









THE STATE OF NEVADA
ENHANCED MITIGATION PLAN 2023

Governor
Joe Lombardo

Lt. Governor
Stavros Anthony

EXECUTIVE SUMMARY

This State Enhanced Hazard Mitigation Plan is the official statement of Nevada's statewide hazard mitigation goals, strategies, and priorities. Hazard mitigation can be defined as any action taken to reduce or eliminate long-term risk to life and property from natural and human-caused disasters.

The standard version of the State Hazard Mitigation Plan was originally submitted by the Nevada Division of Emergency Management and approved by FEMA in 2004; it was updated in 2007, updated and enhanced in the 2010 iteration. Since 2010, the Nevada Hazard Mitigation Planning Committee (NHMPC), Nevada Hazard Planning Subcommittee ("Subcomittee"), Nevada Division of Emergency Management staff, and Nevada Bureau of Mines and Geology staff at the University of Nevada Reno contributed to the 2013 update and the last 2018 update of the Enhanced State Hazard Mitigation Plan. Wise Oak Consulting, L.L.C. has worked with the Nevada Hazard Mitigation Working Group (NHMWG) and NV Division of Emergency Management (NV DEM) staff to update the current 2023 update of the Enhanced State Hazard Mitigation Plan. Of note, the NHMWG replaced the former NHMPC and Nevada Hazard Planning Subcommittee.

The Nevada Division of Emergency Management created the Nevada Hazard Mitigation Planning Committee in 2003 to support the development and implementation of the first State Hazard Mitigation Plan. Initially, members were tasked with directing the planning process and the review and approval of the resulting draft document. Since its formation, the NHMPC expanded and promoted the development of hazard plans and public awareness of mitigation activities in Nevada's communities throughout the state. Other responsibilities include the review and prioritization of mitigation activities presented by state and local agencies to the Nevada Division of Emergency Management and the Division of Water Resources for funding under the Unified Hazard Mitigation Assistance programs, promoting land use regulations and providing technical assistance and data for the development of the state and local planning efforts. The Committee was replaced in June 2020 by the Nevada Hazard Mitigation Working Group (NHMWG) which meets quarterly, with special meetings scheduled as necessary. Prior to November 2009, meetings were held alternately in the City of Reno (north) and the City of Las Vegas (south). However, since the beginning of the 2010 calendar year, the NHMPC members agreed to hold meetings around the state in an effort to provide current information about hazards, mitigation efforts, and funding opportunities to the communities hosting the meetings and to learn about the concerns of those communities regarding hazards, capabilities, and resiliency. With the formation of the new NHMWG, as well as the recent pandemic, meetings have been held virtually and will remain in the virtual format in order to allow statewide participation in every meeting.

The Nevada Hazard Planning Subcommittee was created to allow greater flexibility for stakeholder participation in the planning process. Representatives from state, local, and tribal agencies were invited to participate in the process via email from the Nevada Division of Emergency Management on behalf of the NHMPC. Invitations were sent in January of 2011 as the 2013 update of the plan began. The Subcommittee invited participation from experts in different fields based on the hazards being addressed. The Subcommittee established a Planning Team to coordinate the data compilation and to implement the proposed updates of the plan document. The process began again in 2014 with the first meeting of the Subcommittee in order to begin the update of the 2018 plan. This process was changed with the 2023 plan update with

the NHMWG absorbing the work of the Subcommittee using a team of subject matter experts in updating the hazard sections of the plan.

The Planning Team consists of four people gathering the information and incorporating it into the draft plan document: the State Hazard Mitigation Officer, a mitigation specialist (when available), and the contractor who acts as editor and GIS specialist, this time from the Wise Oak Consulting, L.L.C.
Each draft section was distributed via email and posted on the Nevada Division of Emergency Management website for review by the Planning team and the NHMWG members with a request for feedback and distributed to other agencies with expertise in each of the hazards. Any feedback was incorporated into the appropriate draft section revision by the Planning Team members, which was then reposted on the website and sent again via email to members for their review and comment prior to presenting drafts for the NHMWG members to make recommendations to the Chief of Emergency Management for approval to submit to FEMA. Public comment is possible through the Nevada Division of Emergency Management websites for any and all portions of the plan posted. The mitigation planning process at the state level is continuous; the compilation and sharing of data, integration, and implementation of the plan begins immediately upon submission to FEMA for review.
All sections of the 2023 Enhanced Plan were reviewed by the NHMWG and the Planning Team; modifications were made to each section of the plan with current information, new maps, additional hazard data, tabulation of data, and integration of local plans. The NHMWG reviewed and approved the final drafts of all sections and appendices of the updated plan. The NHMWG is confident of the integration of local and regional planning efforts into the State plan and the capability of the State to implement its strategies, assess their effectiveness, and modify those strategies as necessary to accomplish the plan's goals.
The most important parts of the plan are contained in Sections Three and Four. Section Three contains the five elements of the Risk Assessment process:

- Identifying and screening the hazards faced by the State
- Profiling those hazards
- Identifying the assets at risk
- Assessing the vulnerabilities
- Analyzing potential losses due to the major hazards in the state

Much of the work of the NHMWG was spent in compiling this information, which has been expanded with more detail and member input since the last iteration.
Section Four describes the State's mitigation goals and resultant selection of mitigation activities to achieve those goals, which constitute the State's Mitigation Strategy. While the overall goals have not changed since the last iteration, some of the strategic actions have been modified, added, or deleted to correspond with those of member agencies.
Major changes to the 2023 NEHMP include:

- Analysis for the impact of climate change
    - Qualitative impacts for all natural hazards
    - Quantitative analysis for key hazards identified in the Nevada's Climate Strategy
- Integration with the State of Nevada Threat and Hazard Identification and Risk Assessment (THIRA), including a crosswalk between the THIRA and NEHMP
- Integration with the State of Nevada Threats and Hazards Guide to rename NEHMP hazards to match the guide

- Increased whole community information via extensive National Risk Index maps
    - Overall Social Vulnerability Index (SVI) as well as SVI themes
        - Socioeconomic SVI theme
        - Household Composition SVI theme
        - Minority / Language SVI theme
        - Housing / Transportation SVI theme
    - Additional National Risk Index (NRI) maps for all hazards where available
        - NRI Overall Score – Very Low through Very High
        - NRI Exposure in dollars
        - NRI Historic Loss Ratio in dollars
        - NRI Expected Annual Loss in dollars
        - NRI Annualized Frequency in events per year
- Completely new HAZUS runs for the major rivers
- New HAZUS runs for Mt. Rose, Frenchman Fault, and Mt Ruby USGS scenarios
- Section 3 hazard prioritization is updated based on the online survey results
- Section 4 actions prioritization is updated by the NHMWG

The Nevada Hazard Mitigation Working Group and Nevada Division of Emergency Management acknowledge the numerous local, state, federal and tribal groups, agencies, and their representatives who patiently provided their time, effort, and resources to make this a truly Enhanced Plan. There are too many to list all contributors without omitting someone whose help was invaluable, so please know that your assistance is greatly appreciated.

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List of Acronyms

A3	American Avalanche Association
AIS	Aquatic Invasive Species
AML	Abandoned Mine Lands
ANSI	American National Standards Institute
ARC	Atlantic Richfield Company
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ATC	Applied Technology Council
AWG	Alpine Watershed Group
AZGS	Arizona Geological Survey
BAPC	Bureau of Air Pollution Control
BCA	Bureau of Corrective Actions
BFF	Bureau of Federal Facilities
BIA	U.S. Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
BMI	Basic Management Incorporated
BMRR	Bureau of Mining Regulation and Reclamation
BOR	U.S. Bureau of Reclamation
BSDAC	Building and Safety Division Administrative Code
BSDW	Bureau of Safe Drinking Water
BWPC	Bureau of Water Pollution Control
BWQP	Bureau of Water Quality Planning
CBRNE	Chemical, Biological, Radiological, Nuclear, Explosives
CCHD	Clark County Health District
CCSD	Clark County School District
CDBG	Community Development Block Grant
CDC	Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERT	Community Emergency Response Teams
CFR	Code of Federal Regulations
COAD	Community Organizations Active in Disasters
CRMS	Carson River Mercury Site
CRS	Community Rating System
CTP	Cooperating Technical Partners
CVCD	Carson Valley Conservation District
CWPP	Community Wildfire Protection Plans
CWSD	Carson Water Subconservancy District
DCNR	Nevada Department of Conservation and Natural Resources
DFIRMS	Digital Flood Insurance Rate Maps
DHS	Department of Homeland Security
DOB	Duplication of Benefits
DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DPBH	Nevada Division of Public and Behavioral Health
DRI	Desert Research Institute
DRMS	Decision, Risk, and Management Sciences Program

DVCD	Dayton Valley Conservation District
EAA	Emergency Assistance Account
EAP	Environmental Assistance Program
EDA	U.S. Economic Development Administration
EHP	Environmental Planning and Historic Preservation
EHS	Extremely Hazardous Substances
EIP	Environmental Improvement Program
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
ERT	Emergency Response Team
ESF	Emergency Support Functions
FAW	Flood Awareness Week
FEMA	Federal Emergency Management Agency
FMA	Flood Mitigation Assistance
FMAG	Fire Management Assistance Grant
FSA	Farm Service Agency
FTRS	Flood Threat Recognition System
GAR	Governor's Authorized Representative
GIS	Geographic Information Systems
GOAS	Goals, Objectives, Action
HMA	Hazard Mitigation Assistance
HMEP	Hazardous Materials Emergency Preparedness
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HMTA	Hazardous Materials Transportation Act
HPP	Hospital Preparedness Program
HSEEP	Homeland Security Exercise and Evaluation Program
HSWG	Homeland Security Working Group
HUD	U.S. Housing and Urban Development
IBC	International Building Code
ICC	International Code Council
IDF	Inflow Design Flood
IEBC	International Existing Building Code
IECC	International Energy Conservation Code
IFC	International Fire Code
IFGC	International Fuel Gas Code
IGCC	International Green Construction Code
IMC	International Mechanical Code
IPMC	International Property Maintenance Code
IRC	International Residential Code
ISPSC	International Swimming Pool and Spa Code
ITCN	Intertribal Council of Nevada
ITERC	Intertribal Emergency Response Committee
IWUIC	International Wildland-Urban Interface Code
JFO	Joint Field Office
LAS	Loss Avoidance Study

LEPCs	Local Emergency Planning Committees
LHAs	Local Health Authorities
LHMP	Local Hazard Mitigation Plan
LTAISWG	Lake Tahoe Aquatic Invasive Species Working Group
LTBMU	Lake Tahoe Basin Management Unit
LVWD	Las Vegas Water District
MapMod	Map Modernization
MMI	Modified Mercalli Intensity Scale
MTBE	Methyl tert-butyl ether
NAC	Nevada Administrative Code
NAP	Noninsured Crop Disaster Assistance Program
NBMG	Nevada Bureau of Mines and Geology
NCDC	National Climatic Data Center
NDA	Nevada Department of Agriculture
NDEP	Nevada Division of Environmental Protection
NDF	Nevada Division of Forestry
NDHHS	Nevada Department of Health and Human Services
NDI	Nevada Division of Insurance
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDPS	Nevada Department of Public Safety
NDSP	National Dam Safety Program
NDWR	Nevada Division of Water Resources
NEC	National Electrical Code
NEHRP	National Earthquake Hazard Reduction Program
NEPA	National Environmental Protection Act
NESC	Nevada Earthquake Safety Council
NETAP	National Earthquake Technical Assistance Program
Nevada DEM	Nevada Division of Emergency Management
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NHA	Nevada Hospital Association
NHM	Nevada Hazard Mitigation
NEHMP	Nevada Hazard Mitigation Plan
NEHMPC	Nevada Hazard Mitigation Planning Committee
NIC	Nevada Insurance Council
NLTFPD	North Lake Tahoe Fire Protection District
NLVOEM	City of North Las Vegas Office of Emergency Management
NMA	Nevada Mining Association
NNG	Nevada National Guard
NOA	Naturally Occurring Asbestos
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPL	National Priority List
NPS	National Park Service
NRC	National Response Center

NRCS	Natural Resources Conservation Service
NRS	Nevada Revised Statutes
NSAA	National Ski Areas Association
NSF	National Science Foundation
NTRT	Nevada Tahoe Resource Team
NWAM	Nevada Wildfire Awareness Month
NWS	National Weather Service
OMB	Office of Management and Budget
OOE	Office of Epidemiology
OSHA	Occupational Safety and Health Administration
OU-1	Operable Units One
OU-2	Operable Units Two
PA	Public Assistance
PCE	Perchloroethylene
PDA	Preliminary Damage Assessment
PDM	Pre-Disaster Mitigation
PNPs	Private Non-Profit
PSC	Philip Services Corporation
RAP	Radiological Assistance Program
RCRA	Resource Conservation and Recovery Act
RFC	Repetitive Flood Claims
RFCD	Clark County Regional Flood Control District
RiskMAP	Risk Mapping, Assessment, and Planning
RL	Repetitive Loss
RSF	Recovery Support Functions
SAC	Sierra Avalanche Center
SAD	Standards for Accessible Design
SARA	Superfund Amendment Reauthorization Act
SARS	Severe Acute Respiratory Syndrome
SCEMP	State Comprehensive Emergency Management Plan
SEOC	State Emergency Operations Center
SERC	State Emergency Response Commission
SFHA	Special Flood Hazard Area
SHD	State Health Division
SHMO	State Hazard Mitigation Officer
SHMP	State Hazard Mitigation Plan
SHPO	State Historic Preservation Officer
SMAC	State Mapping Advisory Committee
SNWA	Southern Nevada Water Authority
SPS	Singatse Peak Services
SPWD	State Public Works Division
SRL	Severe Repetitive Loss
SSFS	Sparks Solvent/Fuel Site
SUAs	State Units on Aging
SURE	Supplemental Revenue Assistance Payments Program
TCE	Trichloroethylene

TCID	Truckee-Carson Irrigation District
TDFPD	Tahoe Douglas Fire Protection District
TFFT	Tahoe Fire and Fuels Team
THIRA	Threat and Hazard Identification and Risk Assessment
TMWA	Truckee Meadows Water Authority
TNC	The Nature Conservancy
TRFMA	Truckee River Flood Management Authority
TRFP	Truckee River Flood Project
TRPA	Tahoe Regional Planning Agency
TSCA	Toxic Substances Control Act
TTX	Tabletop Exercise
UAC	Uniform Administrative Code
UAS	Unmanned Aircraft System
UMC	Uniform Mechanical Code
UNCE	University of Nevada Cooperative Extension
UNLV	University of Nevada, Las Vegas
UNR	University of Nevada, Reno
UPC	Uniform Plumbing Code
URM	Unreinforced Masonry Building
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDHHS	U.S. Department of Health and Human Services
USFS	U.S. Forestry Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USPSHT	Uniform Swimming Pool, Spa & Hot Tub
VCG	Vista Canyon Group
VOAD	Voluntary Organizations Active in Disasters
WFSC	Desert Research Institute's Wildland Fire Science Center
WHO	World Health Organization
WIPP	Water Isolation Pilot Program
WMD	Weapons of Mass Destruction
WNV	West Nile Virus
WRN	Weather Ready Nation
WUI	Wildland Urban Interface

Section 0

This Section provides an overview of the plan contents, a state profile, and a summary of land management in the State of Nevada. *Demographic and economic data have been updated for the 2023 iteration of the Plan. A new table was added to this section, Table 0-4: population projections (2023-2032) for the state of Nevada.*

0.1 OVERVIEW OF PLAN CONTENTS

This is the fifth revision of the original Standard State Hazard Mitigation Plan (SHMP) that was written and approved by the Federal Emergency Management Agency (FEMA) in 2004 and last revised in 2018. It presents an assessment of the risks and potential losses posed by these hazards throughout the State. It also provides the methodology for prioritization of these risks. The Nevada Hazard Mitigation Working Group (NHMWG) that wrote and revised the plan was composed of representatives from federal, state, tribal, and local entities, and the private sector. This plan is a living document and has been in a state of constant revision since the 2007 Plan, according to the maintenance process presented in Section 6. The NHMWG met quarterly throughout 2019, 2020, 2022, and 2023 until the completion of the major elements of the revised Enhanced Nevada SHMP in June of 2023. The current revision of the SHMP is organized according to the elements presented in the FEMA State Mitigation Plan Review Guide. The plan meets the requirements of the Code of Federal Regulation (44 CFR 201) which precede each section.

This plan provides the basis and guidance for hazard mitigation in the State of Nevada. The goal of the plan is to reduce loss of life and property by fostering disaster-resilient communities.

Section 1 describes the State's process for adoption of the Plan and presents the State's authority to implement the plan.

Section 2 provides an overview of the planning process; identifies the NHMWG members and documents the participation of interested groups in the planning process. It also documents how the planning team reviewed and analyzed each section of the plan and indicates whether each section was revised.

Section 3 provides the identification of hazards that were considered and profiles each hazard affecting Nevada.

Section 4 provides the State's blueprint for reducing the losses identified in the risk assessment. It describes the State mitigation goals that guide the selection of mitigation activities. It also describes how the previous goals were assessed and whether they were revised. It includes a discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities. It includes an evaluation of State laws, regulations, policies, and programs related to hazard mitigation. It evaluates the State's policies related to development in hazard-prone areas and discusses State funding capabilities for hazard mitigation projects. This section includes a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.

Section 5 describes how the State supports local jurisdictions and tribal entities in developing plans that will accomplish their mitigation goals, objectives, and actions, through funding and technical assistance.

Section 6 describes the State of Nevada's plan for monitoring, evaluating, and updating the SHMP. It describes implementation measures, and reviews progress on mitigation goals, activities, and project closures.

Section 7 provides a list of sources used as references to gather data.

Section 8 provides the response to the enhanced plan requirements.

Section 0 0.2 STATE PROFILE

This subsection provides a profile of the State of Nevada including economy, physiography, state facts, demographics, tribal information, geography, population, climate, political divisions, and jurisdictions.

0.2.1 Economy

The major industry in Nevada is tourism with real estate now closely behind. Tourism includes the large resorts and casinos found in large numbers in southern Nevada around Las Vegas and, to a lesser extent, in Reno and Lake Tahoe and the smaller communities. Approximately 90% of the GDP is generate in the private Sector and 10% via government enterprises. Table 0-1 summarizes the State of Nevada Gross Domestic Product (GDP) in millions of dollars by industry for 2022.

Table 0-1. Nevada GDP in $ Millions by Major Industry, 2022.[1]

Industry	2022 GDP ($ million)	Percent of Total GDP
Agriculture, forestry, fishing and hunting	$1,930	0.2%
Mining, quarrying, and oil and gas extraction	$25,268	2.9%
Utilities	$14,075	1.6%
Construction	$62,808	7.3%
Manufacturing	$43,436	5.0%
Wholesale trade	$36,849	4.3%
Retail trade	$62,277	7.2%
Transportation and warehousing	$35,607	4.1%
Information	$24,283	2.8%
Finance and insurance	$50,976	5.9%
Real estate and rental and leasing	$126,411	14.6%
Professional, scientific, and technical services	$41,999	4.9%
Management of companies and enterprises	$24,845	2.9%
Administrative and support and waste management and remediation services	$29,694	3.4%
Educational services	$4,513	0.5%
Health care and social assistance	$52,300	6.1%
Arts, entertainment, and recreation	$29,790	3.4%
Accommodation and food services	$97,522	11.3%
Other services (except government and government enterprises)	$14,009	1.6%
Private industry Subtotal	**$778,591**	**90.1%**
Federal civilian	$12,716	1.5%
Military	$7,990	0.9%
State and local	$64,374	7.5%
Government and government enterprise Subtotal	**$85,080**	**9.9%**
All industry total	**$863,671**	**100.0%**

0.2.2 Physical Geography

[1] Bea, Regional Data, GDP and Personal income, accessed May 2, 2023, https://tinyurl.com/3yj9jcz5.

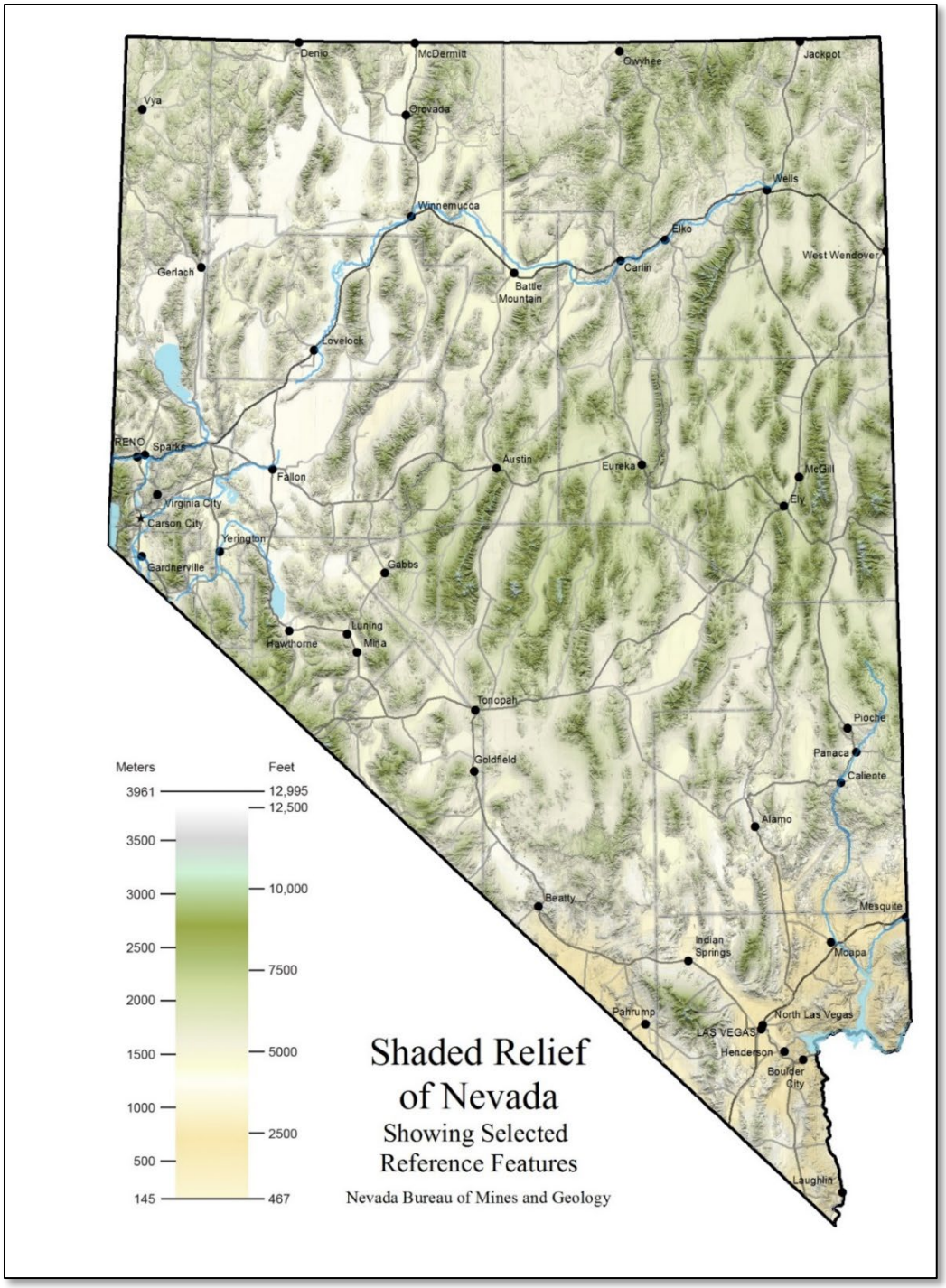


Figure 0-1. Shaded Relief Map of Nevada.

Nevada is bordered by California on the west, Oregon and Idaho on the north, Utah on the east, and Arizona on the southeast. Nevada is located primarily in the Basin and Range physiographic province with more than 30 north-south-trending mountain ranges and intervening valleys. Average elevation in the northern part of Nevada ranges from about 4,000 to 6,000 feet and averages from 2,000 to 3,000 feet in the southern part of the state. The highest elevations are Boundary Peak in the Sierra Nevada, at 13,143 feet, and Wheeler Peak, at 13,063 feet in the

eastern part of the state. The southern part of the state lies within the Mojave Desert. The northernmost part of the state lies within the Columbia River Plateau Physiographic region. Most of Nevada lies within the Great Basin whose waters do not reach the ocean but terminate in sinks or flow into lakes with no outlets. There are some small drainage areas in the north margins of the state that empty into the Columbia River Basin and another limited region in the southeast that drains into the Colorado River.

The state's three main river systems that originate in the Sierra Nevada and flow generally eastward into Nevada are the Truckee, the Carson, and the Walker Rivers. The termini of these rivers are respectively Pyramid Lake, Carson Sink, and Walker Lake. The Humboldt River system in northern Nevada is the only major river system that is entirely contained within the state, ending in Humboldt Sink. In the southern part of the state, the Virgin and Muddy Rivers flow south into the Colorado River system; this includes Lake Mead.

In addition to these natural waterways, there are several major man-made reservoirs in the state. The total capacity (acres) and total storage capacity (acre-feet) are in Table 0-2.

Table 0-2. Major Nevada Reservoirs

Name	River System	Total Storage Capacity (acres)	Total Capacity Units (acre-feet)
Lake Mead	Colorado	29.7M	26.134M
Lake Mohave	Colorado	1.82M	1.818M
Lake Lahontan Reservoir	Carson	317,000	312,000
Pitt-Taylor Reservoir Upper	Humboldt	24,200	24,200
Pitt-Taylor Reservoir Lower	Humboldt	22,200	22,200
Rye Patch Reservoir	Humboldt	171,000	213,000
South Fork Reservoir	Elko	41,000	40,000
Wild Horse Reservoir	Owyhee	73,500	95,235

0.2.3 Climate

Nevada is the driest state in the U.S., with overall average annual precipitation of approximately nine inches. The low precipitation and high average elevation characterize most of the state as high desert.

0.2.4 Temperature

Nevada is characterized by exceptionally large daily ranges of temperature caused by strong surface heating during the day and rapid nighttime cooling. The mean annual temperatures vary from the middle 40s (Fahrenheit) in the northeast to the 50s in the west and central areas, and to the middle 60s in the south. The average range between the highest and the lowest daily temperatures is 30 to 35 degrees with larger variations in summer than the winter. Temperature extremes range from 120° F to 50° F below zero. Summer temperatures above 100° F are

common in the south and occasional over the rest of the state. Over the northern and central portions of the State, freezes begin early in the autumn and continue until late in the spring.

0.2.5 Precipitation

Nevada's geographic location on the lee side of the massive mountain barrier of the Sierra Nevada markedly influences the precipitation that falls on the state. Prevailing west winds bring warm moist Pacific air that ascends, cools, condenses, and falls as precipitation before it reaches the eastern slope of the Sierra Nevada. The effects of this mountain barrier are felt throughout the State, resulting in desert conditions over the rest of the state. Nevada averages only about nine inches of precipitation overall. Highest amounts are in the Sierra Nevada averaging over 40 inches. The Ruby Mountains area in central Nevada averages about 18 inches, and the least amount of precipitation, as little as five inches, falls in the lower valleys of Nevada from Death Valley, California to the Idaho border. In the western and south-central mountains of the state, most of the precipitation falls as winter snow, while in the central and northeastern area most precipitation occurs as spring rain. In the southeastern part of the state, most of the precipitation comes from summer thunderstorms.

Although Nevada is characterized by generally low mean annual precipitation, occasional extreme precipitation events do present a risk to Nevada's people, homes, and infrastructure.

0.2.6 Population

Nevada has 17 counties with its population concentrated in centers separated by large sparsely populated spaces, as shown in Figures 0-2 and 0-3 (more heavily populated areas), and 0-4 (more heavily populated areas). More than 88% of the state's inhabitants reside in the two most populous counties, Clark and Washoe.

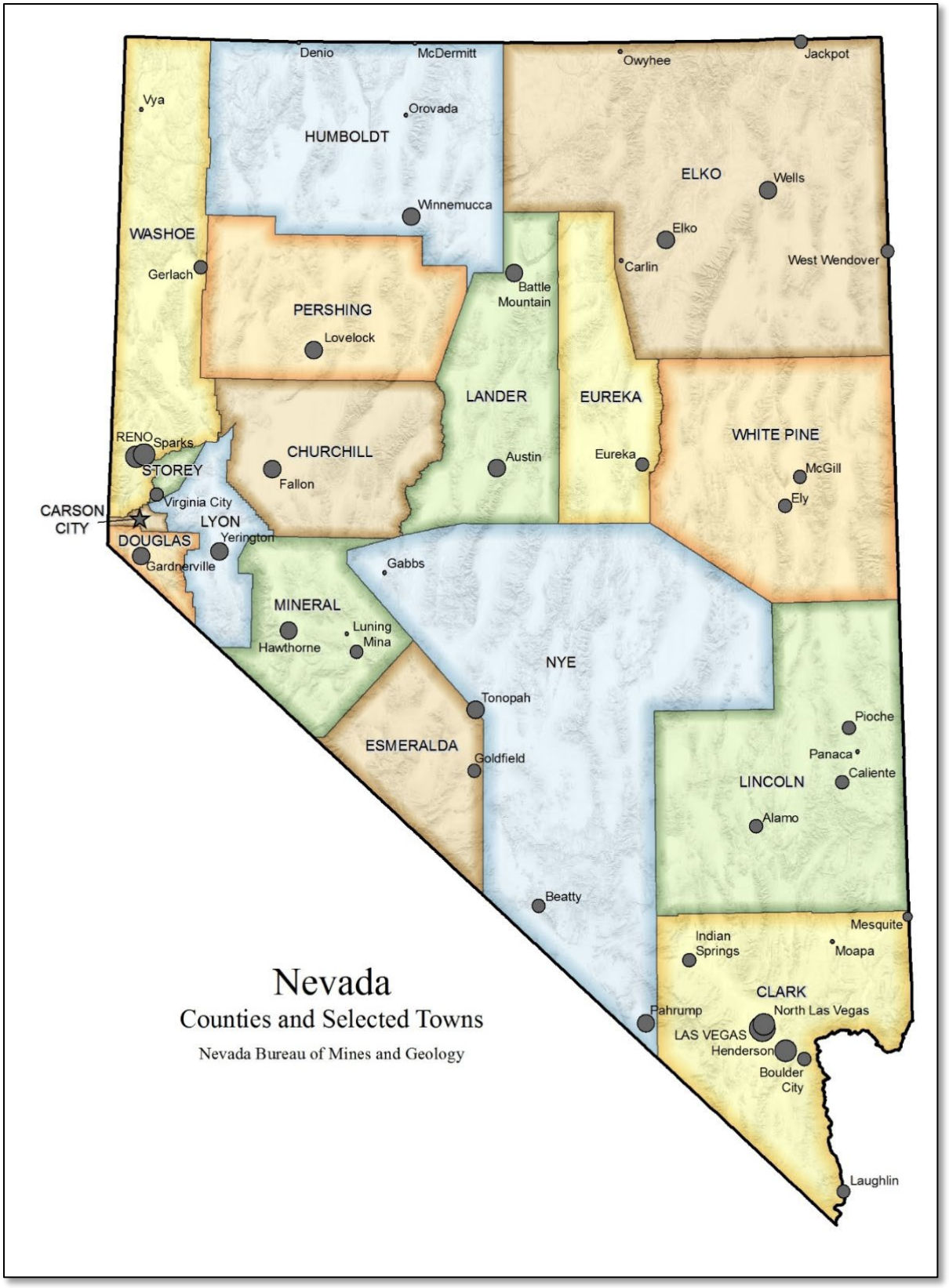


Figure 0-2. County Map of Nevada.

