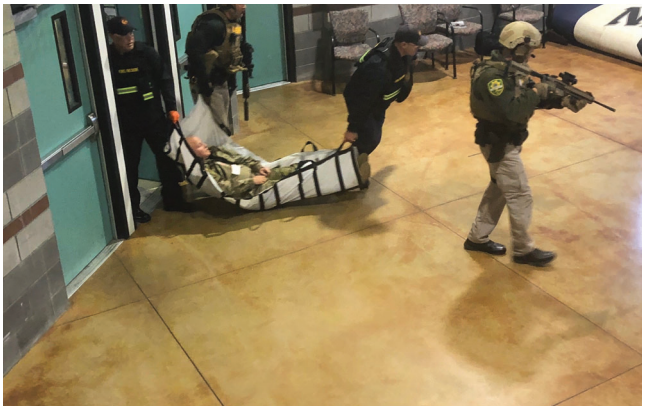
Carson City Hazard Mitigation Plan

2021 Update



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Acronyms

Abbreviation	*Expansion*
ADA	Americans with Disabilities Act
BLM	United States Bureau of Land Management
BRIC	Building Resilient Infrastructure and Communities
CDC	Center for Disease Control
CFR	Code of Federal Regulations
COVID-19	Corona Virus Disease-2019
DFW	Department of Fish and Wildlife
DHS	Department of Homeland Security
DMA 2000	Disaster Mitigation Act of 2000
DOI	U.S. Department of the Interior
DOT	United States Department of Transportation
EA	Education and Awareness
EAP	Emergency Action Plan
EMPG	Emergency Management Planning Grant
EOC	Emergency Operations Center
E&O	Education and Outreach
EPCRA	Emergency Planning and Community Right to Know Act
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
FMAG	Fire Management Assistance Grant
FMCSA	Federal Motor Carrier Safety Administration
GCF	Greatest Common Factor
GHG	Green House Gas
GIS	Geographic Information System
HAZUS-MH	Hazards United States- Multi-Hazard
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
IA	Individual Assistance
LPR	Local Plans and Regulations
M	Magnitude
MMI	Modified Mercalli Intensity mph
MOU	Memorandum of Understanding
mph	miles per hour

Abbreviation	*Expansion*
NCDC	National Climatic Data Center
NDOT	Nevada Department of Transportation
NFIP	National Flood Insurance Program
NHMP	Nevada State Hazard Mitigation Plan
NOAA	National Oceanic and Atmospheric Administration
NOFO	Notice of Funding Opportunity
NRC	Nuclear Regulatory Commission
NSP	Natural System Protection
NVE	NV Energy
NWS	National Weather Service
PA	Public Assistance
PDM	Pre-Disaster Mitigation
P&R	Preparedness and Response
PT	Planning Team
ROA	R. O. Anderson Engineering, Inc.
ROD	Record of Decision
S&I	Structure and Infrastructure
TBD	To Be Determined
USACE	United States Army Corps of Engineers
USA	United States of America
USDA	United States Department of Agriculture
USDM	United States Drought Monitor
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USGS	United States Geological Survey
USHUD	United States Housing and Urban Development
VHFHSZ	Very High Fire Hazard Severity Zone
WUI	Wildland Urban Interface

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Executive Summary

Across the United States, natural and human-caused disasters have led to increasing levels of death, injury, property damage, and interruption of business and government services. The toll on families and individuals can be immense, and damaged businesses cannot contribute to the economy. The time, money, and effort needed to respond to and recover from these emergencies or disasters divert public resources and attention from other important programs and problems. Since the publication of the 2016 Hazard Mitigation Plan update, Carson City has received three Federal declarations, two major disaster declarations for the flood events in 2017 and one emergency declaration for the COVID pandemic in 2020. Carson City, Nevada, recognizes the consequences of disasters and the need to reduce the community's vulnerability to natural and human-caused hazards.

The elected and appointed officials of Carson City acknowledge that with careful selection, mitigation actions in the form of projects and programs can become long-term, cost-effective means for reducing the impact of natural and human-caused hazards. Applying this knowledge, the 2021 Carson City Hazard Mitigation Planning Team updated the *Carson City, Nevada*, *Hazard Mitigation Plan*. With the support of various City officials, the State of Nevada, and the United States Department of Homeland Security/Federal Emergency Management Agency (FEMA), the 2021 Planning Team, led by the Carson City Manager and Emergency Management Division, the plan was prepared over a few months. The resulting update will guide the City toward greater disaster resilience in full harmony with the character and needs of the community and region.

People and property in Carson City are at risk from a variety of hazards that have the potential to cause widespread loss of life and damage to property, infrastructure, and the environment. The purpose of hazard mitigation is to implement actions that eliminate the risk from hazards or reduce the severity of the effects of hazards on people and property. Mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

The goal of mitigation is to save lives and reduce property damage. Mitigation encourages long-term reduction of hazard vulnerability and can reduce the enormous cost of disasters to property owners and all levels of government. In addition, mitigation can protect critical community facilities, reduce exposure to liability, and minimize community disruption.

Preparedness, response, and recovery measures support the concept of mitigation and may directly support identified mitigation actions. The first Carson City Hazard Mitigation Plan was adopted in 2005 under the Disaster Mitigation Act of 2000, Public Law 106-390 dated October 30, 2000. Under the initial 2005 plan, 11 mitigation actions were completed. Between the 2010 and 2016 updates, 13 mitigation actions were completed. In the past five years, many mitigation actions completed the initial base work. However, the nature of the hazard requires ongoing oversight and effort. This updated plan identifies on-going and new hazard mitigation actions intended to eliminate or reduce the effects of future disasters throughout the City.

The *Carson City, Nevada, Hazard Mitigation Plan* has been updated in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act or the

Act), 42 U.S.C. 5165, enacted under Sec. 104 the Disaster Mitigation Act of 2000 (DMA 2000). The 2016 HMP update will expire in early August.

In 2020, the State's implementation of new grant management software caused a six-month delay in the distribution of grant funding. This setback postponed the initiation of this plan update. The 2021 plan update was authorized on April 15, 2021, and the administrative draft was circulated on July 2, 2021.

To maintain the City's eligibility for FEMA's 2020 grant cycle awards expected in September, the planning process was accelerated to accommodate the twelve-week window available for preparing, circulating, and editing this update.

Due to challenges posed by this objective, the plan was submitted with the best available data to date. A more detailed vulnerability assessment, including HAZUS Level 2 Analysis, will be incorporated via an amendment within four months from receipt of FEMA's approval of the 2021 HMP Update. The amendment will also include public comments received at Meeting 4 as well as the means of addressing them.

1 Overview & Official Record of Adoption

This section provides an overview of the Disaster Mitigation Act of 2000 (DMA 2000; Public Law 106-390), the adoption of the updated *Carson City, Nevada, Hazard Mitigation Plan* (HMP) by the local governing body, and documentation supporting the adoption.

1.1 What Changed?

The update to this iteration of the Carson City HMP for 2021 required an expedited process for adoption. To meet the expiration deadline, the update will be submitted to FEMA as planned. To meet the City's request, an amendment to the plan will be prepared upon final adoption by the Carson City Board of Supervisors, the local governing body of Carson City, and approval by FEMA. The amendment will include Hazus 2 level analysis for flood and earthquake and will be completed within four months of FEMA's approval of the Plan Update. The adoption document is found in Section 1.4 below rather than in an appendix.

1.2 About the Disaster Mitigation Act of 2000

The DMA 2000 was passed by Congress to emphasize the need for mitigation planning to reduce vulnerability to natural and human-caused hazards. The DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act; 42 United States Code [USC] 5121-5206 [2008]) by repealing the act's previous Mitigation Planning section (409) and replacing it with a new Mitigation Planning section (322). Section 322 provides the legal basis for the Federal Emergency Management Agency's (FEMA's) mitigation plan requirements for mitigation grant assistance.

To implement the DMA 2000 planning requirements, the Federal Emergency Management Agency (FEMA) established the mitigation planning requirements for states, tribes, and local communities in the Federal Register, 44 Code of Federal Regulations [CFR] Part 201. The planning requirements are described in detail in Section 2 and identified in their appropriate sections throughout this 2021 update of Carson City's Hazard Mitigation Plan (CCHMP).

1.3 Planning Area

The requirements for the adoption of a Hazard Mitigation Plan (HMP) by the local governing body, as stipulated in the DMA 2000 and its implementing regulations, is described below.

The Consolidated Municipality of Carson City, to be referred to as Carson City or the City throughout this plan, is the sole jurisdiction represented in this HMP.

The City may choose to address the addition of the School District and the Airport in the next update to the plan. Currently, there are no other political subdivisions within Carson City.

The 2021 iteration of the Carson City HMP meets the requirements of Section 409 of the Stafford Act and Section 322 of the DMA 2000.

Note that the Carson Water Subconservancy District (CWSD), which is based in Carson City, is addressed as an annex in the 2020 version of the Storey County Hazard Mitigation Plan. The CWSD is a unique multi-county, bi-state agency supporting management solutions for a robust Carson River Watershed.

1.4 Adoption by the Local Governing Body

The local governing body of Carson City is the Carson City Board of Supervisors (BOS). The BOS meets every first and third Thursdays of the month. The adoption of the HMP will immediately be placed on the next upcoming BOS meeting agenda upon receiving the notice from FEMA that it is Approved Pending Adoption.

This adoption of the Plan demonstrates the commitment of the City's governing body to increase the resiliency of the community.

ELEMENT	REQUIREMENTS
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? *44 CFR 201.6(c)(5)* ***Intent**: To demonstrate the jurisdiction's commitment to fulfilling the hazard mitigation goals outlined in the plan, and to authorize responsible agencies to execute their responsibilities.*	a. The plan **must** include documentation of plan adoption, usually a resolution by the governing body or other authority. If the local jurisdiction has not passed a formal resolution, or used some other documentation of adoption, the clerk or district attorney **must** provide written confirmation that the action meets their community's legal requirements for official adoption and/or the highest elected official or their designee **must** submit written proof of the adoption. The signature of one of these officials is required with the explanation or other proof of adoption. Minutes of a Supervisors' or other meeting during which the plan is adopted will be sufficient if local law allows meeting records to be submitted as documentation of adoption. The clerk of the governing body, or district attorney, **must** provide a copy of the law and a brief, written explanation such as, "in accordance with section____of the city code/ordinance, this constitutes formal adoption of the measure," with an official signature. If adopted after FEMA review, adoption **must** take place within one calendar year of receipt of FEMA's "Approval Pending Adoption."

1.5 Adoption Supporting Documentation

The executed adoption document is shown in Figure 1-1 below.

RESOLUTION NO. 2021-R-25

A RESOLUTION ADOPTING THE 2021 CARSON CITY HAZARD MITIGATION PLAN AND REQUESTING THAT THE FEDERAL EMERGENCY MANAGEMENT AGENCY APPROVE THAT PLAN

WHEREAS Carson City Charter § 2.090(1) vests with the Carson City Board of Supervisors ("Board of Supervisors") the power to make and pass resolutions necessary to manage the affairs and government of Carson City; and

WHEREAS the Board of Supervisors recognizes the threat that natural and human-caused hazards pose to people and property within Carson City; and

WHEREAS, since 2005, Carson City has implemented Hazard Mitigation Plans, consistent with the Disaster Mitigation Act of 2000, 42 U.S.C. § 5165, and 44 C.F.R. Part 201; and

WHEREAS the Board of Supervisors adopted Carson City's last Hazard Mitigation Plan in 2016 through Resolution No. 2016-R-21 ("2016 Plan"); and

WHEREAS 44 CFR § 201.6(d)(3) requires Carson City to revise and resubmit its Hazard Mitigation Plan for approval by the Federal Emergency Management Agency ("FEMA") every five years to maintain eligibility for federal mitigation project grant funding; and

WHEREAS Carson City has worked with its staff, community members, and other material stake-holders to develop the 2021 Carson City Hazard Mitigation Plan ("2021 Plan"), which, among other things, reflects changes in development, progress in mitigation efforts, and changes in priorities since the 2016 Plan's adoption: and

WHEREAS the 2021 Plan identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Carson City from the impacts of future hazards and disasters: and

WHEREAS, FEMA has reviewed the 2021 Plan and determined that it is eligible for final approval, once the Board of Supervisors formally adopts the 2021 Plan; and

WHEREAS 44 CFR § 201.6(c)(5) requires that the Board of Supervisors adopt the 2021 Plan and request that FEMA formally approve it: and

WHEREAS the Board of Supervisor's adoption of the 2021 Plan demonstrates Carson City's commitment to hazard mitigation and achieving the goals outlined in the 2021 Plan.

***NOW, THEREFORE*, the Board of Supervisors resolves that:**

1. Subject to non-substantive corrections and changes read into the record at its September 16, 2021 meeting, the 2021 Plan is adopted and the Board of Supervisors requests that FEMA formally approve it.
2. The respective Carson City officials identified in the mitigation strategy of the 2021 Plan are hereby requested to pursue implementation of the recommended actions, subject to the availability of resources; and
3. Future revisions and amendments to the 2021 Plan which are required by FEMA or the Disaster Mitigation Act of 2000 are hereby adopted as part of this resolution for a period of five years from the date of this resolution.

Upon motion by Supervisor Stacey Giomi, seconded by Supervisor Stan Jones, the foregoing Resolution was passed and adopted the 16th day of September 2021 by the following vote:

AYES: Supervisor Stacey Giomi
Supervisor Stan Jones
Supervisor Maurice White
Supervisor Lisa Schuette
Mayor Lori Bagwell

NAYS: None
ABSENT: None
ABSTAIN: None

Lori Bagwell
LORI BAGWELL, Mayor
Carson City, Nevada

ATTEST:
Aubrey Rowlatt
AUBREY ROWLATT Clerk-Recorder

FIGURE 1-1: ADOPTION DOCUMENT

The FEMA approval letter is found in Figure 1-2 below.

U.S. Department of Homeland Security
FEMA Region 9
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

October 13, 2021

Jason Danen
Deputy Emergency Manager
Carson City Fire Department
777 S. Stewart Street
Carson City, NV 89701

Dear Mr. Danen:

The *Carson City Hazard Mitigation Plan 2021* was officially adopted by Carson City on September 16, 2021 and submitted for review and approval to the Federal Emergency Management Agency (FEMA). The review is complete, and FEMA finds the plan to be in conformance with the Code of Federal Regulations, Title 44, Part 201, Section 6 (44 C.F.R. 201.6).

This plan approval ensures Carson City's continued eligibility for funding under FEMA's Hazard Mitigation Assistance programs, including the Hazard Mitigation Grant Program (HMGP), the Building Resilient Infrastructure and Communities program (BRIC), and the Flood Mitigation Assistance (FMA) program. All requests for funding are evaluated individually according to eligibility and other program requirements. Approved hazard mitigation plans may also be eligible for points under the National Flood Insurance Program's Community Rating System (CRS).

FEMA's approval is for a period of five years, effective starting the date of this letter. Prior to **October 13, 2026**, Carson City must review, revise, and submit its plan to FEMA for approval to maintain eligibility for grant funding. The enclosed plan review tool provides additional recommendations to incorporate into future plan updates.

If you have any questions regarding the planning or review processes, please contact the FEMA Region 9 Hazard Mitigation Planning Team at fema-r9-mitigation-planning@fema.dhs.gov.

Sincerely,

KATHRYN J LIPIECKI Digitally signed by KATHRYN J LIPIECKI Date: 2021.10.13 13:02:28 -07'00'

Kathryn Lipiecki
Director, Mitigation Division
FEMA Region 9

Enclosures (1)
Carson City Plan Review Tool, dated October 13, 2021

cc: Alison Kearns, Risk Analysis Branch Chief, FEMA Region 9
Susan Coyote, Recovery and Mitigation Supervisor, Nevada Division of Emergency Management
Janell Woodward, Grants and Projects Analyst II, Nevada Division of Emergency Management

www.fema.gov

FIGURE 1-2: FEMA APPROVAL LETTER

2 Purpose of the Plan, Mitigation Programs, & Organization of the Plan

This section provides an overview of the purpose of the City's HMP, current Hazard Mitigation Assistance Programs, and an overview of the organization of the Plan.

Carson City has authority as a local jurisdiction under its emergency management regulations for building strategies to protect its residents and property (Title 6 Emergency Management), to increase resiliency of the community, and to review and revise this plan based on hazard events, growth, and planned development. The timely update of this HMP will allow the continuation of Carson City's eligibility for all (pre- and post-disaster) Hazard Mitigation Assistance Program funding. Please see Table 2-1 in Section 2.2 FEMA Funding Programs Requiring a Hazard Mitigation Plan.

The Carson City HMP meets the requirements of the DMA 2000, which calls for all communities to prepare hazard mitigation plans. By preparing this HMP, the City is eligible to receive Federal mitigation funding after disasters and to apply for mitigation grants before disasters strike. The Carson City HMP continues the ongoing process of evaluating the risks posed by different types of hazards and engaging the City and the community in dialogue to identify the most important steps needed to reduce these risks. This constant focus on planning for disasters continues to make the City, including its residents, property, infrastructure, and the environment, much safer.

The local hazard mitigation planning requirements encourage agencies at all levels, residents, businesses, and the non-profit sector to participate in the mitigation planning and implementation process. This broad public participation enables the development of mitigation actions that are supported by these various stakeholders and reflect the needs of the entire community.

States are required to coordinate with local governments in the formation of hazard mitigation strategies, and the local strategies combined with initiatives at the state level form the basis for the State Mitigation Plan. The information contained in an HMP helps states to identify technical assistance needs and prioritize project funding. Furthermore, as communities prepare their plans, states can continually improve the level of detail and comprehensiveness of statewide risk assessments.

2.1 What Changed?

The Hazard Mitigation Assistance Programs went through many changes in 2020. New programs are now in place such as Building Resilient Infrastructure and Communities (BRIC) and Rehabilitation of Potential High Hazard Dams. Others, such as the Pre-Disaster Mitigation and Severe Repetitive Loss programs, are no longer available.

These changes are reflected in Section 2.2, which includes the addition of a table showing the programs requiring a FEMA-approved HMP for eligibility.

2.2 FEMA Funding Programs Requiring a Hazard Mitigation Plan

FEMA's hazard mitigation assistance provides funding for eligible mitigation measures that accomplish one or more of the following goals.

- Reduce disaster losses.
- Reduce vulnerability of communities to disasters and their effects.
- Promote individual and community safety and the ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies (resilience).
- Promote community vitality after a disaster.
- Lessen response and recovery resource requirements after a disaster.
- Foster safer communities less reliant on external financial assistance.

The tables below summarize hazard mitigation plan requirements for state, tribal, territorial, and local officials that are applying to FEMA for assistance, either directly or through a state as sub-applicants.[1] Each program is hyperlinked to facilitate research. The State Hazard Mitigation Officer, **mitigation@dps.state.nv.us,** can also provide additional information on Nevada specific procedures and requirements necessary for applying for these funding sources.

These programs generally require a cost-share of 25% of the total cost of the proposed project. The cost-share may be met via in-kind services or direct payment. Applications for activities requiring construction must develop a Benefit Cost Analysis (BCA) and meet the requirements of the National Environmental Policy Act (NEPA).

All federal funding programs require the adherence to grant guidance found in Title 2 of the Code of Federal Regulations, Chapter 2 **(2 CFR 201).**

TABLE 2-1 ENABLING LEGISLATION: STAFFORD ACT

FEMA Assistance Program	Current HMP Required for a State/Tribal Applicant?	Current HMP Required for a Tribal/Local Sub-Applicant?
Individual Assistance (IA)	No	No

[1] Mitigation Planning & Grants, FEMA, accessed May 6, 2021, **https://www.fema.gov/emergency-managers/risk-management/hazard-mitigation-planning/requirements**.

FEMA Assistance Program	Current HMP Required for a State/Tribal Applicant?	Current HMP Required for a Tribal/Local Sub-Applicant?
The community must meet requirements and be approved in the Presidential Declaration.		
Public Assistance (PA) Categories A and B (e.g., debris removal, emergency protective measures) Approved by Presidential Declaration	No	No
Public Assistance (PA) Categories C through G (e.g., repairs to damaged infrastructure, publicly owned buildings). Approved by Presidential Declaration.	Yes	No
Fire Mitigation Assistance Grants (FMAG) Post-disaster funding allocated to the state after a wildfire event for distribution to local/Tribal jurisdictions.	Yes	No
Hazard Mitigation Grant Program (HMGP) Planning funding available only after approval of a Presidential Disaster Declaration and passed through by the state.	Yes+	No
Hazard Mitigation Grant Program (HMGP)	Yes+	Yes++

FEMA Assistance Program	Current HMP Required for a State/Tribal Applicant?	Current HMP Required for a Tribal/Local Sub-Applicant?
Project (involving construction) funding available only after approval of a Presidential Disaster Declaration and passed through by the state.		
Building Resilient Infrastructure and Communities (BRIC) Planning Funding. This program is available annually through a Notice of Funding Opportunity publicized generally in the Fall. The federal application period closes in January. Nevada's application period is usually closed in mid-December to allow for ranking of applications.	No	No
Building Resilient Infrastructure and Communities (BRIC) Project (involving construction) Funding. This program is available annually through a Notice of Funding Opportunity publicized generally in the Fall. The federal application period closes in January. Nevada's application period is usually closed in mid-December to allow for ranking of applications.	Yes*	Yes**

TABLE 2-2: ENABLING LEGISLATION: NATIONAL FLOOD INSURANCE ACT

FEMA Assistance Program	Required for a State/Tribal Applicant?	Required for a Tribal/Local Sub-Applicant?
Flood Mitigation Assistance (FMA)	Yes*	No

FEMA Assistance Program	Required for a State/Tribal Applicant?	Required for a Tribal/Local Sub-Applicant?
Planning grant. This program's cycle is the same as BRIC's.		
Flood Mitigation Assistance (FMA) project (construction) grant with the same cycle as BRIC.	Yes*	Yes**

TABLE 2-3: ENABLING LEGISLATION: WATER INFRASTRUCTURE IMPROVEMENTS FOR THE NATION (WIIN) ACT

FEMA Assistance Program	Required for a State/Tribal Applicant?	Required for a Tribal/Local Sub-Applicant?
Rehabilitation of High Hazard Potential Dam (HHPD) Grant Program New program. The notice of funding opportunity is publicized in July. Contact the **Dam Safety Program** in Nevada for guidance.	Yes#	Yes#

NOTES

+ At the time of the Presidential major disaster declaration and at the time of obligation of HMGP grant funds.

++ At the time of obligation of HMGP grant funds for mitigation projects.

* By the application deadline and at the time of obligation of the BRIC or FMA award.

** By the application deadline and at the time of obligation of BRIC or FMA grant funds for mitigation projects.

Mitigation plans must include all dam risk in accordance with the requirements set forth in the HHPD Grant Program Notice of Funding Opportunity (NOFO). Nonprofit organizations must be located in a jurisdiction with a FEMA-approved local mitigation plan that includes all dam risks in order to receive funds.

2.3 Plan Organization

The remainder of this HMP consists of the following sections. Each section contains a subsection called "What Changed?" summarizing updates for this iteration of the plan.

- **Section One: Official Record of Adoption**

This Section first provides an overview about the Disaster Mitigation Act of 2000 and its legal requirements. Second, it documents the City's formal adoption.

- **Section Two: Purpose of the Plan, Mitigation Programs, & Organization of the Plan**

Section Two presents the purpose of the plan, the authority of the City to develop the plan, the FEMA mitigation programs requiring an approved plan for eligibility to apply for funding and provides a succinct description of the content of each section within the plan.

- **Section Three: Community Description**

Section Three provides a general overview of the history, geography, and features of the City as well as the economic base, demographic/population, and local governance. Historic and current trends in land use and development are also discussed.

- **Section Four: Planning Process**

Section Four describes the planning process and identifies Planning Team members and key stakeholders within the community and surrounding region. In addition, this section documents public outreach activities and the review and incorporation of relevant plans, reports, and other appropriate information. The public outreach efforts are documented in Appendix B.

The maintenance process for this plan is included in this Section. The process includes monitoring, evaluating, and updating content; reviewing public involvement; and integrating with other planning mechanisms to ensure the HMP information remains relevant.

- **Section Five: Risk Assessment**

Section Five describes the process through which the Planning Team identified and compiled relevant data on all potential natural hazards that threaten the City and the immediate surrounding

area. Information collected includes historical data on natural hazard events that have occurred in and around the City and how these events impacted residents and their property.

The descriptions of natural hazards that could affect the City are based on historical occurrences and best available data from agencies such as FEMA, the U.S. Geological Survey (USGS), and the National Weather Service (NWS). Detailed hazard profiles include information on the frequency, magnitude, location, and impact of each hazard as well as probabilities for future hazard events. Climate change and secondary effects such as power outages and lingering hydrophobic soils, will also be discussed as appropriate for individual hazards.

- **Section Six: Vulnerability Analysis**

Section Six identifies potentially vulnerable assets such as people, housing units, critical facilities, infrastructure and lifelines, hazardous materials facilities, and commercial facilities. The data were compiled by assessing the potential impacts from each hazard using GIS and FEMA's natural hazards loss estimation model, HAZUS, and other GIS overlays. The resulting information identifies the full range of hazards that the City could face and the community assets susceptible to damage from a given hazard.

- **Section Seven: Capability Assessment**

Section Seven provides an overview and analysis of the City's available resources for addressing hazard mitigation activities in the following areas.

  - Administrative and technical: The staff, personnel, and department resources needed to expedite the actions identified in the mitigation strategy.
  - Education and outreach: Ability to implement mitigation actions designed to involve and inform the public through the use of organizations and programs within City.
  - Financial: Financial resources needed to implement the mitigation strategy.
  - Planning and Regulatory resources: The adopted codes and laws supporting mitigation in the community.

- **Section Eight: Goals, Objectives, & Actions for Mitigation Strategy**

As Section Eight describes, the Planning Team developed a list of mitigation goals, objectives, and actions based upon the findings of the risk assessment and the capability assessment. Based upon these goals and objectives, the Planning Team reviewed and prioritized a comprehensive range of appropriate mitigation actions to address the risks facing the community. Such measures may include preventive actions, property protection techniques, natural resource protection strategies, structural projects, emergency services, and public information and awareness activities.

- **Section Nine: References**

Section Nine lists the reference materials used to prepare this update to the HMP.

- **Appendices**

Appendix A Meeting Documents and Handouts

This appendix documents the distribution of meeting notices, the meeting agenda and outcomes, handouts, and results of Planning Team homework.

Appendix B Public Outreach

A compilation of documents showing the activities completed in the effort to reach the public in the community.

Appendix C Previous Plan Actions

Provides the status of the previous plan's action items.

Appendix D Maintenance Documents

Contains forms to facilitate and record activities to support the maintenance of the Plan.

Appendix E FEMA Region IX Review Tool

A completed checklist to confirm compliance with the requirements of 44 CFR 201.

Appendix F Vulnerability Documentation

Documents supporting the data found in the vulnerability analysis section of this Plan.

Appendix G HAZUS Reports

The reports generated by the HAZUS Level 1 software for earthquake and flood hazards are contained in this appendix.

3 Community Description

This section describes the City in relation to each of the topics listed below. This description intends to foster a better understanding of the community and provide context for the discussions of risk and vulnerability that follow in other sections.

Figure 3-1[2] situates the City in relation to neighboring sites and illustrates its location within the Hydrographic Great Basin which covers a 200,000 square mile area that drains internally.[3]

- History
- Geography
- Climate
- Demographics
- Employment
- Economics
- Housing
- Transportation
- Infrastructure
- Cultural resources
- Government structure
- Land Use
- Development Trends

FIGURE 3-1: CARSON CITY AND THE GREAT BASIN

[2] Map of the Great Basin, accessed May 23, 2021, **https://t3v5s5v7.rocketcdn.me/wp-content/uploads/2016/04/Greatbasinmap.jpg**.

[3] "The Great Basin," "*What is the Great Basin,"* National Park Service, updated April 22, 2021, accessed May 23, 2021, **https://www.nps.gov/grba/planyourvisit/the-great-basin.htm**.

3.1 What Changed?

Much of the content in this description—particularly the history—remains the same. Changes to the organization of the plan were added to include a broader picture of Carson City.

The 2016 Carson City Hazard Mitigation Plan was organized under four categories: History, Location, and Geography; Government; Demographics; and Land Use and Development Trends. The 2021 Update features additional categories including Climate, Employment, Economics, Housing Transportation, Infrastructure, Natural and Cultural Resources, Population, and Quad County Partnership.

These categories expand the description to include additional information about the how the City operates as well as its unique features—as explained in the narrative and illustrated in additional tables and figures.

3.2 History

The Consolidated Municipality of Carson City, Nevada's territorial and state capital, has a rich and colorful frontier past. Carson City was founded as a community in 1858, seven years after the first settlement of Eagle Station trading post in 1851. Eagle Valley had been settled by ranchers. Carson City is named for the famous frontiersman and scout Christopher Houston “Kit” Carson. During his 1843-1844 expedition, John C. Fremont had named Carson City's nearby river for Kit Carson, Fremont's scout. Pioneer Abraham Curry arrived in Eagle Valley in 1858 and soon thereafter surveyed and plotted a town site. A cadre of well-connected attorneys whose names still decorate street signs here (Proctor, Musser) bought the richest part of the valley for $500 and a herd of horses. The farsighted and optimistic Curry set aside 10 acres expressly for the construction of a capitol—prior to the formation of Nevada Territory in 1861. Carson City was soon designated both the territorial capital and county seat of the new Ormsby County. President Abraham Lincoln, recognizing the importance of Nevada's silver and gold to the Union's Civil War effort, signed the proclamation that ushered Nevada into statehood on October 31, 1864. Carson City was selected as the state capital at the Constitutional Convention and has retained that honor to the present day.

Following the discovery of gold and silver in the nearby Comstock Lode in 1859, Carson City became a thriving commercial center. To the astonishment and delight of its citizens, the discovery of the Comstock Lode brought Carson City to life as a freight and transportation center. Abe Curry then built the crude Warm Springs Hotel a mile to the east and when Carson City was selected as the territorial capital in 1861, leased it to the Legislature as a meeting hall. The Legislature established Carson City as the seat of Ormsby County (named for one of the dead "heroes" at the Battle of Pyramid Lake). The legislators also leased the Warm Springs Hotel to serve as the

FIGURE 3-2: CLEAR CREEK FLUME

Territorial Prison and named their genial host and landlord its first warden. The property was eventually purchased by the state and is still a part of the state prison system.

Carson City was confirmed as Nevada's permanent capital with statehood in 1864, and development thereafter was no longer completely dependent on the health of the Comstock mines. Until they began to decline in the 1880s, these mines provided Carson City with most of its economic importance as a freight staging center and marshalling point for much of the timber harvest in the Lake Tahoe basin. The United States Mint in Carson City, completed in1869, is now the site of the Nevada State Museum.

Long shallow flumes, such as the Clear Creek Flume in Figure 3-2,[4] capable of carrying enormous pine logs in a shallow spill of fast water,swooped down the steep eastern slope of the Sierra from Spooner Summit to Carson City. Logs used to shoot down this flume from Spooner Summit, on their way to the wood yard at Carson City.

Scorched and smoldering where they had rubbed against the flume's sides in their dashing descent, the logs were fed into sawmills where they became timbers for the underground mines and planed boards for the surface cities. The finished lumber was then loaded onto flatcars and rolled off to Silver City, Gold Hill, and Virginia City via the Virginia and Truckee Railroad (V&T).

The V&T was completed between Carson City and Virginia City in 1869, with the railroad's shops and main offices in Carson City. The V&T rails were extended north to connect with the transcontinental railroad at Reno in 1872. By 1874, when the Comstock mines were reaching their peak production, 36 trains a day passed through Carson City. The huge sandstone V&T engine

FIGURE 3-3: V&T RAILROAD SHOPS IN 1939

[4] "Clear Creek Flume," Nevada Appeal, August 29, 2009, Western Nevada Historical Society, accessed May 23, 2021, **https://wnhpc.com/wnhpcphoto0149-xs.jpg**.

house and roundtable dominated the northeast corner of the city for well over a century. Figure 3-3 below shows the engine house and roundtable in 1949.[5]

Neglected and falling into ruin since the track was torn up in 1950, they have now been torn down and the stones sent to create facades for wineries in the Napa Valley.

Like many other Nevada towns, in its youth Carson City was made lively, and occasionally dangerous, by the presence of dozens of ruthless, restless men. Shootings, stabbings, and street brawls were commonplace around Nevada, but Carson City was unique in contending with outbreaks from the State Prison. After the turn of the century, Carson City participated vicariously in the Tonopah and Goldfield booms far to the south. Much of the freight and passenger traffic bound for those two celebrated cities was routed to Reno and then through Carson City to Mound House on the V&T line. From there the narrow-gauge Carson & Colorado (C&C) carried it to Sodaville where freight wagons and stagecoaches were waiting for the last leg of the journey.

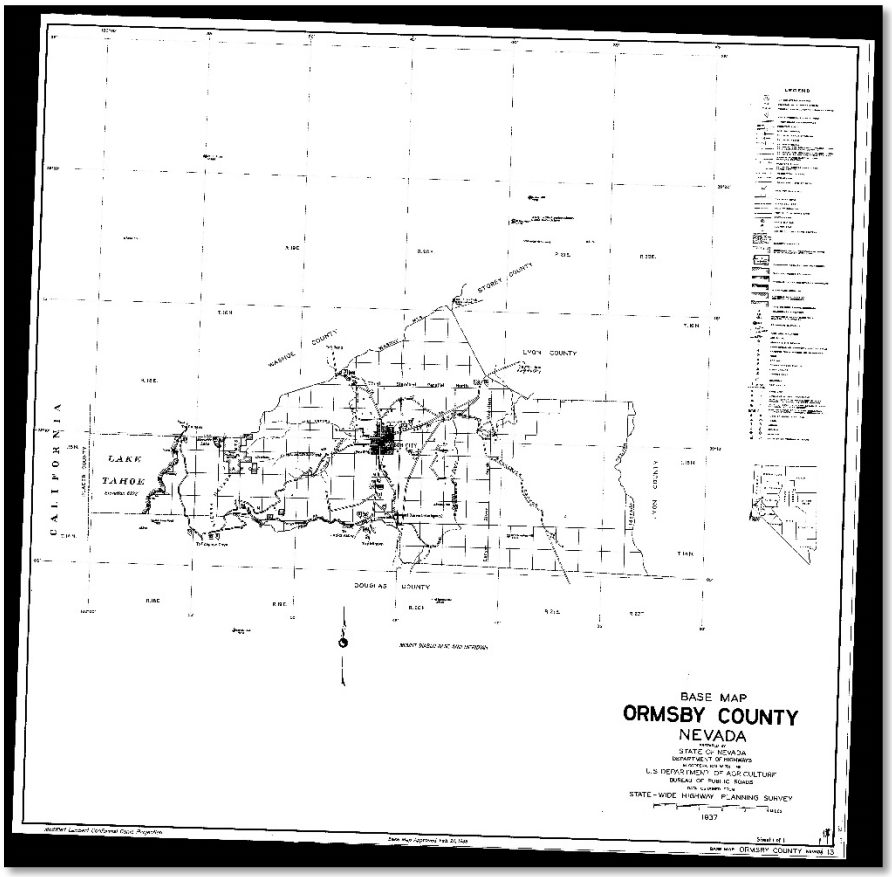

FIGURE 3-4: 1937 MAP OF ORMSBY COUNTY, NDOT

Railroad traffic through Carson City came to a sudden halt when the Southern Pacific built a branch line connecting with the C & C from the east that bypassed the V&T altogether. The capital then resumed the quiet lifestyle that evolved after the decline of the Comstock, which continues (with variations) today. At the turn of the century, the railroad extended its line south into the Carson Valley, but the Minden-Gardnerville traffic never came close to replacing the Tonopah-Goldfield traffic. The railroad—and Carson City—slipped

[5] "Virginia and Truckee Railroad Shops," Around Carson, uploaded February 16, 2006, accessed May 23, 2021, **https://photos.aroundcarson.com/details/216**.

back into quiescence. In 1930, the population had dwindled to 1,800, about a quarter of what it had been at the peak of the mining boom 50 years earlier.[6]

In 1933, the highway was paved through town, but for a long time afterward the kids could rollerskate on it without worrying too much about traffic. In those innocent days, Carson City advertised itself as America's smallest state capital. In 1960, Carson City regained its 1880 population level, and in 1969, Ormsby County was abolished, and its territory merged with Carson City to form the Consolidated Municipality of Carson City. With the consolidation, the city limits today extend west across the Sierra Nevada to the California state line in the middle of Lake Tahoe. Like other independent cities in the United States, it is treated as a county-equivalent for census purposes, and in fact, with its area of 146 square miles, Carson City could now advertise itself as one of the largest state capitals in America.

3.3 Geography

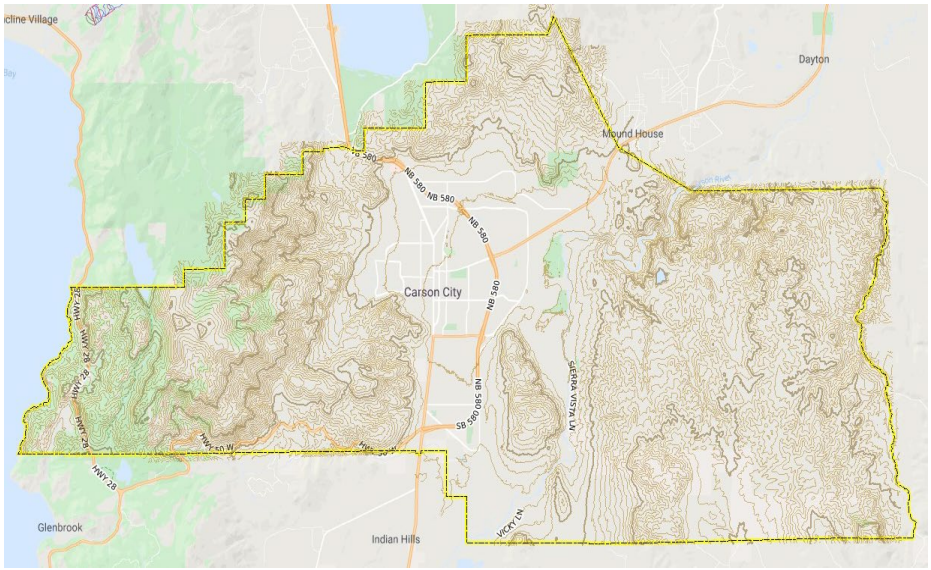

FIGURE 3-5: TOPOGRAPHIC MAP OF CARSON CITY (CARSON CITY GIS)

As part of the Great Basin, Carson City enjoys the north-south trending mountain blocks and broad intervening valleys. The peaks with enough elevation catch precipitation in the form of snow supporting conifer stands and providing snow-melt water for the valleys year-round.

Located southeast of the Carson Range, a section of the Sierra Nevada, Carson City is bounded by Washoe County and Storey County to the north, Lyon County to the East, Douglas County to the South, and Placer County, California to the west. The Carson and Stewart Colonies of the Washoe Tribe of Nevada and California are located within the Carson City boundaries. Sections of the City's jurisdiction are within the Humboldt-Toiyabe National Forest. Eagle Valley, where the majority of the City's population resides, is 4,600 feet above sea level. The Carson City land area is 146 square miles

[6] "Base Map Ormsby County, NV, State of Nevada Department of Highways in cooperation with U.S. Department of Agriculture, Bureau of Public Roads. 1937, accessed May 25, 2021, **https://www.dot.nv.gov/HOME/SHOWDOCUMENT?ID=672**.

(371.8 km), with surface water of 19.82 (31.9 km).[7] Figure 3-6 below illustrates Eagle Valley's hydrography.[8]

Several significant creeks within the Carson River Watershed flow from the Sierra Nevada mountains into the City, including Kings Canyon Creek, Ash Canyon Creek, Clear Creek, and the Hot Springs Extension. The Carson River flows through the eastern portion of the City, and as most rivers in the Great Basin, does not make its way to an ocean but terminates in the Carson Sink east of the City after traveling approximately 150 miles. The river's watershed encompasses approximately 3,065 square miles and offers a variety of outdoor activities for locals and visitors such as rafting, hiking, and fishing.[9]

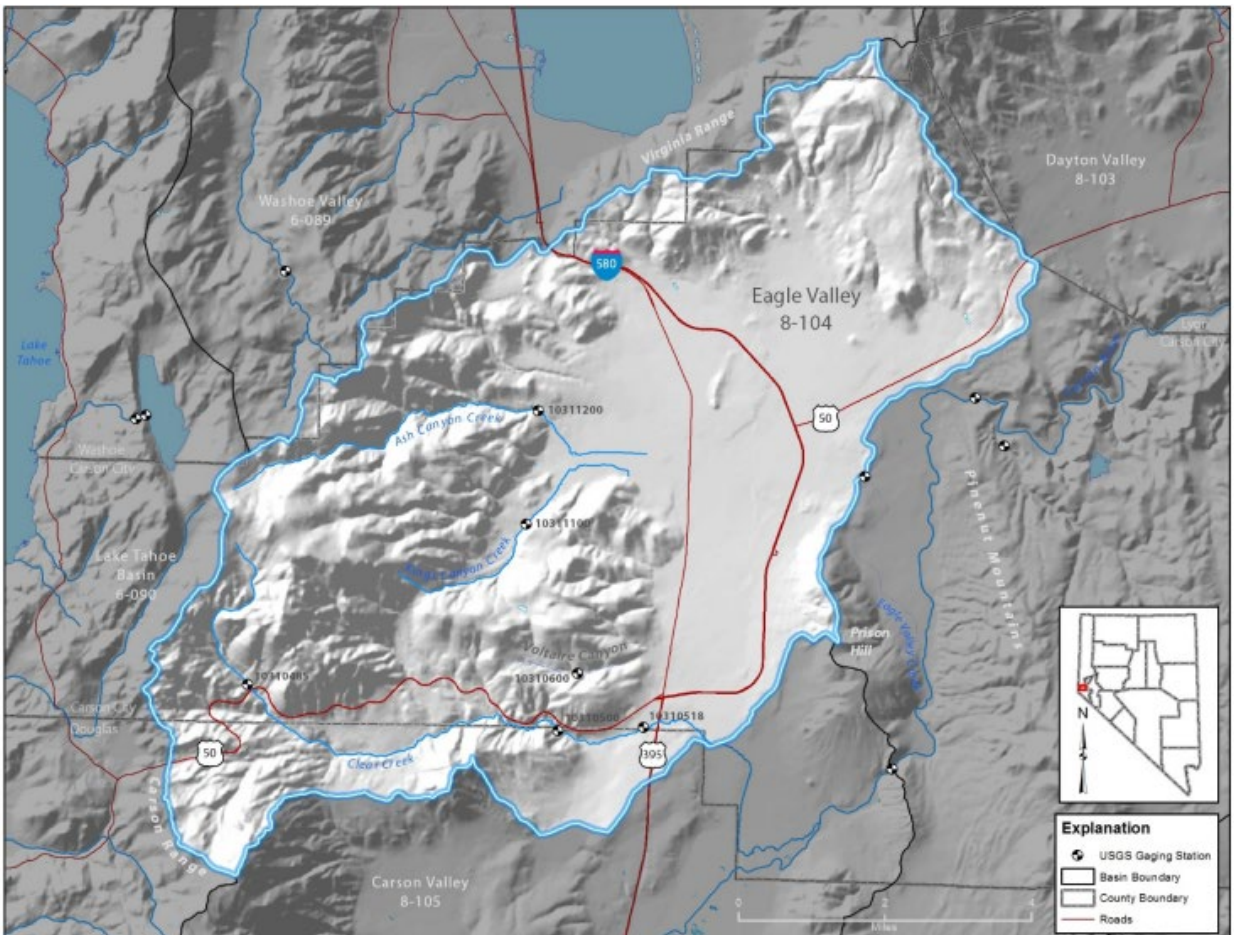

FIGURE 3-6: EAGLE VALLEY (HYDROGRAPHIC BASIN 8-104) PHYSIOGRAPHIC MAP

[7] City Facts, Carson City, accessed May 3, 2021, **https://www.carson.org/residents/city-facts#ad-image-0**.

[8] King, Jason, PE, State Engineer, "Eagle Valley Hydrographic Basin 8-104" (Figure 1), State of Nevada, Department of Conservation and Natural Resources, Water Year 2016, p. 8, accessed May 23, 2021, **https://www.douglascountynv.gov/UserFiles/Servers/Server_12493019/File/Community%20Development/Planning/Eagle%20Valley%20Basin%20104%20Pumpage%20Inventory%202016.pdf**.

[9] Science in the Carson River Basin, USGS, accessed May 4, 2021, **https://www.usgs.gov/centers/nv-water/science/science-carson-river-basin?qt-science_center_objects=0#qt-science_center_objects**.

3.4 Climate

In the Great Basin, temperatures vary up to 40 degrees between night and day. Seasonal winds sweep across western Nevada along the east side of the Sierra Nevada. These winds, locally known as the zephyr, occur generally in the summer months, typically from mid-afternoon until late evening.[10] The Sierra Nevada forms a rain shadow over the entire Great Basin, frequently preventing rain from the Pacific Ocean from reaching the eastern side of the Sierras. The following table is taken from the City Facts, on the City's website.[11]

TABLE 3-1: CARSON CITY CLIMATE AND WEATHER

Carson City Climate and Weather	
Average Annual Snowfall:	22.2"
Average Annual Rainfall:	11.8"
Average High Temperature (Summer):	89°
Average Low Temperature (Winter):	19°
Average Growing Season:	123 days
Average Yearly Days of Sunshine:	266
Altitude:	4,600' above sea level

3.5 Demographics

Information in this section comes from Carson City's Comprehensive Annual Financial Report (CAFR). Sections 3.5 Employment, 3.6 Economics, and 3.7 Housing also rely on information from the CAFR.[12] Based on Vintage 2019 data, the population of Carson City was 55,916 in 2019 (as of July 1, 2019), an increase of 1.2% since the 2010 Census.[13]

[10] Rich Moreno, "The Nevada Traveler: Eastern Sierra's zephyrs have long fascinated Nevadans." *Nevada Appeal*, Tuesday, October 6, 2020, accessed May 4, 2021, **https://www.nevadaappeal.com/news/2020/oct/06/the-nevada-traveler-eastern-sierras-zephyrs-have-l/**.

[11] City Facts, Carson City, accessed May 3, 2021, **https://www.carson.org/residents/city-facts#ad-image-0**

[12] Sheri Russell, CPA, CFO. *Comprehensive Annual Financial Report*, "Archived Budget & Financial Information," Carson City, Published June 30, 2020, accessed May 3, 2021, **https://www.carson.org/home/showpublisheddocument/73901/637456102843470000.**

[13] "Methodology for the United States Population Estimates: Vintage 2019," Population and Housing Unit Estimates, United States Census Bureau, Last updated May 14, 2021, p. 1, accessed June 14, 2021, **https://www.census.gov/programs-surveys/popest/technical-documentation/methodology.html**. See also Section 6.2.1, Population.

The following data is taken from the U.S. Census Bureau's Quick Facts for Carson City as of July 1, 2019[14] and reflects estimates based on Vintage 2019 data.[15]

The majority of the population, 53.4%, falls between the ages of 18 and 65 years, and the majority of the citizens are male, 51%. Over 66% of the population is White followed by 24.8% Hispanic, 2.9% American Indian, and 2.4% Black/African American. The median household income is $55,718 (2019); the per capita income over the last 12 months (in 2019 dollars) is 12.2%. Over ninety percent of residents 25 years and older have a high school (or higher) level of education. Over eighty-two percent of residents 25 years and older have a bachelor's degree.

TABLE 3-2: DEMOGRAPHICS FOR THE CITY

Age & Sex	Race (4 highest)	Income & Poverty	Computer & Internet Use/Education
<5 years -5.6%	White ~ 66.4%	Median Household Income (2019 $) $55,718	Households w computer (2015-2019). 22,755
<18 years -20.3%	Hispanic ~ 24.8%	Per Capita Income in the past 12 months - $31,549	Households w Internet (2015-2019) 82.4%
>65 years-20.7%	American Indian ~ 2.9%	Percent of persons in poverty 12.2%	High School education or higher of person 25+ years 90.1%
Female population 48.7%	Black/African American ~ 2.4%		Bachelor's degree or higher of person 25+ years 82.4%

3.6 Employment

As of March 2021, the region's unemployment rate was 5.1%, an increase of .8% from 2019's 4.3%, a modest increase, particularly in light of the Coronavirus pandemic.[16] According to the Carson City Chamber of Commerce, the State government is the largest employer in the City, the state capital. Carson City is itself a major employer. The Carson City Chamber of Commerce

[14] QuickFacts, U.S. Census Bureau, Carson City, NV (County), accessed May 3, 2021, **https://www.census.gov/quickfacts/carsoncitynevadacounty**.

[15] "Methodology," p. 1.

[16] "Carson City, NV," Economy at a Glance, U.S. Bureau of Labor Statistics, data extracted May 21, 2021, accessed May 23, 2021, **https://www.bls.gov/eag/eag.nv_carsoncity_msa.htm**.

provides the following list of other primary employers in Carson City.[17] The average wage per hour is $24.77.[18]

- Army National Guard
- Corrections Department
- Transportation Department
- Employment Security Division
- Carson Tahoe Regional Med Center
- Click Bond Inc
- Legislative Counsel Bureau
- Health Division
- Carson City Nugget
- Motor Vehicle Dept
- Gold Dust West Casino-Carson
- Wyndham Garden Carson City Max
- PCC Structurals
- Carson City School District
- Carson City Recreation Division
- A1 Auto Transport
- Employment Services Division
- Taxation Department
- Slotworld
- Lowe's Home Improvement

One hundred and seventy-six manufacturers call Carson City home, making the city the largest light industry manufacturing base in Nevada. Manufacturing accounts for approximately 24 percent of the total primary earnings in Carson City, employing 17 percent of all workers. Most manufacturers are located in the Airport Industrial Park (AIP). Proximity to major highways, rail (Reno), and airports as well as mild seasonal weather and a favorable regulatory climate make Carson City a convenient location for manufacturers. The top five Carson City manufacturing industries include electronics, transportation, machinery, plastics and rubber, and chemicals.[19]

3.7 Economics

Information in this section is found in the Comprehensive Annual Fiscal Report (CAFR) for Carson City for fiscal year end 2020.[20]

As of June 2020, the City had not yet experienced significant financial effects from the non-essential business shut down announced on March 12, 2020 in response to the Coronavirus pandemic. Federal financial assistance provided under the CARES Act, including taxpayer stimulus payments and enhanced unemployment benefits, have kept the City's Consolidated Taxes higher than expected.[21]

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[17] "Largest Employers," "Carson City Workforce Statistics," Nevada Labor Market Information, Carson City Chamber of Commerce, accessed May 23, 2021, **http://www.carsoncitychamber.com/community/economy**.

[18] "Average Wage," Carson City Chamber of Commerce, accessed May 23, 2021, **http://www.carsoncitychamber.com/community/economy**.

[19] "Manufacturing," Carson City Chamber of Commerce, accessed May 23, 2021, **http://www.carsoncitychamber.com/community/economy**.

[20] Sheri Russell, CPA, Chief Financial Officer, Carson City, NV. *Comprehensive Annual Financial Report.* June 30, 2020, accessed, May 3, 2021, **https://www.carson.org/home/showpublisheddocument/73901/637456102843470000**.

[21] Russell, page 2.

The 2020 CAFR addresses the City's tax base and economic forecast in its analysis of the Local Economy as described in the excerpt below.

> *The assessed valuation of Carson City increased by 6.3% in Fiscal Year 19-20 and by 8.9% in FY 20-21. Due to a cap on growth in property tax for existing property and improvements approved by the 2005 Nevada Legislature, the real growth in tax revenues is limited. The growth in the tax bill for residential property is limited to 3% annual growth and commercial property can grow by a maximum of 8% per year. Only new construction is outside of this cap for the first year it is on the tax rolls.*
>
> *Despite the economic difficulties resulting from the pandemic during most of 2020, three are signs that steady construction activity will continue into 2021. Construction in Carson City has been steadily increasing in both residential and commercial development. Construction started this year or is planned to start next year on site improvements for several new subdivisions in which construction of new houses is expected to begin in 2021 [. . .] The home-building industry has indicated to City staff that they continue to sell homes as fast as they can build them and that they expect this trend to continue into 2021. While commercial development is still average to above average, the City is concerned with what the long-term effect of working at home will have on commercial real estate. Business license collections are down 7.3% from the prior year as some businesses were unable to weather the non-essential business shut down.* [22]

3.8 Housing

The Carson City real estate market experienced growth in 2020. As noted in the 2020 Comprehensive Annual Financial Report, under "Local Economy," "according to the Assessor's Office, the average sales price of a home in 2020 year was $357,631, slightly down from $360,857 (0.9% decrease) from the prior year."[23]

The information below is also taken from the U.S. Census Bureau Quick Facts about housing in Carson City.[24]

[22] Russell, page 3.

[23] Russell, page 2.

[24] QuickFacts, U.S. Census Bureau, Carson City, NV (County), accessed May 3, 2021 **https://www.census.gov/quickfacts/carsoncitynevadacounty**.

TABLE 3-3: CARSON CITY HOUSING OVERVIEW

Topic	# / % / $
Housing Units	#24,356
Owner Occupied Housing unit rate	56.8%
Median value of owner-occupied housing units	$273,800
Median selected monthly owner costs with mortgage	$1,449
Median selected monthly owner costs without mortgage	$434
Median gross rent	$940
Building permits	#248
Households	#22,755
Persons per household	#2.31
Language other than English spoken at home, % of persons 5 years+	22.6%

3.9 Transportation

The Carson City Public Works Transportation Division oversees the Regional Transportation Commission, the Carson Area Metropolitan Planning Organization (CAMPO), and the City's public transit system: Jump Around Carson (JAC). The information below is found on the Carson City website as identified in footnotes, as applicable for each section.

Regional Transportation Commission (RTC)

The RTC, comprised of five members who also represent Carson Area Metropolitan Planning Organization (CAMPO), establishes priorities and recommends appropriate funding for transportation improvement projects within Carson City. The RTC meets the second Wednesday of every month after the Carson Area Metropolitan Planning Organization Meeting in the Sierra Room of the Carson City Community Center, and Carson City residents are welcome to attend these meetings.[25]

[25] Transportation Division, Carson City Public Works, Regional Transportation Commission (RTC), accessed May 17, 2021, **https://www.carson.org/government/departments-g-z/public-works/transportation**.

Carson Area Metropolitan Planning Organization (CAMPO)

The U.S. Census Bureau designated the Carson City urbanized area in 2002. In 2003, the Governor of Nevada designated CAMPO as the agency responsible for metropolitan transportation planning in the Carson City urbanized area, which consists of **Carson City**, northern **Douglas County**, and western **Lyon County**.

CAMPO is responsible for creating and updating the following documents.[26]

- **Unified Planning Work Program (UPWP)**
  The UPWP is a statement of work identifying the planning priorities and activities to be undertaken within the CAMPO planning area. The UPWP includes a description of planning work and resulting products, details on who will perform the work, the timeframe for completing each of the work elements, the cost of each of the work elements, and the source of funding for each of the work elements.

- **Transportation Improvement Program (TIP)**
  The TIP is a prioritized listing of transportation projects covering a period of four years that is developed and formally adopted by CAMPO as part of the metropolitan transportation planning process.

- **Regional Transportation Plan (RTP)**
  The RTP is the official multimodal transportation plan that addresses a minimum 20-year planning horizon that is developed, adopted, and updated by CAMPO through the transportation planning process.

- **Public Participation Plan (PPP).**
  The PPP is developed in consultation with all interested parties and describes the procedures, strategies, and desired outcomes of the public participation process as it pertains to the CAMPO transportation planning process.

The Carson Area Metropolitan Planning Organization MPA Boundary is shown in Figure 3-7, below.[27]

[26] "The Role of Carson Area Metropolitan Planning Organization (CAMPO), "About Us," Metropolitan Area Map, accessed May 23, 2021, **https://www.carson.org/government/departments-g-z/public-works/campo-carson-area-metropolitan-planning-organization-7358**.

[27] "CAMPO Boundary Map," Chapter 1: Overview and Regulatory Framework, Carson City 2040 Regional Transportation Plan, August 16, 2016, Carson Area Metropolitan Planning Organization, CAMPO, accessed July 11, 2021, **https://www.carson.org/home/showdocument?id=51018**.

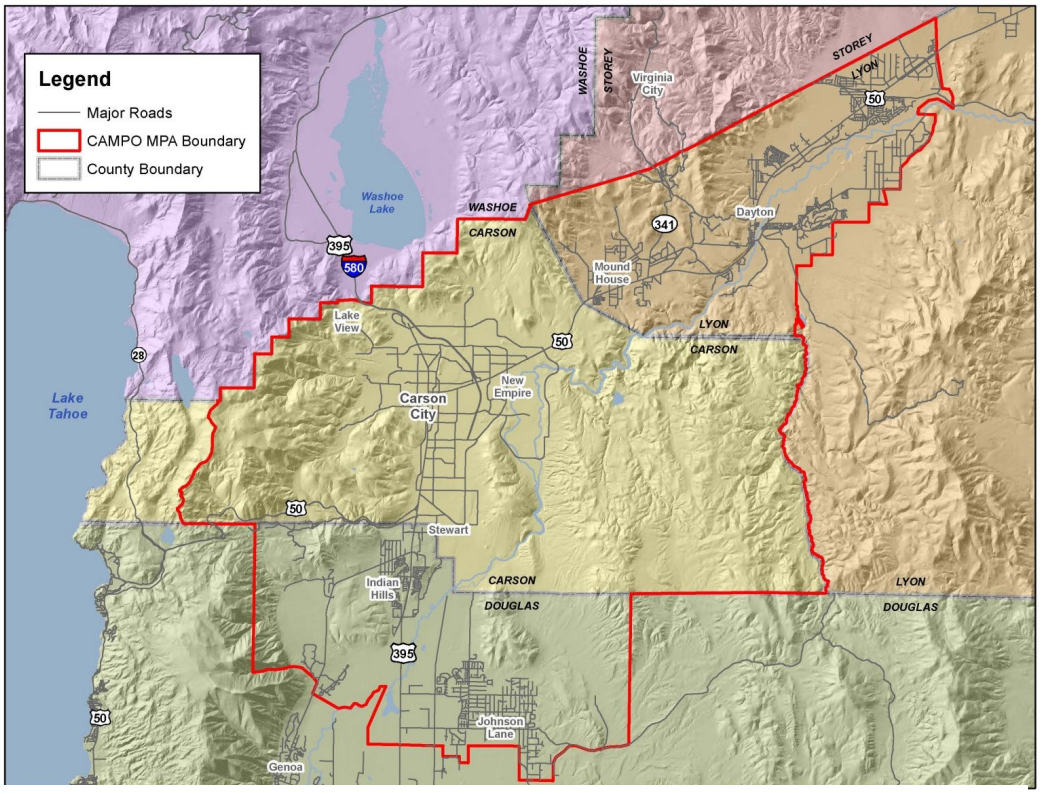

FIGURE 3-7: CARSON CITY METROPOLITAN AREA MAP

3.9.1 Public Transportation

Jump Around Carson (JAC) began operating in October 2005. JAC is governed by the RTC. It is a fixed route system and includes the JAC Assist program that provides transportation for eligible persons with disabilities. The JAC system offers fixed routes as well as a curb-to-curb program for eligible persons with disabilities. Fares are $1 per one-way trip for adults. Persons with disabilities, seniors, and youth ride for $0.50 per trip. JAC's assets include four buses on four distinct fixed routes and seven paratransit vehicles. Paratransit cost is $2.00 one-way (3/4 mile around fixed routes), and $4.00 per one-way trip in the extended zone (additional ¼ mile beyond standard zone).

Figure 3-8 below illustrates the available JAC routes.[28]

[28] System Map, Routes & Schedules, JAC-Jump Around Carson, accessed May 23, 2021, **https://www.carson.org/home/showpublisheddocument/68982/637153725653330000**.

FIGURE 3-8: JAC SYSTEM ROUTES

This transportation system relies on federal funding, the City's general fund, farebox revenue, a grant from the State Aging and Disability Services Division, an agreement with the Department of Health Care Financing and Policy, and advertising revenues.[29]

[29] "Funding Sources," JAC Fact Sheet, Carson City, Nevada Website, accessed May 23, 2021, **https://www.carson.org/home/showpublisheddocument/54561/636276648036100000**.

3.9.2 Transportation Resource Advisory Forum for Carson City (TRAFCC)

The Transportation Resource Advisory Forum for Carson City (TRAFCC) was created to give Carson City staff and the public a forum to discuss local transportation issues and also to educate the community about current and upcoming transportation projects. This group was also created in order to obtain feedback or comments with regards to funding prioritization, utilization of funds, and project development. TRAFCC meets annually. Upcoming meetings are available on the TRAFCC calendar.[30]

3.9.3 Airport

The information below comes from the Carson City Airport website. The information *in italics* reflects language from the Carson City Airport website as identified in the footnote, as applicable for each section.

In the Heart of the Sierra

Carson City Airport, KCXP, is conveniently located 3 miles NE of downtown Carson City, 30 miles from downtown Reno, 13 miles from Virginia City, and only 20 minutes from Lake Tahoe, making our airport a welcome destination for vacation and business travelers, and 'just for pleasure' aviators. Pilots consider Carson City Airport to be the most user-friendly airport in Northern Nevada.

The airport is currently the 5th overall busiest airport and the 3rd busiest General Aviation (GA) airport in Nevada. The "Capital City" airport is a public use, 24-hour airport with a 6,100 ft. long x 75 ft. wide runway.

Instrument Approaches and an IFR Departure Procedure; AWSOS III P/T with Terminal Area Forecasts provided by the National Weather Service. Full-service FBOs with small to large aircraft maintenance capabilities.[31]

Carson City Airport is used regularly by private and air taxi operators and is an important hub for business, pleasure, and those doing business with the state government. The airport is used as an emergency response base by firefighting operations, medical flights, and law enforcement operations. The airport also offers support for flight schools, air charter services, aircraft sales, Jet A and 100LL fuel and maintenance services.[32]

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[30] TRAFCC, Transportation Resource Advisory Forum for Carson City, accessed May 23, 2021, **https://www.carson.org/government/departments-g-z/public-works/transportation-resource-advisory-forum-for-carson-city** and calendar **https://www.carson.org/government/meetings-and-events**.

[31] "In the Heart of the Sierra," Home, Carson City Airport, accessed May 23, 2021, **https://flycarsoncity.com/**.

[32] Home, Carson City Airport.

Airport History

The Carson City Airport was initially established in 1928 on 76 acres of land provided to Carson City by 3 prominent local families. The Airport expanded significantly in the 1940s and 50s to allow for an east-west runway taking advantage of the prevailing westerly Sierra Nevada winds. This acreage comprises the approximate footprint of the main runway. Many areas were dirt and services on the field were limited. In the 1970's, Carson City designated land north of the main runway as the Carson City Industrial Airport and offered parcels for lease in order to attract clean, high quality manufacturers. These parcels were eventually sold to the tenants, and the area continues to evolve as a thriving manufacturing / industrial hub.

In 1989, the Airport Authority Act for Carson City was passed by the Nevada State Legislature. This Act created the current governance structure for the Airport. The Carson City Board of Supervisors appoints the members of the Carson City Airport Authority Board who in turn operate the Airport, establish rules for its safe use, financial stability and provide policy guidance to the Airport Manager who executes policy. Pursuant to the Act, the Carson City Airport Authority is comprised of seven members. Three members representing the general public, of which one is a pilot and one is a City Official, two members that represent manufacturers within a 3-mile radius of the Airport, and two members who are Fixed Base Operators.

In 1990, the Airport Authority entered into a cooperative agreement with the City of Carson City to effectuate the transfer of all operations to the Airport Authority and to provide a mechanism for exchange of resources. This agreement expires in May 2020 and is currently being re-drafted to continue the successful cooperation between the City and the Airport Authority.

In 2001, the Federal Aviation Administration (FAA) accepted the Authority's first Master Plan for airport development and agreed to provide 93.75% of the funding of the Airport Capital Improvement Program under which the Airport Authority contributed a 6.25% local grant match. The Authority accomplished the goals of that Master Plan with runway and taxiway improvements, new hangar construction and orderly development of the Airport. The Authority is presently developing an exciting new future for the Airport via a state-of-the-art Master Plan that will take the Airport into the next decade and beyond. The new Master Plan takes into consideration the many new developments in aviation, GPS, avionics, autonomous systems, and the economic development opportunities for the Airport and the larger community served by the Airport.

In 2019, the University of Nevada, Reno, Center for Economic Development presented the report, "Estimation of Economic Impacts of Operation and Construction Activities of the Carson City Airport on the Economy of Carson City (Impact Study)". The Impact Study determined that the Carson City Airport contributes $65M annually to the Carson City community and generating 490 jobs in the community. The Report underscores the progress to date and the solid base for growth.[33]

[33] "Airport History," Carson City Airport Website, accessed May 23, 2021. **https://flycarsoncity.com/airport-authority-and-staff/#**.

Airport Master Plan

The Carson City Airport (CXP) Master Plan Study was undertaken to evaluate the airport's capabilities and role, to forecast future aviation demand, and to plan for the timely development of new or expanded facilities that may be required to meet that demand. The ultimate goal of the Master Plan is to provide systematic guidelines for the airport's overall maintenance, development, and operation. The document was approved at the Board of Directors meeting on July 17, 2019. The draft version available online is the same as the approved draft.

The Master Plan is intended to be a proactive document which identifies and then plans for future facility needs well in advance of the actual need for the facilities. This is done to ensure that Airport management can coordinate project approvals, design, financing, and construction to avoid experiencing detrimental effects due to inadequate facilities.

The Airport Master Plan is available online at **https://flycarsoncity.com/wp-content/uploads/2021/05/CXP-Carson-City-AMP-FINAL-E.pdf**.

Figure 3.9 features a Concept Map of the envisioned development for the Carson City airport.[34]

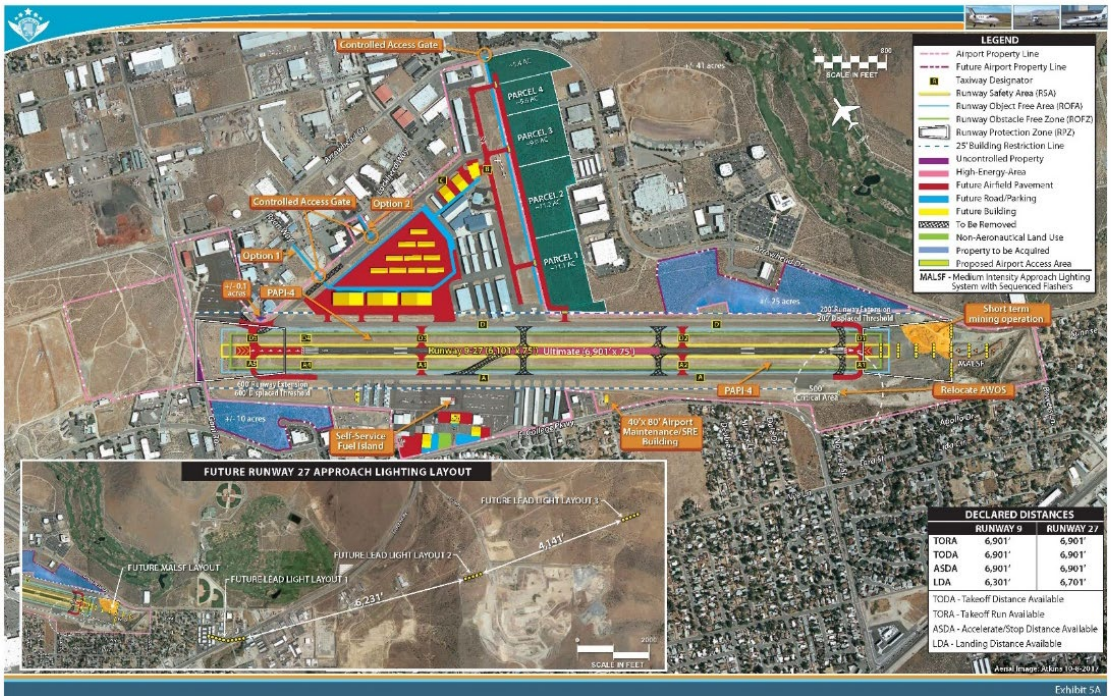

FIGURE 3-9: CONCEPT MAP FOR DEVELOPMENT AT AIRPORT

[34] "About," 2019 Draft Master Plan, Carson City Airport Website, accessed May 17, 2021, **https://flycarsoncity.com/information/airport-master-plan/**.

3.10 Infrastructure

The Carson City Public Works Division oversees and as appropriate maintains the City's landfill, transportation services, streets, stormwater management systems, water distribution systems, sewer systems, and wastewater treatment plant.

3.10.1Overview of Public Works Division

The key divisions managing infrastructure are described below.

Capital Projects: The Engineering Division oversees capital projects including street infrastructure improvements, traffic signals, stormwater drainage and detention basis, wells, pump stations, water and wastewater pipelines, new and renovated parks, landscaping, new and remodeled municipal buildings, facility maintenance, and other projects.[35]

Environmental Control Authority (ECA): Carson City Recycling, Landfill and Hazardous Waste programs, Recycling/Disposal Guide for Home Gadgets and Devices[36]

Wastewater Division: This division operates and maintains the City's sewer collection system, Water Resource Recovery Facility, overseeing sewage lift pump stations, laboratory monitoring, testing, and recording of EPA compliance requirements.[37]

Stormwater & Floodplain Management Program: This program includes floodplain management, stormwater quality, and stormwater management.[38]

Streets Division: This division is responsible for maintaining the city's streets, signs, pavement markings, traffic signals, City parking lots, paved bike paths, and storm water collection system.[39]

Note that Transportation, also administered by Public Works, is discussed in Section 3.8 above.

[35] Engineering Division, Carson City, Nevada Website, accessed May 17, 2021, **https://www.carson.org/government/departments-g-z/public-works/capital-projects-engineering-division**.

[36] Environmental Control Authority, Carson City, Nevada Website, accessed May 17, 2021, **https://www.carson.org/government/departments-g-z/public-works/environmental-control-authority**.

[37] Wastewater Division, Carson City, Nevada Website, accessed May 17,2021, **https://www.carson.org/government/departments-g-z/public-works/sewer** and **https://www.carson.org/government/departments-g-z/public-works/water-resource-recovery-facility**.

[38] Stormwater & Floodplain Management Program, Carson City, Nevada Website, accessed May 17, 2021, **https://www.carson.org/government/departments-g-z/public-works/storm-water-management-program**.

[39] Streets Division, Carson City, Nevada Website, accessed May 17, 2021, **https://www.carson.org/government/departments-g-z/public-works/street-maintenance**.

Water Division: This division is responsible for overseeing the City's water production, distribution, and metering, as well as maintaining the City's fire hydrants and infrastructure.[40]

3.10.2 Pavement Maintenance: Streets Division

The Carson City Roads Division maintains approximately 303 centerline miles of which 282 are paved and 21 are unpaved. Staff developed the Pavement Management Plan (PMP),[41] which formalizes and establishes an efficient and effective strategy for preserving and maintaining the City's 606 lane-miles of roadway. The PMP establishes five performance districts within the City and a five-year rotating schedule to streamline work efforts. The PMP provides a predictable use of roadway funding while maintaining flexibility for unplanned City projects and "match" for grant funding opportunities. The PMP identifies current conditions and establishes performance measures to monitor pavement conditions over time. The 2017 overall pavement condition within Carson City is rated Fair, with a pavement condition index (PCI) rating of 65 out of a 100-point scale.

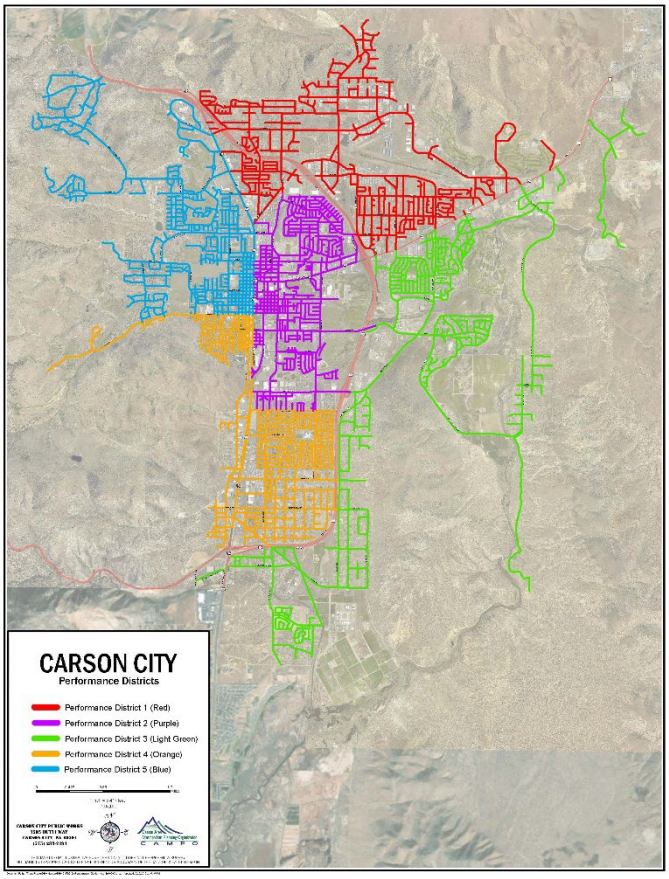

FIGURE 3-10: CARSON CITY PAVEMENT MANAGEMENT PLAN

This Plan establishes a process to share and track the City's pavement conditions. Using the Pavement Condition Index (PCI) rating, the City will be able to set targets for improving pavement conditions at a city-wide level and for different transportation facilities, including regional and local roadways. Target setting will help staff and decision makers annually evaluate the allocation of resources for maintaining pavement infrastructure.

Carson City's FY 2019 to 2023 Pavement Management Plan was approved at the April 11, 2020, meeting of the Regional Transportation Commission (RTC).

[40] Water Division, Carson City, Nevada Website, accessed May 17, 2021, **https://www.carson.org/government/departments-g-z/public-works/water**.

[41] This acronym is not standard for Carson City. "PMP" was added to clearly distinguish it from the HMP.

3.11 Natural & Cultural Resources

The Carson City Consolidated Municipality is rich in natural and cultural resources. For many residents, hiking is available just outside their back door. The City is investing in infrastructure to support access to hiking paths that lead to waterfalls and beautiful views from the west side the City itself. To the east, the City has created public parks and spaces with access to the Carson River—where residents enjoy hiking, floating, and exploring along the banks of the river. The municipality includes frontage along Lake Tahoe—and the lakes and trails found in the mountains in between.

