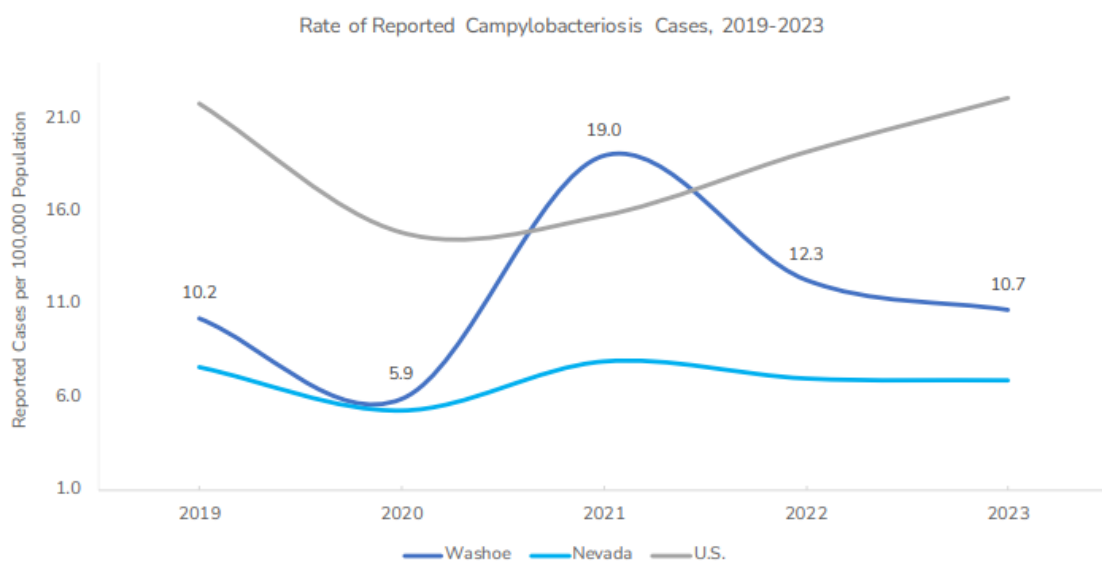


Figure 124: Rate of Reported Campylobacteriosis Cases, 2019–2023²¹⁸

²¹⁷ 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

²¹⁸ 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

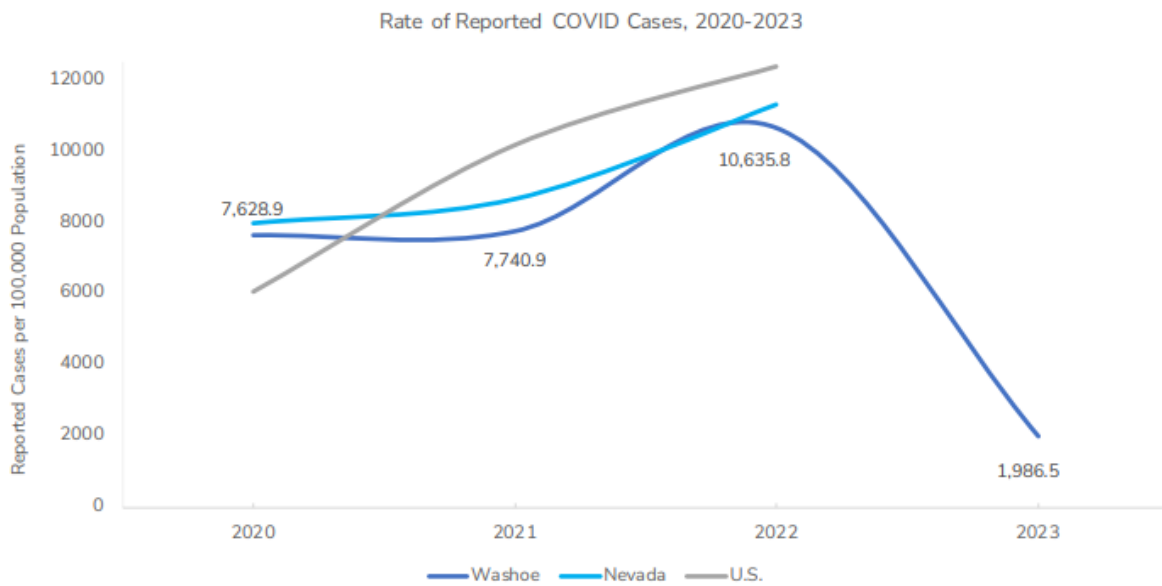


Figure 125: Rate of Reported COVID-19 Cases, 2020–2023²¹⁹

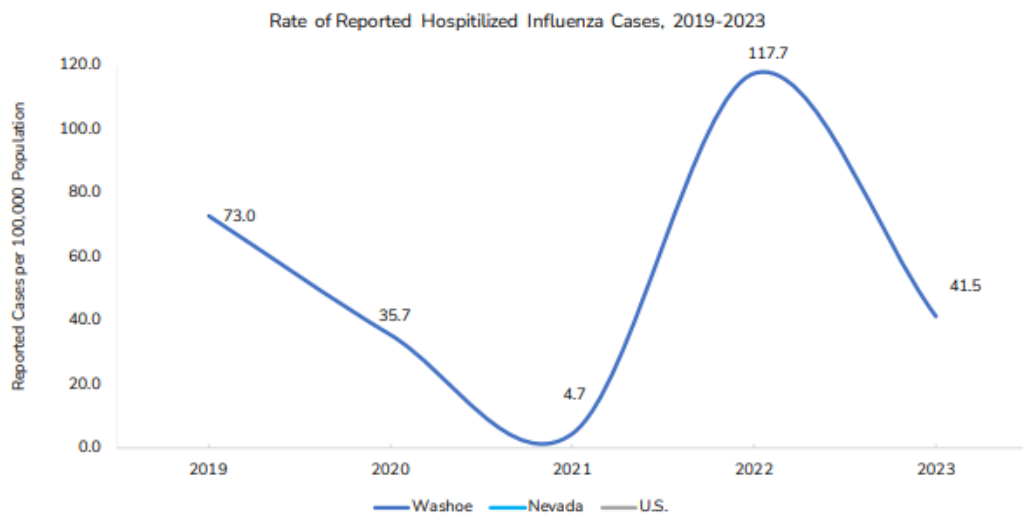


Figure 126: Rate of Reported Hospitalized Influenza Cases, 2019–2023²²⁰

²¹⁹ 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

²²⁰ Northern Nevada Public Health, 2023 Annual Communicable Disease Summary, “Rate of Reported Hospitalized Influenza Cases, 2019–2023.”

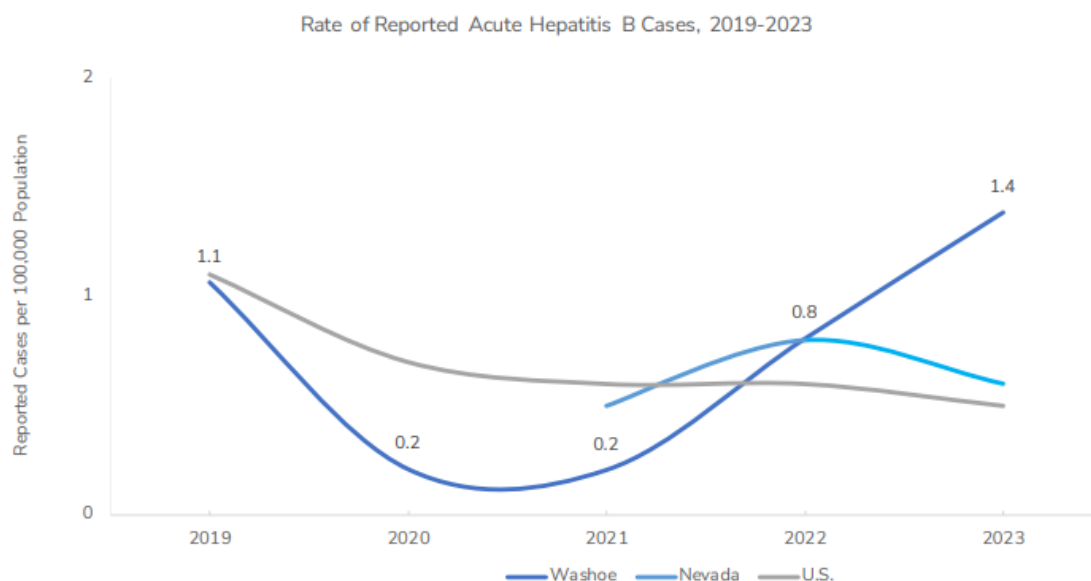


Figure 127: Rate of Reported Acute Hepatitis C Cases, 2019–2023²²¹

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.

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.

[https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD Annual 2023 final v published.pdf](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

²²¹ 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

- 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 128 and Figure 129 present demographics in the County for vaccine-preventable diseases and sexually transmitted infections, respectively, while Table 96 and Table 97 present data for cases in the County of HIV and COVID-19.

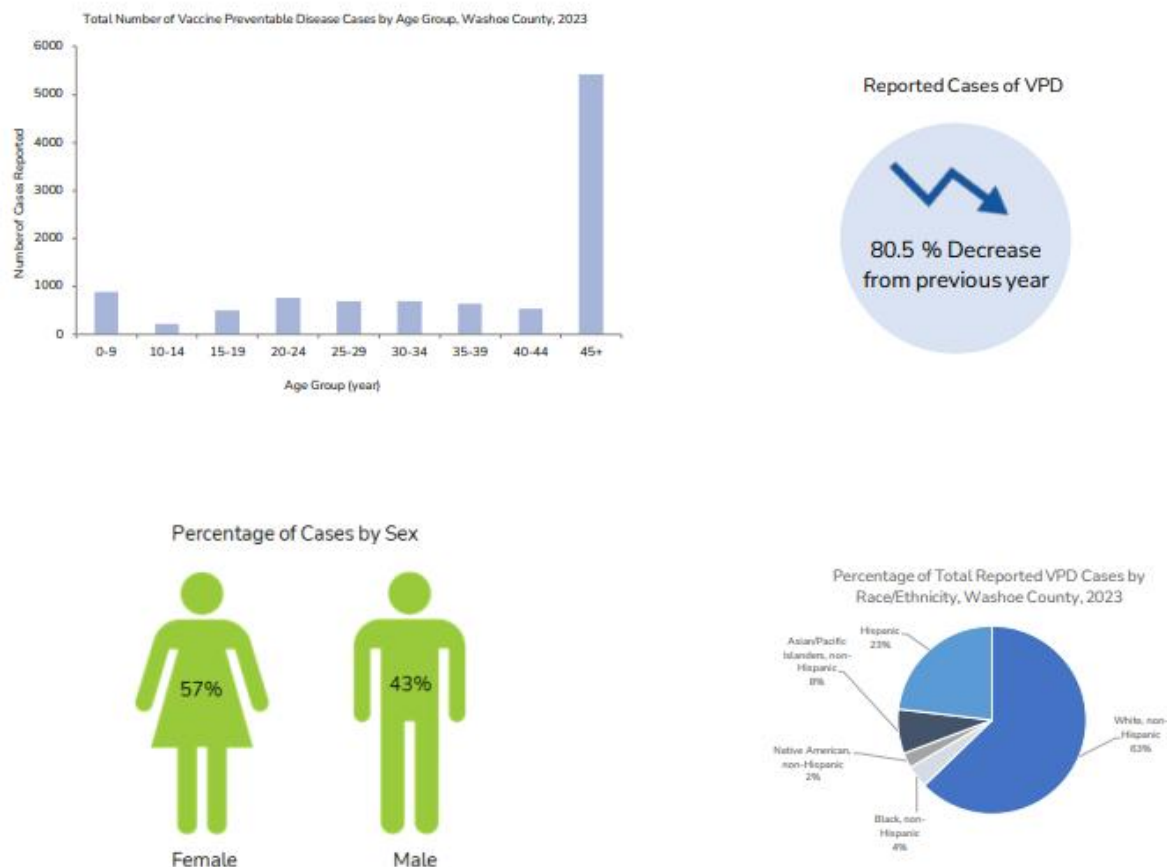


Figure 128: Demographics of Vaccine-Preventable Disease Cases, Washoe County, 2023²²²