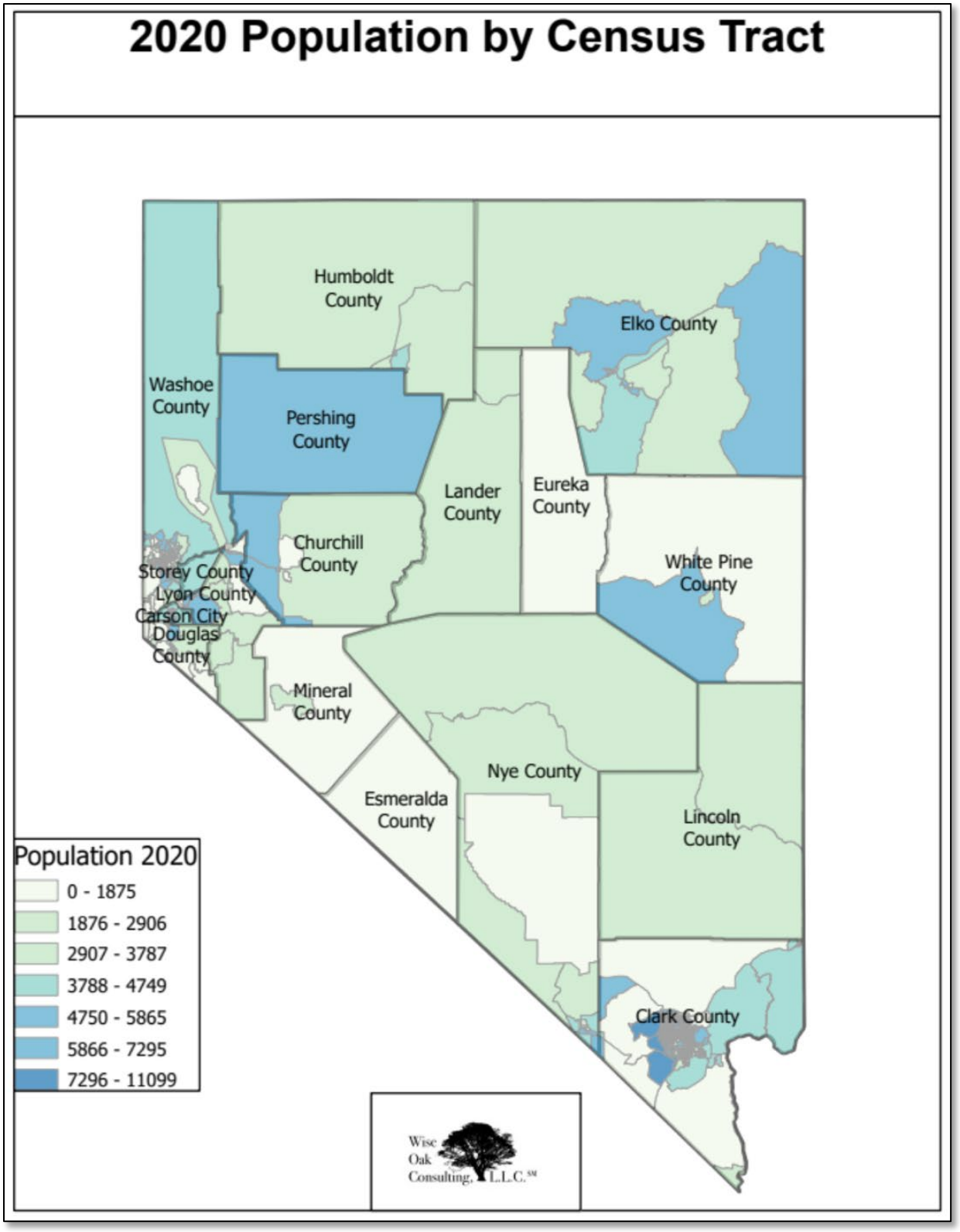


Figure 0-3. 2020 Population by Census Tract – Statewide.

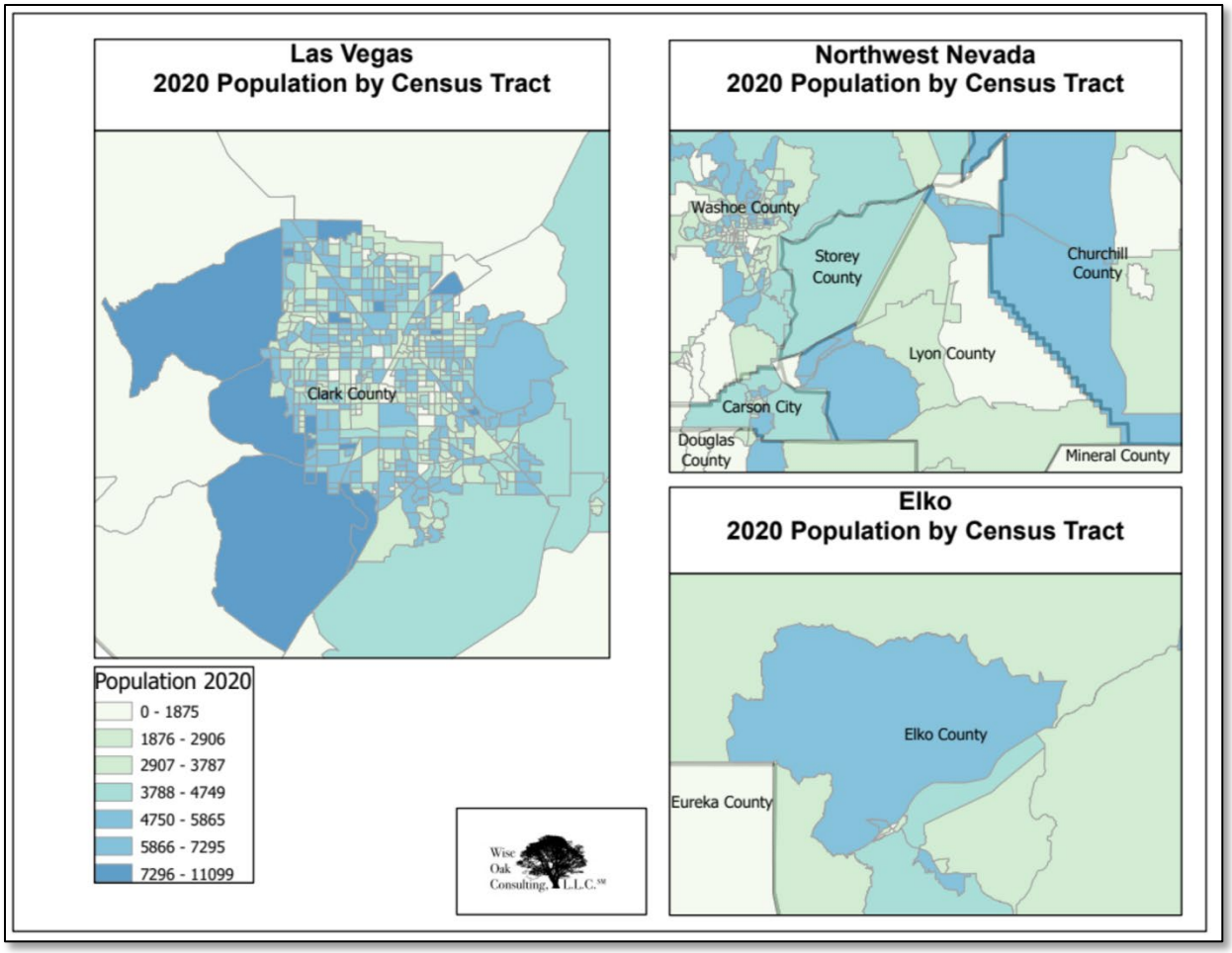


Figure 0-4. 2020 Population by Census Tract – More Heavily Populated Areas.

The 2020 U.S. Census population is presented in Table 0-3. The sparsity of population and vast distances between population centers seriously impacts preparation, response, and recovery efforts in an emergency event.

Table 0-3. Nevada County and City Population Estimates 2021.[2]

County	Population		County	Population
Carson City	**59,644**		**Lander County**	**5,734**
			No cities	
Churchill County	**25,516**		*Unincorporated towns*	
Cities			Austin Caliente	170 686
Fallon Fallon Station	9,294 791		Battle Mountain	4,122
			Kingston	128
Clark County	**2,265,461**		**Lincoln County**	**4,499**
Cities			*Cities*	

[2] Nevada Demographics, Nevada Cities by Population, accessed May 2, 2023, https://www.nevada-demographics.com/cities_by_population.

Table 0-3. Nevada County and City Population Estimates 2021.[2]				
County	**Population**		**County**	**Population**
Henderson	311,250		Caliente	1,056
Las Vegas	634,786		*Unincorporated towns*	
Mesquite	20,019		Alamo	1,154
North Las Vegas	259,638		Panaca	1,038
Unincorporated towns			Pioche	1,154
Blue Diamond Boulder City	299 14,868			
Bunkerville	949		**Lyon County**	**59,235**
Enterprise	259,638		*Cities*	
Indian Springs	794		Dayton East Valley Fernley Lovelock Silver Springs Smith Valley	15,036 1,450 22,343 1,747 4,684 1,454
Laughlin	8,174		Yerington	3,093
Moapa	1,352			
Moapa Valley	7,436		**Mineral County**	**4,554**
Mt. Charleston	415		*No cities*	
Paradise Sandy Valley	189,852 1,723		*Unincorporated towns*	
Searchlight	308		Hawthorne	3,023
Spring Valley	217,441		Luning	98
Summerlin	28,861		Mina Schurz	160 960
Sunrise Manor	196,411		Walker Lake	313
Whitney	45,105			
Winchester	36,307		**Nye County**	**5,591**
			Cities	
Douglas County	**49,488**		*Unincorporated towns*	
No cities			Amargosa Valley	1,455
Unincorporated towns			Beatty	762
Carter Springs Double Springs Fish Springs Gardnerville	451 284 555 6,037		Gabbs Hawthorne	245 2,786

Table 0-3. Nevada County and City Population Estimates 2021.[2]				
County	**Population**		**County**	**Population**
Gardnerville Ranchos	11,761			
Genoa	958		Manhattan	133
Glenbrook	253			
Indian Hills	5,955			
Johnson Lane	6,277			
Kingsbury	1,981			
Lakeridge	255			
Minden	3,335		Pahrump	42,471
Round Hill Village	884			
Ruhenstroth	1,511			
Skyland	329			
Stateline	916			
Topaz Lake	229			
Topaz Ranch Estates	1,654			
Zephyr Cove	662			
			Round Mountain	846
Elko County	**53,702**		Tonopah	1,895
Cities				
Carlin	2,279		**Pershing County**	**6,650**
Elko	20,391		*Cities*	
Wells	1,105		Lovelock	1,952
West Wendover	4,517		Unincorporated towns	
Unincorporated towns			Imlay	139
Jackpot	1,130			
Lamoille	63			
Montello	56		**Storey County**	**4,104**
Mountain City	12		*No cities*	
Owyhee	921			
Spring Creek	15,176			
			Unincorporated towns	
Esmeralda County	**729**		Gold Hill	201
No cities			Virginia City	770
Unincorporated towns				
Dyer	291		**Washoe County**	**486,492**
Goldfield	272			
Silver Peak	128		*Cities*	

Table 0-3. Nevada County and City Population Estimates 2021.[2]				
County	**Population**		**County**	**Population**
			Cold Springs	10,920
			Gerlach	54
			Golden Valley	911
			Incline Village	9,440
			Lemmon Valley	5,100
			Mogul	1,421
			Nixon	304
			Reno	259,638
Eureka County	**1,855**		Sparks	106,900
			Spanish Springs	16,13122,622 304
			Sun Valley	1,094
			Sutcliffe	721
			Verdi	2,800
			Wadsworth	
			Washoe Valley	
No cities				
Unincorporated towns			**White Pine County**	**9,080**
Crescent Valley	443		*Cities*	
Eureka (town)	340		Ely	3,983
			Cities	
Humboldt County	**17,285**		Lund	208
Cities			McGill	838
Winnemucca	8,325		**Ruth**	429
No towns Fort McDermott	283			
STATE (2022)	**3,177,772**			

Table 0-4 depicts the 10-year projected population estimate from the Nevada State Demographer.

Table 0-4. Nevada Population Projections 2023 to 2032.[3]

Year	Total Population	Change Previous Year	Percentage Change
2023	3,246,914	38,830	1.2%
2024	3,292,872	45,958	1.4%
2025	3,336,509	43,637	1.3%
2026	3,378,958	42,449	1.3%
2027	3,419,781	40,823	1.2%
2028	3,457,699	37,918	1.1%
2029	3,492,391	34,692	1.0%
2030	3,525,793	33,402	1.0%
2031	3,557,551	31,758	0.9%
2032	3,587,875	30,324	0.9%

0.3 LAND MANAGEMENT AND JURISDICTION

An effective hazard mitigation plan must involve cooperation among all land management participants. Figure 0-5 is a map showing the overall distribution of federal and tribal lands in Nevada. Federal agencies control more than 86% of the land. These groups include the U. S. Bureau of Land Management (BLM), U.S. Department of Defense (DOD), U.S. Forest Service (USFS), U.S. Bureau of Indian Affairs (BIA), U.S. Bureau of Reclamation (BOR), U.S. Fish and Wildlife Service (USFWS), National Parks Service (NPS), and others. Some of the areas controlled by these agencies are shown in Figure 0-5.

[3] Matthew F. Lawton, Nevada County Population Projections 2021 to 2040, October 1, 2021, accessed May 2, 2023, https://tax.nv.gov/uploadedFiles/taxnvgov/Content/TaxLibrary/Nevada%20County%20Population%20Projections%202021%20to%202040.pdf.

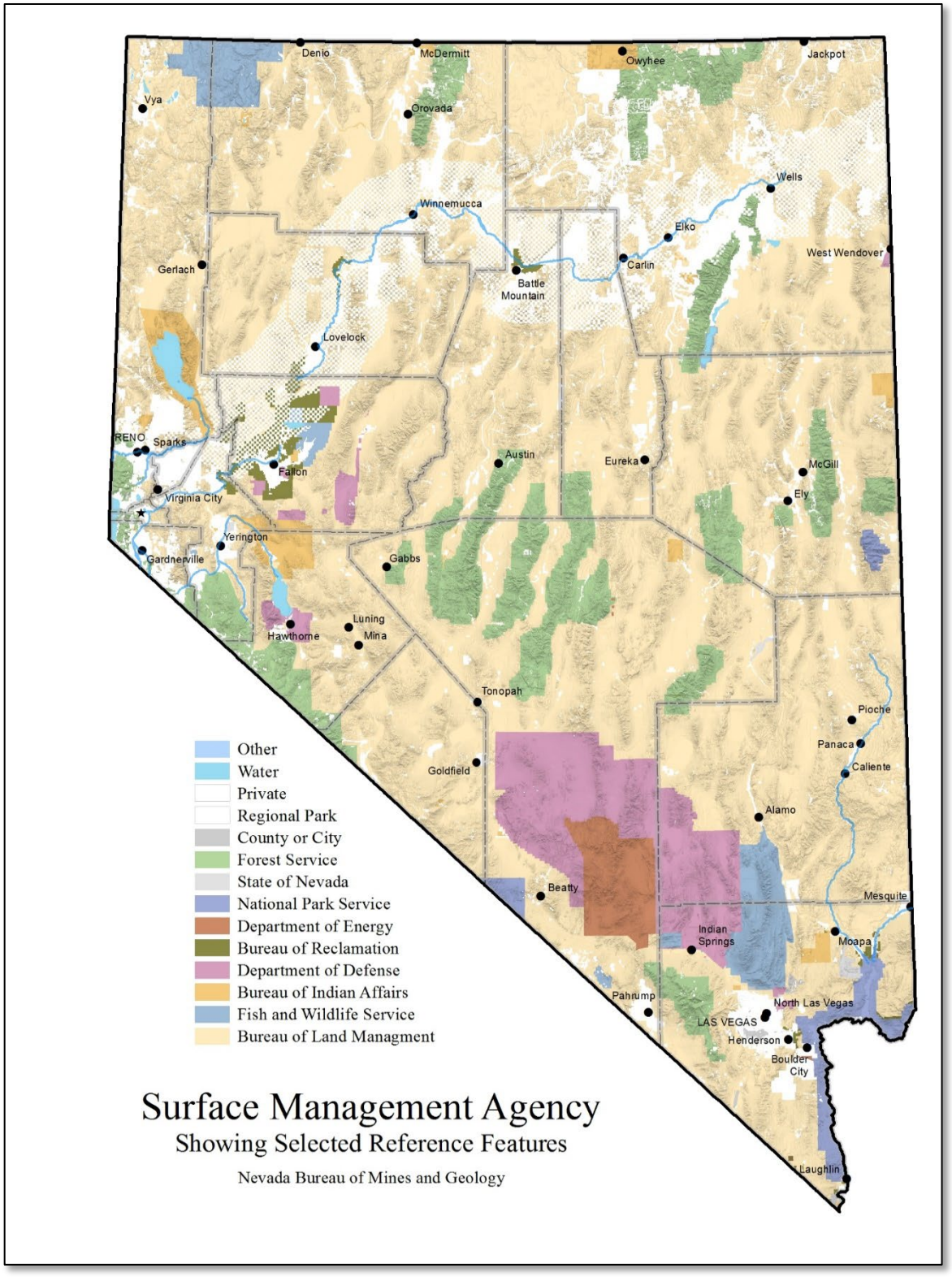
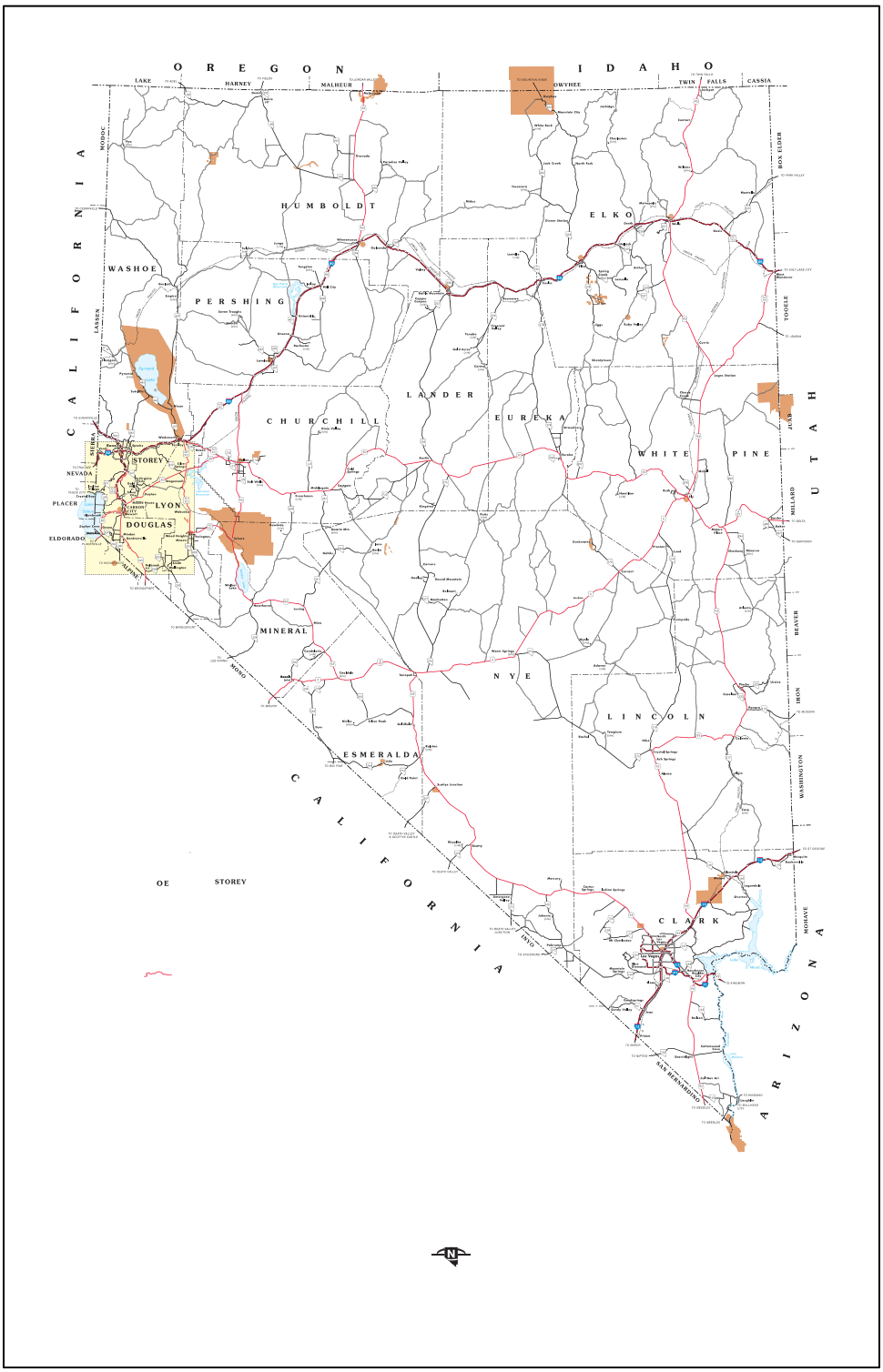


Figure 0-5. Nevada Land Use and Jurisdictions.

Figure 0-6 shows the location of American Indian reservations and colonies in Nevada and contact information for each tribal entity.


OREGON
IDAHO
CALIFORNIA
UTAH
ARIZONA
LAKE
HARNEY
MALHEUR
OWYHEE
TWIN FALLS
CASSIA
MODOC
BOX ELDER
HUMBOLDT
ELKO
WASHOE
PERSHING
LASSEN
TOOELE
LANDER
CHURCHILL
EUREKA
WHITE PINE
JUAB
SIERRA
STOREY
NEVADA
PLACER
LYON
DOUGLAS
ELDORADO
MILLARD
MINERAL
NYE
BEAVER
LINCOLN
IRON
ESMERALDA
WASHINGTON
CLARK
MOHAVE
SAN BERNARDINO
INYO
MONO
OE
STOREY



INDIAN RESERVATIONS AND COLONIES IN NEVADA

Duck Valley Sho-Pai Tribe (1)
P.O. Box 219
Owyhee, Nevada 89832
Phone: (208) 759-3100
Fax: (208) 759-3940
www.shopaitribes.org

Duckwater Sho-Pai Tribes (2)
P.O. Box 140068
Duckwater, Nevada 89314
Phone: (775) 863-0227
Fax: (775) 863-0301
www.duckwatertribe.org

Ely Shoshone Tribe (3)
16 Shoshone Circle
Ely, Nevada 89301
Phone: (775) 289-3013
Fax: (775) 289-3156
www.elyshoshonetribe-nsn.org

Fallon Paiute-Shoshone Tribe (4,5)
565 Rio Vista Drive
Fallon, Nevada 89406
Phone: (775) 423-6075
Fax: (775) 423-5202
www.fpst.org

Fort McDermitt Paiute Shoshone Tribes (6,7)
P.O. Box 457
McDermitt, Nevada 89421
Phone: (775) 532-8259
Fax: (775) 532-8487

Fort Mojave Indian Tribe (8)
500 Merriman Street
Needles, California 92363
Phone: (760) 629-4591
Fax: (760) 629-5767
www.fortmojave.com

Goshute Business Council (9)
P.O. Box 6104
Ibapah, Utah 84034
Phone: (435) 234-1138
Fax: (435) 234-1162
www.goshutetribe.com

Las Vegas Paiute Tribe (10,11)
1 Paiute Drive
Las Vegas, Nevada 89030
Phone: (702) 386-3926
Fax: (702) 383-4019
www.lvpaiutetribe.com

Lovelock Paiute Tribe (12)
P.O. Box 878
Lovelock, Nevada 89419
Phone: (775) 273-7861
Fax: (775) 273-5151

Moapa Band of Paiutes (13)
P.O. Box 340
Moapa, Nevada 89025
Phone: (702) 865-2787
Fax: (702) 865-2875
www.moapapaiutes.com

Pyramid Lake Paiute Tribe (14)
P.O. Box 256
Nixon, Nevada 89424
Phone: (775) 574-1000
Fax: (775) 574-1008
www.plpt.nsn.us

Reno-Sparks Indian Colony (15,16)
98 Colony Road
Reno, Nevada 89502
Phone: (775) 329-2936
Fax: (775) 329-8710
www.rsic.org

Summit Lake Paiute Tribe (17)
1708 H Street
Sparks, Nevada 89431
Phone: (775) 827-9670
Fax: (775) 827.9678
www.summitlaketribe.org

Te-Moak Tribe of Western Shoshone
525 Sunset Street
Elko, Nevada 89801
Phone: (775) 738-9251
Fax: (775) 738-2345
www.temoaktribe.com

Battle Mountain Band Council (18)
37 Mountain View Drive #C
Battle Mountain, Nevada 89820
Phone: (775) 635-2004
Fax: (775) 635-8016

Elko Band Council (19)
1745 Silver Eagle Dr
Elko, Nevada 89801
Phone: (775) 738-8889
Fax: (775) 753-5439

South Fork Band Council (20,21)
H.C. 30 Box B-13
Spring Creek, Nevada 89815
Phone: (775) 744-4273
Fax: (775) 744-4523

Wells Band Council (22)
P.O. Box 809
Wells, Nevada 89835
Phone: (775) 345-3089
Fax: (775) 752-2179

Timbisha Shoshone Tribe (23)
1349 Rocking W Dr
Bishop, California 93514
Phone: (760) 872-3614
Fax: (760) 690-4486
www.timbisha.org

Walker River Paiute Tribe (24)
P.O. Box 220
Schurz, Nevada 89427
Phone: (775) 773-2306
Fax: (775) 773-2585
www.wrpt.us

Washoe Tribe of Nevada & California
919 Highway 395 South
Gardnerville, Nevada 89410
Phone: (775) 265-4191
Fax: (775) 265-6240
www.washoetribe.us

Carson Colony Community Council (25)
2900 South Curry Street
Carson City, Nevada 89703
Phone: (775) 883-6459
Fax: (775) 883-6467

Dresslerville Community Council (26)
1585 Watasheamu
Gardnerville, Nevada 89460
Phone: (775) 265-5645
Fax (775) 265-6240

Stewart Community Council (27)
465 Clear Creek
Carson City, Nevada 89701
Phone: (775) 883-7794
Fax: (775) 265-6240

Woodfords Community Council (28)
96A Washoe Boulevard
Markleeville, California 96120
Phone: (530) 694-2170
Fax: (530) 694-1890

Winnemucca Colony Council (29)
P.O. Box 1370
Winnemucca, Nevada 89446
Phone: (775) 623-0888
Fax: (775) 623-0888

Yerington Paiute Tribe (30,31)
171 Campbell Lane
Yerington, Nevada 89447
Phone: (775) 463-3301
Fax: (775) 463-2416

Yomba Shoshone Tribe (32)
H.C. 61 Box 6275
Austin, Nevada 89310
Phone: (775) 964-2463
Fax: (775) 964-2443
www.yombatribe.com

RELATED ORGANIZATIONS

Bureau of Indian Affairs Western Regional Office
400 North 5th Street
Phoenix, Arizona 85004
Phone: (602) 379-6782

Bureau of Indian Affairs Western Nevada Agency
311 E Washington Street
Carson City, NV 89701
Phone: (775) 887-3500
Phone: (775) 887-3531

Bureau of Indian Affairs Eastern Nevada Agency
1555 Shoshone Circle
Elko, NV 89801
Phone: (775) 738-5165

Nevada Indian Commission
5366 Snyder Avenue
Carson City, Nevada 89701
Phone: (775) 687-8333
Fax: (775) 687-8330
www.nic.nv.gov

Nevada Urban Indians, Inc.
745 W Moana Ln
Suite 330
Reno, Nevada 89509
Phone: (775) 788-7600
Fax: (775) 788-7611
www.nevadaurbanindians.org

Inter-Tribal Council of Nevada
680 Greenbrae Drive, Suite 280
Sparks, Nevada 89431
Phone: (775) 355-0600
Fax: (775) 355-0648
www.itcn.org

Las Vegas Indian Center, Inc.
2300 West Bonanza Road
Las Vegas, Nevada 89107
Phone: (702) 647-5842
Fax: (702) 647-4497
www.lasvegasindiancenter.org

California / Nevada Tribal Technical Assistance Program (TTAP)
Nevada Indian Justice Center
5250 Aero Drive
Santa Rosa, California 95403
Phone: (707) 579-5507 or (707) 579-9019

Figure 0-6. Nevada Indian Reservation Map with Contact List.[4]

[4]Nevada Department of Transportation accessed May 2, 2023, https://www.dot.nv.gov/home/showpublisheddocument/142/638086105528130000.