The Carson City Historic District was created in 1982 by the Carson City Board of Supervisors to support the preservation of the historic buildings and the tales they tell. To tell the story of Carson City's westside residential district—which dates to the 1860's—the City has created virtual guides for several different informative Walking Tours.

As the State Capital, Carson City offers a wide range of cultural resources to visitors and residents including the Nevada State Museum, Nevada State Railroad Museum, Children's Museum of Northern Nevada, Stewart Indian School Cultural Center and Museum, Battle Born Hall, Nevada Capitol Building, and several others.

Carson City events are also an important cultural resource. Carson City's Nevada Day parade celebrates the state's admission to statehood on October 31, 1864. In addition to the parade, tours, chili feeds, beard contests, rock drilling championships, chalk art contests, balloon launches, prison tours, film festivals, railbike tours, and treasure hunts have been on the agenda for this jam-packed day.

The Brewery Arts Center, located on the site of the longest-operating brewery in the state to date, was restored with funds granted by the National Park Service's Historic Preservation Fund and has become a home for a variety of community events.

3.12 Government

The debate concerning the consolidation of Ormsby County and Carson City continued for some 20 years. Finally, the process was formally initiated, and after two legislative sessions, and a favorable statewide vote by the citizens in 1966, the required constitutional amendment was ratified by the electorate in November 1968. Thereafter the 55th Session of the Legislature passed Senate Bill No.75, and Ormsby County and Carson City were thereby consolidated into one municipal government known as Carson City Consolidated Municipality. The Charter was approved on April 1, 1969.[42]

[42] "Government," Section 3: Community Description, Carson City 2016 Hazard Mitigation Plan, p. 3-3, accessed May 17, 2021, **https://carson.org/hazardplan**.

3.12.1 Governing Body

The local governing body is composed of a five-member elected representation called the Board of Supervisors (BOS). The Mayor and four Supervisors are elected by and accountable to the voters. All the members of the Board serve four-year staggered terms. The Mayor and Supervisors from Wards 2 and 4 are elected during Presidential election years. The Supervisors from Wards 1 and 3 are elected during off-Presidential election years.

The Board of Supervisors appoints a City Manager to be responsible for the general direction, supervision, administration, and coordination of all affairs for the City. Below please see Carson City departments and key divisions.[43]

3.12.2 Departments

Twenty-four departments provide services and support for the City as illustrated in the table below.[44]

TABLE 3-4: CARSON CITY DEPARTMENTS

List of Departments for Carson City		
Alternative Sentencing	Courts	Juvenile Services
Animal Services	Court Fines & Fees Office	Library
Assessor	District Attorney	Parks, Recreation and Open Space
Administration, City Manager's Office	Finance	Public Guardian
Clerk-Recorder	Fire Department	Public Works
Community Development	Health and Human Services	Senior Center
Redevelopment	Human Resources	Sheriff's Office
Cooperative Extension	Information Technology	Treasurer

[43] 2016 Carson City Hazard Mitigation Plan, accessed May 17, 2021.

[44] Department Directory, Carson City Website, accessed May 17, 2021, **https://www.carson.org/government/department-directory**.

3.12.3 Washoe Tribal Lands within the Carson City Boundary

The Washoe Tribe of Nevada and California

The Washoe Tribe of Nevada and California includes communities within the Carson City boundary. The Washoe Tribe has an approved Tribal Level Multi-Hazard Mitigation Plan dated August 4, 2009, and an update is in process.

The ancestral homeland of the Washoe Tribe radiated from Lake Tahoe, a spiritual and cultural center in the central Sierra Nevada Mountain Range west of Carson City. The area originally encompassed over 1.5 million acres. The traditional homelands stretched from the Central Sierra Nevada in California to the Great Basin in Nevada.

Today, through ongoing tribal efforts and federal collaborations, the Tribe has recovered approximately 5,669 acres and approximately 65,420 acres of individual trust allotments within the ancestral homelands. Washoe Tribal lands are unique in that they do not comprise a single reservation but are fractionated into several discrete parcels, located in six different counties and two different states. While the Tribe has some forested lands in the Sierra Nevada, most current lands are located just within the boundaries of the Great Basin Desert, in the Carson River Watershed.

The last Tribal census in 2010 determined the total tribal enrollment to be 1,649 (one-quarter or more blood quantum), with 590 Tribal members living on one of four reservation communities. While not all of these Tribal members live within Carson City, a significant number do. In addition, the Tribe maintains around 304 employees, most of whom work out of the administration buildings in the Dresslerville parcel. While many of these employees are not residents of Tribal lands, they are nonetheless exposed to the hazards therein.

There are two federally recognized communities under the Washoe Tribe of Nevada and California that are located within the jurisdictional boundary covered by this hazard mitigation plan:

Two Federally Recognized Communities fall within Carson City.

- Carson Colony (Carson) west of Carson City, NV
- Stewart Community (Stewart) southeast of Carson City, NV

Twenty miles south of Carson City, Washoe Tribal headquarters is centrally located on Tribal Land within the Dresslerville Community and within a 20-mile radius of nearly all current Tribal lands.

The Tribe is organized under the provisions of the Indian Reorganization Act of June 18, 1934, exercising rights of home rule and responsibility for the general welfare of its membership. The Washoe Tribal Council, a 12-member body, serves as the local authority for purposes of authorizing any planning program for the Tribe's future.

3.13 Land Use

The City is generally surrounded by open space. Development is concentrated resulting in new development typically being infill development.[45]

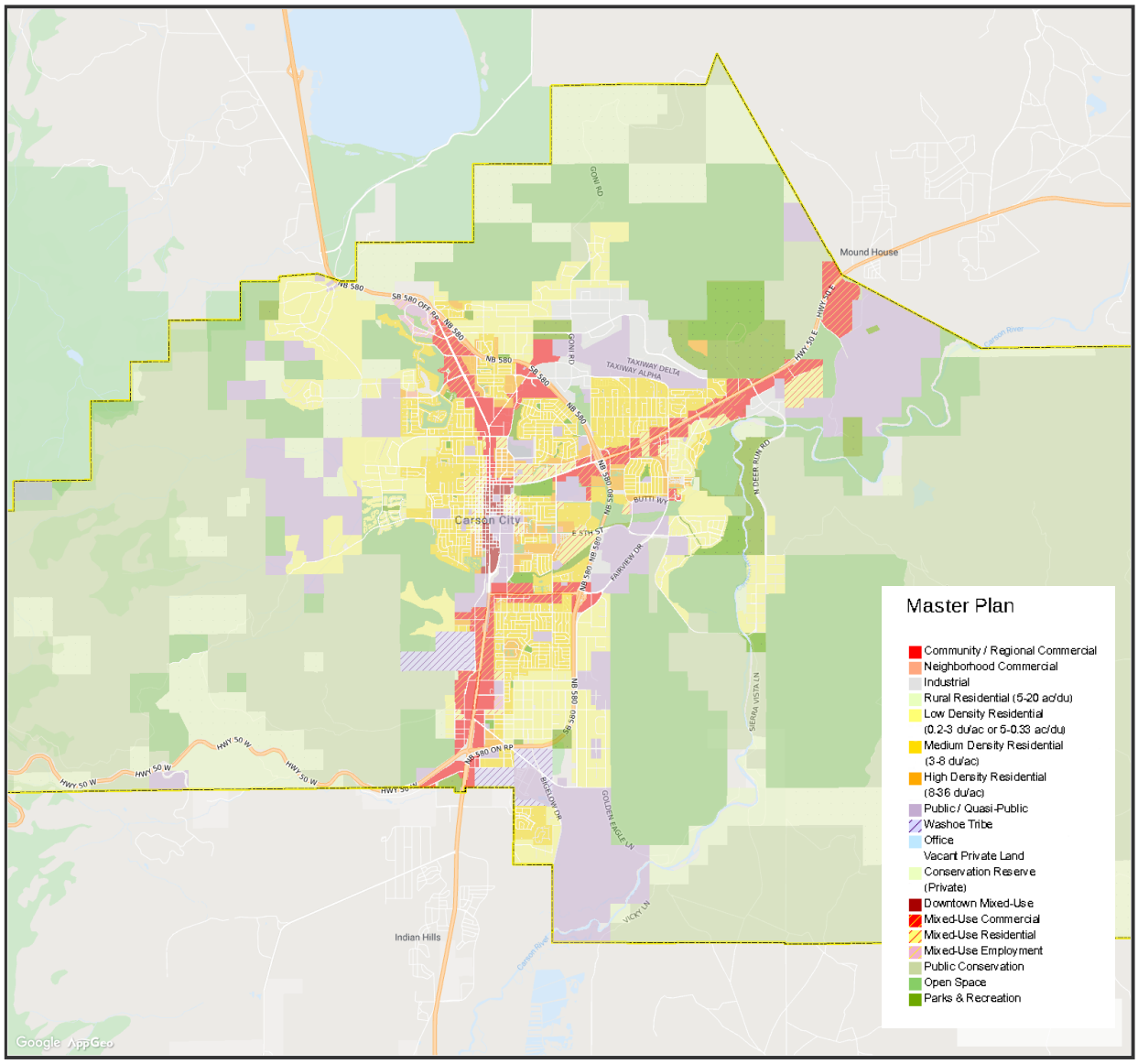

FIGURE 3-11: CARSON CITY LAND USE MAP

[45] Master Plan Layer, Carson City GIS, accessed May 24, 2021, carsoncitynv.mapgeo.io/.

3.13.1 Residential Development

The dropped pins in Figure 3-13 identify locations currently in development. Carson City Master Plan Land Uses are illustrated in Figure 3-12. The side-by-side presentation below illustrates that new development is being built within the city's core.[46] [47]

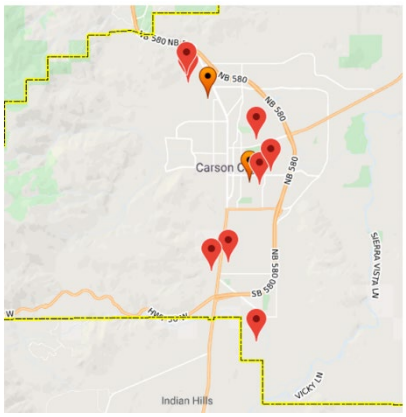

FIGURE 3-13: LOCATIONS OF AREAS UNDER CURRENT DEVELOPMENT

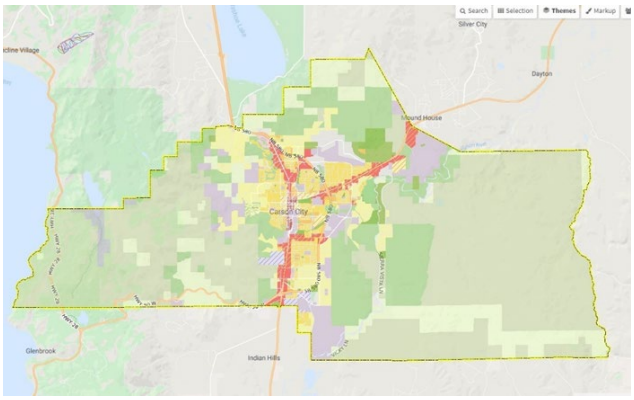

FIGURE 3-12: MASTER PLAN LAND USE MAP

With the sale of the Lompa (bisected by 395, eastern Carson), Schulz (southeast Carson) and Anderson (western Carson) ranch land for development, the City is experiencing housing development throughout the City. In addition, the Silver Oaks housing tract continues to provide areas for development. Table 3-5 below illustrates the current housing trend based on housing starts in the last two (plus) years.[48]

The City has approximately 1,200 approved single family residence parcels within the City for future development. The Nevada State Demographer projects growth in Carson City at approximately .4% per year over the next five years.[49]

[46] Hope Sullivan, "Where is the housing under construction?" An Overview of Residential Development in Carson City. Presentation to Planning Team Meeting on May 7, 2021.

[47] Carson City Map Geo, accessed May 11, 2021, **https://carsoncitynv.mapgeo.io/datasets/properties**.

[48] Hope Sullivan, "An Overview of Residential Development in Carson City, Nevada," May 4, 2021.

[49] "Five Year Population Growth for Nevada and its Counties 2019 to 2023," Nevada State Demographer, accessed May 24, 2021, **https://tax.nv.gov/uploadedFiles/taxnvgov/Content/TaxLibrary/March-2019-Five-Year-Projections.pdf.**

TABLE 3-5: HOUSING STARTS 2019 TO 2021

Housing Starts 2019 to 2021 (April)			
	2019	**2020**	**2021***
Single Family Residential	97	176	50
Multi-Family Residential	282	0	8
TOTAL	379	176	58
	* Through April 30, 2021		

3.13.2 Non-Residential Development

Non-residential development is located throughout the City and includes a large expansion at the hospital and redevelopment along North Carson Street. Commercial zoning tends to be located on major thoroughfares such as Carson Street (north and south), Highway 50E, E. Williams Street, and near the airport. At this time, the City is not seeing a demand for office development.

3.13.3 Development Trends

Since the 2016 HMP was approved, Carson City acquired land through transfers associated with the Lands Bill that passed Congress in 2009. The bill facilitates the trading of land with Carson City, Bureau of Land Management (BLM), U.S. Forestry Service, and the Washoe Tribe. These acquisitions support the City's intention for development. They are consistent with the City's open space plan, which reinforces the Master Plan concept of a compact, diversified core surrounded by a greenbelt.

3.14 Population

The Nevada State Demographer projects improving job growth conditions in Northern Nevada and growth in Carson City at approximately 0.4% per year through the year 2023, with growth continuing at a similar pace in future years. Table 3-6, from the Office of the State Demographer for Nevada, shows the five-year population projections for Carson City.[50]

TABLE 3-6: PROJECTED GROWTH 2018-2023

	Carson City		
	Total Population	Change Previous Year	Percentage Change
2018	56,057		
2019	56,298	241	0.4%
2020	56,541	242	0.4%
2021	56,784	243	0.4%
2022	57,029	244	0.4%
2023	57,274	246	0.4%

Unfortunately, the 2020 census information was not available at the time of this update. However, a Population Density Map is provided below. The map includes census block information based on the 2010 Census Data. Additional revisions were made to include the U.S. Census Bureau's estimates for 2019 using the "vintage" method. From the Census Bureau's website, **https://www.census.gov/programs-surveys/popest/data/tables.html**, the method of calculating "vintage" information is described below.

> The population and housing unit estimates are released on a flow basis throughout each year. Each new series of data (called vintages) incorporates the latest administrative record data, geographic boundaries, and methodology. Therefore, the entire time series of estimates beginning with the most recent decennial census is revised annually and estimates from different vintages of data may not be consistent across geography and characteristics detail. When multiple vintages of data are available, the most recent vintage is the preferred data.
>
> The vintage year (e.g., V2019) refers to the final year of the time series. The reference date for all estimates is July 1, unless otherwise specified.

The population increased approximately 1.2% from 2010 to 2019. This number is based on the final estimate per the U.S. Census Bureau's Vintage method, and the data from the 2010 census.

[50] "Five Year Population Growth for Nevada and its Counties 2019 to 2023," Nevada State Demographer, accessed May 19, 2021, **https://tax.nv.gov/uploadedFiles/taxnvgov/Content/TaxLibrary/March-2019-Five-Year-Projections.pdf.**

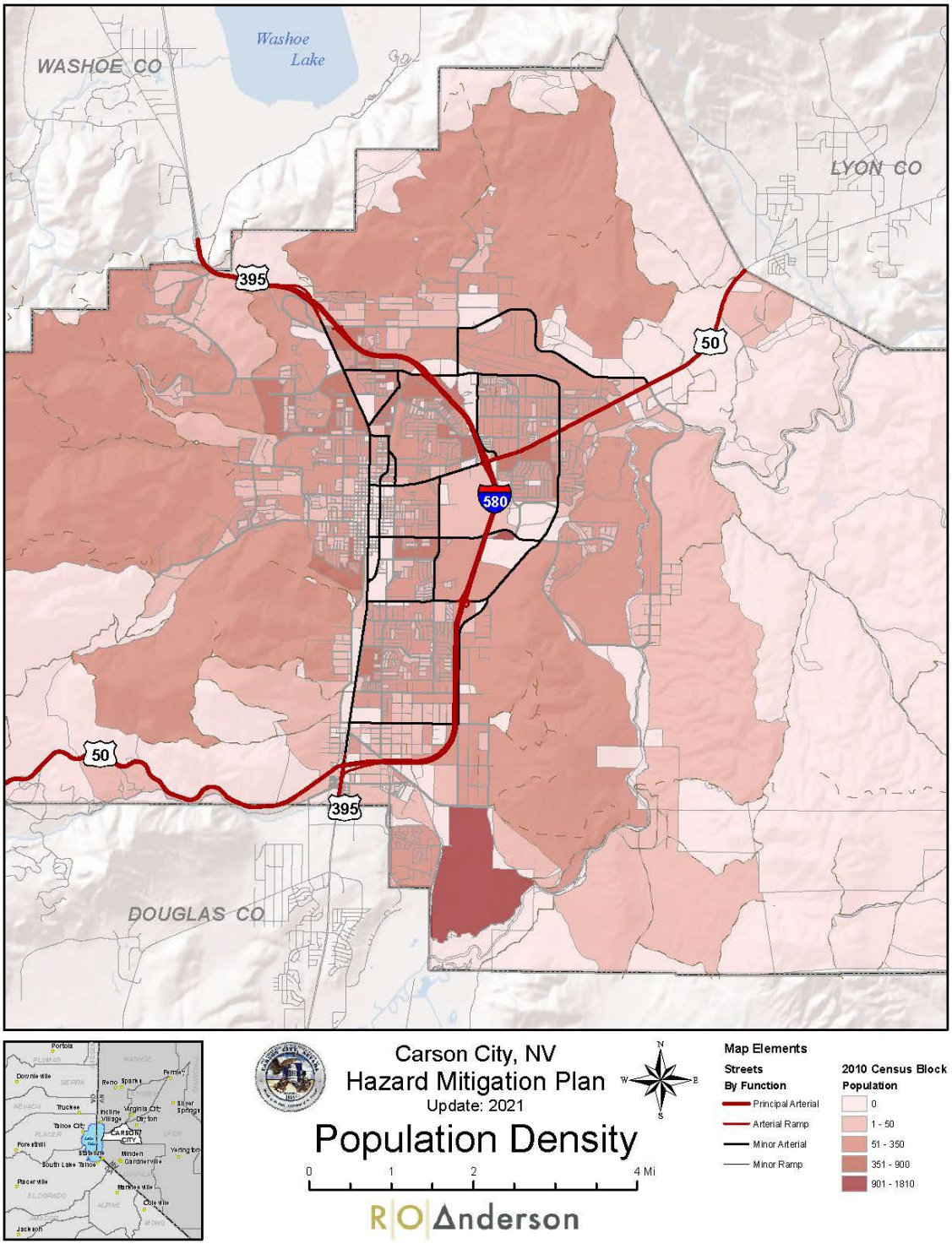

FIGURE 3-14: POPULATION DENSITY MAP

3.15 Quad County Partnership

History & Purpose

The emergency managers for Carson City, Douglas, Lyon, and Storey Counties worked together on legislative issues in the early 2000's. Over time, their connection expanded, and in 2008, when East Fork Fire took on the duties of Douglas County's Emergency Management, Carson City Health and Human Services was tapped to be the public health preparedness authority for all four counties.

From there, the emergency managers and their deputies began collaborating to address concerns collectively. Since then, the Quad-Counties have established a record of collaboration and coordination, providing mutual aid among fire agencies and by the Carson Hazmat Team as well as sharing an Ethernet project, supporting the expansion of GIS services, and expanding coordination among the various agencies. Over time, the County representatives are seeking a Quad-County Emergency Operations Center to facilitate shared responders and collaborative training. Quad-County members now include representatives from Carson City Health and Human Services.

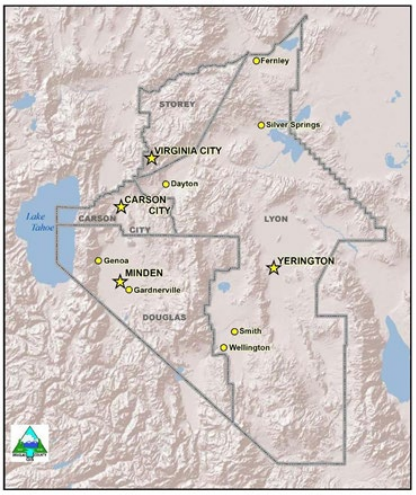

FIGURE 3-15: QUAD COUNTY AREA

Multi-Agency Coordination Guide

In 2018, the Quad-County Emergency Managers published a Multi-Agency Coordination (MAC) Guide to define a strategy to support collaboration among the four counties as they "plan, prepare, respond, and recover from emergencies."[51] The MAC Guide frames the operations and procedures needed to support the collaboration required to define policies, identify and share resources, respond to large-scale

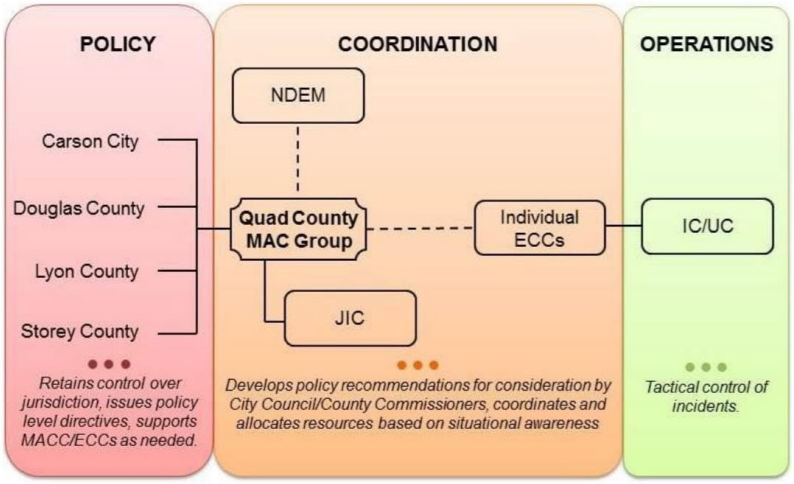

FIGURE 3-16: QUAD COUNTY MAC GROUP STRUCTURE

[51] *Quad-County Multi-Agency Coordination Guide,* August 2018, Introduction. p. 1-2, accessed May 2021, **https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/330809/Quad_County_MAC_Guide.pdf**.

events, manage crises, coordinate communication, and facilitate recovery. These processes are designed to adapt to all jurisdictions with modifications appropriate for each jurisdiction's unique needs.

The MAC identifies operational levels as originating under field level and evolving to Incident Command, as needed. As the incident unfolds, the operation may move from field level to local support, from local to Quad-County level, and from there to state and potentially federal level assistance. Procedures and objectives are clearly outlined in the operational guidelines Emergency Coordination Centers (ECC). For events requiring high-level coordination, the Quad-County partners may initiate a Multi-Agency Coordination Group (MAC Group) to act as "a vehicle for consensus-based regional decision-making during an event that impacts multiple jurisdictions in the Quad-County Planning area."[52]

In the spring of 2020, the Quad-County Public Health Preparedness, which is housed in Carson City Health and Human Services, provided centralized oversight of the COVID-19 pandemic, tracking active cases, recoveries, and deaths for each of the four counties. They also played a key role in offering COVID-19 testing and distributing vaccines. Each fall, flu vaccinations are distributed by Carson City Health and Human Services to Carson City, Douglas County, and Lyon County residents.

This regional approach—and collaboration by the four jurisdictions and their agencies—plays an important role in hazard mitigation planning. In the future, Quad-County members may be a conduit for implementing regional mitigation strategies.

[52] *Quad-County Multi-Agency Coordination Guide.* Quad County MAC Group Structure. p. 4-2, accessed May 2021, **https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/330809/Quad_County_MAC_Guide.pdf**

4 Planning Process & Method for Monitoring, Evaluating, & Updating the Plan

This section provides an overview of the planning process; identifies Planning Team members and key stakeholders; partially documents public outreach efforts; and summarizes the review and incorporation of existing plans, studies, and reports used in the development of this update to the HMP. Additional information regarding the Planning Team and public outreach efforts is provided in Appendix A: Meeting Notes and Handouts and Appendix B: Public Outreach.

The following five-step planning process generally guided the development of this plan. Because the timely completion of the plan allowed approximately 12 weeks from start to completion of the draft document, these tasks were often initiated concurrently—and reviewed and discussed throughout the process rather than sequentially.

- Organize resources: The Planning Team identified resources, including Carson City staff, agencies, and local community members, which could provide technical expertise and historical information needed in the update of the HMP.
- Assess risks: The Planning Team identified the hazards specific to Carson City and developed the risk assessment for the 12 final hazards. The Planning Team reviewed the risk assessment, including the vulnerability analysis, prior to and during the development of the mitigation strategy.
- Assess capabilities: The Planning Team reviewed current administrative and technical, education and outreach, financial, and planning and regulatory capabilities to determine whether existing provisions and requirements adequately address relevant hazards.
- Develop a mitigation strategy: After reviewing the risks posed by each hazard, the Planning Team worked to develop a comprehensive range of potential mitigation goals, objectives, and actions. Subsequently, the Planning Team identified and prioritized the actions to be implemented.
- Monitor progress: The Planning Team developed an implementation process to ensure the success of an ongoing program to minimize hazard impacts to Carson City.

This Section also describes a formal plan maintenance process to ensure that the HMP remains an active and applicable document. It includes an explanation of how the City and the Planning Team intend to organize its efforts to ensure that improvements and revisions to the HMP occur in a well-managed, efficient, and coordinated manner while ensuring continued public involvement in the process and consistency with existing planning mechanisms.

4.1 What Changed?

The Planning Process was streamlined to accommodate the City's deadline. Due to the compact window available for completing the update, the plan was submitted with best available data to date. A more detailed vulnerability assessment, including HAZUS Level 2 Analysis for earthquake and flood, will be incorporated via amendment within four months from receipt of FEMA's approval of the 2021 HMP Update.

The updates made to the 2016 Hazard Mitigation Plan are addressed in each Section of this document under "What Changed?" rather than in a table. Plan Maintenance has been incorporated into this section to outline, emphasize, and integrate the ongoing process required by FEMA for maintaining and updating the plan.

4.2 Formation of the Planning Team

The requirements for the planning process, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? ***44 CFR 201.6(c)(1)*** ***Intent****: To inform the public and other readers about the overall approach to the plan's developmentand serve as a permanent record of how decisions were made and who was involved. This record also is useful for the next plan update.*	a. Documentation of how the plan was prepared **must** include the schedule or timeframe and activities that made up the plan's development as well as who was involved. Documentation typically is met with a narrative description, but may also include,for example, other documentation such as copies of meeting minutes, sign-in sheets, or newspaper articles. ***Document*** *means provide the factual evidence for how the jurisdictions developed the plan.* b. The plan **must** list the jurisdiction(s) participating in the plan that seek approval. c. The plan **must** identify who represented each jurisdiction. The Plan **must** provide, at a minimum, the jurisdiction represented andthe person's position or title and agency within the jurisdiction. d. For each jurisdiction seeking plan approval, the plan **must** document how they were involved in the planning process. For example, the plan may document meetings attended, data provided, or stakeholder and public involvement activities offered.Jurisdictions that adopt the plan without documenting how they participated in the planning process will not be approved. ***Involved in the process*** *means engaged as participants and given the chance to provide input to affect the plan's content.* This is more than simply being invited (*See* "***opportunity to be involved in the planning process***" in A2 below) or only adopting the plan. e. Plan updates **must** include documentation of the current planning process undertaken to update the plan.

As stated in Section 1.3 Planning Area, the sole jurisdiction seeking plan approval for this iteration is Carson City itself.

- **Jurisdiction: Carson City**

The City considered adding the Carson City School District and the Carson City Airport as separate jurisdictions in this plan. However, due to the project deadline, this action was deferred. These jurisdictions may be added to the next iteration of this plan.

Upon confirming the planning area for the jurisdiction, the next step in the planning update process was to establish a Planning Team. Sean Slamon, Fire Chief/Emergency Manager, and Jason Danen, Deputy Emergency Manager, both of Carson City, served as the primary Points of Contact (POC) for Carson City and the public. Jason Danen led the process on behalf of the City. The Planning Team included the Carson City Local Emergency Planning Committee (LEPC) as well as representatives from the City and stakeholders from non-profits, local businesses, and neighboring communities. Figure 4-1 below illustrates the organization of the HMP Planning Team, stakeholders, and the public.

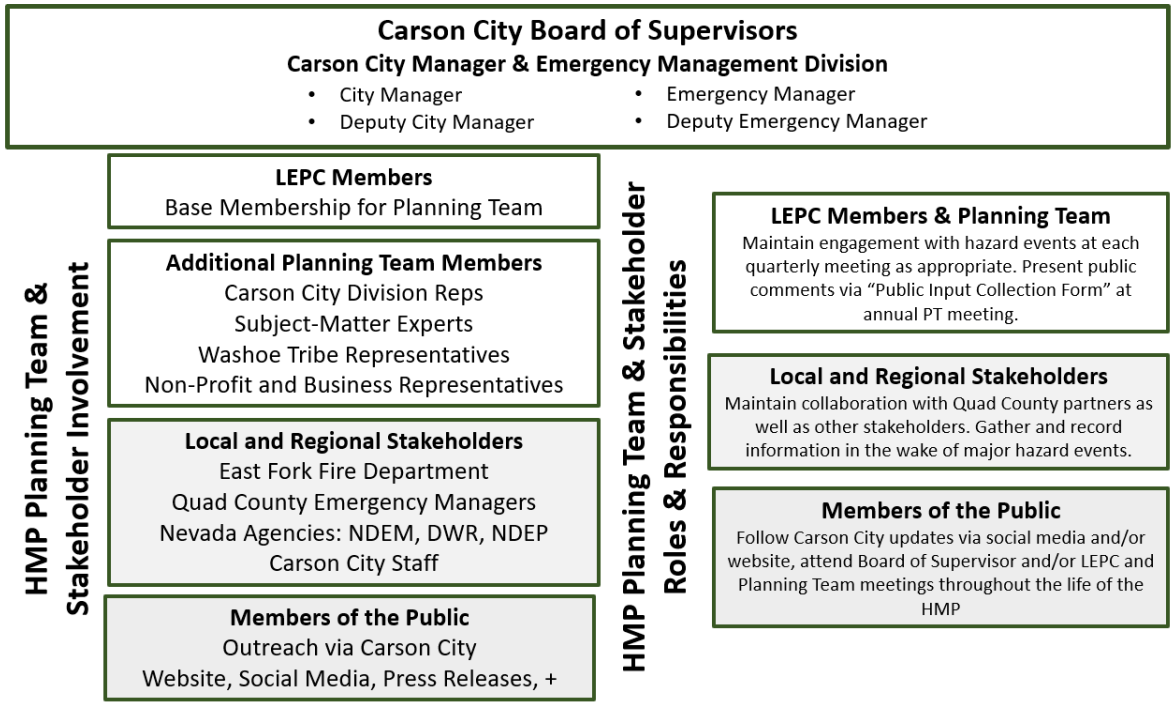

FIGURE 4-1: CC 2021 HMP ORGANIZATIONAL CHART

Planning Team members are listed in alphabetical order by last name in the table below.

TABLE 4-1: CARSON CITY 2021 HMP PLANNING TEAM

Carson City 2021 HMP Planning Team		
Name & Title	**Organization**	**Participation**
Nicki Aaker, Director LEPC Member	Carson City Health & Human Services	Presented on epidemics and infectious disease at PT Meeting; participated in meetings 1 & 3.5; reviewed, edited, estimated costs, and identified new action items for health-related mitigation; comments on Sections 3 and 5; participation in hazard ranking and prioritization of mitigation strategies.
Liz Breeden, Senior Emergency Administrator	NV Energy	Completed a hazard ranking form.
Ann Cyr, Risk Manager LEPC Member	Carson City School District	Participated in meetings 1, 2, and 3.5; reviewed and edited mitigation action items; participated in prioritization of mitigation actions; contributed insights on specific hazards evaluated by the Carson City School District.
Jason Danen, Deputy Emergency Manager LEPC Member	Carson City Fire Department	Led the overall strategy for the HMP Update, participated in all PT meetings, met with ROA Consultants weekly (generally), coordinated with consultants to identify the Planning Team members as well as stakeholders, facilitated the collection of data, participated in hazard ranking and prioritization of mitigation action items.
Kelly Echeverria, Emergency Manager	Washoe County	Participated in meetings 1 and 3, participated in hazard ranking, contributed insights into alternative approaches to data collection/analysis.
Robb Fellows, Senior Project Manager, Stormwater	Carson City Public Works	Participated in all meetings; participated in hazard ranking and mitigation action prioritization; reviewed and updated the status, cost, etc. of 2016 mitigation action items; provided previous occurrences for the flood profile; reviewed and commented on select capabilities.
Dave Fogerson, Chief	Nevada Department of Public Safety	Participated in Meeting 1, participated in hazard ranking, provided comments and direction to support the new Quad County section in the Community Profile.
Jeanne Freeman, Quad-County Public	Carson City Health & Human Services	Participated in Meeting 1 and hazard ranking, participated in virtual meeting to discuss updates to infectious disease-related mitigation action items.

Carson City 2021 HMP Planning Team		
Name & Title	**Organization**	**Participation**
Health Preparedness Manager		
Stephanie Hicks, Deputy City Manager	Carson City, City Manager's Office	Participated in Meeting 1 and hazard ranking, reviewed mitigation action items.
Andy Hummel, Wastewater Utility Manager LEPC Member	Carson City Public Works	Participated in all meetings, participated in hazard ranking and mitigation action prioritization, reviewed and commented on select capabilities.
Tyler Jesse, Asset Manager	Carson City Information Technology	Did not attend meetings, provided support/direction for securing GIS data required for hazard mapping and asset inventory.
Nancy Merritt, Office Specialist	Carson City Fire Department	Participated in Meetings 2, 3, 3.5; aided the distribution of meeting information; participated in mitigation action prioritization.
Taryn Peirce, Interim Emergency Preparedness LEPC Member	Carson Tahoe Health	Participated in Meetings 1 (online), 2, and 3.5; participated in hazard ranking and mitigation action prioritization.
Randall Rice, City Engineer	Carson City Public Works, Citizen Outreach	Participated in Meeting 1 via Zoom, participated in hazard ranking.
Craig Robinson, Facilities Director LEPC Member	Western Nevada College	Participated in Meetings 1 (online), 3, and 3.5; participated in mitigation action prioritization.
Dave Ruben, Fire Marshall	Carson City Fire Department	Participated in hazard ranking; reviewed, edited, and evaluated fire-related mitigation action items; assisted Consultant with identifying a Subject-Matter Expert for Wildland Fire.
Rodd Rummel, Wildland Fuels Management Officer	Carson City Fire Department	Participated in Meeting 1 as SME on Wildland Fire.

Carson City 2021 HMP Planning Team		
Name & Title	**Organization**	**Participation**
Rachael Schneider, Community Relations Coordinator	Carson City, City Manager's Office	Prepared and distributed HMP information via press release, city-wide survey and social media posts; participated in Meetings 1, 3, and 3.5; presented on Carson City Outreach Strategies at Meeting 1; secured technical assistance and equipment to facilitate the integration of video for Zoom access to Meeting 1; participated in hazard ranking and mitigation action prioritization.
Lisa Schuette, Supervisor Ward 4	Carson City Board of Supervisors	Participated in all meetings, participated in hazard ranking and mitigation action prioritization.
Darren Schulz, Public Works Director LEPC Member	Carson City	Participated in Meeting 1 (online), participated in hazard ranking.
Jocelyn Seemann, Disaster Program Manager	American Red Cross	Participated in Meeting 1 (online), participated in hazard ranking.
Sean Slamon, Fire Chief/Emergency Manager LEPC Chair	Carson City Fire Department	Participated in Meetings 1 and 2, participated in hazard ranking.
Chris Smallcomb, Warning Coordination Meteorologist LEPC Member (Non-voting)	NOAA	Participated in Meeting 1 (online), presented on Severe Weather hazards, participated in hazard ranking.
Dan Stucky, Deputy Public Works Director	Carson City	Participated in all meetings; participated in hazard ranking and mitigation action prioritization; reviewed, edited and updated 2016 mitigation action items; provided asset data for properties owned by Carson City.
Hope Sullivan, Community Development Director	Carson City	Participated in Meetings 1, 3, and 3.5; presented on Future Growth in Meeting 1; participated in hazard ranking and mitigation action prioritization; reviewed, edited and updated 2016 mitigation action items; hosted

Carson City 2021 HMP Planning Team		
Name & Title	**Organization**	**Participation**
		a meeting to coordinate distribution of asset data for future growth.
Jerome Tushbant, Undersheriff LEPC Member	Carson City Sheriff's Office	Attended Meetings 1 and 2; presented on Acts of Violence including Terrorism, Civil Disorder/Riotous Behavior, and Criminal Acts; participated in hazard ranking.
Jim Walker, Emergency Operations Manager	NDOT	Participated in all meetings as well as hazard ranking and mitigation action prioritization.
Dave Yohey, EHS Manager LEPC Member	Chromalloy Nevada	Participated in Meetings 1 (virtual) and 2 as well as hazard ranking.

Other Invitees, Participants, & Internal Stakeholders		
Name & Title	Association	Participation
Dustin Booth, Division Manager	Carson City Health and Human Services, Disease Control and Prevention	Participated in Meeting 2; participated in virtual meeting with CCH&HS to discuss updates to mitigation actions.
Jerry Evans, Owner/General Manager LEPC Member (Non-voting)	KCMY/KKFT FM	Invited to participate.
Keith Forbes, Veterinarian LEPC Member (Non-voting)	Nevada Department of Agriculture	Invited to participate.
Ken Furlong, Sheriff LEPC Member	Carson City Sheriff's Office	Participated in Meeting 1.
Aaron Lowe, Deputy Chief LEPC Member	Carson City Fire Department	None

Other Invitees, Participants, & Internal Stakeholders		
Name & Title	Association	Participation
Lucia Maloney, Transportation Manager	Carson City Transportation Division	City Transportation Manager, Subject Matter Expert, Consulted.
Scott O'Brien, Fire Fighter	Carson City Fire Department	Participated in Meeting 3
P.K. O'Neill, Assemblyman, District 40, Carson City LEPC Member	Nevada Assembly	Unable to attend due to legislative season.
Robyn Orloff, Carson City Resident	Private Citizen	Attended PT Meetings 3 & 3.5, presented comments at Meeting 3.5.
Nancy Paulson, City Manager	Carson City, City Manager's Office	Deputy manager, Stephanie Hicks participated in Meeting 1 and provided oversight of the Plan update with the project lead, Jason Danen.
Shelby Price, Senior Office Specialist	Carson City Fire Department	Assisted with Meeting 2 and posting meeting announcements.
Kenneth Quiner, Emergency Manager	Washoe Tribe of Nevada & California	Started position in June 2021.
Dave Spencer	SOSAR	Participated in Meeting 1
Mark Stearns, Captain, Corp Officer LEPC Member	Salvation Army Carson City Corps	Scheduling conflicts prevented participation.
James Underwood, Former Carson City CIO	Carson City	Participated in Meeting 1 and hazard ranking.
Sandy Wartgow, EMS Manager LEPC Member	Carson City Fire Department	On leave
Jim White, Firefighter/Paramedic	Carson City Fire Department	Participate in Planning Team Meeting 2.

The City, assisted by R.O. Anderson Engineering (ROA), updated the 2016 HMP over a period of approximately three months—from April to July of 2021—with the intention of securing FEMA approval prior to the expiration of the existing plan. The Deputy Emergency Manager and Carson City Community Relations Coordinator met with ROA staff in late April to identify the timeline for meetings and deliverables and discuss outreach strategies.

With just about three months to complete the update, the planning process took place at an accelerated pace. In the first meeting, Subject Matter Experts (SMEs) presented information about key hazards from the previous plan.[53] The SME presentations provided updates on recent events and impacts to prepare the team for the 2021 hazard ranking. Shortly after Meeting 1, the 2016 mitigation actions were circulated to specific departments for review, revision, and status updates. Although the agenda for each meeting generally followed the categories outlined in the Plan, all aspects of the plan were under review concurrently throughout the planning process due to the project deadline. Document reviews and updates conducted via phone, email correspondence, and/or virtual meetings with Planning Team members and Carson City staff were ongoing throughout the planning process.

Weekly meetings between ROA and the Deputy Emergency Manager were scheduled to coordinate efforts, establish priorities, preview upcoming deadlines, and consult on the content and strategy for the update.

The table below recaps the meeting schedule and agenda items. Meeting outcomes can be found in Appendix A: Meeting Notes and Handouts.

Meeting Date	Agenda
Meeting 1: May 7, 2021	**Public Workshop & HMP Planning Team Meeting**

In-person with live streaming and virtual access.	• Introduce update process and schedule.
	• Review Planning Process.
	• Outreach Overview
	• Presentations by Subject Matter Experts
	  • Future Growth: Hope Sullivan, CC Director of Community Development
	  • Flood: Robb Fellows, CC Floodplain Manager
	  • Wildfire: Rodd Rummel, CC Wildland Fuels Management Officer
	  • Earthquake+: Craig dePolo, Geologist, UNR
	  • Severe Weather: Chris Smallcomb, NOAA
	  • Epidemics: Nicki Aaker, CC Director Carson City Health and Human Services
	  • Hazardous Materials: Tom Raw, CC Retired Deputy Emergency Manager
	  • Acts of Violence: Jerome Tushbant, CC Undersheriff
	  • Cybersecurity: James Underwood, CIO (added at the meeting)
	• Q&A
	• Public Comment 1

[53] At this first PT meeting, an additional hazard, cybersecurity, was proposed. However, this hazard was not included in the final plan due to the limited time frame for this project—and limited resources in Carson City IT Department.

Meeting Date	Agenda
	• Hazard Identification & Ranking • Public Comment 2 • Task Assignments • Upcoming Meetings
Meeting 2: May 27, 2021	**Public Workshop & HMP Planning Team Meeting**
This in-person meeting did not require masks. Virtual access available upon request.	• Introductions • Hazard Ranking Outcome • Section 1: Overview – Discussion and Possible Approval by PT • Section 2: Background – Review, Discussion, and Possible Approval by PT • Carson City Assets: Review, Discussion and Possible approval by PT • Vulnerability/Exposure: Review, Discussion, and Possible Approval by PT • Future Growth/Exposure: Review, Discussion, and Possible Approval • Preliminary Mitigation Actions Review and Discussion • Capability Assessment and Integration: Review, Discussion, and Possible Approval • Q&A • Public Comment • Task Assignments • Upcoming Meetings
Meeting 3: June 21, 2021	**Public Workshop and HMP Planning Team Meeting**
Originally scheduled on June 18th, Meeting 3 was rescheduled when key PT members were unable to attend. Based on the tasks for this meeting and the lack of time in previous meetings, the Deputy Emergency Manager/PT Lead agreed that two meetings over two consecutive days would be a better way to conduct the prioritization process. *Virtual access to this in-person meeting was available upon request.*	• Introductions • Section 3: Community Profile – Review, Discussion, and Possible Approval by PT • Section 4.6: Plan Maintenance Process – Review, Discussion, and Possible Approval • Section 5: Hazards – Review, Discussion, and Possible Approval • Carson City Assets: Review, Discussion, and Possible Approval • Vulnerability/Exposure: Review, Discussion, and Possible Approval • Future Growth Vulnerability/Exposure: Review, Discussion, and Possible Approval • Discussion of Vulnerability Analysis and Review of Current Mitigation Actions • Q&A • Public Comment • Task Assignments • Upcoming Meetings
Meeting 3.5: June 22, 2021	**Public Workshop and HMP Planning Team Meeting**
Originally scheduled on June 18th, Meeting 3.5 was rescheduled as explained above.	• Introductions • Discussion of Vulnerability Analysis and Review of Current Mitigation Actions • Mitigation Actions Review of Benefit vs Costs

Meeting Date	Agenda
Virtual access to this in-person meeting was available upon request.	• Mitigation Action Prioritization • Questions and Answers • Public Comment • Task Assignments • Upcoming Meetings
Meeting 4: July 22, 2021	**Final Review and Approval of Incorporation of Public Comment**
Invitations went out to Stakeholders and the Planning Team. Public outreach included postings on social media as well as in places required by Nevada Public Meeting. The 2021 Administrative Plan as well as the agenda and presentation for the meeting were available at carson.org/hazardplan webpage. Virtual access was also publicly available.	• The Importance of Public Participation • Why Update the Hazard Mitigation Plan? • Overview of the Hazard Mitigation Plan Update Process • What Changed? • Plan Update Outcomes • Approval of Incorporation of Public Comment • Q&A • Public Comment 1

4.3 Participation of Neighboring Jurisdictions

FEMA requires the planning process to provide an opportunity for neighboring jurisdictions, local, tribal, regional, and federal organizations to participate as described in the table.

ELEMENT	REQUIREMENTS
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? *44 CFR 201.6(b)(2)* ***Intent**: To demonstrate a deliberative planning process that involves stakeholders with the data and expertise needed to develop the plan, with responsibility or authority to implement hazard mitigation activities, and who will be most*	a. The plan **must** identify all stakeholders involved or given an opportunity to be involved in the planning process. At a minimum, stakeholders **must** include: 1) Local and regional agencies involved in hazard mitigation activities; 2) Agencies that have the authority to regulate development; and 3) Neighboring communities. *An **opportunity to be involved in the planning process** means that the stakeholders are engaged or invited as participants and given the chance to provide input to affect the plan's content.* b. The Plan **must** provide the agency or organization represented and the person's position or title within the agency. c. The plan **must** identify how the stakeholders were invited to participate in the process.

ELEMENT	REQUIREMENTS
affected by the plan's outcomes.	Examples of stakeholders include, but are not limited to: • Local and regional agencies involved in hazard mitigation include public works, zoning, emergency management, local floodplain administrators, special districts, and GIS departments. • Agencies that have the authority to regulate development include planning and community development departments, building officials, planning commissions, or other elected officials. • Neighboring communities include adjacent counties and municipalities, such as those that are affected by similar hazard events or may be partners in hazard mitigation and response activities. • Other interests may be defined by each jurisdiction and will vary with each one. These include, but are not limited to, business, academia, and other private and non-profit interests depending on the unique characteristics of the community.

A wide range of stakeholders were invited to participate in the planning process. Some of these individuals were also consulted when questions arose that fall under their oversight or expertise. Every participant in the planning process received an email invitation with the schedule of meetings, and when applicable, a link to a virtual meeting was provided within the text of the email. Options to attend in person and through virtual software were provided for all meetings except the public presentation of the Plan on July 22, 2021. Appendix A: Meeting Notes and Handouts includes copies of the email invitations for each meeting. Additional information on outreach to the public follows below in Section 4.4.

TABLE 4-2: STAKEHOLDERS INCLUDING NEIGHBORING JURISDICTIONS

Name & Title	Organization	Participation
Rebecca Bodnar, Environmental Scientist	State NDEP	Invited to participate as subject matter expert for the state.
Tod Carlini, Chief	East Fork Fire Protection District	Neighboring jurisdiction, Douglas County, Fire Chief and Emergency Manager. Invited to participate.
Joe Curtis, Emergency Manager	Storey County	Neighboring jurisdiction, Storey County, Fire Chief and Emergency Manager; participated in hazard ranking
Craig dePolo, Geologist	UNR, Bureau of Mines and Geology	Participated in Meeting 1 and presented on Earthquakes and related hazards; consulted for additional information/clarifications for hazard profile.

Name & Title	Organization	Participation
Crystal Harjo, DEM Emergency Management & Tribal Health Coordinator	NDEM	Invited to participate.
Zachary Lamebull, Environmental Scientist, Environmental Assistance Program Coordinator	NDEP, Bureau of Correction Actions	Participated in hazard ranking.
Stefanie McCaffrey, Senior Community Relations Advisor	NV Energy	Invited to participate.
Hannah McDonald, Director	Partnership Carson City	No response to invitation.
Katie Nannini, Community Relations Manager	NV Energy	Invited to participate.
Jeff Page, Lyon County Manager	Lyon County	Neighboring jurisdiction, Lyon County, Fire Chief and Emergency Manager.
Tom Raw, Retired Deputy Emergency Manager	Retired, Carson City Fire Department	Participated in Meeting 1, provided a presentation on Hazardous Materials.
Serrell Smokey, Chair	Washoe Tribe of NV & CA	Invited to participate.
Brian Wacker, Chief of Planning	State Public Works Division, Nevada	Attended Meeting 1 (online).
Erin Elizabeth Warnock, State Floodplain Manager/NFIP Coordinator	NV Division of Water Resources	Invited to participate—and responded with interest.
Janell Woodward, State Hazard Mitigation Officer	NV Division of Emergency Management	Participated in Meeting 1 (online) and completed a hazard ranking form. Collaborator for state critical infrastructure.

4.4 Public Involvement/Outreach

Public outreach requirements under the DMA 2000 and its regulations are listed below.

ELEMENT	REQUIREMENTS
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? ***44 CFR 201.6(b)(1) and 201.6(c)(1)*** ***Intent**: To ensure citizens understand what the community is doing on their behalf, and to providea chance for input on community vulnerabilities and mitigation activities that will inform the plan's content. Public involvement is also an opportunity to educate the publicabout hazards and risks in the community, types of activities to mitigate those risks, and how these impact them.*	a. The plan **must** document how the public was given the opportunity to be involved in the planning process and how their feedback was incorporated into the plan. Examples include, but are not limited to, sign-in sheets from open meetings, interactive websites with drafts for public review and comment, questionnaires or surveys, or booths at popular community events. b. The opportunity for participation **must** occur during the plan development, which is prior to the comment period on the finalplan and prior to the plan approval / adoption.

On Saturday, April 24, 2021, the *Nevada Appeal,* published an article promoting the first workshop. Written and submitted by the Carson City Community Relations Coordinator, the article provided the date, time, and location as well as an overview of the purpose for this initial hazard mitigation plan workshop. The article closed with contact information for the Carson City Deputy Emergency Manager and lead for the project, Jason Danen.

Nevada Appeal | Saturday, April 24, 2021 | A3

Carson City mitigation workshop set for May 7

By Carson City

Carson City Emergency Management will host a planning and community hazard mitigation workshop May 7 at 1:30 p.m. in the Carson City Sheriff's Office Ormsby Room, 911 E. Musser St.

The workshop will feature subject matter experts and presentations addressing several of the key hazards identified.

The public is encouraged to attend or watch the public workshop online at carson.org/hazardplan.

The event runs between 1:30 p.m.-4:30 p.m. Masks will be required. Citizens will have additional opportunities to provide feedback to the planning team, a community survey will be available May 7 at carson.org/hazardplan.

To frequently assess and address the changing threat of local hazards, the Hazard Mitigation Plan is required to periodically undergo refinement. A planning group, comprised of city and state agencies, private organizations, with other agencies, including utilities, will identify a list of potential hazards that could occur within the Carson City area. Some of the hazards include flooding, severe weather, earthquakes, epidemics, and wildfires.

While an important part of emergency management deals with disaster recovery (the actions that a community takes to repair damages), an equally important aspect of emergency management involves hazard mitigation — sustained actions taken to reduce long-term danger to life and property.

The plan identifies risks and vulnerabilities to establish mitigation strategies. The process for implementing this planning activity includes participation of agencies, stakeholders, and the public. Maintaining and updating the plan is essential to securing support from FEMA and other agencies to improve the community's resilience through pre-disaster mitigation actions.

For information or to reference the 2016 Hazard Mitigation Plan visit carson.org/hazardplan or contact the Deputy Emergency Manager Jason Danen at (775) 887-2210 or e-mail jdanen@carson.org.

FIGURE 4-2: "CARSON CITY MITIGATION WORKSHOP SET FOR MAY 7"

The Workshop Schedule was posted on the Carson City Hazard Mitigation Plan page where visitors to the site could also access a link to the 2016 HMP. The video produced by the City for Meeting 1 was posted online at carson.org/hazardplan—and this link was circulated to other social media platforms.

Meeting invitations were sent to Planning Team members as well as stakeholders. As required by Nevada Open Meeting Law, the agenda for each meeting was posted in public buildings: one at the location of the meeting and two additional locations where the public can easily view the meeting information. The agendas were also posted on "**Nevada Public Notice**," a central website dedicated to posting of agendas for public bodies statewide.

In May, a survey hosted on the carson.org/hazardplan website was circulated online via social media. Designed to solicit feedback and foster engagement, the survey received 71 responses. An overview of the survey outcomes was presented to the May 27th Planning Team to help participants understand the concerns of the public. In addition, comments excerpted from the survey were presented to the Planning Team at the June 21st meeting to provide public context to the mitigation actions prioritization ranking. The results include the question posed. The full survey, its results, and how these results were addressed can be found in Appendix B: Public Outreach.

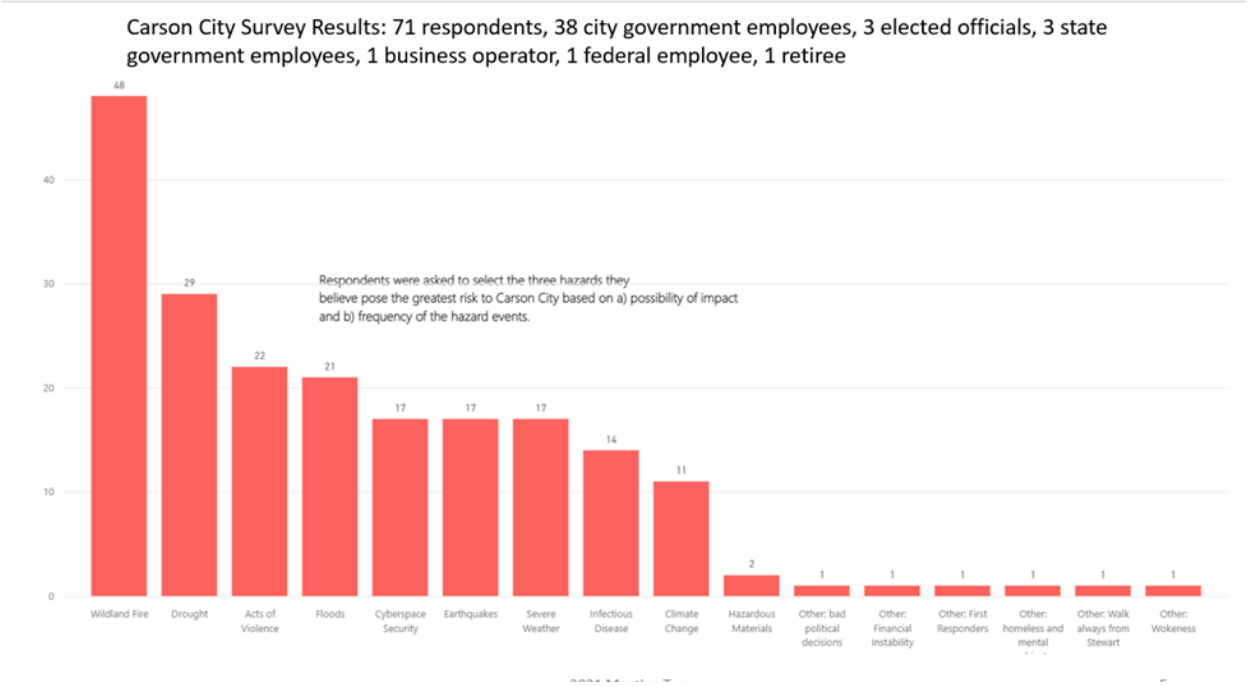

FIGURE 4-3: CARSON CITY HMP SURVEY RESULTS

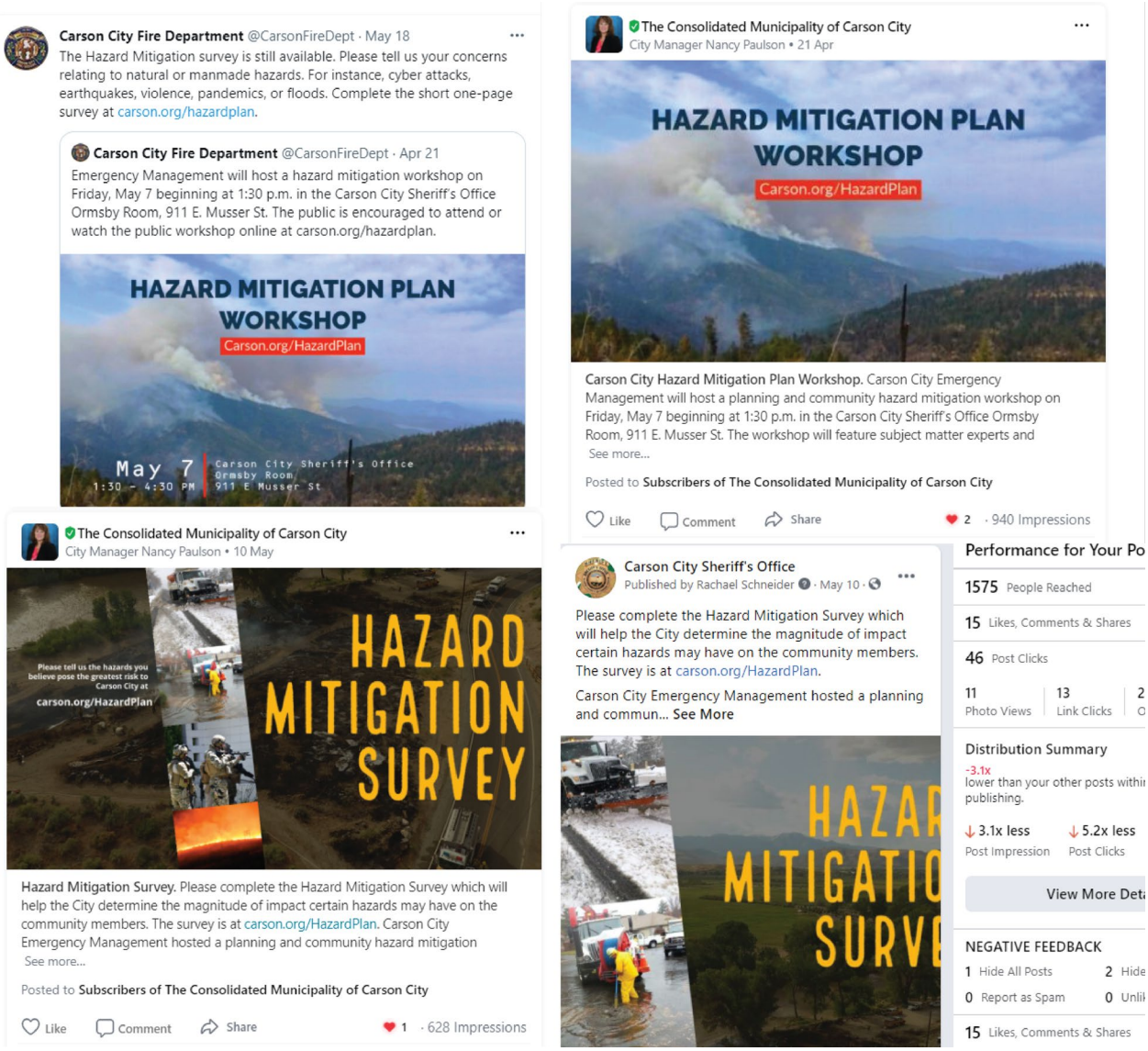

FIGURE 4-4: SNAPSHOTS FROM SOCIAL MEDIA OUTREACH

The City utilized various social media platforms to enlist public participation and feedback, with the maximum post reach ranging from 3,020 and the minimum of 653 over the cumulative of 18 postings. For inclusiveness, the HMP webpage featured an Americans with Disabilities Act (ADA) component, enabling different modes for specific needs. The HMP workshop recording had 138 viewers and featured a Closed Captioning option. The mobile friendly survey had 298 views with the 71 submissions and was hosted between May 2, 2021 and May 21, 2021. The landing site page, carson.org/hazardplan, had 905 site visitors recorded May through June.

In June, a feedback form was posted on the carson.org/hazardplan webpage to invite the public to provide comments on the process. As a result of the postings at carson.org/hazardplan, one member of the public participated virtually in the June 21 and 22 meetings and provided comments on an issue of concern—which were addressed in the meeting by Jason Danen, Deputy Emergency Manager, Hope Sullivan, Community Development Director, and Lisa Schuette member of the Board of Supervisors. The concern focused on wildfires in the Prison Hill area. City staff pointed out the mitigation actions addressing the hazard, provided information about code enforcement for off road vehicles, fire, and a point of contact with applicable information to report violations of code and concerns. Mitigation actions addressing this concern are also available under Goal 5 in the Mitigation Strategy (Section 8). No additional comments were received during PT Meetings 1 to 3.5.

The update for this HMP was initiated in April 2021 during the vaccination stage of the COVID pandemic. On May 13, the CDC issued guidance that fully-vaccinated individuals would not need to wear a mask in most locations. After May 13th, virtual access to Planning Team Meetings was available upon request. Opportunities for outreach at community events were just becoming available during the final weeks of this update. The Maintenance Plan in Section 4.6 below suggests ongoing outreach efforts for the Carson City community, including promotion at community events; however, no events were available during the remaining window.

Comments received from the survey were discussed at PT Meeting 2 for consideration during the hazard ranking review and prior to approval. Survey results were again reviewed at PT Meeting 3 for consideration in the review of mitigation actions. Comments received in meeting 3.5 were addressed satisfactorily during the discussion with the public in the meeting. The wildfire concern is covered by the mitigation actions found under Goal 5 of the strategy.

The final draft was posted at carson.org/hazardplan on July 13 for public review and comments. A press release was issued in tandem with this posting and circulated via several social media platforms, including Facebook, Next Door, and others. The press release included event details for the Public Meeting on July 22, 2021. At this event, the updated 2021 plan was presented to the public. Any public comments from this meeting as well as the method of addressing these comments will be incorporated into the Amendment described in the Executive Summary above.

4.5 Incorporation/Integration of Existing Plans and Studies.

The following table lists the requirement for integration of existing documents and studies in the update process for local hazard mitigation plans.

ELEMENT	REQUIREMENTS
A4. Does the Plan document the review and incorporation of existing plans, studies, reports, and technical information? *44 CFR 201.6(b)(3)* ***Intent**: To identify existing data and information, shared objectives, and past and ongoing activities that can help inform the mitigation plan. It also helps identify the existing capabilities and planning mechanisms to implement the mitigation strategy.*	a. The plan **must** document *what* existing plans, studies, reports, and technical information were reviewed. Examples of the types of existing sources reviewed include, but are not limited to, the statehazard mitigation plan, local comprehensive plans, hazard specific reports, and flood insurance studies. b. The plan **must** document *how* relevant information wasincorporated into the mitigation plan. ***Incorporate** means to reference or include information from otherexisting sources to form the content of the mitigation plan.*

The update process involved the review and incorporation of several plans, technical information, reports, and studies. Many of these documents are linked in footnotes throughout the plan and are also available in Section 9: References.

Each section of the previous HMP plan was reviewed for content. Revisions and updates were presented to the Planning Team (PT) for input and final approval. As noted above, all sections of the plan include a subsection titled “What Changed?” providing a synopsis of modifications.

The Planning Team did not meet over the last five years to complete maintenance tabletop exercises or compile information on plan integration, hazards, and new events. Mitigation actions were reviewed as part of this update. Section 4.6: Plan Maintenance provides strategies for supporting the ongoing process of maintaining the HMP.

4.6 Plan Maintenance: Monitoring, Evaluating, and Updating the Plan

Plan maintenance is the process the planning team establishes to track the plan’s implementation and inform the plan update. The plan must include a description of the method and schedule for monitoring, evaluating, and updating within a 5-year cycle. Plan updates also provide an opportunity to consider how well the procedures in the previously approved plan worked and to review and revise them as needed. The procedures outlined in this section are designed to support the following goals.

- Ensure that the mitigation strategy is implemented according to the plan.
- Provide the foundation for an ongoing mitigation program in your community.
- Standardize long-term monitoring of hazard-related activities.
- Integrate mitigation principles into department roles and the daily job responsibilities.

- Maintain momentum through continued engagement and accountability for the plan's progress.
- Evaluate the success of procedures established in the previously approved plan—and propose and authorize changes as needed.
- Revise the established procedures.

The Carson City Fire Department's Emergency Management Division is the lead agency in the hazard mitigation planning process. The Emergency Manager and Deputy Emergency Manager are responsible for the maintenance and timely update of the City's HMP. Together, the Carson City Emergency Manager and Deputy Emergency Manager will serve as the primary points of contact and will coordinate all local efforts to monitor, evaluate, and revise the HMP.

Ongoing support and oversight of the City's overall hazard mitigation process is provided by the Local Emergency Planning Committee (LEPC). Although the LEPC was created primarily for HazMat purposes, the LEPC now takes an all-hazards approach to coordinating strategies while ensuring compliance with federal requirements as well as sharing information related to the hazards. The LEPC meets every quarter. The Emergency Manager and Deputy Emergency Manager are responsible for these meetings. LEPC members are listed above in Section 4.2, Formation of the Planning Team.

The Carson City Hazard Mitigation Planning Team overseeing the 2021 Carson City HMP Update includes LEPC members as well as City staff with knowledge of local hazards and their impacts. In addition, regional subject matter experts—from UNR, National Weather Service, adjacent jurisdictions, and private industry—were invited to participate on the Planning Team or as Participants/Stakeholders. This extended participation brought a wide and well-rounded community to the HMP maintenance process. Section 4.2 above lists the Planning Team, Other Participants, and Stakeholders in Tables 4-1 and 4-2.

Federal requirements for the maintenance of the plan follow below.

ELEMENT	REQUIREMENTS
A5. Is there discussion on how the community(ies) will continue public participation in the plan maintenance process? *44 CFR 201.6(c)(4)(iii)* ***Intent**: To identify how the public will continue to have an opportunity to participate in the plan's maintenance and implementation over time.*	a. The plan **must** describe how the jurisdiction(s) will continue to seek public participation after the plan has been approved and during the plan's implementation, monitoring and evaluation. ***Participation** means engaged and given the chance to provide feedback.* Examples include, but are not limited to, periodic presentations on the plan's progress to elected officials, schools or other community groups, annual questionnaires or surveys, public meetings, postings on social media and interactive websites.

ELEMENT	REQUIREMENTS
A6. Is there a description of the method and schedule for keepingthe plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? *44 CFR 201.6(c)(4)(i)* ***Intent**: To establish a process for jurisdictions to track the progress of the plan's implementation. This also serves as the basis of the next plan update.*	*a.* The plan **must** identify how, when, and by whom the plan will be monitored. ***Monitoring** means tracking the implementation of theplan over time. For example, monitoring may include a system for tracking the status of the identified hazard mitigation actions.* *b.* The plan **must** identify how, when, and by whom the plan will beevaluated. ***Evaluating** means assessing the effectiveness of the plan at achieving its stated purpose and goals.* *c.* The plan **must** identify how, when, and by whom the plan will be updated. ***Updating** means reviewing and revising the plan at least once every five years.* *d.* The plan **must** include the title of the individual or name of the department/ agency responsible for leading each of these efforts.

4.6.1 Continued Public Involvement

The City is dedicated to involving the public directly in the continual reshaping and updating of the HMP. A downloadable copy of the plan and any proposed changes will be available on the Carson City Hazard Mitigation Plan page (carson.org/hazardplan) under the Emergency Management Division. This site also includes an e-mail address and phone number to which interested parties may direct their comments or concerns.

Going forward, the City will continue to promote public involvement in hazard mitigation planning throughout its website content. The Planning Team will also take advantage of opportunities to raise community awareness of the HMP and the City's hazards—for example, by tabling at community events to engage the public and distribute information. Specific committees, boards, and advisory councils, including LEPC, typically publish meeting schedules inviting public attendance and provide a point of contact for those looking for more information.

Planning Team (PT) members are directed to record public comments on the HMP—whether these comments are provided in person, by phone, via email, or other correspondence. A "Public Input Collection" form, provided in Appendix D, will be distributed to PT members to facilitate the documentation of these interactions. Conversations may occur at public meetings, community events, or the grocery store check-out line. The Emergency Manager/Deputy Emergency Manager will collect these forms annually—approximately two months prior to the annual meeting. The outcomes/comments will be presented to the PT at its annual meeting. The collected data will be included in an annual report to the City Manager and reviewed as part of the process during future HMP updates.

Additional continued public involvement is secured through compliance with the Nevada Open Meeting Law. Nevada Open Meeting Law requires governmental bodies, such as the LEPC, to physically post agendas in public buildings: one at the location of the meeting and two additional locations where the public can easily view the meeting information. The agendas are also posted on "**Nevada Public Notice**," a central website dedicated to posting of agendas for public bodies statewide.

In addition, Carson City's staffing capabilities include a full-time Community Relations Coordinator who supports public outreach and gathers input for all divisions within the City's government. The tools used for outreach include the City's website as well as social media outlets, press releases, and public surveys used to gather input from residents, businesses, visitors, and those employed in the City.

4.6.2 Monitoring, Evaluating, and Updating Process

During the life of the 2016 plan, frequent management and personnel changes within the Emergency Management Division disrupted the continuity of the maintenance process. In light of these challenges, the previous process for monitoring, evaluating, and updating the plan was revised to better support the gathering of data necessary for the next update. The revised procedure is described below.

The Planning Team will re-convene annually. The annual meeting agenda will include the following topics as outlined in FEMA Worksheet 7.2, Plan Update Evaluation Worksheet, a questionnaire designed by FEMA to facilitate the process, available in Appendix D.

1. Review **Planning Process** questions from FEMA worksheet 7.2, Plan Update Evaluation Sheet, are available in Appendix D. Review and discuss information gathered through Public Input Collection forms.

2. Discuss changes/no changes in **capabilities** for the City.

3. Review data collected such as new hazard events (Tracking Hazard Events Form available in Appendix D), new studies, or new data affecting the **risk assessment**.

4. Review reports from the Planning Team Evaluation Group (explained below in Section 4.6.2.2, Evaluating) describing the status for each mitigation strategy. Identify any necessary modifications to the current **mitigation actions,** and/or required new actions.

5. Establish whether the plan maintenance process requires modifications.

6. Determine next steps.

A proposed timeline for managing plan maintenance over the next five years is outlined below.

TABLE 4-3: PROPOSED TIMELINE FOR PLAN MAINTENANCE

Proposed Schedule	Year 1	Year 2	Year 3	Year 4	Year 5
Annual PT Meeting	~	11/2022	11/2023	11/2024	11/2024
Collect Public Input Forms*	~	9/2022	9/2023	9/2024	9/2024
Collect Mitigation Action Updates	~	9/2022	9/2023	9/2024	9/2024
Present Mitigation Action Updates	~	11/2022	11/2023	11/2024	11/2024
Present Mitigation Action Results	~	~	11/2023	11/2024	11/2024
Present Status/Results to BOS	~	01/2022	01/2023	01/2024	01/2025
Annual Report to City Manager	03/2022	03/2023	03/2024	03/2025	HMP Update
Draft RFP for 2025 Update**	~	~	06/2023	~	~
Circulate RFP**	~	~	10/2023	~	~
Initiate 2025 Update efforts	~	~	~	01/2024	~
*Present comments at annual meeting					
**These items do not apply if the City chooses to complete the update independently.					

Sections 4.6.2.1, 4.6.2.2, and 4.6.2.3 below outline specific methods for gathering the information required for plan maintenance and updates.

4.6.2.1 Monitoring: Tracking the Implementation of the Plan Over Time

Plan monitoring means tracking the implementation of the plan over time. The Planning Team Evaluation Group, which includes the parties responsible for reviewing and updating assigned mitigation actions, will track and report on the status for each action item. Worksheet 7.1, Mitigation Action Progress Report, included in Appendix D, will be distributed electronically by the Emergency Manager/Deputy Emergency Manager and collected about two months prior to the annual meeting. Monitoring, therefore, becomes part of the regular administrative function of the offices or positions to which each action is assigned.

The Emergency Management Division will track the status of each action item using the Mitigation Action Progress Report Tracking Sheet in Appendix D. Updates on the implementation of mitigation actions will be presented to the Planning Team at each annual meeting for discussion and recordation in the meeting minutes.

4.6.2.2 Evaluating: Assessing the Effectiveness of the Plan and its Achievements

To evaluate the effectiveness of each mitigation action, the Planning Team Evaluation Group will present the results of the mitigation actions completed in or prior to the previous year. The results may be measured in several ways, as appropriate for each action item, and may include analyzing data on structures, population, public awareness, and GIS data. The purpose of this presentation will be to answer the question: *How has this mitigation action increased resiliency for Carson City?*

This presentation will be included in the annual Planning Team meeting as outlined in the proposed timeline in Section 4.6.2. above. The City's Emergency Management Division (Emergency Manager or Deputy Emergency Manager) will provide the results of this evaluation to the Board annually.

4.6.2.3 Updating: The Five-Year Update Process

Updating means reviewing and revising the plan at least once every five years to reflect changes in development, progress in local mitigation efforts, and changes in priorities. The steps below present a procedure for updating the plan beginning in year four for approval before the plan expires.

1. Two to three years prior to expiration of the current plan, the Emergency Manager/Deputy Emergency Manager will submit the request for funding to update the plan.

2. If using a consultant, upon receipt of the funding, City's Emergency Manager/Deputy Emergency Manager will begin Request for Proposal process. If no consultants will be used, the Emergency Manager/Deputy Manager will proceed to Step 3.

   2.1. Evaluate proposals and ensure compliance with contractual requirements under federal guidelines.

   2.2. Award the project pending approval by the Board of Supervisors.

3. The City's Emergency Manager/Deputy Emergency Manager will lead the plan update process by compiling the following documentation provided by the Planning Team and the Planning Team Evaluation Group.

   3.1. The tracking sheets completed for each mitigation action as presented at each previous annual meeting.

   3.2. Data collected for hazard events and impacts which occurred during the lifespan of the 2021 HMP.

4. The City's Emergency Manager/Deputy Emergency Manager will initiate the Planning Team's activities needed to update the existing plan.

5. The City's Emergency Manager/Deputy Emergency Manager will ensure compliance with federal requirements, including the timely adoption of the plan by the Board of Supervisors.

The City may choose to update the plan following a disaster event. Several reasons to update the plan in the wake of a hazard event follow below.

- Additional funding sources become available.
- Public awareness and support for mitigation increases.

- Mitigation and recovery activities together may be utilized to support reduction of the same types of impacts/incidents.

Should an update be needed due to major changes in the City's priorities, vulnerabilities, or capabilities, the implementation of the update would follow steps 2 to 5 of the five-year update process described above in Section 4.6.2.3. Note that in this situation, grant funding from FEMA for the update may not be accessible.

Amendments

Amendments to an approved plan are also possible. Amendments are partial updates made to a currently approved plan. Amendments to HMPs must be reviewed and approved by the Planning Team.