²²² 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

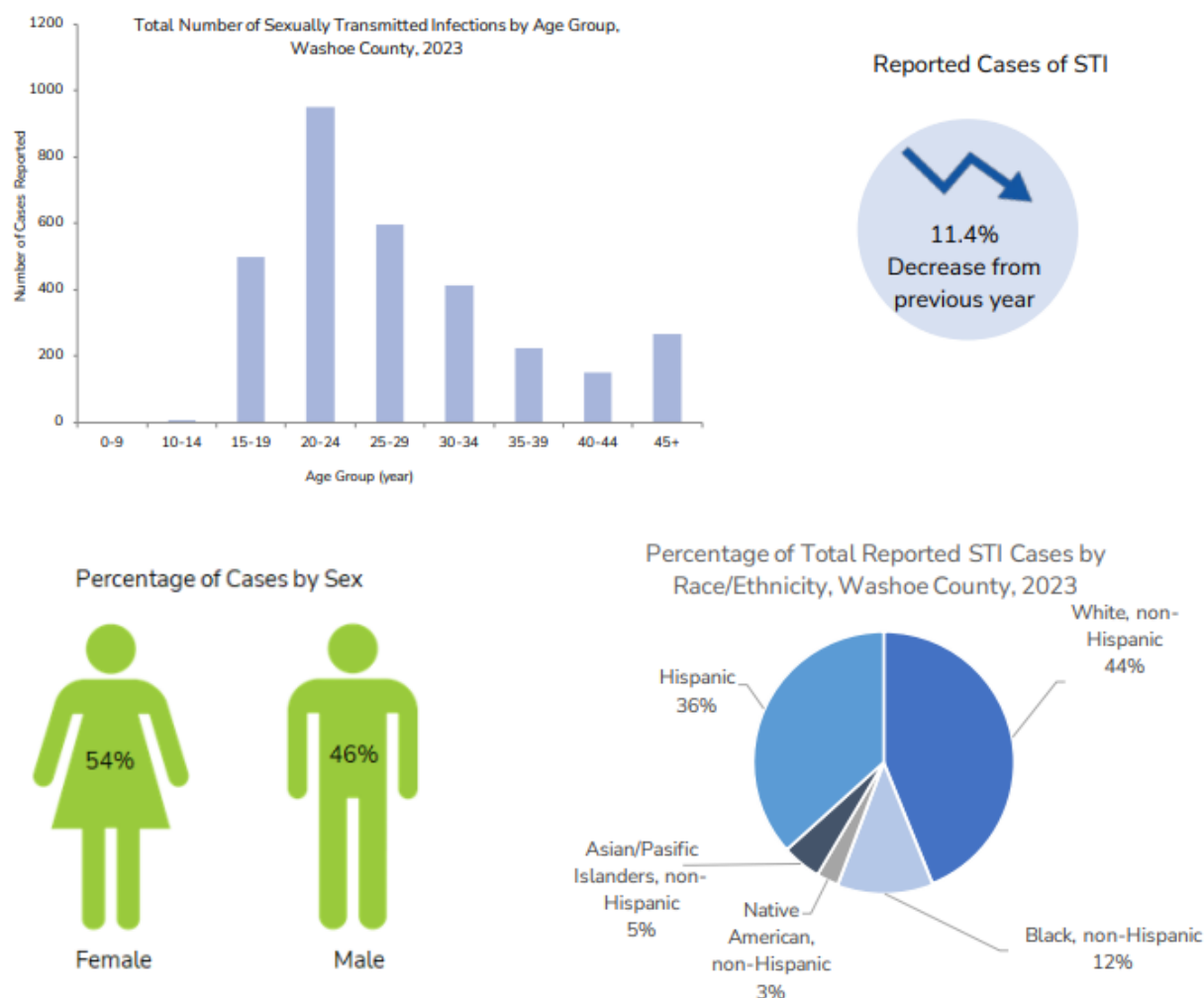


Figure 129: Demographics of Sexually Transmitted Infections, Washoe County, 2023²²³

²²³ 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

Table 96: HIV Cases by Selected Characteristics, Washoe County, 2023²²⁴

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 American, non-Hispanic	0	0.0
Asian/Pacific Islanders, non-Hispanic	1	2.6
Hispanic	16	11.5
Unknown	1	NA
Total	38	7.5

²²⁴ 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](https://www.nnph.org/files/ephp/communicable-diseases/annual-summary/CD%20Annual%202023%20final%20v%20published.pdf)

Table 97: COVID-19 Cases by Selected Characteristics, Washoe County 2023²²⁵

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

²²⁵ 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 (see Figure 130). 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 130: FEMA Community Lifelines

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.

Table 98 provides the Consequence Analysis of the Potential for Detrimental Impacts of Infectious Disease, which was done for accreditation with EMAP.

Table 98: 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.

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 99 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 99: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

The following table provides the Calculated Priority Risk Index (CPRI) for infectious disease impact for Washoe County based on the current plan's hazard risk assessment results. Washoe County's hazard assessment shown in Table 100 identifies infectious disease as a medium-risk hazard, with a CPRI value of 2.1. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 100: Calculated Priority Risk Index for Infectious Disease in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Infectious Disease	2	2	1	4	2	2.1	Medium

NATIONAL RISK INDEX

There are no NRI findings for this hazard as the NRI only provides data for natural hazards.

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 131 shows the routes they might use.



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 132 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 132: Nuclear Power Reactors in the United States²²⁶

²²⁶ 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 101 lists these incidents.

Table 101: Radiological Incidents, 2013–2020²²⁷

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.

²²⁷ 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.

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.²²⁸

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

²²⁸ 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/>

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.

Table 102 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 102: 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 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.

Subject	Ranking	Impacts/Radiological waste
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, 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.

Subject	Ranking	Impacts/Radiological waste
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.

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 103 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 103: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

The following table provides the Calculated Priority Risk Index (CPRI) for radiological waste transport impact for Washoe County based on the current plan's hazard risk assessment results. Washoe County's hazard assessment shown in Table 104 identifies radiological waste transport as a high-risk hazard, with a CPRI value of 3.1. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 104: Calculated Priority Risk Index for Radiological Waste Transport in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Radiological Waste Transport	3	3	4	3	3	3.1	High

NATIONAL RISK INDEX

There are no NRI findings for this hazard as the NRI only provides data for natural hazards.

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.²²⁹

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.²³⁰

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 133).

²²⁹ United States Department of Transportation, 2024, "The Road Safety Problem."

<https://www.transportation.gov/NRSS/SafetyProblem>

²³⁰ Federal Railroad Administration, 2024, "Accident/Incident Definitions."

<https://railroads.dot.gov/forms-guides-publications/guides/accidentincident-definitions>

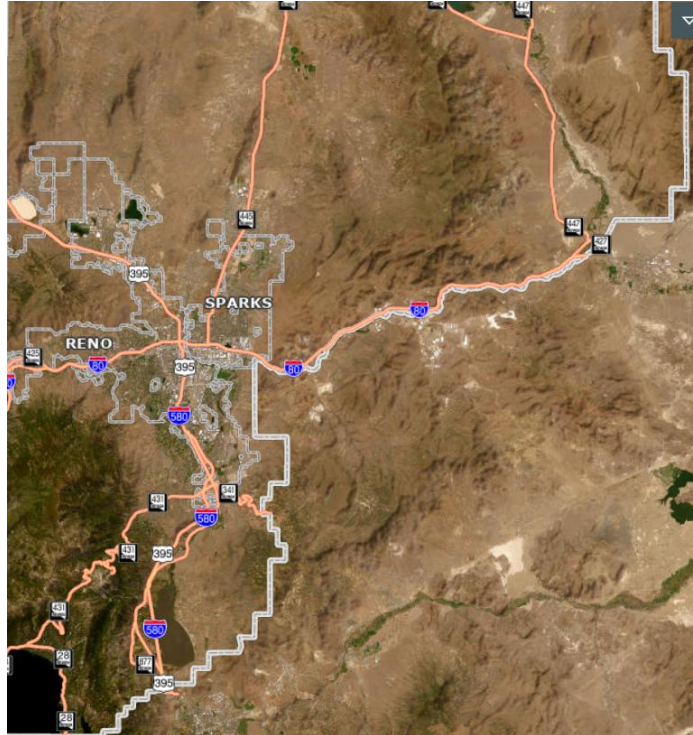


Figure 133: Highways in the Washoe County Region²³¹

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 (see Figure 134).

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.

²³¹ 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 134: Railroad Lines in the Washoe County Region²³²

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

²³² 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 2020.²³³

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.²³⁴

The US Department of Transportation compiles annual statistics on the incidents by transportation type (see Figure 135). These annual statistics show that roadway transportation has the highest percentage of all Transportation incidents at 94.2%.

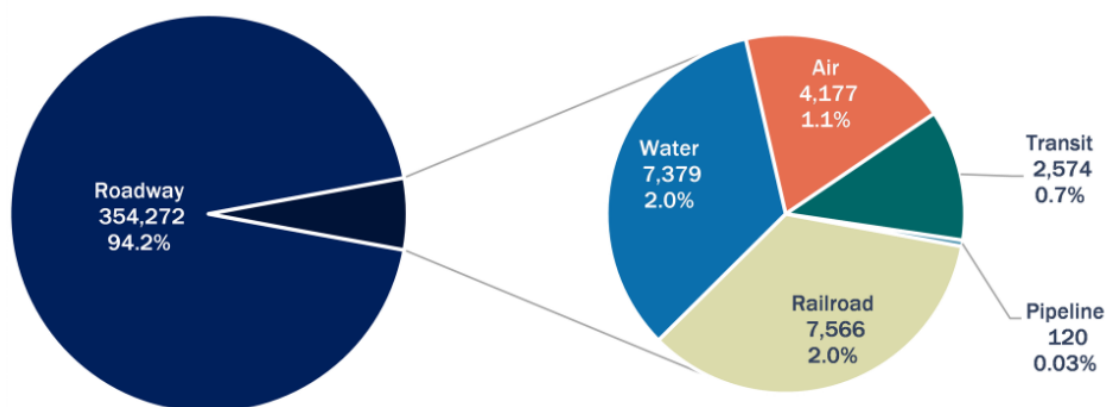


Figure 135: Bureau of Transportation Incident Statistics (Annual Percentages per Transportation Type)²³⁵

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

²³³ 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>

²³⁴ United States Department of Transportation, Bureau of Transportation Statistics 2024. <https://data.bts.gov/stories/s/Freight-Transportation-Safety/vu39-vtqh>

²³⁵ 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.²³⁶

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:

²³⁶ 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 136 shows the memorial of this incident.



Figure 136: Memorial for Galaxy Airlines Flight 203 Victims, Located at Rancho San Rafael Regional Park in Reno²³⁷

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.

²³⁷ 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 105 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 data in Table 105 and Figure 137 indicate an increasing trend of fatalities and serious injuries as a result of roadway accidents for the state of Nevada.