Table 0-5. Tribal Demographics in Nevada[5]				
Reservation Names and Map ID Numbers shown on Figure 0-6	**Date Established**	**Resident Tribe(s)**	**Population of the Reservation in NV (2017-2021 ACS Estimates)**	**Enrolled Tribal Members**
Shoshone-Paiute Tribes of the Duck Valley Reservation (1)	1877	Western Shoshone, Paiute	1,125	~2,300
Duckwater Shoshone Tribe of the Duckwater Reservation (2)	June 14, 1942	Western Shoshone	219	
Ely Shoshone Tribe of Nevada (3)	1931	Western Shoshone	254	~500
Paiute Shoshone Tribe of the Fallon Reservation and Colony (4, 5)	1887	Paiute, Western Shoshone	852	1,457
Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation (NV and OR) (6, 7)	1892	Shoshone, Paiute	283	
Fort Mojave Indian Tribe (AZ, CA, NV) (8)			1,735	
Confederated Tribes of the Goshute Reservation (NV and UT) (9)	1863; 1940 constitution	Goshute, Western Shoshone, Navajo, Ute, Paiute, Northern Cheyenne, Southern Arapahoe, Bannock	139	
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony (10, 11)	1911	Paiute	111	
Lovelock Paiute Tribe of the Lovelock Indian Colony (12)			109	

[5] U.S. Census Bureau, My Tribal Area (2017-2021 American Community Survey 5-Year Estimates), and Nevada county HMPs, accessed April 21, 2023, https://www.census.gov/tribal/?st=32&aianihh=0165.

Table 0-5. Tribal Demographics in Nevada[5]				
Moapa Band of Paiute Indians of the Moapa River Indian Reservation (13)			286	~311
Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation (14)	1936	Paiute	1,513	~2,253
Reno-Sparks Indian Colony (15, 16)	Early 1900s; more formal Tribal Government in 1935	Paiute, Shoshone, and Washoe	928	1,134
Summit Lake Paiute Tribe of Nevada (17)			0	
Te-Moak Tribe of Western Shoshone Indians of Nevada *(see the four constituent bands below)*		Te-Moak Western Shoshone		
Battle Mountain Band (18)	1917	Te-Moak Western Shoshone	207	
Elko Band (19)	1918	Te-Moak Western Shoshone	887	
South Fork Band (20, 21)	1941	Te-Moak Western Shoshone	71	
Wells Band (22)	1863	Te-Moak Tribes of Western Shoshone	54	
Walker River Paiute Tribe of the Walker River Reservation (24)	1874	Paiute	1,142	3,540
Washoe Tribe (Nevada and California) *(see individual bands below)*				
Carson Colony (25)	1934	Washoe	352	
Dresslerville Colony (26)	1934	Washoe	406	
Stewart Community (27)	1934	Washoe	240	
Woodfords Community (28)	1934	Washoe		
Washoe Ranches	1934	Washoe	3,259	

Table 0-5. Tribal Demographics in Nevada[5]				
Winnemucca Indian Colony of Nevada (29)			27	
Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch (30, 31)			229	
Yomba Shoshone Tribe of the Yomba Reservation (32)	Dec 22 1939	Western Shoshone	41	

Table 0-6 presents pertinent historical, geographic, and demographic facts about the State of Nevada as well as State Trivia.

Table 0-6. Nevada Facts[6]	
State Facts	
Admitted to United States	October 31, 1864
State name	Nevada, meaning snow-capped
Capital City	Carson City
Largest City: Population	Las Vegas
Largest City: Area	Boulder City
Number of Counties	17
Number of Tribal Reservations	26
Percentage of federally controlled lands	85.9%
Physiography	
Total land area	110,567 sq. mi., rank: 7th largest
Latitude and Longitude	Longitude: 114°W to 120°W Latitude: 35°N to 42°N
Highest point	13,147 ft. at Boundary Peak in the White Mountains
Lowest point	470 ft on the Colorado River in Clark County
Mean elevation	5,500 feet above sea level
Demographics	
Total population (2022 estimate)	**3,177,772**
Population per square mile (2022)	24.6

[6] U.S. Census Bureau accessed April 10, 2023, https://www.census.gov/quickfacts/fact/table/NV/PST120217#viewtop.

Table 0-6. Nevada Facts[6]	
Population, percent change 2010 to 2017	1.0%
Owner-occupied housing unit rate, 2017-2021	57.8%
Median household income (in 2016 dollars), 2017-2021	$65,686
High school graduates, percent of persons age 25+, 2017 - 2021	88.5%
State Trivia	
State nickname	Silver State, Sagebrush State, Battle-Born State
State slogan	Battle Born
State motto	"All for our country"
State animal	Desert Bighorn Sheep *(Ovis canadensis nelsoni)*
State bird	Mountain bluebird *(Sialia currucoides)*
State fish	Lahontan cutthroat trout *(Salmo clarki henshawi)*
State flower	Sagebrush *(Artemisia tridentate)*
State fossil	Ichthyosaur *(Shonisaurus)*
State grass	Indian rice grass *(Oryzopsis hymenoides)*
State reptile	Desert tortoise *(Gopherus agassizii)*
State trees	The Single-leaf pinon *(Pinus monophylla)* **a**nd the Bristlecone Pine *(Pinus aristata)*
State rock	Sandstone
State precious gemstone	Virgin Valley black fire opal
State colors	Silver and blue
State metal	Silver

Section 1

This Section provides an overview of the Disaster Mitigation Act of 2000 (DMA 2000; Public Law 106-390), the adoption of the *State of Nevada Enhanced Hazard Mitigation Plan* (NEHMP) by the State of Nevada, and assurances to amend the NEHMP to reflect changes in federal laws and regulations.

1.1 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 et seq.) by repealing the act's previous Mitigation Planning Section (409) and replacing it with a new Mitigation Planning Section (322).

To implement the DMA 2000 planning requirements, the Federal Emergency Management Agency (FEMA) published an Interim Final Rule in the *Federal Register* on February 26, 2002 (FEMA 2002a). This rule (44 code of Federal Regulations [CFR] part 201) established the mitigation planning requirements for states, tribes, and local communities. The planning requirements are described in detail in Section 2 and identified in their appropriate sections throughout the plan.

This Plan complies with mitigation planning requirements as authorized under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288; 42 United States Code [U.S.C.] 5121 et seq.), as amended by the Disaster Mitigation Act of 2000; National Flood Insurance Act of 1968, as amended (42 U.S.C. 4001 et seq.); 44 CFR Part 77 Flood Mitigation Grants; 44 CFR Part 201 Mitigation Planning; and 44 CFR Part 206, Subpart N Hazard Mitigation Grant Program, § 206.434. Eligibility.

1.2 PLAN ADOPTION PROCEDURES

The requirements for the adoption of the NEHMP by the State of Nevada, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S19. Did the state provide documentation that the plan has been formally adopted? [44 CFR §201.4(c)(6)][7]	a. The state must provide documentation of formal adoption by the highest elected official or designee prior to FEMA approval. Documentation of formal adoption may be a resolution or other mechanism. After FEMA has determined that all plan requirements have been met, including receipt of the formal adoption documentation, FEMA will provide a letter indicating the plan is approved. See Appendix A, Standard Submission and Review Procedures. ***Highest elected official or designee*** means a senior state official with authority to commit the various state agencies responsible for implementing the mitigation actions identified in the plan.

[7] 44 CFR §201.4(c)(6): "A Plan Adoption Process. The plan must be formally adopted by the State prior to submittal to us for final review and approval."

ELEMENT	REQUIREMENTS
S20. Did the state provide assurances? [44 CFR §201.4(c)(7)]	a. The plan must include assurances that the state will manage and administer FEMA funding in accordance with applicable federal statutes and regulations. For example, reporting requirements include, but are not limited to, submitting quarterly financial and performance reports on time. b. The plan must include assurances that the state will update its plan whenever necessary to reflect changes in state or federal laws and statutes. For information about consequences of failure to comply with applicable federal statutes and regulations, see Appendix A, Standard Submission and Review Procedures.

Upon completion, the Nevada Hazard Mitigation Working Group (NHMWG) will forward the plan to FEMA for final approval through the Nevada Division of Emergency Management (Nevada DEM). The Governor of the State of Nevada will adopt the plan upon approval by FEMA. The Nevada DEM will immediately forward the adoption documentation to FEMA. The Governor's adoption resolution for the 2018 plan is in Appendix A. A similar document will be prepared and completed to adopt the 2023 plan.

The Nevada HMP meets the requirements of Section 409 of the Stafford Act and Section 322 of the DMA 2000. This includes meeting the requirement that the Nevada HMP is adopted by the State. The State plan was prepared by the NHMWG, with participation from various State and Local agencies, and other organizations listed in Section 2.

1.2.1 State Authority

The Governor of the State of Nevada has broad powers over emergency management within the State of Nevada under Chapter 414 of the Nevada Revised Statutes (NRS). Under these powers, he has the obligation to ensure that an emergency management plan is prepared for the entire State, to ensure its proper implementation and to ensure compliance with all State and Federal laws pertaining to emergency management, which would include mitigation issues. The Nevada DEM is the lead agency for compliance and implementation.

1.2.2 Nevada Revised Statutes

The Nevada Revised Statutes (NRS) are the current codified laws of the State of Nevada and are a compilation of all legislation passed by the Nevada Legislature. In **NRS 220.110, the Nevada Revised Statutes** shall contain the following items:[8]

1. The Constitution of the United States.
2. The Constitution of the State of Nevada.
3. The laws of this state of general application.
4. A full and accurate index of the statute laws.
5. Such annotations, historical notes, Supreme Court and district court rules, and other information as the Legislative Counsel deems appropriate to include.

Table 1-1 below provides a summary of information on specific statutes that promote hazard mitigation on the state level. These statutes can be found at the following link: http://www.leg.state.nv.us/NRS/Index.cfm.

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation

NRS Statute	Summary
NRS Chapter 205	This chapter is titled "Crimes Against Property," which includes arson.
NRS Chapter 206	Chapter 206 is titled "Malicious Mischief," and includes crimes to public and private property.
NRS Chapter 239C & NRS Section 239C.010	Chapter 239C is Nevada's Homeland Security legislation, which provides plans to respond to terrorism and related emergencies. Also, it promotes statewide preparations for acts of cyber-terrorism, environmental catastrophes, and other related incidents.
NRS Chapter 268 & NRS Section 268.012	This Chapter and section give the cities of the State authority to adopt uniform building, plumbing and electrical codes.
NRS Chapter 278 & NRS Section 278.02521	This Chapter provides direction in land use planning for the protection of environmentally sensitive areas and development where there are sufficient resources and water to accommodate such development and to promote the efficient use of land in urban areas along with conversion of rural lands to other uses as appropriate.

[8] [Part 2:304:1951; A 1953, 388]—(NRS A 1963, 1022; 1969, 12; 2021, 220)

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Section 278.580(6)(a-b)	This Section mandates that a governing body shall amend its building codes to include seismic provision of the International Building Code and the standards for the investigation of hazards relating to seismic activity including, without limitation, potential surface ruptures and liquefaction.
NRS Section 321.5977	This Chapter provides objectives in administering Public lands under NRS Chapter 321 – State Public Lands.
NRS Sections 321.640 – 321.770	NRS Sections 321.650 through 321.770 contain State land use planning – laws to govern growth and use of lands which could impact emergencies.
NRS Chapter 322	This Chapter provides direction in the Use of State Lands – those lands that belong to the State and the governing of them.
NRS Chapter 323	This Chapter is the State of Nevada's adoption of the "Taylor Grazing Act" which facilitates that law within our State.
NRS Chapter 324	This Chapter is the State of Nevada's adoption of the principles in the "Carey Act" – which regulates the use of water, particularly the capturing of water in dams, for irrigation and the reclamation aspects of such water projects as governed by the Bureau of Land Management.
NRS Chapter 341 & NRS Section 341.087	Chapter 341 pertains to the construction of state facilities. The Legislature has also mandated the state Public Works Board to adopt the seismic provisions of the International Building Code and the standards for the investigation of hazards relating to seismic activity, including, without limitation, potential surface ruptures and liquefaction.
NRS Section 353.2735	Chapter 353 creates and administers the Disaster Relief Account. The account is used to stabilize the operation of the State Government, including local jurisdictions, from an emergency/disaster.
NRS Sections 410.095 - 410.210	NRS Sections 410.095 through 410.210 contain the regulation and restriction of landfills, garbage dumps and junkyards.
NRS Section 414.040	Under this Chapter, the Chief of the Division of Emergency Management has the authority and power to develop an integrated process for the mitigation of, response to and recovery from emergencies or disasters through the various governmental agencies, business and industry, volunteer organizations and any other interested parties.

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Section 414.060 (3)(b)	The Governor may prepare a comprehensive state emergency management plan and develop a program for emergency management in this state to be integrated into and coordinated with the plans of the Federal Government and of other states for emergency management to the fullest possible extent, and coordinate the preparation of plans and programs for emergency management by the political subdivisions of this state to be integrated into and coordinated with the plan and program of this state to the fullest possible extent.
NRS Section 414.135	The Section describes the Emergency Assistance Account. This account is to provide supplemental emergency assistance to the State of Nevada or to its local governments impacted by an emergency and/or disaster.
NRS Chapter 415	This Chapter contains the Emergency Management Assistance Compact. "The purpose of this Compact is to provide for mutual assistance between the States entering into this Compact in managing any emergency or disaster that is duly declared by the Governor of the affected State(s), whether arising from natural disaster, technological hazard, man-made disaster, civil emergency aspects of resources shortages, community disorders, insurgency, or enemy attack." It also provides for mutual cooperation in emergency exercises, testing, and training.
NRS Chapter 416	This Chapter is about Emergencies Concerning Water or Energy. In NRS Section 416.010, "the purpose of this chapter is to meet effectively water and energy emergencies by providing for conservation, efficient utilization, production and allocation of water and energy in ways which will: 1. Carry out as necessary, national water and energy policies under federal water and energy laws; 2. Maintain vital services necessary for the peace, health, safety and welfare of the people of this state; 3. Promote the most efficient use of water and energy; 4. Lessen adverse impacts upon employment in and the economy and environment of this state; 5. Ensure to the extent reasonably possible equitable treatment of all regions of the State and all sectors of the economy, consistent with other necessary considerations; and 6. Promote and protect the interests of this state in the course of decisions to be made and actions to be taken under federal water and energy laws. (Added to NRS by 1977, 548)"

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Chapter 441A	This Section deals with Infectious Diseases (a communicable disease is a disease which is caused by a specific infectious agent or its toxic products, and which can be transmitted, either directly or indirectly, from a reservoir of infectious agents to a susceptible host organism), Emergency Isolation or Quarantine of humans, and Enforcement of quarantines.
NRS Chapter 444A	This Chapter contains programs for recycling and the regulation of disposal of solid waste and other waste.
NRS Chapter 445A	This Chapter contains Water Controls – laws to protect the Lake Tahoe Watershed, to prevent water pollution and to regulate the fluoridation of water supplies.
NRS Chapter 445B	This Chapter deals with Air Pollution – laws for control of and administration of all aspects of prevention of air pollution – the creation of the State Environmental Commission.
NRS Chapter 445C	This Chapter contains environmental requirements, penalties for violations and the administration and enforcement of such requirements.
NRS Chapter 445D	This Chapter contains environmental covenants that attach to real property – governed by the Nevada Department of Natural Resources and Conservation.
NRS Chapter 455	This Chapter contains the control and restriction of excavations and high voltage lines.
NRS Section 459	This Chapter is concerned with hazardous materials and contains the Western Interstate Nuclear Compact, of which Nevada is a member State. It provides for the development of nuclear related fields for economic development of the Western States with provisions for the cooperation of party states in the response to and mitigation of a nuclear incident in any of the member states and to recommend changes to laws, regulations, ordinances, administrative procedures, and practices to facilitate safe and secure usage of nuclear technologies.
NRS Sections 459.010-370	The Nevada Legislature in NRS 459.001 adopted the Western Interstate Nuclear Compact making Nevada a participating state in this compact. It is the purpose of this compact to provide the instruments and framework for such a cooperative effort in nuclear and related fields, to enhance the economy of the West and contribute to the individual and community well-being of the region's people. Sections 010-290 include the State Control of Radiation and 300-370 contain Regulation of Mills and By-Products.

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Sections 459.0085- 0098	NRS Sections 459.0085 through 459.0098 contain the creation, duties, and powers of the Committee on High-Level Radioactive Waste. These sections empower the Committee to study and evaluate: Information and polices regarding the location in the State of Nevada of a facility for the disposal of high-level radioactive waste; Any potentially adverse effects from the construction and operation of a facility and the ways of mitigating those effects; and Any other policies relating to the disposal of high-level radioactive waste.
NRS Sections 459.380-930	The remainder of Chapter 459 of the NRS (Sections 459.380 through 459.930) provides for the regulation of, storage of and transportation of hazardous materials within the State. These laws proved for the response to, the mitigation of and recovery from hazardous material releases.
NRS Section 461.170	The Nevada Legislature has adopted by statute, for the purposes of manufactured buildings, "…the adoption by regulation nationally recognized codes and standards for the construction of factory-built housing, manufactured buildings and modular components."[9]
NRS Chapter 472	This Chapter gives the State Forester Fire Warden authority over the development of, mitigation of and prevention of fires within the state's forested areas by establishing fire control districts, adopting, and enforcing regulations regarding standards for fire retardant roofing and administering monies appropriated and grants awarded for fire prevention, control, and the education of fire personnel for these purposes. Establishment and preservation of forest and vegetation cover in forest and watershed.
NRS Chapter 475	This Chapter entitled "Crimes and Responsibilities Concerning Fires" details penalties for neglecting or causing fires on one's own property or the property of another.
NRS Chapter 476	This Chapter entitled "Explosives and Inflammable Materials" details the penalties for misuse of these materials.
NRS Chapter 477	This Chapter of the NRS governs the State Fire Marshal's Office and its duties and powers. These laws provide for the proper regulation of and enforcement of existing laws, which govern the prevention of mitigation of and recovery from fires within this State. Particularly, the State Fire Marshal makes recommendations for changes to building codes and existing structures to ensure fire safety.
NRS Chapter 486A	This Chapter provides provisions for alternative fuels and clean-burning fuels.
NRS Chapter 506	This Chapter is the Wildlife Violator Compact – a compact among the states to aid wildlife management as a trust by the state for all residents and visitors.

[9] Added to NRS by 1971, 1312; A 1979, 1220; 1985, 373; 1993, 232; 1999, 928; 2007, 385

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Section 514.040(3)	The Nevada Bureau of Mines and Geology, established by the Legislature and given as one of its duties: ". . . to apply geologic engineering principles to problems of conservation, environment, construction, mineral industry and other scientific matters that may be of importance to the welfare of the State."
NRS Chapter 519A	This chapter governs the reclamation of land subject to mining operations and exploration projects.
NRS Sections 522.039-522.040	Sections 522.039 and 522.049 regulate oil and gas drilling to prevent waste.
NRS Chapter 527	This Chapter titled "Protection and Preservation of Timbered Lands, Trees and Flora" describes the protection and preservation measures for Nevada's trees and flora. In addition, it describes measures taken for controlled burns.
NRS Chapter 528	This Chapter regulates forest practice and reforestation.
NRS Chapter 534	This Chapter regulates underground water and depletion of aquifers.
NRS Section 535.030	This section covers dam inspections and the State Engineer's powers to protect life and property by lowering the water level in the reservoir, emptying the reservoir, or any other step to essential to safeguarding life and property.
NRS Chapters 540 -540A	Chapters 540 and 540A provide planning and development of water resources and the regional planning and management of water resources.
NRS Chapter 541	This Chapter creates Water Conservancy Districts for wise water management.
NRS Chapter 543 & NRS Section 543.020	This Chapter is dedicated to flood control. The declaration of the policy being adopted states: " It is hereby declared to be the policy of the State of Nevada to cooperate with the United States and its departments and agencies, and with the counties, cities and public districts of the State, in preventing loss of life and property, disruption of commerce, interruption of transportation and communication and waste of water resulting from floods, and in furthering the conservation, development, utilization and disposal of water."[10]
NRS Chapter 548	This Chapter regulates agricultural lands to preserve and conserve the natural resources of this State.
NRS Chapter 555	This Chapter provides the Director of the Department of Agriculture with the powers to control insects, pests, and noxious weeds.
NRS Chapter 568	This Chapter regulates the grazing and ranging of lands within the State of Nevada.

[10] Added to NRS by 1960, 56

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Chapter 571	This Chapter defines the State Quarantine Officer and provides the Officer power to proclaim and enforce quarantine. This Chapter also adopts the rules and regulations of the federal Secretary of Agriculture relating to control and suppression of disease in animals.
NRS Chapter 701	This Chapter provides for the Office of Energy (under the Governor), which regulates energy resources and energy conservation and encourages renewable energy.
NRS Chapters 703 – 704	Chapters 703 and 704 provide for the regulation of public utilities by the Public Utilities Commission.
NRS Section 708.120	This Section authorizes the Public Utilities Commission to regulate oil pipelines to prevent waste and dangerous operations.

1.2.3 Legislative Process

The Nevada Legislature meets every odd number year for approximately six months. During this period, the NHMWG may support hazard mitigation-related legislation presented by state agencies, private non-profits (PNPs), businesses and or local jurisdictions. The NHMWG can also present new or modifications to existing hazard mitigation-related legislation

1.2.4 Assurances to Comply with Federal Laws and Regulations

Through the development and enforcement of this plan, the assurances listed in Appendix H are provided as documentation that the state or any subsequent sub-grantee will continue to comply with all applicable Federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 CFR 201.3(c), and will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 201.4 (d) and 44 CFR 201.5 (c).

Section 2

This Section provides an overview of the planning process; identifies the NHMWG members; documents public outreach efforts; and summarizes the review and incorporation of existing plans, studies, and reports used in the development of this NHMP. *The overall planning revision process was the same as in the previous update. Since the 2018 update, efforts have continued to track public education and outreach, and efforts in hazard mitigation were made by Nevada Hazard Mitigation Working Group NHMWG members. The plan continues to document Nevada's participation in the U.S. Army Corps of Engineers' Silver Jackets program.*

2.1 OVERVIEW OF THE PLANNING PROCESS

The requirements for the documentation of the mitigation planning process, as stipulated by the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S1. Does the plan include a description of the process used to develop the plan? [44CFR §§201.4(b) and 201.4(c)(1)][11]	a. The plan must describe the current process used to update the plan, including how the plan was prepared, the schedule or time frame, specific milestones and activities, the agencies and stakeholders who were involved in the process, and if the mitigation planning process was integrated to the maximum extent possible with other state planning efforts. Supporting documentation, such as meeting sign-in sheets and notes, does not need to be included in the plan itself. States are strongly encouraged to retain supporting documentation as a record of how decisions were made and who was involved. ***Agencies and stakeholders*** mean state, local and tribal agencies; colleges and universities; private entities, including private nonprofit organizations; or quasi-governmental authorities and special districts like port authorities or utility districts that perform critical functions.

[11] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."

ELEMENT	REQUIREMENTS
S2. Does the plan describe how the state coordinated with other agencies and stakeholders? [44 CFR §§201.4(b) and 201.4(c)(1)]	a. The plan must describe how the state coordinated with other state agencies and appropriate federal agencies that were involved in the process, and how they were involved in the process. At a minimum, the plan must describe how the state coordinated with other agencies and interested groups, including stakeholders responsible for the following sectors: ▪ Emergency management (including Safety and Security, Hazardous Materials, and Food, Water, Shelter community lifelines). ▪ Economic development. ▪ Land use and development, including the agency or department that regulates building codes. ▪ Housing (including Food, Water, Shelter community lifelines). ▪ Health and social services (including Health and Medical community lifelines). ▪ Infrastructure (including Energy, Communications, Transportation, and Food, Water, Shelter community lifelines). ▪ Natural and cultural resources. In addition to the sectors above, the plan should describe how the state coordinated with agencies and organizations with climate change and climate adaptation expertise, state agencies with programs, policies, and assistance that support underserved communities, and other representatives serving these communities in the mitigation planning process. Where coordination with the agencies and stakeholders representing these sectors is not practicable, the plan must describe the limitations as well as how the state will overcome barriers. These items may be included in the mitigation strategy. ***Involved in the process*** means engaged as participants and given the opportunity to provide meaningful input to affect the plan's content. b. *If the state is interested in HHPD funding eligibility, the planning process must describe how the state agency(ies) responsible for dam safety and other stakeholders participated in the planning process and contributed expertise, data, studies, information, etc. related to high hazard potential dams (see HHPD1 in Section 3.8.).*

2.1.1 How the Updated Plan was Prepared

The NHMWG followed the method for updating the plan presented in Section 6.1.4 of the 2018 NHMP. What follows is a narrative summary of how this was accomplished:
In September of 2020, the NHMWG met to discuss the 2023 Hazard Mitigation Plan (HMP) update and modifications to the hazard profiles documented in Section 3. The Working Group continually provided direction and expertise throughout the update process. The DEM planning team solicited input from other agencies with the expertise needed to address the required State Mitigation Plan Review Guide element revisions for each section. Each section of the plan was reviewed, analyzed, and updated before presentation to the Working Group. The Working Group members would provide input as needed. Members from the planning team presented updated sections to the NHMWG for final approval. Table 2-4 in Section 2.1.4 lists each planning teamwork session and accomplishments.

Proposed updates to sections were emailed to Working Group members prior to quarterly NHMWG meetings and were presented at the meetings where revisions were discussed, and feedback was provided in the weeks following. If no changes were made, the new sections were incorporated into the NEHMP update.

2.1.2 Who Was Involved in the NHMP Update Process

To prepare the 2023 update to NHMP, the NHMWG reevaluated FEMA's State Mitigation Plan Review Guide comments and the Annual Review Questionnaire to identify any stakeholders whose participation would be invaluable to the planning process or to mitigation actions. Based on this review, the DEM planning team drafted a letter of invitation and a list of potential stakeholders to whom the invitation was sent; some responded, and some did not. The resultant NHMWG participating members are listed in Table 2-1. Participation and contributions are documented by the attendance rosters and minutes of each meeting. These items are available upon request.

Table 2-1. NHMWG Members and Alternates (as of July 5, 2023)

Local Government Emergency Management City of North Las Vegas Fire Department **Solome Barton** 4040 Losee Road North Las Vegas, NV 89030 Email: bartons@cityofnorthlasvegas.com	**Land Use Development** Storey County **Kathy Canfield** P.O. Box 176 Virginia City, NV 89440 E-mail: kcanfield@storeycounty.org
Nevada Housing Division **Stephen Aichroth** 1800 E. College Parkway, Suite 200 Carson City, NV 89706 E-mail: saichroth@housing.nv.gov	**Health and Human Services** **Melissa Whipple** Health Program Manager 4150 Technology Way, Suite 200 Carson City, NV 89706 E-mail: mwhipple@health.nv.gov
Nevada Division of Water Resources **Erin Warnock** State Floodplain Manager & NFIP Coordinator 901 South Stewart St., Suite 2002 Carson City, NV 89701 E-mail: ewarnock@water.nv.gov	**Infrastructure** **Vacant**
Subject Matter Expert, Earthquake **Craig dePolo** University of Nevada, Reno Reno, NV Email: eq_dude@sbcglobal.net	**Subject Matter Expert, Wildfire** **Eric Antel** Deputy Administrator Nevada Division of Forestry 901 S. Stewart St., Suite 1001 Carson City, NV 89701 E-Mail: eantel@forestry.nv.gov

Table 2-1. NHMWG Members and Alternates (as of July 5, 2023)	
Subject Matter Expert, Flood **Andrew Trelease (Vice Chair)** Assistant General Manager Clark County Regional Flood Control 600 S. Grand Central Parkway, Suite 300 Las Vegas, NV 89106 E-mail: atrelease@regionalflood.org	**Natural and Cultural Resources** **Ceira Sampson** Reno-Sparks Indian Colony 680 Greenbrae Dr., Ste 228 Sparks, NV 89431 E-mail: csampson@rsic.org
Subject Matter Expert, Pandemic **Faith Beekman** 4150 Technology Way, Suite 200 Carson City, NV 89706 E-mail: fbeekman@health.nv.gov	**Subject Matter Expert, Weather** **Vacant**
NV Division of Emergency Management **Janell Woodward** State Hazard Mitigation Officer 2478 Fairview Drive Carson City, NV 89701 E-mail: janell.woodward@dem.nv.gov	**NV Division of Emergency Management** **Jon Bakkedahl (Chair)** Deputy Administrator 2478 Fairview Drive Carson City, NV 89701 E-mail: j.bakkedahl@dem.nv.gov

The NHMWG followed the Nevada Revised Statutes on Open Meetings in publicly posting scheduled meetings of the NHMWG. Participation from the public in the planning process was also solicited via postings in the online quarterly meeting agendas, on the NHMWG and Nevada DEM websites, and on social media mitigation sites (Facebook, Twitter) maintained by Nevada DEM requesting input and feedback on mitigation issues and activities. A public commenting period was held between June 1, 2023, and June 30, 2023. Public comment was solicited during this period through Nevada DEM social media accounts and elsewhere. There has been no public comment in response to these postings.

All members of the NHMWG participate in a wide variety of other state and public organizations such as the Wildland Urban Interface (WUI) Summit, the State Mapping Advisory Committee (SMAC), Nevada Mining Association (NMA), the State Emergency Response Commission (SERC), Homeland Security Working Group (HSWG), Nevada Hospital Association (NHA), State Public Works Division (SPWD), Nevada Tribal Emergency Coordinating Council (NTECC), Nevada Insurance Council (NIC), and many other educational and civic groups. Through contact with groups such as these, the Working Group members have much contact with the public and hear their concerns about hazard mitigation in many venues and thus can incorporate these concerns into their work on the Working Group. Future efforts will be directed toward reaching the underserved and disadvantaged population meeting with these groups directly for their input regarding hazards.

2.1.3 How Other Agencies Participated in the NHMP Update Process

Other agencies participated by serving as members of the NHMWG and by providing oversight and direction of the update process. When additional information was required to comply with State Mitigation Plan Review Guide elements and recommendations, the Working Group also solicited specific input, expertise, and data from other agencies not represented on the Working Group. Table 2-2 details the contributions of all agencies in the NHMP update process.