5 Hazard Analysis

Hazard analysis includes the identification and screening of each hazard and subsequent profiling of each. Hazard identification is the process of recognizing the natural and manmade events that threaten an area. Natural hazards result from unexpected or uncontrollable natural events of sufficient magnitude. Manmade hazards result from human activity and include acts of violence, cyberattacks, and hazardous materials. Manmade hazards tend to occur in unpredictable locations at unpredictable times.

Even though a particular hazard may not have occurred in recent history in the study area, all hazards that may potentially affect the study area are included in the screening process. Hazards that are unlikely to occur and those for which the risk of damage is accepted as being very low, are eliminated from consideration.

5.1 What Changed?

The evaluation of each hazard was categorized according to the terms found in current FEMA requirements for ease of review. Under this template, each hazard profile addresses the following sections.

- Planning Significance
- Hazard Problem/Description
- Location and Extent
- Previous Occurrences
- Probability of Future Events
- Future Frequency of Events due to Climate Change
- Cascading Hazards
- Utility Loss

The term “human-caused” was replaced by “manmade.” Based on FEMA requirements and discussions with the Planning Team, Climate Change was added to the hazard list. “Utility Loss,” included as a hazard in the 2016 plan, will be addressed as a cascading event for each applicable hazard. Applicable cascading events will also be identified in relation to other hazards such as post wildfire erosion.

5.2 Hazard Identification and Ranking

The requirements under 44 CFR 201 regarding information about the hazards that can affect the jurisdiction are listed below.

ELEMENT	REQUIREMENTS
B1. Does the Plan include a description of the type, location,and extent of all natural hazardsthat can affect each jurisdiction? *44 CFR 201.6(c)(2)(i) and 44 CFR 201.6(c)(2)(iii)* ***Intent**: To understand the potential and chronic hazards affecting the planning area in order to identify which hazard risks are most significant and which jurisdictions orlocations are most adversely affected.*	a. The plan **must** include a description of the natural hazards that can affect the jurisdiction(s) in the planning area. *A **natural hazard** is a source of harm or difficulty created by a meteorological, environmental, or geological event (see* DHS Risk Lexicon, 2010 Edition. http://www.dhs.gov/xlibrary/assets/dhs-risk-lexicon-2010.pdf) The plan **must** address natural hazards. Manmade or human-caused hazards may be included in the document, but these are not required and will not be reviewed to meet the requirements for natural hazards. In addition, FEMA will not require the removal of this extra information prior to plan approval. b. The plan **must** provide the rationale for the omission of any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area. c. The description, or profile, **must** include information on location, extent, previous occurrences, and future probability for each hazard. Previous occurrences and future probability are addressedin sub-element B2. The information does not necessarily need to be described or presented separately for location, extent, previous occurrences, and future probability. For example, for some hazards, one map with explanatory text could provide information on location, extent, and future probability. ***Location** means the geographic areas in the planning area that areaffected by the hazard.* For many hazards, maps are the best way to illustrate location. However, location may be described in otherformats. For example, if a geographically-specific location cannot be identified for a hazard, such as tornados, the plan may state that the entire planning area is equally at risk to that hazard. ***Extent** means the strength or magnitude of the hazard*. For example, extent could be described in terms of the specific measurement of an occurrence on a scientific scale (*for example*, Enhanced Fujita Scale, Saffir-Simpson Hurricane Scale, Richter Scale, flood depth grids) and/or other hazard factors, such as duration and speed of onset. Extent is not the same as impacts, which are described in sub-element B3. d. For participating jurisdictions in a multi-jurisdictional plan, theplan **must** describe any hazards that are unique and/or varied from those affecting the overall planning area.

ELEMENT	REQUIREMENTS
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? ***44 CFR201.6(c)(2)(i)*** ***Intent****: To understand potential impacts to the community based on information on the hazard events that have occurred in the past and the likelihood they will occur in the future.*	a. The plan **must** include the history of previous hazard events for each of the identified hazards. b. The plan **must** include the probability of future events for each identified hazard. ***Probability*** *means the likelihood of the hazard occurring and may be defined in terms of general descriptors (for example, unlikely, likely, highly likely), historical frequencies, statistical probabilities (for example: 1% chance of occurrence in any given year), and/or hazard probability maps.* If general descriptors are used, then they **must** be defined in the plan. For example, "highly likely" could be defined as equals near 100% chance of occurrence next year or happens every year. c. Plan updates **must** include hazard events that have occurred sincethe last plan was developed.

All identified hazards are profiled by evaluating each according to FEMA requirements. These requirements are outlined for Elements B1 and B2 above and addressed in this Section 5.2. The hazards reviewed for this update were based on those included in the 2016 HMP and were reviewed in relation to 2010 and 2016 Carson City rankings as well as those in the 2018 Nevada Enhanced State Mitigation Plan.

At Planning Team Meeting 1, subject matter experts presented updates on the following hazards: flood, wildfire, earthquake, seiche, volcano, landslides, drought, severe weather, avalanche, infectious disease, hazardous materials, acts of violence, and cybersecurity. After the presentation, the Planning Team members present moved to add cybersecurity, a manmade hazard. Other changes approved at Meeting 1 include the addition of Climate Change and the acknowledgement of cascading hazards such as power outages and post-wildfire erosion.

Information about the hazards and their ranking found in the Nevada Enhanced State Hazard Mitigation Plan as well as those found in the Threat Identification and Risk Assessment (THIRA) were discussed for consideration in the prioritization process. Earthquake shelters for California refugees, a topic covered by the THIRA, was also discussed as a potential action item but did not move forward.

At Meeting 1, Figures 5-1, Hazard Prioritization Criteria, and 5-2, Hazard Ranking Tool, below were presented and reviewed by the Planning Team. As part of this presentation, the PT members present approved the addition of cyberattacks and climate change. Due to the extended meeting time, these forms were provided to PT members present and sent to all PT members via email for review and ranking the following week. After Meeting 2, due to staffing changes within the City, City management determined that cyberattacks would be addressed in the next update to the plan.

Guidelines for Hazard Prioritization
HAZARD PRIORITIZATION CRITERIA

Criteria	Value	Category	Description
Probability / Frequency	1	Very Low	Occurs less than once in 1000 years.
	2	Low	Occurs less than once in 100 to once in 1000 years.
	3	Medium	Occurs less than once in 10 to once in 100 years.
	4	High	Occurs less than once in 5 to once in 100 years.
	5	Very High	Occurs more frequently than once in 5 years.
Magnitude/ Severity • *Economic Impact* • *Area Affected* • *Vulnerability*	1	Very Low	• Negligible property damages (less than 5% of all buildings and infrastructure). • No deaths and injuries/illnesses treatable with first aid and do not require hospitalization. • Negligible loss of quality of life. • Economic and geographic effects are localized.
	2	Low	• Slight property damages (5% to 15%) of all buildings and infrastructure). • No deaths and few injuries/illnesses require hospitalization. • Slight loss of quality of life. • Economic and geographic effects felt at the city or community.
	3	Medium	• Moderate property damages (15% to 30% of all buildings and infrastructure). • Fewer than 5 deaths and multiple injuries/illnesses require hospitalization. • Some loss of quality of life. • Economic and geographic effects felt countywide.
	4	High	• Moderate property damages (30% to 50% of all buildings and infrastructure). • More than 5 deaths and considerable injuries/illnesses require hospitalization in multiple facilities with some resulting in permanent disability. • Moderate loss of quality of life. • Economic and geographic effects felt statewide.
	5	Very High	• Moderate property damages (30% to 50% of all buildings and infrastructure). • Significant number of deaths and injuries/illnesses requiring hospitalization in multiple facilities with some resulting in permanent disability. • Significant loss of quality of life. • Economic and geographic effects felt at the Region IX level.
Warning Time	1	Very Low	Greater than 30 days of warning
	2	Low	5-30 days of warning
	3	Medium	1-5 days of warning
	4	High	1 to 10 hours of warning
	5	Very High	No warning
Duration of Loss of Critical Facilities and Services	1	Very Low	1 to 3 days
	2	Low	4 to 7 days
	3	Medium	8 to 14 days
	4	High	15 to 20 days
	5	Very High	More than 20 days
Frequency in the Future	1	Very Low	Highly unlikely to increase probability of this hazard
	2	Low	Unlikely to increase probability of this hazard
	3	Medium	Could increase probability of this hazard
	4	High	Likely to increase probability of this hazard
	5	Very High	Highly likely to increase probability of this hazard

Carson City Hazard Mitigation Plan Update 2021 – Ranking Criteria

FIGURE 5-1: CRITERIA FOR THE PRIORITIZATION OF HAZARDS

CARSON CITY, NEVADA
Hazard Ranking Tool

Name: _____ Date: _____

Agency: _____ Specialty: _____

Hazard Type*	Probability / Frequency	Magnitude / Severity	Warning Time	Duration of loss of critical facilities & services	Risk Update >, <, =	Total
Acts of Violence						
Avalanche						
Climate Change						
Drought						
Earthquake						
Flood						
Hazardous materials event						
Infectious Disease						
Landslide						
Severe Weather: Storms, dry lightning, extreme heat, high wind						
Wildland Fire						
Volcano						
Cyberattack						

* Cascading effects such as utility loss, seiche, and other impacts will be discussed under primary hazards as appropriate.

FIGURE 5-2: HAZARD RANKING TOOL

Twenty-six ranking forms were submitted. These results were tallied and averaged to determine the overall ranking for each hazard using the criteria in F. The results of the exercise can be found in Table 5-1, Hazard Ranking, below. The table lists the hazards by their score from highest to lowest and identifies the planning significance for each of hazard as High, Moderate, or Low.

TABLE 5-1: PLANNING SIGNIFICANCE OF HAZARDS (HAZARD RANKING)

HAZARD RANKING
2021 Carson City HMP Update

HAZARD RANKING RESULTS	Total	Planning Significance
Earthquake	19	High
Wildfire	19	
Flood	16	
Severe Weather	16	
Acts of Violence	16	
Infectious Disease	15	Moderate
Drought	14	
Hazardous Materials	14	
Climate Change	13	
Landslides	12	
Avalanche	10	Low
Volcano	10	

5.2.1 Hazard Profiles

The specific hazards profiled in this HMP Update are organized in alphabetical order and have been examined in a methodical manner based on the criteria listed below. Most of the language in the 2016 hazard profiles remains valid. Statistical data and previous occurrences of hazard events were updated accordingly. New sections noted in "What's New" above, including Future Frequency of Events Due to Climate Change and Cascading Hazards, required new data. Also new is the addition of the means of measuring the strength or magnitude of each hazard under the Location and Extent section of the profile.

- **Planning Significance:** Carson City's Planning Team evaluated the impact of specific hazards. Thirteen hazards were discussed and presented for the Team to consider the risk it poses to the community. The "Planning Significance" for each hazard is provided in this section.

- **Hazard Problem/Description:** This section provides a definition and/or description of the hazard and its primary impacts. In this HMP, secondary, or cascading impacts, are described in a separate section. See "Cascading Hazards" below.

- **Location and Extent:** Under this heading, the profile provides a description and/or map identifying the areas impacted by the hazard as well as the criteria used to determine the extent of the hazard (where relevant).

- **Previous Occurrences**: This section includes information about previous events, including impacts and location (when available). Previous occurrences may include disaster declarations, if applicable, and previous occurrences as identified by the Subject Matter Expert for the hazard and other City representatives as well as online resources such as NOAA and FEMA.

- **Probability of Future Events:** Using information gathered and presented in the sections described above, the probability of the hazard event occurring is identified as very low, low, medium, high, or very high. Table 5-2 provides the definition for each ranking category from very low to very high.

TABLE 5-2: DESCRIPTION OF CATEGORIES FOR PROBABILITY OF FUTURE EVENTS

Probability	Description
Very Low	Occurs less than once in 1000 years
Low	Occurs less than once in 100 years
Medium	Occurs less than once in 10 to once in 100 years
High	Occurs less than once in 5 to once in 10 years
Very High	Occurs more frequently than once in 5 years

- **Future Frequency of Events due to Climate Change:** Table 5-3 defines the categories used to identify the probability of future frequency due to climate change for the profiled hazard. Each profile addresses climate change as a potential factor impacting the severity and frequency of applicable natural hazards.

TABLE 5-3: ROLE OF CLIMATE CHANGE IN THE FUTURE FREQUENCY OF EVENTS

Increased Frequency	Description
Very Low	Climate change highly unlikely to increase probability of this hazard
Low	Climate change unlikely to increase probability of this hazard
Medium	Climate change could increase probability of this hazard
High	Climate change likely to increase probability of this hazard

- **Cascading Hazards:** This section discusses possible secondary indirect effects of the hazard including, but not limited to, NV Energy's Public Safety Outage Management Program, wildfire-related erosion, and seiche (earthquake).

5.2.2 Acts of Violence

5.2.2.1 Planning Significance – High

5.2.2.2 Hazard/Problem Description

The Carson City Sheriff's Office has identified three types of Acts of Violence: Terrorism, Civil disorder, including riotous behavior; and Criminal Acts Involving Mass Casualties, as described below.

5.2.2.2.1 TERRORISM

The Department of Justice (DOJ) Federal Bureau of Investigation (FBI) defines terrorism as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (28 C.F.R. Section 0.85). The FBI further describes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. For the purpose of this Section, the FBI uses the following definitions.

- **Domestic Terrorism.** The unlawful use, or threatened use, of force or violence by a group or individual based and operating entirely within the United States or Puerto Rico without foreign direction committed against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof in furtherance of political or social objectives.
- **International Terrorism.** Violent acts or acts dangerous to human life that are a violation of the criminal laws of the United States or any state, or that would be a

criminal violation if committed within the jurisdiction of the United States or any state. These acts appear to be intended to intimidate or coerce a civilian population, influence the policy of a government by intimidation or coercion, or affect the conduct of a government by assassination or kidnapping. International terrorist acts occur outside the United States or transcend national boundaries in terms of the means by which they are accomplished, the persons they appear intended to coerce or intimidate, or the locale in which their perpetrators operate or seek asylum.

- **Weapons of Mass Destruction (WMD)** include from nuclear, biological and chemical weapons threatening/causing widespread death and destruction. Technological terrorism is defined as the intentional disruption in the nation's data control systems. Attacks on financial, business, and governmental computer networks are being considered as technological terrorist-related acts.

5.2.2.2.2 CIVIL DISORDER/RIOTOUS BEHAVIOR

When confronted with civil disorder, the Carson City Sheriff's office relies on Policy 468 First Amendment Assemblies to guide their response to and management of public activism.

Individuals or groups present on the public way, such as public facilities, streets or walkways, generally have the right to assemble, rally, demonstrate, protest or otherwise express their views and opinions through varying forms of communication, including the distribution of printed matter. These rights may be limited by laws and ordinances regulating such matters as the obstruction of individual or vehicle access or egress, trespass, noise, picketing, distribution of handbills and leafleting, and loitering. Participant behavior during a demonstration or other public assembly can vary. These may include but are not limited to:

- *Lawful, constitutionally protected actions and speech;*
- *Civil disobedience (typically involving minor criminal acts) and;*
- *Rioting.*

All of these behaviors may be present during the same event. The purpose of a law enforcement presence at the scene of public assemblies and demonstrations should be to preserve the peace, to protect life and prevent the destruction of property.

Civil Disorder/Riotous Behavior. A behavior that refers to a situation where groups intentionally choose not to observe the law. Civil disorder/riotous behavior can be further defined by the following three categories:

- Civil Disobedience. The refusal to obey civil laws in an effort to affect change in governmental policy or legislation.
- Civil Disturbance. Group acts of violence and disorder prejudicial to public law and order.

- Rioting. A violent disturbance of the public peace by a statutorily defined number of people assembled for a common purpose.

While peaceful protests—often initiated to bring attention to an issue, cause, or agenda—are protected, those protests that evolve into civil disobedience, civil disturbance, and/or rioting, are criminal.

Civil disorder may also be defined as random acts of violence by three or more persons with the potential to injure people or damage property, which does not meet the definition of a terrorist act. Civil disorder can take the form of small or large groups that block or impede access to a building or disrupt normal activities by generating noise and intimidating people. These demonstrations may include both peaceful sit-ins (that block or impede access) and/or a full-scale riot in which a group destroys property and disregards or retaliates against law enforcement response. Civil disorder varies widely in size and scope.

Impacts may be significant. For example, in 2021, numerous demonstrations at the State Capitol in Carson City required an expanded presence of emergency personnel and law enforcement. This coverage was obtained at a cost—that impacted budgets for these specific departments and the City.

5.2.2.2.3 CRIMINAL ACTS

Criminal Acts include intentional acts against the public including mass casualty incidents and workplace violence. When mass causality incidents occur, emergency management teams are called upon to assist and mitigate the impact to the city. There have been several incidents in Carson City in the last decade. Criminal acts can be random in nature or preplanned and perpetrated by individuals or groups.

5.2.2.3 Location and Extent

Acts of violence are likely to occur in populated areas or places where people gather. Sporting events and public facilities such as the State Capital and legislative buildings, county courthouses, and correctional facilities are specific locations where civil disorder may occur. Criminal acts of violence also occur in the workplace—including but not limited to schools, hospitals, restaurants, and casinos. Overall, public locations of all kinds are vulnerable to acts of violence.

For Carson City, a worst-case scenario involving civil disorder or criminal acts events may require support from Quad County. If the emergency escalates, state level support would respond to the incident. These events can impact critical facilities and disrupt services for one to three or more days—creating citywide economic impacts. Typical civil disorder and criminal acts events are handled at the city level, disrupt services for less than one day, and are limited to economic impacts affecting the immediate community or part of the city involved.

All areas of Carson City are potentially susceptible to the impacts of terrorism, though the risk is comparatively higher for the State Capitol Building, Supreme Court Building, and Legislative Building. During those years when the Legislature is in session, the city tends to see a higher number of protests. Other targets may include the State Computer Center, Carson City Airport, the Nevada State Military facilities in and around the Capital City and the downtown corridor. Special events (drawing 5,000 to 40,000 individuals per day), the above-ground fuel tank farm, and the sewage plants are also susceptible to terrorist attacks.

The National Terrorism Advisory System Bulletin provides an updated "Summary of Terrorism Threat to the U.S. Homeland" approximately four times per year. At this time, a means of measuring the extent of acts of terrorism has not been identified. The potential extent of these acts are suggested by the previous occurrences discussed in the following section.

5.2.2.4 Previous Occurrences

5.2.2.4.1 TERRORISM

The information in the table below is a compilation of occurrences provided by the Carson City Sheriff's Office.

TABLE 5-4: TERRORISM PREVIOUS OCCURRENCES

TERRORISM PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Event**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
2021	FBI Statement: "Domestic violent extremism poses an 'Elevated Threat'. Targets include critical infrastructure, government buildings, military installations, with soft targets being hospitals and casinos."	Warning – no impact

5.2.2.4.2 CIVIL UNREST, DISOBEDIENCE, AND DISTURBANCE

The information in the table below is a compilation of occurrences provided by the Carson City Sheriff's Office.

TABLE 5-5: CIVIL UNREST, DISOBEDIENCE, AND DISTURBANCE PREVIOUS OCCURRENCES

CIVIL UNREST, DISOBEDIENCE, AND DISTURBANCE		
Date/ Month/ Season	**Event**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
January 6, 2021	Protest/Rally in front of capitol building	
April to November 2020	Weekly City-wide protests	Numerous calls for minor disturbances were reported. Disruptions to traffic flows and businesses occurred. The majority of citations and arrests were traffic related. Tolerant rather than enforcement and negligent discharge resulting in criminal charges. No damage or injuries were reported.
March 11, 2015	Immigration protest in front of capitol blocking traffic. More than 100 people peacefully demonstrated Wednesday in front of the Nevada State Capitol Building in Carson City, Nevada protesting immigration issues, and specifically Nevada Attorney General Adam Laxalt's decision to join a lawsuit with 24 states challenging executive actions by President Barack Obama on immigration.	The demonstrators came from throughout the state of Nevada make their plea to keep Nevada families together. The demonstration was organized by the Las Vegas Culinary Union and the Progressive Leadership Alliance of Nevada. Motorists, however, were not happy about the protest disrupting traffic through Carson Street past the capitol during lunch hour. The protest was peaceful, and no arrests were made. Carson City Sheriff's Office and Capitol Police allowed the demonstrators to protest. Due to the number of people arriving from around the state to Carson City, traffic was diverted around Carson Street to allow for the demonstration, which moved northbound through downtown

5.2.2.4.3 CRIMINAL ACTS

The information in the table below is a compilation of occurrences provided by the Carson City Sheriff's Office

TABLE 5-6: CRIMINAL ACTS PREVIOUS OCCURRENCES

CRIMINAL ACTS PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Event**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
2021	FBI Statement: "Domestic violent extremism poses an 'Elevated Threat'. Targets include critical infrastructure, government buildings, military installations, with soft targets being hospitals and casinos."	Warning – no impact
Sept 6, 2011	IHOP: International House of Pancakes shooting incident in Carson City.	On Sept. 6, 2011, Nevada Guardsmen Lt. Col. Heath Kelly, 35, Master Sgt. Christian Riege, 38, Sgt. 1st Class Miranda McElhiney, 31, and South Tahoe resident Florence Donovan-Gunderson, 67, were killed during an incident. Two other Soldiers and seven other patrons suffered injuries during the shooting rampage.

5.2.2.5 Probability of Future Events

Based on the recent increase in acts of terrorism around the country—as well as the variety of forms these events can take, the overall probability of future Acts of Violence is High, less than once in five to ten years.

5.2.2.5.1 TERRORISM

The Summary of Terrorism Threats to the U.S. Homeland issued by the National Terrorism Advisory System on May 14, 2021 follows below.[54]

> *The Secretary of Homeland Security has issued a new National Terrorism Advisory System (NTAS) Bulletin regarding the current heightened threat environment across the United States. The Homeland is facing threats that have evolved significantly and become increasingly complex and volatile in 2021. These threats include those posed by domestic terrorists, individuals and groups engaged in grievance-based violence, and those inspired or influenced by foreign terrorists and other malign foreign influences. Social*

[54] "Summary of Terrorism Threat to the U.S. Homeland," National Terrorism Advisory System Bulletin, May 14, 2021, accessed June 1, 2021, **https://www.dhs.gov/sites/default/files/ntas/alerts/21_0514_ntas_bulletin_all-sectors.pdf**.

> *media and online forums are increasingly exploited by these actors to influence and spread violent extremist narratives and activity. Such threats also are exacerbated by the impacts from the ongoing global pandemic.*

Based on this summary of the current threat level, the risk of acts of terrorism in the United States remains **very high** for the foreseeable future.

5.2.2.5.2 CIVIL DISORDER & CRIMINAL ACTS

Based on the frequency of contributing factors to civil disorder and criminal acts, such as the increase in mental health issues, drug use, as well as the current political environment, the probability of future occurrence is considered **very high** with an estimated occurrence of one incident every five years.

5.2.2.5.3 CRIMINAL ACTS

The Summary of Terrorism Threats to the U.S. Homeland issued by the National Terrorism Advisory System and referenced in Section 5.2.2.5.1 above includes language that applies to criminal acts: "*These threats include those posed by domestic terrorists, individuals and groups engaged in grievance-based violence [. . .]."* In light of this advisory, the probability of criminal acts occurring is considered **very high.**

5.2.2.6 Future Frequency of Events Due to Climate Change

The following excerpt from the National Institute for Health's National Center for Biotechnology Information (NCBI) reached the following conclusion in a study completed in St. Louis, MO.[55]

> *The current study examines the relation between climate change and levels of violence in different groups of neighborhoods. Using data from St. Louis, MO, USA, the findings indicate that climate change is likely having a greater impact on levels of violence in disadvantaged communities than levels of violence in more affluent communities. After controlling for confounding factors, the most disadvantaged group of communities in St. Louis typically experience an average 1% monthly increase in violent crimes for each degree increase in anomalous temperatures. In fact, results show that the 20% of most disadvantaged neighborhoods are predicted to absorb over 50% of climate change-related increases in violence. On the other hand, the least disadvantaged neighborhoods in the study display no significant correlation between violence and temperature anomalies. Combined, these results suggest that those already at higher risk for a plethora of health issues connected to climate change are also likely to experience higher levels of violent victimization.*

[55] Dennis Mares, "Climate Change and Levels of Violence in Socially Disadvantaged Neighborhood Groups," *J Urban Health,* 2013 August, 90(4): 768-783, accessed June 3, 2021, **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3732690/**.

Based on the above findings, the probability of increased frequency of acts of violence due to climate change is **medium**, less than once in 10 to once in 100 years.

5.2.2.7 Cascading Hazards

The 2016 iteration of this plan states that the impacts of violent acts pose a short and long-term impact to the public. These impacts include social and economic losses.[56]

- **Social losses**: the loss of human life, disruption to quality of life, untold psychological trauma, harm to the community's reputation.
- **Economic losses**: business disruption, traffic issues, increased cost of investigation/prosecution, higher insurance rates, lower property values, higher prices for goods and services, reduced tax revenue, and decreased economic opportunity.

5.2.2.8 Utility Loss

No scientific data was found to determine the impact of acts of violence on utilities. Utilities may become a direct target for acts of violence—or a cascading effect of an act of terrorism, particularly one instigated by weapons of mass destruction.

5.2.3 Avalanche

5.2.3.1 Planning Significance – Low

5.2.3.2 Hazard/Problem Description

An avalanche is a mass of snow sliding down a mountainside. An avalanche occurs when gravitational pull exceeds the bonding strength of the snow cover. There are four factors that contribute to an avalanche: a steep slope, a snow cover, a weak layer in the snow cover, and a trigger. About 90 percent of all avalanches start on slopes of 30 to 45 degrees; about 98 percent of all avalanches occur on slopes of 25 to 50 degrees. Avalanches release most often on slopes above the timberline, such as gullies, roads cuts, and small openings in the trees. Avalanches can also occur on small slopes well below timberline, such as gullies, road cuts, and small openings in the trees. Very dense trees can anchor the snow to steep slopes and prevent avalanches from starting; however, avalanches can release and travel through a moderately dense forest.

The vast majority of avalanches occur during and shortly after winter storms, during the winter and spring months between January and April. The most avalanche-prone months are in order,

[56] Jerome Tushbant, "Carson City Hazard Mitigation Plan: Acts of Violence," Presentation to Planning Team, May 7, 2021.

February, March, and January. The avalanche danger increases with major snowstorms and periods of thaw. Duration of avalanche impacts is generally one to three days or less.

According to an article in South Lake Tahoe Now, "Snow avalanches kill more people in National Forests than any other natural hazard."[57]

5.2.3.3 Location and Extent

The western section of Carson City lies within the higher altitudes of the Sierra Nevada Mountains and near Lake Tahoe. As of 2021, no residential, City government, or commercial structures are located within these avalanche areas. However, Nevada State Route Highway 28 as well as electrical and sewer utilities along the road are potentially subject to the impacts of an avalanche in this area. The existing structures are a park and a historical site. Both structures are property of the State of Nevada.

Figure 5-3, Region of Elevated Avalanche Danger, illustrates the potential danger along the westernmost boundary of the City.[58] Note that "yellow" indicates a "moderate" risk of avalanche.

The extent of an avalanche is generally measured by estimate(s) from past events: Cubic yards of earth moved (could be millions); area shifted/how far it shifted – e.g. "landslide could be 1000 yards of hillside moving 200 feet."[59]

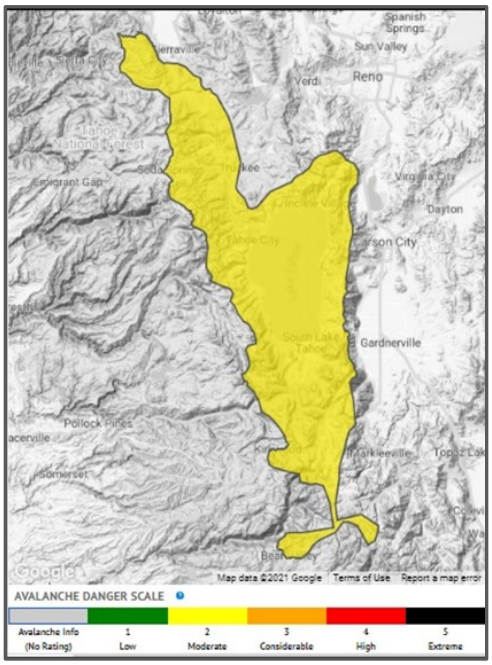

FIGURE 5-3: REGION OF ELEVATED AVALANCHE DANGER (INCLUDES WESTERN PORTION OF CARSON CITY)

As noted below, there have been no reports of avalanche to the National Weather Service since 2015 for Carson City. Currently, avalanche warnings are conducted by the Sierra Avalanche Center for the back country areas of Lake Tahoe which include Carson City's jurisdiction in the region. A sample avalanche warning issued on January 28, 2021 by the Sierra Avalanche Center follows below.[60]

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[57] Paula, Peterson, "Know the snow before you go," *South Tahoe Now,* February 17, 2021, accessed June 3, 2021, **http://southtahoenow.com/story/02/17/2021/know-snow-you-go-elevated-danger-backcountry-avalanches-around-lake-tahoe**.

[58] Peterson, Paula,

[59] "Avalanche," *Extent Examples by Hazard*, FEMA-provided document.

[60] Chris Smallcomb, "Avalanche," Presentation, May 7, 2021.

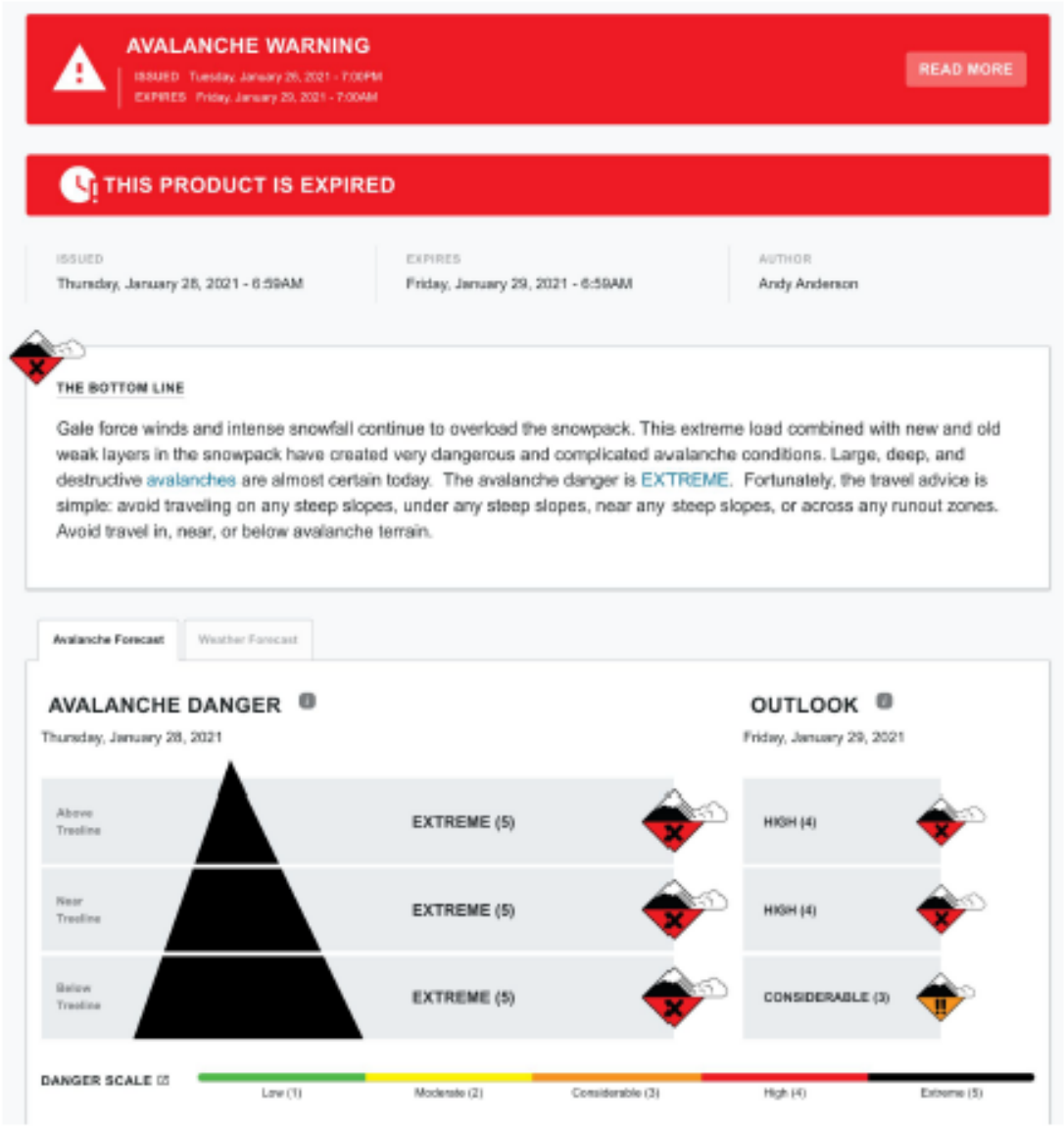


FIGURE 5-4: SAMPLE AVALANCHE WARNING FROM THE SIERRA AVALANCHE CENTER

5.2.3.4 Previous Occurrences

No reports of avalanche have been identified by the National Weather Service since 2015 for Carson City. Due to the potential of such occurrences in the Lake Tahoe area of Carson City and

sloping areas that may be prone to an avalanche event, avalanche has the potential to impact the community.

5.2.3.5 Probability of Future Events

Due to the lack of previous occurrences of avalanches in the City, the probability of future avalanches is **low**, occurring less than once in 100 years.

5.2.3.6 Future Frequency of Events Due to Climate Change

An article on the National Oceanic and Atmospheric Administration's (NOAA) website explains the impact of climate change on the snowpack of the Sierra Nevada. Carson City's jurisdiction is within the North Eastern section of the Sierra Nevada.[61]

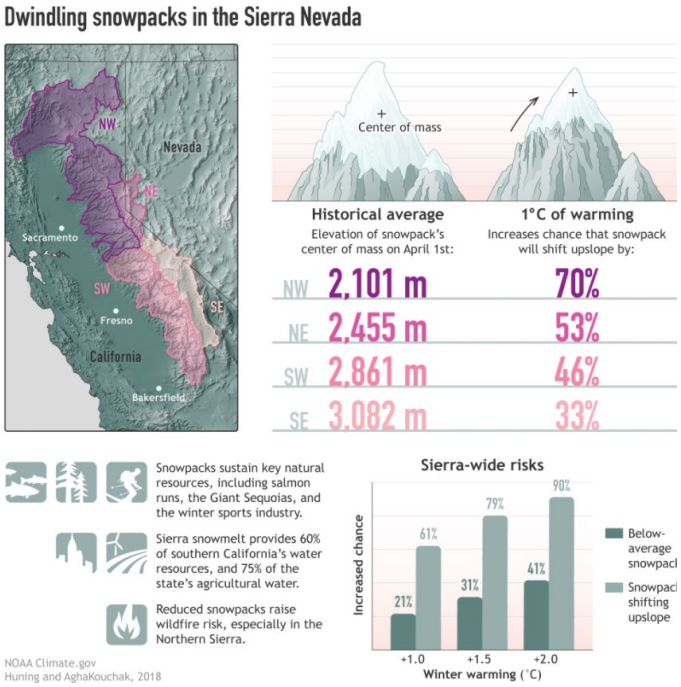


FIGURE 5-5: CLIMATE CHANGE RESULTS IN DWINDLING SNOWPACK

Across the Sierra Nevada, increases in average temperature bring greater risks of both below-average snowpack and snowpack shifts upslope. The graph in Figure 5-5 compares the risks for a temperature increase of 1°C (1.8°F), 1.5°C (2.7°F), and 2.0°C (3.6°F) over the entire mountain range. With 1.5°C of winter warming, the odds that a given year's snowpack will be below average increase by more than 30 percent. With 2.0°C of winter warming, the odds of below-average snowpack rise by more than 40%. These sorts of changes in Sierra snowpack will likely have profound—and expensive—impacts on everything from salmon runs to ski resorts and regional fire risk.

[61] Michon Scott, "Warming winters and dwindling Sierra Nevada snowpack will squeeze water resources in parts of California," NOAA, Climate.gov, December 19, 2018, accessed June 3, 2021, **https://www.climate.gov/news-features/featured-images/warming-winters-and-dwindling-sierra-nevada-snowpack-will-squeeze**.

Because climate change is trending toward lower-than-average snowpacks, the probability of increased frequency of avalanches due to climate change is **low**: climate change is unlikely to increase the probability of avalanches.

5.2.3.7 Cascading Hazards

An avalanche in the planning area has the potential to impact transportation, communication, water, and energy lifelines. Loss of life is possible for passengers traveling in vehicles impacted by an avalanche.

5.2.3.8 Utility Loss

An avalanche in this area of Carson City has the potential to damage sewer lines along the road (Hwy 28), and electric power lines in the area causing the loss of service to residents of Lake Tahoe and some in Carson City.

5.2.4 Climate Change

5.2.4.1 Planning Significance - Moderate

5.2.4.2 Hazard/Problem Description

The following definition and discussion of climate change comes from the National Aeronautics and Space Administration (NASA) website.[62]

> *Climate change is a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates. These changes have a broad range of observed effects that are synonymous with the term.*
>
> *Changes observed in Earth's climate since the early 20th century are primarily driven by human activities, particularly fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere, raising Earth's average surface temperature. These human-produced temperature increases are commonly referred to as global warming. Natural processes can also contribute to climate change, including internal variability (e.g., cyclical ocean patterns like El Niño, La Niña and the Pacific Decadal Oscillation) and external forcings (e.g., volcanic activity, changes in the Sun's energy output, variations in Earth's orbit).*

[62] Holly Shaftel, Site Editor, "Overview: Weather, Global Warming and Climate Change," "What is Climate Change?" accessed June 3, 2021. **https://climate.nasa.gov/resources/global-warming-vs-climate-change/**.

Scientists use observations from the ground, air and space, along with theoretical models, to monitor and study past, present and future climate change. Climate data records provide evidence of climate change key indicators, such as global land and ocean temperature increases; rising sea levels; ice loss at Earth's poles and in mountain glaciers; frequency and severity changes in extreme weather such as hurricanes, heatwaves, wildfires, droughts, floods and precipitation; and cloud and vegetation cover changes, to name but a few.

5.2.4.3 Location and Extent

All of the planning area is at risk of the effects of climate change.

While no previous occurrences (such as extreme weather events) within Carson City have been officially identified as resulting from climate change, the Fourth National Climate Assessment completed in 2018 by the National Climate Assessment (NCA) identifies multiple measures for evaluating changes in the planet's climate. These methods identify worldwide trends—including changes in carbon dioxide, average surface temperature, rising sea-levels, acidifying oceans, loss of ice sheets, and an increase of extreme weather events –that are impacting populations on a local level.

The Climate Change Committee, a UK-based established to advise the country on reducing, preparing for, and adapting to the impacts of climate change, provides the following means of measuring the extent of climate change.[63] These methods measure changes in the air, the ground, the ocean, and space, as described in the *excerpts* below.[64]

- **Atmospheric carbon dioxide**
  Scientists have maintained a long-running observational record of the levels of carbon dioxide in the atmosphere since the late 1950s. Over this period atmospheric concentrations have increased from around 280 parts per million (ppm) to over 410 ppm today. Since the pre-industrial period atmospheric CO2 is estimated to have increased by nearly 50%. Evidence indicates that the combustion of fossil fuels and human alterations to the planet's land surface explain all of this increase.

  The present atmospheric CO2 concentration is expected to be the highest in at least 800 thousand years and is increasing at what is likely an unprecedented rate. The atmospheric concentrations of other heat-trapping heats have also increased alongside CO2. Concentrations of methane and nitrous oxide, the two largest contributors to

[63] "About," Climate Change Committee, accessed May 30, 2021, **https://www.theccc.org.uk/about/**.

[64] "Measuring a warming world," *What is Climate Change?* Climate Change Committee, accessed May 30, 2021, **https://www.theccc.org.uk/what-is-climate-change/measuring-a-warming-world-2/**.

anthropogenic forcing on the climate system after CO2, have increased by around 60% and 25% since their respective pre-industrial levels.

- **Global average surface temperature**
  Climate change is most commonly measured using the average surface temperature of the planet. Measurements of near-surface air temperature from weather stations can be combined with measurements of ocean surface temperature from ships and buoys to create a record of the planet's surface temperature going back to the mid-19th century.

  Different estimates from the UK Met Office, NASA, NOAA and Berkeley Earth all show a rising trend in average global surface temperature over the last century despite using slightly different methodologies. Looking across datasets, the IPCC concluded that the average of the 2006-2015 decade was around 0.87°C (0.75°C to 0.99°C) above the average of the second half of the 19th century (an approximation for pre-industrial levels).

  Year-on-year, natural fluctuations can be seen on top of this long-term warming. For this reason, scientists traditionally use a period of at least 30 years to identify a genuine climate trend.

- **Rising sea-levels and acidifying oceans**
  More than 90% of the additional energy trapped in the climate system by raised greenhouse gas concentrations ends up in the oceans, contributing, along with melting ice on land, to rising global sea level. Recent observations indicate an increase in the rate of global sea-level rise since 1990. Sea levels around the UK are rising at a rate of around 1.4 mm per year.

  The oceans have absorbed about 25% of the cumulative CO2 emissions into the atmosphere since the mid-19th century, increasing the acidity of the oceans. This has led to a decrease in ocean pH of around 0.1 since the pre-industrial period, around a 25% increase in acidity, which can affect the ability of coral organisms to build shells creating knock-on effects on whole marine ecosystems.

- **Changing cryosphere**
  Satellite-based observations of Arctic sea-ice extent show a downward trend in all months of the year. September Arctic sea-ice extent (the month with the lowest ice extent of the year) has decreased by approximately 13% per decade since 1979. The ice in the Arctic has become both thinner and younger, with the fraction of Arctic sea-ice area that is more that 5-years old has decreased by 90% over the same period.

  On land, the Greenland and Antarctic ice sheets have lost mass, contributing to observed global sea-level rise. Glaciers have shrunk, and areas of permafrost (ground that remains permanently frozen – which generally contain very large stores of carbon) have warmed to reach record high temperature.

- **Extreme weather events**
  Across the globe land area as a whole there has been a measured overall decrease in the number of cold days and nights and overall increase in the number of warm days and nights. More areas with increases than decreases in the frequency, intensity and/or amount of heavy rainfall. Large parts of Europe, Asia and Australia and for the globe as a whole have seen detectable increases the in frequency or length of warm spells.

5.2.4.4 Previous Occurrences

No previous occurrences (such as extreme weather events) within Carson City have been officially identified as resulting from climate change.

5.2.4.5 Probability of Future Events

Based on the trends identified under "Location and Extent" above, the probability of future changes in the earth's climate is **very high**.

5.2.4.6 Future Frequency of Events Due to Climate Change

Scientific data on climate change effects on climate change was not identified through research. The future frequency of events for this hazard is unknown.

5.2.4.7 Cascading Hazards

As suggested in Section 5.2.4.5 above, climate change may trigger new hazards. Rising acidity in the ocean, for example, may threaten the population of fish—a significant resource.

The effects of climate change on other natural hazards are discussed in the individual and applicable hazard profile. These discussions take place within the section "Future Frequency of Events Due to Climate Change," and if applicable, Cascading Hazards.

The information below provides climate change data from the Nevada Climate Initiative.[65]

[65] "Climate Impacts in Nevada," Table 1, Nevada's Climate Strategy, accessed June 6, 2021, **https://climateaction.nv.gov/policies/climate-nv/**.

	Heat & Heat Waves	Drought	Loss of Snow	Floods	Wildfire Risk
			CLIMATE SCIENCE		
Historical Trends	Increasing temp; Rates of increase are higher in urban areas than rural areas	Increasing evaporative demand; More drought that not in last 10 years	Decrease between 20-60% from 1955-2016	No historical trends; Most recent flooding events are 2017 and 2006	Between 1984-2017, 4 of the 5 years with the largest area burned have occurred since 2005.
Projected Trend & Confidence	Increase in average temp; Increase in frequency and severity of heat waves ***HIGH Confidence***	Increase in frequency and intensity ***Confident***	By the end of this century, projections indicate a potential 30-50% reduction in April snowpacks,; Earlier snow melt ***HIGH Confidence***	More frequent flooding; ***Confident***	Increase of invasive species, increasing fire spread; Increase drying of fuels; Increase precipitation variability affecting fuel production ***HIGH Confidence***
			IMPACTS		
Public Health	Increased risk of mortality and morbidity; Increase in preterm births	Potential for mental health impacts; Increased dust due to drying and lowered water levels in desert terminal lakes	Greater change of flooding and associated safety risks	Greater risks to public safety, private property, and infrastructure	Wildfire smoke decrease air quality; Increase in respiratory illness; Increases in hospitalizations and emergency room visits
Water Resources	Degradation of water quality; Increased water loss due to higher evaporative demand	Increase in demand and decrease in supply, limiting water availability for all sectors	Loss of a natural reservoir, reduced water storage; More growing days increasing water demand	Decrease in water quality; May limit the ability to capture rainwater for water supply (i.e., too much, too fast)	Potential erosion leading to changes in biogeochemical cycling and water quality
Environment	Species' ranges will shift; Some local extinctions; Negative impacts on wildlife health including higher mortality	Drought impacts to plant health and growth; Potential for plant mortality	Less and earlier-in-the-year availability of surface water and ground water limiting the bioavailablity of water	Increased sheet and river bank erosion affecting Riparian habitats	More cheatgrass, loss of native sagebrush further increasing wildfire risk; Loss of forested areas will impact erosion and sedimentation into watersheds; Negatively impacts wildlife species
Recreation & Hospitality	Decrease in time available to be safely outside; Deterrent to attracting visitors	Partial loss of recreational opportunities due to limited snow pack; Dust to negatively impact tourism	Partial loss of recreational opportunities due to decline of snow pack	Flooding impacts in downtown areas of Reno and Las Vegas; Road closures due to flood and landslide risk following wildfire	Increased fire risk and smoke may lead to loss of tourism and recreation during fire season
Ag and Ranching	Health impacts of being outdoors during heat waves; Heat impacts to livestock health and milk production; Longer growing seasons and new crop varieties; Impacts to plant health and crop production; Delayed or reduced production from adapting to shifting seasons and crop performance	Potential decrease on crop yield and production; Decreased forage quantity, range condition; Water hauling needs; Reduction in use of federal land; Increased need of feeding hay; Reduction in land available for production	Earlier and longer duration of irrigation needs due to decrease in run-off later in the season; Reduced irrigation capacity due to lack of water availability; Reduction in rangeland production	Increase erosion and soil loss; Potential crop loss/damage; Damage to water holding and confinement structures; Microbial contamination of crops	Direct livestock losses; Potential impact on forage production due to wildfire-induced changes in vegetation cover including noxious weeds; Crop and forage loss; Federal land permits closed or temporally closed due to fire; Loss of infrastructure

FIGURE 5-6: PROJECTED IMPACTS IN NEVADA FROM CLIMATE CHANGE

5.2.4.8 Utility Loss

Rising temperatures, generally attributed to climate change, may lead to greater dependence on energy during extreme heat events. These events can strain distribution systems and often occur during seasons associated with high fire risk.

5.2.5 Drought

5.2.5.1 Planning Significance - Moderate

5.2.5.2 Hazard/Problem Description

Drought is a normal, recurrent feature of virtually all climatic zones, including areas of both high and low rainfall, although characteristics will vary significantly from one region to another. Erroneously, many consider it a rare and random event. It differs from normal aridity, which is a permanent feature of the climate in areas of low rainfall. Drought is the result of a natural decline in the expected precipitation over an extended period of time, typically one or more seasons in length. Other climatic characteristics, such as high temperature, high wind, and low relative humidity, impact the severity of drought conditions. Northwest Nevada, including Carson City, depends almost exclusively on winter snowpack and rainfall for its water supply. Rains from summer thunderstorms do little to recharge reservoirs and ground water tables.

Drought can be defined using both conceptual and operational definitions. Conceptual definitions of drought are often utilized to assist in the widespread understanding of drought. Many conceptual definitions portray drought as a protracted period of deficient precipitation resulting in extensive damage to agricultural crops and the consequential economic losses.

Operational definitions define the beginning, end, and degree of severity of drought. These definitions are often used to analyze drought frequency, severity, and duration for given periods of time. Such definitions often require extensive weather data on hourly, daily, monthly, or other time scales and are utilized to provide a greater understanding of drought from a regional perspective. Four common definitions for drought are provided below.

- **Meteorological drought** is defined solely on the degree of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- **Hydrological drought** is related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- **Agricultural drought** is defined principally in terms of soil moisture deficiencies relative to water demands of plant life, usually crops.
- **Socioeconomic drought** associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a

result of weather-related supply shortfall. These conditions may also be called a water management drought.[66]

A drought's severity depends on numerous factors, including duration, intensity, and geographic extent as well as regional water supply demands by humans and vegetation. Due to its multi-dimensional nature, drought is difficult to define in exact terms and also poses difficulties in terms of comprehensive risk assessments.

Drought differs from other natural hazards in three ways.

1. The onset and end of a drought are difficult to determine due to the slow accumulation ("creeping hazard") and lingering of effects of an event after its apparent end.
2. The lack of an exact and universally accepted definition adds to the confusion of its existence and severity.
3. In contrast with other natural hazards, the impact of drought is less obvious and may be spread over a larger geographic area.

These characteristics have hindered the preparation of drought contingency or mitigation plans by many governments.

5.2.5.3 Location and Extent

Drought impacts the entire community.

The US Drought Monitor (USDM) produced weekly since 2000 can be used to visualize trends in drought over the region. The map, which rates drought from D0 (abnormally dry) to D4 (exceptional drought), is based on measurements of climatic, hydrologic, and soil conditions as well as reported impacts and observations from more than 350 contributors around the country.[67]

[66] "Drought," *Nature,* Hazard Analysis, Carson City 2016 Hazard Mitigation Plan, p. 5-12.

[67] "U.S. Drought Monitor, Nevada," USDA, NDMC, DOC, NOAA, accessed June 4, 2021, **https://droughtmonitor.unl.edu/data/pdf/20210511/20210511_nv_trd.pdf**.

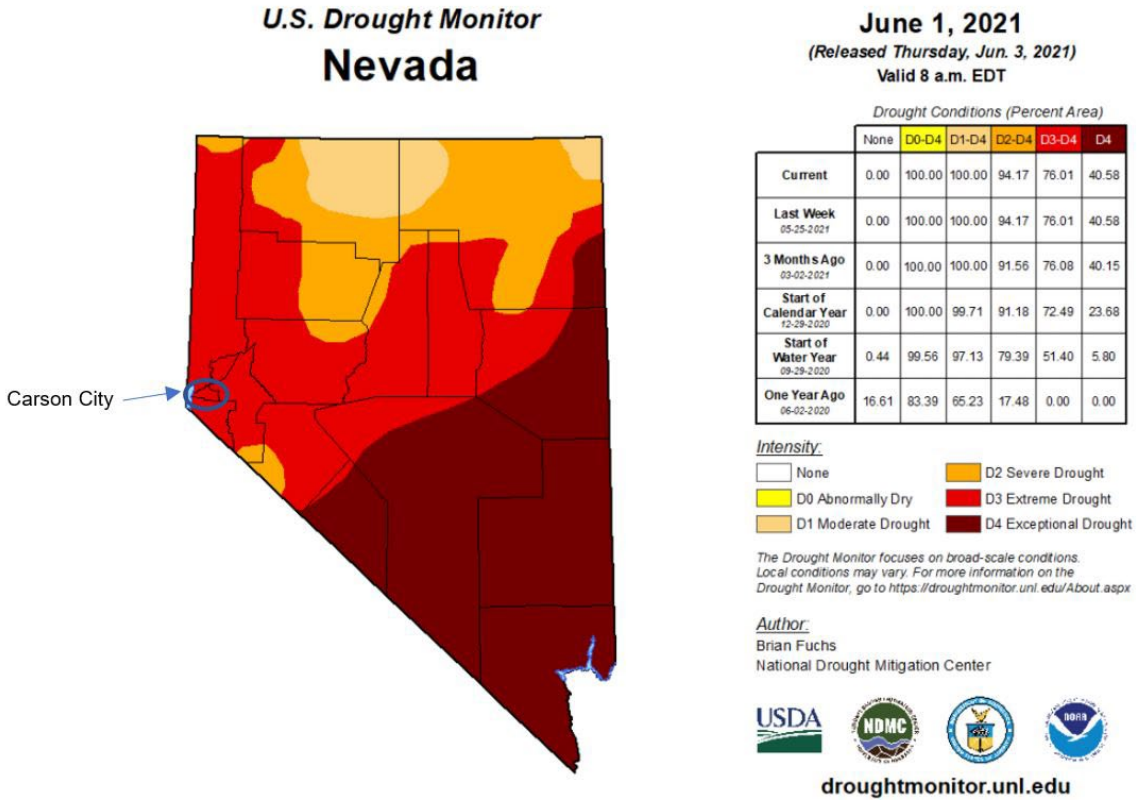


FIGURE 5-7: NEVADA DROUGHT MONITOR

The Palmer Drought approach includes four means of measuring the impacts of drought.

- **Palmer Z Index**
  This index "*measures short-term drought on a monthly scale.*"[68]

- **Palmer Drought Severity Index**
  This index "*attempts to measure the duration and intensity of the long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns plus the cumulative patterns of previous months. Since weather patterns can change almost literally overnight from a long-term drought pattern to a long-term wet pattern, the PDSI can respond fairly rapidly.*"[69]

[68] "Historical Palmer Drought Indices," Temp, Precip, and Drought, National Centers for Environmental Information, NOAA, accessed May 30, 2021, **https://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/overview**.

[69] "Historical Palmer Drought Indices."

- **Palmer Modified Drought Index**
  The Modified Palmer Drought Severity Index (PMDI) is obtained from the sum of the wet and dry terms weighted by probability values. The PMDI has the same value as the PDSI during established dry or wet spells but can be different during transition periods.[70]

- **Palmer Hydrological Drought Index**
  The index *"measures hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) which take longer to develop and longer to recover from. This long-term drought index was developed to quantify these hydrological effects, and it responds more slowly to changing conditions than the PDSI."*[71]

NOAA provides a weekly drought and crop moisture data table for each region of the United States. The sample below includes report for Northwestern Nevada for the week ending May 1, 2021.[72]

ST CD CLIMATE DIVISION	TEMP (F)	PCPN (IN)	SOIL MOISTURE UPPER LAYER (IN)	SOIL MOISTURE LOWER LAYER (IN)	PCT FIELD CAP. END WEEK	POT EVAP (IN)	RUN OFF (IN)	CROP MOIST INDEX	CHANGE FROM PREV WEEK	MONTH MOIST ANOM (Z) INDEX	PRELIM-P FINAL -F PALMER DROUGHT INDEX	PRECIP NEEDED TO END DROUGHT (IN)
NV 1 NORTHWESTERN	49.4	0.12	0.00	1.73	24.7	0.44	0.00	-0.52	-0.27	-2.46	-3.01 F	3.13

FIGURE 5-8: SAMPLE PALMER DROUGHT WEEKLY DATA

[70] "Modified Palmer Drought Severity Index," Glossary of Climate Terms, Carolinas Precipitation Patterns & Probabilities, accessed May 30, 2021, **https://www.cisa.sc.edu/atlas/glossary.html#**.

[71] "Historical Palmer Drought Indices."

[72] "Weekly Palmer Drought and Crop Moisture Report," Climate Prediction Center, NCEP, NWS, NOAA, Week 61 of the 2020 Growing Season, Week Ending May 2021, accessed May 30, 2021, **https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/pastdata/palmer/wpdowes3.txt**.

5.2.5.4 Previous Occurrences

According to information from the USDM, Nevada has been, for the most part, in some degree of drought since 2000. The comparison in the figure below shows a change from moderate to extreme drought between June 2020 and June 2021.[73]

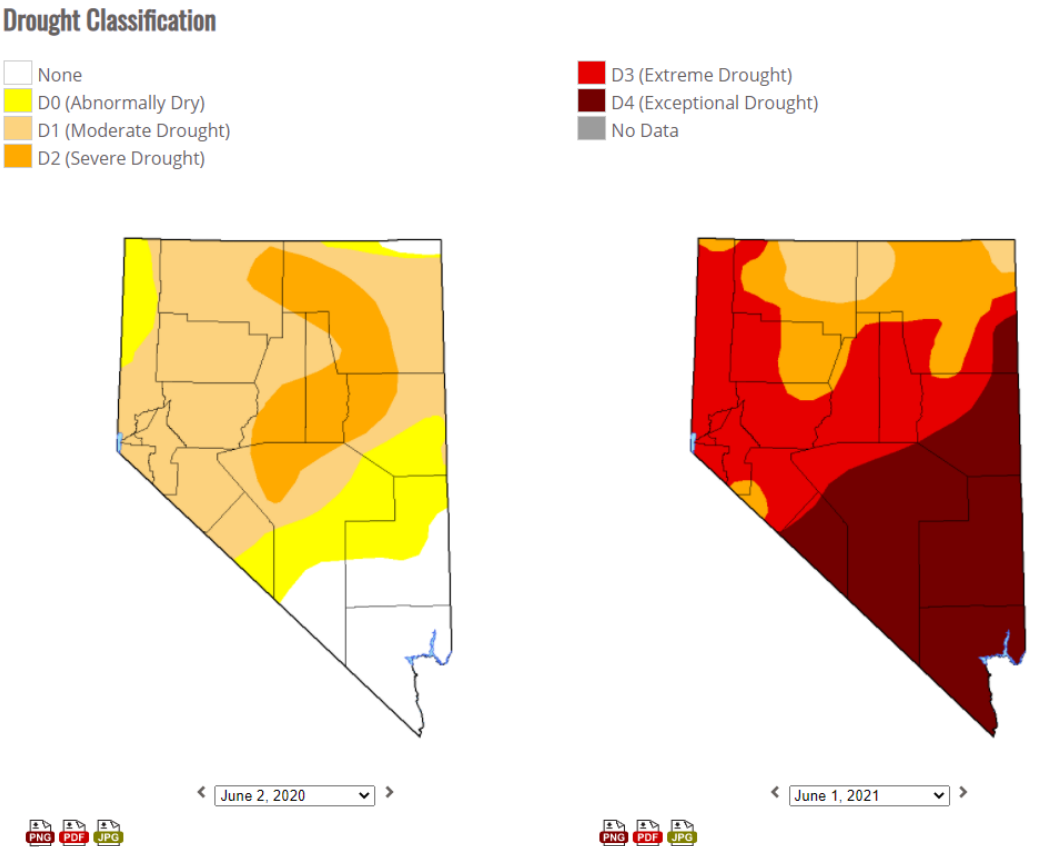


FIGURE 5-9: DROUGHT SEVERITY COMPARISON MAP

Figure 5-10 below identifies the percent area for drought conditions in the United States as of June 15, 2021 as distributed amongst the six categories in the legend provided.[74]

[73] "Compare Two Weeks," U.S. Drought Monitor, Nevada, accessed June 4, 2021, **https://droughtmonitor.unl.edu/Maps/CompareTwoWeeks.aspx**.

[74] "Continental U.S. (CONUS) Percent Area in U.S. Drought Monitor Categories," U.S. Drought Monitor, accessed June 4, 2021, **https://droughtmonitor.unl.edu/DmData/DataGraphs.aspx**.

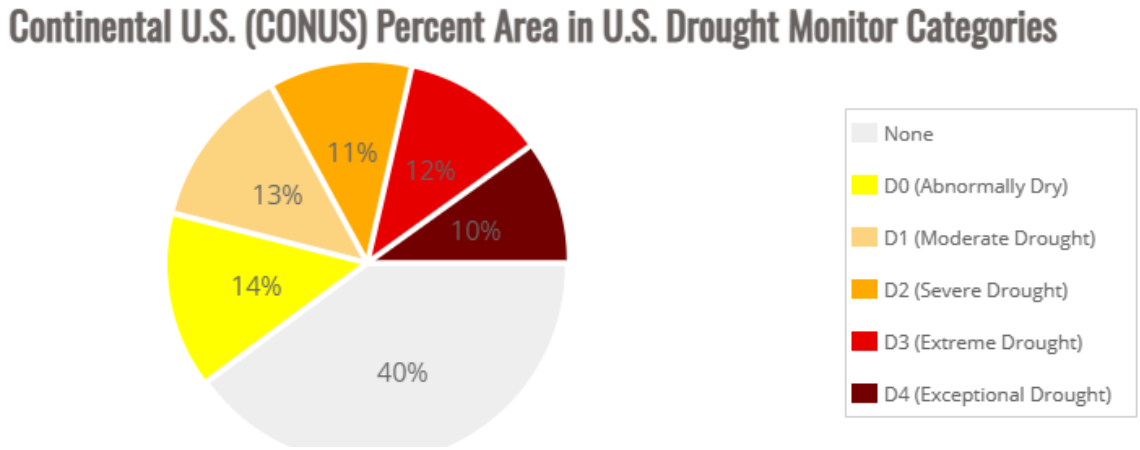


FIGURE 5-10: CONTINENTAL U.S. (CONUS) PERCENT AREA IN U.S. DROUGHT MONITOR CATEGORIES

The time series below illustrates the fluctuation in drought conditions in the State of Nevada over the last 20 years. Between 2017 and 2020, the State's drought level has varied from relatively moderate to very low conditions. The current spike in extreme and exceptional drought conditions began in mid-2020.[75] Note that the intensity of the drought is described in the key above in Figure 5-10.

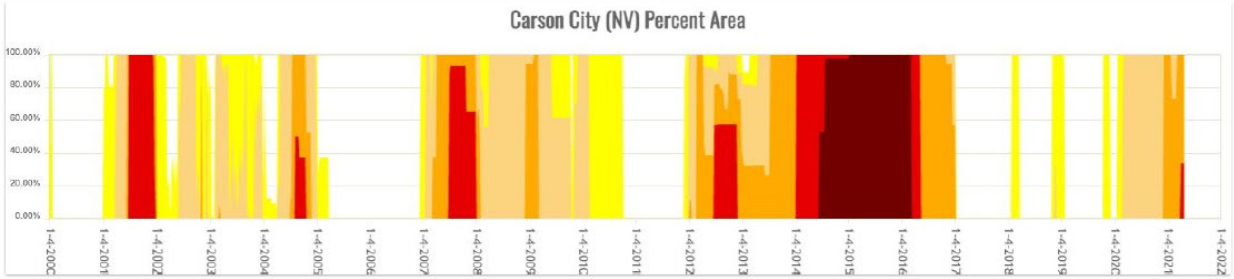


FIGURE 5-11: CARSON CITY PERCENT AREA IN U.S. DROUGHT MONITOR CATEGORIES

In Carson City, abnormally dry to severe drought and extreme drought conditions appear to be trending.

5.2.5.5 Probability of Future Events

Drought trends are difficult to predict. The current state of seasonal weather prediction science is such that it is nearly impossible to predict well in advance the beginning or the ending of droughts with meaningful confidence levels. However, periods of drought have regularly occurred in the

[75] Smallcomb, Chris, "Carson City (NV) Percent Area," Presentation at May 7, 2021 Planning Team meeting.

recent history of Carson City and Nevada, and as such drought can be expected to occur with some regularity in the future.

In the western United States, snowpack deficits and reservoir levels can be used to anticipate drought impacts for the coming year.[76] The NOAA Climate Prediction center provided the map below showing "large-scale" trends for ongoing drought in the west—including the entirety of the State of Nevada.[77]

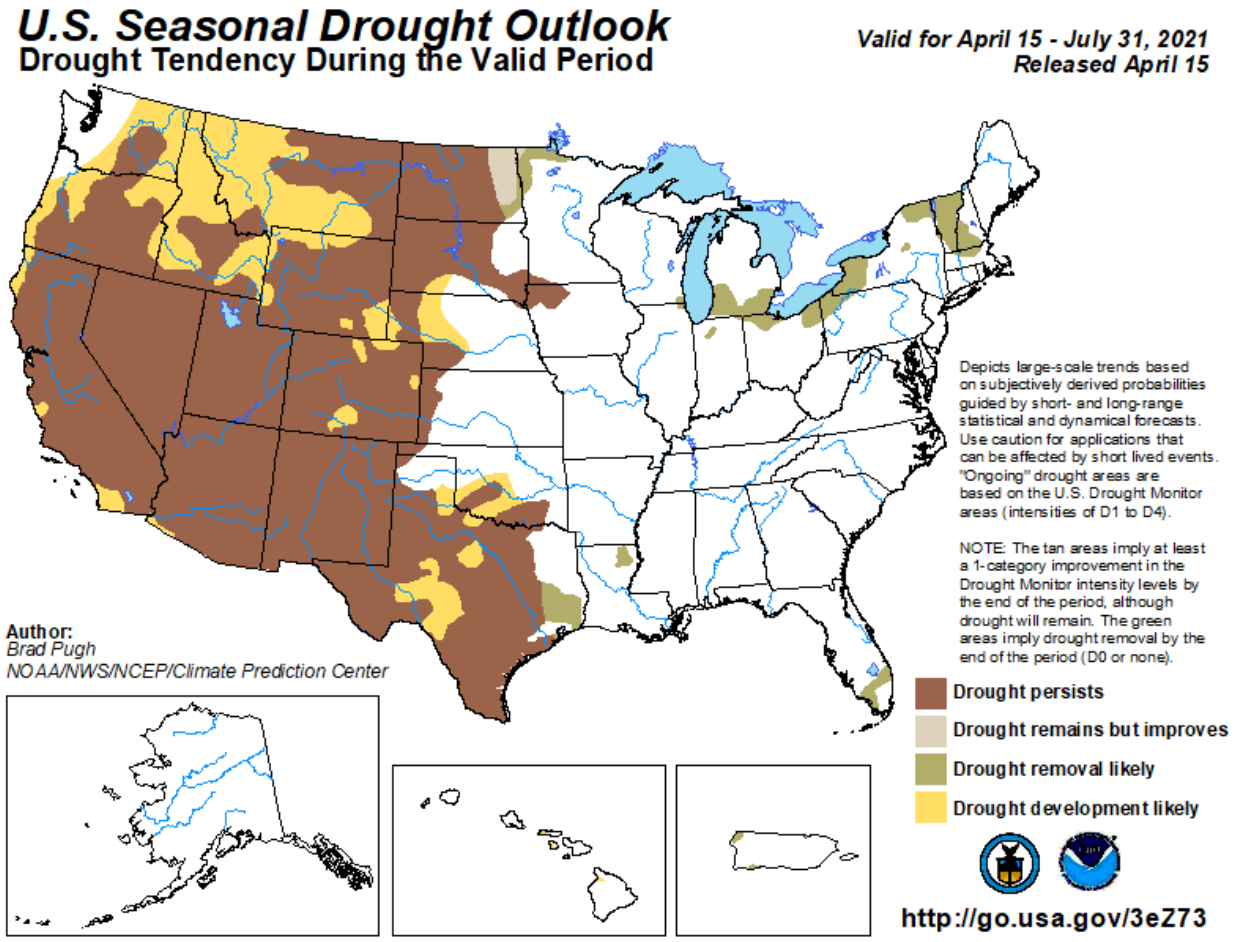


FIGURE 5-12: US SEASONAL DROUGHT OUTLOOK MAP

Impacts to Carson City will initially be less than those to other communities in Nevada. Carson City relies primarily on ground water; however, over the course of many years they have practiced

[76] Smallcomb, Chris, May 7, 2021 Planning Team Meeting.

[77] "U.S. Seasonal Drought Outlook," Climate Prediction Center, National Weather Service, NOAA, accessed May 17, 02021, **https://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php**.

conjunctive use of surface water and ground water and have developed and utilized a ground water recharge program which helps maintain higher levels in the aquifers from which they pump—in effect banking water for future use. Because the City is not a heavily cultivated area, the demand for surface water and pumping for crop irrigation is lower than that in other communities.

Carson City water system operations are constantly monitored and adjusted to maintain peak efficiencies with care and concern for the use of both ground and surface water resources. Carson City has continued to develop other sources such as the regional water line project known as the north/south transmission project, which allows the City to capture and utilize our Carson Valley water from Minden. This line, currently in service, allows the City to periodically rest and recover some of the Eagle Valley and Dayton Valley wells, thus helping reduce strain on the aquifer. The second phase of the regional water line project is an east west transmission main which was completed and provides the City the ability to supply water to the west side of town, again reducing the load on the wells helping with aquifer recover and allowing the City to better manage our surface water.

Even considering these mitigation actions, the probability of future drought is **very high** for Carson City.

5.2.5.6 Future Frequency of Events Due to Climate Change

For his presentation at the first Planning Team meeting, Chris Smallcomb, Warning Coordination Meteorologist for the National Weather Service in Reno, Nevada, prepared the illustration below showing the temperature patterns in the Carson City area over the last six years. Though 2019 temperatures included a few areas with below normal temperatures, the overall pattern trends toward “above normal” or “much above normal” for the Carson City region.

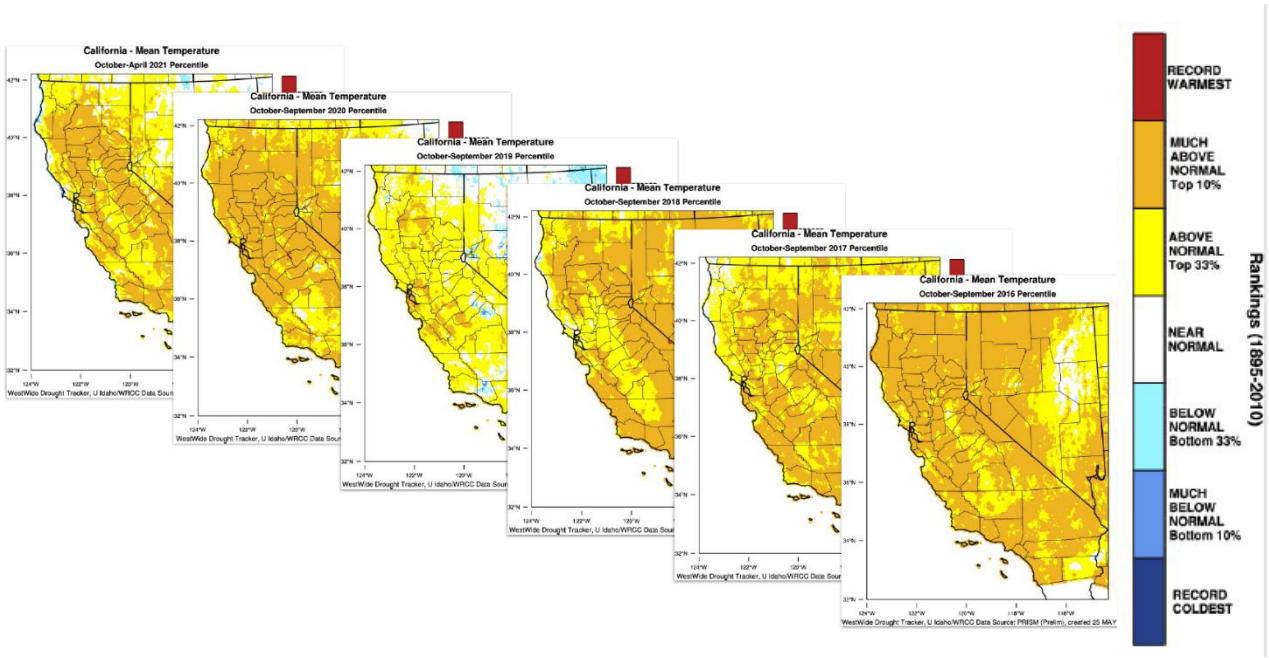


FIGURE 5-13: IT'S NOT JUST PRECIP! IT'S BEEN WARM!

This tendency toward higher-than-normal temperatures broadly correlates with the description of climate change effects. As noted in Section 4 above, "the IPCC concluded that the average of the 2006-2015 decade was around .87° (0.75°C to 0.99°C) above the average of the second half of the 19th century" (Section 5.2.4.2, Climate Change, Location and Extent, above).

Rising temperatures contribute to rising snow levels along the mountain ranges where snow is turning to rain at higher and higher altitudes. This scenario results in a loss of snowpack—which has been a reliable means of storing water for future use in the past. As a result, Carson City will need to continue its practice of conjunctive use and ground water recharge for maintaining and storing water supplies.

The likelihood of future drought events due to climate change is **very high**.

5.2.5.7 Cascading Hazards

Secondary hazards triggered by drought may include increased risk of wildfires, water shortages, insect infestations, and crop damages.

5.2.5.8 Utility Loss

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 may be considerable as those areas depend more on ground water which can be depleted quickly in drought conditions.

5.2.6 Earthquake

5.2.6.1 Planning Significance - High

5.2.6.2 Hazard/Problem Description

An earthquake is a sudden motion of a fault that creates shaking and trembling of the Earth. The effects of an earthquake can be felt far beyond the site of its occurrence. Earthquakes usually occur without warning and, after just a few seconds, can cause massive damage and extensive injuries and casualties. The most common effect of earthquakes is ground motion, or the vibration or shaking of the ground during an earthquake.

The severity of ground motion generally increases with the magnitude of an earthquake (amount of energy release) and decreases with distance from the fault or epicenter of the earthquake. The shaking is made up of waves in the Earth's interior, known as body waves, and waves that travel along the Earth's surface, known as surface waves.

There are two kinds of body waves.

- P (primary) waves are longitudinal or compressional waves similar in character to sound waves that cause back-and-forth oscillation along the direction of travel, and
- S (secondary) waves, also known as shear waves, which are slower than P waves and cause the ground to vibrate from side- to-side (horizontal motion).

There are also two kinds of surface waves.

- Raleigh waves, which have retro-elliptical motion, and
- Love waves, which have side-to-side motion.

Surface waves travel more slowly and tend to have longer periods than body waves.