Table 105: Nevada Highway Safety Performance Measures, 2014–2022²³⁸

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

²³⁸ 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>

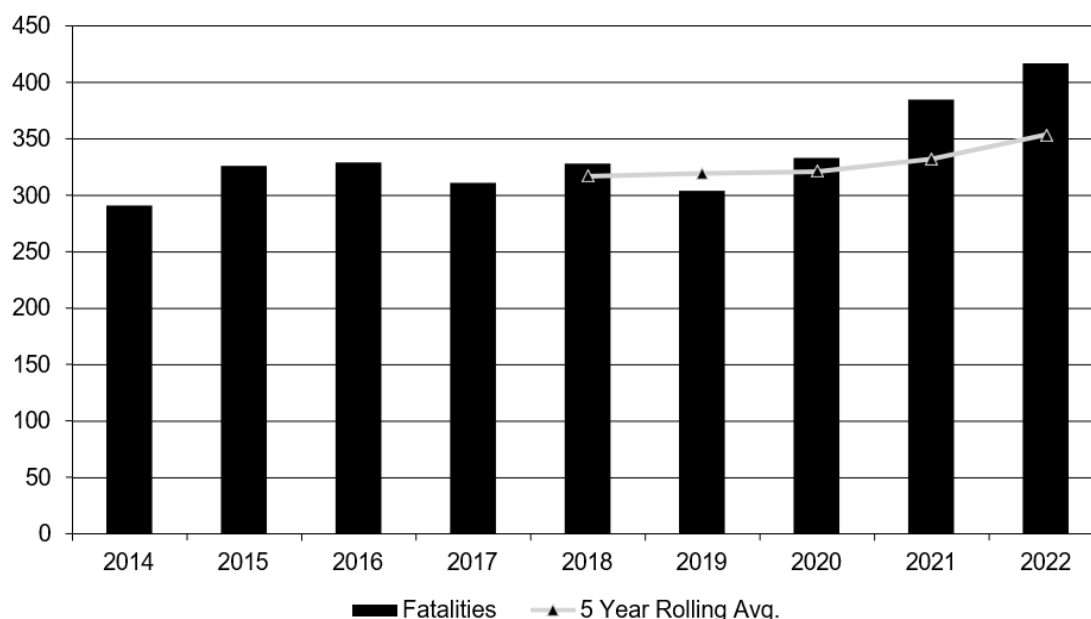


Figure 137: Annual Vehicle Highway Fatalities in Nevada, 2014–2022²³⁹

AIRCRAFT INCIDENTS

Statistics on airplane crashes include the following:²⁴⁰

- 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.

Figure 138 highlights the extremely low risk of injury or fatality in commercial air travel based on data from 2015 to 2020.

²³⁹ 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>

²⁴⁰ Flyfright.com, “Flying High: The Real Odds of Experiencing a Plane Crash,” <https://flyfright.com/plane-crash-statistics/>



Figure 138: Air Travel Statistics, 2015–2020²⁴¹

Weather conditions are associated with up to 70% of aircraft incidents.²⁴² 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.

Figure 139 presents the number of aviation accidents in Nevada from 2014 to 2024, distinguishing between fatal and non-fatal accidents.

²⁴¹ Flyfright.com, “Flying High: The Real Odds of Experiencing a Plane Crash,” <https://flyfright.com/plane-crash-statistics/>

²⁴² 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

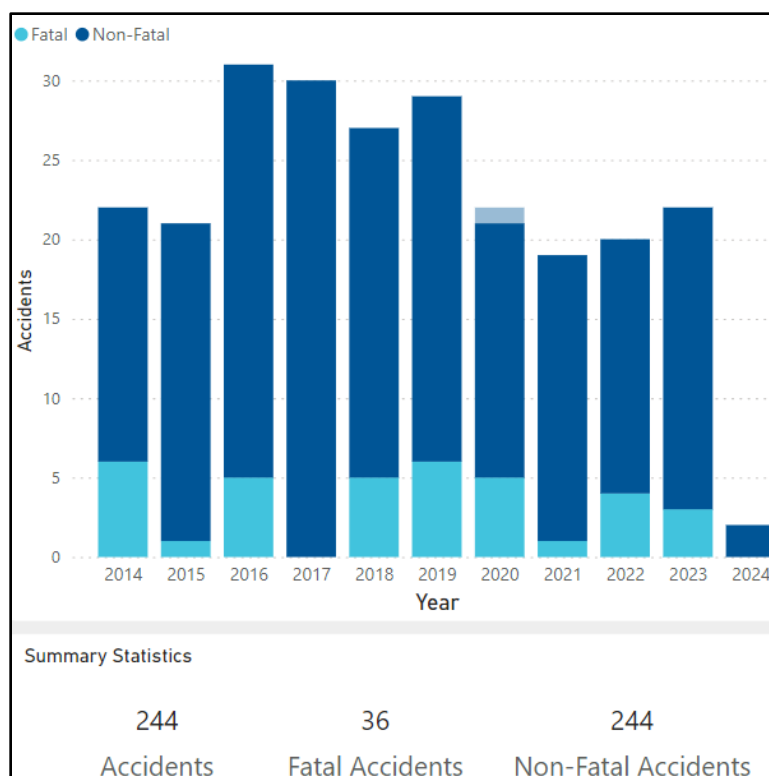


Figure 139: Aviation Accidents by Calendar Year in Nevada, 2014–2024²⁴³

Figure 140 maps the locations of aviation accidents across Nevada from 2014 to 2024, showing geographic patterns and concentrations.

²⁴³ National Transportation Safety Board, “Monthly Aviation Dashboard-Aviation Accidents by Calendar Year-Nevada.” <https://www.nts.gov/safety/data/Pages/monthly-dashboard.aspx>

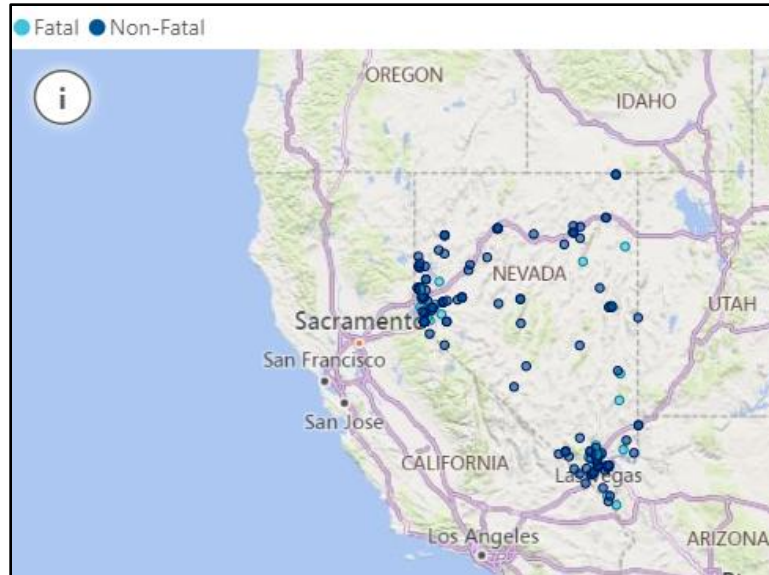


Figure 140: Locations of Aviation Accidents in Nevada, 2014–2024²⁴⁴

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.²⁴⁵ Mixed commercial, 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.

²⁴⁴ National Transportation Safety Board, “Monthly Aviation Dashboard-Aviation Accidents by Calendar Year-Nevada.” <https://www.ntsb.gov/safety/data/Pages/monthly-dashboard.aspx>

²⁴⁵ 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

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 2022.²⁴⁶

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.

Table 106 provides the Consequence Analysis of the Potential for Detrimental Impacts of Transportation incidents specific to aircraft incidents that was done for accreditation with the Emergency Management Accreditation Program (EMAP).

²⁴⁶ Nevada Department of Transportation, 2024, “Mt. Rose Highway Corridor Study,” <https://www.dot.nv.gov/projects-programs/programs-studies/mt-rose-highway-corridor-study>

Table 106: 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.
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

Subject	Ranking	Impacts/Transportation incidents (Aircraft)
		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 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.

Subject	Ranking	Impacts/Transportation incidents (Aircraft)
		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.

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 107 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 107: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

The following table provides the Calculated Priority Risk Index (CPRI) for transportation incident impact for Washoe County based on the current plan's hazard risk assessment results. Washoe County's hazard assessment shown in Table 108 identifies transportation incident as a high-risk hazard, with a CPRI value of 3.4. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 108: Calculated Priority Risk Index for Transportation Incident in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Transportation Incident	3	4	4	3	3	3.4	High

NATIONAL RISK INDEX

There are no NRI findings for this hazard as the NRI only provides data for natural hazards.

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 109 indicates the approximate distances of these volcanoes from Reno. Figure 141 is a map of these volcano locations by threat rank from USGS.²⁴⁷

Table 109: 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

²⁴⁷ 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.

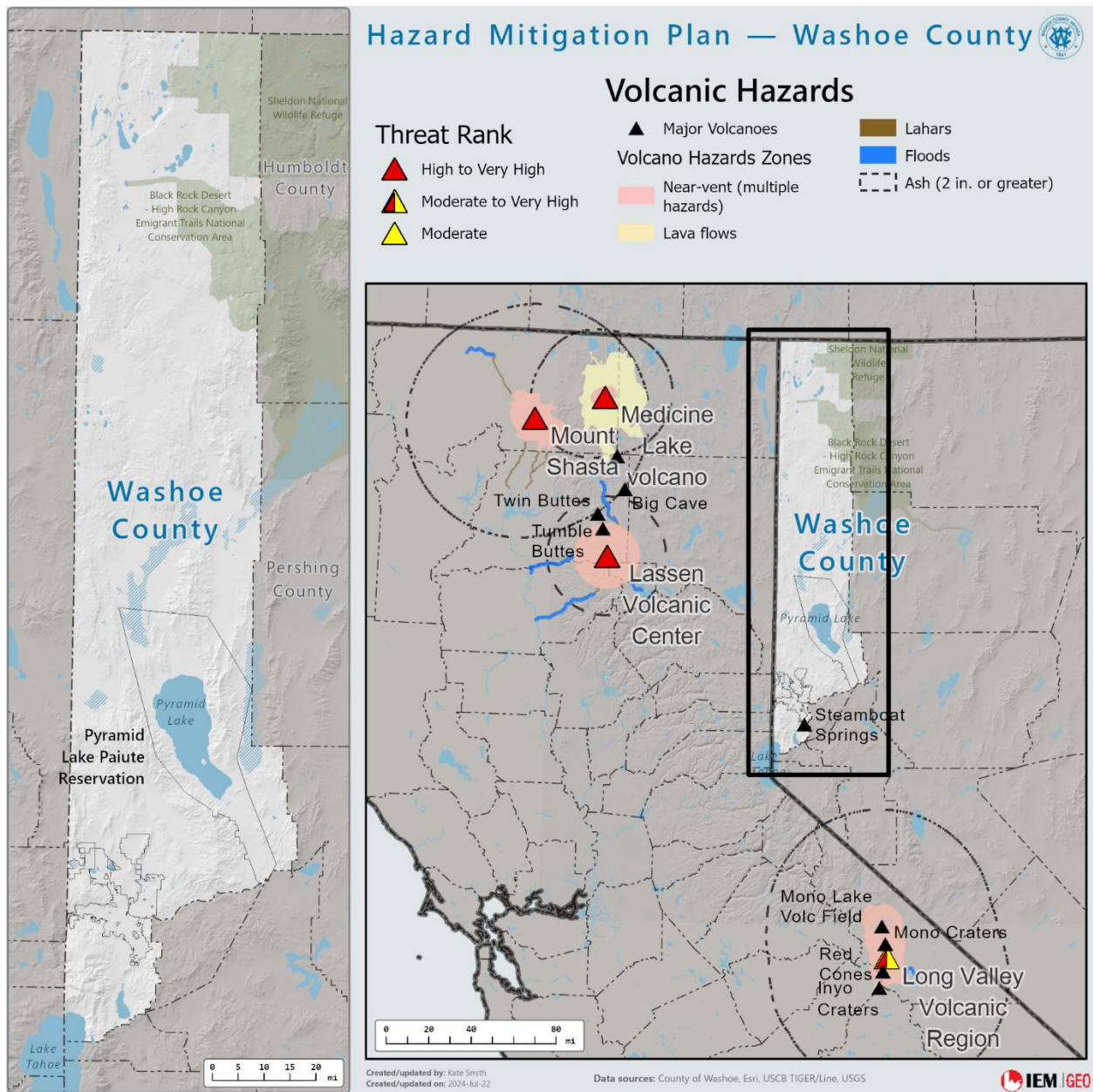


Figure 141: Volcanic Hazards near Washoe County

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 (CO₂) occurred when a skier and rescuers became trapped in a snow pocket that was filled with CO₂. The emission of CO₂ in this area is associated with volcanic unrest between more dramatic eruption cycles. Elevated CO₂ 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 142 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.