Table 2-2. Documentation of Agency Participation in Update Process	
Agency	**Mode of Participation in the Plan Update Process**
Carson City Fire Department	Provides input on WUI fire risks and mitigation strategies to reduce WUI fire risk
Carson City Office of Emergency Management	Provides input on mitigation of Wildland-Urban Interface fires, flooding, earthquake, hazardous materials, etc.
City of Las Vegas Office of Emergency Management	Represents the interests of Clark County's Hazard Mitigation Committee on the State Mitigation Planning Subcommittee.
FEMA Region IX	Provides FEMA guidance to the Subcommittee in revising the NHMP.
National Weather Service - Reno	Provides data on weather-related hazards to aid in the revision and update of the NHMP at quarterly meetings and via email.
Nevada Attorney General's Office	Provides legal counsel to the Subcommittee and language revisions used in the updated plan. Ensures compliance with Nevada Revised Statutes in all updated material in the NHMP.
Nevada Bureau of Mines and Geology	Provides geologic information, editorial and technical assistance, GIS data, and support personnel to the Subcommittee to aid in the revision and update of the NHMP.
Nevada Department of Administration/ Division of Risk Management	Provides insurance, safety, loss prevention and risk management data used to update the NHMP.
Nevada Department of Agriculture	Provides information regarding agriculture and related industries to the Subcommittee for use in updating the NHMP
Nevada Department of Cultural Affairs, State Historical Preservation Office	Provides technical assistance to the Working Group regarding preservation of Nevada's historic and cultural resources. Provides Unreinforced Masonry Building (URM) data regarding historical buildings to the Subcommittee to aid in the revision and update of the NHMP.
Nevada Department of Transportation	Provides leadership and direction to the Working Group in updating the NHMP; identified state transportation-related infrastructure vulnerable to hazards; and updated hazard data tables at quarterly meetings and via email.
Nevada Dept. of Conservation & Natural Resources	Provides data and information to the Working Group for use in updating the NHMP specifically pertinent to infestation, epidemic, flood, Hazmat, wildfire, and other sections. Provides input regarding land use and works with disadvantaged and underserved population with regard to land use and opportunities.
Nevada Dept. of Wildlife	Provides expert input and data on invasive species.

Table 2-2. Documentation of Agency Participation in Update Process	
Nevada Division of Emergency Management	Provides personnel, resources, research, and data used to update the NHMP. Provides a link between FEMA Region IX and the Subcommittee. Provides disaster response and recovery information to the Subcommittee.
Nevada Division of Environmental Protection	Provides the Working Group with input relating to air quality, water quality, and hazardous materials used in updating the NHMP.
Nevada Division of Forestry	Provides input on Wildland Urban Interface (WUI) fire risks, and mitigation strategies to reduce WUI fire risk at quarterly meetings and via email.
Nevada Division of Housing	Provides input on housing for all statewide population including specifically underserved and disadvantaged communities. Provides input on grant and individual housing support available for population.
Nevada Division of Insurance	Provides direction to the Working Group to promote hazard mitigation in the private sector to enhance its benefits to reducing risk at quarterly meetings and via email.
Nevada State Public Works Division	Provides information regarding facilities infrastructure to the Working Group to aid in the revision and update of the NHMP.
Nevada Division of Water Resources	Provides floodplain management data and Repetitive Loss data to the Working Group for use in updating the NHMP. Provided dam inspection data pertinent to dam safety, risks, and mitigation. Provided high hazard dam information.
Nevada Public Agency Insurance Pool	Provides data on Unreinforced Masonry Buildings (URM) data to the Working Group to aid in the revision and update of the NHMP at quarterly meetings.
Nevada State Emergency Response Commission	Provides expertise on hazardous materials profile and permitting in plan updates.
Nevada State Fire Marshal's office	Provides information regarding fire and Hazmat hazard in the state to the Working Group for plan updates.
Nevada State Hospital Association	Provides critical facilities information to the Working Group used to update the NHMP and supports the implementation of mitigation activities in hospitals statewide.
Sierra Avalanche Center	Provides expertise and historical input regarding avalanche hazards.
U. S. Army Corps of Engineers	Provides input on mitigation of flood hazards through frequent meetings and teleconferences with committee members.
U. S. Bureau of Land Management	Provides input on mitigation of Wildland-Urban Interface fires through quarterly meetings.

Table 2-2. Documentation of Agency Participation in Update Process	
U. S. Dept. of Agriculture	Provides data and information to the Working Group for use in updating the NHMP specifically pertinent to infestation, epidemic, Hazmat, wildfire, and other sections through interactions with committee members at a variety of meetings.
U. S. Forest Service	Provides input on mitigation of WUI fires through interaction with Working Group at meetings.
U. S. Geological Survey	Provides input on mitigation of flood and earthquake hazards through interactions with Working Group members at a variety of meetings.
University of Nevada, Reno Dept. of Geological Sciences	Provides geological and historical input on avalanche, tsunami, earthquake, and landslide hazards.
University of Nevada Seismological Laboratory	Provides technological, geological, and historical input on earthquake hazards through interactions with Working Group members at a variety of meetings.
Washoe Tribe (Nevada & California)	Provides information regarding tribal nations to the Working Group for use in updating the NHMP

2.1.4 How the Working Group Achieved the Update of Each Section of the NHMP

The Working Group charged the planning team with specific tasks in reviewing and analyzing each section of the plan. The planning team revised each section accordingly and presented revisions to the Working Group for final review. The contractor presented the planning team's updated sections to the NHMWG for final approval. As part of the update process, local jurisdictional hazard mitigation plans were incorporated into the NHMP as they were approved by FEMA and made available. As hazard and vulnerability assessments became available, these data were incorporated into the NHMP. Table 2-3 documents specific accomplishments of the planning team at each work session and Table 2-4 documents the progress made at NHMWG quarterly meetings.

Table 2-3. Documentation of DEM Planning Team Meetings		
Date	**Update Planning Team Participants**	**What was accomplished**
19 August 2020	Janell Woodward	Grant out funds to NBMG to work on 2023 HMP update.
15 October 2020	Janell Woodward, Rachel Micander	Coordination effort between Nevada DEM and Nevada Bureau of Mines and Geology (NBMG) to establish needs for the 2023 HMP update and HAZUS runs.
31 March 2021	Janell Woodward, Rachel Micander	Devised plan and grant for updating SHMP. Collected other western state plans to garner ideas for expanding mitigation practices

Table 2-3. Documentation of DEM Planning Team Meetings		
13 June 2021	Janell Woodward, Rachel Micander	Continued working on scoping and collecting data/information for the SHMP update. Modified the subject matter review requests to address issues raised by FEMA, including impacts on climate change and listing mitigation projects for all hazards. Reviewed reports and plans to modernize update and engaging in the modified timeline activities for a high-quality completion. Continued providing DEM with outreach and mitigation activities collected via the monthly mitigation surveys.
29 June 2021	Janell Woodward, NHMWG	Overview of mitigation program, mitigation grants, and the hazard mitigation plan.
30 September 2021	Janell Woodward, Rachel Micander, Dr. Craig dePolo	Completed research on the damage from the 2020 Monte Cristo Range earthquake and wrote a paper documenting the damage. The paper is being submitted for review. Reviews are back for the three previous papers, and they have been revised to include the reviewer's comments.
27 September 2021	Janell Woodward, NHMWG	Discussion of State Hazard Mitigation Plan update and grant status update.
14 December 2021	Janell Woodward, Ryan Gerchman, NHMWG	Discussion of State Hazard Mitigation Plan update and grant status update. Discussed approved abbreviations for use with mitigation plans in Nevada.
8 March 2022	Janell Woodward, Ryan Gerchman, NHMWG	Discussion of several of the hazards in section 3 including severe storms, extreme heat, and drought. Also discussed mitigation grants update.
30 August 2022	Janell Woodward, Ryan Gerchman, NHMWG	Discussed drought amendment to state hazard mitigation plan.
12 October 2022	Janell Woodward, Ryan Gerchman, NHMWG	Discussion of COVID HMGP application and ranking. Discussion of state plan update.
14 November 2022	Janell Woodward, Ryan Gerchman	Discussed next steps and timeline.

Table 2-3. Documentation of DEM Planning Team Meetings		
	Randy Brawley	
12 December 2022	Janell Woodward, Ryan Gerchman, Randy Brawley	Discussed FEMA advisory on How to Connect Mitigation Planning and THIRA/SPR for Increased Resilience. Set up documents in Microsoft Teams so sharing. Discussed Bubble chart format for possible use.
10 January 2023	Janell Woodward, Ryan Gerchman, Randy Brawley	Discussed basic editorial reviews. Discussed fresh graphics for all that need to be updated. Obtaining new updated graphics. Discussed earthquake section update. Went over social vulnerability update. Obtaining new maps.
19 January 2023	Janell Woodward, Ryan Gerchman, Randy Brawley, NHMWG	Discussion of BRIC applications and ranking. Discussion of state hazard mitigation plan update and status.
7 February 2023	Janell Woodward, Ryan Gerchman, Randy Brawley	Discussion of annex updates and who would be responsible for those updates. Work was completed.
7 March 2023	Janell Woodward, Ryan Gerchman, Randy Brawley	Discussed timing of meetings and status of section three. Discussed responsibilities and the ranking of hazards and mitigation actions.
5 April 2023	Janell Woodward, Randy Brawley, NHMWG	Worked on HAZUS runs. Completing section 3. Discussed essential facilities. Discussed update of plan with working group. Discussion of Safeguarding Tomorrow Revolving Loan Fund program, working group charter revisions and overall status of the plan with Working Group.
16 May 2023	Janell Woodward, Randy Brawley	Discussed next HMWG meeting and update of remaining sections of the SHMP. Discussed survey to be sent out regarding ranking of hazards.
13 June 2023	Janell Woodward, Randy Brawley	Discussion of HAZUS updates, edits to plan, plan cover page, public comment, remaining needed updates.
10 July 2023	Janell Woodward, Randy Brawley, NHMWG	Final discussion of overall plan, last minute edits and updates to all sections, and submission to FEMA for review and approval.

Table 2-4. NHMWG Meetings	
Meeting Date	**What was accomplished**

Table 2-4. NHMWG Meetings	
June 2021	Initial meeting of the new Hazard Mitigation Working Group
September 2021	Plan update process discussion
December 2021	Discussion of HMP update status to date, process to complete.
March 2022	Reviewed and discussed submitted hazard sections
June 2022	Meeting canceled
August 2022	Presented and discussed Drought amendment to current plan
October 2022	Review and ranking of COVID HMGP subapplications
January 2023	Presented plan update to date.
April 2023	Presented plan update to date.
June 2023	Meeting canceled
July 2023	Presented final draft for approval prior to sending to FEMA.

2.1.5 Which Sections of NHMP Were Revised in the Update Process

Table 2-5 below indicates which sections of the NHMP were revised as part of the 2023 update process and or added to the Plan and when each was approved by NHMWG. Details about specific revisions made to each section or subsection are included in that section and are also described in Table 2-3 above in the Planning Team meeting accomplishments.

Table 2-5. NHMP Revised Sections		
Description	**Updates Made Y/N?**	**Date Approved by NHMWG**
Introduction	Y	
Section Zero - Overview	Y	**7/10/2023**
Section One – Adoption	Y	**7/10/2023**
Section Two – Planning	Y	**7/10/2023**
Section Three – Risk Assessment	Y	**7/10/2023**
Section Four – Mitigation Strategy	Y	**7/10/2023**
Section Five – Local Coordination	Y	**7/10/2023**
Section Six – Plan Maintenance	Y	**7/10/2023**
Section Seven - References	Y	**7/10/2023**
Section Eight – Enhanced Plan	Y	**7/10/2023**
Appendix A - Adoption Resolution Document	Y	**7/10/2023**
Appendix B – NHMWG Charter	Y	**7/10/2023**
Appendix C – Meeting agendas and minutes	Y	**7/10/2023**
Appendix D - NV Admin Code Application for Emergency Assistance	Y	**7/10/2023**
Appendix E – County Ground Motion Maps Maps	N	**7/10/2023**

Table 2-5. NHMP Revised Sections		
Appendix F – List of Dams by County	Y	**7/10/2023**
Appendix G – HAZUS Flood Maps for NV Rivers	Y	**7/10/2023**
Appendix H – Federal and State Assurances	Y	**7/10/2023**
Appendix I – Earthquake Vulnerability County & Statewide	Y	**7/10/2023**
Appendix J – Wildfire Maps: Counties & State-Owned Buildings	Y	**7/10/2023**
Appendix K – Threat and Hazard Identification and Risk Assessment (THIRA) Executive Summary	Y	**7/10/2023**
Appendix L – Mitigation Activities	Y	**7/10/2023**
Appendix M – Public Outreach	Y	**7/10/2023**
Appendix N– Nevada Ditches List & Reno Area Map	Y	**7/10/2023**
Appendix O – State Mitigation Plan Review Guide	Y	**7/10/2023**
Appendix P – Assessment of Drought Resiliency in Rural Northern Nevada	N	**7/10/2023**
Appendix Q – Loss Avoidance Study	Y	**7/10/2023**
Appendix R – Radiological Emergency Response Plan	Y	**7/10/2023**
Appendix S – State of Nevada Mitigation Success Stories	Y	**7/10/2023**

2.2 COORDINATION AMONG AGENCIES

The requirements for coordination among agencies, as stipulated by the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S1. Does the plan describe the process used to develop	a. The plan must describe the current process used to update the plan, including how the plan was prepared, the schedule or time frame, specific milestones and activities, the agencies and stakeholders who were involved in the process, and if the mitigation planning process was integrated to the maximum extent possible with other state planning efforts. Supporting documentation, such as meeting sign-in sheets and notes, does not need to be included in the plan itself. States are strongly encouraged to retain supporting documentation as a record of how decisions were made and who was involved. ***Agencies and stakeholders*** mean state, local and tribal agencies; colleges and universities; private entities, including private nonprofit organizations; or quasi-governmental authorities and special districts like port authorities or utility districts that perform critical functions.

ELEMENT	REQUIREMENTS
the plan?[44CFR §§201.4(b)[12] and (c)(1)][13]	
S2. Does the plan describe how the state coordinated with other agencies and stakeholders? [44 CFR §§201.4(b) and (c)(1)]	a. The plan must describe how the state coordinated with other state agencies and appropriate federal agencies that were involved in the process, and how they were involved in the process. At a minimum, the plan must describe how the state coordinated with other agencies and interested groups, including stakeholders responsible for the following sectors: ▪ Emergency management (including Safety and Security, Hazardous Materials, and Food, Water, Shelter community lifelines). ▪ Economic development. ▪ Land use and development, including the agency or department that regulates building codes. ▪ Housing (including Food, Water, Shelter community lifelines). ▪ Health and social services (including Health and Medical community lifelines). ▪ Infrastructure (including Energy, Communications, Transportation, and Food, Water, Shelter community lifelines). ▪ Natural and cultural resources. In addition to the sectors above, the plan should describe how the state coordinated with agencies and organizations with climate change and climate adaptation expertise, state agencies with programs, policies, and assistance that support underserved communities, and other representatives serving these communities in the mitigation planning process. Where coordination with the agencies and stakeholders representing these sectors is not practicable, the plan must describe the limitations as well as how the state will overcome barriers. These items may be included in the mitigation strategy. ***Involved in the process*** means engaged as participants and given the opportunity to provide meaningful input to affect the plan's content.

[12] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."
[13] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."

ELEMENT	REQUIREMENTS
	b. If the state is interested in HHPD funding eligibility, the planning process must describe how the state agency(ies) responsible for dam safety and other stakeholders participated in the planning process and contributed expertise, data, studies, information, etc. related to high hazard potential dams (see HHPD1 in Section 3.8.).

2.2.1 Involvement of Federal and State Agencies in the Planning Process

State agency personnel who are members of the NHMWG are listed in Table 2-1 in Section 2.1.2. Federal and state agencies that contributed to the update process are listed in Table 2-2 in Section 2.1.3. The composition of the NHMWG adjusts to address compliance with requirements of the plan update process.

In addition to being represented on the NHMWG, Nevada's Tribal nations also work directly with FEMA in their planning process due to increased funding opportunities. The state continues to provide the tribes with technical assistance in their planning as requested.

The WUI is composed of multiple state and federal agencies that include BLM, Nevada Cooperative Extension, USFS, NDF, Nevada DEM, local fire departments, and interested private citizens. The WUI meets regularly to plan an annual summit on WUI fire mitigation issues for businesses and homeowners. Mitigation goals and strategies identified at these summits are then incorporated into both the local and state planning update process.

The NHMWG includes members with expertise in floodplain management including representatives from the Clark County Regional Flood Control District (RFCD), State Floodplain Manager, and Nevada Division of Water Resources (NDWR). They provide flood mitigation and dam safety goals and strategies and review proposed updates to the plan. It also includes members of the NDF with expertise in wildfire mitigation. NDF provides wildfire mitigation goals and strategies and review proposed updates to the plan. The NHMWG also includes members from agencies such as NBMG with expertise in earthquake hazard mitigation who provide mitigation goals and strategies for earthquake hazards and review proposed updates to the plan. Other members include members of State agencies from Housing, Health and Social

Services, Emergency Management, Economic Development, Land Use and Development, Infrastructure, and Natural and Cultural Resources.

2.2.2 Participation of Interested Groups in the Planning Process

Participation of private businesses, PNPs, and other interested parties is documented by their representation in NHMWG, and WUI Summit Committee as described in the previous section. Voluntary Organizations Active in Disasters (VOAD) and Community Organizations Active in Disasters (COAD) are national and local faith-based groups that coordinate with state and federal emergency management agencies in assisting communities in recovering from disasters. The Nevada DEM staff coordinates with these groups and incorporates their concerns into the planning process.

Citizens and interested groups can review the plan on the Nevada DEM website (www.dem.nv.gov) and provide input directly to the SHMO for use in the planning process. Notice is also provided to these groups through Facebook and Twitter.

Additionally, all Working Group meetings are posted according to the Nevada Open Meeting Law and teleconferencing information is noted on the agenda.

Public involvement is considered an important part of the planning process and helps address the needs of our citizenry. The Working Group has determined that public involvement efforts must continue to be a component of the local planning process and counties must bring those local concerns to the state. At the state level, the intent is mainly to keep the public aware of the planning process and to keep it open, accessible, and transparent to anyone who wishes to view it, by posting it online. The NHMWG continue to hold all meetings with a virtual component, to elicit more participation from the public and local officials. These efforts continue to produce much additional public participation and interaction among stakeholders at both the local and state levels. The virtual meeting venues provide valuable opportunities for networking and exchange of information on mitigation resources and concerns regarding local hazards. These NHMWG meetings in the local communities will continue, while funding is available, to provide support for local plan maintenance and development of additional tribal plans.

To encourage more direct public participation in the future plan update process, a PowerPoint presentation on the purpose of the NHMWG and its mitigation program was developed and is available for educational and awareness use in public presentations and speaking engagements across the state.

NHM Working Group members continue to present outreach and awareness activities to other groups, concerned citizens, and the public. This information can be found in Appendix M. These are examples of some of the venues where hazard mitigation information is shared with the public. This is by no means a comprehensive listing of all such activity by NHMWG members.

While there are vacant positions within the NHMWG, the Working Group continues to reach out to and contact individuals specializing in all aspects needed to update the state plan. The Working Group continues to look for additional stakeholders to assist with the planning process.

2.2.3 Changes in Federal and State Coordination

Cooperation among agencies to comply with Federal requirements for hazard mitigation planning has had the added effect of enhancing mutual awareness of the goals and functions of a wide variety of agencies, both federal and state. Working together on the planning and update process has helped members become more cognizant of common goals and opportunities for coordination of efforts in the mitigation planning process at the state level. One example of this

is the increased coordination among the NDWR, NDEP, and Nevada DEM to leverage resources in addressing environmental concerns related to mitigation activities, such as Nevada Clean Water and U.S. Clean Air Act programs. Another example of improved coordination of federal and state agency efforts is the increased cooperation among the entities participating in the WUI Summit meetings. A WUI conference, held by the International Association of Fire Chiefs (IAFC) was held in April 2023, and offered attendees hands-on training and interactive sessions on the challenges of wildland fire. Mitigation staff were able to attend this conference.
For more information about the WUI conference, see https://www.iafc.org/events/wui/about.
This has resulted in both reduced fire risk to homes and businesses and increased awareness of funding opportunities to communities for implementing strategies.
Increased federal and state agency coordination in the planning process has greatly enhanced awareness, cooperation, and the leveraging of resources in the implementation of mitigation strategies.
In 2015, Governor Sandoval established the Nevada Drought Forum. The purpose of the Forum, according to the Department of Conservation and Natural Resources (DCNR), is to "bring together the best minds, managers and all interested stakeholders to assess the drought in Nevada, identify best conservation practices and policy needs, and make recommendations to the Governor regarding next steps." Drought Forum members and partners include a variety of federal, state, and local/regional agencies. For a complete list of members and partners, and to learn more about the Drought Forum, please see: http://dcnr.nv.gov/divisions-boards/nevada-drought-forum/about-the-drought-forum. Drought continues to be an increased concern in Nevada, and a drought working group continues to work together to address these gaps.
The National Oceanic and Atmospheric Administration's (NOAA) Weather Ready Nation (WRN) Ambassador initiative was developed to give their partners a means to show their commitment to being prepared for environmental hazards. Ambassadors help promote the concepts of a WRN by staying weather aware, personal responsibility and setting an example. The initiative is open to the public and private sector. For more information, please see: https://www.weather.gov/wrn/ambassadors.

2.2.4 Silver Jackets Program

Federal agencies, including the U.S. Army Corps of Engineers (USACE), FEMA, the Natural Resources Conservation Service (NRCS), the National Weather Service (NWS), and the U.S. Geological Survey (USGS) are partnering to form a unified forum to address Nevada's flood risk management priorities. Developed at the state level, Nevada DEM and NDWR have formed an active Silver Jackets program (http://silverjackets.nfrmp.us/State-Teams/Nevada) that provides a formal and consistent strategy for an interagency approach to planning and implementing measures to reduce the risks associated with flooding and other natural hazards. The silver jackets have completed various team activities. In 2020, USACE and NDWR partnered together on Dam Safety technical webinars for Non-Corps Dams, which helped raise awareness on how dams play a role in flood risk management and how to properly maintain them. In 2021 a *Flood After Fire Guide for Nevadans* was created to help residents understand the effects of the conditions and how to prepare for them. Between 2021 and 2022, serval projects have been underway including a Watershed University Forum webinar to educate communities about flood risk and best floodplain management practices. Other projects have included the promotion of virtual outreach materials that included school standard curricula to go in conjunction with Story Maps and the Flood Fighter computer game to educate students on the history of flooding and the importance of flood control. Flood Mitigation Funding Opportunities workshops have been held across the state and virtually to educate communities on funds available and the process to apply. Furthermore, a South Fork Dam Floodplain Management plan is in the process of development to serve as an official FMP example for the FEMA HHPD Grant. Involvement from other federal, state, regional, local, and tribal groups within this program will improve and increase flood risk communication with a unified interagency message and help collaboration on flood mitigation, response, and recovery.

2.2.5 Nevada Division of Environmental Protection

The NDEP is the primary state agency charged with coordinating state, federal and private resources to detect, identify, contain, clean up, dispose of, and minimize releases of hazardous substances; and preventing, mitigating, or minimizing the threat of potential releases. To this end, the Environmental Assistance Program (EAP) operates within the NDEP Bureau of Corrective Actions to coordinate hazard mitigation and response activities for various NDEP Bureaus. The Bureaus provide hazard mitigation through both short-term and long-term activities that reduce the cause or occurrence of hazards; reduce exposure to hazards; or reduce effects of hazards. Descriptions of individual NDEP Bureau emergency response and mitigation activities are provided below:

- Bureau of Air Pollution Control (BAPC) - As identified in Section 3.3.19.2 (Identification of Hazardous Materials Releases) in this plan, fixed site facilities are potential sources of hazardous material releases. Currently, the Chemical Accident Prevention Program (CAPP) (housed in the BAPC) requires fixed site facilities handling highly hazardous substances in quantities less than the program threshold quantities, to become subject to CAPP regulatory oversight after having two accidental releases within a 12-month period. Through mitigation plans, CAPP requires these facilities to ensure the safe and adequate handling of hazardous chemicals that are produced used, stored, or handled in the State and explosives that are manufactured for sale in the State.
- Bureau of Mining Regulation and Reclamation (BMRR) - Mining facilities in Nevada are a potential source of hazardous materials release. In response, the BMMR requires robust

monitoring, leak detection, and double containment at Nevada Mining Facilities. Because of this, when releases occur and/or are discovered they tend to be small and easily managed during normal facility operations. Often, the permittee can manage releases with existing staff and equipment, augmented by confirmatory analyses at a Nevada certified third-party laboratory. Additionally, upon closure, BMMR requires each facility to obtain adequate financial assurance to ensure mine facilities are reclaimed and closed for the long-term per the approved Final Permanent Closure Plan and do not pose a future threat to environmental or human health.

- Bureau of Federal Facilities (BFF) – BFF regulates the DOE's environmental restoration and waste management activities at the Nevada National Security Site (NNSS). All NNSS waste and water facilities permitted by BFF and all investigative and corrective actions overseen and regulated by BFF at NNSS, operate under a DOE Emergency Plan Implementing Procedure specific to the permitted facility or regulated activity.
- Bureau of Safe Drinking Water (BSDW) - In accordance with the Code of Federal Regulations, the BSDW requires all drinking water systems in the State to provide an Emergency Response Plan addressing hazard mitigation. Additionally, BSDW coordinates source water protection activities at the local, state, and federal levels, and encourages community-based protection and preventive management strategies to ensure all public drinking water resources are kept safe from future contamination. This program aids public water systems in delineating the areas that are sources of public drinking water, identifies potential contaminant sources within the delineated area, and assesses the water systems' susceptibility to contamination.
- Bureau of Water Pollution Control (BWPC) – Regulates some stormwater discharges from three potential sources: municipal separate storm sewer systems, construction activities, and industrial activities. This permitting mechanism is designed to prevent stormwater runoff from washing harmful pollutants into local surface waters. The benefits of effective stormwater runoff management can include:
    - protection of wetlands and aquatic ecosystems,
    - improved quality of receiving waterbodies,
    - conservation of water resources,
    - protection of public health, and
    - flood control.

2.3 PROGRAM INTEGRATION

ELEMENT	REQUIREMENTS
S1. Does the plan describe the process used to develop the plan?[44CFR §§201.4(b)[14] and (c)(1)][15]	a. The plan must describe the current process used to update the plan, including how the plan was prepared, the schedule or time frame, specific milestones and activities, the agencies and stakeholders who were involved in the process, and if the mitigation planning process was integrated to the maximum extent possible with other state planning efforts. Supporting documentation, such as meeting sign-in sheets and notes, does not need to be included in the plan itself. States are strongly encouraged to retain supporting documentation as a record of how decisions were made and who was involved. ***Agencies and stakeholders*** mean state, local and tribal agencies; colleges and universities; private entities, including private nonprofit organizations; or quasi-governmental authorities and special districts like port authorities or utility districts that perform critical functions.
S2. Does the plan describe how the state coordinated with other agencies and stakeholders? [44 CFR §§201.4(b) and (c)(1)]	a. The plan must describe how the state coordinated with other state agencies and appropriate federal agencies that were involved in the process, and how they were involved in the process. At a minimum, the plan must describe how the state coordinated with other agencies and interested groups, including stakeholders responsible for the following sectors: ▪ Emergency management (including Safety and Security, Hazardous Materials, and Food, Water, Shelter community lifelines). ▪ Economic development. ▪ Land use and development, including the agency or department that regulates building codes. ▪ Housing (including Food, Water, Shelter community lifelines). ▪ Health and social services (including Health and Medical community lifelines). ▪ Infrastructure (including Energy, Communications, Transportation, and Food, Water, Shelter community lifelines). ▪ Natural and cultural resources. In addition to the sectors above, the plan should describe how the state coordinated with agencies and organizations with climate change and climate adaptation expertise, state agencies with programs, policies, and assistance that support underserved communities, and other representatives serving these communities in the mitigation planning process. Where coordination with the agencies and stakeholders representing these sectors is not practicable, the plan must describe the limitations as well as how the state will overcome barriers. These items may be included in the mitigation strategy. ***Involved in the process*** means engaged as participants and given the opportunity to provide meaningful input to affect the plan's content.

[14] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."
[15] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."

ELEMENT	REQUIREMENTS
	b. If the state is interested in HHPD funding eligibility, the planning process must describe how the state agency(ies) responsible for dam safety and other stakeholders participated in the planning process and contributed expertise, data, studies, information, etc. related to high hazard potential dams (see HHPD1 in Section 3.8.).

2.3.1 Integration of Existing Plans

The primary way in which Nevada integrates the State mitigation planning process with other ongoing State planning efforts is by having members of NHMWG who also serve as primary managers of specific programs directly involved in hazard mitigation. Their expertise across a broad spectrum of hazards provides a framework for networking and integration of the NHMP with other ongoing state planning efforts. Specific examples of this mechanism for integration of plans are presented in Table 2-6 below, organized by hazard.