5.2.6.3 Location and Extent

According to the University of Nevada, Seismological Laboratory, over the last 150 years, Nevada has ranked third in the country in the number of large earthquakes. Since the 1850s, 76 earthquakes with potentially destructive magnitudes of 5.5 or greater have occurred in Nevada.[78] Western Nevada is the most seismically active part of the state, being part of the Basin and Range extensional province and the Walker Lane, which carries part of the Pacific and North American plate motion. Carson City has the highest earthquake hazard in the Basin and Range Province. Background earthquakes, magnitude 3 and smaller, are frequent in Carson City. The map below illustrating the large number of faults in the Carson City area was included in a presentation titled "The Capital of Earthquake Country: Earthquake Hazards of Carson City," by Craig M. dePolo, Nevada Bureau of Mines and Geology, University of Nevada, Reno.[79]

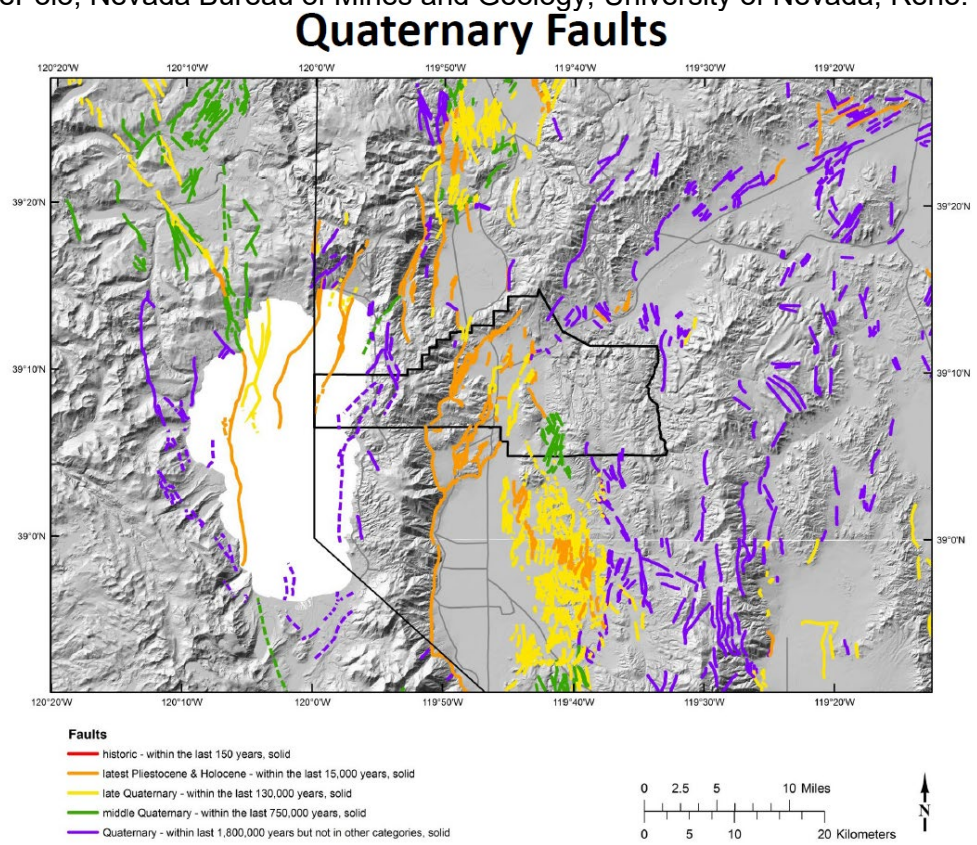


FIGURE 5-14: QUATERNARY FAULTS IN CARSON CITY REGION

The size of an earthquake is commonly expressed in two ways, earthquake magnitude (M) and Modified Mercalli Intensity (MMI). Earthquake magnitudes are correlated to the energy release of an earthquake and are determined by seismologists from seismic waves. Earthquake magnitudes also can be correlated with fault rupture length and maximum surface displacement

[78] "Preparedness," "Earthquake Info," The Nevada Seismological Laboratory," accessed June 6, 2021, **http://www.seismo.unr.edu/Preparedness**.

[79] Craig dePolo, "The Capital of Earthquake Country: Earthquake Hazards of Carson City," May 7, 2021.

and is the basis for earthquake scenario models. The Modified Mercalli Intensity scale is based on the effects of an earthquake and considers human experience, shaking effects, and inflicted damage.

Magnitude and intensity measure different characteristics of earthquakes. Magnitude measures the energy released at the source of the earthquake and is determined from measurements on seismographs. Intensity measures the strength of shaking produced by the earthquake at a certain location and is determined by effects on people, human structures, and the natural environment. The table below includes the descriptions used by both methods to identify the magnitude and severity of an earthquake.[80]

TABLE 5-7: EARTHQUAKE MAGNITUDE VS. SEVERITY – MODIFIED MERCALLI SCALE OF EARTHQUAKE INTENSITY

Magnitude	Typical Maximum Modified Mercalli Intensity (MMI)
1.0 - 3.0	**I.** Not felt except by a very few under especially favorable conditions.
3.0 - 3.9	**II – III** **II**. Felt only by a few persons at rest, especially on upper floors of buildings. **III**. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4.0 - 4.9	**IV – V** **IV**. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably. **V**. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 - 5.9	**VI – VII** **VI**. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. **VII**. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0 - 6.9	**VII – IX** **VIII**. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.

[80] Adapted from "The Modified Mercalli Intensity Scale," Earthquake Hazards, USGS, accessed April 2020, https://www.usgs.gov/natural-hazards/earthquake-hazards/science/modified-mercalli-intensity-scale?qt-science_center_objects=0#qt-science_center_objects.

Magnitude	Typical Maximum Modified Mercalli Intensity (MMI)
	IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.0 and higher	**VIII** or higher **X**. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent. **XI**. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly. **XII**. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

5.2.6.4 Previous Occurrences

The following information is derived from the 2018 Nevada Enhanced Hazard Mitigation Plan,[81] as well as the University of Nevada Seismological Laboratory's (Seismo Lab) website,[82] USGS,[83] and the 2016 Carson City HMP.[84]

TABLE 5-8: EARTHQUAKE PREVIOUS OCCURRENCES

EARTHQUAKE PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Location/Magnitude**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
July 8, 2021	Little Antelope Valley, CA / 6.0 event	This earthquake was felt in Carson City. At this time, no damages or injuries have been reported in Carson City.
May 28, 2021	Lake Tahoe 4.2 event	Shaking reported in Carson City
March 21, 2020	Johnson Lane 4.5 event	Light to weak shaking. Minor damage was reported in south Carson City

[81] "M 6.2 – Near Carson City, Nevada," Magnitude updated September 9, 2019, USGS, accessed June 7, 2021, **https://earthquake.usgs.gov/earthquakes/eventpage/cdmg18691227100000000/executive**.

[82] "Nevada Earthquakes in the Last Decade," "History," Section 3.3.3.2, "Earthquakes," State of Nevada Enhanced Hazard Mitigation Plan, p. 3-34, accessed June 7, 2021, **https://data.nbmg.unr.edu/Public/NEHMP/StateOfNevadaEnhancedHazardMitigationPlan2018.pdf**.

[83] "Magnitude 6.0 Earthquake in California," USGS, accessed July 9, 2021, **https://www.usgs.gov/news/magnitude-60-earthquake-california?qt-news_science_products=2#qt-news_science_products**.

[84] "Major Historical Earthquakes that have Produced Strong Ground Motion in Carson City," "History," Section 5.2.4.2, "Earthquakes," Carson City Hazard Mitigation Plan 2016, p. 5-17, accessed June 6, 2021, **https://www.carson.org/home/showpublisheddocument/54500/636265687065070000**.

EARTHQUAKE PREVIOUS OCCURRENCES		
March 20, 2020	Indian Hills 5.0 event	
June 5, 2013	Carson City 3.0 event	
September 16, 2005	Johnson Lane area 4.2 event	
November 18, 1994	East Carson City 4.4	
January 3, 1991	North Carson City 4.0	
January 2, 1991	North Carson City 4.4	
January 27, 1896	Carson City magnitude 5+ event	Cracked walls, fallen plaster
June 3, 1887	Carson City magnitude 6.5 event	Building damage, liquification
December 27, 1869	Carson City 6.2 event	

Carson City has been strongly shaken many times in the past and has a high rate of background seismicity. The first recorded earthquake in Carson City occurred in 1857. This earthquake was estimated as a magnitude 6.0; however, because of fires in Virginia City and San Francisco most of the records for this event have been destroyed.

The best documented earthquake of the 19th century was also the largest event in Carson City's history and occurred June 3, 1887. The earthquake shook western Nevada, the Sierra Nevada, and the central Great Basin. Rock falls, landslides, and liquefaction occurred, several buildings were severely cracked, and large amounts of plaster fell. There are no accounts of death or serious injury, and major concerns were limited to fixing buildings and re-establishing businesses.

The map below, "Historical Earthquake Locations from 1857 to 2014," illustrates the earthquakes within and adjacent to Carson City.[85]

[85] Craig dePolo, "Historical Earthquake Locations from 1857 to 2014," "The Capital of Earthquake Country: Earthquake Hazards of Carson City," May 7, 2021.

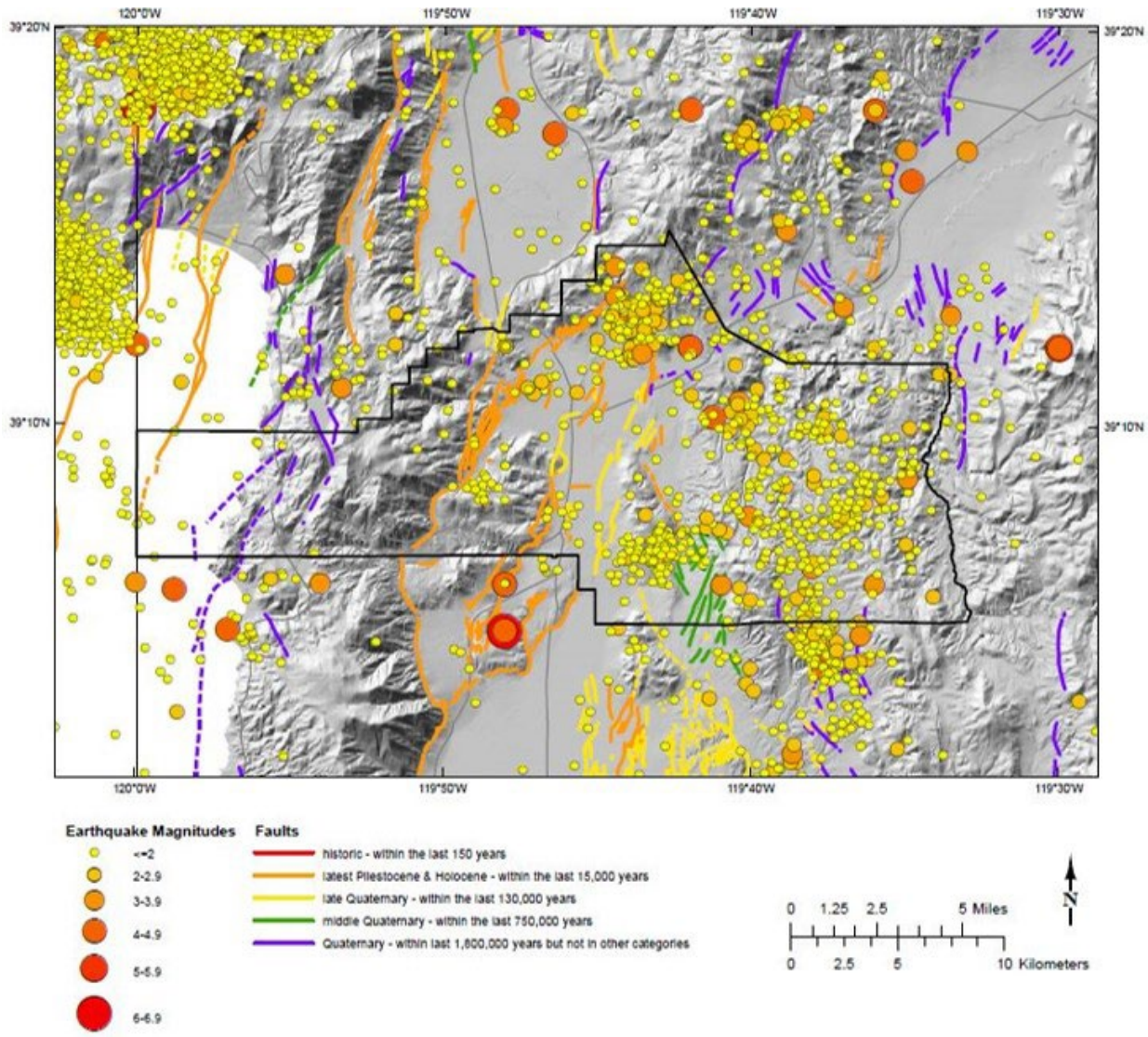


FIGURE 5-15: HISTORICAL EARTHQUAKE LOCATIONS FROM 1857 TO 2014

The map below shows earthquake events of a magnitude of 2 to greater than 7 in the Carson City area from 2015 to 2019 and was generated by the Nevada Bureau of Mines and Geology (NBMG) MyHazards website.[86]

[86] "MyHAZARDS – Nevada," Nevada Bureau of Mines and Geology, University of Nevada Reno, accessed June 6, 2021, **https://gisweb.unr.edu/myhazards/**,

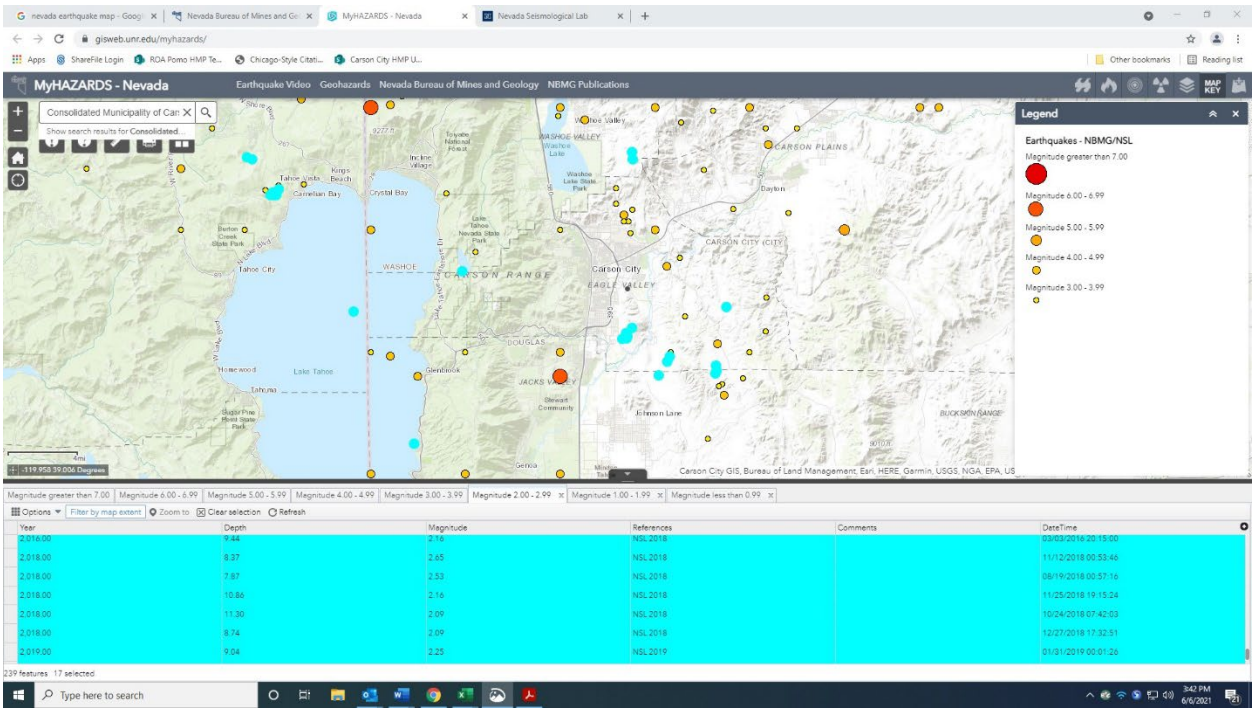


FIGURE 5-16: EARTHQUAKE EVENTS IN CARSON CITY FROM 2015-2019

According to the Volcano Discovery website, in 2020, Carson City was shaken by one quake of magnitude 4.5, 8 quakes between 3.0 and 4.0 magnitude, and 55 quakes between 2.0 and 3.0. There were also 1,094 quakes below a magnitude of 2.0.[87]

[87] "Global Earthquake Monitor," Volcano Discovery, accessed June 6, 2021, **https://www.volcanodiscovery.com/region/64307/earthquakes/carson-city/archive/2020.html**.

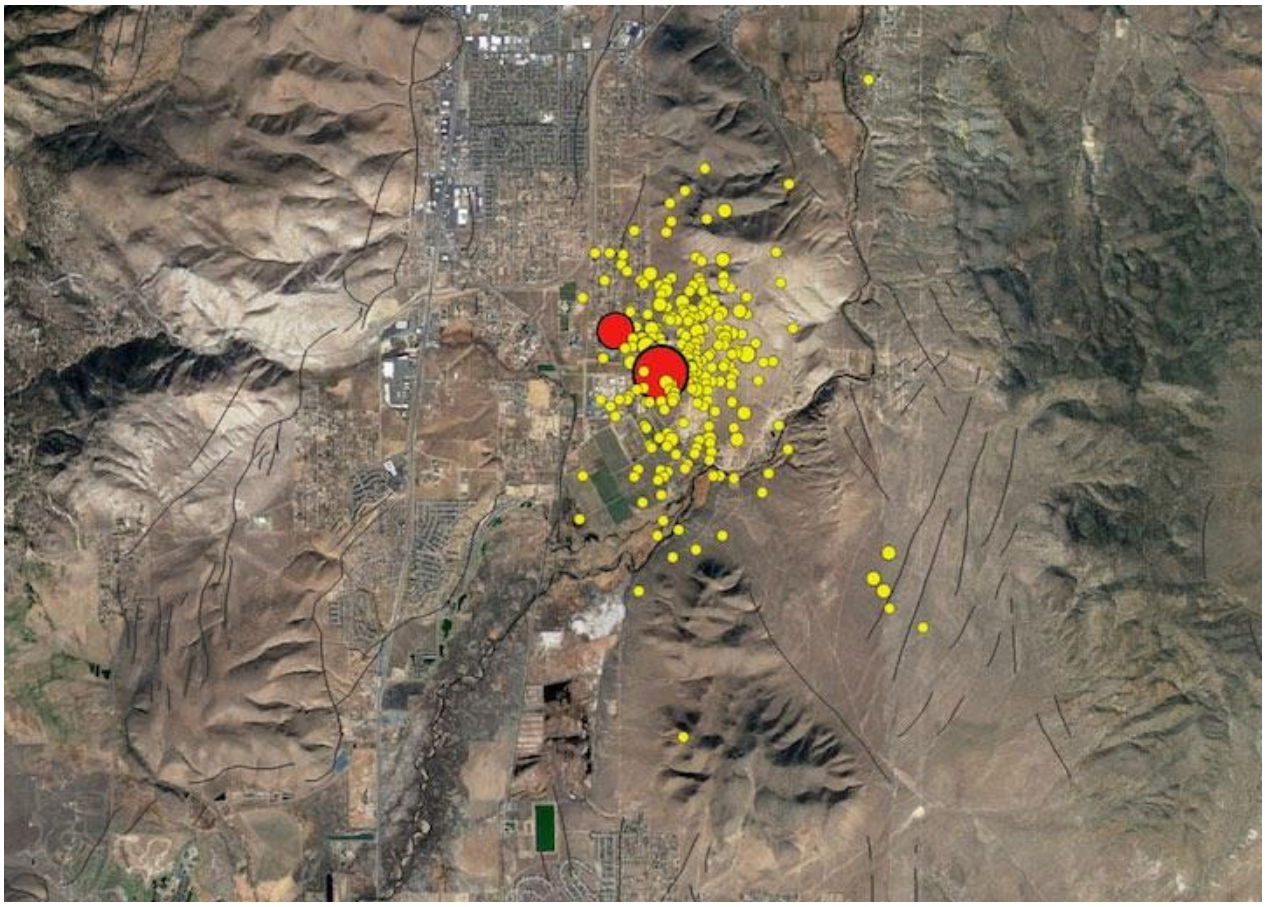


FIGURE 5-17: 2020 M 4.5 SOUTH CARSON CITY EARTHQUAKE SEQUENCE THRU 03-22-2021

The Nevada Seismological Laboratory presented the following information, including the earthquake sequence map shown in Figure 5-18 below. The map shows the March 20, 2020 South Carson City magnitude 4.5 earthquake occurred at a depth of 8 km (5 mi) beneath northern Carson Valley, near the southwest flank of Prison Hill. Over 6,900 people reported feeling the event via the U.S. Geological Survey Did You Feel It? website.

The earthquake produced moderate shaking near the epicenter in Carson City and Minden, NV. Residents in surrounding Carson Valley, Reno/Sparks, and Tahoe/Truckee regions reported light to weak shaking. Minor damage was reported in south Carson Valley, and people as far away as Fallon, Susanville, Sacramento, the San Francisco Bay Area, and Fresno reported feeling the event.

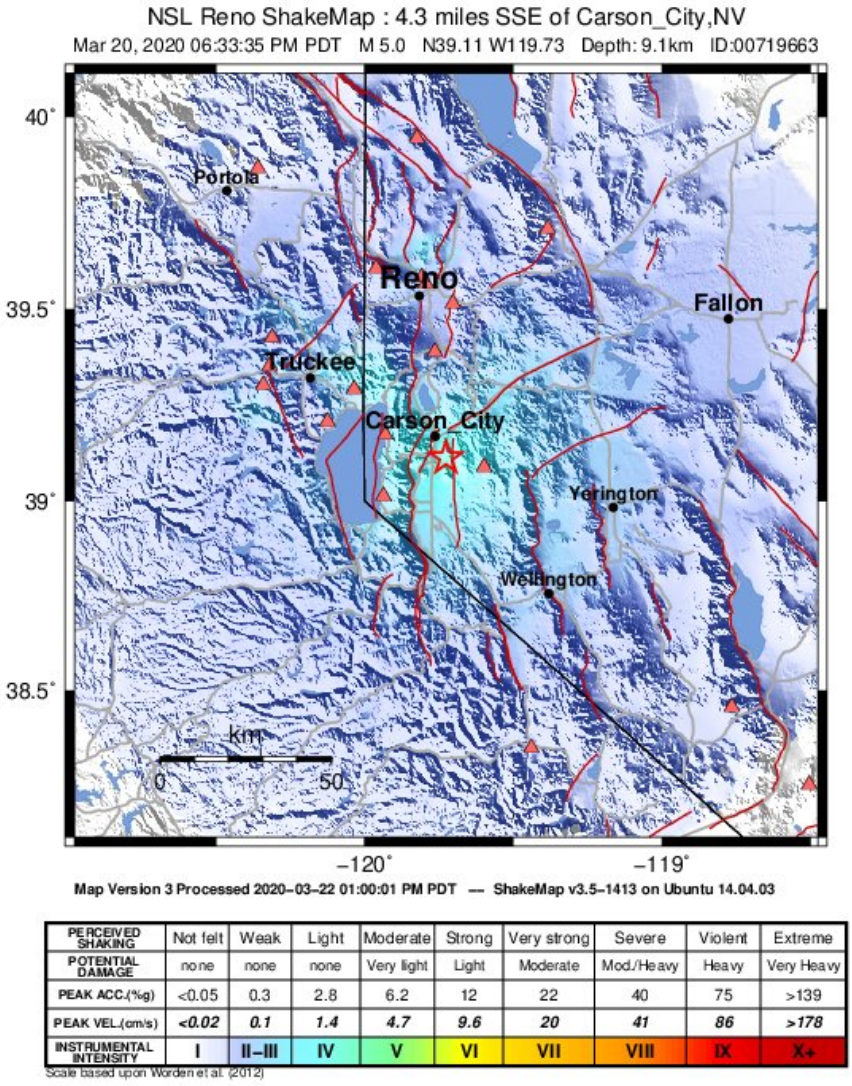


FIGURE 5-18: SHAKEMAP ILLUSTRATES SHAKING INTENSITY FROM THE M 4.5 EARTHQUAKE THAT STRUCK CARSON CITY, NV ON MARCH 20, 2020. (U.S. GEOLOGICAL SURVEY)

As of March 23, 2020, the Nevada Seismological Laboratory (NSL) has recorded over 200 aftershocks in the South Carson City sequence. Aftershocks can occur for weeks to months following this type of event. By definition, aftershocks are smaller than the main shock of an earthquake sequence; however, past observations of earthquake sequences worldwide indicate that there is an ~5% chance that the March 20th earthquake could be a foreshock to a larger event. Both the rate of aftershocks and the chance of a larger event will decrease in the days and weeks following the M 4.5 event.

In 2021, morning of May 28th at 8:25 am, a magnitude 4.2 earthquake occurred beneath Lake Tahoe. The Nevada Seismological Laboratory (NSL) reported via Twitter an ongoing sequence that began on April 25, with a magnitude 3.7 in the Tahoe/Truckee, Carson City, and Reno area.[88]

[88] Nevada Seismo Lab, Earthquake Update via Twitter, May 28, 2021, accessed June 6, 2021, **https://twitter.com/NVSeismoLab/status/1398328848811323392**

The New York Times interviewed with the NSL (Nevada Seismo Lab) Director, Graham Kent, and Alex Hatem of the USGS.[89]

> *Dr, Kent stated the sequences are closely watched by seismologists because of two main fault lines beneath Lake Tahoe. The two fault lines last ruptured 4,500 year ago and are past their average rupture occurrence. It is possible that the rupture would create a tsunami wave as high as 30 feet. Alex Hatem, a U.S.G.S. research geologist, said the 4.2 earthquake this morning occurred in a faulting area known as the Walker Lane that had "complex and closely spaced faults of different styles," which made it difficult to determine which fault ruptured on Friday.*
>
> *Within 20 minutes of the 4.2 earthquake, U.S.G.S. received more than 1,200 reports from residents who said they felt the quake.*

To date, the sequence continues as shown in the following map from the NSL Earthquake Events website.[90]

[89] "Small Earthquakes Rattle Lake Tahoe," *The New York Times,* May 26, 2021, accessed June 6, 2021, **https://www.nytimes.com/2021/05/28/us/lake-tahoe-earthquake.html**.

[90] "Latest Earthquakes," "Nevada Regional Earthquakes in the Last 14 Days," NSL, accessed June 6, 2021, **http://www.seismo.unr.edu/Earthquake**.

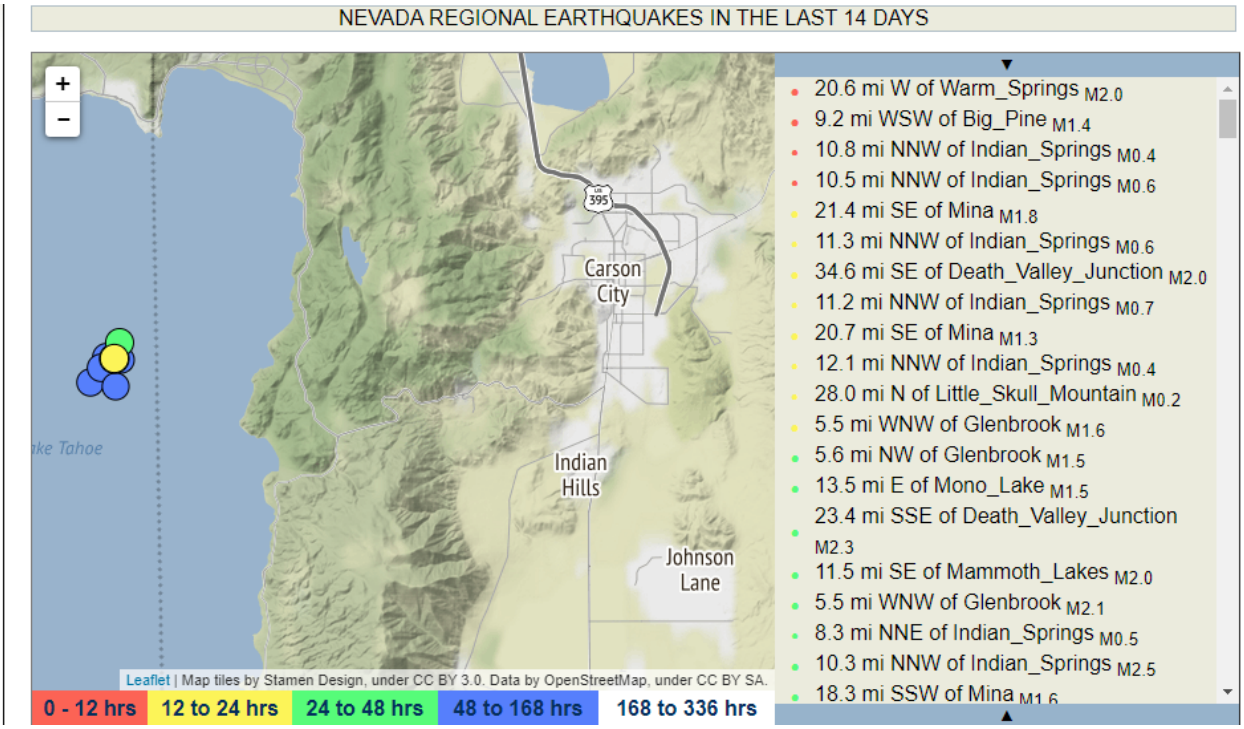


FIGURE 5-19: JUNE 6, 2021 MAP OF EARTHQUAKES IN THE CARSON CITY AREA

Table 5-9 indicates that 10 earthquakes have caused Modified Mercalli Intensity VI or greater intensity shaking in Carson City over the last 150+ years—an average of once every 12 years. One event, the 1887 earthquake, caused severe damage to Carson City.

TABLE 5-9: SIGNIFICANT RECORDED EARTHQUAKE EVENTS IN CARSON CITY

Date	Magnitude	Nearest Community	Effects	CC MMI*
September 3, 1857	6.3	Incline Village (?)	Unknown	?
March 15, 1860	6.5	Reno (?)	Content damage	VI
May 30, 1868	6.0	Virginia City	Two eqs? panic	VI
December 27, 1869	6.4, 6.2	Virginia City	Content dam, wall cracks	VI+

Date	Magnitude	Nearest Community	Effects	CC MMI*
June 3, 1887	6.5	Carson City	Buildings, damage, liquefaction	VII-VIII
January 27, 1896	5+?	Carson City	Cracked walls, fallen plaster	VI+
May 15, 1897	5+?	Virginia City (?)	Fallen plaster	VI+
December 20, 1932	7.1	Gabbs	Surface rupture, chimney damage	VI
June 25, 1933	6.0	Wabuska	Building and chimney damage	VI+
July 6, 1954	6.2	Fallon	Building and plaster damage	VI
December 16, 1954	7.1, 6.9	Fallon	Building and plaster damage	VI+
*Carson City: Modified Mercalli Intensity				

5.2.6.5 Probability of Future Events

The Carson City area continues to experience high levels of earthquake activity, especially in the eastern half of the county. Any of the faults shown in Figure 5-14 in Section 5.2.6.2 above could be the source of a future earthquake in Carson City.

The probability of earthquake damage in Carson City within the next 50 years is projected below using the Modified Mercalli Intensity method. Note that the outcomes identified can be affected by mitigation.[91]

[91] Craig dePolo, "Probability of Earthquake Damage in Carson City within 50 Years," "The Capital of Earthquake Country: Earthquake Hazards of Carson City," Presentation, May 7, 2021.

TABLE 5-10: PROBABILITY OF EARTHQUAKE DAMAGE IN CARSON CITY WITHIN 50 YEARS

Modified Mercalli Intensity	% Likelihood	Damage Type
MMI VI	78-79%	Cracked walls, frightened residents
MMI VII	55-57%	Chimney damage, emergency response
MMI VIII	19-25%	Building damage, recovery
MMI IX	6-10%	Serious reconstruction

The probability of an earthquake of magnitude ≥6 within 31 miles over 50 years (about 60%) is illustrated for Carson City and surrounding communities in the map below.[92]

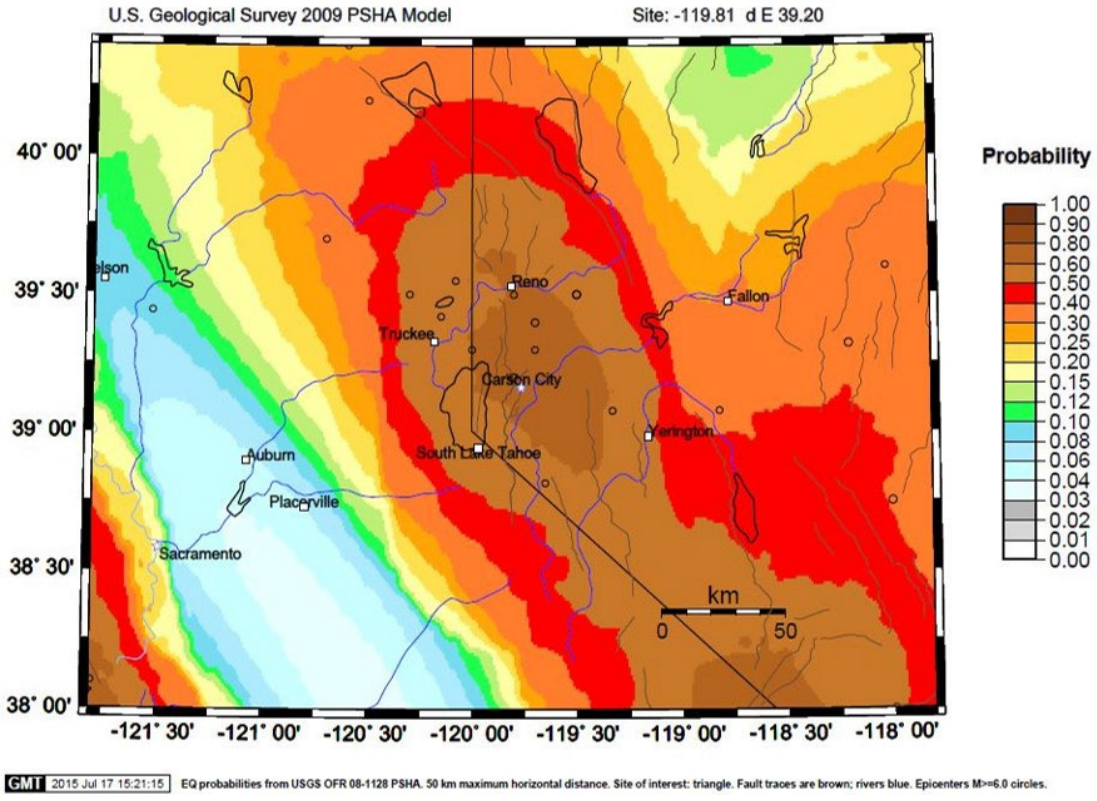


FIGURE 5-20: PROBABILITY OF AN EARTHQUAKE OF MAGNITUDE ≥ 6 WITHIN 31 MILES OVER 50 YRS

[92] Craig dePolo, "Probability of Earthquake of Magnitude ≥6 within 31 miles over 50 years," "The Capital of Earthquake Country: Earthquake Hazards of Carson City," Presentation, May 7, 2021.

The probability of a M≥7 earthquake occurring in the next 50 years and within 31 miles is significantly lower at about 15-20%.[93] Note that should an 1887-sized earthquake occur today, there would be much more structural and nonstructural damage because of the risk exposure for population and infrastructure is much greater.

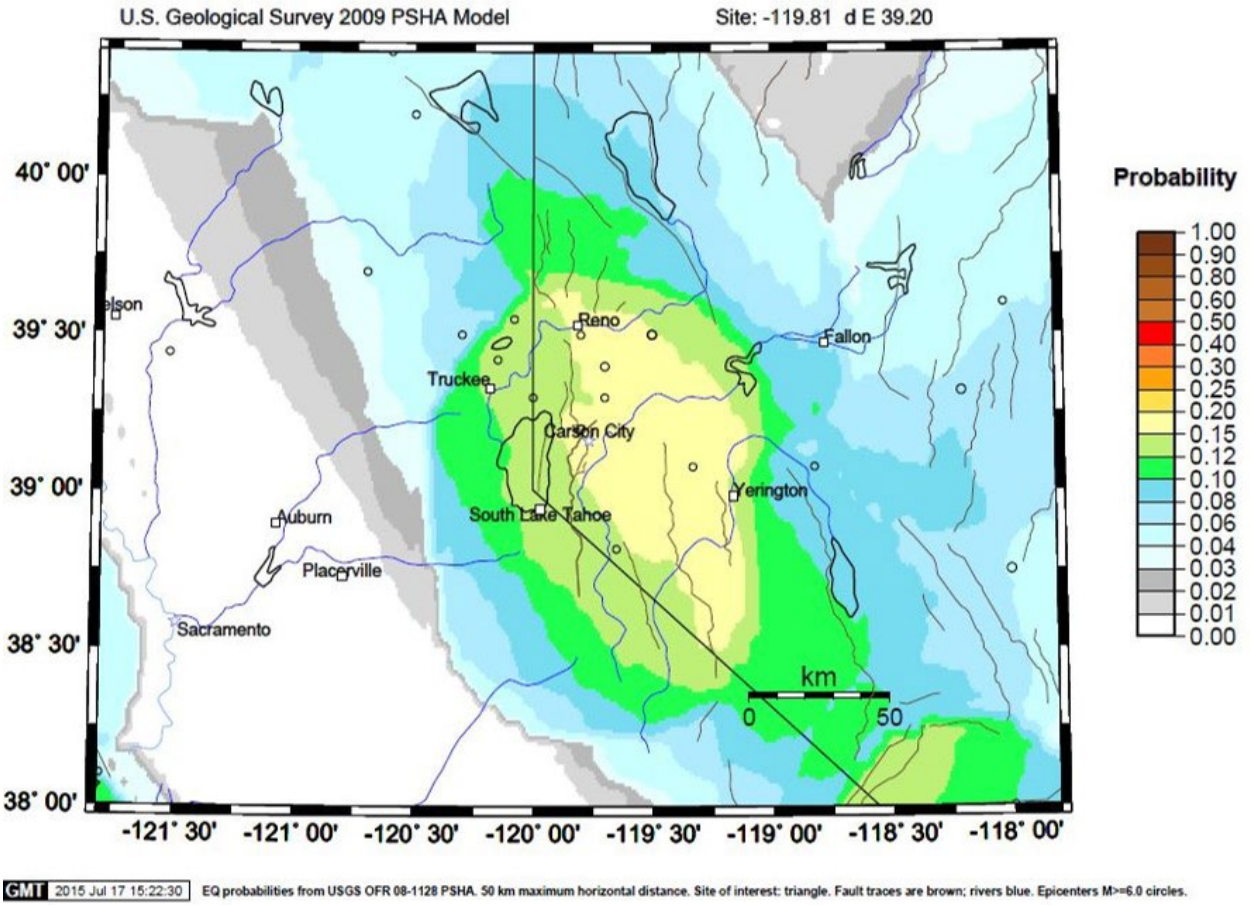


FIGURE 5-21: PROBABILITY OF AN EARTHQUAKE OF MAGNITUDE ≥7 WITHIN 31 MILES – 50 YRS

5.2.6.6 Future Frequency of Events Due to Climate Change

An article published by YaleEnvironment360 describes the theory that climate change will increase the frequency of earthquakes due to the changing pressure of water on the earth's crust. This theory is not corroborated by climate scientists, and geologists are skeptical. Therefore, based on current science, the probability of increased future frequency of earthquake events due to climate change is **low**.

[93] Craig dePolo, "Probability of Earthquake of Magnitude ≥7 within 31 miles over 50 years," "The Capital of Earthquake Country: Earthquake Hazards of Carson City," Presentation, May 7, 2021

5.2.6.7 Cascading Hazards

There have been historical instances of collateral earthquake effects during Nevada earthquakes, such as surface faulting, liquefaction, volcanoes, tsunami/seiche, landslides and rock fall, multiple HAZMAT incidences, communication failures, and fire following earthquake. Several instances of surface rupture have also accompanied large Nevada earthquakes.

Surface faulting occurs when an earthquake breeches the ground surface along a fault and forms a scarp or tear. Displacement along faults, both in terms of length and width, varies but can be significant (e.g., from several inches to 20 feet), as can the length of the surface rupture (e.g., as long as a few hundred feet to 50 miles). Surface faulting can cause severe damage to buildings constructed over faults, as well as railways, highways, pipelines, and tunnels. If the amount of surface offset can be anticipated, there are mitigation techniques that can help minimize damage to structures that have to cross faults (like pipelines).

Liquefaction occurs when seismic waves pass through saturated granular soil, distorting its granular structure and causing some of the granules to collapse into the empty spaces between grains. This increases the pore-water pressure and when this pressure is sufficient, soil can behave like a fluid for a brief period and flow. Liquefaction causes lateral spreads (horizontal ground movements of commonly many feet wide, but up to 100 feet), flow failures (massive flows of soil, typically hundreds of feet, but up to miles), and loss of bearing strength (which can cause structures to settle or tip). Thus, liquefaction can cause severe damage to property. When liquefied soil gains a pathway to the surface, it can erupt as a mixture of sand and water, and build small sand “volcanoes.”

Tsunami/seiche

Two secondary effects of earthquakes can impact water bodies such as Lake Tahoe: seiches and tsunamis. A seiche is a back-and-forth oscillation of an enclosed body of water that is excited by seismic waves. It is similar to the sloshing back-and-forth that can occur in a bathtub when the water is disturbed. A tsunami is a wave or displacement of water that occurs when there is a fault offset on the floor of a water body, or when a large landslide enters a water body. Tsunami-forming landslides may be triggered by seismic waves but can also form without an earthquake. A tsunami can develop into a seiche as the disturbance dissipates by sloshing back-and-forth.

A seiche or tsunami can occur at Lake Tahoe, and the people along the shoreline would be the most effected. When an earthquake occurs at Lake Tahoe, there will not be enough time to determine whether a tsunami has formed and send out a warning. Therefore, people at Lake Tahoe must respond automatically and head to higher ground immediately as soon as the shaking subsides.

The wave heights of Lake Tahoe tsunamis modeled by Ichinose and others (2000) are shown in Figure 5-22.[94] Two scenarios are shown, a rupture on the North Tahoe-Incline Village fault (A – black triangles), and a rupture on the West Tahoe-Dollar Point fault zone (B – gray dots). In these model runs, wave heights of 15 to 23 feet were generated at the lake shore in Carson City, but to the south wave heights are as high as 30 feet. These are reasonable wave heights to consider when thinking about the tsunami/seiche hazard along this shoreline.

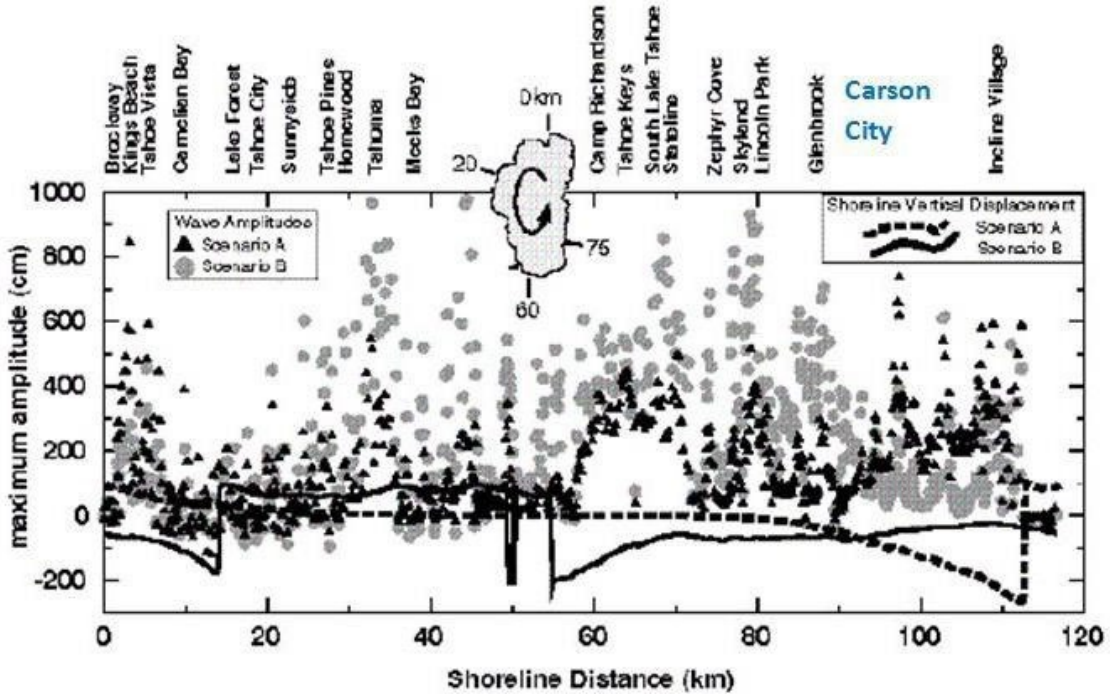


FIGURE 5-22 WAVE HEIGHTS OF LAKE TAHOE TSUNAMIS

The population and development in Carson City would experience minimal direct exposure to impacts from a tsunami or seiche. Carson City's boundary along Lake Tahoe includes a few privately owned structures. The road and utilities are at a high enough elevation that they would not be affected by a 30-foot wave.

There have not been any well documented occurrences of seiches or tsunamis occurring in Lake Tahoe, but geologic evidence for paleo seismic events within the basin suggests past events almost certainly would have created these water disturbances. In addition, seiches and a possible tsunami have occurred in water bodies near large earthquakes in the western United States. For

[94] G.A. Ichinose, J.G. Anderson, Kenji Satake, R.A. Schweickert, and M.M. Lahren, "The potential hazard from tsunami and seiche waves generated by large earthquakes within Lake Tahoe, California-Nevada." Geophysical Research Letters. April 15, 20001. *Advancing Earth and Space Science.* Accessed May 2021. **https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/1999GL011119**.

example, a seiche was reported in Mono Lake from the 1932 M7.1 Cedar Mountain, Nevada earthquake.

Other Secondary Impacts. Landslides, liquefaction, HAZMAT incidents, communication failures, surface ruptures, and fires as all secondary potential impacts of an earthquake. The wave heights of Lake Tahoe tsunamis have been modeled by Ichinose and others (2000) and are shown in Figure 5-22 above. Two scenarios are shown, a rupture on the North Tahoe-Incline Village fault (A – black triangles), and a rupture on the West Tahoe-Dollar Point fault zone (B – gray dots). In these model runs, wave heights of 15 to 23 feet were generated at the lake shore in Carson City, but to the south are wave heights of as high as 30 feet. These are reasonable wave heights to consider when thinking about the tsunami/seiche hazard along this shoreline. Because of the low exposure of Carson City to the impacts from a tsunami or seiche, this hazard is considered low in Carson City.

5.2.6.8 Utility Loss

Earthquakes pose a threat to water lines, the electrical grid, and the sewer system. An earthquake has the potential to damage and create ground deformations through liquefaction, surface rupture, and landslides. The pipeline is constructed of high-grade steel using modern full penetration welding techniques. Pipelines have withstood major earthquakes in the past with minor to no damage due to the ability of welded steel pipe to withstand considerable ground deformation without failure. The ductility of high-grade steel pipe provides the pipe with a large amount of resistance to rupture from most ground deformation and shaking. The pipeline was constructed to withstand a 7.5 magnitude earthquake and has a proven track record in this area.

Damage to tanks and connections, however, are common during events of extreme shaking. Tank damage such as sidewall buckling, separation of sidewalls from the bottom plate, and sloshing of liquids can result from severe shaking. If connections between pipes and tanks are not flexible, they are vulnerable to damage during earthquakes. Containment dikes serve as a good line of defense in the event pipe connections break. Once contained within the dikes, the petroleum products can be kept from ignition sources and the spill can be controlled.

Earthquake has a high probability of impacting the water and wastewater in the entire Carson City area due to underground and above ground piping that would be damaged.

5.2.7 Floods

5.2.7.1 Planning Significance - High

5.2.7.2 Hazard/Problem Description

Flooding as defined by the National Flood Insurance Program is "a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from:

- Overflow of inland or tidal waters;
- Unusual and rapid accumulation or runoff of surface waters from any source;
- Mudflow [a river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is carried by a current of water], or;
- Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above."[95]

Floodplains are lowlands adjacent to water bodies that are subject to recurring floods. Floods are natural events that are considered hazards only when people and property are affected.

Nationwide, floods result in more deaths than any other natural hazard. Physical damage from floods includes the following:

- Inundation of structures, causing water damage to structural elements and contents.
- Erosion or scouring of stream banks, roadway embankments, foundations, footings for bridge piers, and other features.
- Impact damage to structures, roads, bridges, culverts, and other features from high-velocity flow and from debris carried by floodwaters. Such debris may also accumulate on bridge piers and in culverts, increasing loads on these features or causing overtopping or backwater effects.
- Destruction of crops, erosion of topsoil, and deposition of debris and sediment on croplands.
- Release of sewage and hazardous or toxic materials as wastewater treatment plants are inundated, storage tanks are damaged, and pipelines are severed.

In Carson City, flooding is most commonly associated with unusually heavy rainfall caused by atmospheric rivers. Atmospheric rivers throughout the State of Nevada and can be influenced by both frontal systems out of the Northern Pacific Ocean and tropical storms coming from the South. Due to the aridity of the City, the area is dry except during and shortly after these storms. When a major storm develops, water collects rapidly in a short period of time. As a consequence, flows are of the flash-flood type. Flash floods are generally understood to involve a rapid rise in water

[95] "What is Flood?" National Flood Insurance Program, Summary of Coverage, FEMA, accessed June 5, 2021, **https://www.ncdoi.gov/media/952/open#**.

level, high velocity, and large amounts of debris, which can lead to significant damage that includes the uprooting of trees, undermining of buildings and bridges, and scouring of new channels. The intensity of flash flooding is a function of the intensity and duration of rainfall, steepness of the watershed, stream gradients, watershed vegetation, natural and artificial flood storage areas, and configuration of the streambed and floodplain. It is important to note that even in drought, scattered summer thunderstorms can bring excessive rainfall and flash flooding, particularly near wildfire burn scars that enhance water runoff. These kinds of floods produce debris flows, large amounts of water runoff laden with burn debris and mud.

In areas where alluvial fans are present, the flow paths of flash floods lack definition. Flow depths with alluvial fan flooding are generally shallow with damage resulting from inundation, variable flow paths, localized scour, and the deposition of debris.

5.2.7.3 Location and Extent

The storm water problems of Carson City are different than those in many other communities. Because the core of the urban area is directly below several canyons that drain into the Carson Range, these areas are prone to flooding and flow of sediment and debris.[96] The Carson City Watershed areas are listed from smallest to largest as shown in the figure and associated tables below.[97]

[96] Carson City Stormwater Management Utility Final Funding Report, Water Resources Inc., 12/14/2002

[97] "Carson City Watersheds," Carson City Stormwater Management Program, accessed May 17, 2021, **https://www.carson.org/Home/ShowDocument?id=65184**.

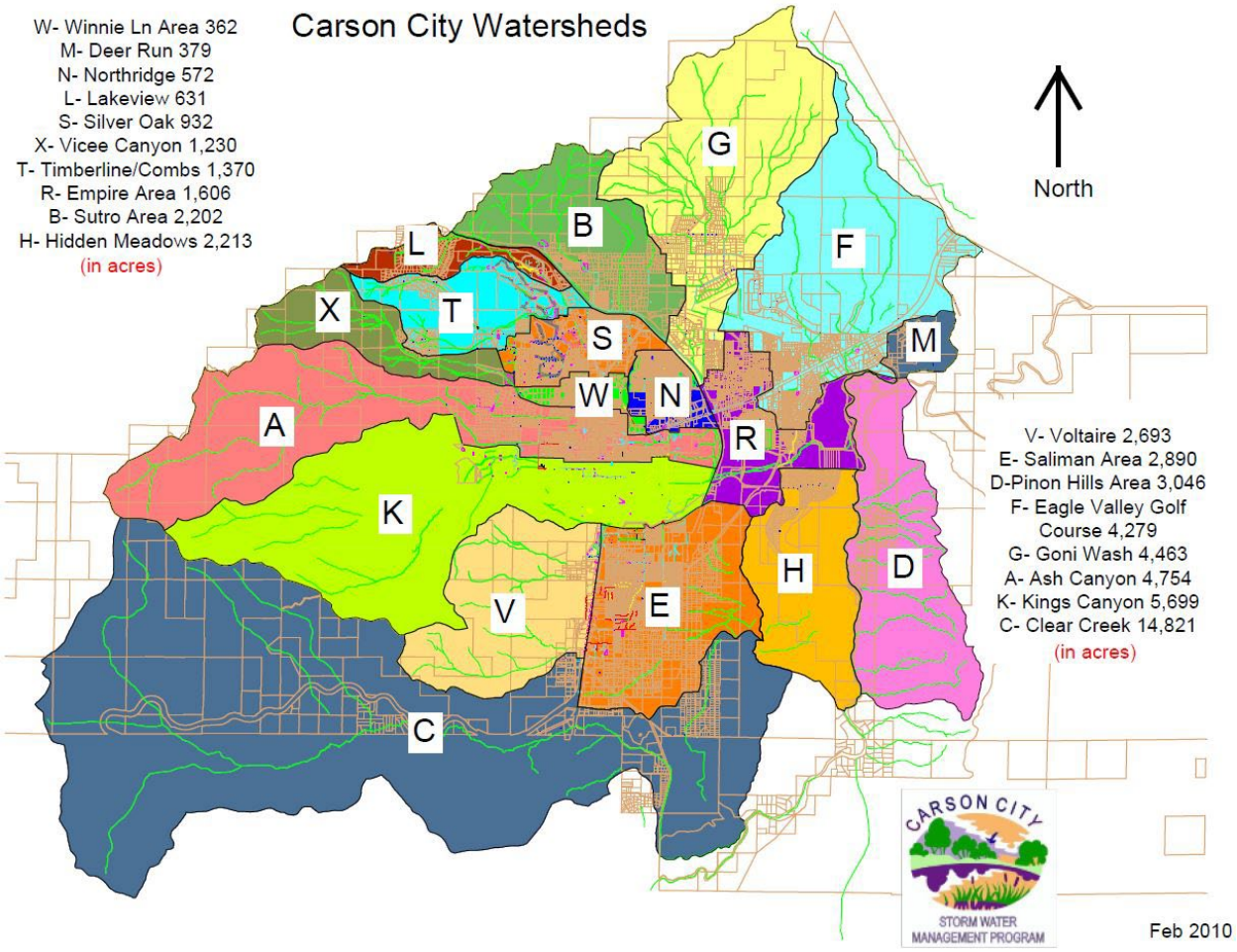


FIGURE 5-23 CARSON CITY WATERSHEDS

Flood events may be measured by depth, crest height, number of feet over the flood stage (100-year flood) and/or by number of feet for a wall of water. A flood event may also be measured by the velocity of moving water, measured in feet per second.[98]

The updated FEMA Special Flood Hazard Area Map showing the 100 year flood zone is presented below.

[98] "Flood Damage," Unit 1: Floods and Floodplain Management. Federal Emergency Management Agency. pp. 1-23. https://www.fema.gov/pdf/floodplain/nfip_sg_unit_1.pdf.

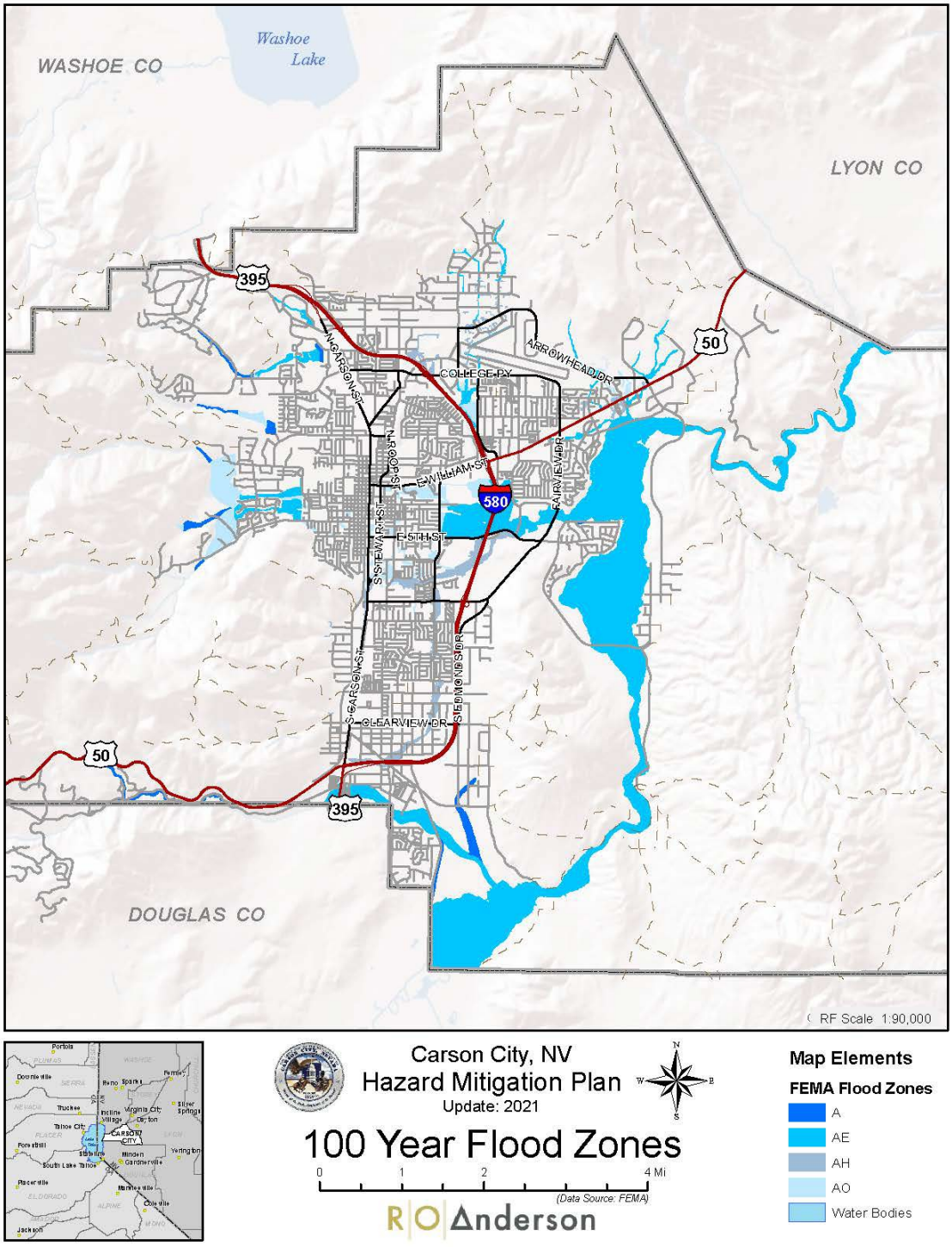


FIGURE 5-24: 100 YEAR FLOOD ZONES

5.2.7.4 Previous Occurrences

The previous occurrences outlined in the table below was provided by Robert D. Fellows, PE, Chief Stormwater Engineer Project Manager.[99]

TABLE 5-11: PREVIOUS FLOOD OCCURRENCES

FLOOD PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Event/Location**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
February 5 thru 22, 2017	Flooding due to Atmospheric River, impact region wide.	The winter storm caused extensive damage to park trails, roadways, and drainage facilities. Disaster FEMA-4307-DR-NV was declared.
January 5 thru 14, 2017	Flooding due to Atmospheric River, impact region wide.	The winter storm caused extensive damage to park trails, roadways and drainage facilities. Disaster FEMA-4303-DR-NV was declared.
August 11, 2014	Moderately high atmospheric moisture with slow-moving thunderstorms brought heavy rain and isolated severe thunderstorms. An NWS spotter reported 1.10 inches of rain in just 25 minutes from one storm in the Carson City area.	Extensive damage from flash floods and debris flows was reported in Douglas County and Carson City. Water over roads and mud debris along and near Center Drive were reported by a fire department official. Extensive damage to streets due to undermining was noted along with minor water and mud intrusions into several homes. One home had up to a foot of water and mud in the garage along with damage to the garage door.
July 20, 2014	A flash flood hit Prison Hill area and Carson City and Goni areas of Carson City which dropped about 1.5 inches of rain in 30 minutes. Wind gusts were measured at 61 mph.	Flows caused sediment deposits and severe erosion in the Prison Hill and Goni areas. Some streets received 5 to 6 feet of dirt and debris. Cleanup effort began immediately and continued until December of 2014.
July 20, 2014	Short intense storm dropped about 1 inch of rain in 20 minutes in Southeast and North Carson City, and hail in the Goni area where the ground was covered with a couple inches of ice.	Heavy sediment and debris on streets and on yards throughout the area.
December 31, 2005 to	New Year's Flood are wide impacts.	King Street was completely closed due to the flooding. Portions of Stewart, Mountain, and Curry Streets were also closed. Flooding occurred on US Hwy 395 near

[99] Robert D. Fellows, PE, Carson City Public Works, based on the 2016 HMP and 2021 updates.

FLOOD PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Event/Location**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
January 1, 2006		Carson Mall. 2 Business & 12 houses were flooded. At the Waterfall Fire burn area west of Carson City, the heavy rain caused damage to trees & vegetation on the mountainside, along with rockslides & mudslides. FEMA 1629, New Year's Flood
January 1-3, 1997	Extremely heavy rainfall combined with snow levels above 10,000 feet and complete melt-off of a heavy low-elevation snow pack causing moderate to severe flash flooding and small stream flooding on streams throughout the Carson Basin, especially above Carson City	Damages amounted to millions of dollars, separate from losses due to mainstream river flooding. Rain-swollen Ash Canyon, Kings Canyon and Vicee Canyon Creeks caused extensive flood damage to homes, businesses and roads in downtown Carson City.
December 12, 1995	Warm winter rainfall caused sever flooding in the Carson City, Gardnerville and Dayton areas	Many roads closed and some businesses flooded due very heavy rainfall.
June 26, 1995	Strong thunderstorms dropped heavy rain across western NV, causing flash flooding in Carson City and Douglas County. Rainfall rates of from 1 to 2 inches per hour were reported by spotters in these areas.	About a dozen homes were damaged, as basements, garages and yards were flooded, and many roads were inaccessible. U.S. 395 through Gardnerville was closed for many hours.
March 10, 1995	Flash flooding caused by very heavy rainfall (about 0.2 to 0.5 in. per hour in the afternoon and evening hours, with moderate rainfall from 10am to 10pm, with 12-hour totals of from 1 to 3.5 inches).	Flash flooding caused water over three feet deep in many parts of the city, stranding people in their cars all over the City.
February 1986	Unprecedented rains over a 10-day period in February 1986 caused severe flooding along regional waterways including the Carson River Basin. Maximum precipitation for the period was 12 inches in valley areas, 20 inches in the foothills of the Sierra Nevada, and 30 inches in the higher mountains. Flows in the Carson River at Carson City were the greatest since 1963. The rains caused several small landslides. Some residents became stranded or were evacuated	Damage resulting from this flood was estimated at the time to be $12,700,000 region wide.
July 29, 1960	Thunderstorms and flash-flood over the Carson Range caused an extensive mudflow washed boulders and pine trees out of Kings Canyon Creek. The flow was	The channel of the creek was scoured down to bedrock. Downstream ranch land was covered with debris, and a few homes suffered flood damage with

FLOOD PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Event/Location**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
	estimated at about 200 cfs on Kings Canyon Creek.	two trailers were carried as far as 600 feet by the mudflow.

5.2.7.5 Probability of Future Events

Based on the frequency suggested by the previous occurrences listed above, the risk of flooding is trending toward a **high** rate of occurrence, once in 5 to 10 years. While mitigation actions completed over the last five or more years have begun to restrict flooding pathways in Carson City, future data will be needed to evaluate their success and as a result, potentially lower the probability of flood events.

5.2.7.6 Future Frequency of Events Due to Climate Change

According to the Washoe County Regional Resiliency Study, the northern Nevada region can expect higher probability of localized rain events with more water and associated flooding.

Increased warming increases the capacity of the atmosphere to hold moisture, which leads to more water vapor in the atmosphere. Warmer conditions between summer thunderstorms can additionally dry and compact the soil, making it more impervious to heavy rain, and further increase the rate of runoff during flash flood events.

The 2018 Nevada Enhanced Hazard Mitigation Plan provides the following thoughts on climate change and its potential impacts on flooding.[100]

> *In the western United States, climate change has led to warmer overall climate conditions compared to what has been observed in the past, with the trend is expected to continue. Nevada will likely see more frequent flooding events under a warmer climate, as snow levels on average, will be higher during winter storms, resulting in more precipitation falling as rain over river basins. This will allow much larger portions of river basins to contribute to runoff, leading to higher flows resulting in more frequent flooding events. In addition, warmer air can hold more moisture (water vapor) which can potentially be converted into heavy precipitation, making flood events more extreme in the future.*

[100] "Location, Severity, and Probability of Future Events," Section 3.3.9, 2018 Nevada Enhanced Hazard Mitigation Plan, p. 3-94, accessed June 5, 2021, **https://data.nbmg.unr.edu/Public/NEHMP/StateOfNevadaEnhancedHazardMitigationPlan2018.pdf**.

Based on this observation, the probability of increased frequency of flooding due to climate change is **high**.

5.2.7.7 Cascading Hazards

Even though the flooding problems in Carson City are relatively localized, floods cause economic losses by disrupting (or closing) businesses and government facilities, communications, and the provision of utilities such as water and sewer service. Flood events also result in excessive expenditures for emergency response and generally disrupt the normal function of a community.

By creating saturated soil conditions, stormwater also contributes to other pressing problems in the urban area such as water quality impacted by stormwater run-off.

5.2.7.8 Utility Loss

River and stream crossings at locations where a pipeline is near an embankment are subject to erosion. Floodwaters pose the greatest threat to breaking a pipeline, since flooding can result in large amounts of erosion and mass wasting along drainage over a very short period of time.

Preventative measures have kept stream erosion from causing any breaks in the pipeline in the past, however heavy flood waters can change the whole course of a river or stream in minutes. Some of these crossing may be at higher risk of erosion or embankment failure due to soil types, nearby tectonic activity, and gradient of the embankments and river. There are many washes, dry creeks, marshes, and irrigation ditches that drain into the Carson River that are traversed by the pipeline. It is imperative that, in the event of a spill, an assessment of the location is made to determine whether it is in drainage.

5.2.8 Hazardous Materials

5.2.8.1 Planning Significance - Moderate

5.2.8.2 Hazard/Problem Description

Hazardous materials may include hundreds of substances that pose a significant risk to humans. These substances may be highly toxic, reactive, corrosive, flammable, radioactive, or infectious. Hazard materials are regulated by numerous Federal, State, and local agencies including the U.S. Environmental Protection Agency (EPA), U.S. Department of Transportation (DOT), National Fire Protection Association, FEMA, U.S. Army, and International Maritime Organization.

Hazardous material releases may occur from any of the following:

- Fixed site facilities (such as refineries, chemical plants, medical marijuana production facilities, storefronts, warehouses, single-family residences, storage facilities, manufacturing, warehouses, wastewater treatment plants, swimming pools, dry cleaners, automotive sales/repair, and gas stations)
- Highway and rail transportation (such as tanker trucks, chemical trucks, and railroad tankers)
- Air transportation (such as cargo packages)
- Pipeline transportation (liquid petroleum, natural gas, and other chemicals)

Unless exempted, facilities that use, manufacture, or store hazardous materials in the United States fall under the regulatory requirements of the Emergency Planning and Community Right to Know Act (EPCRA) of 1986, enacted as Title III of the Federal Superfund Amendments and Reauthorization Act (42 USC 11001–11050; 1988). Under EPCRA regulations, hazardous materials that pose the greatest risk for causing catastrophic emergencies are identified as Extremely Hazardous Substances (EHS). These chemicals are identified by the EPA in the List of Lists – Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112 of the Clean Air Act. Releases of EHSs can occur during transport to and from fixed site facilities. Transportation-related releases are generally more troublesome because they may occur anywhere, including close to human populations, critical facilities, or sensitive environmental areas. Transportation-related EHS releases are also more difficult to mitigate due to the variability of locations and distance from response resources.

In addition to accidental human-caused hazardous material events, natural hazards may cause the release of hazardous materials and complicate response activities. The impact of earthquakes on fixed facilities may be particularly serious due to the impairment or failure of the physical integrity of containment facilities. The threat of any hazardous material event may be magnified due to restricted access, reduced fire suppression and spill containment, and even complete cut-off of response personnel and equipment. In addition, the risk of terrorism involving hazardous materials is considered a major threat due to the location of hazardous material facilities and transport routes throughout communities and the frequently limited antiterrorism security at these facilities.

On behalf of several Federal agencies including the EPA and the DOT, the National Response Center (NRC) serves as the point of contact for reporting oil, chemical, radiological, biological, and etiological discharges into the environment within the United States.

In Carson City, the Fire Department issues hazardous materials permits and acts as the first responder to hazardous materials spills or releases.

5.2.8.3 Location and Extent

The EPA regulates 11 facilities within the City that are permitted to discharge to water and 151 that handle hazardous waste, of these, four have reported toxic releases, two produce and release air pollutants, and five are active and/or archived cleanup sites. However, while several

of the small, fixed facilities (e.g., body shops) have varying uses of hazardous chemicals, in general these facilities do not pose a significant risk to the City.

In addition to fixed facilities, hazardous material events have the potential to occur along Interstate 580, U.S.50 and U.S. 395. The trucks that use these transportation arteries commonly carry a variety of hazardous materials including gasoline, other crude oil derivatives, and other chemicals known to cause human health problems.

Figure 5-25 below identifies the location of facilities registered to use hazardous materials within Carson City.

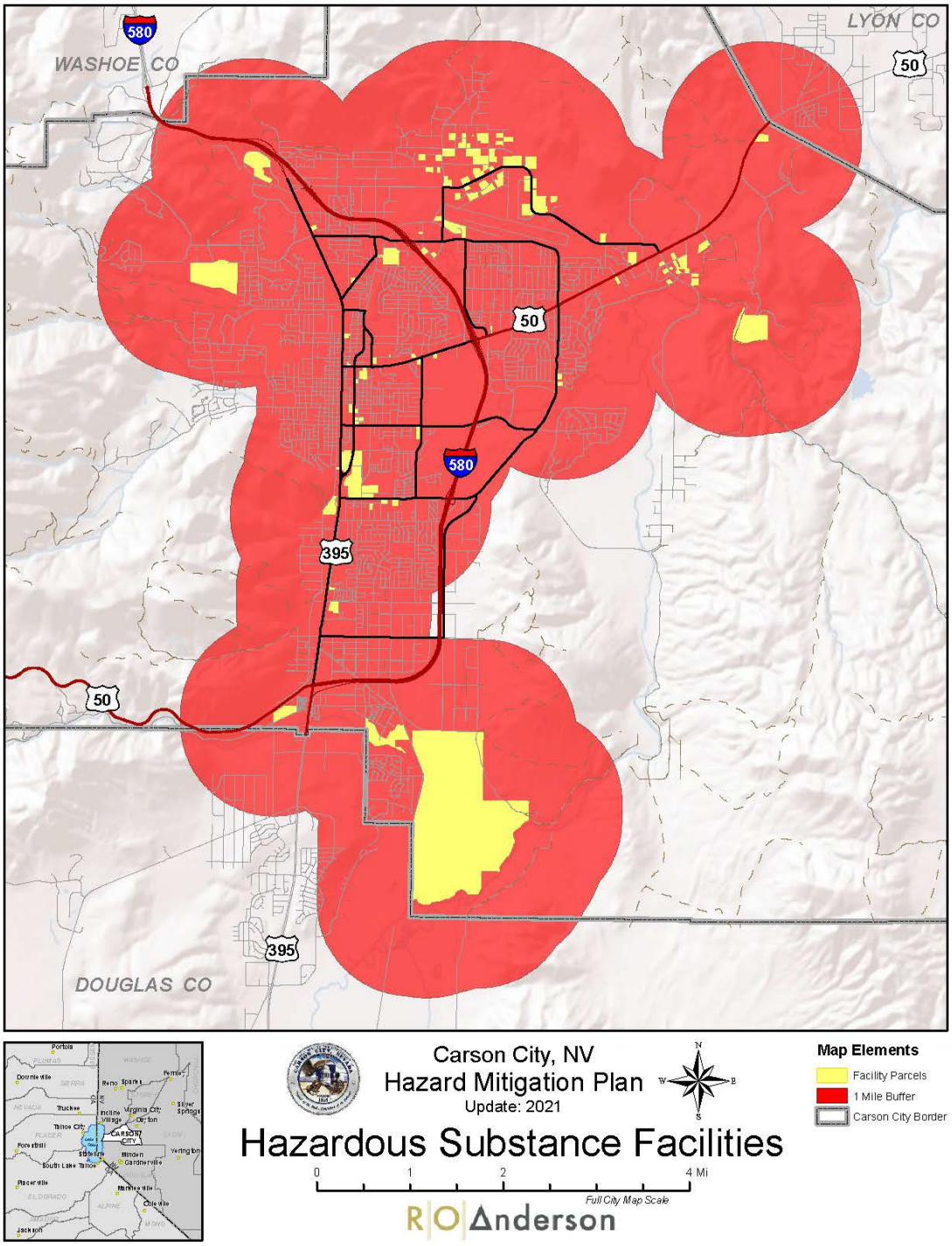


FIGURE 5-25: HAZ MAT FACILITIES WITH 1 MILE BUFFER

The Department of Transportation has provided a classification system for the transportation of hazardous materials. The system defines nine classes based on risk and requires specific placards be placed on vehicles transporting these materials. Figure 26 comes from the U.S. Department of Transportation federal Motor Carrier Safety Administration (FMCSA) and illustrates these requirements.[101] These classes identify the range of intensity for hazardous materials events.

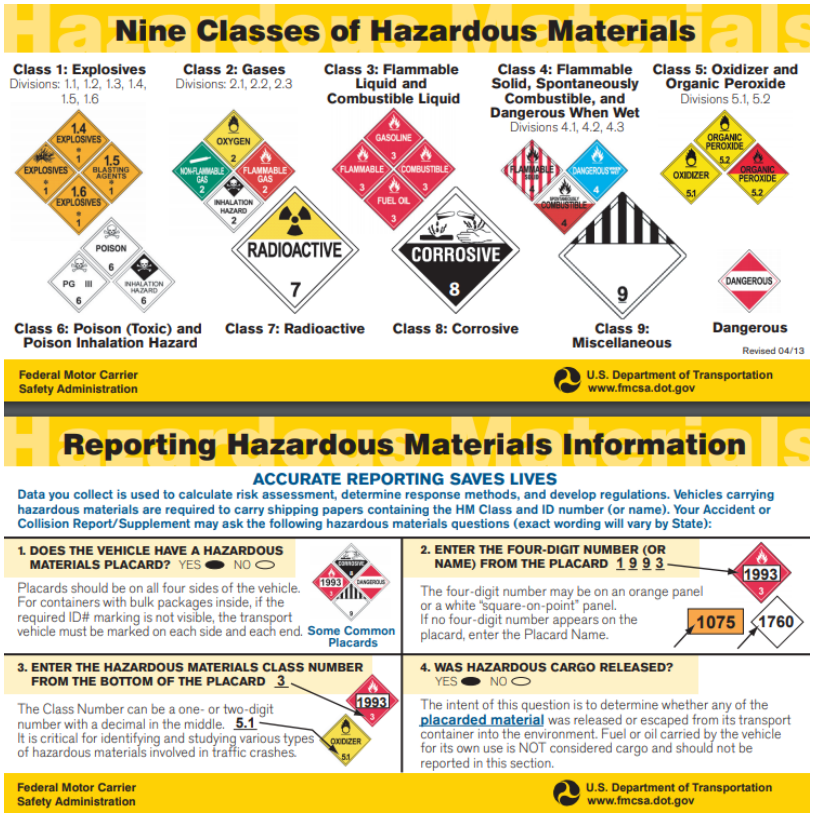


FIGURE 5-26: HAZARDOUS MATERIALS CLASSIFICATION

The National Fire Protection Association (NFPA) provides a guide for determining appropriate response levels based on the nature of a hazardous material event.[102] The table below comes

[101] "Nine Classes of Hazardous Materials (Yellow Visor Card)," FMCSA, accessed May 25, 2020, **https://www.fmcsa.dot.gov/regulations/enforcement/nine-classes-hazardous-materials-yellow-visor-card**.