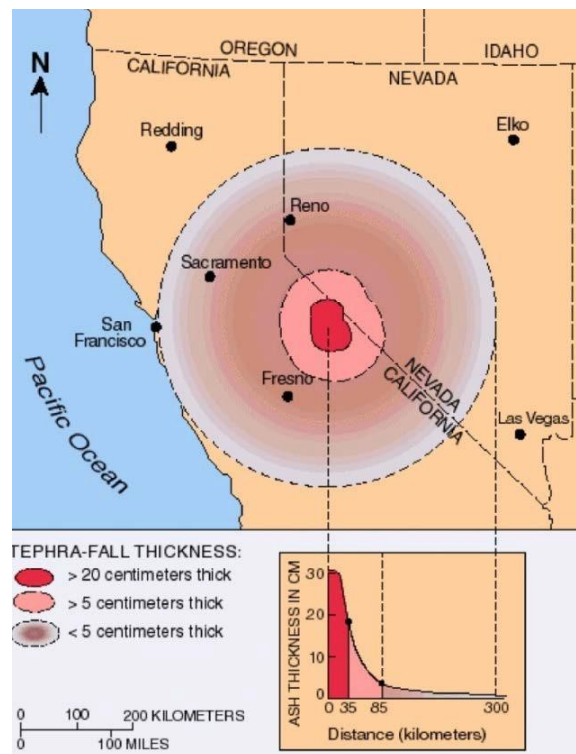


Figure 142: Tephra-Fall Thickness Map of the Long Valley-Mono Lake Area, California²⁴⁸

²⁴⁸ 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,²⁴⁹ 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

²⁴⁹ 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=-123.216666666667&min_y=35.916666666663&max_x=-111.341666666667&max_y=42.591666666662&coord_x=-117.279166666667&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.”²⁵⁰

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 350 years. This indicates a 0.6% chance of these volcanoes erupting in

²⁵⁰ State of Nevada, “The State of Nevada Enhanced Hazard Mitigation Plan 2023, Draft.” [https://dem.nv.gov/uploadedFiles/demnv.gov/content/About/NEHMP_09-22-2023\(4\).pdf](https://dem.nv.gov/uploadedFiles/demnv.gov/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.

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

Community lifelines are essential systems that support public health and safety during disasters (see Figure 143). Continuity of operations for the county and jurisdictional agencies that support lifelines would be vulnerable to larger ash explosions. This vulnerability would increase as conditions worsened to 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.



Figure 143: FEMA Community Lifelines

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.

Table 110 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 110: 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.
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

Subject	Ranking	Impacts/Volcano
		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 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 145 is a picture from the public meeting.

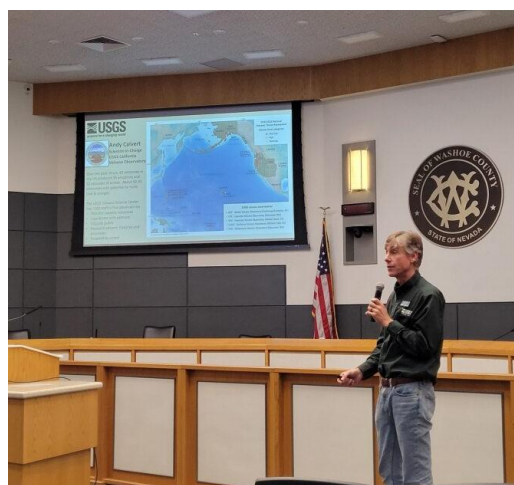


Figure 144: USGS Presentation on Volcanoes at the Public Meeting

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.

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 111 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 111: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

Table 112 provides the Calculated Priority Risk Index (CPRI) for volcano impact in Washoe County based on the current plan's hazard risk assessment results. Washoe County assigned volcano a risk factor value of 2.1, reflecting medium magnitude, medium onset, and longer duration impacts. This risk factor value falls in the range of 2.0 to 2.4, which is considered a medium risk hazard. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 112: Calculated Priority Risk Index for Volcano in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Volcano	1	3	3	4	1	2.1	Medium

NATIONAL RISK INDEX

The National Risk Index (NRI) contains national level data for 18 natural hazards including volcano activity. The index provides rankings for historical losses, expected annual loss, and overall risk at the county and census tract levels. For Washoe County, the NRI ranks volcanic activity as Not Applicable, meaning that there is no expected annual loss. See Figure 145 for the NRI ranking of Washoe County for volcanic activity.

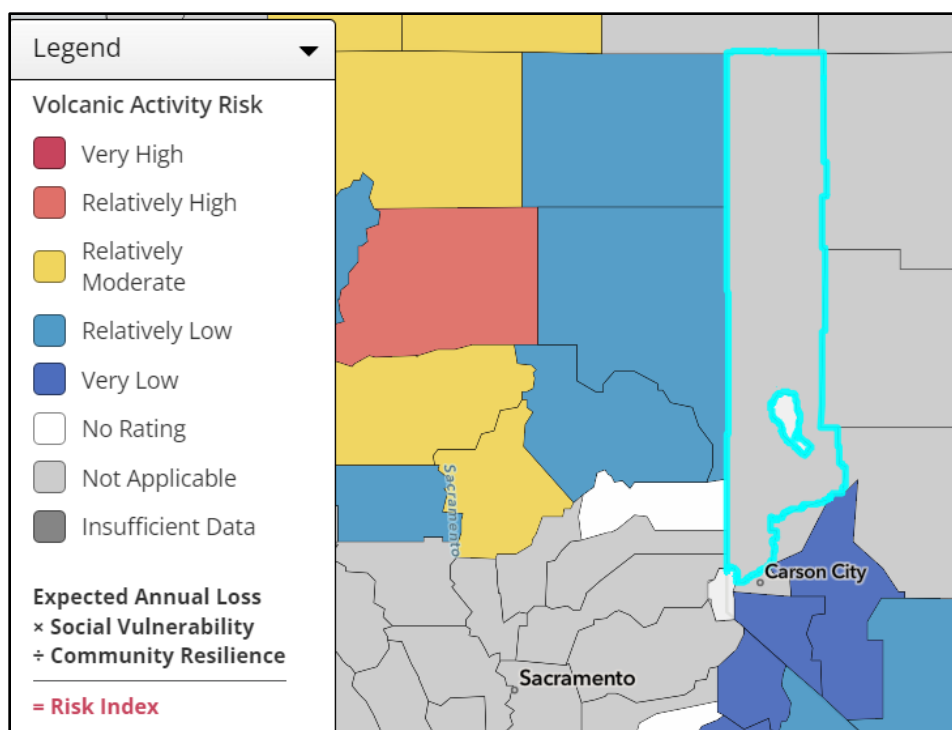


Figure 145: NRI Overall Risk Score for Volcanic Activity in Washoe County²⁵¹

²⁵¹ FEMA, “National Risk Index Washoe County Volcanic Activity Score, Map and Legend.”
<https://hazards.fema.gov/nri/map>

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 (*Artemisia 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 146 shows the potential for significant wildfires during the summer months.

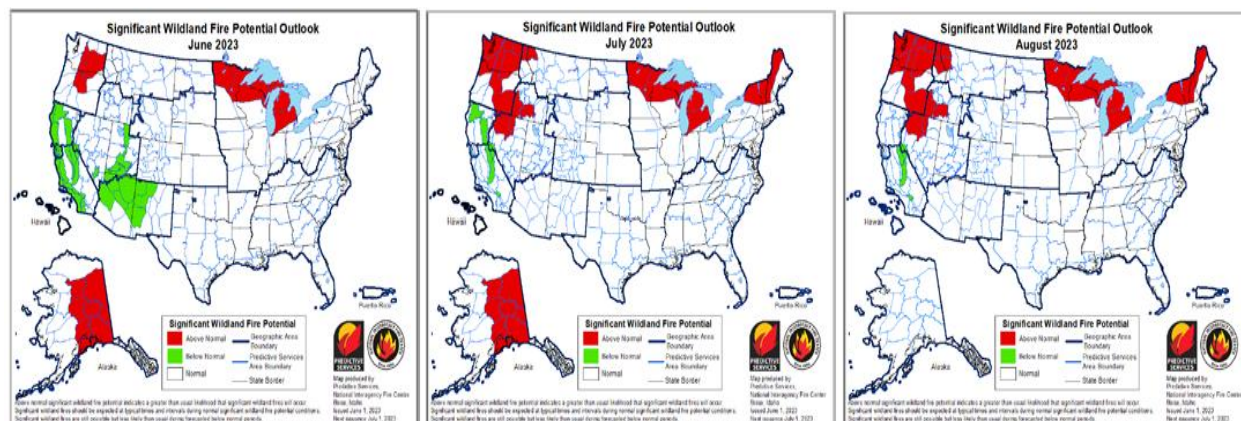


Figure 146: Significant Wildfire Potential in June (left), July (middle), and August (right)²⁵²

Intense wildland fires can create their own weather systems, which can help fires spread “by lofting embers and causing spot fires.”²⁵³ 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.²⁵⁴

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

²⁵² 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>.

²⁵³ U.S. National Science Foundation, “Researchers Discover how Wildfires Create Their Own Weather.” <https://www.nsf.gov/news/researchers-discover-how-wildfires-create-their-weather>

²⁵⁴ 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 147 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.²⁵⁵ 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.

²⁵⁵ USDA Forest Service, Wildfire Risk to Communities. <https://wildfirerisk.org/>

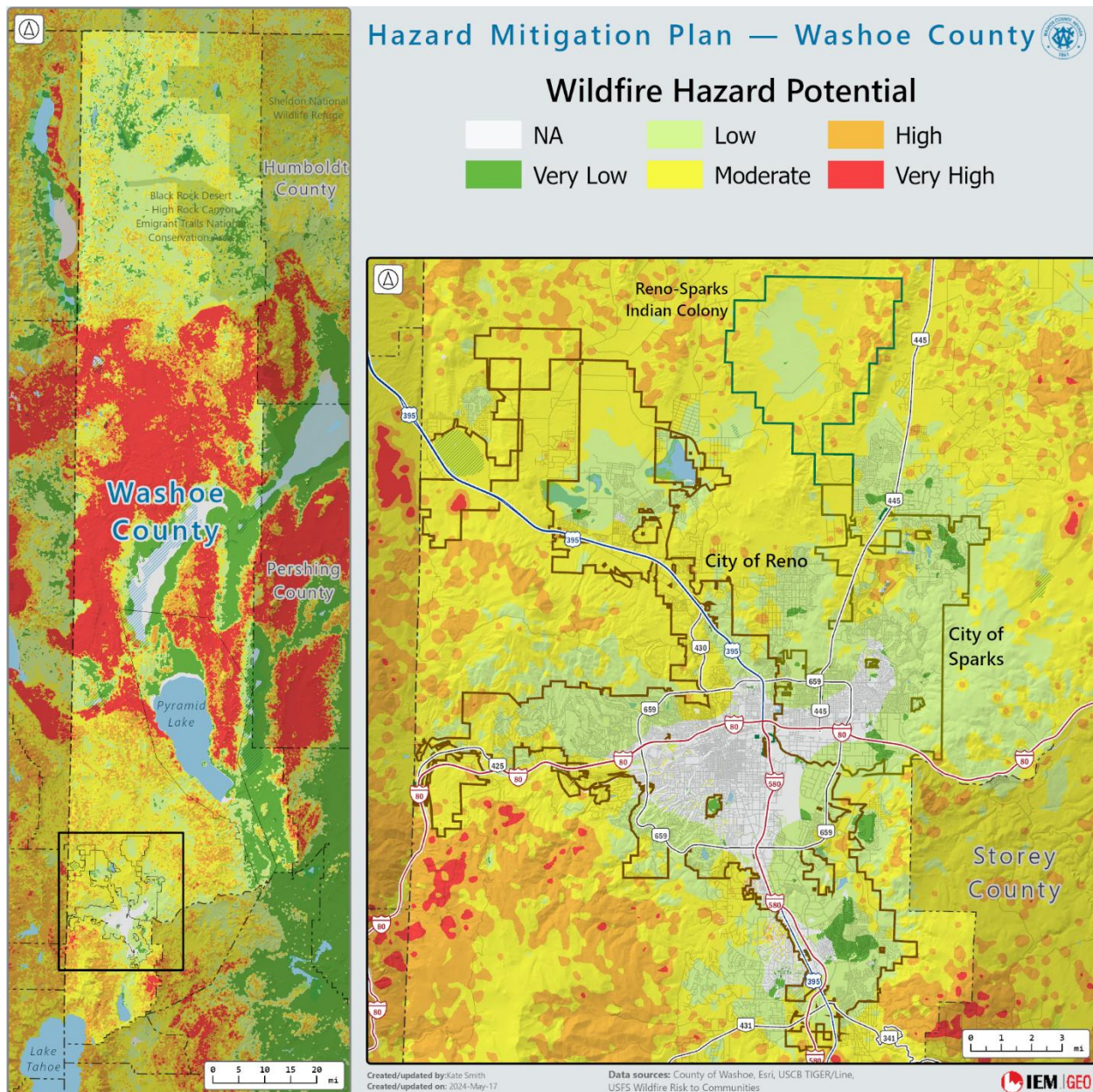


Figure 147: Wildfire Hazard Potential for Washoe County

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 148 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.