Table 2-6. Integration of the NHMP with other State Planning Efforts

Hazard	Name of plan/website reference	Codes and Regulations	Plan description Mechanism for Integration
All hazards	City Planning	NRS 623 - Architecture, Interior Design and Residential Design	Development Has members in common with NHMWG
All hazards	Community Master Plans	NRS 278.160 – Planning and Zoning	Conservation and Development This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG
All Hazards	County Hazard Mitigation Plans		Risk analysis and mitigation plans of local hazards. This plan's goals and the NHMP's goals are both to reduce losses. Risk assessment data and action items are incorporated into Sections 3 and 4 of this plan. Has members in common with NHMWG
All Hazards	Local Hazard Mitigation Plans		Provide planning and project grants for hazard mitigation**.**

Table 2-6. Integration of the NHMP with other State Planning Efforts			
Hazard	**Name of plan/website reference**	**Codes and Regulations**	**Plan description Mechanism for Integration**
	Reference: http://dem.nv.gov		These plan**'s** goals and the NHMP's goals are both to reduce losses. Have members in common with NHMWG
All Hazards	Nevada Natural Resource Plan Reference: http://dcnr.nv.gov/	NRS 548 – Conservation	Conservation of Nevada's natural resources This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG
All Hazards	Open Space Plan	NRS 376A – Taxes for development of open space land	Development and use for open space land for 20 years**.** This plan's goals and the NHMP's goals are both to reduce losses.
All Hazards	State Comprehensive Emergency Management Plan	NRS 414	This is the over-arching plan for the emergency management program in Nevada. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG.
Climate	State of Nevada Climate Strategy		The State Climate Strategy is an integrated, economy-wide roadmap for the Silver State to accelerate climate action necessary to achieve Nevada's climate goals and capture the health and economic benefits of the clean energy and technology revolution. The Strategy is just the beginning of future climate action in Nevada.
Dam Failure	Nevada Dam Safety Reference: http://water.nv.gov/DamsAndSafetyHome.aspx	NRS 535- Dams and other Obstructions	Promote safe construction and operation of dams and prevent loss of life and property. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG

Table 2-6. Integration of the NHMP with other State Planning Efforts			
Hazard	**Name of plan/website reference**	**Codes and Regulations**	**Plan description Mechanism for Integration**
Drought	Drought Plan -2014 Reference: http://water.nv.gov/programs/planning/NV_Long_Term_Drought_Strategic_Plan.pdf	NRS 540 – Planning and Development of Water Resources	Recording and reporting mechanism for drought management. This plan's goals and the NHMP's goals are both to reduce losses. County emergency managers participate in both this plan and NHMWG.
Drought	Nevada State Water Plan Reference: http://water.nv.gov/programs/planning/stateplan/documents/NV_State_Water_Plan-complete.pdf	NRS 540 – Planning and Development of Water Resources	Framework for water planning and management This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG
Drought	Southern Nevada Water Authority Drought Plan		Sustain and promote water goals in Southern Nevada. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG.
Earthquake	Strategic Plan for Earthquake Safety in Nevada Reference: http://www.nbmg.unr.edu/nesc/NESC_Strategic_Plan/NESC_Strategic_Plan_2013_FINAL.pdf		Goals are to reduce losses due to earthquakes in Nevada. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG.
Earthquake	Nevada Earthquake Risk Mitigation Plan http://www.un-spider.org/sites/default/files/7-Earthquake_Mitigation_Nevada%20Earthquake%20Safety%20Council.pdf		The goal is to reduce losses due to earthquakes in Nevada. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG.

Table 2-6. Integration of the NHMP with other State Planning Efforts			
Hazard	**Name of plan/website reference**	**Codes and Regulations**	**Plan description Mechanism for Integration**
Earthquake	Nevada Resilience Advisory Committee	NRS 414	The goal is to reduce losses due to earthquakes in Nevada. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG.
Flood	Nevada Floodplain Management Program		Monitor and implement the Community Assistance Program, the Flood Mitigation Assistance Program, and the Statewide Flood Management and Mitigation Plan This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG
Flood	Statewide Floodplain Management/Mitigation Planning Reference: http://water.nv.gov/FloodProgramHome.aspx	Floodplain Management Ordinance for Nevada Communities	Minimize public and private losses due to flooding. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG.
Flood	Truckee River Flood Management		"The Living River Plan" This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG.
Wildfire	Community Wildfire Protection Plans (CWPP)		Rating and risk analysis of fire danger in "Communities at Risk" by county This plan's goals and the NHMP's goals are both to reduce losses. Some goals and objectives were carried into this plan. Has members in common with NHMWG

Table 2-6. Integration of the NHMP with other State Planning Efforts			
Hazard	**Name of plan/website reference**	**Codes and Regulations**	**Plan description Mechanism for Integration**
Wildfire	Western Governors Assn. 10-year Comprehensive Strategy and Implementation Plan: National Fire Plan, USFS Reference: http://www.forestsandrangelands.gov/		Agency mitigation and response to wildland fires This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMWG

2.3.2 Implementation of State Mandates at the Local Level

In Nevada, any State mandate approved by the State legislature must also be approved by the county and city governing body before it can be implemented at the local jurisdiction. Counties are required by NRS 278.160 to integrate hazard mitigation actions with planning and development at the local level.

2.3.3 Integration of the NHMP with FEMA Programs and Initiatives

State and local mitigation efforts are enhanced and promoted by FEMA programs nationwide and in Nevada specifically. To apply for FEMA mitigation funding, communities must first develop their own mitigation plans that are consistent with both FEMA programs and initiatives and NHMP guidelines. All counties in Nevada either have approved plans or are in the plan re-write process, some in cooperation with other counties.

Some of the major state-administered FEMA-funded hazard mitigation programs for which communities and tribal entities can qualify by adherence to the NHMP are described in Table 2-7.

Table 2-7. Integration of NEHMP and Local Mitigation Plans with FEMA Mitigation Programs and Initiatives		
Hazard	**Program**	**Mechanism for Integration**
All hazards	Hazard Mitigation Grant Program (HMGP) To provide funds to governments and communities to significantly reduce or permanently eliminate future risk to lives and property from natural hazards. HMGP funds projects identified in the community's hazard mitigation plan and enables the implementation of mitigation measures during the recovery from a disaster.	Parallel goals, objectives, and action items among FEMA programs, NHMP, and local plans

Table 2-7. Integration of NEHMP and Local Mitigation Plans with FEMA Mitigation Programs and Initiatives		
All hazards	HAZUS MH HAZUS-MH is a nationally applicable standardized methodology and software program that uses models to estimate potential losses from earthquakes, floods, and hurricane winds. Estimating losses is essential to decision making at all levels of government, providing a basis for developing mitigation plans and policies, emergency preparedness, and response and recovery planning.	In Nevada, HAZUS is used to generate the potential loss data on which mitigation plans at all levels are based.
All hazards	Pre-Disaster Mitigation Pre-Disaster Mitigation (PDM) is a federal program administered by FEMA, which funds a) local and state mitigation planning to meet the requirements of DMA 2000 and b) mitigation projects.	Parallel goals, objectives, and action items among FEMA programs, NHMP, and local plans.
All hazards	Threat and Hazard Identification and Risk Assessment (THIRA) . Stakeholder Preparedness Review (SPR)	Crosswalk of threats and hazards in Section 3.2.2 of the NEHMP.
Dam failure	National Dam Safety Program (NDSP) This program is a partnership of state and federal agencies with other stakeholders to encourage individual and community responsibility for dam safety. The program includes grant assistance to states, dam safety research and dam safety training.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Earthquake	National Earthquake Hazard Reduction Program (NEHRP) has four basic goals: Promote understanding of earthquakes and their effects. Work to better identify earthquake risk. Improve earthquake-resistant design and construction techniques. Encourage the use of earthquake-safe policies and planning practices	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
All hazards	Building Resilient Infrastructures and Communities (BRIC) BRIC is a federal program administered by FEMA, which funds a) local and state mitigation planning to meet the requirements of DMA 2000 and b) mitigation projects.	Parallel goals, objectives, and action items among FEMA programs, NHMP, and local plans.

Table 2-7. Integration of NEHMP and Local Mitigation Plans with FEMA Mitigation Programs and Initiatives		
Flood	National Flood Insurance Program (NFIP) NFIP enables property owners in participating communities to purchase flood insurance as protection against flood losses, while requiring state and local governments to enforce floodplain management ordinances that reduce future flood damages.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Flood	Community Rating System (CRS) This is a voluntary program recognizing and encouraging community floodplain management activities that exceed the NFIP's minimum standards.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Flood	Cooperating Technical Partners (CTP) This program creates partnerships between FEMA and participating NFIP cooperators having an interest and capability to become more active participants in the FEMA Flood Hazard Mapping Program.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Flood	Flood Map Modernization This federal program provides up-to-date maps to support a flood insurance program that is more closely aligned with actual risk, encourage wise floodplain management, and increase the public's flood hazard awareness. In Nevada, Clark County's flood maps have been updated. All of Washoe County's maps are digitized.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Flood	Flood Mitigation Assistance To implement cost-effective measures that reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP.	Parallel goals, objectives, and action items among FEMA programs, NHMP, and local plans
Flood	Repetitive Flood Claim To reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP that have one or more claim payment(s) for flood damages.	Parallel goals, objectives, and action items among FEMA programs, NHMP, and local plans

Table 2-7. Integration of NEHMP and Local Mitigation Plans with FEMA Mitigation Programs and Initiatives		
Flood	**Severe Repetitive Loss Program** To reduce or eliminate the long-term risk of flood damage to severe repetitive loss properties and the associated drain on the NFIP.	Parallel goals, objectives and action items among FEMA and federal programs, NHMP, and local plans.

Section 3

This Section includes the identification, profiling, and ranking of hazards in the State of Nevada. It documents the process and resources used to assess risk and vulnerability throughout the state resulting in the foundation to build the strategy for mitigation of the identified risks. The Subcommittee ranked the hazards as low, medium, and high risk.

The winter storm and extreme snowfall hazard was renamed to severe storms. The severe storm hazard now encompasses windstorm, winter storms, and extreme snowfall. Revisions were made to several of the hazard profiles to update them with recent events. Naturally occurring asbestos (NOA) was included in the HAZMAT profile to reflect recent discoveries of materials where the substance was present. Terrorism and Weapons of Mass Destruction (WMD) was discussed by the NHMWG. Since these hazards are not natural, the NHMWG determined that they should be removed from this plan update. The Terrorism and WMD hazard profile can be included in the state plan in the future should the Committee decide otherwise. Human-caused hazards, including Hazmat release, cyber-attacks, and others are addressed in the Threat and Hazard Identification and Risk Assessment (THIRA). A single condensed Vulnerability Analysis section for highest-ranked hazards, Earthquake, Flood, and Wildfire is included at the end of Section Three.

The requirements for risk assessment are described below:

ELEMENT	REQUIREMENTS
S7. Was the risk assessment revised to reflect changes in development? [44 CFR §201.4(d)[16]] *	The plan must provide a summary of recent development and potential or projected development in hazard-prone areas based on state and local government risk assessments including, but not limited to the following: a. Changes in land use and the built environment and projected future growth or re-development areas. b. Changes in population demographics that may affect vulnerability to hazard events, including socially vulnerable and underserved communities. c. Changes to the vulnerability of state assets. d. Changes in development that could impact jurisdictions most threatened by the identified hazards based on local risk assessments, including the potential impacts of climate change. *Changes in development* include conditions that may affect jurisdictions risks from and vulnerabilities to hazards, such as changes in land use and development, including infrastructure development, declining populations, projected increases in population, or shifts in the needs of underserved communities or gaps in social equity.

* *44 CFR §201.4(d): "Review and updates. Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Administrator every 5 years."*

[16] 44 CFR 201.4(d), accessed January 31, 2023, https://www.ecfr.gov/current/title-44/chapter-I/subchapter-D/part-201#p-201.4(d).

3.1 OVERVIEW OF RISK ASSESSMENT

A risk assessment requires the collection and analysis of hazard-related data to enable the State to identify and prioritize mitigation actions that will reduce losses from potential hazards. There are five risk assessment steps in the hazard mitigation planning process, as outlined below:

3.1.1 General Use of FEMA's National Risk Index Maps

In order to provide more intuitive products for state, local, and tribal government organizations, the State of Nevada maximized use of FEMA's National Risk Index (NRI) maps. The NRI includes hazards that in 2017 were in at least half of the state hazard mitigation plans or that regional significance (i.e., hurricane). National Risk Index maps provide intuitive representations of the potential loses, vulnerability, and impacts of each hazard that is either present in half of the state hazard mitigation plan or represented regionally significant risks (e.g., tsunami). The calculations use nationally recognized data from myriad data sets to estimate the effect that the hazards have all the way down to the census tract level. This provides greater fidelity than typical county-wide assessments. The National Risk Index was chosen as for several reasons:

- The NRI provides analysis based on standardized, nationally recognized data.
- The NRI is accessible for free to anyone.
- The NRI assesses hazards to a hyper-local level – census tracts.
- The NRI provides an intuitive, GIS-based interface.

According to NRI technical data:

- The general risk calculation is Risk = Likelihood X Consequence
- The National Risk Index calculation applies the general risk calculation as Risk = Expected Annual Loss X Community Risk Factor. The Community Risk Factor is based on a function of Social Vulnerability/Community Resilience. It is important to recognize that the National Risk Index has a vulnerability assessment built in.
- The risk equation behind the Risk Index includes three components: a natural hazards component (Expected Annual Loss), a consequence enhancing component (Social Vulnerability), and a consequence reduction component (Community Resilience).
- The expected annual loss (EAL) is based on Exposure, Annualized Frequency, and Historic Loss Ratio (HLR) factors. It is important to note that the EAL also has vulnerability built in (Exposure) in developing the consequences of each hazard.
    - "Values. Values for Risk and EAL are in units of dollars, representing the community's average economic loss from natural hazards each year. For Social Vulnerability and Community Resilience, values are the index values for the community provided by the source data sets.
    - Scores. Scores represent the national percentile ranking of the community's component value compared to all other communities at the same level (county or Census tract).

- Ratings. Ratings are provided in one of five qualitative categories describing the community's component value in comparison to all other communities at the same level. Rating categories range from "Very Low" to "Very High.""[17]

In summary, the National Risk Index calculations and resulting maps provide hyper-local (census tract) risk estimates that include probability, vulnerability, and consequences. The GIS presentation provides an intuitive tool for governmental organizations to quickly identify regions of greatest risk.

3.1.3 Vulnerability of Jurisdictions

Again, the NRI provides a hyper-local (census tract level) estimate of the dollar value of vulnerability through Exposure. In addition to Exposure maps, Exposure is included in Expected Annual Loss maps. Exposure includes three factors – buildings, population, and agriculture.

- Building exposure value is the dollar value of the buildings exposed to a hazard.
  - The maximum possible building exposure of an area (Census block, Census tract, or county) is its building value as recorded in Hazus 6.0,[21] which provides 2022 valuations of the 2020 Census.[22]
- Population exposure is the estimated number of people exposed to a hazard.
  - The maximum possible population exposure of an area (Census block, Census tract, or county) is its population as recorded in Hazus 6.0.
  - Population loss is monetized whith each fatality or ten injuries is treated as $11.6 million of economic loss (2022 dollars).
- Agriculture exposure value is the dollar value of the crops and livestock determined to be exposed to a hazard.
  - Agriculture exposure is derived from the USDA 2017 Census of Agriculture[23] county-level value of crop and pastureland with 2018 values for the US territories. All dollar values are inflation-adjusted to 2022 dollars.

3.1.2 Vulnerability of State Assets

The three most significant hazards that impact State of Nevada assets are Earthquake, Flood, and Fire. As such, Sections 3.6 and 3.7 provide detailed analysis including 801State of Nevada critical buildings beyond the baseline hazard profiles. Appendix T contains analysis of the vulnerability of State of Nevada critical buildings to hazards based on natural hazards in this section that are included in FEMA's National Risk Index (NRI) assessments. The same 801 State of Nevada critical buildings are analyzed in this appendix as were evaluated in detail for earthquake, flood, and wildfire in Section 3.7. The standard value of $1,150 per square foot replacement value was used for each building to provide a consistent apporcah to vulnerability values across the state. The full table of critical buildings is available on request from DEM.

[17] Federal Emergency Management Agency, "National Risk Index: Technical Documentation, March 2023," accessed September 22, 2023, https://www.fema.gov/sites/default/files/documents/fema_national-risk-index_technical-documentation.pdf.

3.1.4 Hazard Profile Process

Step 1: Identify and Screen Hazards

Hazard identification is the process of recognizing natural and human-caused events that threaten an area. There are two general categories of hazards and one general category of threats – Natural and Technological hazards, and Human-Caused threats:

- Natural hazards result from unexpected or uncontrollable natural events of sufficient magnitude to cause damage.
- Technological hazards are human-related accidents or failures of systems and structures.
- Human-caused threats are intentional actions of adversaries.

Hazards are identified by investigating past history of occurrence of these hazards and by gathering scientific data indicating the likelihood of recurrence of these hazards. 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 initially considered. This screening and categorization process allows us to concentrate efforts on developing mitigation strategies for those hazards categorized as higher risk.

Step 2: Profile Hazards

Hazards are profiled by first collecting data on the location, previous occurrence, and probability of future occurrence of each natural hazard. After these data are collected, each hazard is categorized based on these data. It is helpful in the profiling process to review existing plans and studies and use maps where appropriate.

Step 3: Identify Assets

Assets are defined as population; buildings; critical facilities and infrastructures; economic resources; cultural and environmental resources that may be affected by hazard events.

Step 4: Assess Vulnerabilities

A vulnerability analysis predicts the extent of exposure that may result from a hazard event of a given intensity in a given area. The assessment provides quantitative data that may be used to identify and prioritize potential mitigation measures by allowing the State to focus attention on areas with the greatest risk of damage. In addition to the vulnerabilities identified in the hazard profiles in this section, Appendix T contains analysis of the vulnerability of critical state buildings for which the census tract National Risk Index (NRI) rating is "Relatively High" or "Very High."

Step 5: Analyze Potential Losses

The final stage of the risk assessment process provides a general overview of vulnerable populations, structures, critical facilities, and resources in hazardous areas. This information provides groundwork for decisions about where the mitigation strategies would be most effective. A useful modeling tool to accomplish this is HAZUS, a risk assessment software program developed by FEMA to analyze potential losses from floods, hurricane winds, and earthquakes. HAZUS couples current scientific and engineering data with GIS technology to produce estimates of hazard-related damage before, or after, a disaster occurs. In order to maximize standardization across the nation and consistency across Nevada's planning updates, the State is incorporating FEMA's National Risk Index and the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) and associated Social Vulnerability Themes. Figures 3-1 – 3-10 show the 2018 and 2020 overall census tract-level Social Vulnerability Index and the four Social Vulnerability Theme – Socioeconomic; Household Composition/Disability; Minority/Language; and Housing/Transportation. In general, darker colors represent higher

(worse) vulnerability. The State uses the SVI maps to help determine how it might prioritize mitigation and preparedness projects.

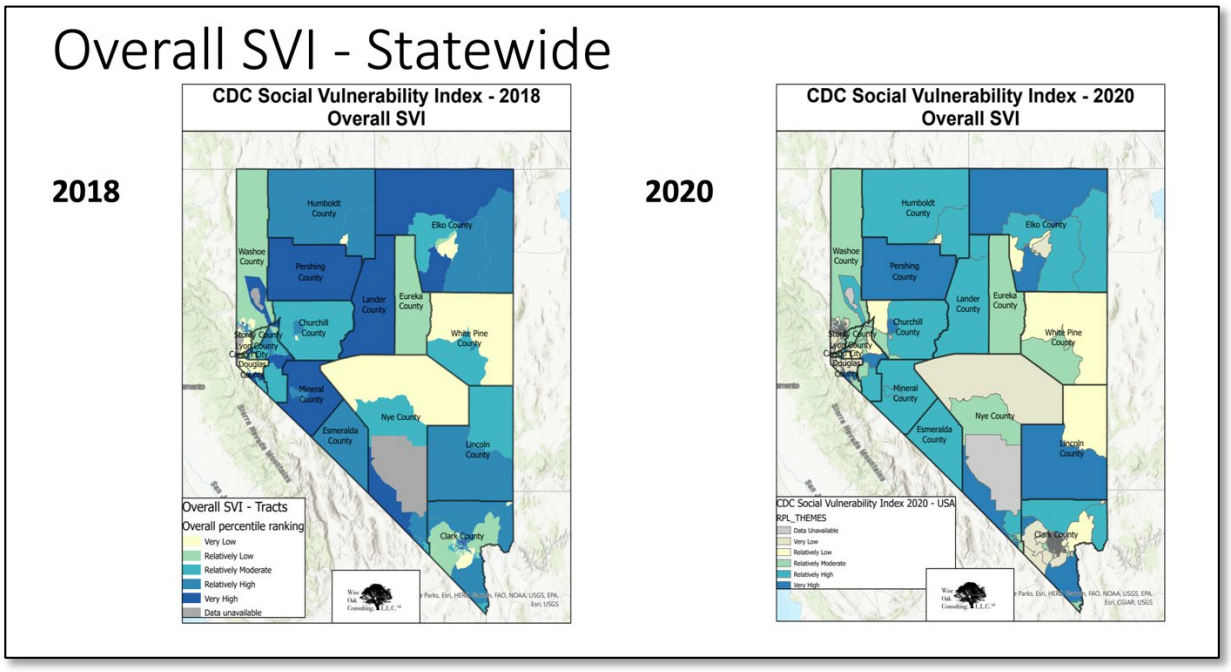


Figure 3-1. 2018 and 2020 Social Vulnerability Indices - Overall, Statewide.

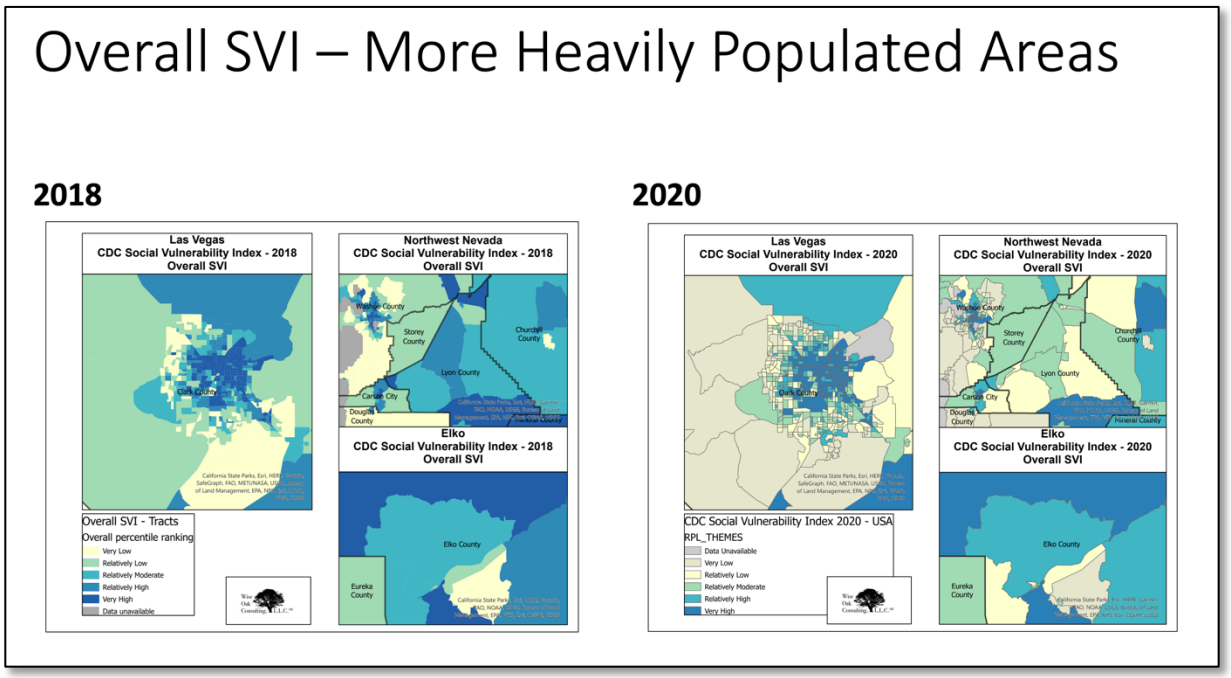


Figure 3-2. 2018 and 2020 Social Vulnerability Indices – More Heavily Populated Areas.

As can be seen in Table 3-1 and 3-02, many census tracts decreased in social vulnerability based on the 2020 census as indicated by lighter coloring. It is important to note that COVID-19 may impact both the overall SVI and SVI themes when data updates are available.

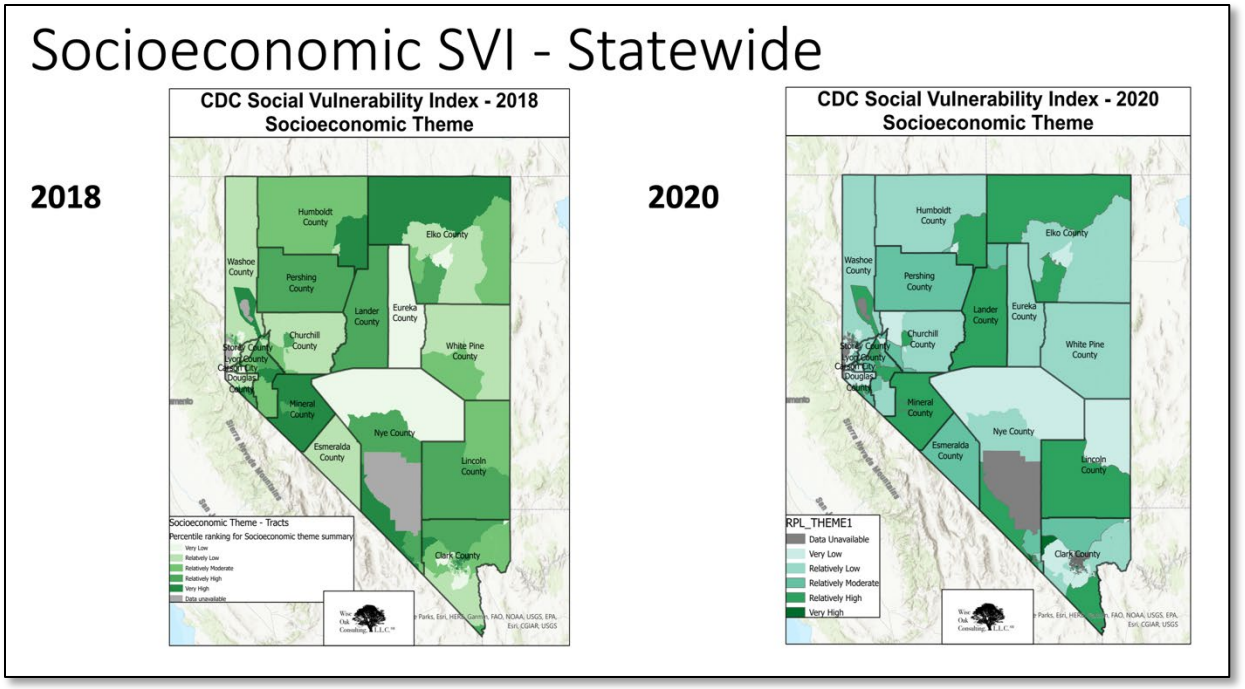


Figure 3-3. 2018 and 2020 SVI Socioeconomic Theme - Statewide.

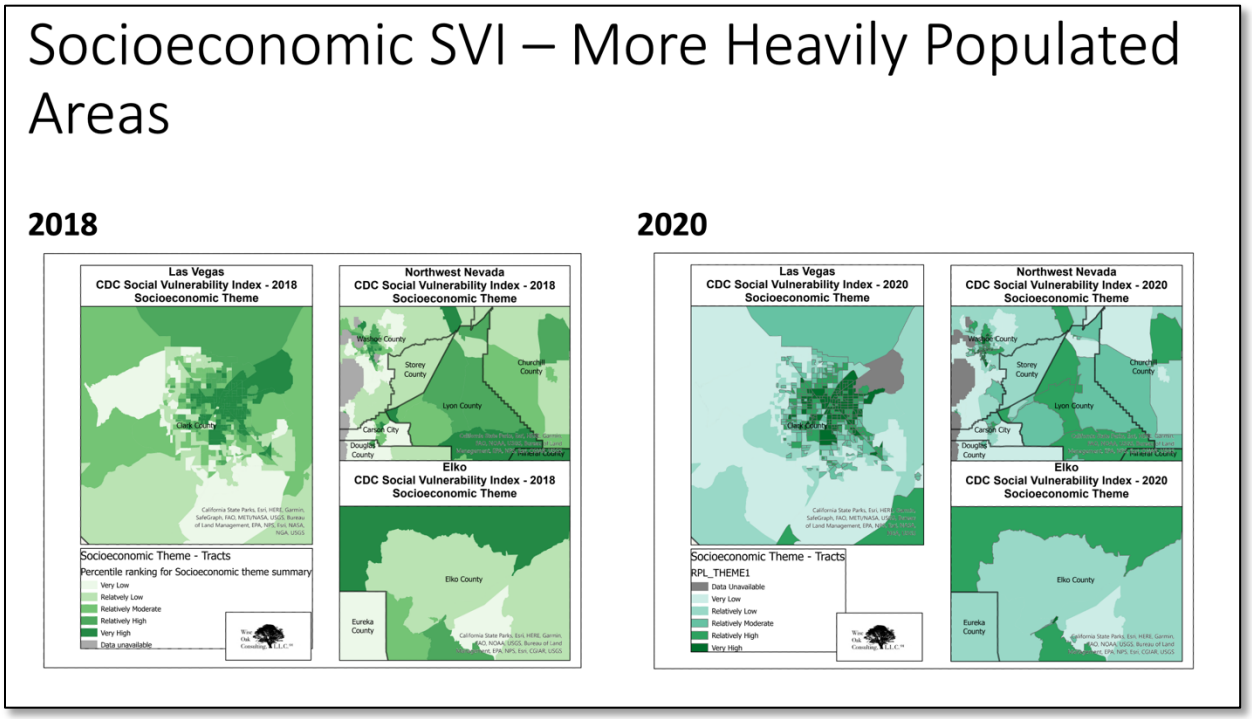


Figure 3-4. 2018 and 2020 SVI Socioeconomic Theme – More Heavily Populated Areas.

Unlike the overall SVI, there was no broad-based improvement or decline in socioeconomic vulnerability across the State (Figures 3-3 and 3-4). While some census tracts improved, others declined. Based on 2021-2022 THIRA/SPR workshops, economic recovery was uneven across the state. Small businesses, in particular, were hampered by national and statewide COVID-19 restrictions and Federal funds to individuals that enabled them to stay out of the workplace.