[102] "Response Levels," *Hazardous Materials/Weapons of Mass Destruction Response Handbook*, Supplement 6, 2008, NFPA, accessed May 30, 2021, **https://www.nfpa.org/~/media/Files/forms%20and%20premiums/472%20handbook/NF472HB08_P3_CHS6.pdf**.

from the 2008 Hazardous Materials/Weapons of Mass Destruction Response Handbook from the NFPA.[103]

TABLE 5-12: PLANNING GUIDE FOR HAZARDOUS MATERIALS INCIDENTS, NFPA

TABLE S6.1 Planning Guide for Determining Incident Levels for Response and Training Incident Level

Incident Conditions	*Incident Level One*	*Incident Level Two*	*Incident Level Three*
Product identifications	Placard not required, NFPA 0 or 1 all categories, all Class 9 and ORM-D	DOT placarded, NFPA 2 for any categories, PCBs without fire, EPA regulated waste	Class 2, Division 2.3 — poisonous gases, Class 1, Division 1.1 and 1.2 — explosives, organic peroxide, flammable solid, materials dangerous when wet, chlorine, fluorine, anhydrous ammonia, radioactive materials, NFPA 3 & 4 for any categories including special hazards, PCBs & fire, DOT inhalation hazard, EPA extremely hazardous substances, and cryogenics
Container size	Small [e.g., pail, drums, cylinders except 1-ton (910 kg), packages, bags]	Medium [e.g., 1-ton (910 kg) cylinders, portable containers, nurse tanks, multiple small packages]	Large (e.g., tank cars, tank trucks, stationary tanks, hopper cars/trucks, multiple medium containers)
Fire/explosion potential	Low	Medium	High
Leak severity	No release or small release contained or confined with readily available resources	Release may not be controllable without special resources	Release may not be controllable even with special resources
Life safety	No life-threatening situation from materials involved	Localized area, limited evacuation area	Large area, mass evacuation area
Environmental impact (potential)	Minimal	Moderate	Severe
Container integrity	Not damaged	Damaged but able to contain the contents to allow handling or transfer of product	Damaged to such an extent that catastrophic rupture is possible

5.2.8.4 Previous Occurrences

The NRC Web-based query system of non-Privacy Act data shows that since 1999 to 2009, ten oil and chemical spills have occurred within Carson City. In addition to oil and chemical spills, the EPA recorded three airborne hazardous material releases during this time frame.[104] Between 2010 to 2015, there were seven hazardous material release events in Carson City which included

[103] "Planning Guide for Determining Incident Levels for Response and Training Incident Level, Table S6.1, NFPA, accessed May 30, 2021, **https://www.nfpa.org/~/media/Files/forms%20and%20premiums/472%20handbook/NF472HB08_P3_CHS6.pdf**.

[104] "Hazardous Materials Events," Section 5.2.6.2, History, Carson City Hazard Mitigation Plan, August 4, 2016, pp. 5-30 to 5-31.

three raw sewages spills. The event dated September 2017, mercury spill, was found in the State of Nevada Enhanced Hazard Mitigation Plan, 2018.[105]

TABLE 5-13: HAZMAT PREVIOUS EVENTS

HAZARDOUS MATERIALS PREVIOUS OCCURRENCES				
Date/ Month/ Season	**Event/Location**	**Substance**	**Description**	**Response Agency**
2018 to 2021	NA	NA	During this period, any hazardous materials events were of small quantity and not reportable. No hazmat spills or events were recorded during this period.	
September 2017	Unnamed government building.	Mercury	A government office building reported a mercury spill. An office desk was moved, and 280 grams of mercury was spilled from an unknown source. NDEP informed EPA, State Health, and Carson City Environmental. Following NDEP webpage directions for on-site small cleanups, personnel in personal protective equipment used eye droppers to remove as much mercury as possible. H2O Environmental was called for further remediation as needed.	
March 4, 2015	Spill on Stewart Community Tribal Property	Raw sewage	48,079 gallons of raw sewage spilled on to Washoe Stewart Community property.	Carson City Public Works, Washoe Tribe – Carson Colony and NDEP
December 8, 2013	Corner of Baker and Armory in Carson City	Sewage	Sewage backup overflowed out of a manhole.	Carson City Fire Dept.
April 9, 2012	West Course, left course at Arrowhead Drive and Bowers Lane	Treated effluent	Two-inch line broke and released treated effluent to the adjacent area at West Course.	Carson City Fire Dept
February 24, 2012	3155 South Carson Street	Raw sewage	Raw sewage from a sewer main line backed up and overflowed out of an MHP space's cleanout, which did not have the cap in place. Sewage flowed off the property, onto the	Carson City Fire Dept

[105] "Historical HAZMAT Events in Nevada, State of Nevada Enhanced Hazard Mitigation Plan 2018, page 3-119, accessed June 7, 2021. **https://data.nbmg.unr.edu/Public/NEHMP/StateOfNevadaEnhancedHazardMitigationPlan2018.pdf**.

HAZARDOUS MATERIALS PREVIOUS OCCURRENCES				
Date/ Month/ Season	**Event/Location**	**Substance**	**Description**	**Response Agency**
			adjacent property to the north and into the storm drain system.	
October 10, 2011	Frontier Village Mobile Home Park on C Street off Roop Street, near Winnie, Storm Drains between C Street and Dan Street	Oil from Fog Seal material	Sierra Stripers crew allegedly failed to heed weather conditions. The company laid down slurry and the rain carried oil from fog seal material to Roop St.	Carson City Fire Dept
January 23, 2010	3701 North Carson Street, Carson City	Non-PCB mineral oil	Car hit ground mounted transformer causing release of non-PCB mineral oil.	Carson City Fire Dept
August 9, 2009	3301 Airport Road	Mercury	Release of mercury from unknown source. Impacts include 20-unit apartment building evacuated and three-month cleanup.	
February 6, 2009	Carson High School	Mercury	Release of mercury from unknown source. School was evacuated.	
June 18, 2008	3301 E. 5th Street	Mercury	Mercury release due to broken thermometer near drain at 3301 E. 5th St.	
April 17, 2007	3915 Fairview	Chromic Acid Flakes	Acid flakes were accidently mixed in with caustic based sludge creating vapors at 3915 Fairview. The event made one employee sick, caused building evacuation, and road closure.	
September 14, 2005	1111 N. Saliman Road	Mercury	Mercury was release from a portable blood pressure machine break.	
November 17, 2004	Ash Canyon Water Storage Tank	Diesel	Diesel release from a temp. storage tank spilled due to the tank being tipped over at the Ash Canyon Water Storage Tank.	
July 16, 2004	Timberline Subdivision	Natural Gas	Natural gas leaked during a wildfire in the Timberline Subdivision	
July 14, 2004	Entire west side of Carson	Other	Potential hazardous material release from auto body shop and fertilizer store effected the entire west side of Carson City.	

HAZARDOUS MATERIALS PREVIOUS OCCURRENCES				
Date/ Month/ Season	**Event/Location**	**Substance**	**Description**	**Response Agency**
November 13, 2002	South Lake Tahoe	Oil/Diesel	Pleasure craft sank causing an oil/diesel spill at South Lake Tahoe.	
Month (?) 31, 2002	Washoe Tribe, Snider & Clear Creek Road	Sewage	Old sewer line next to creek has leaked at Washoe Tribe, Snider & Clear Cr. Rd.	
January 8, 2002	NV 798 at Marker 17	Arsenic, Trisulfide	A pile of rocks found in parking area. Material may be ore that contained 2.6 lbs of arsenic trisulfide.	
May 5, 1999	2727 Lockheed Way	Sulfuric Acid	One 30 gal. drum. Drum was punctured by a forklift causing a spill.	

5.2.8.5 Probability of Future Events

Comprehensive information on the probability and magnitude of hazardous material events from all types of sources (such as fixed facilities or transport vehicles) is not available. Wide variations among the characteristics of hazardous material sources and among the materials themselves make such an evaluation difficult. While it is beyond the scope of this HMP to evaluate the probability and magnitude of hazardous material events in the City in detail, it is possible to determine the exposure of population, buildings, and critical facilities should such an event occur.

Extremely Hazardous Substances pose the greatest risk for causing catastrophic emergencies. Areas at risk for hazardous material events include any area within a 1-mile radius of Interstate 580, U.S.50, and U.S. 395 and EHS fixed facilities. Based on the consistency of these events occurring almost yearly, the probability of future hazardous materials events is **very high**, occurring more frequently than once every 5 years.

5.2.8.6 Future Frequency of Events Due to Climate Change

While a direct relationship between hazardous materials events and climate change is tenuous, future extreme weather or fire events that occur as a secondary effect of climate change could trigger the release of hazardous materials harbored in storage facilities or en route on state or local roadways. The probability of increased frequency of hazardous materials events due to climate change is **low.**

5.2.8.7 Cascading Hazards

While hazardous material spills are unlikely to trigger other natural or manmade hazards, they can have secondary effects when contamination from a release is not completely removed or when spilled chemicals are exposed to other chemicals or materials that lead to an explosion or new pathway (gas, liquid, etc.). Road closures and evacuations may also result from hazardous material events.

5.2.8.8 Utility Loss

To the extent that hazardous materials are combustible, a hazard event could trigger the loss of electricity—or other infrastructure—due to fire. Hazardous materials spills can also contaminate ground water and streams and in this way impact water quality.

5.2.9 Infectious Disease

5.2.9.1 Planning Significance - Moderate

5.2.9.2 Hazard/Problem Description

The U.S. Department of Health and Human Services, National Institute of Health describes infectious disease as "A disease that is caused by a microorganism, such as a bacterium, virus, or protozoan, that is not normally found in the body and is capable of causing infection. Some, but not all, infectious diseases are contagious, meaning they can spread from person to person. Other infectious diseases can spread from animals or insects to humans, but not from person to person."[106]

Infectious disease can come from several sources, as listed below.

- Natural sources spreading from person to person, such as the flu
- Food-borne, for example E. coli
- Vector-borne from mosquitos (e.g. Zika, West Nile virus)
- Manmade (bioterrorism): intentional spread of disease(s) or toxins[107]

[106] "Infectious Disease," HIV/AIDS Glossary, U.S. Department of Health and Human Services, National Institute of Health, accessed June 1, 2020, **https://clinicalinfo.hiv.gov/en/glossary/infectious-disease**.

[107] City of Pasadena 2018 Hazard Mitigation Plan, accessed June 1, 2020, **http://ww2.cityofpasadena.net/councilagendas/2019%20Agendas/Jul_22_19/AR%2018%20LOCAL%20MITIGATION%20PLAN.pdf**.

An infectious disease outbreak—such as the COVID-19 pandemic—threatens the health of all community members, particularly those on the front lines working in hospitals, senior care facilities, and as emergency responders. The impact can also threaten the economy—when shelter-in-place orders are mandated on a local, state, and/or federal level.

A disease is a pathological (unhealthy or ill) condition of a living organism or part of the organism that is characterized by an identifiable group of symptoms or signs. Disease can affect any living organism, including people, animals, and plants. Disease can both directly (via infection) and indirectly (via secondary impacts) harm these living things. Some infections can cause disease in both people and animals. The major concern here is an epidemic, a disease that affects an unexpected number of people or sentinel animals at one time. (Note: an epidemic can result from even one case of illness if that illness is unheard of in the affected population, i.e., smallpox.)

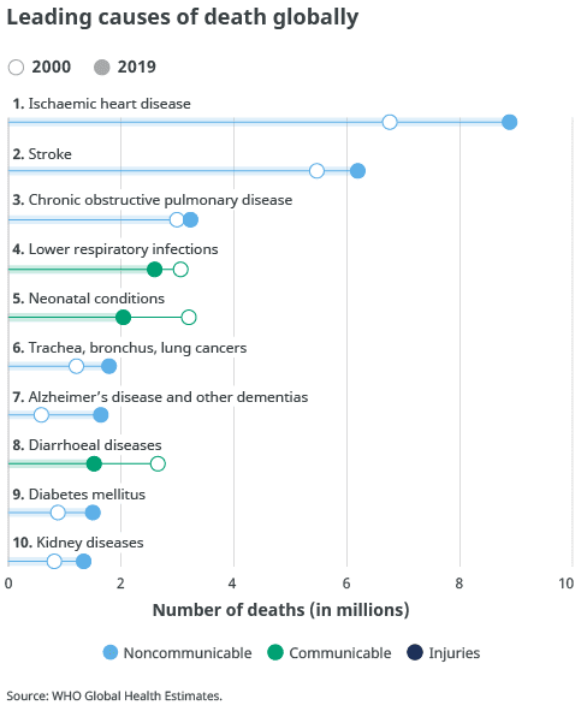


FIGURE 5-27: LEADING CAUSES OF DEATH GLOBALLY

Of great concern for human health are infectious diseases caused by the entry and growth of microorganisms in man. Most, but not all, infectious diseases are communicable. They can be spread by coming into direct contact with someone infected with the disease, someone in a carrier state who is not sick at the time, or another living organism that carries the pathogen.

Disease-producing organisms can also be spread by indirect contact with something a contagious person or other carrier has touched and contaminated, like a tissue or doorknob, or another medium (e.g., water, air, food). In response to the threat of emerging infectious diseases, the CDC launched a national effort to protect the US public in a plan titled Addressing Emerging Infectious Disease Threats. Based on the CDC's plan, major improvements to the US health system have been implemented, including improvements in surveillance, applied research, public health infrastructure, and prevention of emerging infectious diseases.[108]

[108] "Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States," *Morbidity and Mortality Weekly Report,* CDC, April 15, 1994, accessed June 5, 2021, **https://www.cdc.gov/mmwr/pdf/rr/rr4305.pdf**.

Despite these improvements, infectious diseases are a leading cause of death in humans worldwide as shown in Figure 5-27 above.[109] According to the U.S. Department of Health and Human Services, "in 2017, the 10 leading causes of death were, in rank order: Diseases of heart; Malignant neoplasms; Accidents (unintentional injuries); Chronic lower respiratory diseases; Cerebrovascular diseases; Alzheimer disease; Diabetes mellitus; Influenza and pneumonia; Nephritis, nephrotic syndrome and nephrosis; and Intentional self-harm (suicide)."[110] These 10 causes were responsible for 74% of all deaths in the United States. An article published in *Viewpoint* on March 31, 2021, included the following information for the Leading Causes of Death, US, 2015-2020. COVID-19, an infectious disease, ranks as the third leading cause of death in 2020.[111]

Table. Number of Deaths for Leading Causes of Death, US, 2015-2020[a]

	No. of deaths by year					
Cause of death	2015	2016	2017	2018	2019	2020
Total deaths	2 712 630	2 744 248	2 813 503	2 839 205	2 854 838	3 358 814
Heart disease	633 842	635 260	647 457	655 381	659 041	690 882
Cancer	595 930	598 038	599 108	599 274	599 601	598 932
COVID-19[b]						345 323
Unintentional injuries	146 571	161 374	169 936	167 127	173 040	192 176
Stroke	140 323	142 142	146 383	147 810	150 005	159 050
Chronic lower respiratory diseases	155 041	154 596	160 201	159 486	156 979	151 637
Alzheimer disease	110 561	116 103	121 404	122 019	121 499	133 382
Diabetes	79 535	80 058	83 564	84 946	87 647	101 106
Influenza and pneumonia	57 062	51 537	55 672	59 120	49 783	53 495
Kidney disease	49 959	50 046	50 633	51 386	51 565	52 260
Suicide	44 193	44 965	47 173	48 344	47 511	44 834

[a] Leading causes are classified according to underlying cause and presented according to the number of deaths among US residents. For more information, see the article by Heron.[4] Source: National Center for Health Statistics. National Vital Statistics System: mortality statistics (http://www.cdc.gov/nchs/deaths.htm). Data for 2015-2019 are final; data for 2020 are provisional.

[b] Deaths with confirmed or presumed COVID-19, coded to *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* code U07.1 as the underlying cause of death.

FIGURE 5-28: LEAD CAUSES OF DEATH US 2015-2020

Based on these trends, further improvements are necessary to prevent, detect, and control emerging, as well as resurging, microbial threats to health. The dangers posed by infectious diseases are compounded by other important trends: the continuing increase in antimicrobial resistance; the diminished capacity of the U.S. to recognize and respond to microbial threats; and the intentional use of biological agents to do harm.

[109] "The top 10 causes of death," World Health Organization, Fact Sheets, accessed June 5, 2021, **https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death**.

[110] Melonie Heron, Ph.D., "Deaths: Leading Causes for 2017," National Vital Statistics Reports, Volume 68, Number 6, NVSS, June 24, 2019, accessed June 5, 2021, **https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_06-508.pdf**.

[111] Farida B. Ahmad, MPH, Robert No. Anderson, PHD, "The Leading Causes of Death in the US for 2020," JAMA. 2021;325(18):1829-1830. doi:10.1001/jama.2021.5469, accessed June 5, 2021, **https://jamanetwork.com/journals/jama/fullarticle/2778234**.

The CDC has established a national list of over 40 nationally notifiable diseases. A notifiable disease is one that, by law, must be reported by health providers to federal, state, or local public health officials. Reportable diseases are those of public interest by reason of their communicability, severity, or frequency. For Week 21, 2021, this list included the diseases listed alphabetically below. The table does not include variants of these diseases.[112]

TABLE 5-14: WEEK 21, 2021 - REPORTABLE DISEASES

A to Ha	He to Sa	Se to Y
Anthrax: Arboviral Disease	Hepatitis A, B, C (select types)	Severe Acute Respiratory syndrome-associated coronavirus disease
Arboviral disease	Invasive pneumococcal disease	Shigallosis
Botulism	Leptospirosis	Smallpox
Brucellosis	Malaria	Syphilis
Cholera	Meningococcal disease	Tetanus
Cryptosporidiosis	Mumps	Toxic shock syndrome
Dengue virus infections	Pertussis	Tuberculosis
Ehrlichiosis and Anaplasmosis	Poliovirus infection	Vancomycin-Intermediate *Staphylococcus auereus*
Gonorrhea	Q fever	Vibriosis
Hansen's Disease	Rubella	Viral hemorrhagic fevers
Hantavirus infection	Salmonella infection	Yellow fever

Due to the wide variation in disease characteristics, the warning time for a disease disaster can vary from no time to months, depending upon the nature of the disease. No warning time may be available due to an extremely contagious disease with a short incubation period, particularly if combined with a terrorist attack in a crowded environment. However, there are agencies in place that have capabilities to prevent, detect, and respond to these types of diseases, such as Carson City Health and Human Services (CCHHS), the Centers for Disease Control (CDC), and the Division of Public and Behavioral Health (DPBH). Together, these resources provides a positive, balancing influence to the overall outcome of a disease disaster event.

[112] "Nationally Notifiable Infectious Diseases and Conditions, United States: Week 21, 2021, Centers for Disease Control and Prevention, accessed June 5, 2021, **https://wonder.cdc.gov/nndss/nndss_weekly_tables_menu.asp**.

CCHHS conducts surveillance of communicable disease occurrences in the municipality of Carson City. They also implement control measures and develop reports as mandated by Nevada Revised Statutes (NRS), as well as receive and investigate complaints from the public regarding possible foodborne illness.

The mission for Carson City Health and Human Services (CCHHS) is "to protect and improve the quality of life for our community through disease prevention, education and support services," and their vision is to lead the region by providing services that support healthy communities.[113]

Specific programs and services provided by CCHHS follow below.

- Chronic Disease Division
- Epidemiology
- Clinical Services
- Environmental Health
- Human Services
- Public Health Preparedness

The COVID-19 pandemic in Carson City, Douglas County, Lyon County, and Storey County was tracked centrally for this Quad County Region.

The impact of any infectious disease outbreak is substantial—and for events like the COVID pandemic, that impact is significantly escalated. Contact tracing, case investigations, and provider/ patient interactions tax the ability of staff to mitigate and respond effectively (at least in the beginning). During the COVID pandemic, the system was often burdened by the need for additional equipment and staff for a sustained effort over many months (more than a year).

5.2.9.3 Location and Extent

Infectious disease threatens the entire planning area as it can occur anywhere, in any season. Disease occurrence, particularly an epidemic, may be difficult to evaluate due to the wide variation in disease characteristics, such as rate of spread, morbidity and mortality, detection and response time, and the availability of vaccines and other forms of prevention.

According to the Center for Disease Control (CDC), the following terms are used to describe the level of the observed occurrence of a disease.[114]

[113] Nicki Aaker, MSN, MPH, RN, Carson City Health and Human Services, Presentation, May 7, 2021.

[114] CDC Principles of Epidemiology in Public Health Practice, Third Edition—An Introduction to Applied Epidemiology and Biostatistics, accessed June 2, 2020, **https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html**.

- *Sporadic* is the term used for a disease that happens infrequently or irregularly.
- *Endemic* describes the baseline or expected level of a disease present in a community.
- *Hyperendemic* is the term used to describe a persistent or high level of occurrence.
- *Outbreak* is used for a baseline or expected level of disease occurrence present in a smaller geographic area than endemic.
- *Cluster* refers to a group of cases in a specific place and time. These cases are suspected to be more than the expected number.
- *Epidemic* happens when adequate numbers of an agent and susceptible hosts are present in adequate numbers, AND, the agent is effectively conveyed from source to the susceptible hosts.
- *Pandemic* is used when an epidemic spreads over several countries or continents affecting large numbers of people—such as COVID-19 in 2020.

As the COVID pandemic established, an outbreak can significantly impact the City. A regional response was required and established through coordination amongst the Quad Counties, Carson Tahoe Regional Medical Center, and the City, as well as state and federal agencies. Segments of the population at highest risk for contracting an illness from a foreign pathogen ranged from the very young to the elderly and included individuals currently experiencing respiratory or immune deficiencies. These populations, of course, continue to live and work in Carson City.

5.2.9.4 Previous Occurrences

The influenza pandemic of 1918 and 1919, known as the Spanish Flu, had the highest mortality rate in recent history for an infectious disease. More than 20 million persons were killed worldwide, some 500,000 of which were in the U.S. alone (Centers for Disease Control and Prevention, October 1998). More recent incidences of major infectious diseases affecting people in the U.S. include the following outbreaks. Information sourced from the State of Nevada Enhanced Hazard Mitigation Plan[115] and the Carson City Health and Human Services Division.

[115] State of Nevada Enhanced Hazard Mitigation Plan 2018, accessed June 7, 2021. **https://data.nbmg.unr.edu/Public/NEHMP/StateOfNevadaEnhancedHazardMitigationPlan2018.pdf**.

TABLE 5-15: INFECTIOUS DISEASE PREVIOUS OCCURRENCES

INFECTIOUS DISEASE PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Event**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
Ongoing since January 20, 2020	COVID-19 Pandemic	DR-4523-NV
February 17, 2014	A nine-week-old canine was diagnosed in Northern Nevada with rabies	9 of 43 persons assessed for rabies exposure were advised and chose to receive rabies post exposure prophylaxis.
2009 – 2012	I H1N1 influenza virus outbreak	
2007 – 2008	West Nile Virus outbreak	A small number of cases of confirmed cases in Carson City were treated.
2004	West Nile Virus outbreak	
Spring 2000	Measles outbreak	Five confirmed cases

Federal Disaster Declarations during this period are listed in the table below.

TABLE 5-16: INFECTIOUS DISEASE FEDERAL DISASTER DECLARATIONS

Disaster Declaration No.	Cause	Date Issued	Incident Period
DR-4523-NV	COVID-19 Pandemic	January 20, 2020	Major Disaster declared April 4, 2020 & continuing
EM-3443-NV	COVID-19	January 20, 2020	Emergency Declaration on March 13, 2020

COVID. On March 12, 2020, Steve Sisolak, Governor of the State of Nevada, declared an emergency directing all state agencies to supplement efforts to save lives, protect property, and protect health and safety.[116] The CCHHS has led the efforts to secure PPA, staffing, and equipment needed to address the immediate and ongoing crisis and has served as a centralized source of information. The CCHHS hosts the Quad County COVID Dashboard which includes a collective and individual tally of each of the Quad County cases, recoveries, and deaths. As of

[116] Excerpted from "Declaration of Emergency for COVID-19," accessed June 6, 2021, **https://gov.nv.gov/News/Emergency_Orders/2020/2020-03-12_-_COVID-19_Declaration_of_Emergency/**.

June 6, 2021, Carson City has identified 12,915 total cases and 228 deaths (1.77% of total cases). The graphs below illustrate cases by gender and age.

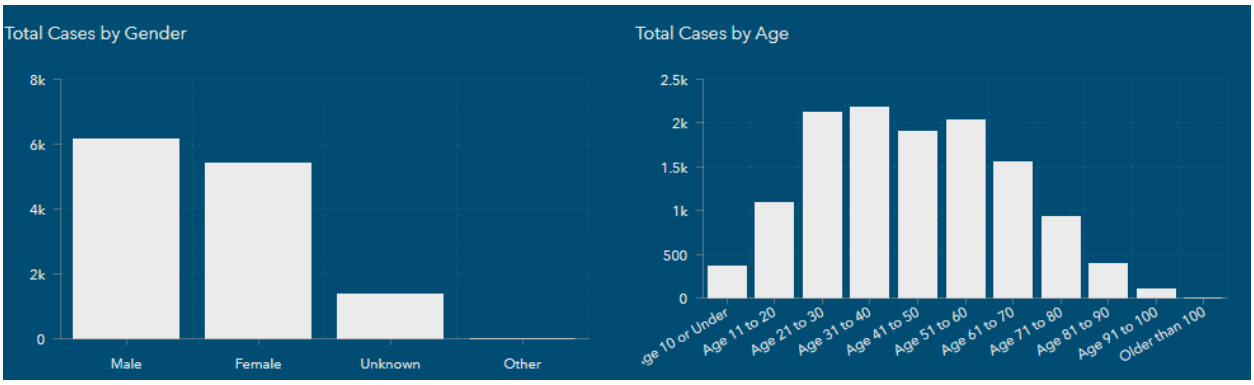


FIGURE 5-29: CARSON CITY COVID DASHBOARD FOR JUNE 6, 2021

Ebola Virus Disease. Ebola Virus Disease (EVD) Ebola, previously known as Ebola hemorrhagic fever, is a rare and deadly disease caused by infection with one of the Ebola virus strains. The 2013 to 2016 outbreak in West Africa, was the largest and most complex Ebola outbreak since the Ebola virus was first discovered in 1976. There have been more cases and deaths in this outbreak than all others combined. A case of Ebola was announced in the Democratic Republic of Congo on February 7, 2021 and declared ended on May 3, 2021.[117] On February 14, 2021, cases were confirmed in Guinea, the first in Guinea since the 2014 to 2016 West Africa outbreak, was declared over.[118]

H1N1. According to the CDC, the H1N1 virus that caused the 2009-2010H1N1 pandemic is now a regular human flu virus and continues to circulate seasonally worldwide. H1N1 (A-orange) is included in the chart below for influenza cases.[119]

[117] "2021 Democratic Republic of the Congo, North Kivu Province," Ebola (Ebola Virus Disease), CDC, accessed June 6, 2021, **https://www.cdc.gov/vhf/ebola/outbreaks/drc/2021-february.html**.

[118] "2021 Guinea, N'Zérékoré Prefecture," Ebola (Ebola Virus Disease), CDC, accessed June 6, 2021, **https://www.cdc.gov/vhf/ebola/outbreaks/guinea/2021-february.html**.

[119] "CDC Estimates of 2009 H1N1 Influenza Cases, Hospitalizations, and Deaths in the United States," H1N1 Flu, CDC, accessed June 6, 2021, **https://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm**.

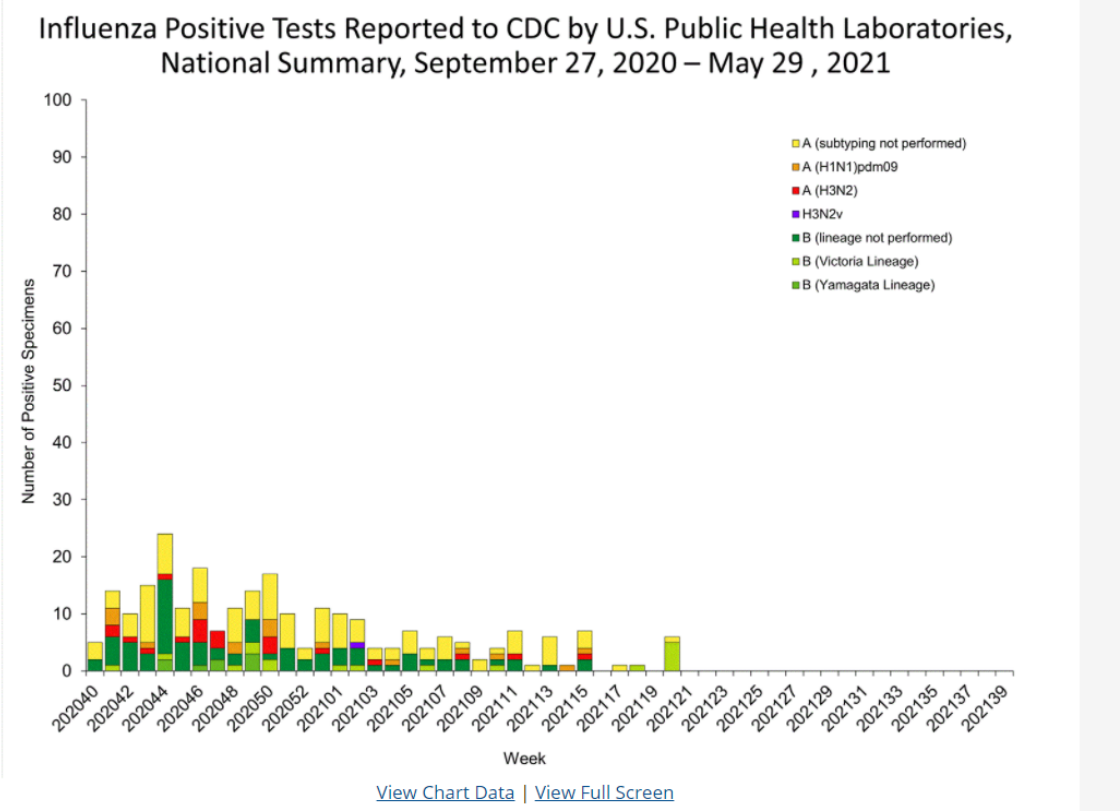


FIGURE 5-30: CDC INFLUENZA POSITIVE TESTS

Measles. Measles is an acute viral respiratory illness. Since 2000, when measles was declared eliminated from the U.S., the annual number of cases has ranged from a low of 37 in 2004 to a high of 1,282 in 2019. The 2019 outbreak included cases at the University of Nevada, Reno. Measles is still common in many parts of the world including some countries in Europe, Asia, the Pacific, and Africa; travelers with measles continue to bring the disease into the U.S. Thirteen cases were reported in the United States in 2020.[120]

Pertussis. Pertussis is a highly contagious respiratory tract infection. Although it initially resembles an ordinary cold, whooping cough can turn more serious, particularly in infants. In 2017 a pertussis outbreak lasting 2.5 months occurred in Carson City, Douglas County, and Lyon County. Ten cases, some associated with a group home or daycare facility, and 95 close contacts were identified and monitored. Due to the hindrances associated with the current COVID

[120] "Number of measles cases reported by year," Measles (Rubeola), CDC, accessed June 6, 2021, **https://www.cdc.gov/measles/cases-outbreaks.html**.

epidemic, the CCHHS is conducting outreach to remind the community to stay up-to-date on pertussis vaccination.

Rabies. Rabies is a preventable viral disease of mammals most often transmitted through the bite of a rabid animal; the principal rabies hosts today are wild carnivores and bats. Rabies-related human cases in the United States are rare, with only one to three cases reported annually. The number of rabies deaths has been declining annually.[121]

Modern day prophylaxis has been very successful in reducing the number of rabies cases. However, if a person is bitten by a possibly rabid animal, rabies is still a medical urgency, and medical attention should be pursued quickly. Each year, hundreds of of thousands of animals need to be placed under observation or be tested for rabies, and between 30,000 to 60,000 people need to receive rabies postexposure prophylaxis.[122]

West Nile Virus (WNV). WNV, a seasonal infection transmitted by mosquitoes, caused an epidemic which grew from an initial U.S. outbreak of 62 disease cases in 1999 to 51,801 cases in 2019. During the same period, Nevada recorded 427 cases. As the CDC notes below, this disease has no known cure.

> *There are no vaccines to prevent or medications to treat WNV in people. Fortunately, most people infected with WNV do not feel sick. About 1 in 5 people who are infected develop a fever and other symptoms. About 1 out of 150 infected people develop a serious, sometimes fatal, illness. You can reduce your risk of WNV by using insect repellent and wearing long-sleeved shirts and long pants to prevent mosquito bites.*[123]

In Carson City, the incidence of the disease varies based drought (vs. wet) conditions. Presently, CCHHS manages mosquito abatement and is seeking funds on an ongoing basis—and is currently researching the possibility of delivering abatement via drone.

[121] "Human Rabies," Is Rabies in your State? CDC, accessed June 6, 2021, **https://www.cdc.gov/rabies/location/usa/surveillance/human_rabies.html**.

[122] Human Rabies, accessed June 6, 2021.

[123] "West Nile Virus," CDC, accessed June 6, 2021, **https://www.cdc.gov/westnile/index.html#**.

Food Borne Illness. The Federal government estimates that there are about 48 million cases of foodborne illness annually–the equivalent of sickening 1 in 6 Americans each year. And each year these illnesses result in an estimated 128,000 hospitalizations and 3,000 deaths.[124] The most common types follow after the map below[125].

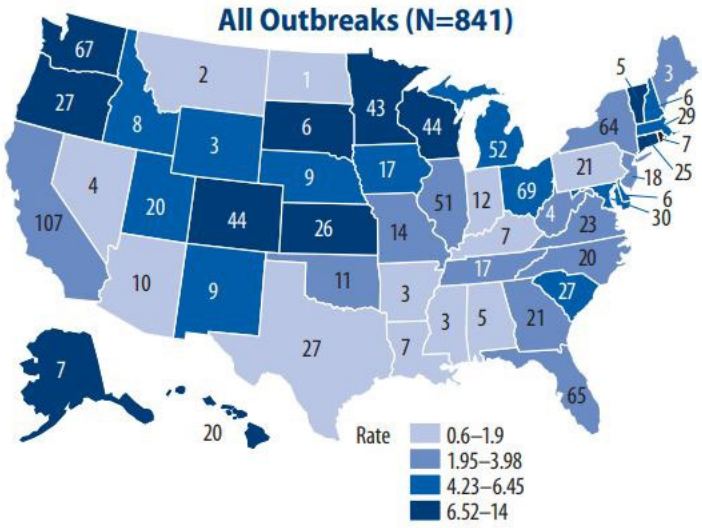


FIGURE 5-31: FOODBORNE DISEASE OUTBREAKS, 2017 ANNUAL REPORT

- **Norovirus** is the most common cause of acute gastroenteritis and foodborne-disease outbreaks in the United States, which typically occur from November to April. Each year, it causes an average of 900 deaths, primarily among adults aged 65 and older. Carson City Health and Human Services has responded to a number of norovirus cases, often in nursing homes.
    - In 2017, a local sandwich shop was linked to several illnesses. The CCHHS conducted 62 phone and paper surveys and found that 65% of respondents had experienced GI symptoms after eating a sandwich there. While norovirus was suspected due to reported symptoms and time of offset, no food or human samples yielded a causal agent. Epidemiology staff at the CCHHS provides education and information to mitigate the effects and to prevent the spread of the disease in the community.
    - In 2016, a family reunion outbreak was associated with a local casino. Eleven of 47 attendees became ill. No on ill submitted samples for testing. No food

[124] "Burden of Foodborne Illness: Findings," Estimates of Foodborne Illness in the United States, CDC, accessed June 6, 2021, **https://www.cdc.gov/foodborneburden/2011-foodborne-estimates.html#**.

[125] "Surveillance for Foodborne Disease Outbreaks United States, 2017, Annual Report," Centers for Disease Control and Prevention, CDC, Atlanta, Georgia: U.S. Department of Health and Human Services, CDC, 2019, accessed June 6, 2021, **https://www.cdc.gov/fdoss/pdf/2017_FoodBorneOutbreaks_508.pdf**.

service workers became ill. No other patrons became ill. One person was ill prior to the reunion and was identified as the source of this unidentified outbreak.

- **Escherichia coli** (abbreviated as E. coli) are bacteria found in the environment, foods, and intestines of people and animals. E. coli are a large and diverse group of bacteria. Although most strains of E. coli are harmless, others can make you sick. Some kinds of E. coli can cause diarrhea, while others cause urinary tract infections, respiratory illness and pneumonia, and other illnesses. Of the 15 outbreaks recorded by the CDC between 2017 and February 1, 2021, none were identified as occurring in the State of Nevada.
- **Salmonella.** The CDC estimates that approximately 1.2 million illnesses and approximately 450 deaths occur due to non-typhoidal Salmonella annually in the United States.
    - In 2018, CCHHS investigated a case of salmonella typhi (typhoid fever) which required the exclusion of household contacts that worked in the food service industry and in multiple food establishments. No additional cases in the community or the household were identified.

TABLE 5-17: HISTORIC OCCURRENCES OF EPIDEMICS REGISTERED IN NEVADA

Date	Historic Occurrences of Epidemics Registered in Nevada
February 1992	Cholera outbreak confirmed. At least 26 passengers from Aerolineas Argentinas Flight 386 that brought a cholera outbreak to Los Angeles traveled on to Las Vegas, where 10 showed symptoms of the disease. Cholera or cholera- like symptoms developed in 67 passengers of Flight 386.
Spring 2000	Five cases of the measles confirmed. Outbreak identified and confirmed, Clark County Health District (CCHD) Office of Epidemiology (OOE) worked with the Immunization Clinic and the media to alert the community about the prevention of the spread of the disease.
October 2004	Norovirus confirmed at a major public accommodation facility on the Strip
2004	During October 13-19, a total of 200 cases of human **West Nile Virus** were reported in 20 states, which included Nevada. During 2004, 40 states including Nevada reported a total of 2,151 cases of human West Nile Virus.
Fall 2004	**Chickenpox** (varicella) outbreak in Clark County, Nevada elementary school. 32 students from all grades were infected.
April 2006	**Norovirus** outbreak at a Reno, Nevada daycare, Noah's Ark. 30 norovirus cases were confirmed. 2 additional people were infected after the daycare had been cleaned and sanitized.
March 2007	A **norovirus** outbreak in Las Vegas, Nevada sickened at least 215 inmates and 41 staff members at the Clark County Detention Center. Most of those sickened complained of stomach-related distress such as diarrhea, vomiting and cramps. None were hospitalized.
April 2009	H1N1 virus confirmed by the WHO as a worldwide epidemic. The CDC is currently working on vaccinating the public for the 2015-2016 flu seasons.
2009 - 2012	The **novel H1N1** influenza virus became a global pandemic and in Nevada thousands of people were infected leading to 40 deaths.

5.2.9.5 Probability of Future Events

According to the CDC, "The U.S. experiences flu epidemics every year – it's called the "flu season. It's not possible to predict what this flu season will be like. Flu seasons are unpredictable in a number of ways. While flu spreads every year, the timing, severity, and length of the season varies from one year to another." In Carson City from the 2010 through the 2014 flu seasons, the average number of reported cases was 110. In 2015, Carson City saw 436 flu cases, a 25% increase over the average.

For the 2015 – 2018 flu seasons, the average number of reported cases was 577. Starting with the 2019 influenza season, Carson City Health and Human Services (CCHHS) changed how influenza was being reported. CCHHS switched to Influenza Like Illness (ILI) reporting, utilizing the Nevada ESSENCE reporting system. Using the new reporting system, Carson City

experienced an average of 1,431 ILI reports since the 2019 influenza season. In 2020, due to the COVID-19 pandemic and the mitigation measures put in place, Carson City saw a decrease of 85% in ILI reports.

The CDC estimates that 1 in 6 Americans will get a foodborne illness in a given year. For Carson City, that would be approximately 9,441 people. Carson City has averaged 14 confirmed cases of foodborne illnesses in the last five years so the probability of having a foodborne epidemic is low.

Carson City Health and Human Services has received an average of approximately 1,854 confirmed cases of reportable diseases, excluding COVID each year for the last five years, with 46% being influenza. During the pandemic, Carson City had 5,659 reported conditions of which 89% being COVID-19 (or 6,626), and the rest encompassing a variety of reportable conditions ranging from hepatitis to botulism, CRE, RSV, Rotavirus, tuberculosis and a variety of foodborne illnesses.

Epidemics constitute a significant risk to the population of Nevada, particularly considering the frequency with which the Carson City population travels and the proximity of Lake Tahoe and Reno's tourist population. Of highest concern is the Reno area, where various entertainment venues, events such as Burning Man when it resumes, and tourist destinations attracting visitors from around the globe who often arrive via the Reno/Tahoe International Airport. The transient nature of the population, coupled with dense population gatherings increase the potential for an epidemic, as well as for its spread into Carson City.

Based on previous occurrences and the range of potential diseases, the probability of future infectious disease outbreaks is **high**.

5.2.9.6 Future Frequency of Events Due to Climate Change

The projected trend toward higher temperatures is "expected to precipitate more frequent extreme events such as [. . .] infectious diseases," according to the Strategic Foresight Initiative on Climate Change.[126] Warmer weather brings people outdoors and increases numbers of mosquitos making contact between the people and mosquitos more likely—and vector-borne diseases more prevalent.

Also, warmer weather brought on by climate change may allow species to live in areas previously too cold for their survival. In light of these trends, the probability of increased frequency of infectious diseases due to climate change is **medium**.

[126] "Key Trends and Drivers," *Climate Change: Long Term Trends and their Implications for Emergency Management,* Strategic Foresight Initiative, August 2011, FEMA, accessed July 2021, https://www.fema.gov/pdf/about/programs/oppa/climate_change_paper.pdf.

Temperature dependencies show correlation between disease rates and weather variations over weeks, months, or years and in close geographic associations between key climate variables and the distributions of important vector borne diseases. These temperature dependencies can impact both humans and livestock. Temperature has also been found to affect food-borne infectious diseases.

The likelihood of future infectious disease events due to climate change is **high**, likely to increase the probability of this hazard.

5.2.9.7 Cascading Hazards

Many other hazards, such as floods, earthquakes, and droughts, may create conditions that significantly increase the frequency and severity of diseases. These hazards can affect basic services (e.g., water supply and quality, wastewater disposal, electricity), the availability and quality of food, and the public and agricultural health system capacities. As a result, concentrated areas of diseases may result and, if not mitigated right away, increase, potentially leading to large losses of life and damage to the economic value of the area's goods and services.

5.2.9.8 Utility Loss

Infectious disease is unlikely to trigger utility loss. However, the loss of utilities (water, wastewater disposal, power) could contribute to an outbreak of infectious disease due to water contamination, exposure to pathogens, and loss of power.

5.2.10 Landslide

5.2.10.1 Planning Significance – Moderate

5.2.10.2 Hazard/Problem Description

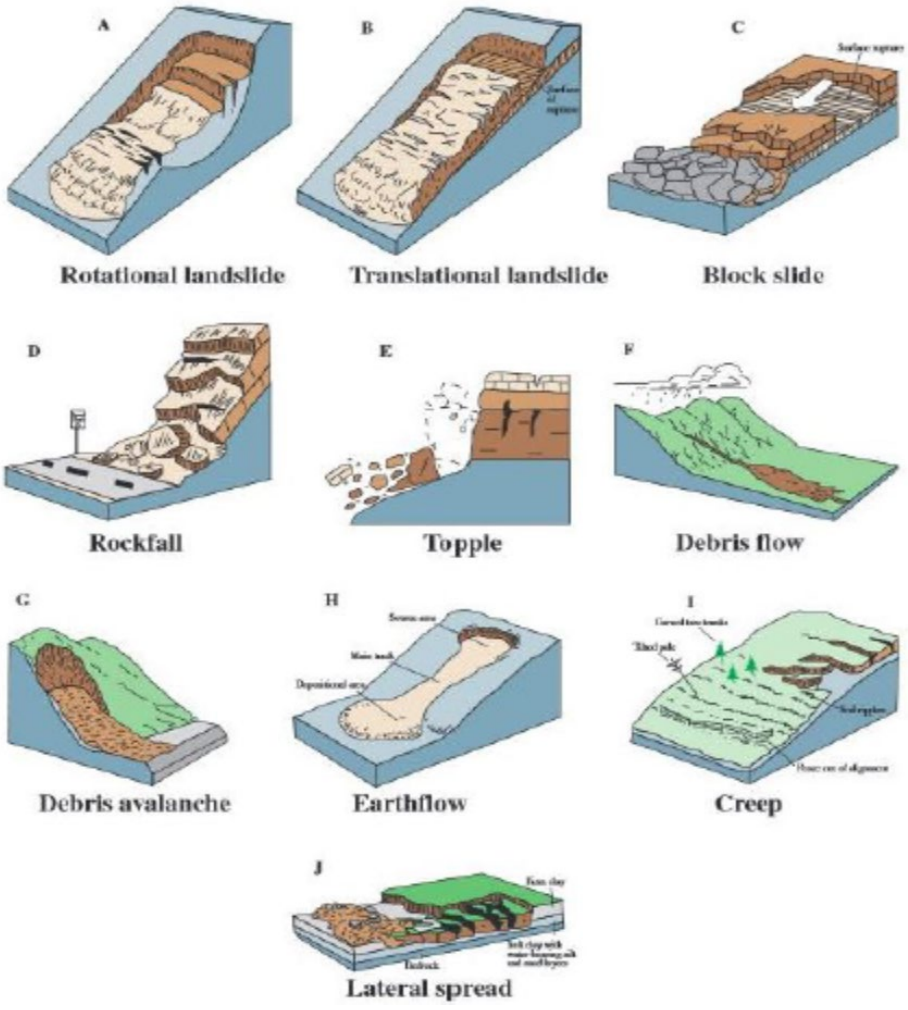
A landslide is the movement of rock and soil downslope that may take place gradually over a small area or may be very rapid and involve a large area, such as landslides that have been documented at Slide Mountain. Landslides occur when the force of gravity on a slope overcomes the strength of earth materials in the slope, and the slope fails. A stable slope can be made unstable and susceptible to landslides by an increase in the gravitational force or a decrease in the resisting force (the strength of the slope).

Increases in gravitational forces include putting weight on a slope, such as a building, mine dump, roadway fill, or even heavy rain. Decreases in the strength of supporting materials include weathering (for example, groundwater deterioration or undermining), stream erosion, or other forms of removal of material from the base of a slope, and infiltration of water. Water infiltration

can increase pore pressure along planes of weakness, which can reduce friction and promote slope failure. Some slopes have geology that is favorably oriented for landslides. For example, dip slopes have planes of weakness that are parallel to the slope and can favor slope failure.

Examples of landslide triggers include shaking from earthquakes, heavy rainfall (especially on fire-burned slopes and vegetation-stripped areas that cause large amounts of rapid runoff), and volcanic activity (which is accompanied by earthquakes and can load slopes with ash and debris).

In Carson City, uplift along the range-bounding fault has over-steepened the base of the range front, and combined with occasional strong ground motion from earthquakes, has formed a number of landslides in the hillslope. Some of these can be seen with partial shadowing from the late afternoon sun angle. Another area of tectonically over-steepened slope bases occur is along C-Hill, where the Carson City fault runs along the base of the mountain. In general, steeper slopes have greater gravitational potential, and thus are more susceptible to landslides. Landslides include five modes of slope movement: falls, topples, slides, spreads, and flows. These are further subdivided by the type of geological material, such as bedrock or earth materials (the latter term implied soil or alluvial materials).[127]



[127] "Nature , 2021.
https://w

FIGURE 5-32 SCHEMATIC ILLUSTRATIONS OF DIFFERENT TYPES OF LANDSLIDE

The figure below illustrates an idealized earth rotational slump with the different features of the slide identified. Hazards in the upper part of the slide include downslope movement and foundation distortion. In the lower part of the slide, buildings can be impacted by the slide and damaged and/or moved.[128]

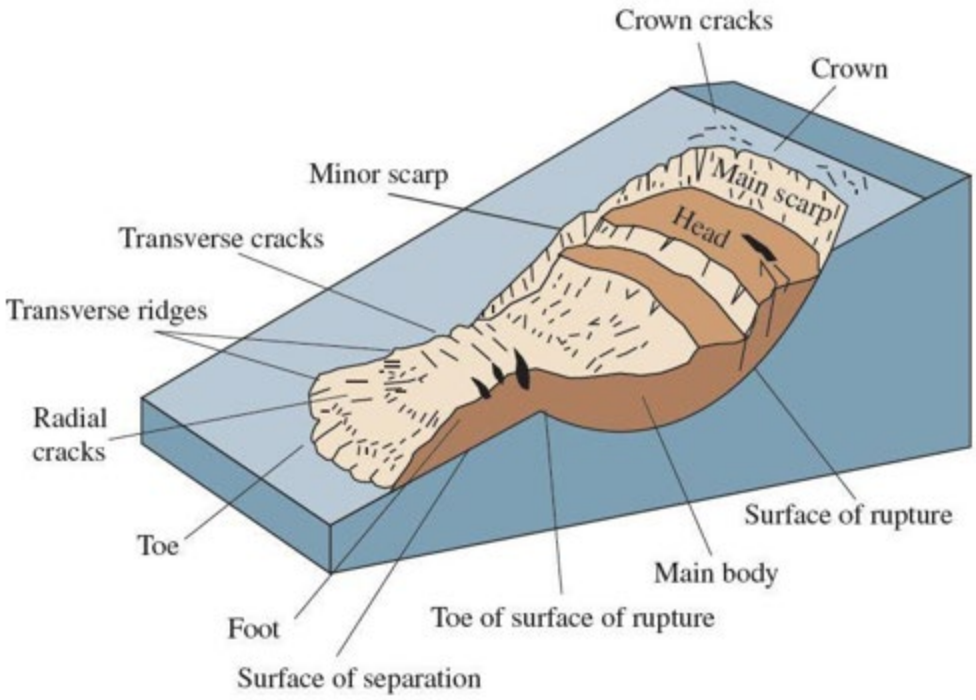


FIGURE 5-33: DIFFERENT PARTS OF A ROTATIONAL EARTH SLIDE

A common type of landslide in Nevada is a rock fall. These can develop with very little material on a steep slope and can become quite substantial in size and impact. They are common when earthquakes or heavy downpours occur in an area. Rock falls can directly injure or kill people,

[128] "Nature," Section 5.2.8.1, "Landslide," Carson City Hazard Mitigation Plan 2016, p. 5-43, accessed June 7, 2021. **https://www.carson.org/home/showpublisheddocument/54500/636265687065070000**.

can invade and damage houses and buildings, and can block transportation routes, especially in the mountainous areas. Rock falls are commonly triggered by heavy rainfall or earthquakes.

5.2.10.3 Location and Extent

Landslides tend to originate in mountainous and hilly areas with steeper slopes but can run out on adjacent areas with lower slopes. The distance a landslide can travel depends on factors—such as the momentum a landslide gains traveling down a slope and whether air gets trapped underneath the slide material—decreasing the basal friction.

An important exception to having a steep slope for a potential landslide is the phenomena of a lateral spread which can occur on low slopes. These are special situations where shallow levels of groundwater and subsurface sediment are pressurized during earthquakes, and the overlying ground flows sideways. This is known as liquefaction and is discussed further in the earthquake hazard section. Lateral spreads can cause sideways movement of the ground, formation of large cracks, formation of sand blows or sand volcanoes, expulsion of subsurface water and sand (including geysering of water), and ground settlement.

One approach to finding areas with landslide potential is to examine the slopes and terrane of an area for existing landslide scars and/or landslides and rock falls. For example, landslides and landslide scars can be seen along the range fronts (such as in the Kings Canyon and Ash Canyon areas), in drainage basins (such as Ash Canyon), and in the upper parts of the Carson Range. A landslide survey would be a useful tool for planning future development and infrastructure.

Currently, the probability of a landslide is considered low within Carson City, partly based on a lack of previous occurrences within the City and the low exposure to potential landslide areas. The orange circle in Figure 5-34 below identifies the location for “Probable Landslide in the Area” per the U.S. Landslide Inventory. Note that the developed areas of this jurisdiction are well distanced from this identified probable landslide area.[129]

[129] “What is a landslide hazard map?” U.S. Landslide Inventory Map, accessed June 6, 2021, **https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=ae120962f459434b8c904b456c82669d**.

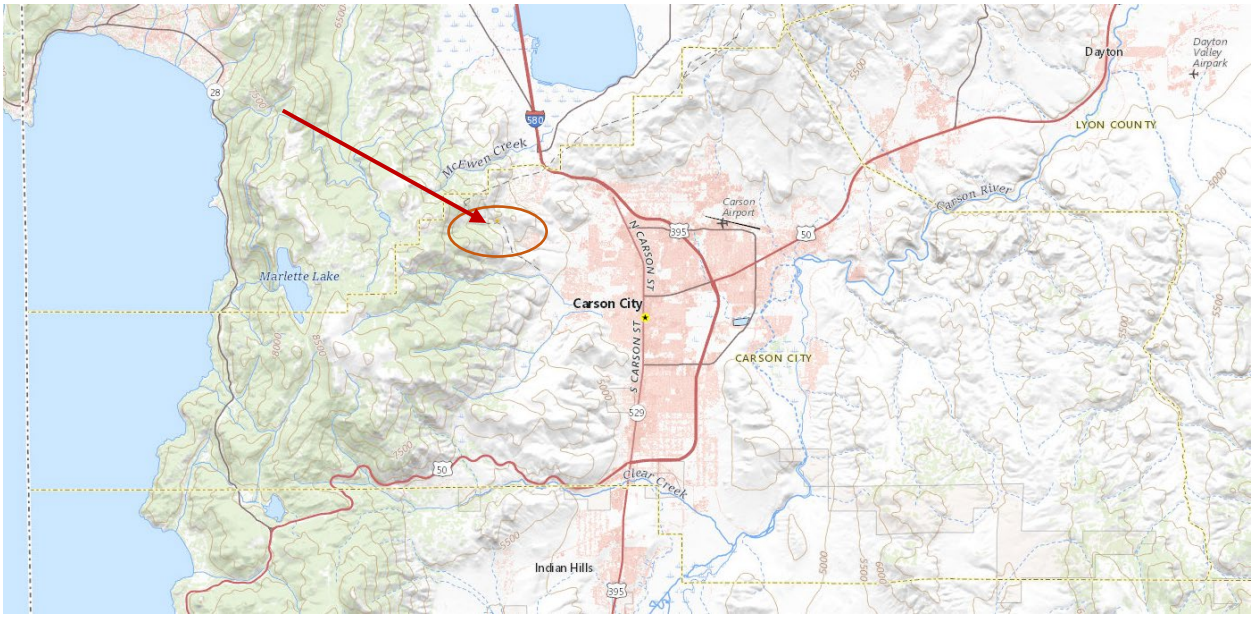


FIGURE 5-34: U.S. LANDSLIDE INVENTORY MAP - PROBABLE LANDSLIDE LOCATION

In general, landslide mitigation involves the careful location of structures to avoid being involved in, or hit by, a landslide. Potential landslide areas and runout areas can be delineated and avoided. Existing landslides can be stabilized by adding material that buttresses the base of the slide and removing material from the upper part of the slide to reduce gravitational potential. In some cases slopes are reinforced with retention structures that help hold a slope in place.

Slopes can also be mechanically stabilized with strong root systems or geofabric-reinforced buttresses. If a landslide exists below a construction site, the slope can be stabilized and the potential for the progression of the landslide upslope can be reduced by installing straight shaft piers into ground immediately downslope from the foundation. When considering the mitigation of an existing landslide, it is important to identify the extent of the slide, the failure surface below the slide, and any older failure surfaces below that from older landslides. In extraordinary cases, landslides can be anchored in place using piers or anchors to reduce the chances of further movement.

The USGS Landslide Inventory map in Figure 5-31 above identifies one landslide susceptibility location within Carson City. Landslide susceptibility maps identify the "relative likelihood of future landsliding based solely on the intrinsic properties of a locale or site. Some organizations use the term 'landslide potential map' for maps of this kind. Prior failure (from a landslide inventory), rock or soil strength, and steepness of slope are three of the more important site factors that determine susceptibility."[130] In addition, "cubic yards of earth moved (could be millions); area shifted/how far

[130] "What is a landslide hazard map?" Natural Hazards, USGS, accessed May 30, 2021, https://www.usgs.gov/faqs/what-a-landslide-hazard-map?qt-news_science_products=0#qt-news_science_products

it shifted – e.g. "landslide could be 1000 yards of hillside moving 200 feet" may also be used to describe landslide susceptibility."[131]

5.2.10.4 Previous Occurrences

The largest recorded event in the area occurred in neighboring Washoe County on the eastern slopes of Slide Mountain and occurred on May 30, 1983. The rockslide killed one man, destroyed a house, and caused $2 million in damage to the area. There are no other recorded landslides, but this may be because there was no damage from previous landslide events, such as the 1852 slide in the same area.

Although evidence of landslides has been documented on the Ash Canyon area, these did not affect the public.

TABLE 5-18: LANDSLIDE PREVIOUS OCCURRENCES

LANDSLIDE PREVIOUS OCCURRENCES		
Date / Month / Season	**Event**	**Impact: Federal Declaration # / Damages / Injuries / Deaths**
Winter 2016-2017	Ash Canyon	No public damage reported

5.2.10.5 Probability of Future Events

During the Waterfall Fire in 2004, the area west of Carson City (Ash Canyon, Kings Canyon, and Combs Canyon) lost soil-retaining vegetation which may pose a threat for small landslides during heavy precipitation. However, each year that goes by reduces that threat. Examples of areas where a rock fall hazard might be considered are the Silver Oak residential area in the center of town and locations around Prison Hill. Landslide risk will need to be re-evaluated if development continues at the base of possible slide-area slopes. Currently, the probability of a landslide is considered **low** within Carson City, partly based on no previous occurrences within the City and low exposure to potential landslide areas.

The probability is less than a 1% chance of occurrence for a landslide that has significant damage to property. The chances of having a landslide are the highest in the mountainous areas with steep slopes of 30 percent or higher and substantially increase when triggering factors such as heavy rains or an earthquake occur. Due to this low probability and the fact that an occurrence would be in a remote rural area at high elevations away from the city, no further detailed analysis

[131] "Landslide," *Extent Examples by Hazard*, FEMA-provided document.

of slopes or magnitude and extent was deemed necessary. Such occurrence would not impact the population or infrastructure or produce significant damage to property.

5.2.10.6 Future Frequency of Events Due to Climate Change

To the extent that climate change could bring heavy rains as well as high winds and storms that may trigger wildfires, the risk of landslides and debris flows will likely increase. The probability of increased frequency of landslide and debris flows due to climate change is **medium**.

5.2.10.7 Cascading Hazards

While many hazards may trigger a landslide, a landslide is not likely to trigger other hazards—with the exception of erosion and power outages.

5.2.10.8 Utility Loss

In the mountainous terrain landslides and avalanches have the potential of disrupting power or uncovering and/or damaging the pipeline. The greatest hazard exists where the electrical wire or pipeline crosses steep mountainous areas. Earthquakes, flooding, and times of high runoff can lead to an increased likelihood of landslides.

5.2.11Severe Weather

5.2.11.1 Planning Significance – High

5.2.11.2 Hazard/Problem Description

Thunderstorms, hailstorms, tornadoes, windstorms, and winter storms were combined into the category of severe weather. Thunderstorms are further defined due to the numerous threats associated with them.

Thunderstorms. Thunderstorms are formed from a combination of moisture, rapidly rising warm air, and a force capable of lifting the air, such as warm and cold fronts or mountainous terrain. A thunderstorm in western Nevada can produce lightning, hail, heavy rains, high winds (microbursts), dust storms, and even tornadoes.[132] The National Weather Service Storm Data for 2015 to 2020 logged zero episodes of thunderstorms in Carson City. Heavy rain and high wind events identified by NWS, however, are included in the previous occurrences below.

[132] Craig Smallcomb, Severe Summer Thunderstorms, Carson City Hazard Mitigation Plan, May 7, 2021.

Thunderstorms are most common from June through August and may occur singly, in clusters, or in lines. As a result, it is possible for several thunderstorms to affect one location in the course of a few hours. The main threats from thunderstorms are hail, wildfires, deadly lightning, tornadoes, flash floods, and downburst winds. Flash floods and wildfires are detailed separately in this plan.

Hailstorms. Hail is a form of solid precipitation which consists of balls or irregular lumps of ice, that are individually called hail stones. Hail stones consist mainly of water ice and measure between 0.20" and 6.00" (5 and 150 millimeters) in diameter, with the larger stones coming from severe and dangerous thunderstorms. Hail is possible with most thunderstorms as strong rising air currents in the thundercloud transport moisture laden air well above the freezing level converting super-cooled water vapor into hail stones. The stronger the updraft into the thunderstorm, the longer these initially small hails stones stay suspended in the storm, allowing them to grow to in size to the point where they eventually become too heavy for the updraft to keep them aloft, and they fall to the surface.

Tornadoes. A tornado is a violent, rotating column of air which is in contact with both the surface of the earth and a thunderstorm cloud. Tornadoes come in many sizes but are typically in the form of a visible condensation funnel, whose narrow end touches the earth and is often encircled by a cloud of debris. Most tornadoes have wind speeds between 65 mph and 110 mph, are approximately 250 feet across, and travel less than a mile before dissipating. Some attain wind speeds of more than 300 mph, stretch more than a mile across, and stay on the ground for dozens of miles.

Downburst Winds. A downburst is created by an area of significantly rain-cooled air that, after hitting ground level, spreads out in all directions producing strong winds. Unlike winds in a tornado, winds in a downburst are directed outwards from the point where it hits land or water. Dry downbursts are associated with thunderstorms with very little rain, while wet downbursts are created by thunderstorms with high amounts of rainfall. Downburst winds are often termed microbursts, macrobursts, or outflow thunderstorm winds. Most downburst winds that impact Carson City occur as dry downbursts due to the high cloud bases of the associated thunderstorms, which allows for much of the rainfall to evaporate before reaching the ground. They are also usually microbursts compared to macrobursts since the area affected is typically less than 2.5 miles.

Macrobursts do occur in the region when individual thunderstorm cells organize into a line or cluster but are less common. Downburst winds are typically 35 to 75 mph but can exceed over 100 mph in rare cases.

Downburst winds typically damages fences, roofs, weakened structures, trees, and power lines. Downbursts do pose a significant risk to aviation, especially to aircraft taking off and landing due to strong winds that change direction over very short distances. In addition, small aircraft on the ground can incur damage if not secured. Downburst winds do pose a significant risk to new lightning induced wildfire starts, allowing small fires to grow quickly. During periods of drought, dust storms result from downburst winds and cause visibilities to drop below ½ mile, creating

hazardous driving conditions. Downburst winds from thunderstorms are common in Carson City from late spring through early fall.

Downslope Windstorms. Winds are horizontal flows of air that blow from areas of high pressure to areas of low pressure. Wind strength depends on the difference between the high- and low-pressure systems and the distance between them. Therefore, a strong pressure gradient results from a large pressure difference over short distance between places and causes strong winds.

Strong and/or severe winds often precede or follow frontal activity, including cold fronts, warm fronts, and dry lines. Down-slope windstorms are common in Carson City during the winter months when winter storms approach the Sierra. Strong winds ahead of a cold front are ducted down to the surface due to mountain waves, enhancing wind speeds that are often stronger than Down-slope windstorms seen in the rest of the United States. Down-slope winds in the lee of the Sierra typically produce sustained southwest winds of 30 to 50 mph with gusts to 70 mph. During the strongest down slope windstorms, winds can exceed over 100 mph and last numerous hours.

Down-slope windstorms and can overturn mobile homes, tear roofs off of houses, down fences, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, and dust storms.

In addition to strong and/or severe winds caused by large regional frontal systems, locally strong winds caused from the funneling of winds through mountain peaks or drainages do occur. Areas impacted by these local winds are much smaller in scale, although wind speeds can be equally as strong as those caused by large scale weather systems.

Winter Storms. Winter storms can bring heavy rain, snow, high winds, extreme cold, and freezing rain to the region. In Nevada, winter storms are massive low-pressure weather systems originating in the North Pacific Ocean that sweep across the western states. Winter storms can also 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 snow or ice can create hazardous conditions. Additionally, a large winter storm event can also cause exceptionally high rainfall that persists for days, resulting in heavy flooding. Winter storms that are able to tap into subtropical moisture are the ones most likely to lead to flooding due to heavy warm rain. Flooding is exacerbated by warm heavy rains falling on low elevation snowpack. The current predictability of winter storms is roughly 3-5 days in advance with a general heads-up, with more specific information 1-3 days in advance. Some of the larger “atmospheric river” winter storms can be identified by forecasters up to 7 days in advance, though there are often large errors in track and intensity this far in advance.

5.2.11.3 Location and Extent

The entire area is subject to more numerous light snowfalls and winter weather events where snow accumulates to 5 or so inches, including the occasional narrow lake effect snow from Lake Tahoe.

Thunderstorms that produce hail and downburst winds occur in Carson City every year. An active thunderstorm pattern, resulting from monsoon moisture over the Southwestern United States being transported into Nevada can lead to a prolonged period of thunderstorm days and severe weather. In addition, weak weather systems moving over Nevada after a period of hot weather often leads to dry thunderstorms with strong downburst winds. The current predictability of specific thunderstorms is limited to 0-30 minutes ahead, though forecasters are able to highlight days where the ingredients for thunderstorms are likely to combine up to 1-3 days in advance.

While no hail events were recorded in NOAA over the last five years, hailstorms have been a common occurrence in Carson City, especially during the late spring through early fall months when thunderstorms are most frequent. Hail sizes are typically between pea and marble size, but can get larger than golf balls during the strongest storms that impact the area. A Severe Thunderstorm for hail, as defined by the National Weather Service, is a thunderstorm capable of producing hail stones greater than 1” in diameter, which usually occurs only a few times per year. The current predictability of severe hailstorms is limited to 0-30 minutes of warning in advance.

Tornadoes are rare in Carson City due to high thunderstorm cloud bases and the mountainous terrain creating erratic wind flows detrimental to tornado formation. Historically, tornadoes in the region are usually weak, often categorized as EF0 (65-85 mph) or EF1 (86-110 mph) on the Enhanced Fujita Scale. An upper level low pressure system is often required for tornado development in Carson City due to the need for sufficient wind shear in the lower atmosphere, which is necessary to create an environment favorable for tornado genesis. The current predictability of tornadoes in the western US is limited to 0-15 minutes of warning in advance.

While NOAA data for the last five years does not show a record of lightning or thunderstorm winds in the Carson Valley area, NOAA data does include high wind and strong wind events. Severe thunderstorm wind events in Carson City have occurred consistently in the past, primarily during the summer thunderstorm season from June to August. These events can be isolated microbursts or part of more widespread thunderstorm outbreaks. For these thunderstorm wind events, the current predictability of severe downburst winds is limited to 0-30 minutes of warning in advance.

Carson City also experiences local ”zephyr” winds gusting to 20-30 mph each summer day due to the areas valley/mountain topography.

Down-slope windstorms occur on-average two to three times per winter season, Extreme down-slope windstorms with gusts in excess of 80 to 100 mph are less frequent, occurring a few times per decade. The most recent example is the December 11, 2014 windstorm where widespread gusts over 80 mph were observed near Carson City. The current predictability of downslope windstorms is roughly 2-4 days in advance with a general heads-up or High Wind Watch, with more specific information 1-2 days in advance with a High Wind Warning. The areas of worst damage from downslope windstorms are often dictated by just subtle changes in wind direction, which limits how predictable the storms are.

Winter storms that generate heavy rainfall that leads to flooding in Carson City generally occur once every several years. The area is subject to numerous light snowfalls and winter weather

events where snow accumulates up to 5 or so inches, including the occasional narrow lake effect snow from Lake Tahoe. These smaller events take place 1-3 times each winter, even in drought years. Snowfall accumulation in Carson City from the bigger snowstorms can often be between 12-24 inches over a 24-hour period. Heavy snowfall events of this magnitude, occurring roughly once every 1-3 years, are generally associated with a strong low pressure system dropping out of the Gulf of Alaska The current state of predictive science allows for a greater heads-up on major winter storms than even just 5 or 10 years ago. The large atmospheric river storms that often create big snowfalls can be tracked across the Pacific Ocean 5-8 days in advance, with more detailed river forecasts up to 2-4 days in advance. It should be noted that uncertainties in rain-snow line elevation forecasts remain one of the biggest prediction challenges and are often of low confidence until 12-24 hours ahead of the storm.

5.2.11.4 Previous Occurrences

Historic weather events occurring between December 2014 and January 1997 are provided in the table below.[133]

TABLE 5-19: HISTORIC SEVERE WEATHER OCCURRENCES

SEVERE WEATHER PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Event**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
December 11, 2014	Strong windstorm with wind gusts over 80 mph were common.	Produced widespread damage, trees down, and power outages across the region.
December 6, 2013	Band of snow produced 6-10 inches of accumulation in Carson City	
March 20, 2013	A winter storm brought damaging winds to the region, with gusts 58-66 mph reported	Caused power outages in Carson City, with power poles knocked down
December 1, 2012	A winter storm brought high winds of 60-70 mph with gusts to 88 mph in the foothills.	Damage reports included downed fences and power lines.

[133] "Severe Weather," "History," Section 5.2.9.2, p. 5-48, Carson City Hazard Mitigation Plan 2016, accessed June 7, 2021, **https://www.carson.org/home/showpublisheddocument/54500/636265687065070000**.

SEVERE WEATHER PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Event**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
January 19, 2012	A winter storm brought high winds to much of the region, with gusts 60 to 84 mph being reported.	
February 25, 2011	Heavy snow fell in Carson City with 12-18 inches in the west side of town	Caused 25 power poles to break and multiple auto accidents and two injuries and $250,000 damages region wide. Non-emergency state services closed.
March 29, 2010	A storm brought high winds to Carson City	Caused difficulty controlling a fire which caused extensive damage to a furniture store ($250k to $500k damage according to fire chief) and a hair salon.
December 6, 2009	Cold storm brought heavy snow to the region including 14-18 inches of snow in Carson City	
February 25, 2009	A possible dust devil descended the foothills just west of Carson City	Flying debris generated by the dust devil damaged 12 automobiles in the DMV parking lot.
February 2, 2008	Powerful winter storm brought high winds and heavy snows with up to 16 inches of snow in the Carson City foothills	
January 4-6, 2008	Powerful winter storm brought high winds and heavy snows 15 inches of snowfall	
June 5, 2007	Strong wind gusts up to 48 knots	Brought down tree limbs in Carson City. One downed tree limb on Fifth Street knocked out power to 900 residents, including the Carson City Courthouse and Sheriff's Department
February 26, 2006	Warm winter storm produced heavy rain up to 3.5 inches fell west of Carson City	

SEVERE WEATHER PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Event**	**Impact: Federal Declaration#/Damages/Injuries/Deaths**
December 30 -31, 2005	Warm winter storm produced heavy rain of up to 6 inches in a 24 hour period	Caused flooding in Carson City
April 27, 2005	An F0 tornado was reported near the Carson-Tahoe Hospital	No injuries or damage reported
January 2 through 10, 2005	Winter storm dropped several feet of snow	Shut down roads and requiring snow removal
December 29, 2004 through January 10, 2005	A winter storm dropped heavy snow	Shut down roads and requiring snow removal
July 20, 2003	Thunderstorm wind gusts estimated at 50 knots blew through Mills Park in Carson City	Injured women and child from falling tree branches
July 26, 1998	Thunderstorm in the central portion of Carson City with winds estimated to 60 knots	Knocked over a tree which downed power and telephone lines near the Carson River, three miles east of Carson City NV
January 1-2, 1997	Warm winter storm brought heavy rainfall on top of a deep snowpack caused largest floods on record for the region	Resulting in damage across the region.

Federal Disaster Declarations related to severe weather during the period between 2016 and the present can be found in the table below.

TABLE 5-20: FEDERAL DISASTER DECLARATIONS FOR SEVERE WEATHER

Disaster Declaration No.	Cause	Date Issued	Incident Period
DR-4307-NV	Severe winter storms, flooding, mudslides	3/27/2017	February 5 to February 22, 2017

Disaster Declaration No.	Cause	Date Issued	Incident Period
DR-4303-NV	Severe winter storms, flooding, mudslides	2/17/2017	January 5 to January 14, 2017

Data provided by NOAA, National Centers for Environmental Information, populates the table below which includes weather events in the Carson City area between February 2016 and June 5, 2021. The events are ordered by event type from past to present.[134]

TABLE 5-21: NOAA RECORDED PREVIOUS OCCURRENCES JANUARY 2014 TO JUNE 2021

SEVERE WEATHER: NOAA RECORDS FOR CARSON CITY			
Date/Month/ Season	**Event Location**	**Event Type**	**Event Narrative**
2/19/2021	Greater Reno/Carson City/Minden Area (Zone)	High Wind	Numerous gusts 50-60 mph along the foothills in Northwest Reno, Caughlin Ranch, Washoe Valley, and west of **Carson City**.
12/30/2020	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	Very light snowfall up to an inch fell across Reno with a dusting to half an inch falling in the northern portion of **Carson Valley**.
12/30/2020	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	For the higher elevations of western Nevada, snowfall around the northern portion of the Carson Range and the Lake Tahoe Basin was generally around 2 to 3 inches above 6500 feet MSL. Along the south and east shore, up to an inch fell.
12/27/2020	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	Very light snowfall less than an inch fell across portions of western Reno, western **Carson City**, and the western portions of the Carson Valley near Gardnerville and US Highway 395.
11/18/2020	Carson City	Heavy Rain	Reporting 0.65 inches of rain in last 12 hours.
11/13/2020	Greater Reno/Carson City/Minden Area (Zone)	High Wind	Widespread strong winds with gusts 50-60 mph in most areas with gusts 70+ mph in wind prone areas such as Washoe Valley, west side of the **Carson Valley**, and along the slopes of Peavine. Mountain ridges gusted 100-110 mph.