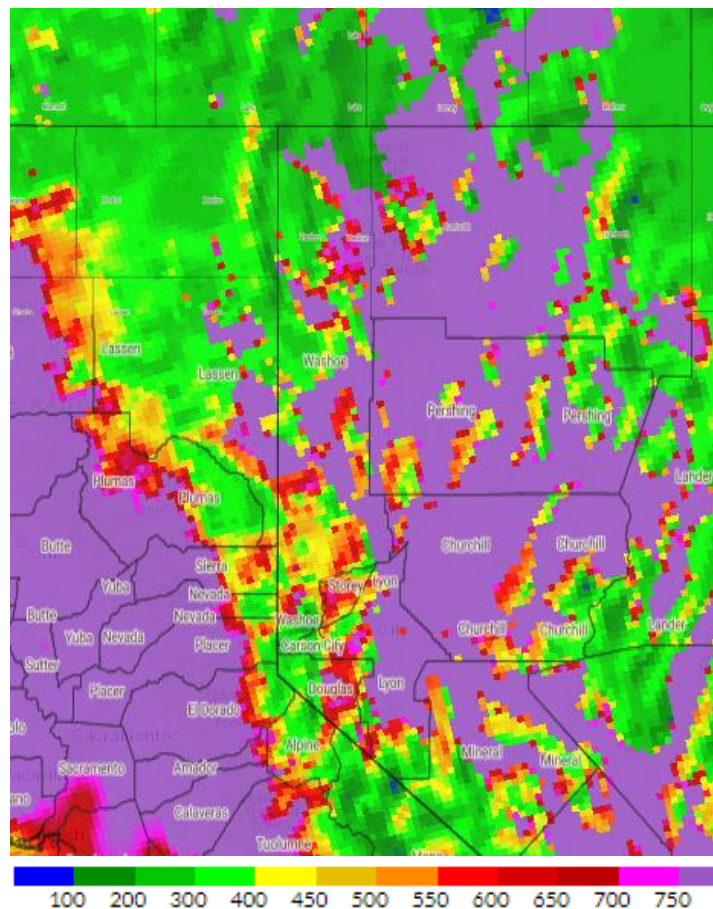


Figure 148: Keetch–Byram Drought Index Map of Washoe County

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 148 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 13 fire management assistance disaster declarations due to wildland fire since the prior plan prepared in 2020. Table 113 identifies the declarations since 2020 that affected Washoe County.

Table 113: FMA Disaster Declarations in Washoe County Since 2020

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard Mitigation Program Declared	Declaration Date	Title
FM-5316	No	Yes	Yes	6/27/2020	Poeville Road Fire
FM-5322	No	Yes	Yes	7/21/2020	Rockfarm Fire

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard Mitigation Program Declared	Declaration Date	Title
FM-5326	No	Yes	Yes	8/3/2020	North Fire
FM-5328	No	Yes	Yes	8/15/2020	Loyalton Fire
FM-5382	No	Yes	Yes	11/17/2020	Pinehaven Fire
FM-5495	No	Yes	Yes	6/12/2024	Sullivan Fire
FM-5448	No	Yes	Yes	8/14/2022	Joy Lake Fire
FM-5494	No	Yes	Yes	6/11/2024	Trail Fire
FM-5530	No	Yes	Yes	8/12/2024	Gold Ranch Fire
FM-5533	No	Yes	Yes	9/7/2024	Davis Fire
FM-5546	No	Yes	Yes	11/11/2024	Callahan Fire
FM-5586	No	Yes	Yes	6/10/2025	Marie Fire
FM-5602	No	Yes	Yes	8/2/2025	Peavine 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 these fires were human caused, 28 were naturally caused, 1 electrical, and the remainder unknown or unavailable.

Table 114 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 114: 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
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

Year	Fire Name	Total Acres Burned	Cause
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 149 shows one aspect of this fire.



Figure 149: Picture of the Little Valley Fire, October 2016 (Photo by CBS News)

Figure 150 presents the spatial extent of past wildfires in Washoe County.

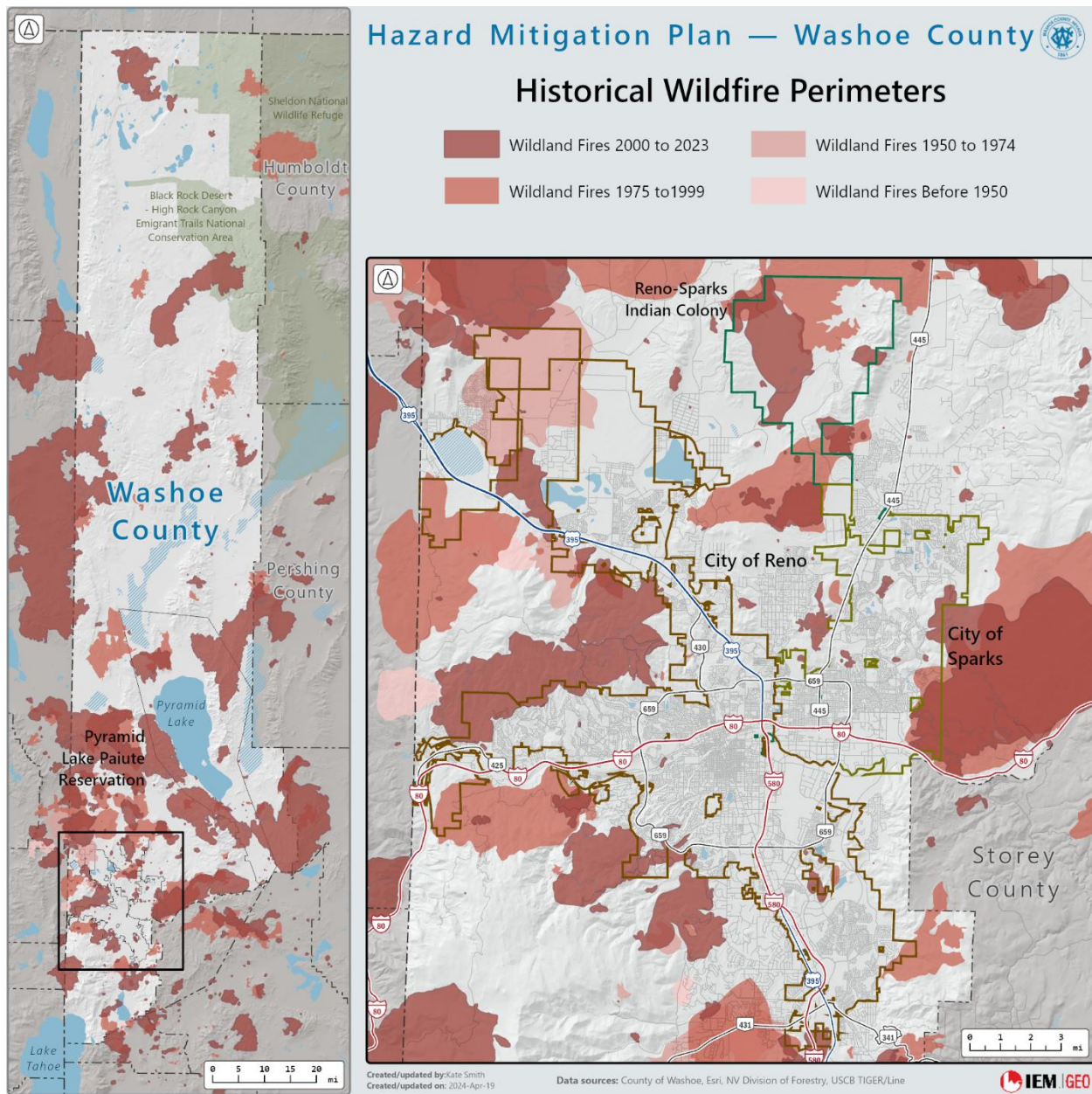


Figure 150: Historical Wildfire Perimeters in Washoe County

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.

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 Plan²⁵⁶ 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 115 lists five primary factors that affect the potential fire hazard assessed to arrive at the community hazard assessment score: community design, construction materials, defensible

²⁵⁶ Washoe County Fire Plan, 2005, “Washoe County Fire Plan: Executive Summary.”
<https://www.rci-nv.com/reports/washoe/summary.html>

space, availability of fire suppression resources, and physical conditions such as the vegetative fuel load and topography.²⁵⁷

Table 115: 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
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

²⁵⁷ Nevada Division of Forestry Historical Wildfire GIS Data

Community	Interface Condition	Interface Fuel Hazard Condition	Ignition Risk Rating	Community Hazard Rating
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 151, 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.²⁵⁸ 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.