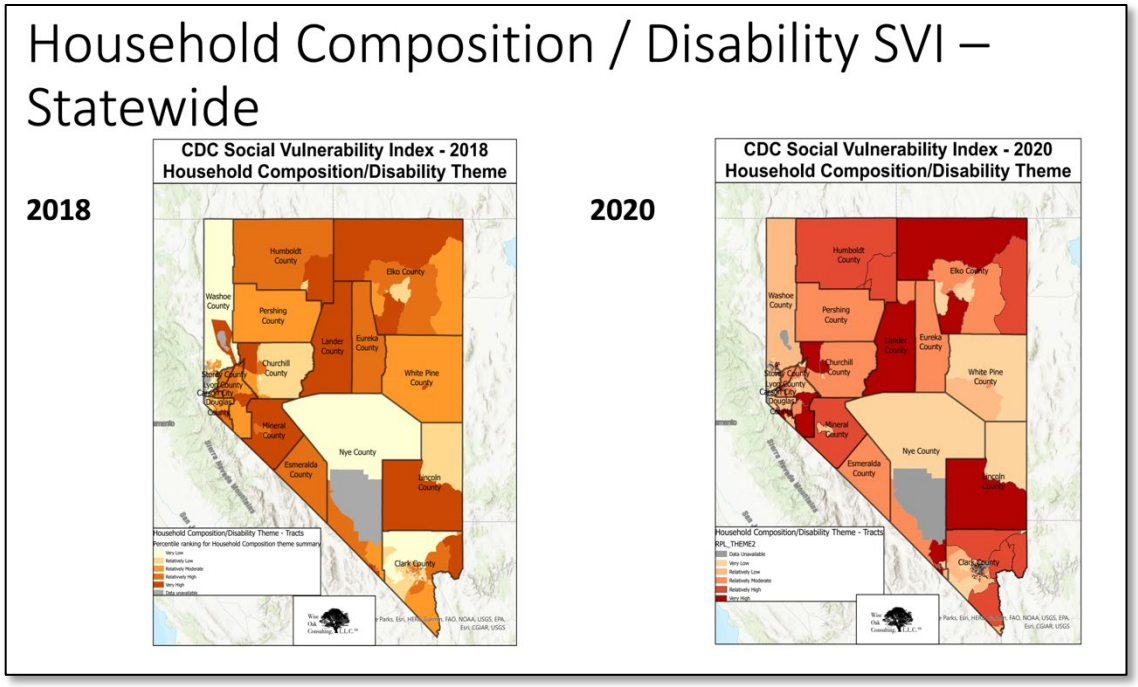


Figure 3-5. 2018 and 2020 SVI Household Composition/Disability Theme – Statewide.

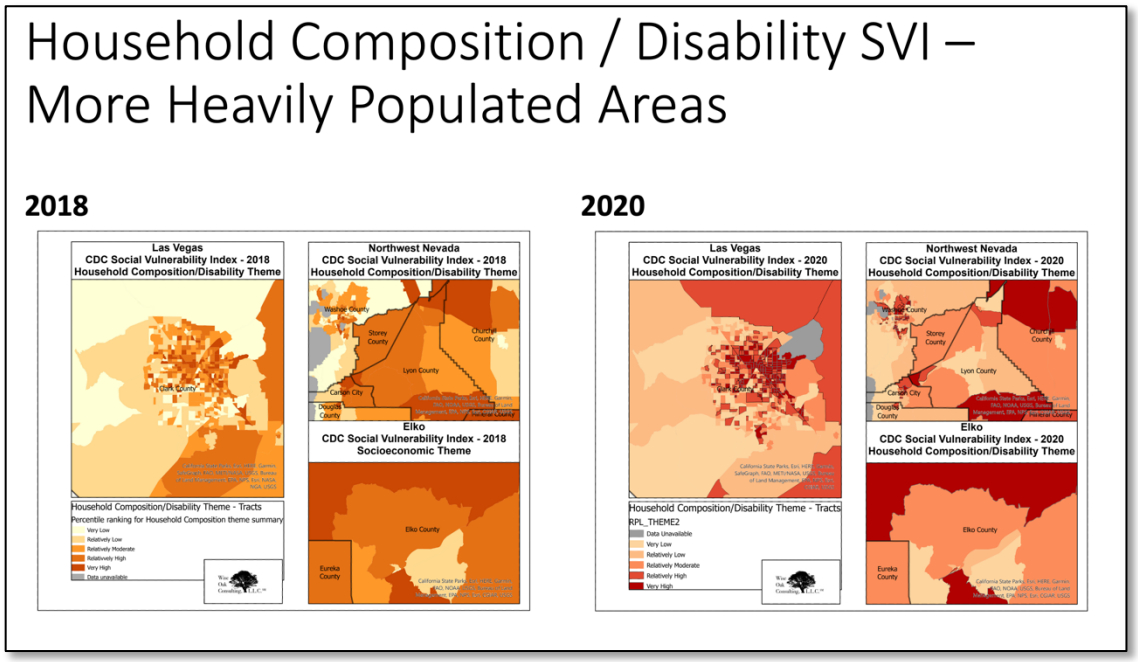


Figure 3-6. 2018 and 2020 SVI Household Composition/Disability Theme – More Heavily Populated Areas.

Similar to the socioeconomic theme, there was no statewide trend in social vulnerability for households with people with disabilities and others with access and functional needs.

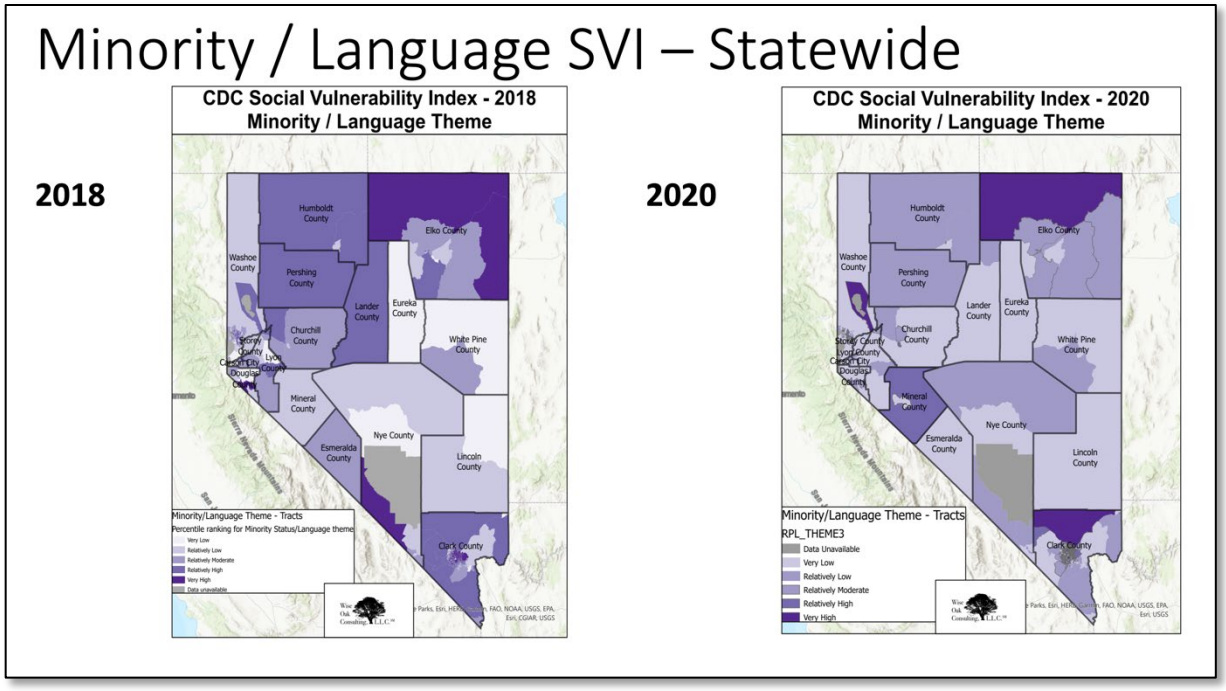


Figure 3-7. 2018 and 2020 SVI Household Minority/Language Theme – Statewide.

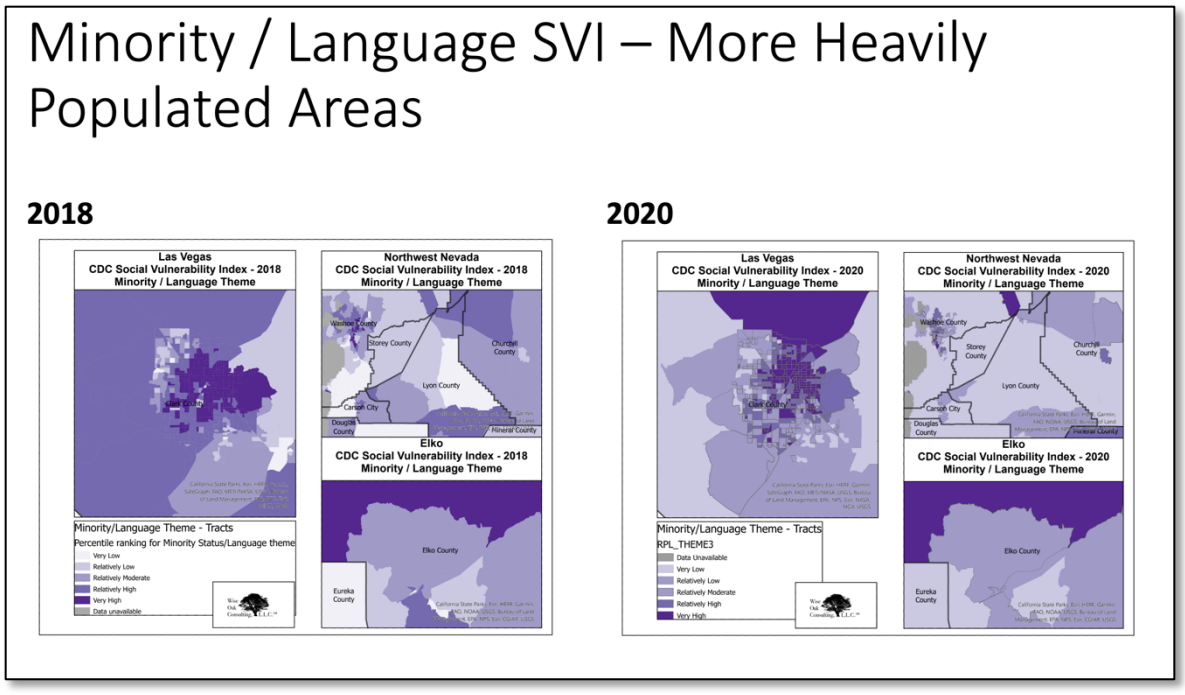


Figure 3-8. 2018 and 2020 SVI Household Minority/Language Theme – More Heavily Populated Areas.

Overall, there was marked improvement in social vulnerability for households with people with minorities and who speak other than English as a primary language at home (Figures 3-07 and 3-08). The general improvement in many census tracts is encouraging since the State's SPR

reflected a great concern for the great increase in numbers of languages being spoken. The 2022 SPR reflected an improvement in Spanish language capabilities across the State.

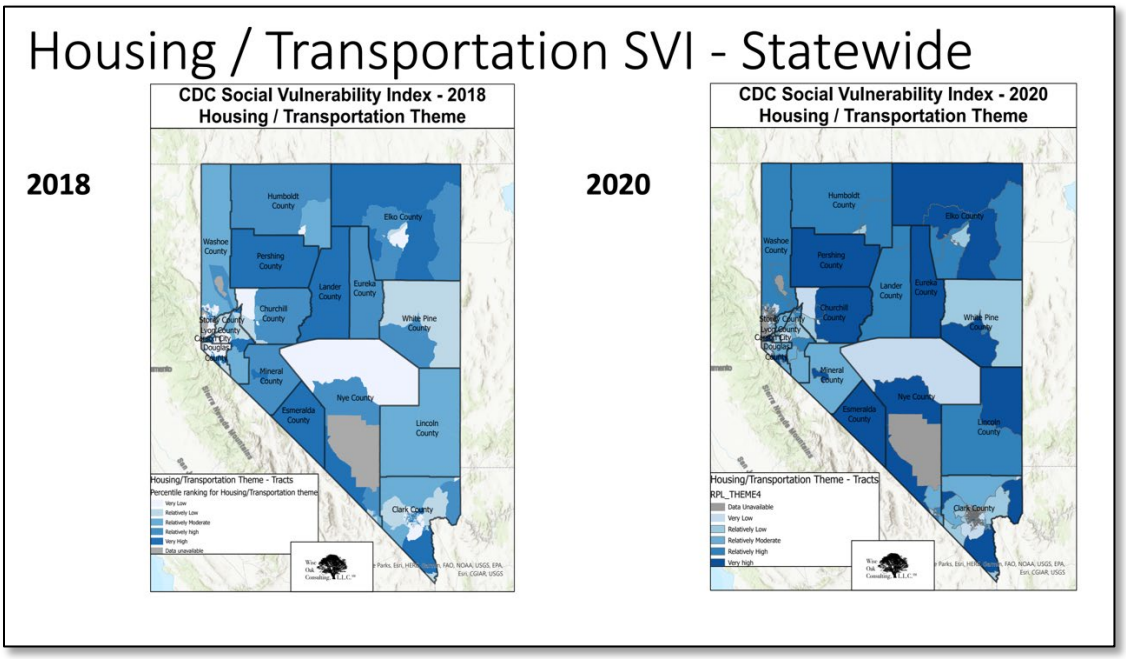


Figure 3-9. 2018 and 2020 SVI Housing/Transportation Theme - Statewide.

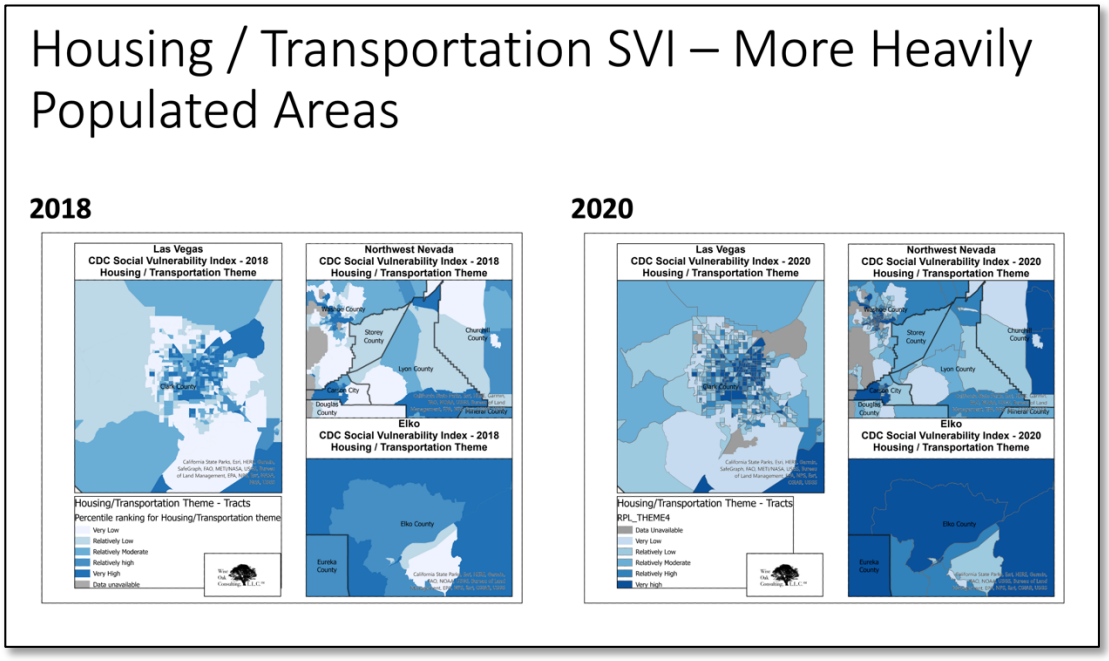


Figure 3-10. 2018 and 2020 SVI Housing/Transportation Theme – More Heavily Populated Areas.

Overall, there was marked deterioration in social vulnerability for housing and transportation. As with communities across the nation, the State of Nevada faces an affordable housing shortage which results in such effects as higher numbers of people in existing households – one of the factors for the Housing/Transportation Theme.

While social vulnerability index trends were often mixed between 2018 and 2020, what is apparent is that certain census blocks have perennially higher social vulnerability. The State of Nevada and its sub-jurisdictions can use this differential to priorities (when able) projects in these tracts to ensure equitable outcomes for all.

Again, the risk equation behind the Risk Index includes social vulnerability and community resilience factors. In addition, the expected annual loss (EAL) also has vulnerability built in (Exposure) in developing the consequences of each hazard. Therefore, every hazard profile that includes NRI information incorporates social vulnerability.

3.2 NEVADA'S RISK ASSESSMENT PROCESS

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

ELEMENT	REQUIREMENTS
S3. Does the risk assessment include an overview of the type and location of all of the natural hazards that can affect the state? [44 CFR § 201.4(c)(2)(i)[18]; FMAG: 44 CFR §204.51(d)(2)[19]]	a. The plan must include a current overview of all natural hazards that can affect the state. In addition to listing the types of hazards, the summary must include the following: 1. Location: Information on where the hazards have occurred or could occur, using maps where appropriate and available. 2. Previous occurrences: Information about when hazards have occurred in the past, including information about the range of observed intensities of these hazards, using maps where appropriate and available. Information about the range of observed and anticipated intensities of the identified hazards are commonly expressed using various scientific scales. For example, the intensity of hurricane wind speeds is measured on the Saffir-Simpson scale, wind speed and damage from tornadoes is measured on the Enhanced Fujita Scale, and the peak ground acceleration indicates intensity of an earthquake.[20] b. *If the state is interested in FMAG program eligibility, the state mitigation plan must identify the state's wildfire hazards (See FMAG1 in Section 3.9 of the State Mitigation Planning Policy Guide).[21] However, note that if wildfire is a commonly recognized hazard in the state, it must be included in the plan regardless of the state's interest in pursuing FMAG grants.[22]* ***Natural hazards*** are sources of harm or difficulty created by meteorological, environmental, or geological events. Natural hazards, such as flooding and earthquakes, affect the built environment, including dams and levees. ***Risk***, for the purpose of hazard mitigation planning, is the potential for damage or loss created by the interaction of natural hazards with assets, such as buildings, infrastructure or natural and cultural resources. The exposure of people and assets to natural hazards can result in disasters, depending on the impacts.

[18] 44 CFR 201.4(c)(2)(i), accessed January 31, 2023, https://www.ecfr.gov/current/title-44/chapter-I/subchapter-D/part-201/section-201.4#p-201.4(c)(2)(i).
[19] 44 CFR 204.51(d)(2), accessed January 31, 2023, https://www.ecfr.gov/current/title-44/chapter-I/subchapter-D/part-204/subpart-D/section-204.51#p-204.51(d)(2).
[20] For more information on describing hazard intensities in the hazard mitigation plan, see the State Mitigation Planning Key Topics Bulletin on Risk Assessment.
[21] Federal Emergency Management Agency, *State Mitigation Planning Policy Guide (FP 302-094-2): Effective April 19, 2023,* 37-38.
[22] 44 CFR § 204.51(d)(2) "As a requirement of receiving funding under a Fire Management Assistance Grant, a State, or Tribal organization, acting as recipient, must: (i) Develop a Mitigation Plan in accordance with 44 CFR Part 201 that addresses wildfire risks and mitigation measures; or (ii) Incorporate wildfire mitigation into the existing Mitigation Plan developed and approved under 44 CFR Part 201 that also addresses wildfire risk and contains a wildfire mitigation strategy and related mitigation initiatives."

	If any commonly recognized hazard(s) that could affect the state is omitted, the state must explain the rationale for not including the hazard(s). This rationale must be based on risk.

3.2.1 Identifying and Screening Hazards

The NHM Working Group reviewed FEMA's listing of hazards to ascertain if any new hazards specific to Nevada were missing from the FEMA list or if any hazards previously removed needed to be reconsidered as pertinent to Nevada. The Subcommittee then used state-specific data, recent occurrence of natural disasters, local plans, and the individual expertise of its members to screen the list for those hazards that should be profiled for Nevada. The data in Table 3-1 below are the result of this screening process. Hazard Type names have been changed since 2018 to match the "Nevada Threats & Hazards Guide." Where applicable, FEMA's National Risk Index (NRI) name is included for reference. This alignment enables greater standardization both across state risk assessment effort and with national analyses. Severe weather hazards (not including winter storms, extreme snowfall, and windstorms) were identified and profiled individually according to their character. While Section 3.2.2 highlights the State of Nevada's Climate Initiative, effects of climate change on individually profiled hazards were discussed where appropriate and included in the profiles. Technological failure and cyber-attacks were discussed by the Subcommittee but were not added to this iteration of the state plan. The NHMWG may develop them further and add them to the next revision/

Table 3-1. Identification and Screening of Hazards Affecting Nevada

Hazard Type	Should it be Profiled?	Explanation
Natural Hazards		
Avalanche	Yes	Avalanches affect a small portion of the State, including: Tahoe, Lee Canyon, and Ruby Mountains.
Coastal storm	No	Nevada is not located in an area prone to coastal storms.
Coastal erosion	No	Nevada is not located in an area prone to coastal erosion.
Drought	Yes	Statewide drought declarations were issued in 2002 and 2004. Governor declared drought proclamation in 2021.
Earthquake (NRI - Earthquake)	Yes	Nevada ranks as the third state in frequency of large earthquakes over the last 150 years.
Expansive Soil	Yes	Expansive soils have caused infrastructure damage in the Reno-Sparks area and around Las Vegas.
Extreme Heat (Formerly "Heat Extreme" (NRI - Heat Wave)	Yes	This hazard can affect areas across the entire state.
Fissures & Subsidence (Formerly "Land subsidence and Ground Failure")	Yes	The southern part of the State is particularly vulnerable to land subsidence due to groundwater extraction. Other parts of the state are also affected by subsidence or more

Table 3-1. Identification and Screening of Hazards Affecting Nevada		
Hazard Type	**Should it be Profiled?**	**Explanation**
		rapid ground failure due to mine dewatering or the presence of underground mine workings adjacent to populated areas.
Floods (NRI - Riverine Flooding)	Yes	Flood damage occurs regularly in Nevada. Flooding may result from rapid snowmelt, thunderstorm-induced flash floods, mudslides, dam failure, or failure of canal walls.
Infectious Diseases (Formerly "Epidemic") (NRI - Pandemic)	Yes	This hazard has caused extreme economic downturns for the State of Nevada, and extensive loss of life.
Infestation	Yes	Infestations impact Nevada's economy through the direct destruction of crops and natural resources as well as indirectly by increasing susceptibility to wildfire.
Landslide & Debris Flow (Formerly "Landslide") (NRI - Landslide)	Yes	In Nevada, rockslides are more common than the normal landslide seen in other areas. They tend to be localized; however, this hazard can occur with earthquakes, major storms, floods, and melting ice and snow.
Seiche (Formerly "Tsunami/Seiche" (NRI - Tsunami)	Yes	Lakes in Nevada could have 10-meter-high waves generated by an earthquake under or adjacent to the lake.
Straight-Line Winds (Formerly under "Severe Storm and Extreme Snowfall")	Yes	All counties in Nevada are susceptible to severe and strong windstorms which have caused property damage.
Thunderstorms & Lightning (Formerly "Hail and Thunderstorm") (NRI - Hail, Lightening, Strong Wind)	Yes	The entire state is susceptible to thunderstorms which may cause localized flooding and wildfire.
Tornado	Yes	Although tornados in Nevada are rare, they do occur.
Winter Storms & Extreme Cold (Formerly "Severe Storm and Extreme Snowfall" (NRI - Winter Weather) (NRI - Ice Storm)	Yes	Normally Nevada can handle winter storms except when these storms are severe. Previous occurrences include extreme precipitation events, snow, and windstorms.
Volcanoes (Formerly "Volcano") (NRI - Volcanic Activity)	Yes	Nevada is downwind from potential volcanic eruptions, most importantly Mammoth Lakes, Mt. Lassen, and Mt. Shasta, California. Major eruptions could cause ashfall in Nevada.
Fire: Wildland Fire & Wildland Urban Interface (Formerly "Wildland Fire")	Yes	The terrain, vegetation and weather conditions in the State of Nevada are favorable for the ignition and rapid spread of wildland fires.

Table 3-1. Identification and Screening of Hazards Affecting Nevada		
Hazard Type	**Should it be Profiled?**	**Explanation**
(NRI - Wildfire)		
Technological Hazards		
Dam Failure (Formerly "Flooding Due to Dam Failure"	Yes	Flood damage occurs regularly in Nevada. Flooding may result from rapid snowmelt, thunderstorm-induced flash floods, mudslides, dam failure, or failure of canal walls.
Flash Floods (Formerly "Flooding Along Irrigation Ditches and Canals")	Yes	Flood damage occurs regularly in Nevada. Flooding may result from rapid snowmelt, thunderstorm-induced flash floods, mudslides, dam failure, or failure of canal walls.
HAZMAT	Yes	All Hazardous Materials events preparedness, planning, response, and mitigation efforts are addressed by the SERC, the State Fire Marshal, and the DCNR. The HAZMAT profile was written with significant input from many Subcommittee members, including NDOT, under whose jurisdiction highway HAZMAT incidents fall.
Human-Caused Threats		
Active Assailant	No	The Committee determined that since this was not a natural hazard or related to natural hazards that it should be removed from this update. These threats have been included in the State THIRA for reference.
Cyberattack	No	The Committee determined that since this was not a natural hazard or related to natural hazards that it should be removed from this update. These threats have been included in the State THIRA for reference.
Terrorism/WMD	No	The Committee determined that since this was not a natural hazard or related to natural hazards that it should be removed from this update. These threats have been included in the State THIRA for reference.

3.2.2 Threat and Hazard Identification and Risk Assessment (THIRA)

New for 2023, the State of Nevada is including information its annual Threat and Hazard Identification and Risk Assessment. While some organizations and/or people may participate in both the THIRA and the hazard mitigation Hazard Identification and Risk Assessment (HIRA) processes, they are two distinct efforts. First, the HIRA is focused on natural hazards while the THIRA fully addresses natural and technological hazards, as well as human-caused threats. Second, the THIRA and HIRA have two different purposes. The outcome of the THIRA is to develop set of targets based on the worst most likely case for each of the National Preparedness Goal's 32 core capabilities (Figure 3-11).[23] Therefore, the THIRA is largely focused on catastrophic scenarios. The HIRA, on the other hand, is focused on a more general assessment of all potential natural hazards – be they catastrophic or not. The State of Nevada is seeking to integrate the THIRA and HIRA into one combined product for future planning efforts. Even

[23] Federal Emergency Management Agency, "Threat and Hazard identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR) Guide: Comprehensive Preparedness Guide (CPG) 201," March 8, 2023, https://www.fema.gov/sites/default/files/2020-04/CPG201Final20180525.pdf.

though they are distinct efforts, the State of Nevada has compared the outcomes of the THIRA and HIRA process in this plan in part to ensure this plan addresses all hazards of concern.

3.2.2.1 Threat and Hazard Identification and Risk Assessment (THIRA) Results

The State of Nevada and the Las Vegas Urban Area Security Initiative (UASI) used the 2018 State of Nevada Enhanced Hazard Mitigation Plan as the baseline for developing their 2019 – 2022 Threat and Hazard Identification and Risk Assessments (THIRA). In developing its 2022 statewide THIRA, Nevada surveyed partners across three regions regarding their threats and hazards of greatest concern as depicted in Table 3-2.

Table 3-2. State of Nevada 2022 THIRA Threats and Hazards of Concern

Northern Nevada	Eastern Nevada	Southern Nevada
Natural Hazards		
Mt. Rose Earthquake	Drought	Drought
Flood	Earthquake	Frenchman Fault Earthquake
Pandemic	Flood	Flood
Festival Severe Weather	Pandemic	Pandemic
Wildfire	Severe Weather – Severe Winds, Thunderstorms, Hail	Wildfire
	Severe Weather – Snowstorm	
	Wildfire	
Technological Hazards		
HAZMAT Release – Rail Tanker Accident	HAZMAT Release – Rail Tanker Accident	HAZMAT Release
	Carlin Tunnel HAZMAT Accident	Utility Interruption – Extreme Heat
	Mining Accident	
Human-Caused Threats		
Active Shooter	Active Shooter	Mass Casualty Attack
Cyberattack - SCADA	Cyberattack	Cyberattack
Cyberattack – Ransomware on Pipeline		Tunnel Poisoning Gas Attack
		Pipeline Attack

Threat / Hazard	Core Capability Whose Target is Determined by the Threat & Hazard					
Earthquake – Frenchman's Fault	Planning	Public Information & Warning	Community Resilience – Building Codes	Critical Transportation - Debris Removal	Economic Recovery	Fire Management & Suppression - Urban
	Health & Social Services	Housing	Infrastructure Systems (4)	Logistics & Supply Chain Management	Mass Care Services – Food & Shelter	Mass Search & Rescue Operations
Earthquake – Mt. Rose	Long-term Vulnerability Reduction	Risk & Disaster Resilience Assessment	Threats & Hazards Identification			
Active Assailant - Reno	Intelligence & Information Sharing	Interdiction & Disruption	Operational Communications	Physical Protective Measures	Risk Management for Protection Programs & Activities	Screening, Search, & Detection
	Situational Assessment					
Active Shooter - Jackpot	Operational Coordination	Fatality Management Services	On-scene Security, Protection, & Law Enforcement	Public Health, Healthcare, & EMS		
Mass Casualty Attack – Las Vegas	Access Control & Identity Verification	Forensics & Attribution				
Wildfire – Ruby Mountains	Critical Transportation - Evacuation	Fire Management & Suppression	Mass Care Services - Relocation			
HAZMAT Accident – Elko Rail	Environmental Response/Health & Safety - Decontamination	Environmental Response/Health & Safety – Clean-Up				
Flood – Northern Nevada	Community Resilience - Outreach	Natural & Cultural Resources				
Cyber Attack – Statewide SCADA	Cybersecurity					
Cyber Attack – Pipeline Ransomware	Supply Chain Integrity & Security					

Figure 3-11. State of Nevada 2022 THIRA Threats and Hazards vs. Core Capabilities.

3.2.2.2 Hazard Mitigation Plan – 2022 THIRA Hazard Crosswalk

Table 3-3 depicts a crosswalk between the State of Nevada's hazards selected to be profiled in this HMP and the worst most likely 2022 THIRA threats and hazards from the three regions – Northern Nevada, Eastern Nevada, and Southern Nevada.