[134] Storm Events Database, National Centers for Environmental Information, NOAA, Search results for Carson City, County, Nevada, accessed 6/16/2021, **https://www.ncdc.noaa.gov/stormevents/**.

SEVERE WEATHER: NOAA RECORDS FOR CARSON CITY			
Date/Month/ Season	**Event Location**	**Event Type**	**Event Narrative**
11/8/2020	Greater Reno/Carson City/Minden Area (Zone)	Heavy Snow	Widespread snowfall reports of 4 to 6 inches in the Reno Sparks area, 3 to 5 inches in **Carson City**, and over 1 foot in Minden Gardnerville.
4/6/2020	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	Snowfall anywhere from 0.5 inches to 4 inches around the Reno, Sparks, and **Carson City** areas.
3/1/2020	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	For western Nevada from the evening of 29 February through the morning of 1 March, snowfall in North Reno was generally between 2.5 to 2.7 inches. In **Carson City**, snowfall of up to 3 inches was reported during the aforementioned time period.
2/29/2020	Greater Reno/Carson City/Minden Area (Zone)	Strong Wind	$5000 property damage, $250 crop damage-An isolated wind gust event caused roof damage to at least two houses along with several trees being uprooted in the area of Bath Street and Pyrenees Street in western **Carson City**. The nearest anemometer to the area at Western Nevada College (mesonet WMC) had a wind gust to 30 mph closest to the time of the reported damage.
1/16/2020	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	For western Nevada, snowfall around the Reno-Sparks metro area was generally 1 to 3 inches, except less than 1 inch on the valley floor. Higher snowfall amounts around 4 inches occurred in the Surprise Valley. Around **Carson City**, Minden, and the higher foothills west of Reno, snowfall totals were between 4 and 8 inches.
12/13/2019	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	Two-day snowfall amounts ranged from a trace to 4 inches across much of the Greater Reno-**Carson City**-Minden Area, with higher totals closer to the Carson Range. Light snowfall amounts up to 1 inch were reported within Spanish Springs and Palomino Valley between 22 March 0600PST and 23 March 0600PST. Valley rainfall amounts around Reno-Carson City-Minden were between 0.10 to 0.37 inches.
7/25/2019	Empire	Heavy Rain	Mesonet station C4390, 3 miles east-northeast of **Carson City** (elevation 4619 feet) reported 0.69 inches of rainfall in a 1-hour period from 26 July 1417PST to 1517PST.
3/27/2019	Carson City	Heavy Rain	CoCoRaHS station NV-CC-21 in **Carson City** reported 0.60 inches of rainfall in a 24 hour period from 27 March 0800PST to 28 March 0800PST.
3/22/2019	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	Light snowfall amounts up to 1 inch were reported within Spanish Springs and Palomino Valley between 22 March 0600PST and 23 March 0600PST. Valley

SEVERE WEATHER: NOAA RECORDS FOR CARSON CITY			
Date/Month/ Season	**Event Location**	**Event Type**	**Event Narrative**
			rainfall amounts around Reno-**Carson City**-Minden were between 0.10 to 0.37 inches.
1/20/2019	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	Between the 20th and 21st, northern Reno and Spanish Springs received between 1.2 to 2.2 inches of snowfall. Areas within the **Carson Valley** received 0.5 to 1 inch of snowfall during the time period.
1/16/2019	Carson City	Heavy Rain	CO-OP observer CRCN2 in **Carson City** reported 1.00 inch of rainfall in a 24 hour period from 16 January 0700PST to 17 January 0700PST.
1/6/2019	Greater Reno/Carson City/Minden Area (Zone)	Heavy Snow	Storm total snowfall amounts ranged from 3.9 inches at the Reno-Tahoe International Airport to 7.5 to 10.5 inches in northwest Reno and northern Reno. Spanish Springs and Sparks received between 2.5 to 8 inches of snowfall during the time period. Galena and Montreux received between 10 to 16 inches of snowfall during the time period. Areas within **Carson City** received 6 to 8 inches of snowfall during the time period.
12/24/2018	Carson City	Heavy Rain	Trained weather spotter 1 mile northeast of **Carson City** reported 0.96 inches of rainfall in a 24-hour period from 24 December 0700PST to 25 December 0700PST.
12/4/2018	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	Twenty-four-hour snowfall amounts ranged from 1.4 inches at the Reno-Tahoe International Airport to 5 inches in northwest Reno and northern Reno. Spanish Springs and Sparks received between 1 to 3 inches of snowfall during the 24 hour period. Significant numbers of traffic accidents occurred in the Reno-Sparks area when temperatures rapidly cooled below freezing during the evening rush hour of Dec 4th. Areas within **Carson City** received 3 to 3.5 inches of snowfall, while the southwest portion of the Carson Valley received anywhere from 3 to 5 inches of snowfall during the 24 hour period.
5/24/2018	Carson City	Heavy Rain	Mesonet station CRSC1, 1 mile northeast of **Carson City** reported 0.96 inches of rainfall in a 24-hour period from 24 May 0919PST to 25 May 0919PST.
5/16/2018	Carson City	Heavy Rain	CoCoRaHS station NV-CC-14, 3 miles north-northeast of **Carson City** reported 0.53 inches of rainfall in a 24-hour period from 16 May 0600PST to 17 May 0600PST.
4/6/2018	Carson City	Heavy Rain	CoCoRaHS station NV-CC-21, **Carson City** reported 0.59 inches of rainfall in a 24 hour period from 6 April 0800PST to 7 April 0800PST.
4/6/2018	Carson City	Heavy Rain	Trained weather spotter 2 miles north of Stewart measured 0.54 inches of rainfall in a 24 hour period from 6 April 1047PST to 7 April 1047PST.

SEVERE WEATHER: NOAA RECORDS FOR CARSON CITY			
Date/Month/ Season	**Event Location**	**Event Type**	**Event Narrative**
3/20/2018	Carson City	Heavy Rain	Mesonet station VCEN2, 2 miles west-southwest of Lakeview reported 3.23 inches of storm total rainfall from 20 March 0648PST to 23 March 0648PST.
3/20/2018	Carson City	Heavy Rain	Trained weather spotter in **Carson City** reported 2.35 inches of storm total rainfall from 20 March 1134PST to 23 March 1134PST. 0.81 inches of that rain fell from 22 March 1134PST to 23 March 1134PST.
3/15/2018	Greater Reno/Carson City/Minden Area (Zone)	Heavy Snow	Trained weather spotter 1 mile northeast of **Carson City** measured a storm total snowfall of 15.5 inches since 15 March 1109PST.
3/15/2018	Greater Reno/Carson City/Minden Area (Zone)	Heavy Snow	Trained weather spotter 1 mile northeast of **Carson City** reported 15.5 inches of snowfall from 15 March 1500PST to 16 March 1500PST. 13.0 inches of snow fell between 1500PST 15 March and 0600PST 16 March. 2.5 inches of snow fell between 0600PST and 1500PST 16 March.
3/15/2018	Greater Reno/Carson City/Minden Area (Zone)	Heavy Snow	Trained weather spotter 1 mile north-northeast of **Carson City** measured 13.0 inches of heavy snow from 15 March 1842PST to 16 March 0642PST.
12/19/2017	Greater Reno/Carson City/Minden Area (Zone)	High Wind	Mesonet CAPN2 2 miles northeast of **Carson City** reported a wind gust of 69 mph.
11/15/2017	Carson City	Heavy Rain	A trained weather spotter reported 4.47 inches of rain from 15 November 0800PST to 16 November 2000PST at an elevation of 5300 feet.
3/4/2017	Greater Reno/Carson City/Minden Area (Zone)	Heavy Snow	Isolated snowfall amounts between 17 and 19 inches fell above 5000 feet west of Carson City on the 5th, with around 12 inches in Virginia City. Four to six inches of snow fell on the north and west sides of Reno, as well as near **Carson City** and east of Highway 395 in the Minden-Johnson Lane area. Six to 8 inches of snow was reported in the north valleys of Reno. Lesser snowfall amounts up to 3 inches fell in Sparks and in southeast Reno.
12/15/2016	Greater Reno/Carson City/Minden Area (Zone)	High Wind	Gusts between 73 and 89 mph were recorded in and near the Carson Range southwest of Reno and west of **Carson City** and Minden, with gusts between 60 and 70 mph along Highway 395 in the north valleys of Reno. A semi-truck was blown over in Washoe Valley at around 530PST. At the Reno-Tahoe International airport, at least 11 flights were cancelled, with at least 5 diversions, due to winds and turbulence.

SEVERE WEATHER: NOAA RECORDS FOR CARSON CITY			
Date/Month/ Season	**Event Location**	**Event Type**	**Event Narrative**
2/17/2016	Greater Reno/Carson City/Minden Area (Zone)	Heavy Snow	Four to 8 inches of snow fell in west and southwest Reno as well as the **Carson City**-Minden area, with 3 to 6 inches in the Virginia Highlands. One to 3 inches of snow were reported in many areas near and east of 395, although Sparks generally received less than an inch.
11/19/2016	Greater Reno/Carson City/Minden Area (Zone)	High Wind	Sustained winds over 40 mph with gusts 58 to 64 mph were recorded on the 19th along the Highway 395/Interstate 580 corridor, including at the Reno-Tahoe International Airport, in the **Carson Valley**, and for the Reno-Stead area. In the foothills south and southwest of Reno winds gusted between 65 and 75 mph, with gusts as high as 81 mph at the Galena RAWS.
1/29/2016	Greater Reno/Carson City/Minden Area (Zone)	High Wind	Sustained winds between 40-50 mph with gusts between 60 and 70 mph were recorded in the foothills north and northwest of Reno and in the Carson Valley, including along highway 395 and Interstate 580. In the wind-prone areas in and near Washoe Valley wind gusts reached as high as 90 mph. Damages from the high winds include: an uprooted 2-ft diameter tree in **Carson City**, 6 snapped power poles on Mount Rose highway, and fence damage near Cold Springs.
12/21/2015	Greater Reno/Carson City/Minden Area (Zone)	High Wind	Wind gusts of 60 to 65 mph were recorded along I-580 and highway 395 in the north valleys of Reno and in the Washoe and **Carson Valleys**. Winds were sustained over 40 mph for a time as well. Wind prone areas along I-580 south of Reno reported wind gusts between 73 and 88 mph.
11/2/2015	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	One to 4 inches of snow was reported between the 2nd and 3rd above the lower valley floors. A medical condition (primary cause per investigators) combined with the snow and cold to cause severe hypothermia in an elderly man. He went out for a walk the afternoon of the 2nd and was not found until late morning on the 3rd. He was alive but later died at the hospital. The victim was found at around 6,200 feet in the Brunswick Canyon area.
2/27/2015	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	A widespread snowfall of between 0.5 and 3 inches was noted around the Reno and Carson City area. However, higher amounts fell in the foothills west of **Carson City** (up to 8 inches) and from the north valleys of Reno (3 to 6 inches) north to the Palomino Valley and the Red Rock area (8 to 15 inches).

SEVERE WEATHER: NOAA RECORDS FOR CARSON CITY			
Date/Month/ Season	**Event Location**	**Event Type**	**Event Narrative**
12/30/2014	Greater Reno/Carson City/Minden Area (Zone)	Winter Weather	A widespread 1 to 2 inches of snow fell in the Reno and **Carson City**-Minden areas during the early morning of the 30th. However, a band of heavier snow with 3 to 5 inches was reported in south and southwest Reno as well as in Virginia City and **Carson City**. Locally higher amounts of more than 6 inches were noted in the Palomino Valley near Pyramid Lake, likely caused by lake effect enhancement.
12/11/2014	Greater Reno/Carson City/Minden Area (Zone)	High Wind	Widespread wind gusts over 65 mph were noted on the 11th, with the highest gusts (over 80 mph) west of highway 395 in the foothills and the southwestern **Carson Valley**. There were an exceptionally high number of damage reports including power lines and trees downed (knocking out power to more than 10,000), fences damaged, and a semi-truck blown over on Interstate 80. In addition, winds caused more than 30 flight cancellations at the Reno-Tahoe International airport. Damages from this event are a rough estimate. Damages estimated $300,000.
8/11/2014	2S Empire	Thunderstorm Wind	Low pressure moved into northern California on the 11th and 12th, aiding in the development of strong to severe thunderstorms. Some storms dropped very heavy rain (for western NV) with between 0.75 and 1.50 inches of rain in 20 to 30 minutes. The Nevada Department of Emergency Management estimated 2.43M in total damage in Douglas County from several flash flooding events in July and August (through the 11th) with damages split between public infrastructure (around 927K) and private residences (1.5M).
7/19/2014	New Empire	Hail	Moderately high atmospheric moisture with slow-moving thunderstorms brought heavy rain and isolated severe thunderstorms from the 19th through the 21st. Extensive damage from flash floods and debris flows was reported in Douglas County and **Carson City** on the 20th. In addition, a large dust storm occurred on the 20th. Hail reported near **Carson City High School**.
3/6/2014	Greater Reno/Carson City/Minden Area (Zone)	Strong Wind	Most areas in the Reno-Carson City area noted wind gusts between 40 and 50 mph early on the 6th. However, wind prone areas recorded wind gusts of 60 to 65 mph. Winds caused a 10 X 20 metal shed to come apart on the north side of **Carson City** and cause damage to a vehicle. An NDOT observation about 1/4 mile northwest of the damage recorded a wind gust to 63 mph at 545PST. Damages estimated at $2,500.

SEVERE WEATHER: NOAA RECORDS FOR CARSON CITY			
Date/Month/ Season	**Event Location**	**Event Type**	**Event Narrative**
2/15/2014	Greater Reno/Carson City/Minden Area (Zone)	High Wind	Widespread wind gusts between 60 and 70 mph were noted on the north, west, and southwest sides of Reno as well as in portions of the **Carson Valley**. In the foothills along Interstate 580, wind gusts of 80 to 90 mph were recorded. The high winds brought a few fences down in Golden Valley and in Spanish Springs. In southwest Reno, small trees were uprooted along with some power outages. Damages estimated at $20,000.
2/8/14	Greater Reno/Carson City/Minden Area (Zone	Strong Wind	Most areas in the Reno-**Carson City**-Minden area recorded wind gusts of between 40 and 50 mph on the 8th. However, foothill areas along Interstate 580 south of Reno (very wind prone) reported wind gusts of 60 to 73 mph. The strong winds caused trees to be downed along with the spilling of large boulders onto a I-580 access road at the south end of Washoe Valley. Damages estimated at $10,000
1/30/2014	Greater Reno/Carson City/Minden Area (Zone)	Heavy Snow	Five to 10 inches of snow fell between **Carson City** and Minden-Gardnerville on the 30th, with 12 inches of snow in Double Springs (5 miles north of Topaz Lake). Power was knocked out per a report 3 miles NNE of Topaz Lake.

The table below recaps the NOAA data in the table above and includes weather events in the Carson City area between January 2014 and June 2021.

TABLE 5-22: NOAA WEATHER EVENTS— JANUARY 2014 TO JUNE 2021

Event Type	Number of Events	Deaths	Indirect Deaths	Injuries	Indirect Injuries	Property Damage	Crop Damage
Hail	1	0	0	0	0	0	0
Heavy Rain	12	0	0	0	0	0	0
Heavy Snow	8	0	0	0	0	0	0
High Winds	11	0	0	0	0	$320,000	0
Lightning & Tornadoes	0	0	0	0	0	0	0
Seiche/Tsunami	0	0	0	0	0	0	0
Strong Wind	3	0	1	0	0	$13,500	$2500

Event Type	Number of Events	Deaths	Indirect Deaths	Injuries	Indirect Injuries	Property Damage	Crop Damage
Thunderstorm Wind	1	0	0	0	0	2.43M (Douglas County)	0
Winter Storms	0	0	0	0	0	0	0
Winter Weather	13	0	0	0	0	0	0
Total	**49**	**0**	**1**	**0**	**0**	**$2.76M**	**$2500**

5.2.11.5 Probability of Future Events

Given the number of heavy rain, high and strong wind, and winter weather events in the historical record, there is a **very high** probability that Carson City will have a least one of these events in a given year.

5.2.11.6 Future Frequency of Events Due to Climate Change

Heavy rain, heavy snow, high winds, and winter weather lead the weather events occurring over the last five. Climate change could result in a higher probability of wetter winter storms—and heavy rains. For the Sierra Front, it is not clear whether windstorms will change in magnitude or frequency due to climate variability.

Thunderstorms, hailstorms, tornadoes, windstorms, and winter storms were combined into the category of severe weather.

Hail: No new hail events were recorded in the NOAA Storm Events Database in the last five years; however, lightning occurrences may increase with climate variability due to increased water vapor in the atmosphere related to warming. Because climate scientists are currently debating the impact of climate change on hailstorms, the probability that climate change will increase the frequency of damaging hail events is **low to medium**. See also "Thunderstorms/Hailstorms" below.

Heavy Rain: "Climate Change in Nevada," prepared by the State of Nevada Climate Initiative, notes that "In the near term, some 5-10% more of total precipitation is anticipated to fall as rain rather than snow."[135] Based on this prediction, heavy rain events are expected to increase in number and volume. The probability of increased frequency of heavy rain due to climate change is **high**.

[135] "Snow Loss and Meltwater Runoff Changes," Climate Change in Nevada, State of Nevada Climate Initiative, accessed June 7, 2021, **https://climateaction.nv.gov/policies/climate-nv/#**.

High and Strong Winds: Currently, scientists are reporting that "wind speeds are getting faster worldwide" having increased from 7 mph to 7.4 mph over the last decade.[136] However, according to an article from the Prairie Research Institute, "If future greenhouse gas emissions rates are high, wind speeds are expected to decrease over most of the western U.S. and the East Coast by then end of the century."[137] Based on this research, the probability that climate change will increase high and strong wind events is **high** for the immediate future—but may decline by the end of the century.

Lightning: No new lightning events were recorded in the NOAA Storm Events Database in the last five years. According to an article from the American Geophysical Union (AGU), evidence suggests that "lightning frequency is changing as the climate changes." In addition, as discussed in "Lightning: A New Essential Climate Variable," lightning also impacts climate change by producing greenhouse gasses: nitrogen oxides.[138] Based on this correlation between lightning events and climate change, the probability of an increase in lightning strikes based on climate change is **medium.**

Thunderstorms/Hailstorms: The 2018 Nevada Enhanced Hazard Mitigation Plan includes this comment on how climate change may impact severe thunderstorms.[139]

> *It is unknown how climate change will affect the frequency and intensity of Nevada's severe thunderstorms. This is due to uncertainties in the future frequency of summertime moisture, instability, and wind shear in the atmosphere – three of the main ingredients for severe thunderstorms. Example: Warming temperatures in theory would fuel more and perhaps stronger thunderstorms through increased energy (unstable atmosphere) and capacity to hold moisture. However, if the atmosphere also warms aloft that would limit the increases in energy, thereby restricting increases in the number or intensity of thunderstorms.*

Based on this assessment, the impacts of climate change on thunderstorms and hailstorms are **inconclusive**—and it is possible that climate change will decrease the frequency and severity of these events.

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[136] Chelsea Harvey, "The World's Winds are Speeding Up," *Scientific American*, E&E News, November 19, 2019, accessed June 7, 2021, **https://www.scientificamerican.com/article/the-worlds-winds-are-speeding-up/**.

[137] Lisa Sheppard, "Study shows future climate changes in wind patterns vary by U.S. region and season," Prairie Research Institute, University of Illinois Urbana-Champaign, July 15, 2020, accessed June 7, 2021, **https://blogs.illinois.edu/view/7447/1990666331**.

[138] Valentin Aich, et al, "Lightning: A New Essential Climate Variable," Eos, Science News by AGU, September 7, 2018, accessed June 13, 2020, **https://eos.org/science-updates/lightning-a-new-essential-climate-variable**.

[139] "Hail and Thunderstorms," Section 3, Risk Assessment, 2018 Nevada Enhanced Hazard Mitigation Plan, 3-101, accessed June 7, 2021, **https://data.nbmg.unr.edu/Public/NEHMP/StateOfNevadaEnhancedHazardMitigationPlan2018.pdf**.

Tornadoes: A link between climate change and tornadoes has not been scientifically established. The probability of increased frequency of tornadoes events due to climate change is low.

Winter Storms/Weather: As noted above, due to rising temperatures, it is anticipated that rainfall will increase and snowfall with decrease. The altitude of snowpack levels have been rising—an observation that supports the overall decrease in snowfall. Winter weather conditions may become mixed—as temperatures warm. Winter storms will continue; however, the probability of increased frequency of snowfall due to climate change is **very low.**

5.2.11.7 Cascading Hazards

Heavy rain may contribute to landslides and flooding—sometimes resulting road closures. Lightning strikes may ignite wildfires. Secondary effects of high wind include wildfire, downed trees, and damage to structures. (Note one strong winds event in the last five years was responsible for $7500 in damages—the only event with associated costs.) High winds may also trigger a the Public Safety Outage Management program, designed to shut off power in extreme fire-risk zones under certain conditions, such as high winds.

High winds can also create a seiche (Section 5.2.6.6).

5.2.11.8 Utility Loss

Severe weather accompanied by high or strong winds, lightning strikes, or heavy rain may lead to power outages caused by fallen trees and power poles or disruptions to the grid caused by lightning strikes. Except for heavy rain events, water lines and wastewater facilities are less vulnerable to these impacts.

5.2.12 Volcano

5.2.12.1 Planning Significance – Low

5.2.12.2 Hazard/Problem Description

A volcano is an opening, or rupture, in a planet's surface or crust, which allows hot, molten rock, ash and gases to escape from below the surface. Volcanic activity involving the extrusion of rock tends to form mountains or features like mountains over time.

Volcanoes are generally found where tectonic plates pull apart or come together. By contrast, volcanoes are usually not created where two tectonic plates slide past one another. Volcanoes can also form where there is stretching and thinning of the earth's crust (called "non-hotspot intra plate volcanism"), such as in the Rio Grande Rift in North America.

Volcanic activity is usually preceded by months of earthquake activity as magma breaks its way towards the surface, so a "surprise" eruption is not a credible scenario. If volcanic activity was to resume today, it would likely be preceded by months of earthquake activity and ground deformation that would be measured by geodetic instruments. The length of time to become aware of volcanic activity and planning a response would be relatively short but could potentially be months long.

The USGS uses a volcano alert-level system for describing the conditions of U.S. volcanoes. The system includes two parts: one to alert people on the ground about the volcano's status and another color-coded system for the aviation community that addresses airborne ash hazards as shown in the figure below.[140]

[140] "Volcanic alert-levels characterize conditions at U.S. volcanoes," Volcano Hazard Program, USGS, accessed May 30, 2021, **https://www.usgs.gov/natural-hazards/volcano-hazards/about-alert-levels**.

ALERT-LEVEL TERMS. When the volcano alert-level is changed, a Volcano Activity Notice (VAN) is issued.	
NORMAL	Volcano is in typical background, noneruptive state or, after a change from a higher level, volcanic activity has ceased and volcano has returned to noneruptive background state.
ADVISORY	Volcano is exhibiting signs of elevated unrest above known background level or, after a change from a higher level, volcanic activity has decreased significantly but continues to be closely monitored for possible renewed increase.
WATCH	Volcano is exhibiting heightened or escalating unrest with increased potential of eruption, timeframe uncertain, **OR** eruption is underway but poses limited hazards.
WARNING	Hazardous eruption is imminent, underway, or suspected.

AVIATION COLOR CODES When the volcano color code changes, a Volcano Observatory Notification for Aviation (VONA) is issued.	
GREEN	Volcano is in typical background, non-eruptive state or, *after a change from a higher level,* volcanic activity has ceased and volcano has returned to noneruptive background state.
YELLOW	Volcano is exhibiting signs of elevated unrest above known background level or, *after a change from a higher level,* volcanic activity has decreased significantly but continues to be closely monitored for possible renewed increase.
ORANGE	Volcano is exhibiting heightened or escalating unrest with increased potential of eruption, timeframe uncertain, **OR** eruption is underway with no or minor volcanic-ash emissions [ash-plume height specified, if possible].
RED	Eruption is imminent with significant emission of volcanic ash into the atmosphere likely **OR** eruption is underway or suspected with significant emission of volcanic ash into the atmosphere [ash-plume height specified, if possible].

FIGURE 5-35: ALERT-LEVEL TERMS AND AVIATION COLOR CODES

5.2.12.3 Location and Extent

The following Forum Report was made available to the Hazard Mitigation Steering Committee on volcanic hazard risks in Nevada by the Nevada Bureau of Mines and Geology, by Jon Price, State Geologist and Larry Garside, Research Geologist, Nevada Bureau of Mines and Geology (June 4, 2002).

> *The most likely volcanic hazard for Nevada is an eruption from the Mono Craters area near Lee Vining and Mono Lake in Eastern California. Small eruptions from these*

volcanoes have sent ash into Nevada as recently as about 260 years ago. Other volcanoes that could deposit ash in Nevada include Mount Lassen, Mount Shasta and the Long Valley Caldera in California and volcanoes in the Cascade Mountains in Oregon. The biggest threat for Nevada from eruptions in California and Oregon is damage to flying aircraft. Ash from eruptions in California or Oregon is not likely to cause long- term problems in Nevada, because the ash deposits are likely to be thin, typically only a few inches thick at most.

A massive eruption from the Long Valley Caldera near Mammoth Lakes, California over 700,000 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 landscape locally. Scientist would expect to see strong indications from seismographs before another eruption of this magnitude. The U.S. Geological Survey continues to monitor the area around Mammoth Lakes and will issue warnings prior to any subsurface changes that could precede a major eruption. Below please see the volcanic ash dispersal map for the Long Valley Caldera. [Figure 5-36]

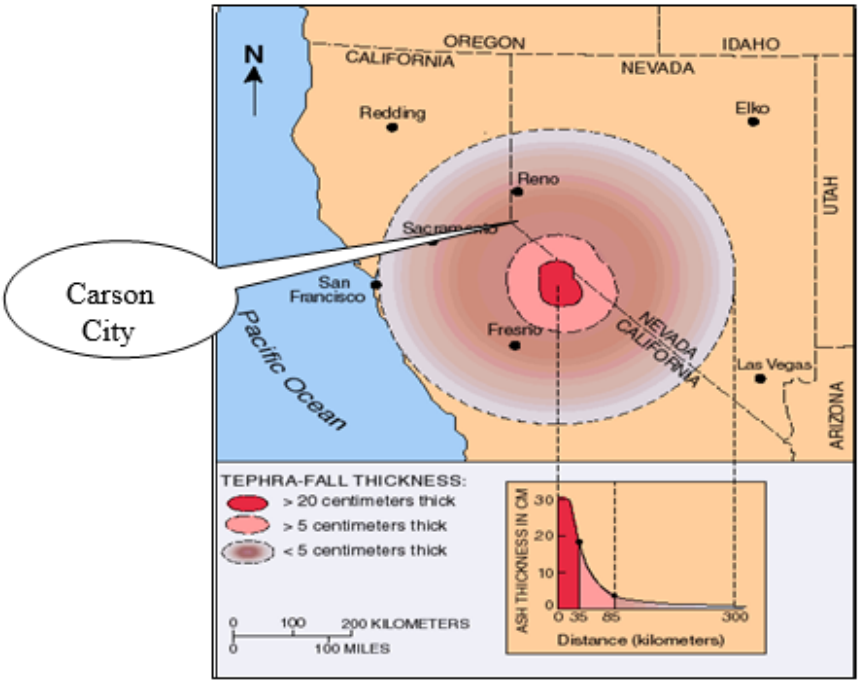


FIGURE 5-36: VOLCANIC ASH DISPERSAL MAP FOR THE LONG VALLEY CALDERA

Our ability to monitor small tremors associated with magma at depth is limited by the currently limited number of seismographs that are operated in Nevada. While the State of Nevada still does not have complete seismic coverage, Carson City does. The Nevada Seismological Laboratory

and the U.S. Geological Survey have joint responsibilities for earthquake monitoring and warnings.

The Soda Lake and Little Soda Lake (near Fallon in Churchill County) maars (volcanoes that form by explosions when magma rises near the surface of the earth and boils the groundwater) are probably the youngest volcanoes within the borders of the State. They have not erupted in recorded history. However, they are definitely younger than the last high stand of Lake Lahontan, about 13,000 years ago because deposits from these volcanoes overlie sediments deposited in the lake.

Other relatively young volcanoes occur in the Crater Flat–Lunar Crater Zone, Nye County, which includes basaltic volcanoes ranging in age from about 38,000 to 1 million years old;[141] in Clayton Valley, near Silver Peak in Esmeralda County; near Winnemucca in Humboldt County; and near Reno in Storey County. Most of these are basaltic volcanoes, which typically form small cinder cones and small lava flows. There are also some one-million-year-old rhyolitic lava flows in the Reno area near Steamboat Hot Springs.

The USGS Volcano Explosivity Index (VEI) provides a means of measuring the explosiveness of volcanic eruptions in relation to other volcanic events. The scale uses volume of products, eruption cloud height, and qualitative observations to determine the explosivity value as illustrated in Figure 5-37 below.[142]

[141] E.I. Smith, D.L. Keenan, T. Plank, "Episodic Volcanism and Hot Mantle: Implications for Volcanic Hazard Studies at the Proposed Nuclear Waste Repository at Yucca Mountain, Nevada," *GSA Today,* v. 12, no. 4, p. 4-10.

[142] "Volcanic Explosivity Index (VEI)," Volcano Hazards Program, USGS, accessed May 30, 2021, **https://volcanoes.usgs.gov/vsc/glossary/vei.html**.

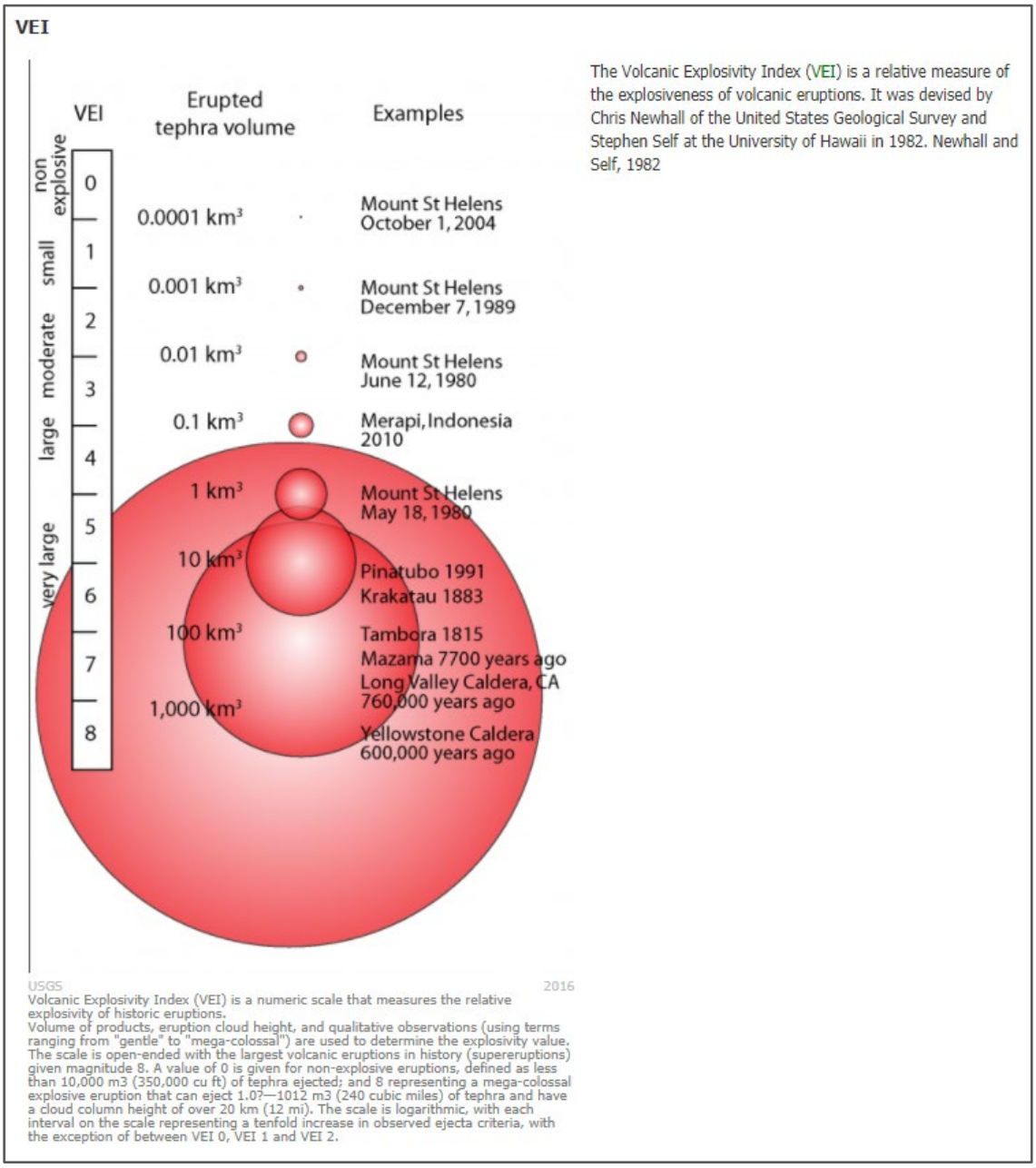


FIGURE 5-37: VOLCANIC EXPLOSIVITY INDEX

5.2.12.4 Previous Occurrences

Nevada has a long history of volcanism. In western Nevada, the most recent episode was between 2.6 to 1 million years ago.[143] At about 1.36 million years ago, two lava flows erupted out of a volcanic cone at Mount Scott-McCellan Peak and "flowed ~6 km [3.6 mi] into what is now suburbs of Carson City and across U.S. Highway 50".[144] Although it has been a long time since these eruptions, renewed activity is not out of the question. In 2003, an earthquake swarm just north of Lake Tahoe was interpreted to have been caused by a magmatic dike injection that went a distance of 3 miles (from 20 miles deep to 17 miles deep) in about 23 days.[145]

As discussed above, a massive eruption from the Long Valley Caldera near Mammoth Lakes, California over 700,000 years ago devastated a considerable area in Owens Valley (Section 5.2.12.3, Figure 5-36) and dispersed volcanic ash over a 300 kilometer circumference.

The occurrences in the table below come from a variety of sources.[146]

TABLE 5-23: PREVIOUS VOLCANO OCCURRENCES

VOLCANO PREVIOUS OCCURRENCES		
Date/ Month/ Season	**Event Location**	**Impact: Federal Declaration#/Damages/Injuries/Deaths/Activity**
May 22, 2015	Lassen Peak, California	Fine ash deposit over the Carson City area
2003	McCellan Peak north of Lake Tahoe	An earthquake swarm caused by a magmatic dike injection that went from 20 miles deep to 17 miles deep
760,000 years ago	Long Valley Caldera near Mammoth Lakes	This ash deposit in Carson City area
1.36 million years ago	McCellan Peak	Two lava flows erupted flowed ~6 km [3.6 mi] into what is now suburbs of Carson City and across U.S. Highway 50

[143] C.D. Henry and B. Cousens, "Young volcanism of the Lake Tahoe – Reno – Fallon area," California and Nevada: The geologic record, abstract, U.S. Geological Survey, Abstracts for the October 2012 meeting on volcanism in the American southwest, Flagstaff, AZ, 2013, Open-File Report 2013-1026.

[144] C.D. Henry and B. Cousens, 2013.

[145] K.D. Smith, D. von Seggern, G. Blewitt, L. Preston, J.G. Anderson, B.P. Wernicke, J.L. Davis, "Evidence for deep magma injection beneath Lake Tahoe, 2004," Nevada-California: Science, v. 305, p. 1277-1280. doi: 10.1126/science.1101304.

[146] "Eruptions of Lassen Peak, California, 1914 o 1917—A Centennial Commemoration," USGS, Department of the Interior, Office of Communications and Publishing, May 21, 2015, accessed June 16, 2021, **https://www.usgs.gov/NEWS/ERUPTIONS-LASSEN-PEAK-CALIFORNIA-1914-1917-%E2%80%94-CENTENNIAL-COMMEMORATION**.

Volcanic activity from surrounding states, particularly California and Oregon, has created ash clouds that have drifted over Nevada. Numerous young ash beds in western Nevada and the 1915 Lassen Peak eruptions attest to this. In 1915, fine ash from Lassen Peak was deposited as far east as Winnemucca, Nevada.

5.2.12.5 Probability of Future Events

The probability of eruptions inside Nevada are not likely in the near future based on past activity and lack of earthquakes that suggest current movement of magma. This opinion may change if seismic signals indicate possible movement of magma in the future. The possibility of air-fall ash from eruptions in the surrounding western states as well as the likelihood of a volcanic eruption is **low**.

5.2.12.6 Future Frequency of Events Due to Climate Change

The probability of increased frequency of volcanic eruptions or the release of geothermal gases due to climate change is very **low**.

5.2.12.7 Cascading Hazards

Any volcanic activity that produces ash would impact Carson City's water for a short period of time.

Volcanic eruptions can release a tremendous volume of particles and CO_2. Approximately every 20 years, a major volcanic event can shield the earth from the sun enough to cause a of global cooling.[147] Other secondary effects of volcanic activity such as a seiche, wildfires, and power outages may be triggered by a volcanic eruption. Falling ash can cause wildfires and ignite structures—and widespread ash can damage machinery, obscure visibility, and cause irritations to humans. Lava flow and/or subsequent debris avalanches may take down power lines.

The environmental effects of a volcano occurring in neighboring states would affect the Carson City area with ash fall from winds blowing it into the valley area. This ash fall could last hours or days depending on the severity of the event. The ash has the potential to get into air conditioning and heating units, car motor systems and building ventilation equipment. Also, the obvious potential to pollute the air, causing those sensitive to pollutants to remain indoors and refrain from normal outdoor activities would be an environmental impact from ash fall.

[147] "What do volcanoes have to do with climate change?" Global Climate Change, NASA, accessed May 23, 2020, **https://climate.nasa.gov/faq/42/what-do-volcanoes-have-to-do-with-climate-change/**.

5.2.12.8 Utility Loss

A volcanic eruption is likely to cause power outages in the area. The entire planning area would be affected by a power outage caused by a volcanic event. Power loss pose challenges to evacuation, communication, and emergency response activities. Water and wastewater facilities may also be affected directly or impacted by ash fall.

5.2.13Wildland Fire

5.2.13.1 Planning Significance – High

5.2.13.2 Hazard/Problem Description

A wildland fire is a type of wildfire that spreads through consumption of vegetation. It often begins unnoticed, spreads quickly, and is usually signaled by dense smoke that may be visible from miles around. Wildland fires can be caused by human activities (such as arson or campfires) or by natural events such as lightning. Wildland fires often occur in forests or other areas with ample vegetation. Wildfires can also be classified as urban fires, interface or intermix fires, and prescribed fires.

As development has spread away from city centers and into the surrounding terrain, fire departments states have come to adopt the term “Wildfire-Urban Interface” or WUI to describe “the zone of transition between unoccupied land and human development [. . .] the line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.”[148]

The following three factors contribute significantly to wildland fire behavior and can be used to identify wildland fire hazard areas.

Topography. As slope increases, the rate of wildland fire spread increases. South-facing slopes are also subject to more solar radiation, making them drier and thereby intensifying wildland fire behavior. However, ridge tops may mark the end of wildland fire spread since fire spreads more slowly or may even be unable to spread downhill.

Fuel. The type and condition of vegetation plays a significant role in the occurrence and spread of wildland fires. Certain types of plants are more susceptible to burning or will burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available to fuel the fire (referred to as the “fuel load”). The ratio of living to dead plant matter is also significant. The risk of fire is increased considerably during periods of prolonged drought, as the moisture content of both living and dead plant matter decreases. The fuel’s continuity, both horizontally and vertically, is also an important factor.

[148] “Wildland Urban Interface (WUI), U.S. Fire Administration, FEMA, accessed June 7, 2021, **https://www.usfa.fema.gov/wui/**.

Weather. The most variable factor affecting wildland fire behavior is weather. Temperature, humidity, wind, and lightning can affect chances for ignition and spread of fire. Extreme weather, such as high temperatures and low humidity, can lead to extreme wildland fire activity. By contrast, cooling and higher humidity often signals reduced wildland fire occurrence and easier containment. The frequency and severity of wildland fires also depends upon other hazards, such as lightning, drought, and infestations. If not promptly controlled, wildland fires may grow into an emergency or disaster.

Carson City has developed a Community Wildfire Protection Plan (July 2009) to help guide the community and its residents on where and how to focus fuel reduction efforts. The plan generally speaks to protecting the built environment from the threats of wildland fire.

5.2.13.3 Location and Extent

Communities in Carson City have a varying degree of risk from wildfire. This risk differs largely due to past fire activity and the type of moisture received during the winter months. Lengthy rainy seasons tend to increase the production of grasses which can create fast moving fires in the brush and grass areas of Carson City. Drought seasons tend to decrease the fuel moisture in the large fuels (trees and large brush) and create high output BTU fires that are difficult to control and can extend for days.

The extent of wildfires is measured in acres burned. In the period between 2015 and 2020, Carson City had 145 wildfire incidents totaling 1,176 acres burned. Most of these fires were quickly contained.

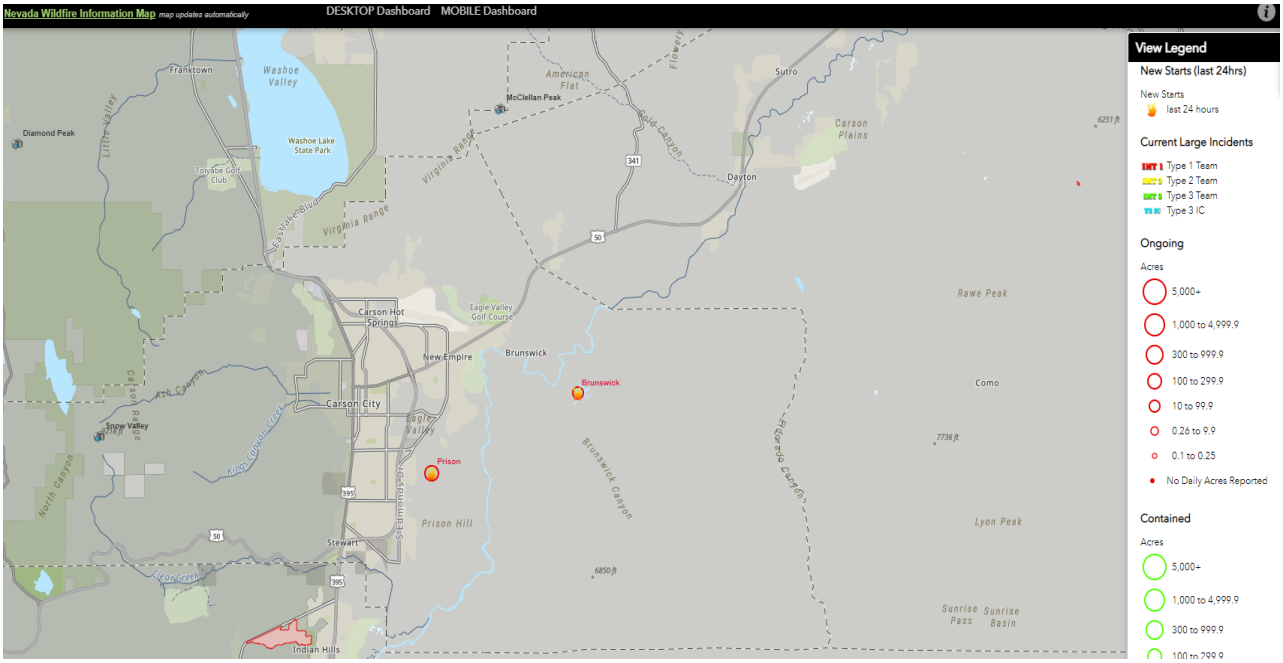


FIGURE 5-38: FIRE MAP FOR 2021 FIRE SEASON

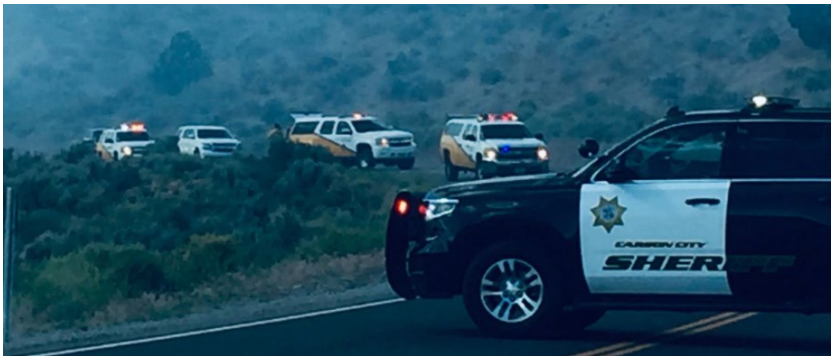
5.2.13.4 Previous Occurrences

Carson City Fire Department reported 145 local wildland fire starts, 10 less than the previous period (2010-2014). Nevada had 3,759 wildland fires between 2015 and 2020, that consumed over 3,069,675 acres. While Carson City has not experienced an increase in acreage burned, Nevada as a whole has experienced a significant increase in acreage burned during the period.

A number of wildfire events took place around the City since the completion of the 2016 HMP. Several small fires, less than 5 acres, were quickly addressed by the Fire Department. Some of these events were documented by local media outlets, as detailed below.

- In 2019, KNTV News reported a small brush fire on the west side of the City on Pardini Street.[149]

- In 2019, KOLO-TV reported a wildfire stopped by the Carson City Fire Department near Sierra Vista Lane.[150]



[149] "Fire Crews Mopping Up West Carson City Brush Fire," KTVN, Channel 2 News, June 27, 2019, accessed July 3, 2021, **https://www.ktvn.com/story/40718506/west-carson-city-brush-fire**.

[150] "Wildfire stopped south of Carson City," Staff, KOLO-TV, June 17, 2019, accessed July 3, 2021, **https://www.kolotv.com/content/news/Wildfire-south-of-Carson-City-511440731.html**.

Larger wildfire events happened outside the City limits, such as the Little Fire in 2017 in Washoe Valley. Fifteen miles north of Carson City, 439,000+ acres, the Numbers Fire in 2020, 30-40 miles South of Carson City, 18,342 acres.

As shown in the tables below, significant wildland fires have been recorded in Carson City over the past fifteen years. During the last five years, approximately 10 percent of these fires were due to lightning, while human and unknown causes account for the remaining 90 percent of ignition sources. Rodd Rummel, Wildland Fuels Management Officer for the Carson City Fire Department, provided the information in Table 5-24.

TABLE 5-24: WILDFIRE OCCURRENCES 2015-2020

POST 2015 CARSON CITY HMP WILDLAND FIRE OCCURRENCES			
Year	**Number of Wildland Fire Ignitions Carson City**	**Carson City Total Wildland Fire Acreage**	**NV Total Wildland Fire Acreage**
2020	15	1.86	259,272
2019	31	5.46	82,283
2018	22	739.9	1,100,196
2017	36	187.3	1,329,289
2016	28	242.7	256,156
2015	13	1.3	42,479
Resource: Rodd Rummel Wildland Fuels Management Officer Carson City Fire Dept. 06-03-21			

The following table includes wildland fire occurrences as recorded in the 2016 Carson City Hazard Mitigation Plan.[151]

TABLE 5-25: WILDFIRE OCCURRENCES PRIOR TO 2015

PRE 2015 CARSON CITY HMP UPDATE WILDLAND FIRE OCCURRENCES			
Year	**Number of Wildland Fire Ignitions Carson City**	**Carson City Total Wildland Fire Acreage**	**NV Total Wildland Fire Acreage**
2014	12	<50	59,252

[151] "Wildland Fire," "History," Section 5.2.12.2, Carson City Hazard Mitigation Plan 2016, p. 5-60, accessed May 2021, **https://www.carson.org/home/showpublisheddocument/54500/636265687065070000**.

PRE 2015 CARSON CITY HMP UPDATE WILDLAND FIRE OCCURRENCES			
Year	**Number of Wildland Fire Ignitions Carson City**	**Carson City Total Wildland Fire Acreage**	**NV Total Wildland Fire Acreage**
2013	4	<50	162,841
2012	3	<50	613,126
2011	6	<492	430,061
2010	1	<50	23,867
2009	15	<50	33,365
2008	32	<50	71,930
2007	57	150	900,498
2006	49	250	1,348,871
2005	44	6,500	1,032,104
2004	43	10,000 (Total) Waterfall Fire* 8,799	40,950 (Total) - Waterfall Fire 8,799
2003	41	200	17,546
2002	52	2,000	77,551
2001	35	Not Available	654,253
2000	48	Not Available	699,210
1999	59	Not Available	1,575,956

5.2.13.5 Probability of Future Events

The Wildfire Occurrences outlined in the tables above suggest that wildfires are increasing in size and number. From 2015 to 2020, the total fire ignitions was 145, while 41 ignitions were incurred between 2009 and 2014. The acreage burned within Carson City from 2015 to 2020 was 1,178, compared to 742 between 2009 and 2014. Based on these observations, the probability of future wildfire events in **very high**, occurs more than once every five years.

The average number of wildland fires starts per year over the last six years is 24.

The Carson City Fire Department has been consistent in their efforts to educate the public and promote fire safety awareness, for example, by participating in the statewide poster contest.[152]

5.2.13.6 Future Frequency of Events Due to Climate Change

Numerous studies indicate that warmer weather coupled with lengthening of the fire season, could lead to an increase both in fire occurrence and in the areas burned. The effects of climate change, depending upon the type and amount of moisture received, can increase the risk to a given community in Carson City which can change from season to season.

5.2.13.7 Cascading Hazards

The indirect effects of wildland fires can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thereby increasing

FIGURE 5-39: HYDROPHOBIC SOIL

[152] "Carson City Fire Prevention Division submits artwork for statewide poster contest," Editor, *Carson Now*, published September 13, 2018, accessed July 3, 2021, **https://carsonnow.org/topics/wildland-fire**.

flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards, as described above.

Even small fires can threaten lives and resources and destroy improved properties. In addition to affecting people, wildland fires may severely affect livestock and pets. Such events may require emergency watering/feeding, evacuation, and shelter.

These secondary effects also include lingering smoke from California fires that become trapped in the valley after traveling over the Sierras and into Nevada. In August of 2020, the National Weather Service in Reno issued a Dense Smoke Advisory for Carson City and other neighboring jurisdictions.[153] As noted in a presentation at Planning Team Meeting 1, the National Weather Service is focusing on smoke modeling to assist with forecasting these events more accurately in the future.[154]

FIGURE 5-41: BEFORE DEBRIS CLEAN-UP

FIGURE 5-40: AFTER DEBRIS CLEAN-UP

5.2.13.8 Utility Loss

To the extent that a severe weather event such as high wind damages utility lines and resulting sparks ignite a fire, causing a power outage, the two hazards are closely connected. A power outage that occurs during a wildfire may affect the efficiency and coordination of emergency

[153] Jeff Munson, "National Weather Service issues Dense Smoke Advisory for Reno, Carson City region," August 19, 2020, accessed June 7, 2021, **https://carsonnow.org/story/08/19/2020/drift-smoke-california-fires-moves-carson-city-area**.

[154] Chris Smallcomb, "Other Considerations?" Carson City Hazard Mitigation Plan Presentation, May 7, 2021.

services, evacuations, and recovery efforts. In mountainous terrain, wildland fires have a strong potential for disrupting power.

Because the majority of Carson City's water is obtained from surface water from Ash & Kings Canyon, wildland fires in those areas provides the greatest risk to water loss. Mike Dondero, Nevada Division of Forestry (retired), stated that fire in that area reoccurs every fifteen (15) years. The probability for a future water loss event is high. The extent of damage caused by a fire can be determined from the section below titled Potential Impacts of the Waterfall Fire.

Carson City's primary source of water is surface water. Other sources of water are pumped from wells within Carson City and purchased from the State of Nevada through the Marlette Hobart pipeline. The effects of the 2004 Waterfall Fire provide an example of the potential impact of a fire on Carson City's water supply. From July 14 through July 20, 2004, the Waterfall Fire burned the eastern flank of the Carson Range along the margins of Carson City and the majority of three of the four watersheds contributing surface water from the Carson Range to the Eagle Valley. The Carson Range flanks the western margin of the Eagle Valley and rises to over 9,000 feet in elevation. The impacted watersheds included Kings Canyon Creek, North Kings Canyon Creek, Ash Canyon Creek, and Vicee Canyon Creek. Of these watersheds, only the uppermost portion of Ash Canyon Creek was left unburned.

6 Vulnerability Assessment

The Local Mitigation Planning Handbook, a 2013 FEMA publication, recommends four steps to conduct a risk assessment. The steps are shown in Figure 6-1. The previous chapter, Section 5 of this plan, contains the required information describing the hazards.

FIGURE 6-1: RECOMMENDED STEPS TO PERFORM A RISK ASSESSMENT

Section 6 identifies community assets, analyzes risks, and summarizes the vulnerability related to each of the 12 hazards in this plan.

The desired outcomes of these steps are 1) an evaluation of each hazard's potential impacts on the people, economy, and built and natural environments in the planning area and 2) an understanding of each community's overall vulnerability and most significant risks.

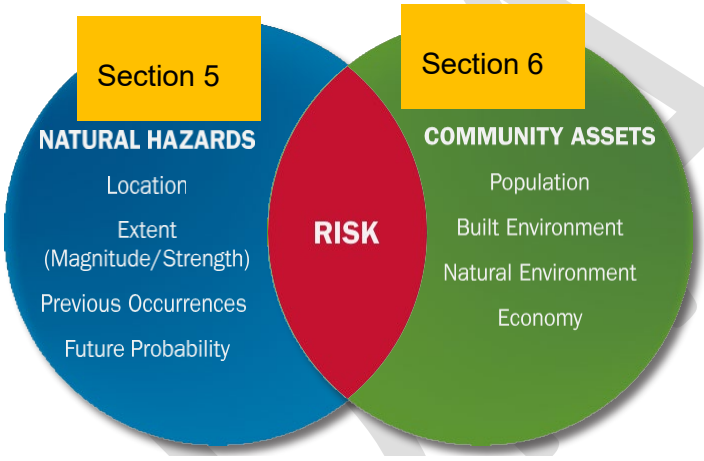


FIGURE 6-2: OVERLAP BETWEEN SECTIONS 5 & 6

The information in Section 5 describing Carson City hazards concludes that the hazards impacting the community have not changed over the last five years. In 2016, climate change was addressed for hazards impacted by climate change. This 2021 update includes a hazard profile for climate change. Each hazard profile also includes a section that evaluates the role of climate in relation to each hazard.

Federal disaster declarations during the life of the 2016 HMP and their impacts on the City are listed below and followed by a brief description of the event's impact/s and the City's response/s.

DR-4303-NV: Nevada Severe Winter Storms, Flooding, & Mudslides

On February 10, 2017, Governor Brian Sandoval requested a major disaster declaration due to severe winter storms, flooding, and mudslides during the period of January 5-14, 2017. This declaration made Public Assistance requested by the Governor available to state and eligible local governments and certain private nonprofit organizations on a cost-sharing basis for emergency work and the repair or replacement of facilities damaged by the severe winter storms, flooding, and mudslides.

DR-4307-NV: Nevada Severe Winter Storms, Flooding, & Mudslides

On March 8, 2017, Governor Brian Sandoval requested a major disaster declaration due to severe winter storms, flooding, and mudslides during the period of February 5-22, 2017. The Governor requested a declaration for Individual Assistance for two areas: Public Assistance, including direct federal assistance for five areas, and Hazard Mitigation statewide. Carson City did not receive approval for Individual Assistance support.

Impacts of 2017 Severe Weather Events

For the two severe winter storms, impacts to the community consisted of flooding along hillsides and streams resulting in heavy erosion, road closures, and mudslides. Sandbagging plans were implemented to protect property. The declarations supported mitigation actions in the repair process which included detention and retention basins in impacted areas with improvements in drainage. These activities supported the NFIP and CRS programs allowing a reduction in the risk to people and property. In the last ten years, the Floodplain Manager has successfully reduced the flood risk around the drainage of mountain canyons leading to the City's most populated area

DR-4523-NV: Nevada Covid-19 Pandemic

This declaration, numbered FEMA-4523-DR-NV, authorized reimbursement through the Public Assistance Program for emergency protective measures (Category B) for all areas in the State of Nevada. The pandemic played an important part in stopping previously projected development in the City.

Impacts of 2020 Covid-19 Pandemic

The impacts of the Covid pandemic continue in Carson City and the Quad County area. The Carson City Health & Human Services Division initially provided COVID testing and later vaccination clinics/drive-throughs and supported efforts throughout the Quad County area. The disaster declaration brought needed economic and practical support to the County.

The requirement under the Code of Federal Regulation to perform an assessment of the risk posed by the identified hazards to the community is displayed below.

ELEMENT	DESCRIPTION
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction?*44 CFR 201.6(c)(2)(ii)* ***Intent**: For each jurisdiction to consider their community as a whole and analyze the potential impacts of future hazard events and the vulnerabilities that could be reduced through hazard mitigation actions.*	a. For each participating jurisdiction, the plan **must** describe the potential impacts of each of the identified hazards on the community. ***Impact** means the consequence or effect of the hazard on the community and its assets. Assets are determined by the community and include, for example, people, structures, facilities, systems, capabilities, and/or activities that have value to the community.* For example, impacts could be described by referencing historical disaster impacts and/or an estimate of potential future losses (such as percent damage of total exposure). b. The plan **must** provide an overall summary of each jurisdiction's vulnerability to the identified hazards. The overall summary of vulnerability identifies structures, systems, populations or other community assets as defined by the community that are susceptible to damage and loss from hazard events. A plan will meet this sub-element by addressing the requirements described in §201.6(c)(2)(ii)(A-C). Vulnerable assets and potential losses is more than a list of the total exposure of population, structures, and critical facilities in the planning area. An example of an overall summary is a list of key issues or problem statements that clearly describes the community's greatest vulnerabilities and that will be addressed in the mitigation strategy.

To address the requirements above, the following categories organize this Section 6: Vulnerability Assessment.

1. Asset Inventory
2. Methodology
3. Quantitative Exposure Analysis
4. Qualitative Exposure Analysis
5. Future Development
6. Data Limitations

6.1 What Changed?

This vulnerability analysis intends to present a more detailed, Hazus Level-2, evaluation of the impacts of flood and earthquake. However, due to challenges gathering needed data over a short period of time, this analysis will be provided separately via amendment post FEMA approval as described in the Executive Summary above.

The population data is based on Vintage 2019 data as described in Section 6.2.1 below.

Hazards ranked as "low," including volcano and avalanche, are not included in this vulnerability analysis.

The vulnerability of population and structures for each hazard and its sub-hazard/s is evaluated and as appropriate, presented in a table listing impacts on population (injuries and deaths) and structures (building value and content value).

6.2 Asset Inventory

The asset inventory enables hazard mitigation planning teams to understand the impacts on population and structures for each type of hazard event. Community assets that may be affected by hazard events include population, residential and non-residential buildings, critical facilities, and infrastructure.

6.2.1 Population

Because the results of the 2020 Census is pending publication, population data for the City was updated using Vintage 2019 population estimates provided by the United States Census Bureau. The Census Bureau relies on a specific methodology used by the Population Estimates Program to estimate the population for the nation, each state, and each county. The term "vintage" refers to "an entire time series created with a consistent population starting point and methodology."[155] The Vintage 2019 data "revises and updates the entire time series of estimates from April 1, 20210 to July 1, 2019.[156]

The data is sifted through a number of methods including cross checks (state numbers compared with county totals) and calculations (adding births, subtracting deaths, and accounting for domestic and international migration).

The Vintage 2019 data shows a 1.2% increase in the Carson City population from 55,274 in the 2010 Census (55,274) to an estimate of 55,916 in 2019 (as of July 1, 2019). From 2010 to 2019, the population varied from a low of 53,726 in 2013 to the 2019 estimate of 55,916, as shown in the table below.[157]

[155] "Methodology for the United States Population Estimates: Vintage 2019," Population and Housing Unit Estimates, United States Census Bureau, Last updated May 14, 2021, p. 1, accessed June 14, 2021, **https://www.census.gov/programs-surveys/popest/technical-documentation/methodology.html**.

[156] "Methodology," p. 1.

[157] "Annual Estimate of the Resident Population for Counties in Nevada: April 1, 2010 to July 1, 2019 (CoEST2019-ANNRES-32)," United States Census Bureau, Population Division, Release date March 2020, accessed June 14, 2021, **https://www.census.gov/data/tables/time-series/demo/popest/2010s-counties-total.html**.

TABLE 6-1: ANNUAL ESTIMATES OF RESIDENT POPULATION FOR COUNTIES IN NEVADA: APRIL 1, 2012 TO JULY 1, 2019

Annual Estimates of the Resident Population for Counties in Nevada: April 1, 2010 to July 1, 2019												
Geographic Area	April 1, 2010		Population Estimate (as of July 1)									
	Census	Estimates Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Nevada	2,700,551	2,700,677	2,702,405	2,712,730	2,743,996	2,775,970	2,817,628	2,866,939	2,917,563	2,969,905	3,027,341	3,080,156
Carson City, Nevada	55,274	55,269	54,981	54,676	54,312	53,726	54,082	54,068	54,147	54,532	55,202	55,916
Note: The estimates are based on the 2010 Census and reflect changes to the April 1, 2010 population due to the Count Question Resolution program and geographic program revisions. All geographic boundaries for the 2019 population estimates are as of January 1, 2019. For population estimates methodology statements, see http://www.census.gov/programs-surveys/popest/technical-documentation/methodology.html.												

Due to the small 1.2 percentage change in population since 2010, the benchmark used in the 2015 Carson City HMP Update, the population density map did not change. The map is found in Section 3.13 Population, Figure 3-14: Population Density Map.

The above population numbers will be used in the vulnerability assessment for hazards other than earthquake and flood. These two hazards will use HAZUS standard information for population.

6.2.2 Building Inventory

The HAZUS MH building inventory was used to calculate the vulnerability of Carson City to earthquake and flood. The Global Risk Reports in Appendix G provide asset details for Flood and Earthquake. These default data will be updated in the planned Amendment once FEMA approves this iteration. The update in HAZUS will include information from the City's Assessor's Office, the Public Works Department, and the Fire Marshall's Office for structures and content value as determined via HAZUS Level 2 analysis.

For the remaining hazards, estimated numbers and replacement values for residential and nonresidential buildings, as shown in Table 6-2, were obtained from the City Assessor's office. The value provided by the Assessor is the full replacement value of improvements with a 1.2 percent depreciation per year after construction. This value is used as Building Replacement Value (BRV) for all residential and non-residential structures.

For municipal buildings, the Public Works Department provided the insured value of the structures. Critical facility values were included in the Assessor's information or provided separately by the appropriate department.

The Risk Manager for the Carson City School District provided the insured values of the district's structures for the BVR.

The residential buildings considered in this analysis include single-family dwellings, mobile homes, multi-family dwellings, temporary lodgings, institutional dormitory facilities, and nursing homes. Nonresidential buildings were also analyzed including commercial, industrial, agricultural, government, educational, and religious centers.

This data is the most complete dataset available at this time. Although the building count or value may not be precise, whether residential or nonresidential, this analysis will meet the intention of DMA 2000 by providing Carson City residents of their community's risk by hazard. This data is the most complete dataset available at this time.

For all structures, the content value will be determined by multiplying the BRV x 50 percent.

6.2.3 Other Assets

Natural and Cultural Assets: Natural resource assets may include wetlands, threatened and endangered species, open space, or other environmentally sensitive areas. Cultural assets include museums, parks, and cemeteries.

Historical Assets: This category of assets includes state and federally listed historic sites.

Economic Assets: Economic assets at risk may include major employers or primary economic sectors, such as agriculture, whose losses or inoperability would have severe impacts on the community and its ability to recover from disaster.

These types of assets are included in the Carson City asset data used in the vulnerability analysis.

Although state structures are within the jurisdiction of Carson City, the land and buildings are owned by the State. For this reason, these structures are not included in the vulnerability assessment.

TABLE 6-2: ASSET INVENTORY LISTING

Structure Type by Land Use Code	# of Assets	Building Replacement Value	Content Value	Total Value of Exposure
Vacant Total	1424	$28,623,687	$14,311,844	$42,935,531
Single Family Total	16212	$2,034,692,450	$1,017,346,225	$3,052,038,675
Multi-Residential Total	870	$234,061,421	$117,030,711	$351,092,132
Commercial Total	1325	$692,266,164	$346,133,082	$1,038,399,246
Industrial Total	205	$138,645,052	$69,322,526	$207,967,578
Rural Total	96	$4,650,302	$2,325,151	$6,975,453
Utilities Total	52	$269,361	$134,681	$404,042
Public Use Total	56	$68,038,798	$34,019,399	$102,058,197
Grand Total	**20240**	$3,201,247,235	$1,600,623,618	**$4,801,870,853**

6.3 Methodology

To understand risk, a community must evaluate assets it owns and identify assets exposed or vulnerable to the identified hazards of concern. Hazard profile information combined with data regarding anticipated risk to population, general building stock, and critical facilities helps the community to develop risk scenarios and estimate potential damages and losses for each hazard.

To address the requirements of DMA 2000 and better understand potential vulnerability and losses associated with hazards of concern, Carson City used standardized tools, combined with local, state, and federal data and expertise to conduct the risk assessment. The standardized tools used to support the risk assessment are described below.

Damage reports can include induced damage (inundation, fire, threats posed by hazardous materials and debris) and direct economic and social losses (casualties, shelter requirements, and economic impact) depending on the hazard and available local data. For this update, data on damages from previous occurrences of hazard events was not available.

HAZUS-MH uses GIS technology to produce detailed maps and analytical reports that estimate a community's direct physical damage to building stock, critical facilities, transportation systems and utility systems. To generate this information, HAZUS-MH uses default HAZUS-MH provided data for inventory, vulnerability, and hazards; this default data was used for this iteration's flood and earthquake vulnerabilities. This information will be supplemented with local data to provide a more refined analysis in the planned Amendment.

For other hazards, a qualitative analysis was conducted using the best available data and professional judgement. The two types of analysis are included in this assessment. Each type of assessment is summarized below.

Quantitative Analysis

A vulnerability analysis models the extent of exposure that may result from a hazard event of a given intensity in a specific location. The analysis provides quantitative data that may be used to identify and prioritize possible mitigation measures by allowing communities to focus attention on areas with the greatest risk of damage. The data for a quantitative analysis was available for three hazards: earthquake, flood, and wildfire. The expiration date of the current plan (10-09-2021) limited the analysis to a Hazus Level 1 run for earthquake and flood for this version of the plan. Carson City provided local asset information for use in the Hazus Level 2 run to enhance the analysis for the two hazards. The resulting revisions will be included in the planned Amendment. The Amendment will also include revisions made to the wildfire vulnerability analysis after the local asset information is added to the GIS files.

Qualitative Analysis

For hazards with limited data, a qualitative analysis was performed. A qualitative analysis uses subjective or observed information about a hazard event of a given intensity in a specific location to determine the extent of exposure.

Where the hazards would not usually affect structures whether very high, high, or medium, 5% of the replacement value of the structures and/or infrastructure is used to determine exposure for very high, high, and medium hazard areas. In the vulnerability assessment for the 2015 Washoe County, Nevada Plan, these hazard types have a small effect on the structure's envelope and/or its improvements and are therefore evaluated using 5% to calculate the estimated losses. For example, extreme heat can cause damage to roofs and roof underlayment, siding, stucco, windows, doors, decking, wiring, gutters, landscaping lighting, HVAC systems, insulation, sheathing, and concrete.

The same 5% is applied to the population total to determine the impacted number of people as applicable.

Under this method, the information is presented in a narrative format that includes an overview of the hazard, a hazard loss estimate summary listing the asset categories and the estimated exposure of population and assets, as well as a discussion of future growth describing potential exposure of people and assets at the location of the proposed development. When the 5% method described above is applicable, the summary lists the asset category and the estimated exposure of the population and assets for 5% of the total population and/or asset (replacement plus content). This analysis represents the number of people at risk. No estimate of the number of potential injuries or deaths was prepared.

The vulnerability of future growth locations is found in Section 6.6.

6.3.1 Earthquake

Overview

The planning significance for this hazard is *high.*

Carson City is located near several earthquake faults as shown in Figure 6-3 below. The determination of vulnerability is based on different scenarios of earthquake magnitudes, their depth, and location. For this initial Hazus run, a magnitude of 6.5 running along the Carson City Fault was selected. The selection was made based on the Bureau of Mines and Geology's report from 2015 completed for the 2016 HMP. This report is included in Appendix F: Vulnerability Documentation. The fault poses a near-field shaking hazard and surface rupture hazard to Carson City. Nevada's State Capitol and Legislative Buildings are within a quarter mile (0.4 km) of the surface trace of the Carson City fault. The earthquake magnitude is based on the report's statement that the maximum magnitude earthquake estimates of M6.5 to M7.2 were used for the major faults in the area. The conservative lower magnitude was selected for this scenario.

The USGS description of this fault follows below.[158]

> *This nearly continuous, north-northeast-striking fault zone has: (1) a main east-dipping, range-front fault extending from Indian Hill north to "C" Hill; (2) a distributed zone of short, west-dipping faults bounding the west side of Indian Hill on the east side of Jacks Valley; and (3) intrabasin faults that splits off the range-front fault at "C" Hill and strikes north and then northeast through downtown Carson City to east of Lone Mountain; fault zone may be related to the Carson Range fault [1285], based on proximity, and similar sense of displacement. The distributed zone of faults on the east side of Jacks Valley is expressed as short, west-facing scarps on Quaternary alluvium and Quaternary-Tertiary gravel. East-dipping faults associated with the range-front fault extend south into the Indian Hill area and are expressed as east-facing scarps on Quaternary-Tertiary gravel and juxtapose this unit against Quaternary alluvium. Faults along the main range-front fault are expressed by uplifted terraces, hill-side scarps, and an oversteepened range-front that has maximum basal fault facets heights ranging from 85 to 134 m. The intrabasin faults within Carson City are expressed as east and southeast-facing scarps on Holocene and Pleistocene alluvium. A north-trending scarp just west of Minnesota Street in Carson City is 13 m high and an east-trending scarp two blocks north of U.S. Highway 50 represents 5 m of vertical offset. Detailed surficial and bedrock mapping are the sources of data.*

[158] "Quaternary Fault and Fold Database of the United States," Carson City fault (Class A) No. 1653, Last Review Date: 1999-10-13, accessed July 1, 2021, **https://earthquake.usgs.gov/cfusion/qfault/show_report_AB_archive.cfm?fault_id=1653&section_id=**.

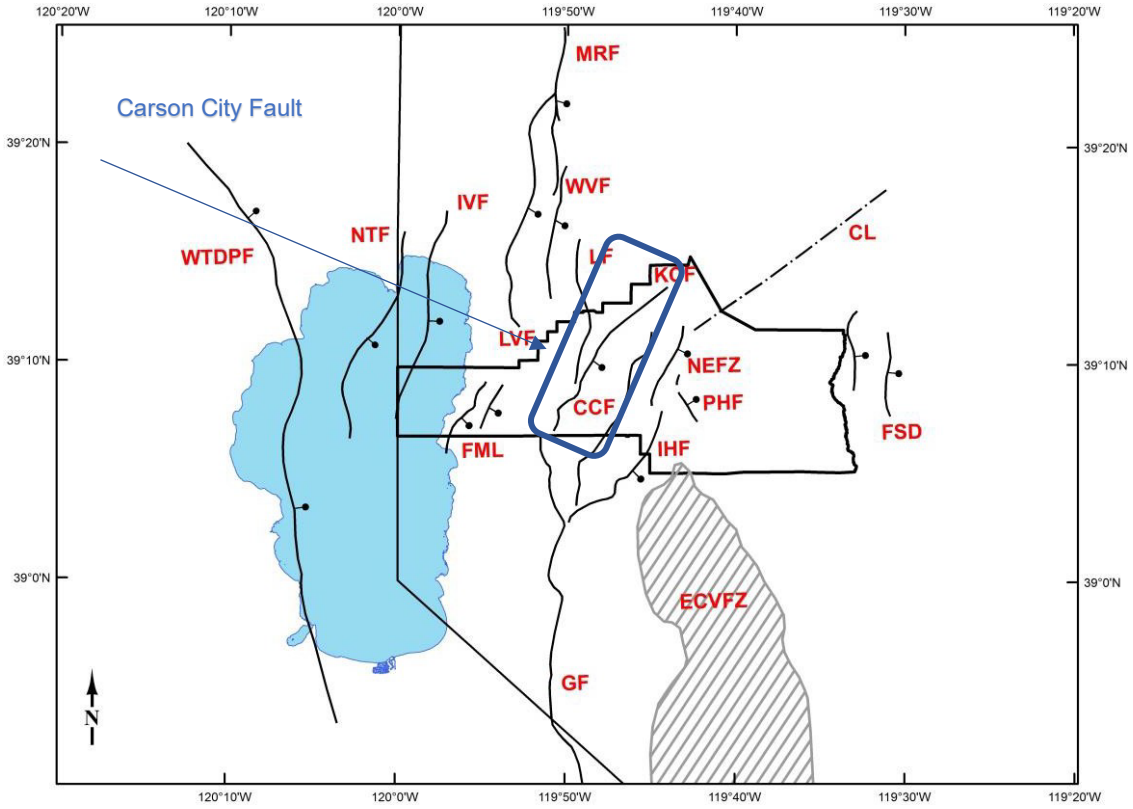


FIGURE 6-3: SCHEMATIC MAP OF MAJOR LATE QUATERNARY FAULTS IN THE CARSON CITY REGION, WITH COUNTY OUTLINED

Legend:
CCF – Carson City fault, CL – Carson lineament,
ECVFZ – Eastern Carson Valley fault zone,
FML – faults near Marlette Lake,
FSD – faults southwest of Dayton, GF – Genoa fault,
IVF – Incline Village fault, IHF – Indian Hill fault,
KCF – Kings Canyon fault, LF – Lakeview fault,
LVF – Little Valley fault, MRF – Mt. Rose fault zone,
NEFZ – New Empire fault zone,
NTF – North Tahoe fault, PHF – Prison Hill fault,
WTDPF – West Tahoe – Dollar Point fault,
WVF – Washoe Valley fault

Hazard Loss Estimate

A Level 1 HAZUS-MH analysis using a probabilistic scenario was performed to analyze the earthquake hazard losses for Carson City. The resulting estimate of losses is found in Appendix G: HAZUS reports. The HAZUS default data will be modified by a future amendment that includes the addition of the City's specific buildings, content value, and infrastructure. The inclusion of this data will support a Level 2 report with more information specific to the City.