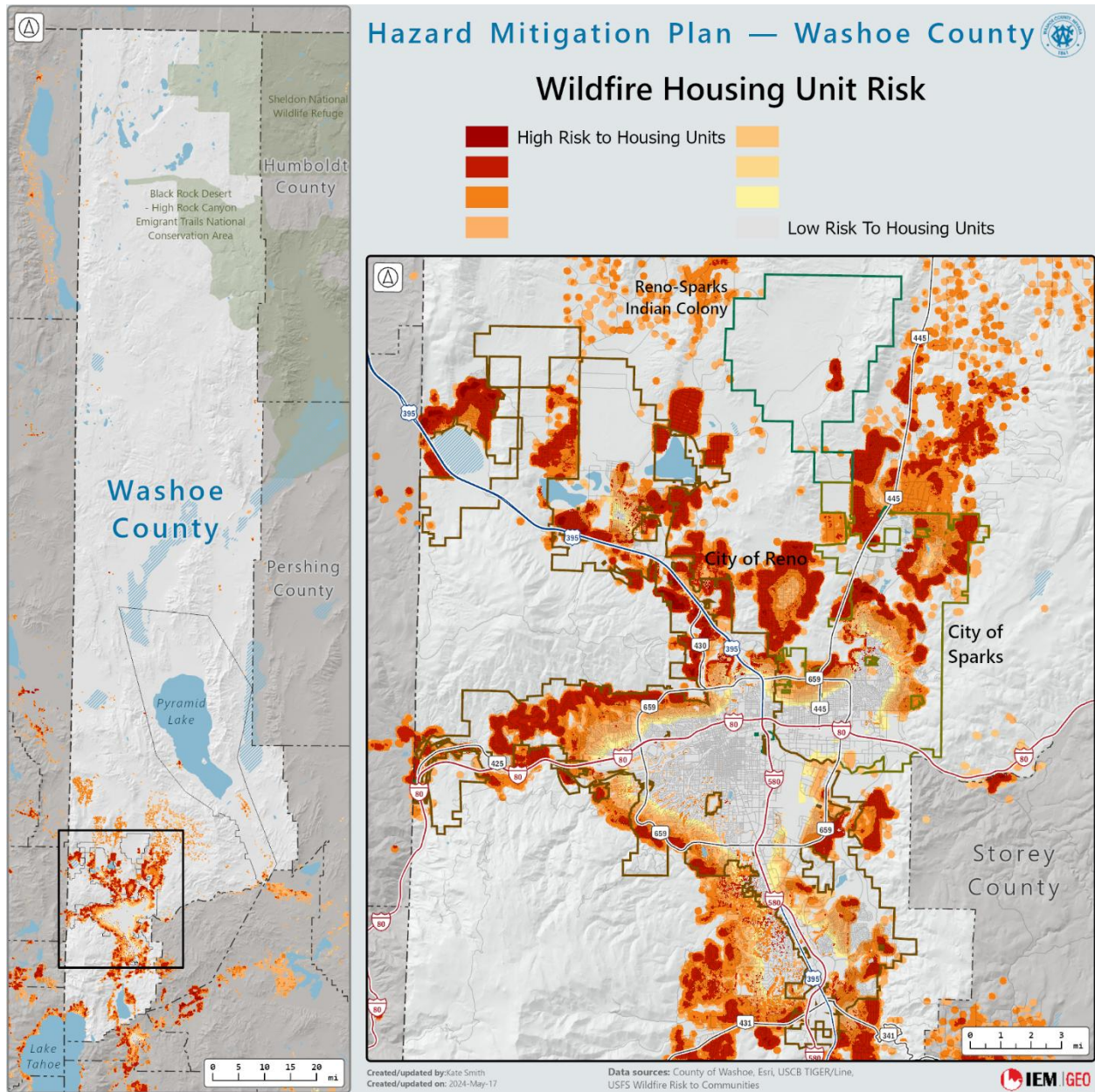


Figure 151: Wildfire Housing Unit Risk for Washoe County

²⁵⁸ USDA Forest Service, Wildfire Risk to Communities. <https://wildfirerisk.org/>

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.²⁵⁹

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.

²⁵⁹ 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/>

- 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.
- 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 152).

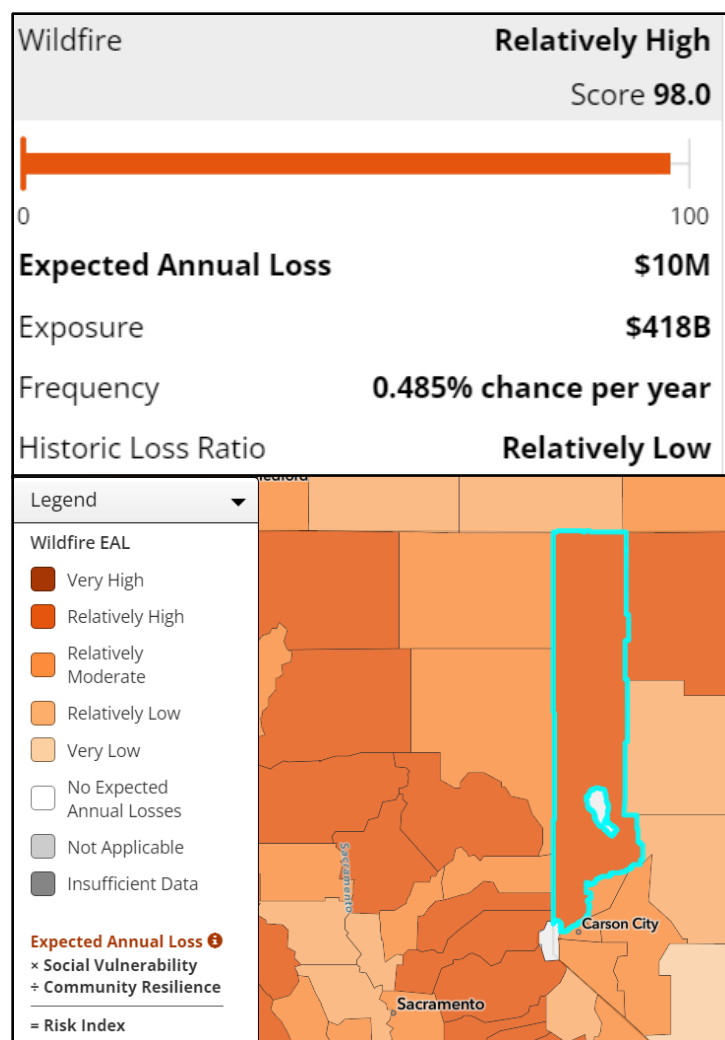


Figure 152: Washoe County Wildfire Expected Annual Loss Score, Map, and Legend²⁶⁰

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

²⁶⁰ FEMA, National Risk Index, "Washoe County Wildfire Expected Annual Loss Score, Map and Legend." <https://hazards.fema.gov/nri/map>

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.

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 2021.²⁶¹

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. A report from the Climate and Economic Justice Screening Tool shows calculated vulnerability to wildfire for certain Washoe County demographic groups. Table 116 provides summary data from the Wildfire Risk To Communities by demographic report for Washoe County. Figure 153 provides the calculated vulnerability to wildfire for certain Pyramid Lake tract demographics). Table 117 shows CEJEST report results for Washoe County census tracts

²⁶¹ 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>

that are considered disadvantaged. Figure 154 displays the geographic location of each of the CEJST-classified disadvantaged census tracts.

Table 116: Washoe County Demographics by Vulnerability to Wildfire²⁶²

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%

²⁶² Wildfire Risk to Communities, 2024. “Washoe County Population Demographics by Vulnerability to Wildfire.” <https://wildfirerisk.org/explore/vulnerable-populations/48/48409/>

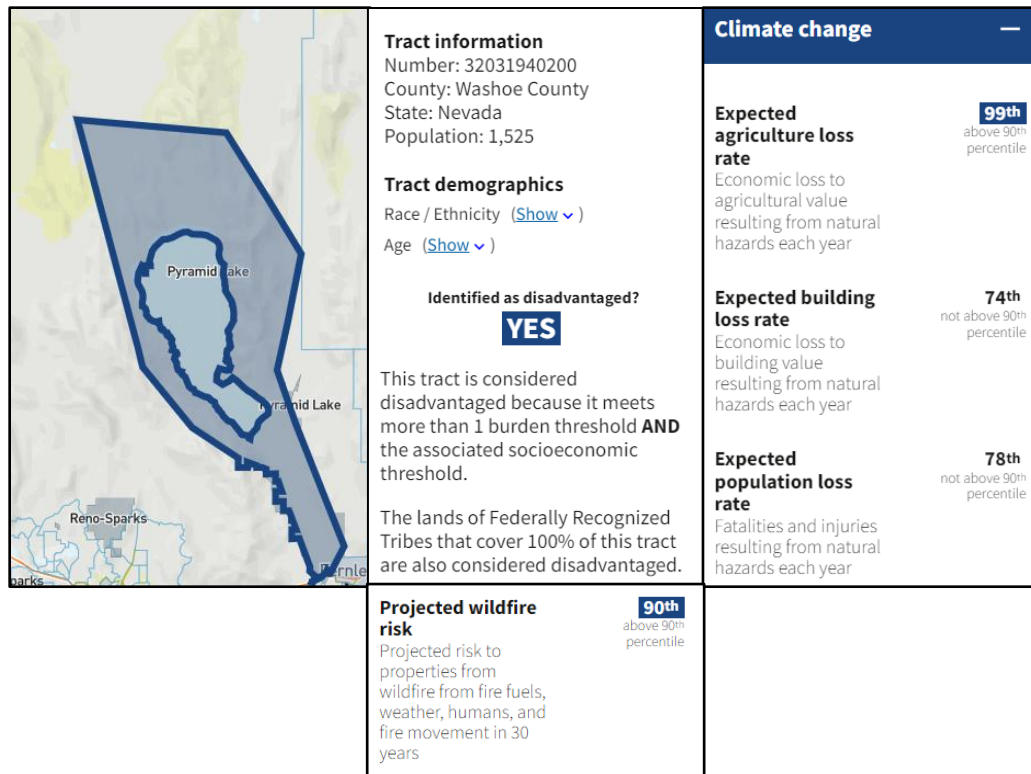


Figure 153: A Census Tract Profile from Pyramid Lake CEJST Report²⁶³

²⁶³ Climate & Economic Justice Screening Tool, 2024, "Washoe County–Pyramid Lake Tract Demographics." <https://screeningtool.geoplatform.gov/en/#13.45/39.6082/-119.76789>

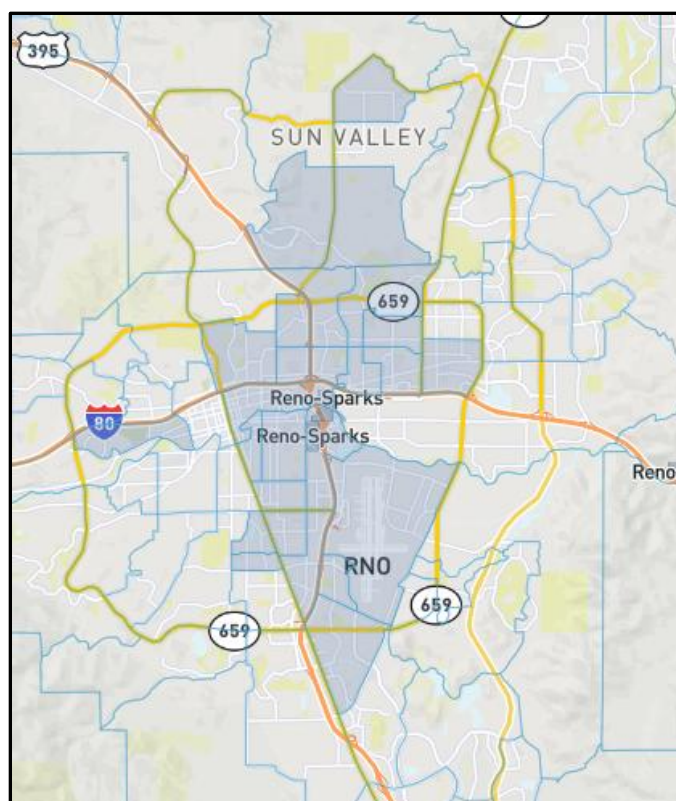


Figure 154: Washoe County Disadvantaged Census Tracts²⁶⁴

Table 117: Washoe County Census Tracts Designated as Disadvantaged²⁶⁵

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%

²⁶⁴ 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>

²⁶⁵ 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 155).

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 155: Possible Economic Impact of Wildfire Smoke in the Reno Metro Area, 2021²⁶⁶

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.²⁶⁷

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.

Table 118 summarizes how recent land use changes, population growth, and climate conditions have influenced vulnerability to wildland fire in Washoe County.

²⁶⁶San Francisco Fed, 2021, <https://www.frbsf.org/community-development/wp-content/uploads/sites/3/2023-wildfire-smoke-impact-snapshots-reno.pdf>

²⁶⁷ 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 118: 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 156).



Figure 156: FEMA Community Lifelines²⁶⁸

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 (see Figure 157). 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

²⁶⁸ 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 shutoffs could impact community lifelines and residents' ability to cool themselves.