Table 3-3. HMP – 2022 THIRA Crosswalk

HMP Profiled Hazard	HMP Risk	THIRA Threat/Hazard	THIRA Jurisdiction
Natural Hazards			
Avalanche	Low	N/A	
Drought	Medium	Drought	• Eastern Nevada • Southern Nevada
Earthquake	High	• Mt. Rose Earthquake • Earthquake • Frenchman's Fault Earthquake	• Northern Nevada • Eastern Nevada • Southern Nevada
Expansive Soil	Low	N/A	
Floods	High	Flood	• Northern Nevada • Eastern Nevada • Southern Nevada
Extreme Heat	Medium	N/A	
Fissures and Subsidence	Low	N/A	
Infectious Diseases	High	Pandemic	• Northern Nevada • Eastern Nevada • Southern Nevada
Infestation	Low	N/A	
Landslide & Debris Flow	Low	N/A	
Land Subsidence	Low	N/A	
Seiche	Low	N/A	
Straight-Line Winds	Medium	Severe Weather – Severe Winds, Thunderstorms, Hail	• Eastern Nevada
Thunderstorms & Lightning (Hail)	Low	Severe Weather – Severe Winds, Thunderstorms, Hail	• Eastern Nevada
Tornado	Low	N/A	
Volcanoes	Low	N/A	
Wildland Fire & Wildland Urban Interface	High	Wildfire	• Northern Nevada • Eastern Nevada • Southern Nevada
Winter Storms & Extreme Cold	Medium	Severe Weather – Snowstorm	Eastern Nevada
Technological Hazards			
Flooding due to Dam Failure	High	N/A	

Table 3-3. HMP – 2022 THIRA Crosswalk			
HMP Profiled Hazard	**HMP Risk**	**THIRA Threat/Hazard**	**THIRA Jurisdiction**
Flooding along Irrigation Ditches and Canals	High	N/A	
HAZMAT (Not profiled)	Medium	• HAZMAT Release – Rail Tanker Accident • HAZMAT Release – Rail Tanker Accident • Carlin Tunnel HAZMAT Accident • HAZMAT Release	• Northern Nevada • Eastern Nevada • Eastern Nevada • Southern Nevada
N/A	N/A	Mining Accident	Eastern Nevada
N/A	N/A	Utility Interruption – Extreme Heat	Southern Nevada
Human-Caused Threats			
Terrorism/WMD (Not profiled)	N/A	• Active Shooter • Active Shooter • Mass Casualty Attack	• Northern Nevada • Eastern Nevada • Southern Nevada
Terrorism/WMD (Not profiled)	N/A	• Cyberattack – SCADA • Cyberattack – Ransomware on Pipeline • Cyberattack • Cyberattack	• Northern Nevada • Northern Nevada • Eastern Nevada • Southern Nevada
Terrorism/WMD (Not profiled)	N/A	Tunnel Poisoning Gas Attack	Southern Nevada
Terrorism/WMD (Not profiled)	N/A	Pipeline Attack	Southern Nevada

3.2.2 State of Nevada Climate Initiative

> *"The State Climate Strategy is an integrated, economy-wide roadmap for the Silver State to accelerate climate action necessary to achieve Nevada's climate goals and capture the health and economic benefits of the clean energy and technology revolution. The Strategy is just the beginning of future climate action in Nevada. As a living document, the Strategy will be adapted and updated as the impacts of climate change evolve and new climate-friendly technologies become available."*[24]

The State of Nevada Climate Strategy Specifically addresses five natural hazards of greatest concern to the State - Heat & heat Waves; Drought; Loss of Snow; Floods; and Wildfire Risk. While the respective hazard profiles address climate change, the overall impacts across these five hazards of concern are depicted in Figure 3-12.[25]

[24] State of Nevada Climate Initiative, "Nevada's Climate Strategy," March 8, 2023, https://climateaction.nv.gov/our-strategy/.
[25] "Nevada's Climate Strategy."

	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 3-12. Climate Impacts in Nevada.[26]

[26] "Nevada's Climate Strategy."

3.2.3 Prioritization of Hazards

The NHMWG used four criteria to prioritize the hazards likely to affect the State of Nevada. These four criteria are as follows:

- Probability/frequency
- Magnitude/severity (includes economic impact, area affected, and vulnerability)
- Warning time
- Duration of loss of critical facilities and services

The Subcommittee members assigned values of 1 through 5 for each criterion based on the descriptions given in the hazard prioritization criteria in Table 3-4. This allowed the planning team to assign some numerical values to the criteria in order to arrive at the rankings of the screened hazards shown on the Hazard Prioritization Worksheet Results, Table 3-5. Some of the criteria, however, are difficult to quantify numerically and compare so the various expertise of Subcommittee members was relied upon in discussions to finalize rankings of profiled hazards.

Table 3-4. Hazard Prioritization Criteria

Criterion	Value	Category	Description
Probability/Frequency	1	Very Low	Occurs less than once in 1,000 years
	2	Low	Occurs less than once in 100 to once in 1,000 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 10 years
	5	Very High	Occurs more frequently than once in 5 years
Magnitude/ Severity (includes Economic Impact, Area Affected and vulnerability)	1	Very Low	• Negligible property damages (less than 5% of all buildings and infrastructure) • Negligible loss of quality of life • Local emergency response capability is sufficient to manage the hazard
	2	Low	• Slight property damages (5% to 15%) of all buildings and infrastructure) • Slight loss of quality of life • Emergency response capability of the city or surrounding community is sufficient to manage the hazard
	3	Medium	• Moderate property damages (15% to 30% of all buildings and infrastructure) • Some loss of quality of life • Emergency response capability, economic, and geographic effects of the hazard are of sufficient magnitude to involve one or more counties
	4	High	• Moderate property damages (30% to 50% of all buildings and infrastructure) • Moderate loss of quality of life • Emergency response capability, economic, and geographic effects of the hazard are of sufficient magnitude to require state assistance
	5	Very High	• Property damages to greater than 50% of all buildings and infrastructure. • Significant loss of quality of life • Emergency response capability, economic, and geographic effects of the hazard are of sufficient magnitude to require federal assistance

Table 3-4. Hazard Prioritization Criteria			
Criterion	**Value**	**Category**	**Description**
Warning Time	1	Very Low	> 48hrs
	2	Low	24 to 48 hrs.
	3	Medium	12 -24 hrs.
	4	High	12 - 6 hrs.
	5	Very High	<6 hrs.
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

Table 3-5. Hazard Prioritization Worksheet Results						
Hazard	Probability / Frequency (1 to 5)	Magnitude / Severity (1 to 5)	Warning Time (1 to 5)	Duration (1 to 5)	**Overall Total**	**Rank**
Totals from subcommittee members						
Natural Hazards						
Avalanche	31	18	34	10	**93**	**6**
Drought	28	22	13	30	**93**	**6**
Earthquake	37	34	38	34	**143**	**1**
Expansive soil	21	11	16	11	**59**	**19**
Floods	38	31	26	31	**126**	**3**
Extreme Heat	35	17	13	17	**82**	**12**
Fissures and Subsidence	23	13	19	11	**66**	**17**
Infectious Disease	21	20	16	22	**79**	**14**
Infestation	25	15	14	16	**70**	**16**
Landslide & Debris Flow	27	17	33	13	**90**	**8**
Seiche	13	20	32	16	**81**	**13**
Straight-Line Winds	34	19	20	13	**86**	**9**
Thunderstorms & Lightning	35	16	24	11	**86**	**9**
Tornado	15	12	28	11	**66**	**17**
Volcanoes	10	22	24	20	**76**	**15**
Wildland Fire & Wildland Urban Interface	40	34	37	32	**143**	**1**
Winter Storms & Extreme Cold	34	18	19	14	**85**	**11**
Technological Hazards						
Hazardous materials						
Flooding due to Dam Failure						
Flooding along Irrigation Ditches and Canals	38	31	26	31	**126**	**3**
Human-Caused Threats						
Terrorism/ WMD	25	24	28	21	**98**	**5**

3.2.4 Categorization of Screened Hazards

Using the above values for the four criteria listed, the 2023 NHM Working Group assigned each of the profiled hazards to one of the following risk categories based on an evaluation of the factors listed for each. Subcommittee members also provided input to the final ranking based on their respective areas of expertise.

- **High Risk:** Immediate action necessary. Beyond the State's available resources and ability to respond alone. Causes substantial property loss and financial impact to the entire State. Critical facilities and/or services may be lost for 15-20 days or more. May occur often or once in five to ten years. Twenty-six percent (26%) to 35% of property (or more) is lost or damaged in the affected area.
- **Medium/Significant Risk:** Prompt action necessary, which ranges from being beyond the State's available resources and ability to respond to handle at county level. Critical facilities and/or services may be lost for 8-14 days. Effects are felt at the county level. May occur frequently to less than once in 10 to 100 years. Between 11% and 25% of property is lost or damaged within the affected area.
- **Low Risk:** Should be planned for in the future. Within the State's or affected community's ability to respond with available resources. Critical facilities and/or services may be lost for 1-7 days. An entire town or city may be affected, may occur frequently or less than once in 100 to 1,000 years, or less than 5% to 10 % of property lost or damaged within the affected area.

After assessing the information from the NHM Working Group members' Hazard Prioritization Worksheets, risk categories of High, Medium/Significant, or Low were assigned to the hazards most likely to occur in the State of Nevada as shown below in Table 3-6. The Subcommittee continues to use three categories as was done in the 2018 plan update and what is done in many of the local mitigation plans in the state. Due to the limited resources available, the NHM Working Group will focus on the development of mitigation strategies for those hazards categorized as High Risk. As more resources become available and mitigation activities are completed, additional mitigation strategies can be developed for lower-ranked hazards.

Table 3-6. Risk Categories Assigned to Nevada Hazards		
High Risk	**Medium/Significant Risk**	**Low Risk**
Earthquake	Extreme Heat	Seiche
Wildfire	Hazardous Materials	Hail
Floods	Drought	Avalanche
Epidemic	Windstorm	Landslide
		Tornado
		Infestation
		Land Subsidence and ground failure
		Volcanic Activity
		Expansive Soil

3.3 PROFILING HAZARDS

Once the screening and prioritization process was completed, the Subcommittee moved on to Step 2 of the Risk Assessment process; the profiling of hazards. The requirements for profiling hazards as stipulated in DMA 2000 and its implementing regulations are described below.

ELEMENT	REQUIREMENTS
S3. Does the risk assessment include an overview of the type and location of all of the natural hazards that can affect the state? [44 CFR § 201.4(c)(2)(i)[27]; FMAG: 44 CFR §204.51(d)(2)[28]]	b. The plan must include a current overview of all natural hazards that can affect the state. In addition to listing the types of hazards, the summary must include the following: 3. Location: Information on where the hazards have occurred or could occur, using maps where appropriate and available. 4. Previous occurrences: Information about when hazards have occurred in the past, including information about the range of observed intensities of these hazards, using maps where appropriate and available. Information about the range of observed and anticipated intensities of the identified hazards are commonly expressed using various scientific scales. For example, the intensity of hurricane wind speeds is measured on the Saffir-Simpson scale, wind speed and damage from tornadoes is measured on the Enhanced Fujita Scale, and the peak ground acceleration indicates intensity of an earthquake.[29] d. *If the state is interested in FMAG program eligibility, the state mitigation plan must identify the state's wildfire hazards (See FMAG1 in Section 3.9 of the State Mitigation Planning Policy Guide).[30] However, note that if wildfire is a commonly recognized hazard in the state, it must be included in the plan regardless of the state's interest in pursuing FMAG grants.[31]* ***Natural hazards*** are sources of harm or difficulty created by meteorological, environmental, or geological events. Natural hazards, such as flooding and earthquakes, affect the built environment, including dams and levees. ***Risk***, for the purpose of hazard mitigation planning, is the potential for damage or loss created by the interaction of natural hazards with assets, such as buildings, infrastructure or natural and cultural resources. The exposure of people and assets to natural hazards can result in disasters, depending on the impacts.

[27] 44 CFR 201.4(c)(2)(i), accessed January 31, 2023, https://www.ecfr.gov/current/title-44/chapter-I/subchapter-D/part-201/section-201.4#p-201.4(c)(2)(i).
[28] 44 CFR 204.51(d)(2), accessed January 31, 2023, https://www.ecfr.gov/current/title-44/chapter-I/subchapter-D/part-204/subpart-D/section-204.51#p-204.51(d)(2).
[29] For more information on describing hazard intensities in the hazard mitigation plan, see the State Mitigation Planning Key Topics Bulletin on Risk Assessment.
[30] Federal Emergency Management Agency, *State Mitigation Planning Policy Guide (FP 302-094-2): Effective April 19, 2023,* 37-38.
[31] 44 CFR § 204.51(d)(2) "As a requirement of receiving funding under a Fire Management Assistance Grant, a State, or Tribal organization, acting as recipient, must: (i) Develop a Mitigation Plan in accordance with 44 CFR Part 201 that addresses wildfire risks and mitigation measures; or (ii) Incorporate wildfire mitigation into the existing Mitigation Plan developed and approved under 44 CFR Part 201 that also addresses wildfire risk and contains a wildfire mitigation strategy and related mitigation initiatives."

ELEMENT	REQUIREMENTS
	If any commonly recognized hazard(s) that could affect the state is omitted, the state must explain the rationale for not including the hazard(s). This rationale must be based on risk.

The specific hazards profiled in the Nevada HMP have been examined in a methodical manner based on the following factors:

- Nature
- History (previous occurrences)
- Location, severity, and probability of future events

All of the screened hazards were profiled. However, a vulnerability assessment to include loss estimates to State facilities was conducted only for those natural hazards categorized as High Risk: earthquake, riverine flooding, wildfire, and pandemic.

The National Weather Service representative on the Subcommittee was consulted and provided statements regarding the effect of climate change on severity and probability of future events that are included in all weather-related hazard profiles.

Tables 3-49 and 3-50 in Section 3.4 summarize hazard ratings for the local jurisdictions (counties, communities, or tribal entities) for the hazard profiles in this section. The tables were updated using information derived from each County's current hazard mitigation plan (all approved or in update process) or from tribal hazard mitigation plans.

The profiled hazards are presented below in Section 3.3 in alphabetical order. The order of presentation does not signify the level of importance or risk.

The threat and hazard profiles are organized according to their type – natural hazard, technological hazard, and human-caused threat.

Natural Hazards

3.3.1 Avalanche (Low Risk)

3.3.1.1 Nature

An avalanche occurs when a mass of snow detaches from a mountainside and slides or falls downward. Snow avalanches can be subdivided into loose-snow avalanches (dry or wet) and slab avalanches (dry or wet). Wet slide avalanches may occur during and after:

a) a rapid rise in air temperature inducing a melting snowpack,
b) a rain-on-snow event, and
c) during the spring thaw.

The majority of slab avalanches occur on natural slopes steeper than 30 degrees, although snow avalanches have been recorded on slopes as low as 15 degrees depending on snow type, water content, temperature, and snow and wind-loading on the existing snowpack. Over 90% of fatalities are triggered by the victims themselves as a result of loading the snowpack by skiing, snowboarding, climbing, or snowmobiling. The snowpack varies within the state. Western and southern Nevada have a maritime snow climate that results in relatively heavy snowfall, and mild temperatures. Northeastern Nevada (Ruby Mountains) is somewhat transitional between maritime and continental (Utah and Colorado), characterized by low snowfall and colder temperatures.

The following three variables interact to determine whether an avalanche is possible:

1. Terrain: the slope must be steep enough to avalanche.
2. Snowpack: the snow must be unstable enough to avalanche.
3. Weather: Weather is another important variable. Changing weather can quickly change snowpack stability.

Figures 3-13 and 3-14 depict the National Risk Index (NRI) Score for Avalanche statewide and in more heavily populated areas respectively. Although there have been avalanches near Las Vegas, the avalanche risk essentially lies in the northwest region of the state along the eastern slope of the Sierras.

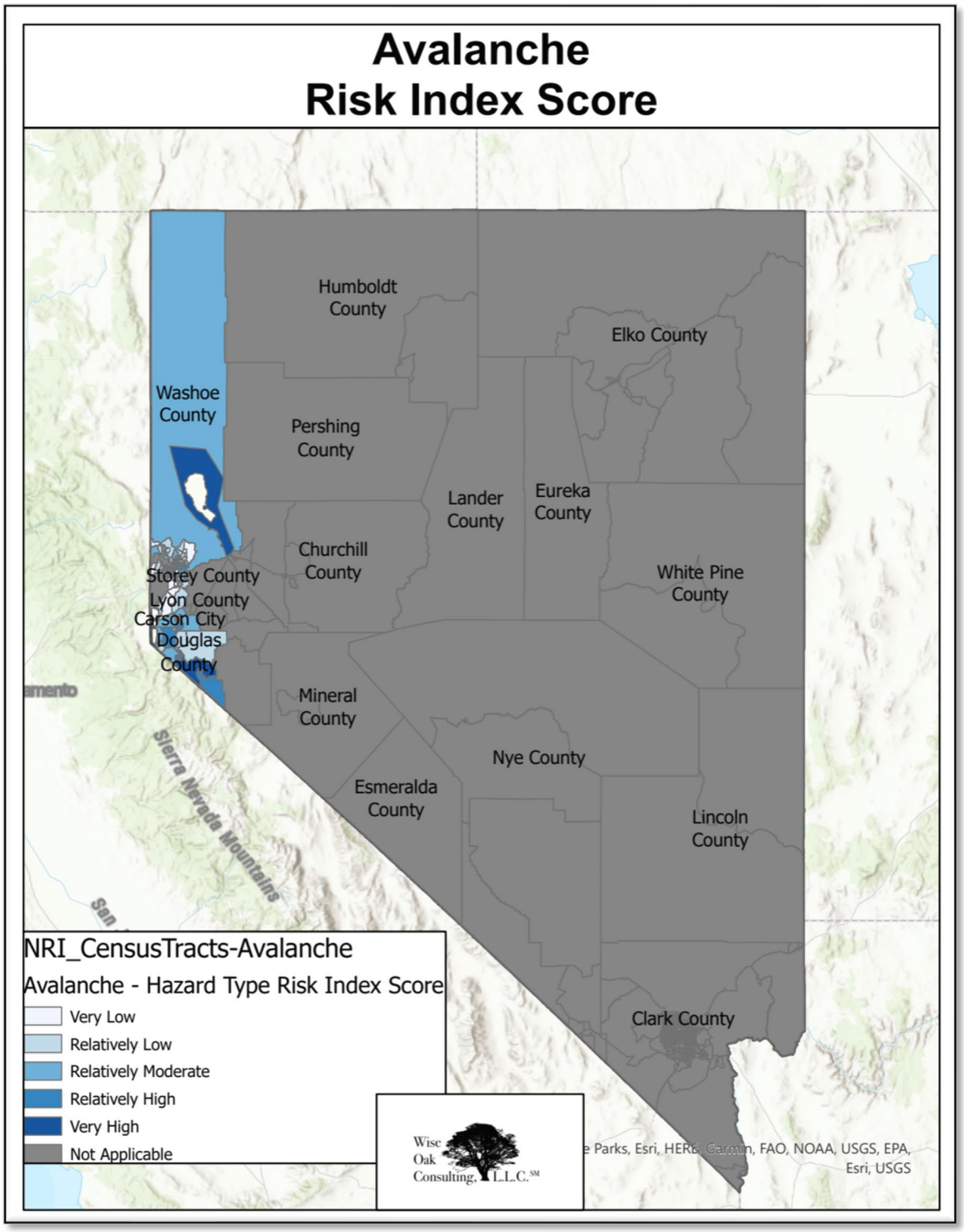


Figure 3-13. Avalanche National Risk Index Score - Statewide.

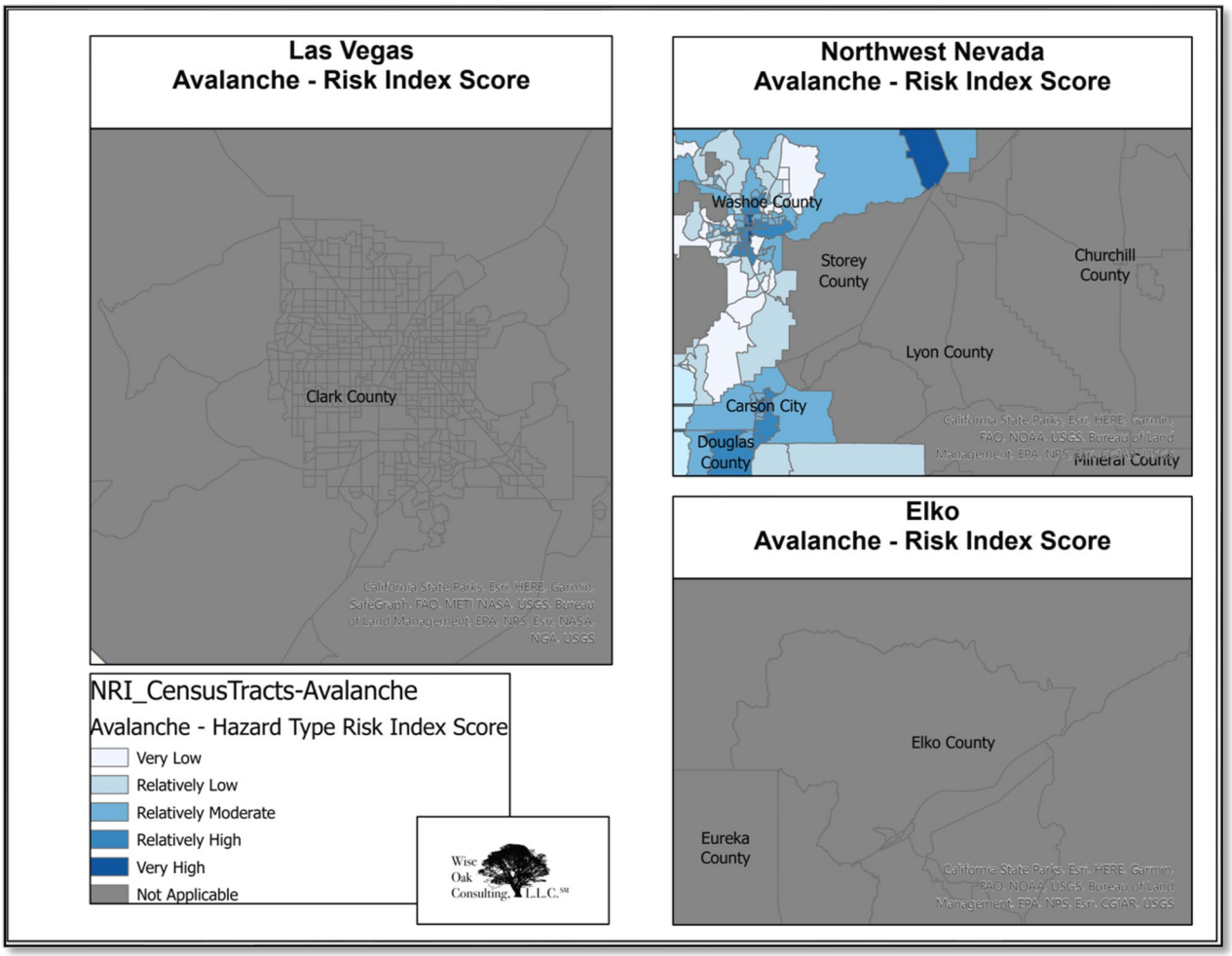


Figure 3-14. Avalanche National Risk Index Score – More Heavily Populated Areas.

Figures 3-15 and 3-16 depict the NRI Exposure in dollar values for Avalanche statewide and in more heavily populated areas respectively. Corresponding to the regions at risk, the exposure (in dollars) essentially lies in the northwest part of the state along the eastern slope of the Sierras.

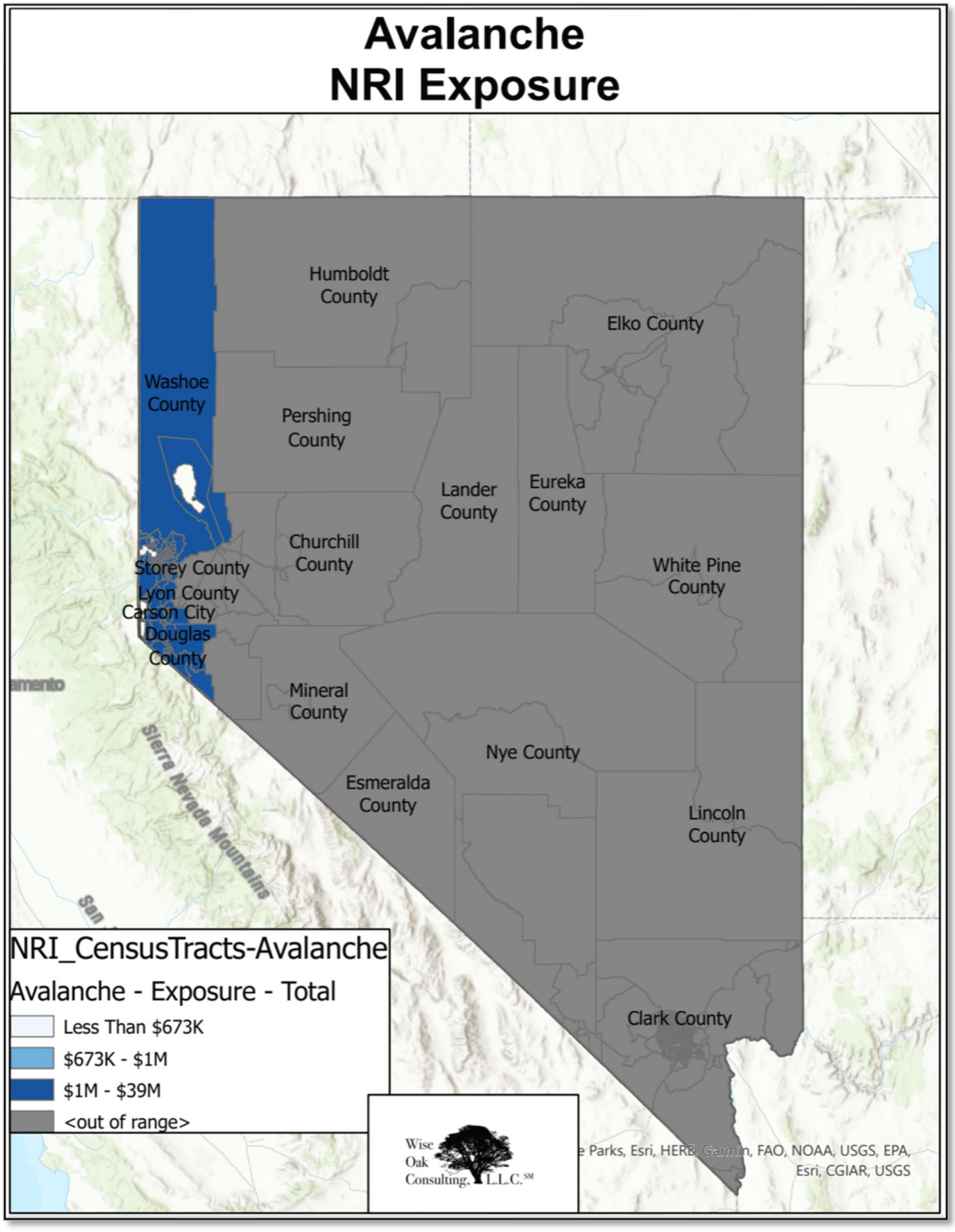


Figure 3-15. Avalanche National Risk Index Exposure – Statewide.

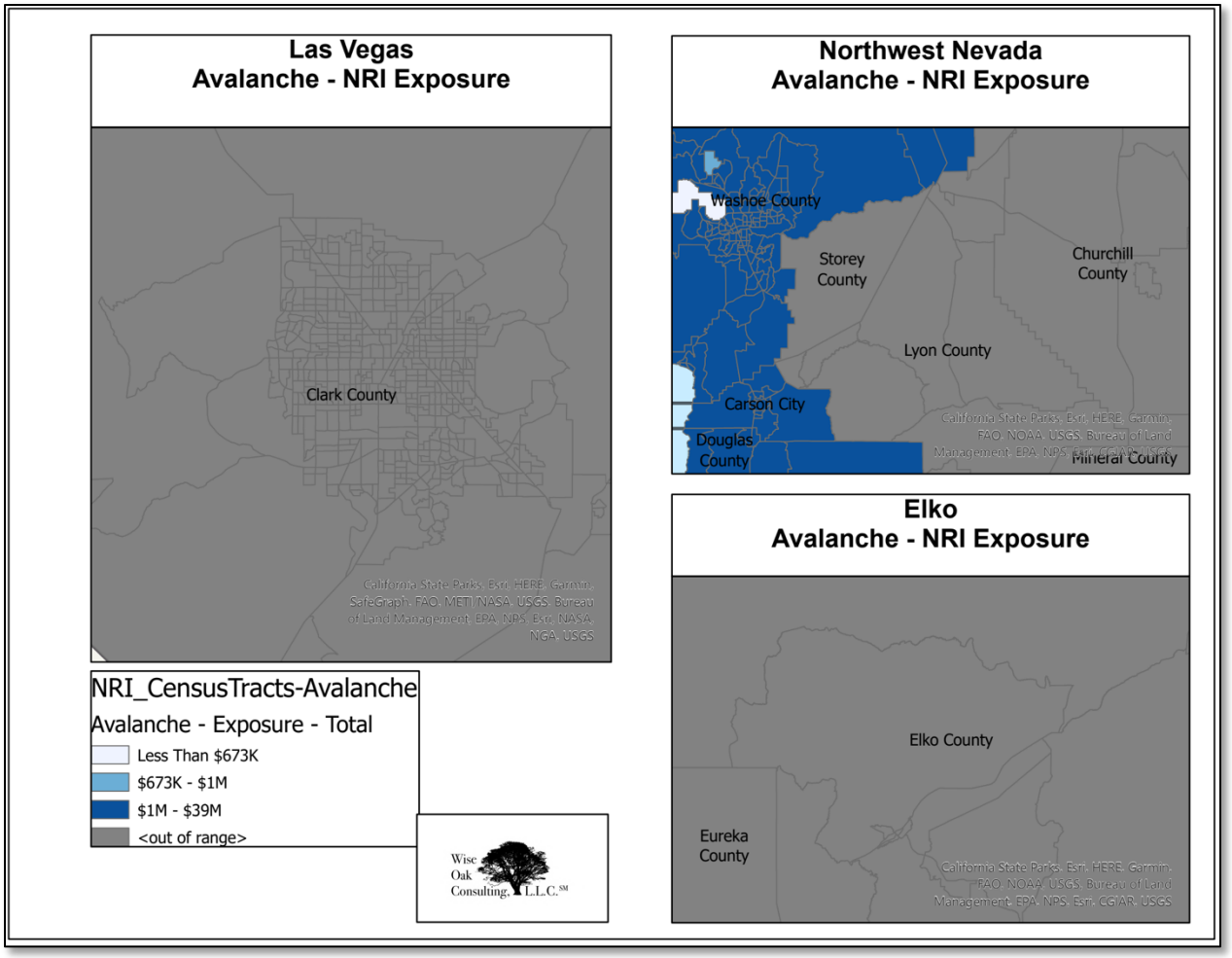


Figure 3-16. Avalanche National Risk Index Exposure – More Heavily Populated Areas.