The Hazus report in Appendix G includes sections on building and lifeline inventories, earthquake scenario parameters, direct earthquake damage, induced earthquake damage, social impact (including projected casualties based on the time of the event), and economic losses.

Future Growth

For the specific outcomes identified in the HAZUS run for this iteration, the enforcement of codes and regulations for new construction will reduce risk. However, all the areas of growth will be susceptible to earthquake events due to the seismic characteristics of Eagle Valley where Carson City is located—especially any events with higher magnitudes.

6.3.2 Flood

Overview

The planning significance for this hazard is *high.*

Over the last ten years, Carson City has implemented mitigation projects to reduce the risk of flooding in its jurisdiction. The Level 1 HAZUS run developed for this iteration of the plan includes a Global Report for the area. However, the Hazus-provided default data will be revised to include values for content, additional building stock, and infrastructure. The result will be a Level 2 HAZUS report that will be incorporated into a future plan amendment as described in the Executive Summary above. Currently, using the NFIP definition of repetitive loss property, the number of repetitive loss structures in Carson City is zero (0).

For this plan update, the depth grids were updated to include changes to the effective data in the National Flood Hazard Layer. The depth grids were integrated into the most current version of HAZUS-MH and the model was run to estimate potential losses at the census block level utilizing the default values. The resulting flood map is shown in Figure 6-4. Also, for visual comparison purposes, the flood map from the 2016 HMP is provided in Figure 6-5. Note the reduction in flodd areas on the 2021 map.

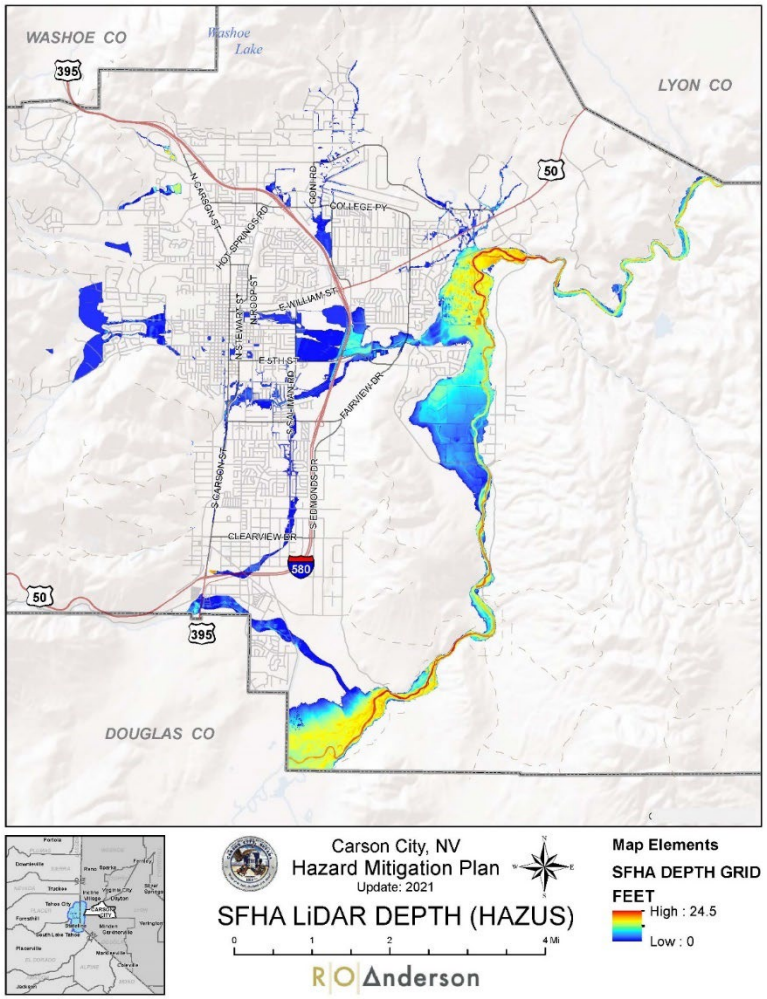


FIGURE 6-4: 2016 SFHA LIDAR DEPTH

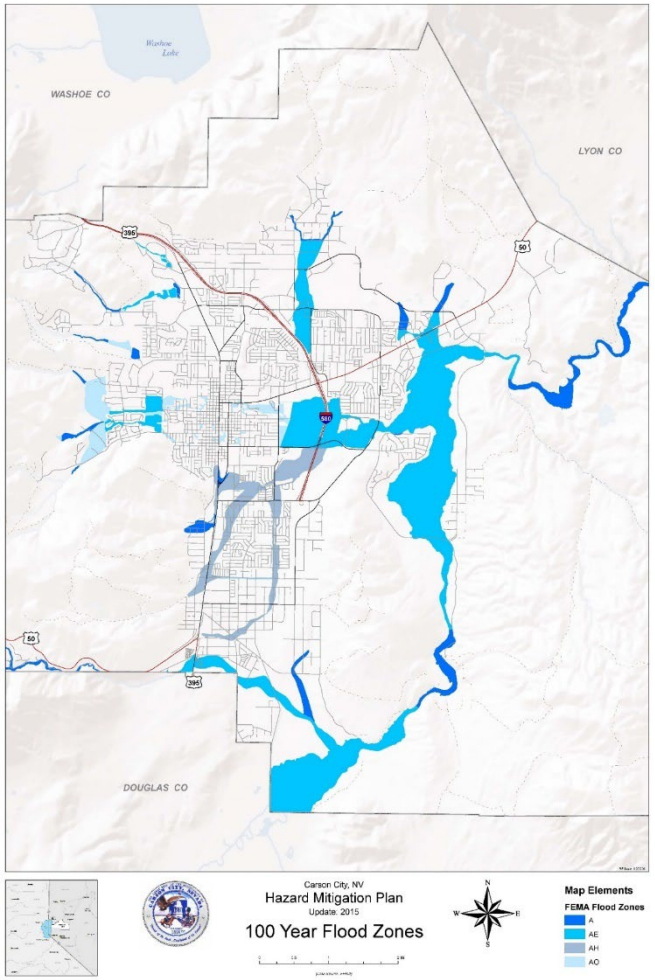


FIGURE 6-5: 2015 SFHA 100 YR. FLOOD ZONES

Hazard Loss Estimate

The report provided by the Level 1 HAZUS run is found in Appendix G HAZUS Reports. The document includes analysis of the building inventory, flood scenario parameters, building damage, induced flood damage, social impact (shelter requirements), and economic losses. A Level 2 HAZUS run will be completed under the Amendment.

Future Growth

As noted above, the City has made significant progress in reducing flood impacts throughout the city, including locations designated for future growth as identified in Section 8: Mitigation Strategy, Figure 8-4, Future Development in Progress. In addition, Title 12.09.080, Provision for Flood Hazard Reduction, requires a two-foot BFE for parcels subject to flood risk.

6.3.3 Wildland Fire

Overview

The planning significance for this hazard is *high.*

The geography of Eagle Valley, where Carson City is located, is a factor in the risk of wildfire. The Sierra Nevada on the west side has a history of significant wildfires, such as the Waterfall Fire (2004). The Carson City Fire Department has an ongoing program to reduce hazardous fuels around the Wildland Urban Interface belt as well as other areas with a high wildfire risk (Mitigation Actions 8A to 8G).

Over the last five years, the Fire Department continued its fuels reduction program in areas of the Wildland Urban interface at risk. This ongoing effort is enhanced by the Legislature's appropriations supporting the Nevada Division of Forestry in implementing fuels reduction activities in the state and on private land within Carson City's jurisdiction. Additional funding for wildfire risk reduction comes from NV Energy, the electric power supplier for the City, to augment the fuels reduction work around the community's power lines.

The Wildfire Risk data obtained through the US Forest Service website was used to define the wildfire hazard areas. The asset data (population, building stock and critical facilities) presented in Section 6.2, Asset Inventory, was used to support an evaluation of assets exposed and the potential impacts and losses associated with this hazard. To determine what assets are exposed to wildfire, available and appropriate GIS data was overlaid upon the hazard area. The limitations of this analysis are recognized, and as such, the analysis is only used to provide a general estimate. These limitations include but are not limited to debris generation, shelter requirements, injuries, or deaths.

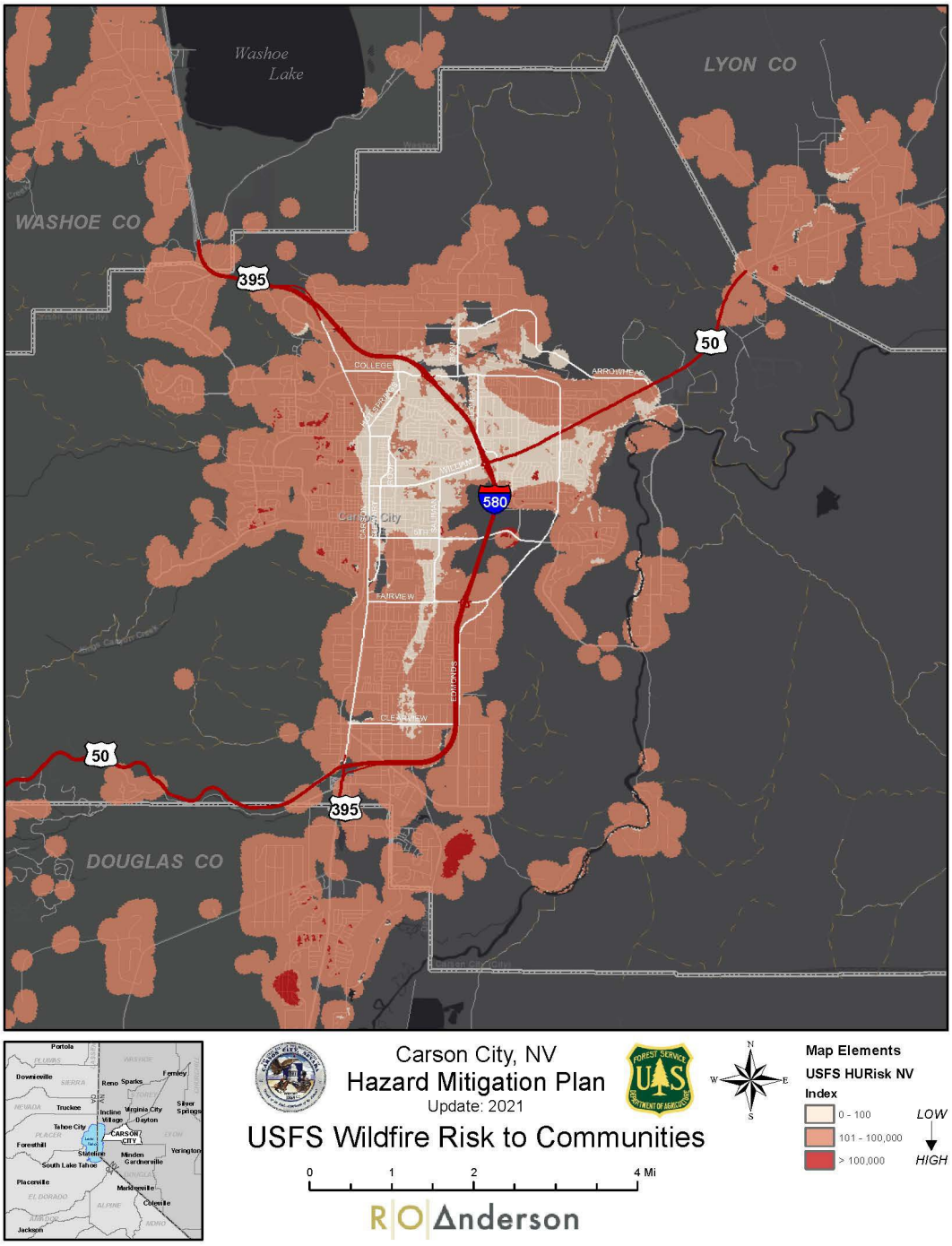


FIGURE 6-6: MAP OF CARSON CITY'S WILDFIRE RISK

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Hazard Loss Estimate

The GIS layer from the U.S. Forest Service was divided into three categories of risk: low, medium, and high. Low indicates impacts to 100 or fewer structures, medium anticipates impacts to 101 to 100,000 structures, and high impacts over 100,000 structures. The data was compared to the U.S. Census Bureau's census block to determine the population within each of the risk categories. Census blocks with more than one risk value were given a "mean" value for the population numbers for each risk category. The population exposure numbers by category are shown in Table 6-3.

TABLE 6-3: WILDFIRE RISK BY CATEGORY FOR POPULATION

Mean Category	Population #
Low	14,000.00
Medium	39,974.00
High	1,293.00
Total	**55,267.00**

To determine the vulnerability of the community's buildings and infrastructure to wildfire, the GIS layer from the U.S. Forest Service was layered with data provided by Carson City. Table 6-4 shows the building replacement value, content value, and total exposure value for each of the mean categories defined above: low, medium, and high

TABLE 6-4: WILDFIRE RISK BY CATEGORY FOR BUILDINGS AND INFRASTRUCTURE

Mean Category	Building Replacement Value	Content Value	Total Value of Exposure
Low	$595,505,959	$297,752,980	$893,258,939
Medium	$2,019,857,238	$1,009,928,619	$3,029,785,857
High	$5,922,584	$2,961,292	$8,883,876
Total	**$2,621,285,781**	**$1,310,642,891**	**$3,931,928,672**

Future Growth

Future growth in Carson City will be vulnerable to wildfire. However, consideration must be given to Carson City's improvements in the management of the practices that increase resiliency for this hazard. Wildfire management strategies include a variety of approaches: education and outreach, local plans and regulations, natural systems protection, and preparedness and response. See also Section 8: Mitigation Strategy.

6.3.4 Acts of Violence

Overview

The planning significance for this hazard is *high.*

Section 5.2.2 of this Plan describes the three types of Acts of Violence identified as affecting Carson City: terrorism, civil disorder/riotous behavior, and criminal acts. The impact on population, buildings, and infrastructure differs greatly among the three types of hazards. Carson City is the capital of the state and home to many state buildings and government officials working within the jurisdictional boundaries of the City. Previous occurrences of acts of violence include the IHOP International House of Pancakes incident, a criminal act that occurred in 2011, as well as protests and rallies at the Capitol building in 2021 and city-wide protests throughout 2020.

Terrorism: Carson City is the capital of the state and home to many state buildings and government officials working within the jurisdictional boundaries of the City. Although no record of a previous occurrence was found or reported, this type of hazard has the potential to impact the entire City. Carson City's population of 55,916 would be impacted regardless of the event. Road closures, economic and social effects, and loss of service will be felt by the community as a whole—with individuals experiencing different levels of exposure.

Civil Unrest, Disobedience, and Disturbance: Previous occurrences of these events show a minor effect on structures. The events caused road closure, law enforcement response, and disruptions. Civil disorder has the potential to result in injuries to people and/or damage to property. These incidents may be peaceful or unruly and vary in size and scope.

Criminal Acts: These include crimes against the public including mass casualty incidents and workplace violence. These acts can be random in nature or preplanned—and may be perpetrated by individuals or groups.

Additional information for scenarios with an established location and a defined event, such as explosives, active shooter, etc. are needed to develop a quantitative analysis for the categories of acts of violence.

Hazard Loss Estimate

While acts of violence can occur anywhere, the profile for this hazard in Section 5.2.2.3, Location and Extent, identifies the State Capital and legislative buildings as well as workplaces including schools, hospitals, restaurants, and casinos as the most likely locations for these events. Impacts from a major event may be more likely to impact structures listed as commercial or industrial rather than residential areas.

Terrorism: The qualitative analysis for the built environment from a terrorism event considers the event location as downtown where most state and city government offices are located. A strong

commercial presence is also found in this area. Rural and industrial buildings are located outside the downtown corridor and are excluded from this qualitative analysis. See Table 6-5 for a summary of the vulnerability for structures and content. Any road closure, economic and social effects, and loss of service will be felt by the community. Again, based on the scenario posed above, the estimate of 5% of population or 2,796 is projected to be affected.

TABLE 6-5: EXPOSURE FOR STRUCTURES AND CONTENT

Structure Type by Land Use Code	# of Assets	5% of # of Assets	Building Replacement Value	Content Value	Total Value of Exposure	5% of Total Value of Exposure
Vacant Total	1424	71	$28,623,687	$14,311,844	$42,935,531	$2,146,777
Single Family Total	16212	811	$2,034,692,450	$1,017,346,225	$3,052,038,675	$152,601,934
Multi-Residential	870	44	$234,061,421	$117,030,711	$351,092,132	$17,554,607
Commercial Total	1325	66	$692,266,164	$346,133,082	$1,038,399,246	$51,919,962
Industrial Total	205	N/A	N/A	N/A	N/A	N/A
Rural Total	96	N/A	N/A	N/A	N/A	N/A
Utilities Total	52	3	$269,361	$134,681	$404,042	$20,202
Public Use Total	56	3	$68,038,798	$34,019,399	$102,058,197	$5,102,910
Grand Total	**20240**	**997**	$3,201,247,235	$1,528,975,941	**$4,586,927,822**	**$229,346,391**

Civil Unrest, Disobedience, and Disturbance: Using the same scenario as terrorism where the event takes place downtown – the same exposure of population and structures is projected in this qualitative analysis. See Table 6-5 above.

Criminal Acts: This type of hazard can take place at any location within Carson City. Unlike terrorism and civil unrest, disobedience, and disturbance—events anticipated to target the Capitol and surrounding area—a criminal act may take place anywhere in the City and would generally be contained to a specific location. The same 5% of population and structures are projected to be affected. See Table 6-5 above.

Future Growth

Carson City's future growth is prone to criminal acts in the same way current assets are impacted by events of this hazard type. Terrorism as well as civil unrest, disobedience, and disturbances are more likely to take place in the downtown area with a potential effect on development on Little Way as well as the Lompa Ranch development—within blocks of the downtown area.

6.3.5 Climate Change

Overview

The planning significance for this hazard is *moderate.*

As Nevada's 2020 State Climate Change Strategy notes, "Droughts have grown more severe, the snowpack is disappearing, and water supplies are at risk." The impacts of climate change include cascading effects. For example, drought conditions invite wildfires > wildfires impact air quality > and may create hydrophobic soil that contributes to erosion and landslides. Climate change trends increase the likelihood and severity of certain hazard events such as flood, wildland fire, drought, and severe weather—as well as their secondary impacts such as utility loss and landslides.

Climate change impacts the entire planning area.

Hazard Loss Estimate

The specific vulnerability risk assessment provided in this Section 6 will apply to each hazard impacted by climate change: flood, fire, drought, landslide, and severe weather. Other hazards, such as infectious disease may increase due to changes in the climate as well. Environmental stress due to climate change may increase acts of violence.

As the intensity of hazard events increases due to climate change, impacts on the entire population will increase. Damage from fire, flood, severe weather, and drought will become more frequent and/or more severe. For example, 100-year flood events may become 50-year or 10-year events in the future. Climate change impacts will affect the entire population, 55,016 persons.

The hazard loss estimates for flood, fire, drought, landslide, and severe weather reflect the estimated impacts on structures due to climate change—for each specific event. The impact and frequency of these events, however, may increase. These events need to be documented to define future climate change impacts more specifically. Based on current data, the exposure due to climate change is estimated as 5% of structures and contents. See Table 6-5 above.

Future Growth

Climate change is most likely to impact water resources. High temperatures, long-term drought, and loss of snowpack may continue and increase due to climate change. As noted below under "Drought," impacts on water resources may limit future growth in the City.

6.3.6 Drought

Overview

The planning significance for this hazard is *moderate*.

Carson City, like much of Nevada and western United States, is currently experiencing drought conditions and has been since the year 2000. The U.S. Drought Monitor identifies Carson City as

experiencing extreme drought as of June 1, 2021. Carson City has a long history of mitigating vulnerability to drought by practicing conjunctive use of surface water and ground water—as well as by developing and utilizing a ground water recharge program which helps maintain higher levels in the aquifers that serve the City.

Hazard Loss Estimate

The impacts of drought on population and buildings is less direct than it is, for example, on agricultural operations. While people and structures are not likely to directly experience harm from drought, a reduction in available water may require changes in water use—and ultimately threatens to make the area less habitable.

Drought affects the entire population of the City's 55,916 residents. These impacts may initially be limited to inconvenience but over time may result in significant impacts—including loss of produce from personal and/or local gardens, limited access to fresh food, increased costs for water, and the effect of water use restrictions.

Impacts to structures are limited to the building envelope; therefore, a calculation of 5% of exposure is used for the replacement value of structures is shown in the figure below.

TABLE 6-6: BUILDING EXPOSURE - DROUGHT

Structure Type by Land Use Code	# of Assets	5% of # of Assets	Building Replacement Value	Total Value of Exposure	5% of Total Value of Exposure
Vacant Total	1424	71	$28,623,687	$28,623,687	$1,431,184.35
Single Family Total	16212	811	$2,034,692,450	$2,034,692,450	$101,734,622.50
Multi-Residential	870	44	$234,061,421	$234,061,421	$11,703,071.05
Commercial Total	1325	66	$692,266,164	$692,266,164	$34,613,308.20
Industrial Total	205	10	$138,645,052	$138,645,052	$6,932,252.60
Rural Total	96	5	$4,650,302	$4,650,302	$232,515.10
Utilities Total	52	3	$269,361	$269,361	$13,468.05
Public Use Total	56	3	$68,038,798	$68,038,798	$3,401,939.90
Grand Total	**20240**	1012	$3,201,247,235	**$3,201,247,235**	$160,062,361.75

Future Growth

An ongoing drought may limit future growth and over time result in a reduction of new development. Fees for water connections may increase to support the strategic management of available water. At this time, no known impacts to planned, approved, or in-progress development projects have been identified.

6.3.7 Hazardous Materials

Overview

The planning significance for this hazard is *moderate.*

In Carson City, hazardous material releases are most likely to occur at fixed site facilities that utilize toxic, reactive, corrosive, flammable, radioactive, or infectious materials—or along highways where chemical spills may occur. Spills or releases may also occur at the airport—or along natural gas pipelines. Any area within a *one-mile radius* of Interstate 580, U.S. Highway 50, and/or fixed facilities housing extremely hazardous substance are at the greatest risk of exposure to hazardous materials.

Figure 5-25 in Section 5 shows the populated areas within (and adjacent to) Carson City are within the one-mile buffer and at risk of exposure from a hazardous materials release.

Hazard Loss Estimate

Hazardous materials spills may impact the health of the population and the cost of cleaning up the spill may impact affected businesses and/or the City. While nearly 100% of the population lives or works within the identified risk radius, the impact of any given incident would be generally be significantly lower than 100%. In this case, a 5% impact on population (2,796) and structures is estimated for this hazard. See Figure 6-7, Drought, above.

Future Growth

The planned and in-progress future growth generally falls within the one-mile radius shown on Figure 5-25. The residents would have a risk comparable to that of the rest of the City.

6.3.8 Infectious Disease

Overview

The planning significance of this hazard is *moderate.*

In 2016, infectious disease ranked on the low end of the scale, just above avalanche and volcanic activity. In the wake of the COVID-19 pandemic, infectious disease moved from the low range to the top of the “Moderate” category. The impacts of infectious disease outbreaks are more familiar than they have been in the past. The community is aware that these events can impact up to 100% of the population through their economic and social impacts as well as the impacts of the disease itself, including loss of life.

Hazard Loss Estimate

According to the *New York Times* Coronavirus Outbreak website, 1 in 8 Carson City residents have been diagnosed as positive for COVID. The 6,626 cases reported represent a significant health impact on almost 12% of the population, resulting in 124 deaths.[159]

Infectious disease has the potential to impact the health, economic well-being, and quality of life for 100% of the population of 55,916 residents.

Exposure to buildings and infrastructure are not applicable for this hazard.

Future Growth

Infectious disease outbreaks in Carson City may affect more people as the population grows through new development. Impacts to structures are not relevant for this hazard.

6.3.9 Landslide

Overview

The planning significance of this hazard is *moderate.*

Carson City is surrounded by mountainous and hilly areas with steep slopes—just the sort of terrain that facilitates landslides. The U.S. Landslide Inventory Map identifies one probable location for a landslide within the boundary of the Consolidated Municipality Carson City. This site is located on the east side of the Sierras in the northwest boundary of the City. No known buildings, structures, or populations inhabit this general area.

Hazard Loss Estimate

No identified population is at risk from the identified probable location for a landslide. Because Carson City residents and visitors do hike in this area and because the probability of landslide risk has not been fully documented throughout this jurisdiction, an estimated exposure of 5% for the population presents a risk to 2,796 people.

At this time, no structures have been identified as having exposure to a landslide.

Future Growth

The Future Growth Estimate map provided in Section 8.5, Changes in Development, shows low density residential and rural residential zoning down slope from the identified probable landslide

[159] "Tracking Coronavirus in Carson City, NV," *The New York Times,* accessed July 1, 2021, **https://www.nytimes.com/interactive/2021/us/carson-city-nevada-covid-cases.html**.

area illustrated Section 5.2.10.2, Location and Extent, for landslide hazards. The arrow on the map below generally identifies the landslide risk area in relation to undeveloped parcels with residential zoning.

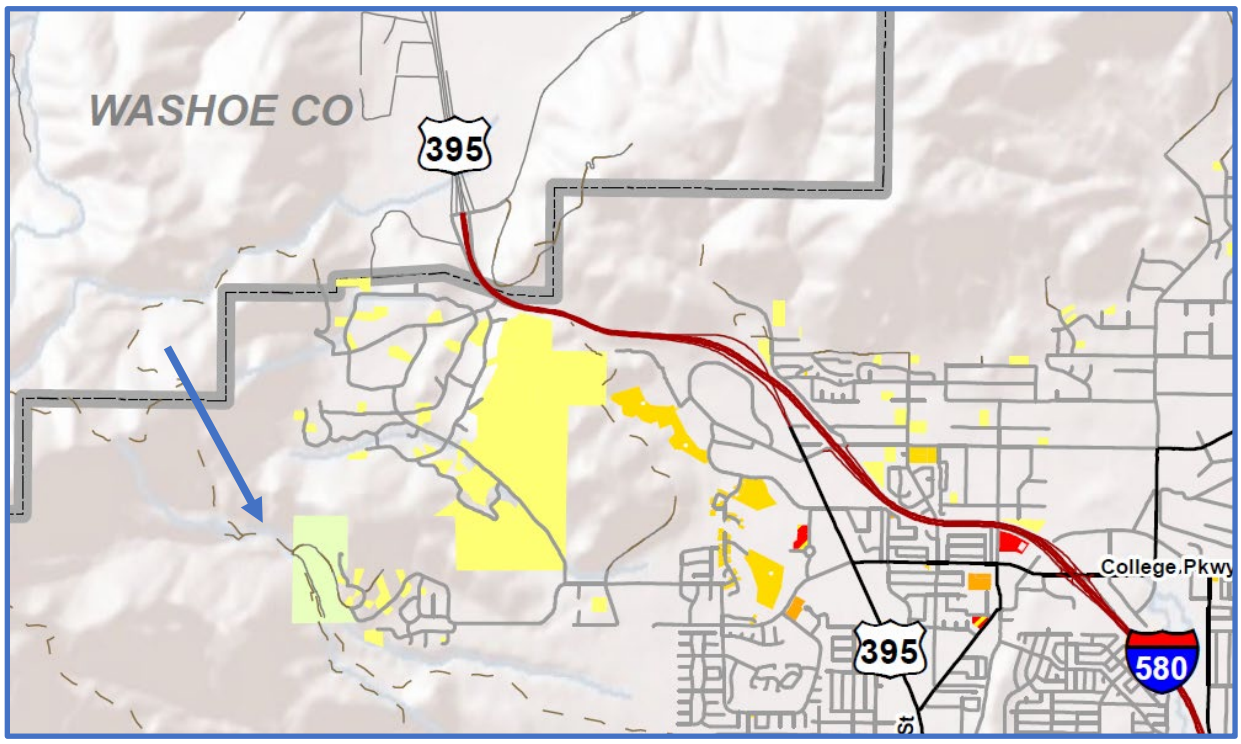

FIGURE 6-7: LANDSLIDE PROBABILITY IN RELATION TO RESIDENTIAL ZONING

6.3.10 Severe Weather

Overview

The planning significance of this hazard is *high.*

Severe weather events in Carson Valley include thunderstorms, hailstorms, tornadoes, downburst winds, downslope windstorms, and winter storms. The entire planning area is subject to snow accumulations, thunderstorms producing hail and downburst winds, and high and strong wind events. Gusts can exceed 80 to 100 miles per hour and threaten lives and property.

Hazard Loss Estimate

NOAA weather event data documented 43 severe weather events between January 2014 and June 2021 due to heavy rain, high wind, heavy snow, winter weather, and strong wind events. The events resulted in $333,500 in property damage and $2500 in crop damage. One indirect death was reported. Based on the frequency of these events and the documented damages, the

estimated impact of severe weather events is presented as 5% for damages to the building envelope. Impacts on the community, including road closures or other inconveniences or hazards related to these events are also calculated as 5% of the population, or 2,796 people.

TABLE 6-7: EXPOSURE FOR WEATHER EVENTS

Structure Type by Land Use Code	# of Assets	5% of # of Assets	Building Replacement Value	Total Value of Exposure	5% of Total Value of Exposure
Vacant Total	1424	71	$28,623,687	$28,623,687	$1,431,184.35
Single Family Total	16212	811	$2,034,692,450	$2,034,692,450	$101,734,622.50
Multi-Residential	870	44	$234,061,421	$234,061,421	$11,703,071.05
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Utilities Total	52	3	$269,361	$269,361	$13,468.05
Public Use Total	56	3	$68,038,798	$68,038,798	$3,401,939.90
Grand Total	**20240**	1012	$3,201,247,235	**$3,201,247,235**	$160,062,361.75

Future Growth

The population and structures that result from future growth planned within the greenbelt that largely surrounds the City are expected to experience impacts similar to those affecting the present population. An estimated 5% of the value of the structures and 5% of the new population will be affected by these events.

6.4 Future Development

The impact of each hazard on future development is discussed above. Section 8-5, Changes in Development, provides more detailed information on growth management as well as permitted, planned, and projects in progress.

Carson City's undeveloped parcels in the figure below have a total capacity of 8,767 units, a 36% increase from the 24,169 existing units. The figure below, created using Carson City Assessor Data, illustrates the anticipated capacity for residential units by Master Plan Land Use Category.

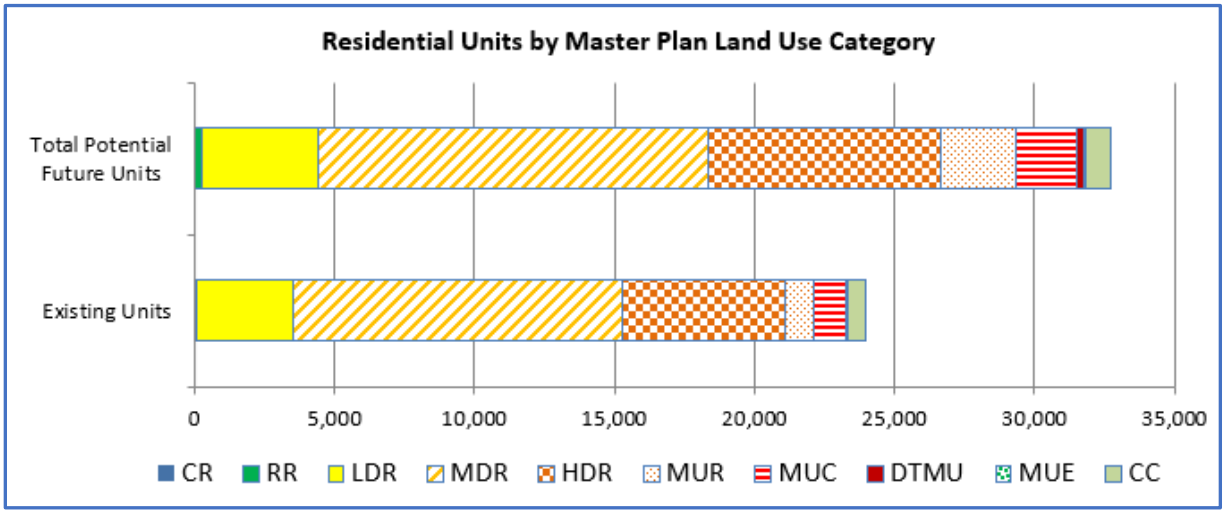

FIGURE 6-8: RESIDENTIAL UNITS BY MASTER PLAN LAND USE CATEGORY

The potential future residential units are consolidated in Figure 6-11. The City has the capacity for significant growth—which will be managed by the Community Development Department as described in Section 8-5.

The map below identifies undeveloped parcels within Carson City. The graph and the map below were created using APNs provided by the assessor and joined with the City's GIS database. The result produced a discrepancy. Only 774 of 995 entries matched the GIS data. These discrepancies may result from duplicates, unreconciled APN changes, and other errors. Consultation with Carson City to resolve the errors will be done and an updated map will be provided with the planned Amendment.

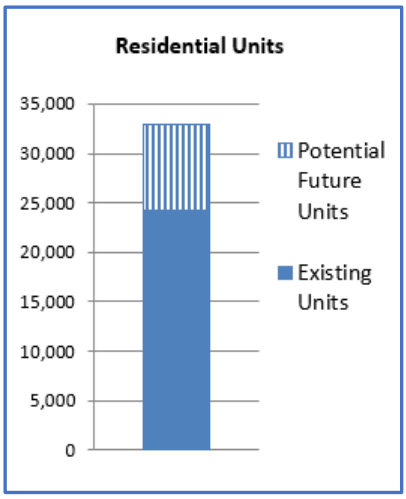

FIGURE 6-9: FUTURE AND EXISTING RESIDENTIAL UNITS

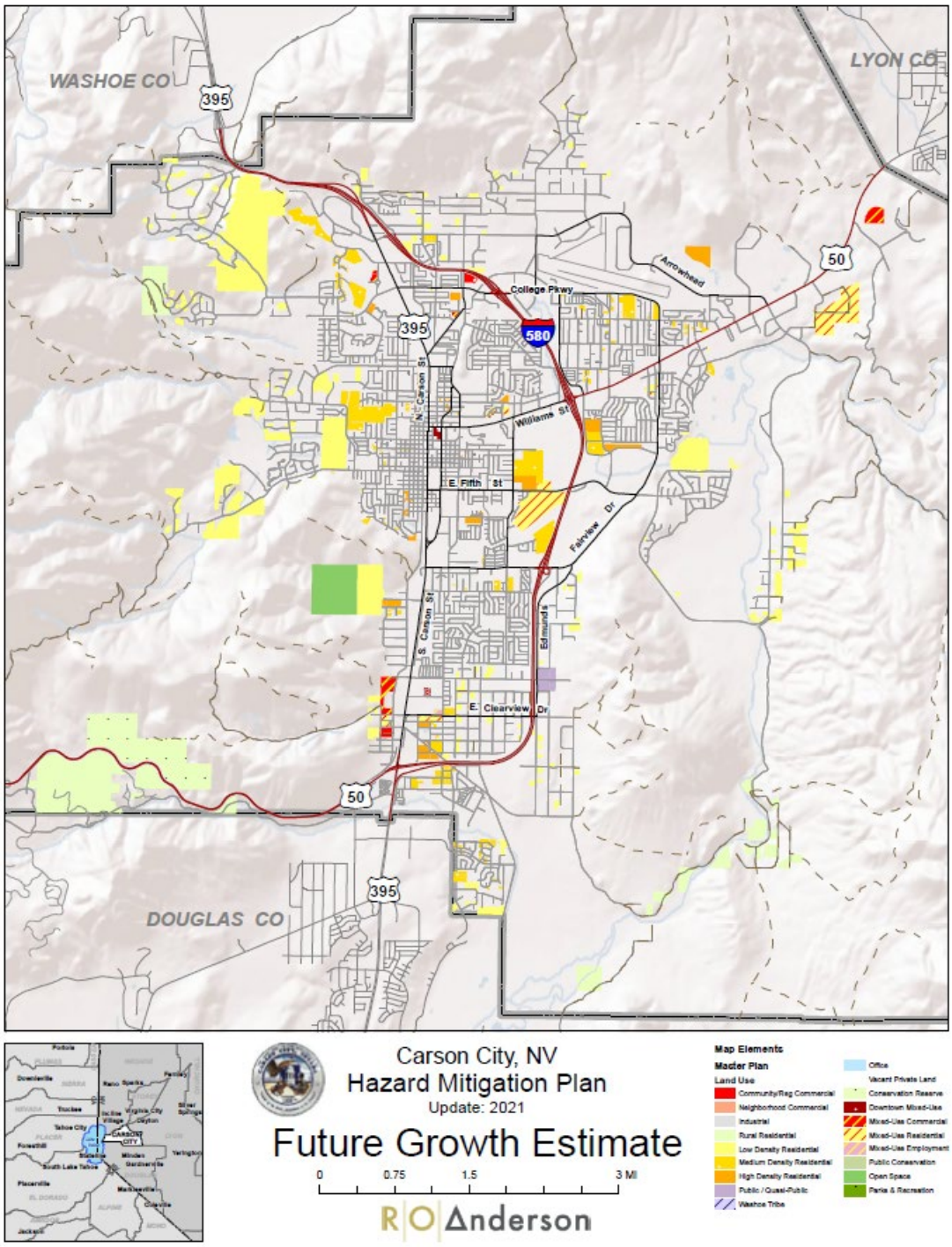

FIGURE 6-10: FUTURE GROWTH ESTIMATE

6.5 Data Limitations

Risk assessment studies are needed for several high-risk hazards including severe weather, drought, and acts of violence. Lower ranking hazards, such as landslide, also need further risk assessment. A lack of data tracking the impacts of past events also limited data availability.

In addition, preparing the update over a 12-week period as well as low staffing levels at the GIS Division were two factors in the limitation of data.

Carson City has an excellent data base for:

1. Structural assets
2. Building Replacement Values
3. Future development
4. Floodplain management

Improvements are possible for:

1. Information about hazard risk specific to the Carson City area (other than flood)
2. Maintenance of records for hazard events and their impact
3. Tracking of implemented projects

As discussed in the Executive Summary, the proposed Amendment will enhance the vulnerability assessment section and improve the analysis of future development for several hazards. The period allowed for the development of the update hampered the completion of the GIS analysis for hazards, such as hazardous materials, and the Level 2 Hazus runs. The planned Amendment will include additional analysis with data already identified as well as new data and resolution of errors in data.

7 Capability Assessment & National Flood Insurance Program (NFIP) Participation

A review of the City's resources is an important component of the hazard mitigation planning process. The review allows the community to identify, evaluate, and improve the capacity of those resources to mitigate the risk of the identified hazards. This section presents the results of the review for Carson City's capabilities in the following fields.

- Administrative and technical
- Education and outreach
- Financial
- Planning and regulatory

To maintain the sequential order of the requirements, Carson City's continued participation in the National Flood Insurance Program (NFIP) is also included in this Section. The program implemented by the City is described in Section 7.3.

7.1 What Changed?

The following changes were made within this updated section.

- The addition of the information to comply with the requirement (44 CFR 201.6(c)(3)(ii)) to address the community's participation in the NFIP was moved into this Section for the convenience of the reviewer.
- The integration of other planning mechanisms was expanded to fully address FEMA's new questions.
    - Administrative, technical, and staff capabilities include a response about the effectiveness of coordination.
    - Education and outreach capabilities respond to the use of the organization/program to implement mitigation strategy.
    - Financial capabilities describe the use of the funding source for implementation of mitigation strategies. The table with funding sources already received link to a current mitigation activity.
    - Planning and regulatory capabilities table has an additional column showing the hazard addressed by each of these capabilities.
- An analysis of each of the capabilities is provided at the end of each of the four tables.

7.2 Capability Assessment.

The resulting worksheets for the four different capabilities reviewed in this update process are listed in alphabetical order in this Section.

The requirement for this review of the community's capabilities is shown below.

ELEMENT	REQUIREMENTS
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? ***44 CFR 201.6(c)(3)*** ***Intent****: To ensure that each jurisdiction evaluates its capabilitiesto accomplish hazard mitigation actions, through existing mechanisms. This is especially useful for multi-jurisdictional plans where local capability varies widely.*	a. The plan **must** describe each jurisdiction's existing authorities, policies, programs and resources available to accomplish hazard mitigation. Examples include but are not limited to: staff involved in local planning activities, public works, and emergency management; funding through taxing authority, and annual budgets; or regulatory authorities for comprehensive planning, building codes,and ordinances.

During the second Planning Team meeting, participants were divided into small groups to review three of the four capabilities: Administrative and Technical, Education and Outreach, and Planning and Regulatory. Planning Team members were encouraged to participate in one or more groups based on their knowledge of the organization. The Financial section was saved for review by the City's Chief Financial Officer.

Worksheets from FEMA's Local Mitigation Planning Handbook were used to gather the information through a group exercise. The worksheets initiated by Planning Team members at the May 27, 2021 meeting are presented in Sections 7.2.1 through 7.2.4 below. The information gathered at the meeting was complemented by additional comments from representatives of Community Development, Public Works, Finance, Fire Department, Public Relations, and Emergency Services.

Note that the required analysis of the City's Current Capabilities is included as a row at the end of each table. The analysis includes comments from individual PT members and possible ways to expand or improve the capability.

7.2.1 Administrative & Technical Capabilities

Administrative and technical capabilities include staff and their skills as well as tools that can be used for mitigation planning and implementation of specific mitigation actions. The group reviewing these capabilities included PT members with knowledge and/or responsibility for these capabilities.

The three tables immediately below show the current administrative and technical capabilities for Carson City.

Administration	Yes/No	Describe capability. Is coordination effective?
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Yes	Public Works: preventive maintenance as needed based on public complaints; Maintain sidewalks, reduce risk. Coordination with other Department Divisions such as the Storm Water Division, Streets, Environmental Division, and the residents is effective, complaints can be reported through the Division's website and handled effectively.
Mitigation Planning Committee	Yes	The Local Emergency Planning Committee (LEPC) members meet quarterly and provide the base for the Planning Team that updates the Hazard Mitigation Plan. The HMP Planning Team includes additional representatives from departments with a stake in hazard mitigation. The LEPC, established in the early 1990's, has a long history of coordinating with all City departments.
Mutual aid agreements	Yes	The Quad County coalition coordinates emergency management strategies for Carson City, Douglas, Lyon, and Storey counties. The Quad Counties support each other in emergencies from preparedness to response, recovery, and mitigation activities. This collaborative body has been in effect for over ten years and played a key role in managing the COVID epidemic.
Planning Commission	Yes	The Planning Commission approves special use permits and variances and provides advisory recommendations to the Board of Supervisors on subdivision, rezoning of property, master plan amendments, and street abandonments. Coordination with the Planning Commission to make them aware of potential hazard areas and hazard impacts is the responsibility of the Planning Division which is part of the Community Development Department.
Regional Transportation Commission	Yes	The Regional Transportation Commission establishes priorities and recommends appropriate funding for transportation improvement projects within Carson City. In this role, RTC Board Members have the opportunity to ensure evacuation routes are in place for hazard events. The RTC coordinates with public works in making decisions about priorities and funding. The Commission works closely with the Transportation Division which manages the CAMPO..

Staff	Yes/No FT/PT[1]	Dept.	Is staffing adequate to enforce regulations?Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	Yes FT	Community Development Department, Building Division	Staffing is currently adequate to support the enforcement of related existing regulations. The Building Division is responsible for managing the construction permitting process. This process includes general public information, plan submittal, plan review, permit issuance, inspection, and document retention. The Building Division is also charged with the task of assuring that all additional approvals required by the Planning Division, Fire Department, Engineering Division, Health Department, and Environmental Control are obtained prior to the issuance of both a building permit and receiving final inspection approval. Although no direct training is provided for hazards and mitigation, the planning staff is aware of hazards and mitigation actions/goals throughout the City. Meetings with the Director of the Department twice a month prior to the Director meeting with the City Manager provides coordination for the Division and other agencies. Direct communication among division staff for many governmental activities, including all aspects of incorporating planning strategies.
City Engineer	Yes FT	Public Works Department Civil Design Community Development Department, Development Engineering Division	Staffing is currently adequate to enforce existing regulations. Civil Design Division, provides technical expertise and support to construct Carson City's capital projects, including preliminary engineering, final design, right-of-way acquisition, public bidding, construction management, and inspection. The Development Engineering Division completes site civil engineering plan review, permitting, and inspections. Public Works and Community Development departments communicate frequently through informal meetings.
Community Development Director	Yes FT	Community Development Department, Development Engineering Division, Code Enforcement Division	Staffing is adequate to support the enforcement of existing relevant regulations. The Community Development Director is a member of the Planning Team. The divisions include the Development Engineering Division, Planning Division, Building Division, Permit Center/Business License Division, and Code Enforcement Division. The Permit Center provides the hub for processing applications and permits and is the point of contact for all processes and Development Services staff. Staff is aware of the hazards impacting the community. GIS supports both current and future development and provides capacity studies for future development to determine the impacts of growth to the community.
Community Planner	Yes Two - FT	Community Development Planning Division	Current staffing is adequate to enforce existing relevant regulations. The Planner Manager leads the Planning Division of the Community Development Department. The Planning Division oversees the following plans, processes, and committees.

		Growth Management	• Zoning and development applications • Master Plan • Major Project Review • Planning Commission • Administrative Permit Agendas • Historic Resources Commission • Growth Management • Title 18 (Zoning) and Development Standards, and Title 17 (Subdivision of Land) of the Carson City Municipal Code • Downtown Development Standards • Housing The Planning Manager position is currently vacant. This position should be included on future Hazard Mitigation Planning Teams. Planning Division's primary role is to provide unified coordination of the City's land development activities. To fulfill this responsibility, it serves as coordinator among the citizens of Carson City, the Board of Supervisors, the Planning Commission, the City Manager and other City departments regarding the physical development of the community. The Planning Division coordinates, although informally, with other divisions within the department, as well as the rest of the governmental agencies in the City. Many Boards and Commissions also use this division in response to development activities in the City. Coordination is effective among agencies and staff.
Code Enforcement Officer/s	Yes FT	Building Division Code Enforcement Division Community Development	Under the Building Division, the number of Officers is adequate to enforce related codes and regulations. Current staffing is adequate for enforcing existing codes and regulations. The Code Enforcement Officers are trained in hazard mitigation through requirements for continuing education. The Officers coordinate with the Divisions within the Community Development Department.
Debt Consultant	NA	Finance Department Consultant as needed	The City uses a debt consultant to evaluate obligations and suggest strategies for decreasing debt. Coordination is done through the finance department and the City Manager.
Digital Media Coordinator	Yes FT	Manager's Office Digital Media Coordinator	This position is adequate currently to support the City in its public outreach efforts. The position is a member of the HM Planning Team for the City, and this participation provides hazard mitigation "training." The position is responsible for the coordination of public outreach for the City. The coordination is effective as demonstrated by the City's website, social media interaction, and other media coverage.
Emergency Manager	Yes PT	Fire Department Emergency Management	Staffing levels are adequate. Partially grant funded ½ time, Works for the fire department as a Battalion Chief the other half. Lead for the HM Planning process and maintenance.

		Emergency Manager & Deputy Emergency Manager.	As the coordinator for the LEPC, this position also serves as Chair for the HM Planning Team. This position is trained in hazard mitigation by participating in all aspects of emergency management field. Coordinates well with Fire Department, Law Enforcement, Community Development, Public Works, City Manager, and Fiscal. The coordination, though informal, results in effective communication about hazard mitigation.
Fiscal Management	Yes FT	Finance Department	The staffing is adequate to enforce related regulations. Finance Department is responsible for maintaining a fiscally sound organization by maintaining accurate and timely financial and accounting records, establishing internal controls to protect and preserve City assets and providing short and long-term financial planning. Services provided include accounting and financial reporting, budget management and compliance, debt management and capital financing, financial analysis and planning, payroll and risk management. Fiscal is consistently involved in emergency responses and is aware of EOC operations and FEMA requirements. The Finance Department coordinates with ALL government agencies. Their support is effective in coordinating hazard mitigation fiscal matters during implementation of mitigation strategy. This includes grant administration.
Floodplain Administrator	Yes PT	Public Works Storm Water and Floodplain Management Program Manager	The Storm Water and Floodplain Management Program is led by a manager. The program is currently adequately staffed to enforce the regulations in place. As part of the Public Works Department, this program's coordination with other Divisions and Departments, such as Finance and Community Development, is to be commended. Their work has reduced the floodplain in the City over the last ten years.
GIS Coordinator	Yes FT	Assessor's Office GIS Division	Although vacancies currently exist in leadership positions for this Division, staffing is adequate to support the enforcement of the City's regulations. Representation on the HMP Planning Team provides training to GIS staff in mitigation. This Division of the Assessor's Office provides support to all the City's Government. Coordination of data, mapping, and other analysis is effective. The staff is knowledgeable about the City's hazards and mitigation activities.
Health Director	Yes FT	Health & Human Services	This position leads the Health & Human Services Department. Staffing at the time of this update is adequate to support the enforcement of the City's related codes and regulations. The Director participates frequently in the Emergency Management exercises locally and at the state level. This training supports her knowledge of hazard mitigation. This position is also a member of the Planning Team. Coordination with other governmental agencies of the City take place through meetings with City Managers and as needed, direct contact with other City staff. Coordination is effective when analyzing the management of past events of infectious disease in the community. These were handled according to planning strategies involving the necessary City departments.

Operations Manager	Yes FT	Public Works	The Operations Manager is the first line of defense for many hazard events. Staffing is adequate and the OM is trained on hazards and mitigation—and also manages the landfill and warehouse. The coordination between divisions in the Public Works Department and the City as a whole are effective. Effectiveness is demonstrated by the quick implementation of mitigation activities in the past supporting risk reduction to the structures and infrastructure of these two important community lifelines.
Public Works Director	Yes FT	Public Works	Yes, staffing is adequate with Director and Deputy Director. Public Works staff as a whole is trained on hazards and mitigation. The coordination between divisions in the Public Works Department and the City as a whole are effective. Effectiveness is demonstrated by the quick implementation of mitigation activities in the past supporting risk reduction to the structures and infrastructure of these two important community lifelines.
School District, Risk Manager	Yes FT	School District Risk Management	Enforcement is not applicable for this staffing category. The School District's Risk Manager provides representation to Carson City, the Carson City Fire Department, the Carson City Local Emergency Planning Committee and coordinates with other agencies in a large emergency. This position is trained on hazards and mitigation topics as part of risk management for the District. As stated above, coordination and representation to the City and its agencies is one of the position's responsibility. Attendance at meetings related to hazards is very effective in coordination of the District's and City's hazard mitigation activities
Sheriff	Yes FT	Sheriff's Office Sheriff Undersheriff	Staffing is adequate to enforce local codes and regulations. The Carson City Public Safety Emergency Communications Center is a division of the Sheriff's Office and includes the Public Safety Answering Point (911 answering point) and Dispatch functions. While the center is the focal point of emergency service requests for Sheriff, Fire, and Medical responses, it is also responsible for coordinating the non-emergency responses and activities of most other city entities such as Public Works, Alternative Sentencing, and Code Enforcement.
Transportation Manager	Yes FT	Public Works Transportation Division	Staffing is adequate to enforce current regulations. Carson City Public Works Transportation Division oversees the Regional Transportation Commission (**RTC**), staffs the Carson Area Metropolitan Planning Organization (**CAMPO**), and operates Jump Around Carson (**JAC**), the city's public transit system. Coordination with the other divisions within the Public Works Department as well as outside agencies has proven effective by the support for public transportation within the City and to the surrounding area.
Water Utility Manager & Wastewater Utility Manager	Yes, FT Yes, FT	Public Works Water Division & Wastewater Division	The staffing is adequate to support the enforcement of codes and regulations today. The water and wastewater (sewer) services are "enterprise" accounts funded completely through fees. The staff for the two Divisions participate regularly in emergency event exercises that include hazard mitigation information.

			The coordination between these two divisions, other divisions in the Public Works Department, and the City as a whole are effective. Effectiveness is demonstrated by the quick implementation of mitigation activities in the past supporting risk reduction to the structures and infrastructure of these two important community lifelines.

[1] Full-time (FT) or part-time (PT) position

Technical	Yes/ No	Department	Describe capability. Has capability been used to assess/mitigate risk in the past?
Grant writing	Yes FT	Finance Department	Grant manager under the Finance Department provides support for the administration of grants. Applications are completed and submitted by the individual agencies with support from this Office. Carson City has previous experience in management of hazard mitigation funding through HMPG, PDM. Most recently, in 2017 a federal disaster declaration resulted in funding under the Public Assistance program.
Hazard data and information	Yes	Assessor's Office GIS	The GIS Division of the Assessor's Office stores data and supports data analysis for all City agencies. This capability has been in place for approximately four years. The automation of data from the Assessor's Office along with distribution of information from other agencies such as Public Works and its divisions have increased the value of this capability. The data used in this plan update was, in large part, provided by the GIS Division.
HAZUS analysis	Yes	Assessor's Office GIS	The GIS Division has the detailed data needed to determine their assets and hazard risk. Currently, a gap in training for HAZUS exists.
Warning systems/services (Reverse 911, outdoor warning signals)	Yes	Fire Department Emergency Management	Code Red: Carson City has instituted the CodeRED Emergency Notification System, an ultra-high-speed telephone communication service for emergency notifications. This system allows the City to telephone all or targeted areas in case of an emergency that requires immediate action. The system is capable of dialing 50,000 phone numbers per hour and delivers a recorded message to a live person or an answering machine, making three attempts to connect to any number. The system was used on the dates below. 03-17-2020 Controlled Burn/Hazardous fuels reduction notification 12-3-2019 Same as above 05-28-2019 Same as above 12-12-2018 Same as above 12-04-2018 Same as above

Other			

How can these capabilities be expanded and improved to reduce risk?
Carson City's Technical and Staffing capabilities demonstrate a diverse breadth of knowledge about hazards and mitigation. Though formal hazard mitigation training is not in place, the strategic plan for the City includes policies to train, hire, and retain staff with the expertise necessary to maintain a safe and resilient community.

7.2.2 Education & Outreach Capabilities

Education and outreach capabilities include programs and methods already in place that are being used to implement mitigation activities related to public education, including hazard-related information.

The Carson City Public Relations Coordinator provided a presentation on Carson City's education and outreach activities. The City's capabilities in this area were discussed in several meetings and with individual city employees with expertise in specific activities described below.

The City's ongoing commitment to keeping the community informed and empowered is evident in its investment in the dedicated staff member who manages publicity. The Carson City Hazard Mitigation Plan is available online under the Emergency Management Division at **carson.org/hazardplan**. In May a community survey on hazard mitigation was hosted on this webpage and circulated through other social media outlets. As of June 2021, the page includes a form inviting public feedback on the hazard mitigation process. In addition to the postings required by Nevada Open Meeting Law, meeting agendas including date, time, and location are available to the public online.

These opportunities invite public participation in the day-to-day government activities of the City, including this hazard mitigation plan update process.

Program / Organization	Yes/No	Describe program/organization and how relates todisaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Firewise Communities certification LIVING WITH FIRE	No YES	The State of Nevada does not use the Firewise USA program. Carson City partners with the University of Nevada Reno, Extension to promote the Living with Fire (LWF) program. LWF distributes information on how to prepare for and reduce the threat of wildfires. The program is a collaborative effort among federal, state, and local firefighting agencies as well as resource management agencies and can be used to implement future wildfire mitigation activities for public outreach.

Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access, and functional needs populations, etc.	Yes	The Community Emergency Response Team (CERT) teaches civilians to prepare for, respond to, and recover from an unplanned disastrous event, particularly when the capability of the existing response is overwhelmed. Upon completion, students may join a formal volunteer CERT group affiliated with a law enforcement agency or fire department. Representatives from the Northern Nevada Chapter of the American Red Cross have been involved with the HMP 2021 Planning Team. Yes, these organizations can be used to implement future mitigation activities. Specifically, the public outreach actions.
Natural disaster or safety related school programs	Yes	Safety-related school programs include active shooter and fire drills. Under the current Risk Manager's guidance, the existing programs support the continuation of public outreach for awareness of hazards and related activities implemented by the City.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes	The Carson City website includes updated information on emergency preparedness and resources available to prepare for emergencies. The Public Relations Coordinator liaises with the Sheriff's office, the Fire Department, and others to share this information via social media, at in person events, as well as on the website. Public Works, Water Division includes a flyer about water use in their billing. The Fire Department provides educational outreach to new homeowners in WUI areas—assisting them with mitigation activities they can implement as well as programs available for fuels reduction managed by the FD.
Public-private partnership initiatives addressing disaster-related issues	Yes	Carson City Emergency Management has participated in preparation exercises facilitated by the American Red Cross. These simulated responses to hazard events have been performed in coordination with Douglas, Lyon, and Storey counties. The Red Cross Disaster Action Team (DAT) consists of trained volunteers who respond to local personal disasters. These partners—especially Quad County members—can be used to support the implementation of activities related to public outreach and risk reduction in areas bordering their jurisdiction.
Public-private partnership initiatives addressingdisaster-related issues	Yes	Many of the examples above illustrate the coordination of public-private efforts through Living with Fire, CERT, and the Red Cross. Also, NV Energy collaborates with state and local agencies in hazardous fuels reduction activities in and around lines of transmission. These examples can be used to implement mitigation actions based on the specific hazard related to the partnership.

StormReady certification	Yes	Carson City was certified as a StormReady community in 2010 to use this grassroots approach to prepare for storm-related hazards and their impacts. The certification lapsed but was restored a couple of years ago. Carson City is currently certified through July of 2023.
Other		

How can these capabilities be expanded and improved to reduce risk?

Carson City's capabilities for public outreach are very good. Additional work is planned to increase volunteer participation and public involvement. Frequent surveys—which generally include an instructional component—are regularly circulated via the City's website to solicit input from residents, businesses, and those employed in the City. During this planning process citizens participated in meetings with comments addressed by the PT and incorporated into the plan as appropriate.

Opportunities for expansion or improvement

- Public announcements or press releases informing the public of existing or newly implemented mitigation activities will increase awareness.
- School District involvement in programs that increase student awareness of hazards and hazard mitigation.

7.2.3 Financial Capabilities

Identify whether the jurisdiction has access to or is eligible to use the following funding resources for implementation of hazard mitigation activities.

Funding Resource	Access/ Eligibility (Yes/No)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigationactions?
Authority to levy taxes for specific purposes	Yes	Nevada Revised Statutes (NRS) authorizes tax levies including property, sales, excise taxes. These funds are used for general operations, Capital Funding such as Corridor Improvements. These funds support maintenance of infrastructure at a standard that reduces exposure to hazard impacts in accordance with current codes and regulations. Residential construction tax is spent on maintenance, construction, and improvements to smaller parks. Grants for mitigation activities; go to the Board for Review and approval providing the review for authority to implement. Capital requests include consideration of safety issues. Capital funds may be used for mitigation actions through either matching grant funds or direct funding. Funding for Parks may be used for implementing mitigation actions that increase the resiliency of the park structures and infrastructure.

Funding Resource	Access/ Eligibility (Yes/No)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigationactions?
Capital Improvement Project (CIP) funding	Yes	Per NRS, capital improvement funds are limited to 5 cents per dollar from property taxes. The City uses half of this levy for short term capital bonds and the other half to fund capital projects. CIP funding may be used for mitigation actions through matching grant funds or direct funding. The City often also bonds to fund capital projects.
Community Development Block Grant (CDBG)	Yes	The City receives a small CDBG grant annually. The City accepts applications for the funding, and a work group reviews the grant requirements and assigns funding. Many projects update compliance with ADA standards. CDBG funds may also be used to match grant funding.
Fees for water, sewer, gas, or electric services	Yes	Water, and wastewater services are run independently as an enterprise business. The user fees fund operations and capital expenses including improvements to mitigate risk. These units do seek grants as appropriate and use State Revolving Funds to get a low interest rate via EPA programs. Gas and electric are public utilities outside the jurisdiction of the City. Fees from enterprise programs such as water and sewer may be used for mitigation actions through matching grant funds or direct funding.
Impact fees for new development Key Accomplishment	Yes	Impact fees for street improvements are being levied as of 2020. Funds will be assigned to the capital funds to expand infrastructure and services to support future growth. The activities mitigate potential impacts by updating access for public safety purposes and enhancing the evacuation potential—thus mitigating risk for all hazards.
Incur debt through general obligation bondsand/or special tax bonds	Yes	The City primarily uses General Obligation Bonds, which tend to have the lowest interest rates, for capital funding when appropriate, depending on current debt levels—particularly for necessary large projects. Currently, the City plans to use bonds to construct a new fire station to address safety issues due to growth.
Incur debt through private activities	Yes	The City uses a debt consultant to evaluate obligations and suggest strategies for decreasing debt. This resource has been used in the past for all types of debt issuance and this resource can be used to evaluate potential funding sources for mitigation activities.
State funding programs	Yes	The City receives pass-through and state-funded grants including those from a Nevada State program that will pay for half of the FEMA match (12.5%). The City intends to apply for the program in the next 12 months to fund repairs related to the 2017 flood damage. The funds may be used for future mitigation activities.
Storm water utility fee	Yes	Stormwater management is an enterprise business. The user fees are used to fund operations and capital expenses including improvements to mitigation risk.

Funding Resource	Access/ Eligibility (Yes/No)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigationactions?
Other federal funding programs	Yes	The City is aware of funding available from FEMA, CARES Act, ARP Funding, PHP, etc. See Funding resources in Section 7. 2.3.1.
Other		

How can these capabilities be expanded and improved to reduce risk?

Carson City uses enterprise programs funded by fees, such as the water and sewer programs, to support mitigation activities. Federal and private grant funding sources, such as FEMA PDM, and HMGP, also support projects related to mitigation. The Fire Department used Southern Nevada Public Lands Management Act funds to support hazardous fuels reduction activities in the City's WUI. Carson City has previously received funding from the Hazard Mitigation Assistance programs PDM and HMGP.

Specialty license plate fees are used to support first responder training. The City partners with Quad County members to assess risk and implement mitigation activities for hazards such as drought, hazardous materials, and wildfire.

In 2019, the Nevada Legislature passed Bill 508 which allocated funds from the general fund to assist in wildfire management and resilient ecosystem restoration across Nevada by supporting wildfire prevention, landscape restoration, and long-term planning. As a condition of the bill, dollar-for-dollar matching funds from non-state government sources were required and obtained from NV Energy. NV Energy had overlapping priorities with the state to protect infrastructure, communities, and ecosystems from wildfire. This program implemented hazardous fuels reduction in lands close to the City and funds continue to be available for local jurisdictions.

Comments from the PT members

- Working with NV Energy Wildland Fire Prevention Program and NFD—they gave City a crew of 6 to 9 people who helped clear brush under powerlines. They also purchased a vehicle to support this effort. Part of a grant.
- Flood –continuing to build our stormwater system. Raised rates significantly to fund improvements to mitigate flood damage.
- Wind – not sure how we would deal with it. Currently, downed trees go through insurance company.
- Carson City is working on developing underground power lines as part of any improvement project downtown.

Expansion or improvement: Identify resources to support for federal cost/share requirements for grants.

7.2.3.1 Additional Potential Funding Resources for Hazard Mitigation

The table below, compiled with assistance from the City's Grant Manager, lists additional potential funding sources for hazard mitigation activities in Carson City. City Departments that have been or may be eligible for funding are listed in alphabetical order. Potential connections to 2021

Mitigation Strategies are noted in the last column which lists a related mitigation action and/or goal along with an explanation of their relationship to available funding.

TABLE 7-1: POTENTIAL FUNDING SOURCES FOR SPECIFIC MITIGATION ACTIONS

City's Department	Potential Funding Program Name & Description	Acronym	Funding Organization	Potential Connections to 2021 Mitigation Action Items
Arts & Culture	**Professional Development Grant** Provides support for personnel to attend training activities.	**NVAC**	**Nevada Arts Council**	1.C Cultural asset protection/ identification via GIS support
Alternative Sentencing	**Highway Safety Grant Funds** Funding to support safety activities such as countermeasures for impaired driving, sobriety, distracted driving, motorcyclist safety, non-motorized safety. Support specialty court activities	**HSGF**	**US Department of Transportation, National Highway Traffic Safety Administration**	Connects with Goal 1, but not a particular action. Protection of life, property (vehicles), and infrastructure (roads, bridges, etc.)
Courts	**Judicial Response and Needs to Combat Covid-19** Online Dispute Resolution Software and equipment for teleconference/video conferencing ability with the public.	**JRNC**	**US Department of Justice**	2.D, 8.D Purchase of technology to stop transmission of infectious disease.
Health & Human Services	Epidemiology & Laboratory Capacity to complete influenza and West Nile Virus surveillance in Carson City, Douglas, and Lyon counties--funding through CDC	**ELC or EPi**	**Center for Disease Control**	4.A, 4.D Produce information for Mass Illness Plan Update and public outreach

City's Department	Potential Funding Program Name & Description	Acronym	Funding Organization	Potential Connections to 2021 Mitigation Action Items
Health & Human Services	**Community Services Block Grant** To deliver community services to individuals and families at risk as a result of COVID-19	**CSBG CARES**	**CARES Act**	4.B, 4.D, 4.E Acquire and store needed medical PPE, public outreach, distribution of disease information
Health & Human Services	**Substance Abuse Prevention and Treatment Block Grant** To implement community-based tuberculosis programs serving individuals with a history of substance abuse to reduce the incidence of tuberculosis disease and infection.	**SAPTA TB**	**Nevada DPBH**	4.B, 4.D, 4.E Acquire and store needed medical PPE, public outreach, distribution of disease information
Fire Department	**Fuels Reduction** To clear brush under power lines located in the Western Foothills of Carson City	**NDF & NVE**	**Nevada Division of Forestry & NV Energy**	1.B, 1.C, 1.F, 8.B, 8.D Identify existing hazards, coordination with City GIS to identify hazard areas, funding for mitigation ordinances, Support community fuel reduction activities.
Fire Department	**Carson City Westside Hazardous Fuels Reduction Program** Hazardous Fuels Reduction and Wildfire Prevention	**SNPLMA**	**Southern Nevada Public Land Management Act (SNPLMA)**	8.B, 8.D Community wide fuel reduction programs
Fire Department	**Assistance to Firefighters** Available for fire departments and non-affiliated emergency	**AF**	**FEMA / U.S. Fire Administration**	Potential

City's Department	Potential Funding Program Name & Description	Acronym	Funding Organization	Potential Connections to 2021 Mitigation Action Items
	medical services. Grant awards based on projects as identified. Provides equipment, protective gear, emergency vehicles, training, and other resources needed to protect the public and emergency personnel from fire and related hazards			
Fire Department/ Emergency Management	**State General Fund United We Stand (license plate)** Provides financial assistance to local governments to support preparedness to combat terrorism, including, without limitation, planning, training, and purchasing supplies and equipment, or for any other purpose authorized by the Legislature.	**SGF**	**State of Nevada**	Potential
Fire Department/ Emergency Management	**Hazardous Materials Emergency Preparedness** Registration Costs for 3 Fire Personnel to attend Fire Show West Conference Reno, NV.	**HMEP**	**SERC**	8.A Education resources for Wildland Fire Plan Update and Wildland Fire Working Group
Fire Department/ Emergency Management	**Emergency Management Performance Grant:** Administered by states, this program offers funds annually for all-hazards preparedness. Available through Nevada Division of Emergency Management.	**EMPG**	**Federal Emergency Management Agency (FEMA)**	8.A Staff to support development of new code

City's Department	Potential Funding Program Name & Description	Acronym	Funding Organization	Potential Connections to 2021 Mitigation Action Items
Public Works	**Hazard Mitigation Grant Program** Available to communities after a Presidentially declared disaster. Grant awards are based on specific projects as these are identified. This program includes **Fire Management Assistance Grant** funding after a presidential disaster declaration for a wildfire event is approved. Available through Nevada Division of Emergency Management.	**HMGP & FMAG**	**Federal Emergency Management Agency (FEMA**	5.I Increase resiliency through purchase of generators for critical facilities
Public Works, Storm Water Management Program Division	**Flood Mitigation Assistance Grant** Annual funding to mitigate repetitive flooding for structures and infrastructure. Available through Nevada Division of Emergency Management.	**FMA**	**Federal Emergency Management Agency (FEMA**	Potential
Public Works, Storm Water Management Program Division	**National Flood Insurance Program** Property owner's insurance protection in exchange for State and community floodplain management and regulation. Managed by the Nevada Division of Water Resources.	**NFIP**	**Federal Emergency Management Agency (FEMA**	5.I Provides insurance for all structures in the community. More importantly, those found in a Special Flood Hazard Area.
Public Works, Storm Water Management Program Division	**Building Resilient Infrastructure and Communities** This program will support states, local communities, Tribes, and territories, as they undertake hazard mitigation projects to reduce the risks they face from disasters and natural hazards.	**BRIC**	**Federal Emergency Management Agency (FEMA)**	5.E, 5.G 5.H, 5.I, 5.J, 5.L, 6.B, 9.C Reduction of flood risk through feasibility study and construction project for retention/ detention basins.

City's Department	Potential Funding Program Name & Description	Acronym	Funding Organization	Potential Connections to 2021 Mitigation Action Items
Public Works, Storm Water Management Program Division	**Clean Water State Revolving Fund** Annual funding cycle. Awards are based on specific projects as identified. Funds projects for water quality, watershed protection or restoration, estuary management, nonpoint source, and traditional municipal wastewater treatment. This program provides financial assistance, including loans and grants for projects such as construction of municipal sewage and water recycling facilities, remediation for underground storage tank releases, watershed protection, and nonpoint source pollution control.	**CWSRF**	**U.S. EPA**	Potential
Library	**Library Services and Technology Act** Community engagement through access to technology equipment	**IMLS-CARES**	**Institute of Museum and Library Services**	2.E, 2.F, 4.D, 8.C, 9.B Provide public access to technology
Library	**Library Services and Technology Act** Community engagement through access to technology equipment	**IMLS-CARES**	**Institute of Museum and Library Services**	2.E Youth education outreach
Parks & Recreation Administration	**Land & Water Conservation Fund** Matching grants to States and local governments for the acquisition and development of public outdoor recreation areas and facilities, and to acquire lands, waters, and interests therein necessary to achieve the natural, cultural, wildlife, and recreation	**LWCF**	**National Park Service**	5.F, 8.G Acquire sensitive land with potential recreational and facility uses

City's Department	Potential Funding Program Name & Description	Acronym	Funding Organization	Potential Connections to 2021 Mitigation Action Items
	management objectives of the National Park Service.			
Parks & Recreation Administration	**Southern Nevada Public Land Management Act (SNPLMA)** Provides for the orderly disposal of certain Federal lands in Clark County, Nevada, and expend the sale proceeds and other revenues for purposes identified in the Act	**SNPLMA**	**Bureau of Land Management**	8.C and 8.D Hazardous Fuels Reduction
Parks & Recreation Administration	**Nevada State Parks - Recreational Trails Program** Provide for trail-related educational programs, purchase trail building tools, develop urban trail linkages near homes and workplaces with trail components, maintain existing recreational trails, restore areas damaged by unauthorized recreational use, long time wear and tear, and natural disasters, develop trailside and trailhead facilities, provide features that facilitate the access and use of trails by persons with disabilities, acquire easements for trails, or for trail corridors, acquire fee simple title to property from a willing seller, construct new trails facilities, maintenance of previous RTP projects, construction of new trails crossing state/federal lands, landscaping of trail facilities, utilities that are directly related to the trail project, trail planning, and archaeological activities.	**RTP**	**Federal Highway Administration**	5.F, 8.G Acquire sensitive land with potential recreational and facility uses

City's Department	Potential Funding Program Name & Description	Acronym	Funding Organization	Potential Connections to 2021 Mitigation Action Items
Parks & Recreation Administration	**Noxious Weed Abatement Program** Noxious Weed Abatement	**CWSD**	**Carson Water Subconservancy District**	8.D Vegetation management program.
Parks & Recreation Administration	**Noxious Weed Abatement Program** Noxious Weed Abatement	**NWAP**	**Carson Water Subconservancy District (CWSD) & National Fish and Wildlife Foundation (NFWF)**	8.D Vegetation management program.
Parks & Recreation Administration	**CWSD Mexican Ditch Bridge** Mexican Dam Ditch Intake Structure Improvements	**CWSD-1**	**Carson Water Subconservancy District**	9.A Maximize the use of surface sources when available and preserve groundwater sources for system peaking needs and times of drought
Parks & Recreation Administration	**Golden Eagle Lane Erosion Control Project**	**CWSD-2**	**Carson Water Subconservancy District**	5.F Slope stabilization for flood and landslide mitigation
Parks & Recreation Administration	**Carson City Weed Coalition** Noxious Weed Abatement	**CCWC**	**Carson Water Subconservancy District & Bureau of Land Management**	8.D Vegetation management program.
Parks & Recreation Administration	**Carson River Canyon, Rifle Range Fire Restoration** Restoration of approximately 220 acres in Carson River Canyon Open Space	**CFWN**	**Community Foundation of Western Nevada (CFWN)**	5.F, 8.D Slope stabilization for flood and landslide mitigation, vegetation management
Parks & Recreation Administration	**Carson City Weed Coalition** Carson City Weed Abatement	**CCWC**	**Nevada Department of Agriculture (NDA)**	8.D

City's Department	Potential Funding Program Name & Description	Acronym	Funding Organization	Potential Connections to 2021 Mitigation Action Items
				Vegetation management program.
Parks & Recreation Administration	**Water Pollution Control Program** Ash Canyon Road Erosion & Sediment Control - Ph. 5 Ash Canyon Road Erosion & Sediment Control	**WPCP**	**Nevada Department of Environmental Protection (NDEP)**	5.F Slope stabilization for flood and landslide mitigation
Parks & Recreation Administration	**Water Pollution Control Program** Golden Eagle Lane Erosion Control Project	**WPCP**	**Nevada Department of Environmental Protection (NDEP)**	5.F Slope stabilization for flood and landslide mitigation
Public Works, Transportation Division	**Federal Highway Administration** Safe Route to School Multi-use paths – increases community safety and promotes environmental sustainability	**FHWA**	**U.S. Department of Transportation**	Potential
Public Works, Transportation Division	**Community Development Block Grant** Sustainable infrastructure and community safety.	**CDBG**	**Community Development Block Grant**	Potential All – may be used as cost-share
Sheriff's Office	**Justice Assistance Grant** Provides support for law enforcement training, community relations, equipment, and personnel to reduce crime and recidivism.	**JAG**	**U.S. Department of Justice**	Behavioral Health support to the community in reduction of risk for acts violence

TABLE 7-2: ADDITIONAL POTENTIAL FUNDING SOURCES

Program Name & Description	Acronym	Funding Organization	Potential Connection to 2021 HMP Goals
Landscape-Scale Restoration Grants Provides funding for projects that cross property ownership, management, and/or jurisdictional boundaries involving collaborative efforts among multiple stakeholders. Funds support activities in the Nevada's Forest Action Plan.	**LSRG**	**U.S. Forest Service/Nevada Division of Forestry**	Goal 8
Community Planning Assistance Teams The Community Planning Assistance Teams (CPAT) program organizes multidisciplinary teams of **planning** professionals that volunteer their time to work with local stakeholders to create a vision plan and implementation strategy. CPAT offers expertise in a diverse range of issues facing communities. CPAT brings planning resources and opportunities to communities and strengthens the ability of residents and other stakeholders to influence and determine decisions that affect their quality of life**.**	**CPAT**	**American Planning Association**	All Goals
National Landslide Hazards Program **This program studies landslide hazards.**	**NLHP**	**U.S. Geological Survey/University of Nevada Reno (UNR)**	Goal10
National Earthquake Hazard Reduction Program. Funding provided through the Division of Emergency Management to support updates of building codes and regulations, development of mitigation plans, safety inspection of critical facilities and infrastructure, and outreach and education.	**NEHRP**	**FEMA**	Goal 3
Risk Map FEMA provides technical support, flood hazard studies, and flood mapping.	**RM**	**FEMA**	Goal 5
Nevada Emergency Assistance Account Funding supports response and recovery efforts for emergencies declared at the state or local level.	**NEAA**	**State**	All Goals

Program Name & Description	Acronym	Funding Organization	Potential Connection to 2021 HMP Goals
Nevada Disaster Relief Account Funding from the Legislative Finance Committee to support cost-share required for federally declared disasters, and the stabilization of state government.	**NDRA**	**State**	All Goals

7.2.4 Planning & Regulatory Capabilities

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce hazard impacts. The responses to the questions below also address the integration of mitigation principles into other planning mechanisms, and conversely, the incorporation of other mitigation activities into this Plan.