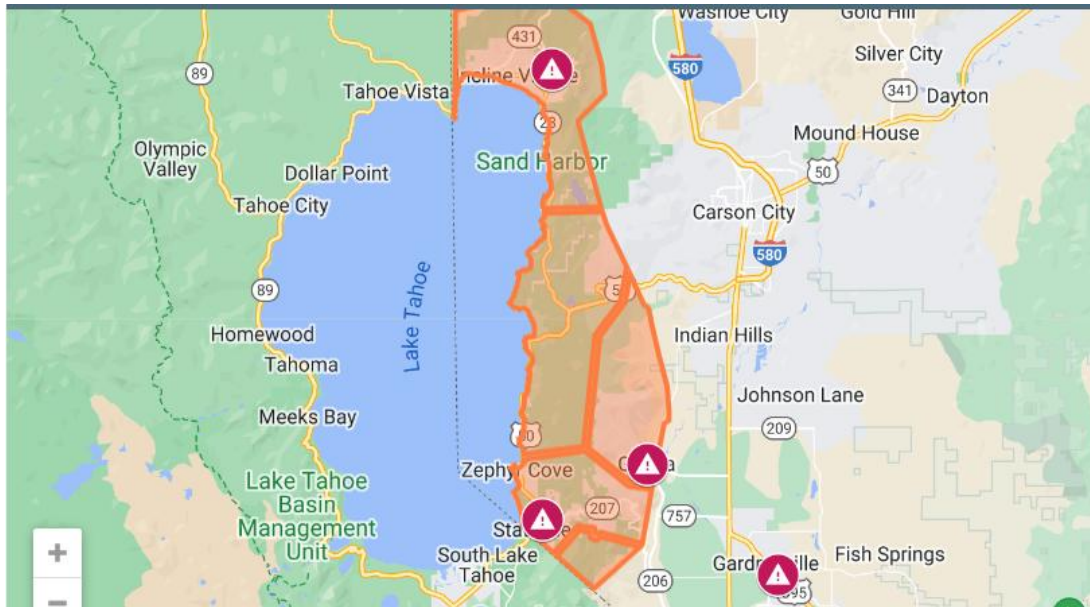


Figure 157: Northern Nevada Public Safety Outage Management Zone²⁶⁹

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.²⁷⁰

²⁶⁹ NV Energy, Power Safe NV. <https://www.nvenergy.com/safety/wildfire>

²⁷⁰ 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

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.

Table 119 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 119: 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

Subject	Ranking	Impacts/Wildland Fire
		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 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.

Vulnerability Score

CALCULATED PRIORITY RISK INDEX (LOCAL RANKING)

Table 120 presents the classification system for the CPRI. Risk factor values are grouped into three categories including high, medium, and low based on their composite score. 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 risk factor value is 4. This provides a framework to compare and prioritize hazards by placing their numeric scores into qualitative categories.

Table 120: Overall CPRI Risk Scores

Risk Factor Value	Overall Risk
2.5 – 4.0	High
2.0 – 2.4	Medium
0 – 1.9	Low

Table 121 provides the Calculated Priority Risk Index (CPRI) for wildland fire impact in Washoe County based on the current plan’s hazard risk assessment results. Washoe County assigned wildland fire a risk factor value of 2.1, reflecting high probability, high magnitude, quick onset, and high frequency impacts. This risk factor value falls in the range of 2.5 to 4.0, which is considered a high-risk hazard. These values were calculated through input from Washoe County jurisdictional agency subject matter experts.

Table 121: Calculated Priority Risk Index for Wildland Fire in Washoe County

Type of Hazard Event	Probability	Magnitude	Onset	Duration	Frequency	Risk Factor Value	Overall Risk
Wildland Fire	4	4	4	3	4	3.9	High

NATIONAL RISK INDEX

The National Risk Index (NRI) contains national level data for 18 natural hazards including wildland fire. The index provides rankings for historical losses, expected annual loss, and overall risk at the county and census tract levels. Table 122 provides the NRI rankings for wildland fire in Washoe County. For this hazard, the NRI assigns scores of Relatively Low for Historical Losses, Relatively High for Expected Annual Loss, and Relatively High for Overall Risk on a scale ranging from Very Low to Very High.

Table 122: National Risk Index for Wildland Fire in Washoe County

Wildland Fire	Historical Losses	Expected Annual Loss	Overall Risk Score	Overall Risk
	Relatively Low	Relatively High	97.6	Relatively High

Based on the NRI, Washoe County has an Overall Risk value for wildland fire of Relatively High compared to all other communities within the United States, with a score of **97.6** (see Figure 158).

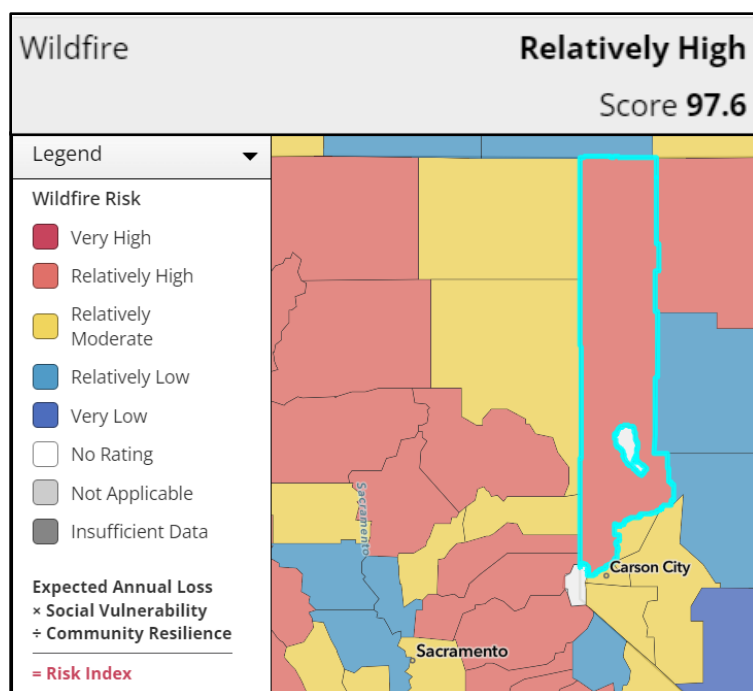


Figure 158: NRI Overall Risk Score for Wildland Fire in Washoe County²⁷¹

²⁷¹ FEMA, “National Risk Index Washoe County Wildfire Score, Map and Legend.”
<https://hazards.fema.gov/nri/map>

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An aerial photograph of a city, likely Salt Lake City, with a prominent snow-capped mountain in the background. The city is densely packed with buildings, and a large, light-colored, rectangular building is visible in the center. The foreground shows a road and some open areas. The sky is blue with some clouds.

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))
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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 123 provides an overview of Washoe County's planning documents and their role in hazard mitigation, including update cycles and implementation strategies.

Table 123: 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.

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?
Capital Improvement Plan	Y	Y	Mitigation projects can be submitted and included on an annual basis	It is adopted as part of the 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 potentially increase,	It can encourage development in safer areas instead of expanding into areas of concern w/ high risk of hazard	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	hazard likelihood.	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.
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	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 (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 124 outlines the County's regulations and ordinances that help reduce hazard impacts and guide safe development.

Table 124: 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.
Zoning Ordinance	Yes	Yes	Ongoing updates, as necessary. Numerous updates in 2024 to

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?
			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. No development within 300 feet of the center line of the Truckee River in the East Truckee River Canyon.

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)			

* 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 125 details Washoe County’s administrative capabilities.

Table 125: 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
Floodplain Administrator	Y	Yes	Yes	Yes
Geographic Information	Y	No	Yes, but primarily for hazard response and	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			lacking in mitigation.	
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
Active VOAD (Voluntary Agencies Active in Disasters)	Y	N	Unclear	Unclear
Other? (Please describe.)				

Table 126 outlines the County's technical capabilities.

Table 126: 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 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 127 includes further descriptions of the potential funding sources available to Washoe County and its regional partners.

Table 127: 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.
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

Funding Source	Description
	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 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 128 outlines Washoe County's financial capabilities.

Table 128: 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
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	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?
		homes and businesses.		
Natural Resources Conservation Services (NRCS) Programs	Y	Unsure.	Unsure.	Unsure.
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	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?
		associated with the 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
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 129 outlines potential FEMA funding sources available with a FEMA-approved Hazard Mitigation Plan (HMP).

Table 129: 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 130 highlights Washoe County's education and outreach capabilities.

Table 130: 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 libraries, door-to-door outreach)	Y – libraries, senior centers, public spaces. Unsure of door to door.	WC CSD posts hard copy notices about being prepared for flood events at 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

Education and Outreach Capability	Do you have this? (Y/N)	Does this resource currently incorporate hazard mitigation?	Notes
			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, NLTPD = North Lake Tahoe Fire Protection District CSD = Community Services Department, NNPH = Northern Nevada Public Health, TMFPD = Truckee Meadows Fire Protection District, WCSO = Washoe County Sheriff'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 Tahoe²⁷²
- Truckee Meadows Community College

²⁷² Sierra College, Tahoe-Truckee Campus. <https://www.sierracollege.edu/visit-sierra-college/tahoe-truckee-campus/>

- 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
- 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 131 summarizes Washoe County’s floodplain management practices and NFIP participation.

Table 131: 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.
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

Question	Response
	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.
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.

Question	Response
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.
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

Question	Response
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 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	Should be completed partly by TRFMA.

Question	Response
availability of flood insurance, in and out of the floodplain?	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.
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.

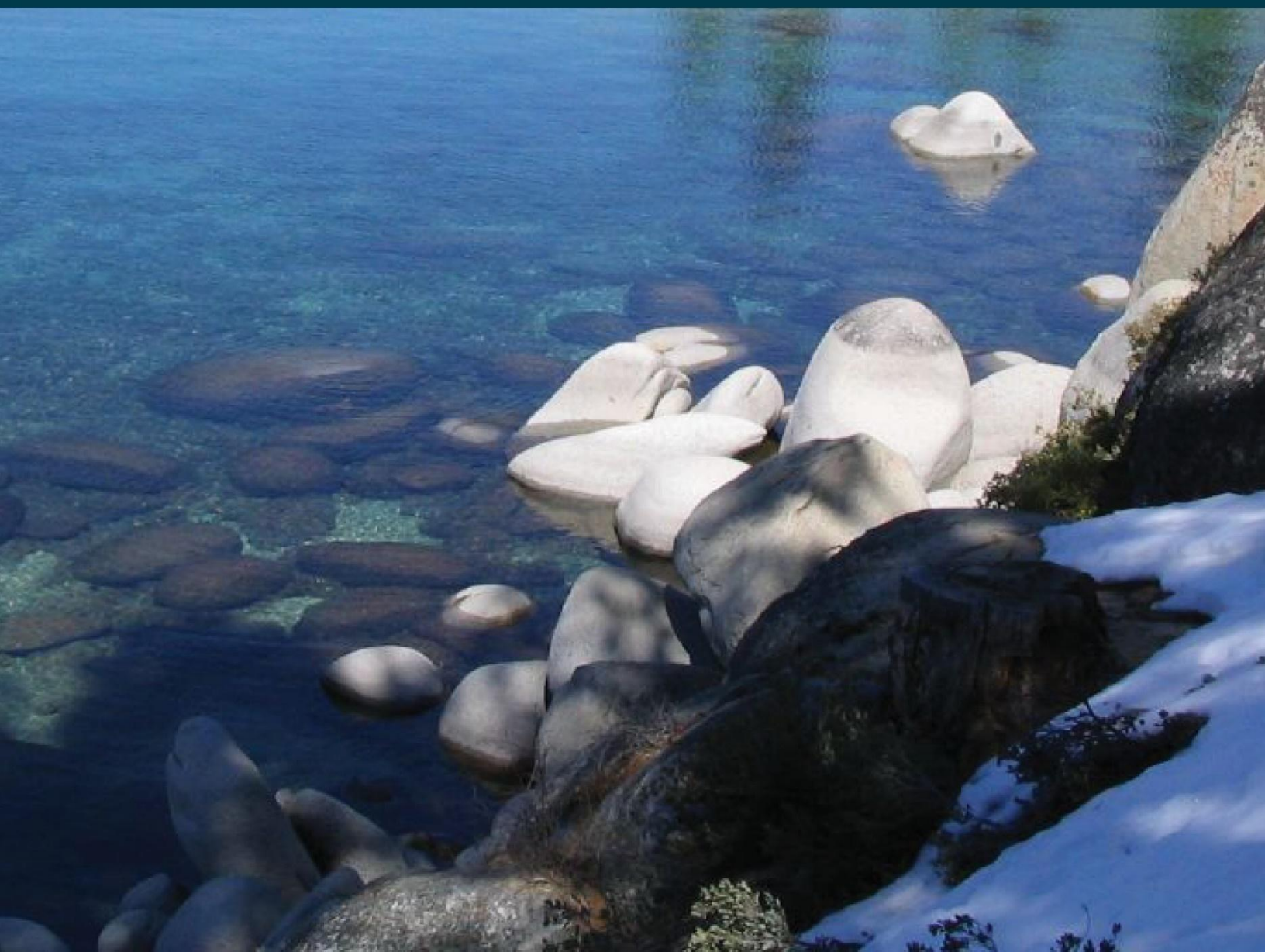
Education and Outreach

- 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?
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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 132 shows the status of the County's mitigation actions. Further status updates are included in each of the plan participant's annexes.

Table 132: 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.	Y

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
			PLPT – no response. Sparks – no response	
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	N

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
			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	
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 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.	N
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	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.	N

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
		Sparks Fire Department	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.	
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 PMR to FEMA for their review. 6–18 months out as of Nov 2023. East Lemmon Valley Hydrobasin FIRM update – Complete by 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.	N
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

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
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 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	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 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	N
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

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
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 wire 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
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

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
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	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 International Airport and airport critical	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	N

Mitigation ID	Mitigation Action	Lead Department	Status For Plan Update	Retain in plan update?
	areas at Reno-Stead Airport. (Washoe County, City of Reno)		EM October 2024 and this will move forward more with them.	
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 133.

Table 133: 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
12	4	3	4	3	3	3	4	High
13	2	2	2	2	3	2	4	Medium
14	3	3	3	2	2	2	3	Medium
15	3	3	2	2	2	2	3	Medium
16	3	4	4	3	4	3	4	High
17	4	4	4	4	4	4	3	High
18	4	4	4	4	4	4	4	High
19	3	4	2	2	3	3	3	Medium
20	4	4	4	4	4	4	2	High
21	4	4	4	4	4	4	3	High
22	4	4	4	4	4	4	2	High
23	4	4	4	4	4	4	2	High
24	4	4	4	4	4	4	2	High

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 134 presents the 2025 actions for Washoe County.

Table 134: Washoe County Updated Mitigation Action Plan, 2025–2029

#	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.	HMA Grants/Silver Jackets, RISC Map, NRCS	\$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	High
Description: This study will be performed to find the areas that cause the most losses in order to mitigate.												
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, EMPG, SERC Funds	\$500 + 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
Description: Hazard Awareness to educate the public and community resilience.												
3	AFN	All Hazards	All persons	WCEM	WC HR and NVDEM	Unsure	HMGP	\$500 + staff time	Increased individual resilience for the public for emergency management meetings and events	Increased individual understanding and participation	Begin in short term	Medium
Description: Increase individual resilience through meetings and events and encourage participation.												
4	Volcano Education and Awareness Program	Volcano	Residents and visitors	WCEM	USGS Menlo Park	RHMP itself	WCEM funded + staff time, EMPG, SERC funds.	Possibly USGS or local. Need better understanding from SME about cost and whether there	Increased awareness and understanding of potential impact, clean-up time, etc.	Beneficial until update is available or needed based on volcanic activity/ occurrence	Short term	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
								are studies that could be used for reference				
Description: Awareness program to educate the public and visitors on volcanoes and their impacts.												
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	General fund, Antiterrorism and Emergency Assistance Program (AEAP), Homeland Security Grants	\$500 + staff time	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: Add to previous plan explaining how to stand up and staff EOC during events.												
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	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	High
Description: Fund a study to map and find the best evacuation routes in the event of an incident.												
7	EV Ready Code Change	All hazards involving	Children, older adults, those with heart/lung disease,	NNPH – AQMD	City of Reno City of Sparks Washoe County	Building code amendment recommendatio	General fund, U.S. Department of	Unsure	Better air quality	Beneficial continuously until updated	In the next 5 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
		transportation	low-income and underserved communities			n to be adopted by municipalities	Energy grants, HMA grants					
Description: Amend the building code to include the EV Ready code change to protect air quality.												
8	Whites Creek Watershed Study	Flood and Wildland Fire	Population and Structures	CSD	TMFPD	Integrated into plans as appropriate.	NRCS, FMA, FMAG, USGS, EPA	\$100,000	Managing land use impacts.	Indefinitely	5 years	Medium
Description: Implement a study to manage land use for the Whites Creek Watershed.												
9	Ingress/ Egress Planning Code Change – Increase minimum number to 3 for new development	MH [Multiple Hazards)	Vulnerable populations	Washoe County Planning Commission	Emergency Management, Fire Departments	County Planning Code	HMA/HMGP	Staff Time -in-kind/25% cost share.	Population loss, domestic animal loss.	Indefinitely	5 Years	Medium
Description: Increase minimum number of ingress and egress points to 3 for new development												
10	Dam tabletop exercises	Flood	Population	CSD & WCEM	Emergency Management, USACE	Dam Plans & REOP	USACE, FMA, Dam Safety Program	Minimal	Preserving life, and wildlife, and structure of the dam and property downstream.	5 years	5 years	High
Description: Hold and help facilitate tabletop exercises for all things Dam related to ensure the population is prepared.												
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
Description: Implement a stormwater utility fee to help with and mitigate for funding issues in the County,												

#	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
12	Avalanche forecaster	Avalanche	Avalanche prediction risk, public education, improving safety protocols, data collection & research, real-time monitoring & alerts	WCEM	N/A	Budgeting & funding, partnerships with local agencies, HMA grants	County budget allocations, federal grants such as the Department of Agriculture or the Department of Interior, HMA/HMGP	\$80,000 annually	Loss of life and injuries, financial losses, property damage, emergency response costs, impact on reputation	Life of filled position	1-3 years	High
Description: Seek funding to improve Avalanche forecast with data collection, research, and real-time monitoring.												
13	Comprehensive avalanche atlas	Avalanche	Geographical awareness, historical data, decision-making support, education and training, emergency planning, wildlife management	WCEM	National Parks Dept., Forestry Dept., 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
Description: A comprehensive study to help in decision making that shows geographical awareness, historical incidents, and supports training.												
14	Permanent snow stabilization &	Avalanche	Avalanche risk, erosion & land stability, infrastructure	WCEM	U.S. Forest Service, NDOT, Washoe County Public Works,	Master Plan and Land Use Policies, Public Works &	Federal grants (FEMA), Partner budgets such	Unknown	Avalanche protection, enhanced safety, infrastructure	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
	defense structures		protection, water management, access & mobility, environmental impact, safety for recreation			Engineering standards, Emergency Management Plans, Stormwater Management Plans, Building codes and regulations	as Department of Transportation, Federal Grants: CDBG/HMA/HMGP, Local government funding		protection, long-term cost efficiency, habitat preservation, controlled water drainage			
Description: Structural project to reduce risk of erosion and avalanche events through stabilization and drainage considerations along slopes. .												
15	Roadway Impacts	Landslides	Erosion & land stability, infrastructure protection	Washoe County CSD and NDOT	WCEM, City of Reno, City of Sparks, PLPT, RSIC	Depending upon Washoe County CSD and NDOT	Federal grants (FEMA: HMA/HMGP), Department of Transportation Grants, Local government funding, CDBG	\$4.7M	Avalanche protection, enhanced safety, infrastructure protection, long-term cost efficiency, habitat preservation, controlled water drainage, resilience measure for low-risk areas that may become higher risk as a result of future conditions	30 Years	5+	Medium
Description: Monitoring mechanisms include visual and electronic inspections, soil stabilization through vegetation on steep slopes, debris flow mitigation techniques such as stabilization and energy dissipation, the establishment of large setbacks for road construction near unstable slopes, and the installation of rock catch-fall nets by roadways.												
16	Water Conservation During Drought Conditions	Drought	All populations and firefighters	Washoe County CSD	Water districts, fire districts, and WCEM, City of Reno, City of Sparks, PLPT, RSIC within the planning area.	Unsure	Local government funding, EPA Water Grants (WIIN, AWIA, PWSS)	\$10,000	Increase to public safety	Life of the plan	1-2 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
Description: Adopt ordinances to prioritize and control water use, especially during emergencies like firefighting.												
17	Increase earthquake risk awareness	Earthquake	Residents and visitors	Washoe County	Subject matter experts/agencies for specific hazards (USGS, fire agencies, LE, NWS/NOAA, etc.)	RHMP	WCEM funded, EMPG, SERC funds	\$500 + staff time	Increased community awareness and resilience	Life of the plan	1-2 years	High
Description: Collaborating with insurance representatives, developing an outreach program on earthquake risk and safety, educating homeowners on safety techniques during and after an earthquake, and providing online GIS hazard mapping for residents and design professionals.												
18	Themed Months/Days (including proclamations)	Winter Storm	Residents and visitors	Washoe County	Subject matter experts/agencies for specific hazards (USGS, fire agencies, LE, NWS/NOAA, etc.)	RHMP	WCEM funded, EMPG, SERC funds	\$500.00 + staff time	Increased community awareness and resilience	Life of the plan	1-2 years	High
Description: Public awareness campaigns												
19	Tree Maintenance and Management	Wind	Residents and visitors	Washoe County CSD	The cities of Reno and Sparks, Keep Truckee Meadows Beautiful, and Living with Fire	Unsure	Operating budget	Staff time	Decreased property damage	Life of plan	1-2 years	Medium
Description: Regularly prune trees and remove dead or weakened branches to reduce the risk of falling debris during severe wind events. Consider replacing high-risk trees with more wind-resistant species, and ensure trees are planted at appropriate distances from structures.												
20	Themed Months/Days (including proclamations)	Extreme Heat	Residents and visitors	Washoe County	Subject Matter Experts/agencies for specific hazards (USGS, Fire Agencies, LE, NWS/NOAA, etc.)	RHMP	WCEM funded, EMPG, SERC funding	\$500.00 + staff time	Increased Community awareness and resilience	Life of the plan	1-2 years	High
Description: Public Awareness campaign												

#	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
21	Preparedness Education	Hazardous Materials Incident	Residents, visitors	Washoe County	Subject Matter Experts/Agencies for specific hazards Fire Agencies, Law Enforcement, NNPH	RHMP	WCEM funded, EMPG, SERC funds	\$500.00 + staff time	Community awareness and resilience	Life of the plan	1-2 years	High
Description: Educate and prepare residents and visitors on Hazardous Materials should an incident occur.												
22	Preparedness Education	Infectious Disease	Residents and visitors	Washoe County	Subject Matter Experts, NNPH	RHMP and partner plans and protocol	WCEM funded, EMPG, SERC funds	\$500.00 + staff time	Community awareness and resilience	Life of the plan	1-2 years	High
Description: Educate and prepare residents and visitors on Infectious Disease in the event of an incident.												
23	Preparedness Education	Radiological Waste Transport	Residents and visitors	Washoe County	Subject Matter Experts, NDOT, Fire Agencies, Law Enforcement	RHMP and partner plans and protocol	WCEM funded, EMPG, SERC funds	\$500.00 + staff time	Community awareness and resilience	Life of plan	1-2 years	High
Description: Educate and prepare residents and visitors on Radiological Waste Transport in the event of an incident.												
24	Preparedness Education	Energy Emergency	Residents and Visitors	Washoe County	Subject Matter Experts	Existing partner plans	WCEM funded, EMPG, SERC funds.	\$500.00 + staff time	Community awareness and resilience	Life of plan	1-2 years	High
Description: Educate and prepare residents and visitors on an Energy Emergency in the event of an incident.												

Notes: ¹Includes vulnerable populations; ²Through 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; EPA = Environmental Protection Agency (WIIN = Water Infrastructure Improvements for the Nation Act, AWIA = America's Water Infrastructure Act of 2018, PWSS = Public Water System Supervision), EMPG = Emergency Preparedness Grant, 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; SERC = State Emergency Response Commission; SME = subject matter expert; TMFPD = Truckee Meadows Fire Protection District; USGS = United States Geological Survey; WC = Washoe County; WCEM = Washoe County Emergency Management





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))
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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 2025 update of the Washoe County RHMP on July 8, 2025. The dates of adoption by each plan participant are included in their respective annexes.

This RHMP was approved by FEMA Region 9 on September 24, 2025. 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))
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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))
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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))
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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))
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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.