Plans & Key Accomplishments	**Yes / No Year**	**Does the plan address hazards?** **Does the plan identify projects to include in the mitigation strategy?** **Can the plan be used to implement mitigation actions?**	**Hazard Mitigated**
Capital Improvements Plan (CIP) Updated reflecting building code changes	Yes 2022-2026 CS-year	Yes all. Funding source for capital improvements, i.e. buildings and vehicles. The CIP provides standards for construction related to building codes. This plan can be used to implement a series of current mitigation actions related to codes and regulations as well as construction.	All Natural Hazards
Carson City Building Code https://library.municode.com/nv/carson_city/codes/code_of_ordinances Continued adoption of the most current IBC.	Yes 12/2020	Current to IBC 2018, addresses codes and regulations related to hazards. The plan identifies projects related to codes and regulations included in the current strategy. The IBC is used to implement mitigation actions.	All Natural Hazards
Carson City Community Wildfire Protection Plan https://www.carson.org/home/showpublisheddocument?id=21209	Yes 2009	This Plan, scheduled for an update in 2022, addresses wildfire risk. Projects identified in this iteration of the plan have been addressed in previous iterations of the HMP. When updated, yes, the CWPP can be used to implement wildfire related mitigation actions.	Wildfire

Plans & Key Accomplishments	Yes / No Year	Does the plan address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?	Hazard Mitigated
Carson City Emergency Action Plan (Brunswick Canyon Dam Developed plan with ongoing update process established	2020	Yes: all Qs above.	Earthquake, Flood
Carson City Emergency Action Plan (Eagle Valley Dam) Developed plan with ongoing update process established	2021	Yes: all Qs above	Earthquake, Flood
Carson City Emergency Action Plan (Shenandoah Basin Dam) Developed plan with ongoing update process established	2021	Yes: all Qs above	Earthquake, Flood
Carson City Emergency Operations Plan Updated plan with ongoing update process established	Yes 2020	Yes this plan address hazards in the City This plan identifies projects to include in mitigation actions and strategies. This plan can be used to implement future mitigation actions.	All Hazards
Carson City Fire Code https://library.municode.com/nv/carson_city/codes/code_of_ordinances?nodeId=TIT14F Developed plan with ongoing update process established	2/2021	Yes Addresses fire hazards and codes. Identifies strategies to prevent and/or mitigate fires.	Wildfires, fires
Carson City Hazardous Material Response Plan Updated plan with ongoing update process established		Identifies hazards and high-risk businesses/locations as well as actions to mitigate risk and procedures for responding to a spill. Yes, the plan can be used to implement mitigation actions related to hazardous materials.	Hazardous Materials

Plans & Key Accomplishments	Yes / No Year	Does the plan address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?	Hazard Mitigated
Carson City Mass Illness Plan		Plan was not available for review.	Infectious Disease
Comprehensive Master Plan Carson City Master Plan https://www.carson.org/government/departments-a-f/community-development/planning-division/master-plan Updated plan with ongoing update process established	Yes April 2006	Yes, see action 1.A of the 2021 HMP. Yes, projects include public awareness and education as well as partnerships, land use code, and regulations.	All Natural Hazards
Ash Canyon Sandbag Plan Updated plan with ongoing update process established	Yes 2016	Addresses flood. Presenting the location for placing sandbags to prevent damage to structures and infrastructure. This Sandbag Plan does not identify projects for mitigation. Plan is a mitigation strategy to reduce impacts of flood. No projects are identified in this plan for mitigation strategy	Flood
Goni Canyon Sandbag Plan Updated plan with ongoing update process established	Yes 2016	Addresses flood. Presenting the location for placing sandbags to prevent damage to structures and infrastructure. No projects are identified in this plan for mitigation strategy. Plan is a mitigation strategy to reduce impacts of flood.	Flood
H&I-Sandbag Plan Updated plan with ongoing update process established	Yes 2016	Addresses flood. Presenting the location for placing sandbags to prevent damage to structures and infrastructure. No projects are identified in this plan for mitigation strategy. Plan is a mitigation strategy to reduce impacts of flood.	Flood
Hells Bells Sandbag Plan Updated plan with ongoing update process established	Yes 2016	Addresses flood. Presenting the location for placing sandbags to prevent damage to structures and infrastructure. No projects are identified in this plan for mitigation strategy. Plan is a mitigation strategy to reduce impacts of flood.	Flood

Plans & Key Accomplishments	Yes / No Year	Does the plan address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?	Hazard Mitigated
King St. Sandbag Plan Updated plan with ongoing update process established	Yes 2016	Addresses flood. Presenting the location for placing sandbags to prevent damage to structures and infrastructure. No projects are identified in this plan for mitigation strategy. Plan is a mitigation strategy to reduce impacts of flood.	Flood
Voltaire Sandbag Plan Updated plan with ongoing update process established	Yes 2016	Addresses flood. Presenting the location for placing sandbags to prevent damage to structures and infrastructure. No projects are identified in this plan for mitigation strategy. Plan is a mitigation strategy to reduce impacts of flood.	Flood
Washington Sandbag Plan Updated plan with ongoing update process established	Yes 2016	Addresses flood. Presenting the location for placing sandbags to prevent damage to structures and infrastructure. No projects are identified in this plan for mitigation strategy. Plan is a mitigation strategy to reduce impacts of flood.	Flood
Wastewater Sandbag Plan Updated plan with ongoing update process established	Yes 2016	Addresses flood. Presenting the location for placing sandbags to prevent damage to structures and infrastructure. No projects are identified in this plan for mitigation strategy. Plan is a mitigation strategy to reduce impacts of flood.	Flood
Carson City Strategic Plan https://www.carson.org/transparency/carson-city-strategic-plan-draft Updated plan with ongoing update process established	2021-2025	Indirectly through two goals listed below. **Safety:** Ensure a safe community through proactive and responsive protection of life and property. **Sustainable Infrastructure:** Develop and maintain a sustainable public infrastructure to meet the current and future needs of our community. Yes, several projects are included in the strategy such as the update of the master plan, continuation of NFIP and to Community Rating System (CRS) participation. Construction of an EOC, and increasing public involvement, among others. Yes, the plan can be used to implement the above mitigation actions.	All Hazards

Plans & Key Accomplishments	Yes / No Year	Does the plan address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?	Hazard Mitigated
Carson River Geographic Response Plan Updated plan with ongoing update process established	Yes 2006	The plan addresses hazardous materials spills on the Carson River. This plan does not identify mitigation projects. This plan could not be used to implement mitigation actions.	Hazardous Materials
Carson River Watershed Regional Floodplain Management Plan (Carson Water Subconservancy District) Updated plan with ongoing update process established	Yes 2018	Yes, floods. Yes, the strategy in this plan for floodplain management are reflected in the actions under Goal 5: "Reduce the possibility of damage and losses due to floods" in this HMP. Absolutely, this plan can be used to implement mitigation actions identified in this HMP -and meets the CRS floodplain management plan requirements.	Flood
Combs Canyon & Eagle Valley Creek Levees EAP Updated plan with ongoing update process established	Yes 2018	Yes, floods. Emergency response protocol and possible material acquisition sites to mitigate impact. Yes, potential post-disaster funding for mitigation can support mitigation actions through this plan.	All Hazards
HazMat Plan Updated plan with ongoing update process established	Yes 2020	Yes, the HazMat plan addresses hazardous materials management. At this time, no projects are identified in the plan. This plan can be used to implement outreach and possibly training. Plan does address mitigation and identifies training and planning as particular areas of concern.	Hazardous Materials
Transit Asset Management Plan Updated plan with ongoing update process established	Yes 2019-2022	Yes, this plan discusses catastrophic loss of assets due to natural or man-made disasters and hazards. No mention of projects are made in this plan. Yes, recovery process-related mitigation activities could be implemented through this plan.	All Hazards
Pavement Management Plan Fiscal Year 2019-2023 https://www.carson.org/home/showpublisheddocu	April 2018	The purpose of this document is to consistently and efficiently evaluate, select, design, and implement pavement projects annually. Includes a flexible funding source with matching funds.	

Plans & Key Accomplishments	Yes / No Year	Does the plan address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?	Hazard Mitigated
ment?id=67694 Updated plan with ongoing update process established		No hazards are identified in this plan. Road and other infrastructure mitigation actions can be implemented through this plan.	
Sustainability in Carson City https://www.carson.org/government/departments-g-z/public-works/sustainability	Website	This website provides a list of activities implemented by the City promoting sustainability in many areas. Although not a plan, the website demonstrates the City's capability to mitigate specific hazard events and its commitment and support of mitigation actions.	Climate Change
Threat & Hazard Identification & Risk Assessment Updated plan with ongoing update process established	2019	THIRA is reviewed and maintained as required. Yes, the THIRA can identify projects to include in the mitigation strategy. The THIRA identified hazard mitigation activities were coordinated for earthquake, and wildfire. Yes, this plan can support the implementation of mitigation actions.	All Hazards
Carson Area Metropolitan Planning Organization, 2040 Regional Transportation Plan Updated plan with ongoing update process established	2016	This plan addresses life safety. Yes, infrastructure improvement/construction (road, bus stops, etc.) are included in the plan. Yes, mitigation actions for the infrastructure addressed in this plan form part of Goal 1 of the 2021 HMP.	All Hazards
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		Carson City partners with its neighbors, collaborates with other entities, and supports the development of regional plans to support the safety and resiliency of the community. The City also demonstrates forethought by integrating many of the existing plans through the Master Plan. Please see Section 8.5 8.5 Integration of Mitigation Plan into Local Planning Mechanisms. Although a specific plan for climate change adaptation is not in place, the City has taken steps to develop sustainability practices related to climate change.	Climate Change
Carson City has plans and regulations that support hazard mitigation activities through their individual strategies. Integration among these plans increased from the last plan to this update. Open space, recreational activities, and the City's strategic plan work together to maintain a safe community and to actively reduce risk. Note that the flood risk in Carson has been continually reduced with projects implemented by the Stormwater and Floodplain Management program.			

Plans & Key Accomplishments	Yes / No Year	Does the plan address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?	Hazard Mitigated
Expansion or improvement: Discussion of integration during the maintenance of the Hazard Mitigation Plan will improve these capabilities.			

7.3 National Flood Insurance Program (NFIP) Participation

The Hazard Mitigation Planning requirement to narrate the City's participation in the NFIP and its continued compliance with program conditions follows below.

ELEMENT	REQUIREMENTS
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? ***44 CFR 201.6(c)(3)(ii)*** ***Intent:*** *To demonstrate flood hazard mitigation efforts by the community through NFIP activities. Where FEMA is the official administering Federal agency of the NFIP, participation in the program is a basic community capability and resource for flood hazard mitigation activities.*	a. The plan **must** describe each jurisdiction's participation in the NFIP and describe their floodplain management program for continued compliance. Simply stating "The community will continue to comply with NFIP," will not meet this requirement. The description could include, but is not limited to: • Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs); • Floodplain identification and mapping, including any local requests for map updates; or • Description of community assistance and monitoring activities. Jurisdictions that are currently not participating in the NFIP and where an FHBM or FIRM has been issued may meet this requirement by describing the reasons why the community doesnot participate.

Carson City identified special flood-hazard areas and entered the National Flood Insurance Program (NFIP) 35 years ago in 1986. Its assigned community number is 320001. The City entered the Community Rating System program on October 1, 1994, 27 years ago. Participation in both programs has been continuous since initiation.

By voluntarily participating in the CRS program, the City demonstrates its dedication to ensure continued compliance well above the minimum NFIP requirements.

As of April 1, 2021, Carson City has a ranking of 6, status C, which allows an SFHA discount of 20% and a 10% discount for non-SFHA. The current effective date is October 1, 2009.[160]

The CRS is a voluntary program under the National Flood Insurance Program (NFIP) that promotes the following goals.

1. Reduce flood losses.
2. Facilitate accurate insurance rating.
3. Promote awareness of flood insurance.

The CRS recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP. It credits community efforts beyond those minimum standards by reducing flood insurance premiums for the community's property owners. The CRS is similar to—but separate from—the private insurance industry's programs that grade communities on the effectiveness of their fire suppression and building code enforcement efforts.[161]

Communities receive additional credit for regulating development outside the Special Flood Hazard Area (SFHA) to the same standards as development inside the SFHA. There is also credit for assessing future flood conditions, including the impacts of future development, urbanization, and changing weather patterns.

Based on the total number of points a community earns, the CRS assigns one of ten classes. Discounts on flood insurance premiums are based on the community's class. In CRS participating communities, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community's efforts that address the three goals of the program listed above.

Flood insurance premium rates in Community Rating System communities are discounted in increments of 5%. A Class 10 community is not participating in the CRS and receives no discount. A Class 9 community receives a 5% discount for all policies in its Special Flood Hazard Areas, a Class 8 community receives a 10% discount, all the way to a Class 1 community, which receives a 45% premium discount. Classifications are based on 19 creditable activities, organized under four categories, as listed below.

- Public Information
- Mapping and Regulations
- Flood Damage Reduction

[160] "Community Rating System Eligible Communities, Effective April 1, 2021, FEMA, accessed June 8, 2021, **https://www.fema.gov/sites/default/files/documents/fema_april-2021-eligible-crs-communities.pdf**.

[161] Excerpted from "The Community Rating System Works," *National Flood Insurance Program Community Rating System: A Local Official's Guide to Saving Lives, Preventing Property Damage, and Reducing the Cost of Flood Insurance,"* FEMA B 573/2018, accessed June 8, 2021, **https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_local-guide-flood-insurance-2018.pdf.**

- Warning and Response

The table below shows the credit points earned and the resulting classification and premium reductions.[162]

TABLE 7-3: CRS CREDIT POINTS, CLASSES, AND PREMIUM DISCOUNTS

Credit Points	Class	Premium Reduction SFHA*	Premium Reduction Non-SFHA**
4,500+	1	45%	10%
4,000-4,499	2	40%	10%
3,500-3,999	3	35%	10%
3,000-3,499	4	30%	10%
2,500-2,999	5	25%	10%
2,000-2,499	6	20%	10%
1,500-1,999	7	15%	5%
1,000-1,499	8	10%	5%
500-999	9	5%	5%
0-499	10	0	0

*Special Flood Hazard Area

**Preferred Risk Policies are available only in B, C and X Zones for properties that are shown to have a minimal risk of flood damage. The Preferred Risk Policy does not receive premium rate credits under the Community Rating System because it already has a lower premium than other policies. The Community Rating System credit for AR and A99 Zones are based on non-Special Flood Hazard Areas (non-SFHAs) (B, C and X Zones).

Credits include: Classes 1 – 6 at 10%. Classes 7 – 9 at 5%. Premium reductions are subject to change.

To support its continued voluntary participation in the CRS and maintain the requirements of the NFIP, Carson City outlined mitigation actions listed under Goals 5 and 6 in Section 8, Table 8-1,

[162] "How are Flood Insurance Premium Discounts for CRS Communities Calculated?" National Flood Insurance Program Community Rating System, FEMA, accessed June 8, 2021, **https://www.fema.gov/floodplain-management/community-rating-system**.

Mitigation Goals and Potential Actions. The City restricted future building within a floodway by implementing Building Code Title 12.09 and 15.05.[163]

Carson City partners with the Carson River Subconservancy in a regional floodplain management plan. This plan complies with the floodplain management planning requirements of the CRS program.

The City's Floodplain Manager completed supplemental Worksheet 4.3, based on FEMA's Local Mitigation Planning Handbook and provided by National Flood Insurance Program, as shown in Table 7-4 below.[164] This table demonstrates the continued commitment of the City to support the goals of the NFIP and CRS programs. More importantly, the residents benefit from the City's efforts to reduced flood insurance rates, as well as from the reduction in flood risk for the entire community.

Also important is management's commitment to continuing support for this program as demonstrated by its inclusion in the City's Strategic Plan under the Quality of Life and Community priority objectives.[165]

TABLE 7-4: NATIONAL FLOOD INSURANCE PROGRAM PARTICIPATION WORKSHEET

NFIP Topic	Access/ Eligibility (Yes/No)	Comments from Floodplain Manager, Carson City, June, 2021
Insurance Summary		
How many NFIP policies are in the community? What is the total premium and coverage?		As of 2021: Policies in Force: 322 Insurance in Force: $99,429,900.00
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?		No. of Paid losses: 92 Total Losses Paid: $578,249.98 Substantial Damage Claims Since 1978: 2
How many structures are exposed to flood risk within the community?		836 Structures in the SFHA as of Sept 2020
Describe any areas of flood risk with limited NFIP policy coverage		Areas in the City where zone AH exists and areas where street grades are less than 1%
Staff Resources		
Is the Community FPA or NFIP Coordinator certified?	No	

[163] "Mitigation Goals and Potential Actions," Section 8, pp. 8-3 to 8-5, Carson City Hazard Mitigation Plan, August 4, 2016, accessed June 8, 2021, **http://carson.org/hazardplan.**

[164] "Worksheet 4.3," National Flood Insurance Program, *Local Mitigation Planning Handbook,* accessed June 8, 2021, **http://mitigationguide.org/wp-content/uploads/2013/05/Worksheet-4.3.pdf**.

[165] "Quality of Life and Community," DRAFT Carson City Strategic Plan, 2021-2025, accessed June 8, 2021, **https://www.carson.org/home/showpublisheddocument/74597/637495825745230000**.

NFIP Topic	Access/ Eligibility (Yes/No)	Comments from Floodplain Manager, Carson City, June, 2021
Is floodplain management an auxiliary function?	Yes	Floodplain management is only one of the duties assigned to the Storm Water Program manager.
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)		The City provides all listed activities in the description in column 1; furthermore, **70% of the SFHA in the City is open space.**
What are the barriers to running an effective NFIP program in the community, if any?		Carson City has an effective NFIP program. The City is a class 6 in the CRS program.
Compliance History		
Is the community in good standing with the NFIP?	Yes	
Are there any outstanding compliance issues (i.e., current violations)?	No	
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	N/A	Last CAV was 2018
Is a CAV or CAC scheduled or needed?	No	

8 Mitigation Strategy

This Section discusses the updated mitigation goals, actions, and strategy.

The process of developing and updating the mitigation strategy for a local jurisdiction is well explained in the FEMA Local Mitigation Planning Handbook. The excerpt below is a modified version of the narrative from the Handbook.[166]

FIGURE 8-1: MITIGATION STRATEGY COMPONENTS

The heart of the mitigation plan is the mitigation strategy. The strategy serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy describes how the City will accomplish the purpose of the HMP.

The mitigation strategy is made up of three required components (listed below) that provide the framework to identify, prioritize, and implement actions to reduce risk to hazards.

- Mitigation goals
- Mitigation actions
- Implementation plan

Mitigation goals are general guidelines that explain what the community wants to achieve with the plan as illustrated in Figure 8.1. They are usually broad policy-type statements that are long- term, and they represent visions for reducing or avoiding losses from the identified hazards.

Mitigation actions are specific projects and activities that help achieve the goals.

Action plan is a description of how the mitigation actions will be implemented, including how those actions will be prioritized,

[166] *Local Mitigation Planning Handbook,* FEMA, March 2013, accessed June 29, 2021, **https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-planning-handbook_03-2013.pdf**.

administered, and incorporated into the community's existing planning mechanisms.

The 5-year plan update is an opportunity for each jurisdiction to assess its previous goals and actions, evaluate progress in implementing the action plan, and adjust its actions to address current realities. The mitigation strategy should also be revised following disasters to determine whether the recommended actions are still appropriate given the impacts of the event.

8.1 What Changed?

Changes to Section 8 consist of updates to the goals, strategy, and integration narrative. The updates were recommended, reviewed, and/or approved by the PT members throughout the planning process.

8.2 Mitigation Goals

The requirements for the local hazard mitigation goals, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? *44 CFR 201.6(c)(3)(i)* ***Intent**: To guide the development and implementation of hazard mitigation actions for the community(ies). Goals are statements of the community's visions for the future.*	a. The plan **must** include general hazard mitigation goals that represent what the jurisdiction(s) seeks to accomplish through mitigation plan implementation. ***Goals** are broad policy statements that explain what is to be achieved.* b. The goals **must** be consistent with the hazards identified in the plan.

The plan must include hazard mitigation goals that represent what the community seeks to achieve through mitigation plan implementation. Clear goals that are agreed upon by the planning team, elected officials, and the public provide the basis for prioritizing mitigation actions. The goals were reviewed individually during the second PT meeting.

The State of Nevada Enhanced Hazard Mitigation Plan includes five goals. Of these, numbers 3, 4, and 5 align with Carson City goals 3, 5, and 8 and address earthquake, flood, and wildfire, the City's highest ranked hazards.

In the discussion, the PT considered the removal or addition of other goals and mitigation actions. The group concluded the existing goals represent current conditions and priorities and would

support what needs to be accomplished to reduce the highest risks to the community. The goals remained consistent with a minor revision to the wording of Goal 2.[167]

The Planning Team reviewed the 11 previously developed goals which will reduce or avoid long-term vulnerabilities to the identified hazards. The only modification was a slight adjustment in language for Goal 1 to depict the "ongoing" nature of the goal. See Table 8-1 below for the updated goals. All hazards identified by the City align with a specific goal with the exception of avalanche and volcano. Avalanche and volcano have a low planning significance with no record of previous occurrence within the last century, as noted in Section 5 above.

TABLE 8-1: UPDATED MITIGATION GOALS

Goal #	Goal Description
1	*Promote increased and ongoing Carson City involvement in hazard mitigation planning and projects.*
2	*Build and support local capacity to enable the community to prepare for, respond to, and recover from disasters.*
3	*Reduce the possibility of damage and losses due to earthquakes.*
4	*Reduce the possibility of threat to life and losses due to infectious disease.*
5	*Reduce the possibility of damage and losses due to floods.*
6	*Reduce the possibility of damage and losses due to severe weather.*
7	*Reduce the possibility of damage and losses due to terrorist events.*
8	*Reduce the possibility of damage and losses due to wildland fires.*
9	*Reduce the possibility of damage and losses due to drought.*
10	*Reduce the possibility of damage and losses due to landslide.*
11	*Reduce the possibility of damage and losses due to hazardous materials.*

[167] A reference to the "public" was changed to "community" to clarify that all members of the community were included in this goal.

8.3 Mitigation Actions

A mitigation action is a specific action, 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 plan's mission and goals. The actions to reduce vulnerability to threats and hazards form the core of the plan and are a key outcome of the planning process.

In this Plan, mitigation actions to reduce long-term vulnerability are organized under the following categories.

- Education and Outreach
- Local Plans and Regulations
- Natural System Protection
- Preparedness and Response
- Structure and Infrastructure

Requirements under the Code of Federal Regulations for Hazard Mitigation Planning to identify and analyze actions to reduce the risk of natural hazards are presented in the table below.

ELEMENT	REQUIREMENTS
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 andexisting buildings and infrastructure? *44 CFR 201.6(c)(3)(ii) and 44 CFR 201.6(c)(3)(iv)* ***Intent**: To ensure the hazard mitigation actions are based on the identified hazard vulnerabilities, are within the capability of each jurisdiction, and reduce or avoid future losses. This is the heart of themitigation plan, and is essential to leading communities to reduce their risk. Communities, not FEMA, "own"the hazard mitigation actions in the strategy.*	a. The plan **must** include a mitigation strategy that 1) analyzes actions and/or projects that the jurisdiction considered to reducethe impacts of hazards identified in the risk assessment, and 2) identifies the actions and/or projects that the jurisdiction intendsto implement. ***Mitigation actions and projects** means a hazard mitigation action,activity or process (for example, adopting a building code) or it can be a physical project (for example, elevating structures or retrofitting critical infrastructure) designed to reduce or eliminate the long-term risks from hazards.* This sub-element can be met with either actions or projects, or a combination of actions and projects. The mitigation plan may include non-mitigation actions, such as actions that are emergency response or operational preparedness in nature. These will not be accepted as hazard mitigation actions,but neither will FEMA require these to be removed from the plan prior to approval. *A **comprehensive range** consists of different hazard mitigation alternatives that address the vulnerabilities to the hazards that the jurisdiction(s) determine are most important.* b. Each jurisdiction participating in the plan **must** have mitigationactions specific to that jurisdiction that are based on the community's risk and vulnerabilities, as well as community priorities. *c.* The action plan **must** reduce risk to existing buildings and infrastructure as well as limit any risk to new development and redevelopment. ***With emphasis on new and existing building andinfrastructure** means that the action plan includes a consideration of actions that address the built environment.*

The existing local authorities, policies, programs, and resources, as well as the abilityto expand on and improve these existing tools, which are detailed in Section 7, were reviewed and considered in the process of updating the mitigation strategy.

To determine the status of the 2016 Plan activities, the Deputy Emergency Manager leading the update of this plan and the consultant coordinated one-on-one meetings with the PT member or point of contact (POC) for the agency identified as responsible for implementing each specific activity. The meeting was used to gather information about each mitigation action to determine its status. The questions in the table below guided the discussion.

- Should the language identifying the action be revised?
- Should the action be included in the updated plan?
- Are new actions needed to accomplish the specific goal?

TABLE 8-2: QUESTIONS TO DETERMINE STATUS OF EXISTING MITIGATION ACTIONS

Implemented? Yes ☐ No ☐	NO Political Support? Yes ☐/No ☐ Enough Funding? Yes ☐/No ☐ Workload realistically or equitably distributed? Yes ☐/No ☐ New Information about the risk or community that made implementation difficult or no longer reasonable? Yes ☐/No ☐ Sufficient resources (staff, technical assistance, etc.) Yes ☐/No ☐	YES: Losses avoided? Results of implementation? Were the outcomes as expected? Explain	Photos of implemented project
Comments:			

The mitigation actions were updated based on the information gathered at these meeting. In most reviews, the authorized Carson City representative agreed the goals and mitigation action aligned with the current conditions and confirmed the strategy in the 2016 Plan is still valid. Small changes in terms were made. For example, “Continue to” was added to the start of some actions to show they were carried over into the 2021 HMP. These actions remain valid for existing and new buildings and infrastructure and have an ongoing timeline. Documentation for these meetings is available in Appendix A: Meeting Notes & Handouts.

The final table with the 2016 Mitigation Strategy and the status of each action is found in Appendix C: Previous Plan Actions.

The process of reviewing existing and developing new action items continued until the vulnerability assessment. Six new mitigation actions were identified after the review of the vulnerability assessment. The actions were reviewed and ranked at Meeting 3.5 by the PT.

Not all the identified actions may be included in the final action plan because of technical feasibility, political acceptance, lack of funding, and other constraints. The requirements for prioritizing, identifying the responsible party for implementation, funding sources, and expected timeline for implementing the strategy are shown in the table below.

ELEMENT	REQUIREMENTS
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? *44 CFR 201.6(c)(3)(iii) and 44 CFR (c)(3)(iv)* ***Intent**: To identify how the plan will directly lead to implementation of the hazard mitigation actions. As opportunities arise for actions or projects to be implemented, the responsible entity will be able to take action towards completion of the activities.*	a. The plan **must** describe the criteria used for prioritizing implementation of the actions. b. The plan **must** demonstrate when prioritizing hazard mitigation actions that the local jurisdictions considered the benefits that would result from the hazard mitigation actions versus the cost of those actions. The requirement is met as long as the economic considerations are summarized in the plan as part of the community's analysis. A complete benefic-cost analysis is not required. Qualitative benefits (*for example*, quality of life, natural and beneficial values, or other "benefits") can also be included in how actions will be prioritized. c. The plan **must** identify the position, office, department, or agency responsible for implementing and administering the action (for each jurisdiction), and identify potential funding sources and expected timeframes for completion.

The Planning Team evaluated and prioritized the existing and proposed mitigation actions. At PT Meeting 3, a review of the hazards in relation to their impact on population and structures was provided in preparation for the prioritization exercise. As a preview to the topics scheduled for the following day, the PT reviewed the prioritization criteria including the cost vs benefit analysis component. The discussion led to a revision of the criteria. Cost vs benefit analysis was ranked under a 1 to 3 rubric rather than a 1 to 9 rubric and select topics were combined into groups (e.g. Administrative and Legal)—as illustrated in the figure below, also available in Appendix A.

Use the criteria defined below to evaluate each mitigation action being considered. For each action, assess the potential benefits and/or likelihood of successful implementation and assign each criterion a value of 3, 2, or 1 where:

3 = Highly effective and/or feasible | 2 = Effective and/or feasible | 1 = Ineffective and/or not feasible	
Administrative & Legal	Does the community have the personnel and administrative capabilities to *implement and maintain* the project, or will outside help be necessary? Does Carson City have the authority to implement the action?
Environmental	Does the mitigation action benefit the environment? Does it support the protection of natural systems? Will it comply with environmental regulations?
Local Champion & Political	Is there a strong advocate for the action or project among local department and agencies that will support the action's implementation? Is there overall public support for the mitigation action? Is there the political will to support it?
Other Community Objectives	Does the action advance other community objectives, such as capital improvements, economic development, environmental quality, or open space preservation? Does it support the policies of the comprehensive (Master) plan?
Social	Will the action adversely affect one segment of the population? Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?
Technical	Is the mitigation action technically feasible? Is it a long-term solution? Eliminate actions that, from a technical standpoint, will not meet the goals.
3 = Highly feasible | 2 = Feasible | 1 = Major Challenges	
Financial Feasibility	Consider the cost of the life of the project, from design through construction and maintenance. Can the project be funded and maintained? To what extent would these costs burden the City? Can the action be implemented over time in stages? Are alternative funding sources available—for construction? Maintenance?
3 = High | 2 = Moderate | 1 = Limited	
Anticipated Benefits	Will the action protect lives and/or prevent injuries? Will the action protect structures and infrastructure? Will the action enhance *quality of life* and the natural and beneficial function of ecosystems (water sources, wetlands, etc.)?
3 = Benefit trumps cost | 2 = Neutral | 1 = Cost over benefit	
Cost vs. Benefit	Using the results of Financial Feasibility and Anticipated Benefits scoring above, assign a Cost vs. Benefit score to each task.

FIGURE 8-2: MITIGATION ACTIONS PRIORITIZATION CRITERIA

At PT Meeting 3.5, the members used the nine criteria in Figure 8-2 above to prioritize actions and/or projects considered to reduce the impacts of hazards identified in the risk assessment. While the ranking began collectively with individuals raising their hands to vote, the PT Lead suggested that each person complete the form individually. All agreed to this approach.

In addition, the proposed new mitigation actions were re-presented at this meeting based on gaps identified during the capability and vulnerability assessment processes. The review resulted in the elimination of two of the proposed actions. The ranking of these new mitigation actions was done collectively during this exercise.

Element C5 of the federal HMP requirements states that the PT must consider the benefits that would result from a mitigation action in relation to the cost. The Carson City PT met this requirement by comparing costs vs benefits for each mitigation action. The estimated costs to implement each mitigation activity were provided by the responsible department/division. The benefits were discussed during the prioritization exercise to gain input from subject matter experts and PT members. The last column in the prioritization sheet records the cost-benefit analysis. These forms can be found in Appendix A.

After the sum of the total values for each criterion were tallied, ROA staff sorted the totals from highest to lowest values. The scoring was converted from a numeric to a three-tiered description: High, Medium, and Low. The PT met virtually on June 29, 2021, to review the ranking and discuss any necessary changes based on the Master Plan priorities. No revisions were made, and the outcome is presented in the table below.

Note that the first column in Table 8-4 below includes abbreviations for the type of applicable mitigation actions. Table 8-3 provides the key to these abbreviations.

TABLE 8-3: MITIGATION ACTION TYPES

Mitigation Action Types	
E&O:	Education and Outreach
LPR:	Local Plans and Regulations
NSP:	Natural System Protection
P&R:	Preparedness and Response
S&I:	Structure and Infrastructure

TABLE 8-4: MITIGATION STRATEGY

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
Goal 1: Promote increased and ongoing Carson City involvement in hazard mitigation planning and projects.								
1.A - *e* LPR	ALL	Review and update the Master Plan to be consistent with the hazard area maps and implementation strategies developed in the HMP in 2022 and 2023. Review & update ordinances & code every three years.	Planning — 2 Years	Staff Time $5,000	Local Gen. Fund	Hope Sullivan	Continuing	Medium
1.B – *e* E&O	ALL	Identify & educate Carson City personnel on high hazard areas.	LEPC Planning Team / Emergency Mgmt. — Annually	Staff time $16,000	Local Gen. Fund, BRIC	Jason Danen & Rachael Schneider	Continuing	Medium
1.C – *e* P&R	ALL	Coordinate existing Geographic Information Systems (GIS) capabilities to identify hazards through the City.	Public Works -— Ongoing	Staff Time $5,000	Local Gen. Fund	Dan Stucky	Continuing	Medium

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
1.D – *e* P&R	ALL	Develop the data sets that are necessary to test hazard scenarios and mitigation tools, including HAZUS MH.	Emergency Management — Ongoing	Staff Time $29,000	UNR, HMGP	Stephanie Hicks	Continuing	Medium
1.E – *e* E&O + P&R	ALL	Continue to utilize the Internet as a communication tool, as well as an education tool.	City Public Relations Coordinator, Emergency Management Ongoing	Staff time for six weeks $24,000 yearly	Local Gen. Funds	Jason Danen and Rachael Schneider	Continuing	Medium
1.F – *e* LPR	Drought, Earthquake, Flood, Landslide, Severe Weather, & Wildfire	Continue to adopt and implement city building codes and ordinances that protect people and structures from drought, earthquake, flood, landslide, severe weather, and wildfire.	Building Dept. — Ongoing	Staff Time $5,000	Local Gen. Fund	Hope Sullivan	Ongoing	High
1.G – e LPR	Wildfire	Collaborate and support the continued update of the Community Wildfire Plan.	Fire Dept. — Ongoing	Staff time $20,000 yearly	National Fire monies, USFS, BLM, NDF	Jason Danen	Continuing	High

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
1.H – n LPR	Earthquake, Flood, Severe Weather, Wildfire	Design and construct a City-owned fuel facility, including emergency fuel storage to support critical infrastructure during an extended power outage.	Public Works — 36-48 months	$900,000	BRIC, Local Gen. Fund, CC PW	Dan Stucky	Not Started (Feasibility study completed 2020)	Low
1.I -n LPR	Severe Weather	Reduce the risk of power outages by collaborating with NV Energy to determine areas where disruption is most likely and the feasibility of underground power lines.	Emergency Management 18-24 months	Staff Time (2 people for 3 months) & Travel $129,500	BRIC, HMGP, Local Gen Fund, US Department of Energy Governor's Office of Energy	Dave Ruben	New / Not started	Low
1.J – n LPR	ALL	Incorporate the HMP Update process into the City's Strategic Plan.	City Manager and Emergency Manager	$0	NA	Jason Danen	New	High

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
Goal 2: Build and support local capacity to enable the community to prepare for, respond to, and recover from disasters.								
2.A – *e* P&R	Flood and Wildfire	Maintain and update emergency evacuation programs for neighborhoods in flood prone and wildland areas.	Public Works Flood Plain Manager, Fire Dept. — 18-24 months	Staff Time $5,000	EMPG, SERC, USEPA, NDEP, NCNR, Utility Service Charge	Robb Fellows	Continuing	High
2.B – *e* LPR	ALL	Annually review the City's Emergency Operations Plan and update and integrate w/local Hazard Mitigation Plan.	Emergency Management Fire Dept. — Ongoing	Staff time $18,000 yearly	HMGP, BRIC, SERC, EMPG, USEPA, NDEP, NDCNR, DHS, Local Gen. Fund	Jason Danen	Continuing	High
2.C – *e* P&R	ALL	Conduct a minimum of one disaster exercise per year.	Emergency Management Fire Dept. — Ongoing	Staff time $18,000 yearly	EMPG, SERC, USEPA, NDEP, NDCNR, Local Gen Fund	Jason Danen	Continuing	Low

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
2.D – *e* E&O	ALL	Establish a budget and identify funding sources for mitigation outreach.	Emergency Management — 18-24 months	Staff time $12,000 yearly	EMPG, BRIC, HMGP, NV Health & Human Services, CDC, USFS	Jason Danen & Rachael	Continuing	Medium
2.E – *e* E&O	ALL	Continue to work with school district to promote education on the Standard Response Plan, a public outreach campaign that teaches children, staff, and families how to avoid danger and behave during an emergency.	Emergency Management — 6-24 months	Materials available at no cost $25,000 Staff time yearly	EMPG, HMGP, NV Health & Human Services, CDC, USFS	Jason Danen, Ann Cyr, Rachael Schneider	Continuing	Medium
2.F – *e* E&O	ALL	Continue to prepare, develop, and distribute appropriate public information about hazard mitigation programs and projects at Carson City-sponsored events and on the Carson City and Fire Department websites.	Emergency Management — Ongoing	Staff time $6,000	EMPG, HMGP, NV Health & Human Services, CDC, USFS	Jason Danen and Rachael Schneider	Continuing	High
2.G – *n*	All	Plan and construct an Emergency Operations Center (EOC), including a fire station and backup emergency dispatch center	Emergency Management, Fire Dept., Sheriff Dept., Public Works	$12.5M	Local Gen Fund/Grants	Dan Stucky	Not Started (Starting design of	Medium

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
			— 36-48 months				facility in 2021)	
2.H – *n* P&R	All	After a hazard event, ask FEMA to conduct a losses-avoided analysis for specific projects as appropriate.	Emergency Management	$0	Local Gen Fund/Grants	Emergency Manager	New	High
2.I – *n* P&R	All	Train GIS staff in the FEMA HAZUS Software (Travel)	Assessor's Office & IT Division	$400	Local Gen Fund/Grants	Chief Information Officer	New	High
2.J – *n* P&R	All	Initiate development of a Recovery Plan	City Manager & Public Works	Staff Time $50,000	Local Gen Fund/Grants	City Manager	New	High
Goal 3: Reduce the possibility of damage and losses due to earthquakes.								
3.A – *e* LPR	Earthquake	Continue to develop, adopt, and enforce policies and regulations pertaining to grading and related construction relative to seismic hazards.	Planning & BuildingDept. — Ongoing	Staff Time $5000	Local Gen. Fund	Dan Stucky & Hope Sullivan	Continuing	Medium

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
3.B – *n* S&I	Earthquake	Evaluate unreinforced masonry structure inventory; using benefit-cost analysis, identify priorities for retrofitting buildings; and complete the necessary upgrades.	Building Maintenance, Building Dept. — 24-48 months	Staff Time Tasks 1 & 2 Only $178,000	Local Gen. Fund, HMGP, BRIC		New	Low
3.C – *e* P&R	Earthquake, Wildfire, Flood, Severe Weather, Landslides	Maintain a structure database using GIS.	Public Works — Ongoing	Staff Time $5,000	Local Gen. Fund, BRIC	Dan Stucky	Continuing	Medium
3.D – *e* S&I	Fire	Acquire and install clean-agent systems for the City Hall and Public Safety computer rooms to reduce damage to computer equipment due to fire.	Building Maintenance 2 months	One time cost $50,000	Local Gen. Fund	Stephanie Hicks	Not Started	Low
Goal 4: Reduce the possibility of threat to life and losses due to Infectious Disease.								

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
4.A – *e* LPR	Infectious Disease	Update Mass Illness Plan and integrate with local Hazard Mitigation Plan.	Health Dept. — 12-15 months	One time cost $35,000	State of Nevada, Div. of Public and Behavioral Health; Public Health Preparedness	Nicki Aaker	Continuing, but needs updating	Medium
4.B – *e* P&R	Infectious Disease	Continuation of training and exercise program relative to infectious disease.	Health Dept. — Ongoing	Yearly $42,000	State of Nevada, Div. of Public and Behavioral Health; Public Health Preparedness	Nicki Aaker	Continuing	Medium
4.C – *e* P&R	Infectious Disease	Prepare by acquiring and storing needed medical PPE to help support medical response due to infectious disease and managing the rotation of stock.	Health Dept. — Ongoing	Yearly $25,000	State of Nevada, Div. of Public and Behavioral Health; Public Health Preparedness	Nicki Aaker	Continuing	Low

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
4.D – *e* E&O & P&R	Infectious Disease	Maintain a public program for information and education.	Health Dept. — Ongoing	Yearly $12,000	State of Nevada, Div. of Public and Behavioral Health; Public Health Preparedness	Nicki Aaker	Continuing	Medium
4.E – *n* E&O P&R	Infectious Disease	Reduce disparities and inequities in the distribution of infectious disease information during and prior to outbreaks.	CC H&HS — 12-24 months for implementation then, ongoing	$50,000 for implementation Yearly Personnel & Operating Budget $116,000	State of Nevada, Div. of Public and Behavioral Health; Public Health Preparedness	Nicki Aaker	New Once implemented, continuing	Low
4.F – *n* LPR P&R	Infectious Disease	Establish a plan that addresses the development, protection, retention, and resilience of the public health workforce and identifies options for expanding the workforce quickly for a health-related emergency that extends beyond 30 days.	CC H&HS — 18-24 months	Consultant Estimate $65,000	State of Nevada, Div. of Public and Behavioral Health; Public Health Preparedness	Nicki Aaker	New	Low

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
Goal 5: Reduce the possibility of damage and losses due to floods.								
5.A – *e revised* LPR	Severe Weather, Flood	Provide a consolidated storm water system Master Plan including development of project proposals to improve storm water facilities.	Public Works — 24-36 months	$75,000	BRIC, HMGP, FMA, RFC, USDA, NDEP, USEPA, NDCNR, 319(h) grants (Clean Water Act), USGS, CC PW	Robb Fellows	Continuing	Low
5.B – *e* LPR	Severe Weather, Flood	Continue to update policies that discourage growth in flood-prone areas.	Public Works — Ongoing	Staff Time $5,000	Local Gen Fund	Robb Fellows	Continuing	Medium
5.C – *e* LPR	Severe Weather, Flood	Continue to review and update flood plans for coordination w/adjacent counties, cities, and special districts supporting a regional approach to flood mitigation.	Public Works — Ongoing	Staff Time $5,000	BRIC, HMGP, FMA, RFC, USDA, NDEP, USEPA, NDRCS, Local, CC PW	Robb Fellows	Continuing	High

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
5.D – *e* LPR	Severe Weather, Flood	Update and expand Sandbagging Plan.	Public Works — 24 months	Staff Time $5,000	Local Gen. Fund, EMGP	Robb Fellows	Continuing	Medium
5.E – *e* S&I	Severe Weather, Flood	Continue to install new flood facilities through the City's CIP program to improve the overall effectiveness of the storm drain system.	Public Works — Ongoing	$950,000	BRIC, HMGP, FMA, RFC, USDA, NDEP, USEPA, NRCS, Local, CC PW	Robb Fellows	Continuing	High
5.F – *e* NSP	Flood, Landslide	Upon completion of land transfers associated with the Lands Bill which includes land trading with Carson City, BLM, US Forestry, and Washoe Tribe; identify/implement projects within transferred lands and other areas within Carson City that need slope stabilization for flood and landslide mitigation.	Public Works — 36-48 months	Staff Time $5,000	BRIC, HMGP, USFS, BLM, Local Gen. Fund	Robb Fellows	Continuing	Medium
5.G – *e* NSP	Flood, Landslide	Design and install facilities to capture debris and sediment within Eagle Valley.	Public Works — Ongoing	$120,000	BRIC, HMGP, FMA, RFC, USDA, NDEP, USEPA, NRCS, Local, CC PW	Robb Fellows	Continuing	Medium

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
5.H – *e* S&I + NSP	Flood	Develop a Flood Management Plan for the New Empire Area and install a new flood control facility for the area.	Public Works — 24-48 months	$5.8M	BRIC, HMGP, FMA, RFC, USDA, NDEP, USEPA, NRCS, Local, CC PW	Robb Fellows	Continuing	Low
5.I – *e* NSP + S&I	ALL	Protect and enhance existing municipal water conveyance structures, storage and treatment facilities.	Public Works — 24-36 months	$50,000	BRIC, HMGP, FMA, RFC, USDA, NDEP, USEPA, NRCS, FEMA, 319(h) grants (Clean Water Act), CC PW	Robb Fellows	Continuing	Medium
5.J – *e* S&I + NSP	Severe Weather, Flood	Install a storm water retention / detention facility in Goni Canyon Watershed and storm drain system at Goni Creek.	Public Works — 24-36 months	$8.6M	BRIC, HMGP, FMA, RFC, USDA, NDEP, USEPA, NRCS, FEMA, 319(h) grants (Clean Water Act), CC PW	Robb Fellows	Continuing (Grant for a portion of project is in progress)	Medium

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
5.K – *e* NSP + LPR	Flood, Severe Weather	Continue land acquisition of buildings with recurring loss or of land which could be used as retention and detention basins for flood control projects.	Public Works — Ongoing	$1M	BRIC, HMGP, FMA, RFC, USDA, NDEP, USEPA, NRCS, FEMA, 319(h) grants (Clean Water Act), USGS, CC PW	Robb Fellows	Continuing	Medium
5.L – *n*	LPR	Install a storm water retention / detention facility in Ash and Kings Canyon Watersheds	Public Works — 48 months	$2M	BRIC, HMGP, FMA, RFC, USDA, NDEP, USEPA, NRCS, FEMA, 319(h) grants (Clean Water Act), CC PW	Robb Fellows	Not Started (Area Drainage Plan is underway for these watersheds)	Medium
Goal 6: Reduce the possibility of damage and losses due to Severe Weather.								
6.A – *e* S&I	Severe Weather	In areas at risk to severe weather, retrofit public buildings to withstand snow loads and severe winds to prevent roof collapse/damage.	Public Works — Ongoing	$1M	BRIC, HMGP, Local Gen. Fund	Dan Stucky	Continuing	Low

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
6.B – *e* LPR	Severe Weather	Continue the Storm Water Management Plan for snow melt and debris storage.	Public Works — 36-48 months	Training & Staff Time $10,000	BRIC, HMGP, FMA, RFC, USDA, NDEP, USEPA, NRCS, FEMA, 319(h) grants (Clean Water Act), USGS, CC PW	Dan Stucky	Continuing	Medium
Goal 7: Reduce the possibility of damage and losses due to terrorist events.								
7.A – *e* LPR	Acts of Violence	Develop mitigation standards for public and high-risk buildings and associated grounds.	Planning, Building Dept. — 6-12 months	Staff Time $148,000	Local Gen. Fund	Jerome Tushbant	Continuing	Medium
7.B – *e* LPR	Acts of Violence	Continue following planning procedures to mitigate acts of violence.	Emergency Management / Sheriff Dept. — Ongoing	$500 Staff Time	EMPG, Local Gen Fund	Jerome Tushbant	Continuing	High
7.C – *e* S&I	Acts of Violence	Retrofit public and high-risk buildings to increase safety and reduce risk associated with acts of violence.	Public Works, Building Maintenance — Ongoing	$500k	EMPG, Local Gen Fund	Dan Stucky	Continuing	Medium

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
Goal 8: Reduce the possibility of damage and losses due to wildland fires.								
8.A – *e* LPR	Wildfire	Continue to adopt and enforce new versions of the Wildland Urban-Interface code and International Fire Code.	CC Fire Dept. — Ongoing	Staff time, outreach meetings, books $8,000 (Due 2024) every six years	Local Gen Fund	Dave Ruben	Continuing	High
8.B – *e* NSP	Wildfire	Continue to conduct current fuel management programs and investigate and apply new and emerging fuel management techniques.	NV Div. of Forestry, CC Fire Dept. — Ongoing	$325,000	HMGP, NDF, BLM, National Fire Monies, Stimulus funds, USFS, Local General Fund	Dave Ruben	Continuing	High
8.C – *e* E&O	Wildfire	Continue public outreach campaign on extreme wildland fire dangers and steps that can be taken to reduce these dangers.	CC Fire Dept. — Ongoing	$2500	HMGP, General Fund, National Fire Monies	Dave Ruben & Rachael Schneider	Continuing	High

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
8.D – *e* NSP + E&O	Wildfire	Expand the community-based vegetation management program.	CC Fire Dept. — Ongoing	$5000	HMGP, Local General Fund, National Fire Monies	Dave Ruben	Continuing	Medium
8.E – *e* E&O	Wildfire	Continue to utilize GIS and the internet as information tools.	CC Fire Dept. — Ongoing	$2500	HMGP, Local General Fund, National Fire Monies	Dave Ruben	Continuing	Medium
8.F – *e* P&R	Wildfire	Maintain the continuing wildland fire technical working group.	CC Fire Dept. — Ongoing	$1000	HMGP, Local General Fund, National Fire Monies	Dave Ruben	Continuing	Medium
8.G – *e* NSP + S&I	Flood, Wildfire	Continue to protect municipal water recharge zones from wildfires and flooding.	CC Fire Dept. — Ongoing	$25,000	HMGP, BRIC, Local General Fund, National Fire Monies	Dave Ruben, Robb Fellows	Continuing	High
Goal 9: Reduce the possibility of damage and losses due to drought.								

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
9.A – *e* NSP + S&I	Drought	Maintain water supply stabilization and recharge programs to maximize the use of surface sources when available and preserve the groundwater sources for system peaking needs and times of drought	Public Works — Ongoing	$2M	NDEP, USEPA, NRCS, FEMA, 319(h) grants (Clean Water Act), USGS, CC PW	Dan Stucky	Continuing	Medium
9.B – *e* E&O + LPR	Drought	Continue to encourage public participation in drought strategies through public information programs on water conservation and drought resistant landscaping and through building code ordinances.	Public Works — Ongoing	Staff Time $5,000	NDEP, USEPA, NRCS, FEMA, 319(h), grants (Clean Water Act), USGS, CC PW	Dan Stucky, Rachael Schneider	Continuing	High
9.C – *n*	Drought	Rehabilitate and upgrade the Quill Water Treatment Plant to maximize the use of available surface water resources and increase water supply.	Public Works — 36-48 months	$15M	NDEP, USEPA, NRCS, FEMA, 319(h) grants (Clean Water Act), USGS, CC PW	Dan Stucky	Not Started (Project design underway)	High
Goal 10: Reduce the possibility of damage and losses due to landslide.								

Goal #. Action Letter Existing = *e* or New = *n*	Hazard Description	Action Description	Lead Dept. or Division -- Timeline	Estimated Cost ($)	Potential Funding Source	Primary Reviewer for the City	Status Not Started, Continuing, Completed, No longer relevant	2021 Priority
10.A – *e* NSP	Landslide	Evaluate natural slopes to determine whether there are slope stabilization treatments that would be appropriate to prevent landslides.	Public Works — 36-48 months	$50k	BRIC, HMGP, BLM, USFS, Local Gen Fund	Dan Stucky, Robb Fellows	Not started	Low
10.B – *e* S&I	Landslide	Conduct slope stabilization projects to prevent landslides.	Public Works — 36-48 months	$500k	BRIC, HMGP, BLM, USFS, Local Gen Fund	Dan Stucky, Robb Fellows	Not started	Low
Goal 11: Reduce the possibility of damage and losses due to hazardous materials.								
11.A – *e* LPR	Hazardous Materials	Consider and as appropriate, adopt building codes and zoning ordinances to reduce public health risks from hazardous materials releases.	Planning, Buildin Dept. — 24 to 48 months	Staff Time $75,000	Local Gen. Fund	Building Department	Not started	Medium

8.4 Integration of Mitigation Plan into Local Planning Mechanisms

Mitigation plans must describe the community's process to integrate the data, analysis, and mitigation goals and actions into other planning mechanisms. This requirement is explained in the table below.

ELEMENT	REQUIREMENTS
C6. Does the Plan describe a process by which local governmentswill integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? *44 CFR 201.6(c)(4)(ii)* ***Intent**: To assist communities in capitalizing on all available mechanisms that they have at their disposal to accomplish hazard mitigation and reduce risk.*	a. The plan **must** describe the community's process to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms. b. The plan **must** identify the local planning mechanisms where hazard mitigation information and/or actions may be incorporated. ***Planning mechanisms** means governance structures that are usedto manage local land use development and community decision- making, such as comprehensive plans, capital improvement plans,or other long-range plans.* c. A multi-jurisdictional plan **must** describe each participating jurisdiction's individual process for integrating hazard mitigation actions applicable to their community into other planning mechanisms. d. The updated plan **must** explain how the jurisdiction(s) incorporated the mitigation plan, when appropriate, into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts. e. The updated plan **must** continue to describe how the mitigation strategy, including the goals and hazard mitigation actions will be incorporated into other planning mechanisms.

The City's HMP identifies existing planning mechanisms where hazard mitigation information and actions may be incorporated in Section 7: Capability Assessment. This Section includes data about existing plans and strategies that promote risk reduction and community safety through their objectives and policies, specifically in Section 7.2.4, Planning and Regulatory Capabilities. This Section reviews how existing planning and regulatory capabilities engage with the hazard mitigation process via the following strategies.

- Address specific hazards.
- Include projects to incorporate in the mitigation strategy.
- Evaluate whether the plan is able to implement mitigation actions.

The City can use the risk assessment results from this Plan—as well as its existing capabilities such as staff and technical expertise—to continue to integrate mitigation principles into policies

and decision-making processes such as the City's Strategic Plan. Several mitigation actions are already integrated into existing plans and policies with current support from the community and government leaders.

1. Open space preservation (Overseen by Open Space Division; Outlined in Chapter 13.06 of Carson City Municipal Code on purchasing and preserving open space)
2. NFIP participation with CRS rating (Carson City Community ID: #320001)[168]
3. Enforcement of building codes[169]
4. Master Plan integrates with other plans, policies, regulations.
    a. Arts & Culture Master Plan
    b. Parks & Recreation Master Plan
    c. United Pathways Master Plan
    d. Wastewater Collection Master Plan
    e. Water Master Plan
    f. Stormwater Master Plan
    g. Carson Area Transportation Plan
    h. Airport Master Plan
    i. Open Space Plan
    j. Carson River Master Plan
    k. Carson City Historical/Archeological Properties Preservation Plan
    l. Tahoe Regional Planning Agency
    m. NV Energy Electric Master Plan

Additional integration is clear in the adoption and enforcement of building codes in pre-disaster planning and post-disaster recovery activities. Recovery activities implemented after the 2017 Severe Winter Storm declaration include the enforcement of current IBC 2018 standards.

The examples below demonstrate how the City and the Planning Team successfully used and integrated risk assessment information, vulnerability details, and mitigation actions into other local planning mechanisms since the 2016 update.

- Carson City Municipal Code (2020) Title 14 - Fire Code: Incorporates mitigation actions.
- Carson City Municipal Code (2020) Title 15 – Building Code: Incorporates mitigation actions.
- Carson City Municipal Code (2020) Title 17 – Division of Land, Subdivision of Land: Incorporates mitigation actions.
- Carson City Municipal Code (2020) Title 18 – Zoning, Development Standards: Incorporates mitigation actions.

[168] Additional information on Carson City's status with the National Flood Insurance Program is available in Section 7.3.

[169] Code enforcement standards are outlined in **https://library.municode.com/nv/carson_city/codes/code_of_ordinances**.

- State of Nevada Enhanced Hazard Mitigation Plan (2018): This plan, prepared by NDEM, utilizes the City's HMP for hazard profile and historical data to include in the State's Plan.
- Development Standards. The development standards document is a comprehensive resource for the design-oriented standards required by the city for the safeguarding and maintenance of community character, safety, and environment.

The Planning Team, in collaboration with City Management, will continue to ensure that the HMP, in particular the Mitigation Action Plan, continues to be incorporated into existing planning mechanisms such as the Carson City Master Plan's Land Use Element and the Carson City Emergency Operations Plan, where mitigation actions are part of these City documents and refer readers to the HMP updates. Note that meetings between the City Manager's Office and staff are also an objective (under Priority 2) in the City's Strategic Plan for 2021-2025.[170] This objective provides an opportunity to expand hazard awareness and integrate mitigation actions throughout the City's daily operations through collaboration among the City's management, staff, and residents.

8.4.1 Other Planning Mechanisms Incorporated into the HMP

Under Gov. Sisolak's executive order on climate change, state agencies were directed to develop Nevada's first-ever State Climate Strategy establishing a framework to advance Nevada-wide climate action for a healthy, sustainable, resilient future.[171]

The overarching goals of the 2020 Climate Strategy are listed below.[172]

1. Provide a framework for reducing Nevada's greenhouse gas (GHG) emissions across all economic sectors.

2. Lay the groundwork for climate adaptation and resilience.

3. Establish a structure for continued, ongoing climate action across the state.

Goal 3 of the State of Nevada Climate Strategy is to "Establish a structure for continued, ongoing climate action across the state." The Carson City HMP aligns with this goal in its mitigation actions addressing drought, severe weather, flood, and wildfire, and potentially landslides.

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[170] "Organizational Culture," Carson City 2021 – 2025 Strategic Plan, p. 11, accessed June 30, 2021, **https://www.carson.org/home/showpublisheddocument/74597/637495825745230000**.

[171] "Climate Action," State of Nevada Climate Initiative, accessed June 30, 2021, **https://climateaction.nv.gov/wp-content/uploads/2021/01/NVClimateStrategy_011921.pdf**.

[172] Mike Osborn, "Nevada Climate Initiative Release State Climate Strategy," December 1, 2020, accessed June 30, 2021, **https://climateaction.nv.gov/news/nevada-climate-initiative-releases-state-climate-strategy/**.

Carson City's government includes adaptation and resiliency in its overall policies. The City's support for activities promoting sustainability is evident in its commitment to sustainability as promoted online[173] and addressed in the City's 2021-2025 Strategic Plan.[174]

8.5 Changes in Development

DMA2000 requires plan updates to describe changes in development in hazard prone areas as shown in the table below.

ELEMENT	REQUIREMENTS
D1. Was the plan revised to reflectchanges in development? ***44 CFR 201.6(d)(3)*** ***Intent****: To ensure that the mitigation strategy continues to address the risk and vulnerabilities to existing and potential development and takes into consideration possible future conditions that can impact the vulnerability of the community.*	a. The plan **must** describe changes in development that have occurred in hazard prone areas and increased or decreased the vulnerability of each jurisdiction since the last plan was approved.If no changes in development impacted the jurisdiction's overall vulnerability, plan updates may validate the information in the previously approved plan. ***Changes in development*** means recent development (*for example*, construction completed since the last plan was approved), potential development (*for example*, development planned or under consideration by the jurisdiction), or conditions that may affect the risks and vulnerabilities of the jurisdictions (*forexample*, climate variability, declining populations or projected increases in population, or foreclosures). Not all development will affect a jurisdiction's vulnerability.

The information below comes from the City's website. It describes changes in development that took place in the City since the approval of the 2016 plan and describes mitigation efforts the City has taken to decrease vulnerability in hazard prone areas.[175]

The Planning Division, in coordination with the Growth Management Program, enforces codes and regulations supporting the resiliency of the City. The Planning Division coordinates land development, current and long-range planning and zoning matters, environmental and historic preservation, and special project-related programs within Carson City. Its goal is to achieve a dynamic community balance between competing interests. The Planning Division's primary role is to provide unified coordination of the City's land development activities.

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[173] "What Carson City is doing," Sustainability, Public Works, Carson City, Nevada Website, accessed June 30, 2021, **https://www.carson.org/government/departments-g-z/public-works/sustainability**.

[174] "Sustainable Infrastructure," (Draft) 2021 – 2025 Carson City Strategic Plan, accessed June 30, 2021, **https://www.carson.org/home/showpublisheddocument/74597/637495825745230000**.

[175] "Growth Management," Residential Development, Current Planning & Zoning, Carson City Community Development, accessed June 30, 2021, **https://www.carson.org/government/departments-a-f/community-development/planning-division/current-planning-zoning/growth-management**.

Carson City's Planning Division manages the Growth Management Program which enforces the Growth Management ordinance for the City. The purpose of the Growth Management ordinance is to ensure that adequate water and wastewater facilities exist for a project and to ensure that the project will not negatively impact the City's ability to provide water and wastewater services.

Figure 8-3 below provides a history of the number of available residential permits and the number issued (through May 2020).

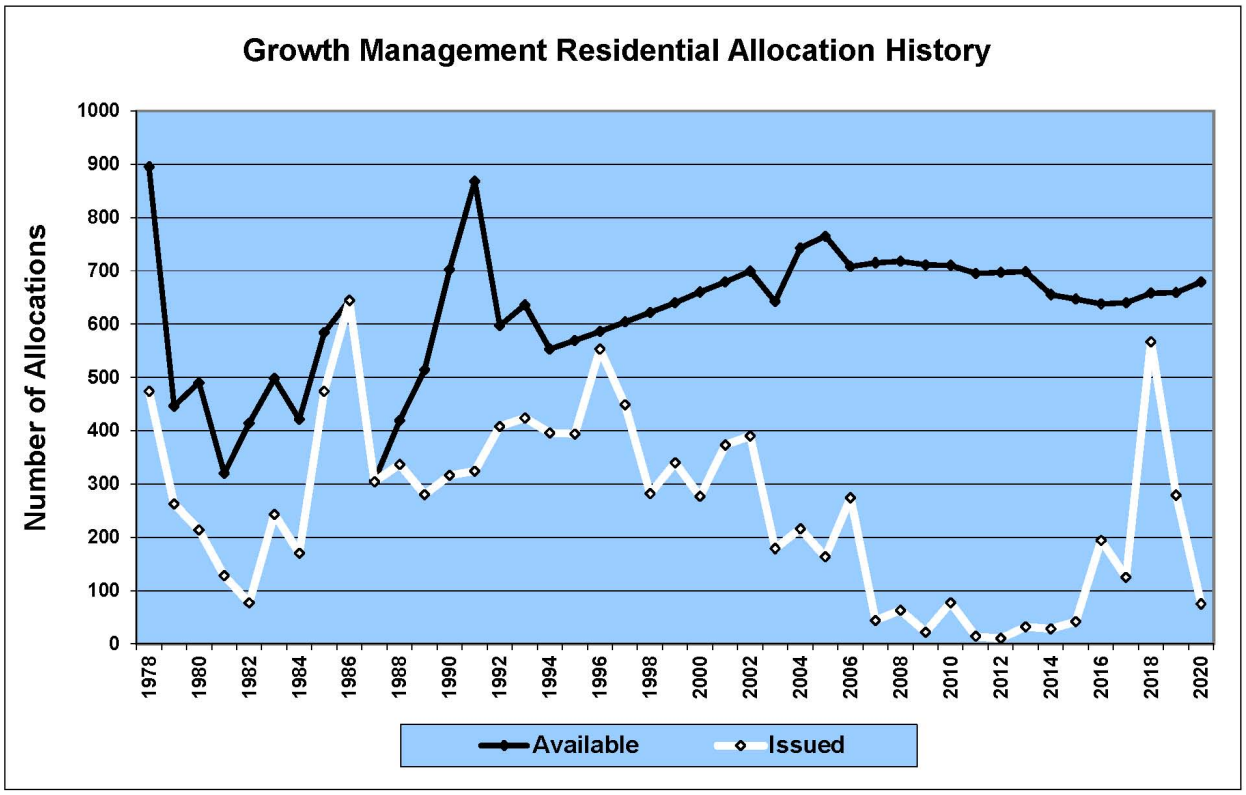

FIGURE 8-3: RESIDENTIAL GROWTH HISTORY

The following report from June 4, 2019, was published originally published on the CarsonNow website.[176]

> — *A tentative planned unit development to create 137 single family lots and 312 multi-family units on 41.6 acres, which will be known as Lompa Ranch East. The new development will be located in the area of Airport Road, and has been approved pending a final map.*

[176] Kelsey Penrose, "Approximately 1,500 housing units could be coming soon to Carson City," CarsonNOW.org, accessed June 30, 2021, https://carsonnow.org/story/06/04/2019/approximately-1500-housing-units-could-be-coming-soon-carson-city.

— An amendment to the zoning map and master plan is under zoning review, to re-designate an area of 206 acres from Conservation Reserve to Single Family One Acre Planned Unit Development, on two public open space parcels. The area is located on Ash Canyon Road.

— A tentative subdivision map to create a 103-lot single family residential subdivision within the Lompa Ranch Specific Plan Area, and within the Blackstone Rain Specific Plan area, zoned single family 6,000, is currently under zoning review, located at Railroad Drive and Saliman Road.

— A development, known as Vintage at Kings Canyon, is approved pending a final map. It will consist of 212 single-family residential units and 96 units of congregate care facilities on a total of 78 acres. Located at Mountain Street and Ormsby Boulevard.

— A rezoning request is under review for Dean Court, to re-designate the area of Low Density Residential, to Medium density residential. This would also change the zoning map amendment to change the zoning from single-family, one-acre, to single family 12,000.

Building Permit Issued

— A 62-unit apartment complex has had a permit issued to begin building, located at 680 Hot Springs Road.

Under Construction

— The Gordon Park Apartments, a 12-unit building, is currently under construction. The new complex will be located at 1660 N. Edmonds Drive.

— An 8-unit apartment building is under construction on Nichols Lane and U.S. 50. The new complex will be located at 1770 Nichols Lane.

— A 147 single-family attached townhouse subdivision development is currently under construction. "Arbor Villas" is located on Little Lane near S. Roop Street.

— A 370-unit apartment complex is currently under construction in the area of 400 West Clearview Drive and 3700 South Curry Street.

— A 41-single family development with detached residential units is under construction, located at 250 Eagle Station Lane near Kohl's and JC Penney's. The development will be called Jackson Village

Figure 8-4 below illustrates the approximate location of the planned development described above.

Figure 8-4 below, Future Development in Progress, shows the approximate location of the residential projects described. The legend identifies their development status.[177]

[177] Carson City Development Status Map, Carson City Community Development, accessed June 20, 2021, **https://carsoncity.maps.arcgis.com/apps/webappviewer/index.html?id=4f4be204eecf4abab748f120aed55da6**.

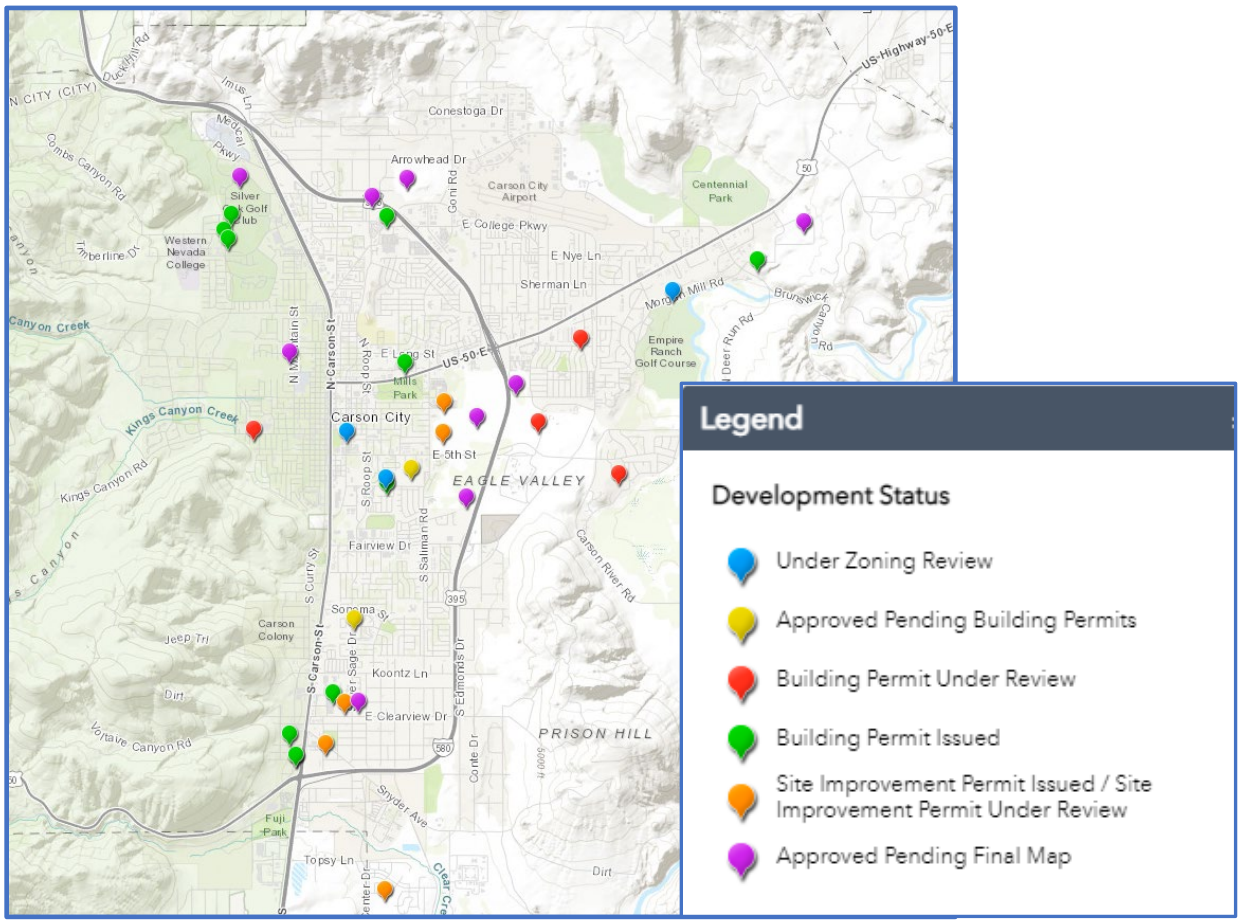

FIGURE 8-4: FUTURE DEVELOPMENT IN PROGRESS

A total of 679 residential permits were allocated for 2020. A residential unit includes a single-family house, a manufactured or mobile home, or a single dwelling unit within a multi-family residence (e.g. townhome or apartment). Connecting an existing residential unit on a private well to the community water system also requires a Growth Management allocation.

The Growth Management Program also has authority to review commercial and industrial development.

New development brings increases to population and the built environment resulting in increased vulnerabilities to the identified hazards. Carson City has the plans, codes, and regulations in place to support this growth as well as an understanding of the vulnerabilities resulting from such growth. Development has been carefully planned and managed to take into account the services necessary to support resilient growth.

The comparison flood maps in Section 6.3.4 corroborate Carson City's implementation of the previous plan's mitigation actions and resulting reduction of flood risk areas. The reduction in risk is a combination of the enforcement of above-mentioned plans, codes, and regulations.

8.6 Progress in Mitigation Efforts and Changes in Priorities

The table below outlines the requirement that plan updates address the progress made in implementing mitigation actions as well as any changes in priorities for the community.

ELEMENT	REQUIREMENTS
D2. Was the plan revised to reflect progress in local mitigation efforts?*44 CFR 201.6(d)(3)* ***Intent**: To evaluate and demonstrate progress made in thepast five years in achieving goals and implementing actions outlinedin their mitigation strategy.*	a. The plan **must** describe the status of hazard mitigation actions in the previous plan by identifying those that have been completed or not completed. For actions that have not been completed, the plan **must** either describe whether the action is no longer relevantor be included as part of the updated action plan.
D3. Was the plan revised to reflectchanges in priorities? *44 CFR 201.6(d)(3)* ***Intent**: To ensure the plan reflects current conditions, including financial, legal, and political realitiesas well as post-disaster conditions.*	a. The plan **must** describe if and how any priorities changed since theplan was previously approved. If no changes in priorities are necessary, plan updates mayvalidate the information in the previously approved plan.

A description of the status of the previous hazard mitigation actions is found in Appendix C. The table within the Appendix identifies the status of each action, the individual action's relevance and current status of that relevance.

Section 8.2 above details the Planning Team's review of the priorities and validates the information in the previous plan. No significant changes were made to the existing goals. While a few new mitigation actions were added, most existing mitigation activities have an "ongoing" status showing these are still effective and relative. A few mitigation actions were retired, and others were updated with minimal edits. The 2021 mitigation actions are available above in Section. 8.3, Mitigation Actions.

Examples of the City's progress in mitigating the hazards identified are included throughout the plan. Several examples of this progress include the following actions.

- Working to reduce hazardous fuels in areas at risk of wildfire.
- Reducing the risk of flood.
- Adopting and enforcing the latest version of building codes.
- Integrating planning efforts related to mitigation.
- Continuing CRS participation.

9 References

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Subject Matter Expert Presentations

The presentations listed below are available in Appendix A.

Acts of Violence. Jerome Tushbant, Undersheriff. May 7, 2021.

Earthquakes. Craig dePolo, Geologist, UN Bureau of Mines and Geology. May 7, 2021.

Flooding in Carson City. Robert D. Fellows, PE, Senior Project Manager, Stormwater. Carson City Public Works. May 7, 2021.

Infectious Disease. Nicki Aaker, MPH, Director of Health and Human Services. May 7, 2021.

Overview of Residential Development. Hope Sullivan, AICP, Community Development Director. May 7, 2021.

Severe Weather. Chris Smallcomb, Warning Coordination Meteorologist. May 7, 2021.

Wildland Fire. Rodd Rummel, Wildland Fuels Officer. May 7, 2021.

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