3.3.1.2 History

Compared to states such as Colorado, Nevada has seen relatively little loss in terms of dollar values and fatalities due to avalanche. Figures 3-17 and 3-18 depict the NRI Historic Loss Ratio statewide and for more heavily populated areas respectively. Due to the remote and isolated nature of most avalanches, the historic losses can be categorized as Very Low.

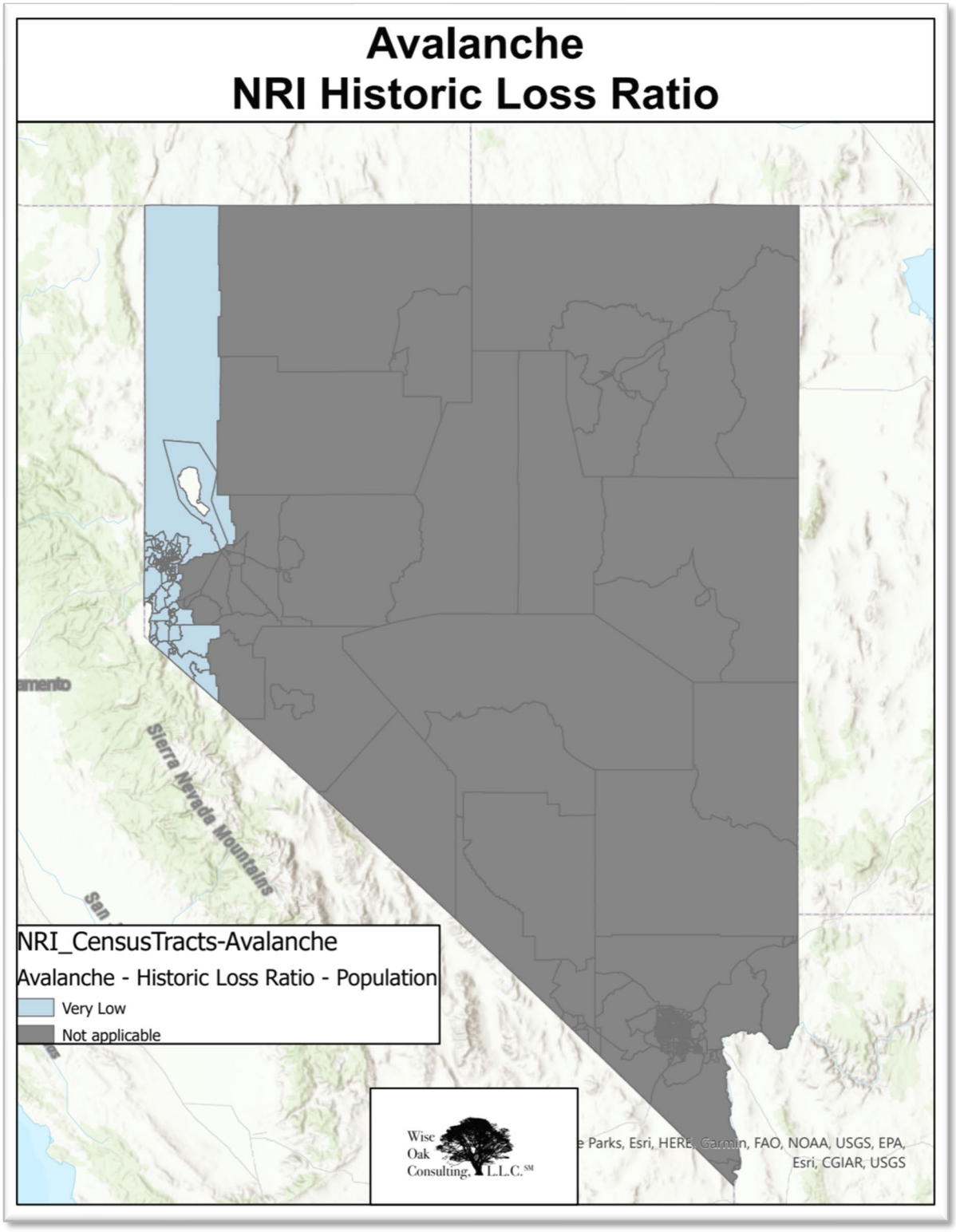


Figure 3-17. Avalanche National Risk Historic Loss Ratio – Statewide.

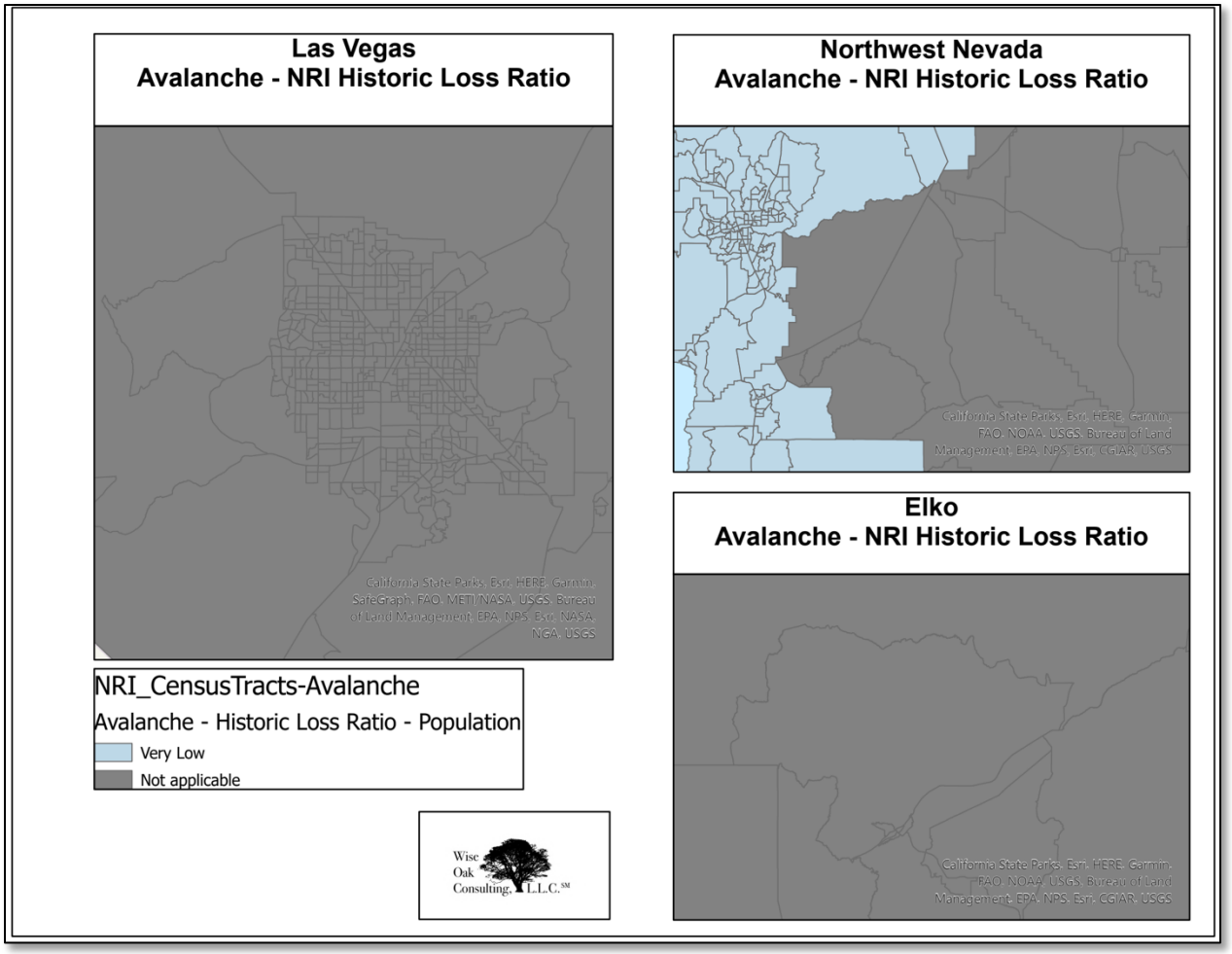


Figure 3-18. Avalanche National Risk Index Historic Loss Ratio – More Heavily Populated Areas.

The avalanche history in Table 3-7 below was gathered from a variety of resources and includes adjacent areas of the northern Sierra Nevada in California that would impact emergency services in northern Nevada. It includes data from the Sierra Avalanche Center (SAC) Annual Reports. This information is used in creating daily avalanche advisories available to the general public. It generally includes only those avalanches which caused injury, death, evacuations, or substantial property damage. Additionally, data was included from the USFS National Avalanche Center, Colorado Avalanche Information Center, and American Avalanche Association's (A3) educational website, www.avalanche.org.

Table 3-7. History of Nevada and Adjacent Sierra Nevada Avalanche Occurrences[32]		
Date	**Location**	**Description/injuries/damages**
April 7, 1882	Genoa area, NV	18 deaths and many residences destroyed.
January 13-19, 1952	Sierra Nevada west of Reno, Yuba Pass	Avalanches trapped a Southern Pacific Railroad's City of San Francisco passenger train for several days, causing many illnesses and one death.
1968	Echo Subdivision Kyle Canyon, Clark Co, NV	Two deaths.
January 2, 1969	Slide Mountain at Mount Rose ski area, NV	One death.
January 29, 1972	Mount Rose Ski area, NV	Seven injuries and two deaths at "The Chutes" ski area. The ski area was closed.
March 31, 1982	Alpine Meadows Ski Area, near Lake Tahoe, CA	Seven people killed, five others injured, several buildings, chair lifts and vehicles destroyed or damaged; total monetary loss of approximately 1.6 million dollars.
February 9, 1985	Squaw Valley, CA	100 houses evacuated; I-80 and U.S. 50 closed; no deaths or injuries.
February18, 1986	Sierra Nevada, NV	Avalanches blocked both I-80 and Amtrak train tracks west of Reno. No deaths or injuries directly related.
23 December 23, 1996	Sugar Bowl ski area, Sierra Nevada CA	An avalanche buried and killed a snowboarder.
December 1997	Mount Rose Highway, NV	An avalanche was triggered by an explosive in the Beehive area of the Chutes. The highway was closed, no injuries or deaths.
February12, 1998	Donner Summit, near Truckee, CA	A snowboarder was swept away and killed in an avalanche.
February 6, 1999	Lake Mary area, near Tahoe-Donner Summit, Truckee, CA	An avalanche buried four people, killing one, and injuring three along the shore of a lake 35 miles west of Reno.
February 21, 2001	Alpine Meadows ski area, Sierra Nevada	The incident occurred between Squaw Valley and Alpine Meadows. Two 17-year-old boys skied out of bounds in a closed area and were killed by a Class II avalanche.

[32] Colorado Avalanche Information Center, "Accidents," February 17, 2023, https://avalanche.org/avalanche-accidents/.

Table 3-7. History of Nevada and Adjacent Sierra Nevada Avalanche Occurrences[32]		
December 15, 2002	Mt. Rose ski resort, NV	East of Mt. Rose, one snowboarder caught and killed, two injured by an avalanche in out out-of-bounds area.
March 8, 2002	Donner Pass Ski area, Sierra Nevada	Avalanche kills one skier.
April 26, 2003	Charity Valley, Alpine County, CA	One snowmobiler was killed in an avalanche, and probably triggered the avalanche
January 1, 2004	Castle Peak, North of Donner Summit, Sierra Nevada	An avalanche caused one fatality.
January 4, 2004	Sierra Nevada near Truckee, CA	An avalanche buries skiers and snowboarders; multiple injuries.
January 9, 2005	Lee Canyon, Mount Charleston, NV	An avalanche swept one boy off a ski chair lift, and was caught, buried, and killed at Las Vegas Ski & Snowboard Resort.
January 10, 2005	Sierra Nevada, CA, NV	Avalanche danger closed the main highways over the Sierra Nevada. No injuries.
March 25, 2005	Mt. Tom, Elderberry Canyon, CA	Two separate avalanches occurred along the CA-NV border. Five skiers were caught, one was injured and two were buried and killed. Two skiers were caught in the first avalanche, and as the three remaining skiers began their decent to rescue the two, another avalanche was triggered. The deaths occurred from the first avalanche. All were able to escape with minor injuries from the second avalanche.
February 20, 2005	North Bowl of Mt. Anderson- behind Sugar Bowl Ski Area, Truckee, CA.	Avalanche caught three backcountry skiers north of Lake Tahoe. Two were partially buried and dug out with minor injuries. They searched for the buried skier and recovered the victim's body with a beacon search and probing.
February 2, 2006	Blacksmith Creek drainage, Twin Lakes area, Sawtooth Range, CA	Avalanche in Sierra Nevada. Three skiers were caught, two of the three were carried, and one was partially buried. Of the two carried by the avalanche, one was killed, and one was revived by a member of the party.
March 2006	Washoe County, NV	Avalanche advisories were issued for Crystal Bay Subdivision and Third Creek area.
February 12, 2007	Mount Rose ski area, NV	An avalanche severely injured one ski patrol member at Extreme Chutes of Ski Tahoe resort, the skier was not buried.
February	Ruby Mountains	Avalanches in Ruby Mountains threatened

Table 3-7. History of Nevada and Adjacent Sierra Nevada Avalanche Occurrences[32]		
27, 2007	Elko County, NV	snowmobilers and skiers. No deaths or injuries.
December 25, 2008	Squaw Valley ski resort, CA	An avalanche kills one skier near Pulsen's Gully. The avalanche occurred in bounds in an open area. Ski patrol had conducted avalanche control work with explosives on the slope prior to the accident.
March 3, 2009	Squaw Valley ski resort, Sierra Nevada	An avalanche killed one ski patrol member working on avalanche control. The victim's partner dug him out, however, he died at a hospital due to multiple fractures and trauma.
December 22-23, 2010	Kyle Canyon and Echo Canyon in Mt. Charleston area, near Las Vegas, NV	Three avalanches in Clark County caused power outages and home evacuations, buried vehicles, and closed ski areas.
April 26, 2011	Split Mountain near Bishop, CA, Sierra Nevada	An avalanche in Sierra Nevada caught two skiers in the backcountry and were partially buried and died.
March 2, 2012	Blackwood Canyon, Ward Canyon, Sierra Nevada, near Lake Tahoe	An avalanche was triggered by a skier and subsequently buried him. He was rescued and later died at the hospital from his injuries.
March 2, 2012	Forestdale Divide in Carson Pass area near Kirkwood, Sierra Nevada	An avalanche triggered by a snowmobiler buried and killed him and destroyed his snowmobile.
December 22-23, 2012	Sierra Nevada	Up to 5 feet of snow in the Sierra Nevada caught several skiers and snowboarders, most of whom were able to dig themselves out and survived, but an Alpine Meadows veteran ski patroller was caught and died in a "controlled" avalanche released by a detonated charge and a snowboarder was buried and died in a separate avalanche event at Donner Ski Ranch a day earlier.
January 14, 2016	Sugar Bowl ski area, Mount Judah, near Lake Tahoe	An avalanche caught, buried, and killed a ski instructor who skied in an out-of-area location. His body was found on February 29, 2016.
January 20, 2016	Tinker Knob, Donner Lake area, near Truckee, CA. Northwest of Lake	An avalanche caught and buried a professional skier in the backcountry, who was with a group of eight people. The skier lost consciousness, and was buried between three feet of snow, and was rescued by the

Table 3-7. History of Nevada and Adjacent Sierra Nevada Avalanche Occurrences[32]		
	Tahoe	group-some had had avalanche safety training.
February 18, 2016	Alpine Meadows Road, CA, near Lake Tahoe	Three natural avalanches closed Alpine Meadows Road. Two vehicles were impacted by the avalanches, one was trapped, and no one was injured. Alpine Meadows ski resort closed due to the avalanche danger.
Dec ember 10, 2016	Mt. Rose Chutes-Closed Area, Nevada	Two skiers hiked/traversed into closed, uncontrolled terrain at Mt. Rose. The first skier triggered a large avalanche and was swept away 600-1,000 ft downslope. The skier's body was found the next day.
January 5, 2017	Mt. Rose ski area, Nevada	Two backcountry skiers escaped an avalanche unharmed, the avalanche closed down Mt. Rose Highway, about 30 miles southwest of Reno. Two vehicles were stuck.
February 20, 2017	Mt. Rose ski area, Nevada	An avalanche buried Mt. Rose highway with about 20 feet of snow. No injuries were reported. Mt. Rose ski area closed the following day due to the avalanche.
November 16, 2017	Hourglass Bowl, Tamarack Peak, Mt. Rose Ski Area	Three skiers were caught and partially buried, one suffered minor injuries.
March 2, 2018	Squaw Valley Ski Resort, Lake Tahoe, CA	Five people were trapped in an avalanche at Squaw Valley Ski Resort. The avalanche occurred in an area open to skiers and snowboarders. Two people were injured, (one severely injured) and the resort closed down for the rest of the day.
March 3, 2018	Mammoth Mountain Ski Area, Sierra Nevada. CA	Eight people were partially buried in an inbounds avalanche at Mammoth Mountain. Mammoth Mountain Ski Patrol was performing avalanche control in a closed area. A large avalanche released and terminated at the bottom of a lift terminal. Two guests were partially buried and escaped without injury, and six employees were partially buried and escaped with minor injuries.
February 20, 2021	Near Castle Lake, Ruby Mountains, Southeast of Elko	Two snowmobilers were caught in an avalanche near Castle Lake in the Ruby Mountains on Saturday, February 20. One snowmobiler was buried and killed. A second snowmobiler was injured and evacuated to a hospital.
January 1, 2023	**Mummy Mountain, west of**	A man was caught and died in an avalanche near Mummy Springs Trail on Mt.

Table 3-7. History of Nevada and Adjacent Sierra Nevada Avalanche Occurrences[32]		
	Las Vegas	Charleston. The avalanche happened in a backcountry area of Spring Mountain National Recreation area Jan. 9. Las Vegas police confirmed the avalanche happened around 12:23 p.m. First responders performed CPR for 30 minutes. Weather conditions such as wind and sleet on the mountain are making the recovery difficult, police said.

3.3.1.3 Location, Severity, and Probability of Future Events

Avalanche possibilities exist in Douglas, Elko, Clark, and Washoe Counties, although there have been no written records of avalanches occurring in the more populated areas of these counties. Incline Village and Crystal Bay are under avalanche advisory several times during the winter months. The Ruby Mountains in Elko County also have this risk, but only in unpopulated areas. Care must be exercised by those snowmobiling or backcountry skiing in Ruby Mountains when accessed by Lamoille Canyon drainage (road closed in winter), as the slopes are prone to avalanche, and the canyon is considered the most vulnerable to avalanching. Avalanches can also occur in Clark County. In January 2017, there was a voluntary evacuation for Mount Charleston communities due to an avalanche risk. About 58 inches of snow accumulated at Kyle Canyon Fire Station, and Lee Canyon Ski Area reported a depth of 94 inches. In February 2017, an avalanche occurred in Kyle Canyon, near Cathedral Rock. The avalanche stopped 200 yards from a subdivision, and Clark County closed down a road, no injuries were reported.

The Sierra Avalanche Center (SAC) maintains a website, http://www.sierraavalanchecenter.org, with avalanche forecast for the Sierra Nevada posted by professional avalanche forecasters. Figure 3-19 is an example for February 17, 2023. This avalanche forecast is provided through a partnership between the Tahoe National Forest and SAC. This advisory describes general avalanche conditions in the Central Sierra Nevada including both California and Nevada and describes general backcountry avalanche hazard and conditions. It does not apply to ski areas and highways where avalanche mitigation is conducted.

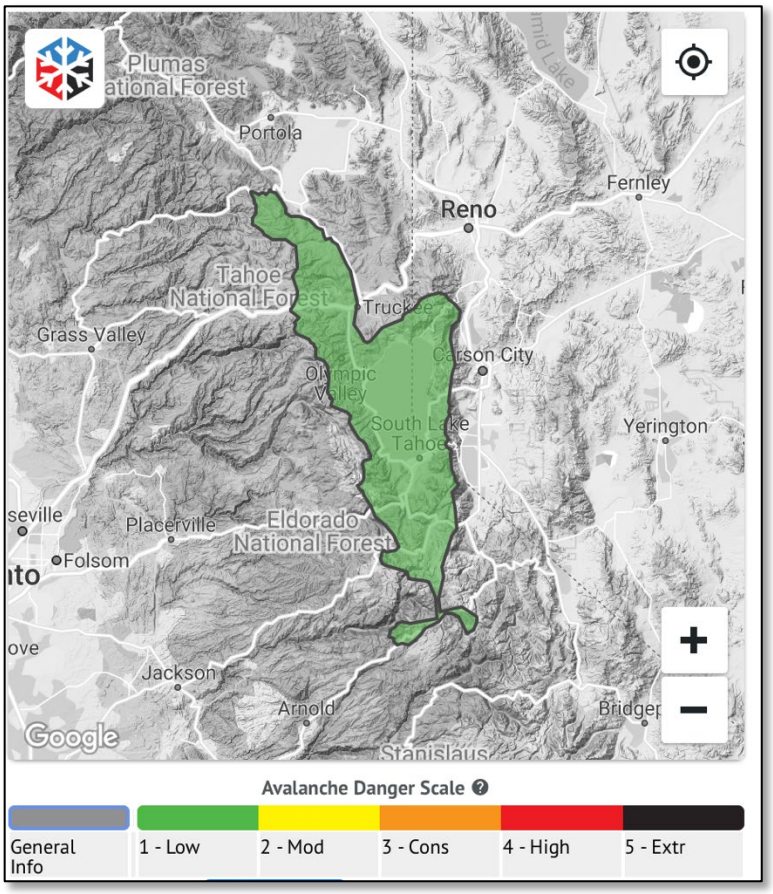


Figure 3-19. Example Map of Sierra Avalanche Center's Forecast Area.[33]

SAC's website includes avalanche facts, FAQs, myths, snowpack and avalanche observations, and useful safety information as well as links to other sites. An example of SAC's avalanche observations can be seen in a topographic map (Figure 3-20) and a snow pit or crown profile (Figure 3-21.)

[33] Sierra Avalanche Center, February 17, 2023, https://www.sierraavalanchecenter.org.

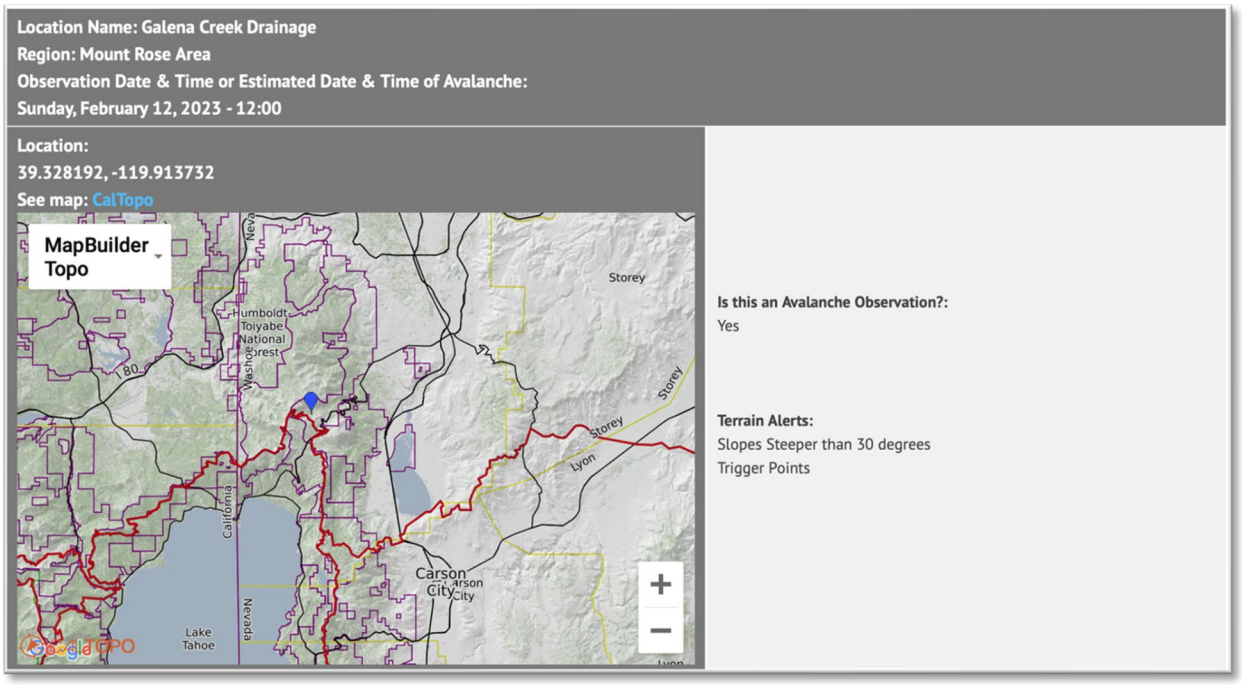


Figure 3-20. Avalanche Observation of Galena Creek Drainage.[34]

[34] Sierra Avalanche Center, "Observations," February 17, 2023, https://www.sierraavalanchecenter.org/observation/2023/feb/12/1200/galena-creek-drainage.

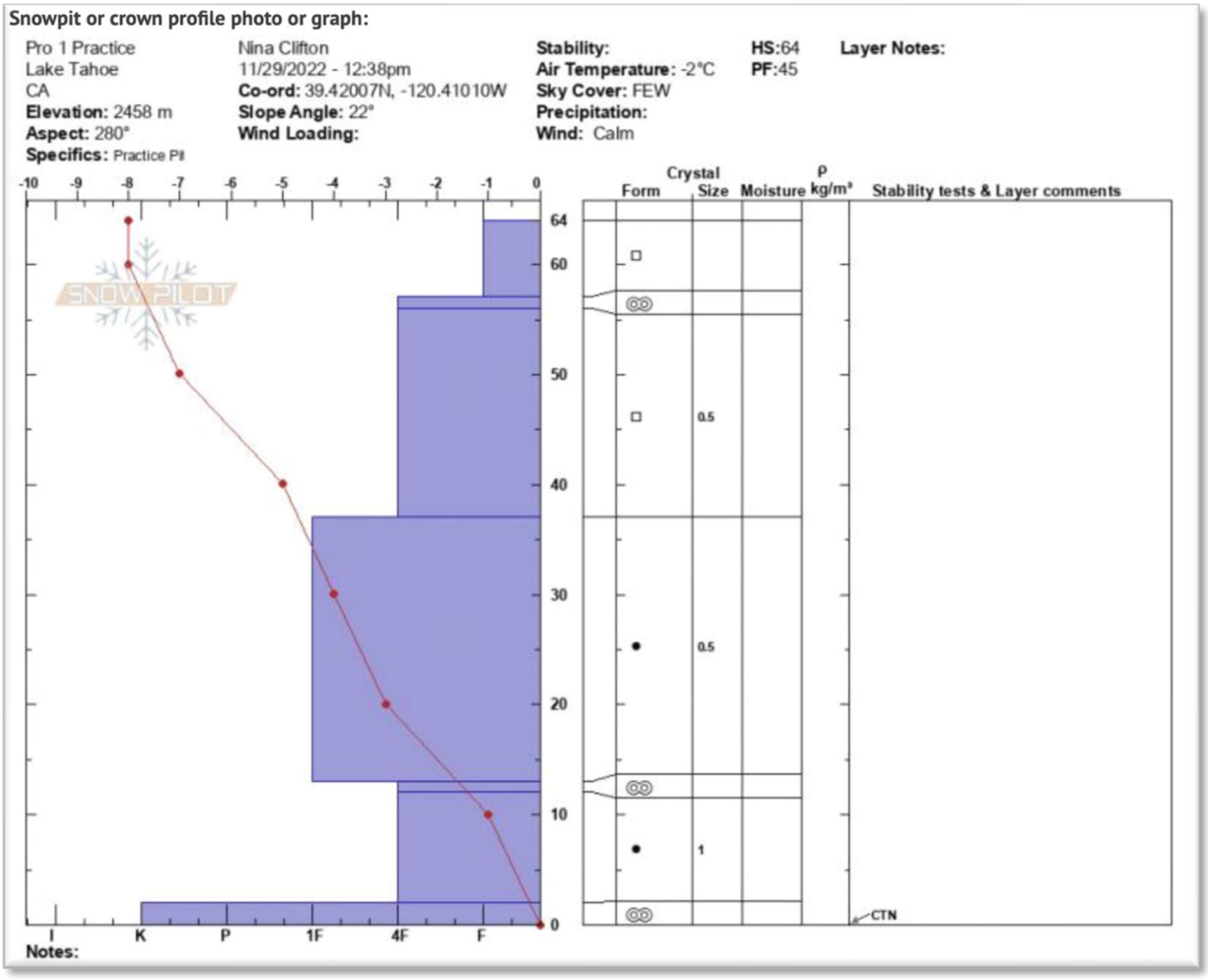


Figure 3-21. Snow Pit or Crown Profile Graph West of Grills, Little Truckee Summit Areas.[35]

Wherever possible, transportation corridors have been constructed to avoid avalanche hazards and are well maintained with state and local resources. When avalanches do occur, they generally affect only roads in the Tahoe basin and those that cross the Sierra Nevada. These roads are closely monitored during periods of heavy snowfall and closed if avalanche danger threatens motorists. Active avalanche mitigation measures are employed on some transportation routes, such as the Nevada Department of Transportation's (NDOT) closures for avalanche control work on SR 431, the Mount Rose Highway. These road closures may cause long delays and/or detours for motorists and truckers. Most avalanche events are located in unpopulated areas that fall under the ownership of USFS, where damage to current and future structures is minimal. Danger to humans increases with winter recreation in these areas such as snowmobiling, backcountry skiing and snowboarding, climbing, cross country skiing, and snowshoeing. Although avalanches can occur within the boundaries of ski resorts, accidents primarily occur in a backcountry setting according to the National Ski Areas Association (NSAA). For example, NSAA noted that in the 2013-2014 ski season, all of the fatalities from avalanches in the U.S. occurred in the backcountry, in out-of-bounds areas.

[35] Sierra Avalanche Center, "Observations," February 17, 2023, https://www.sierraavalanchecenter.org/observation/2022/nov/29/1500/west-grills.

Avalanches are considered to be in the "Low Risk" hazard category because they are likely to affect few people in Nevada. The avalanches that do occur will most likely be handled efficiently by ski resorts, local authorities, NDOT, and/or USFS. As shown in Figure 3-22, Nevada has had few avalanche fatalities compared to other states.

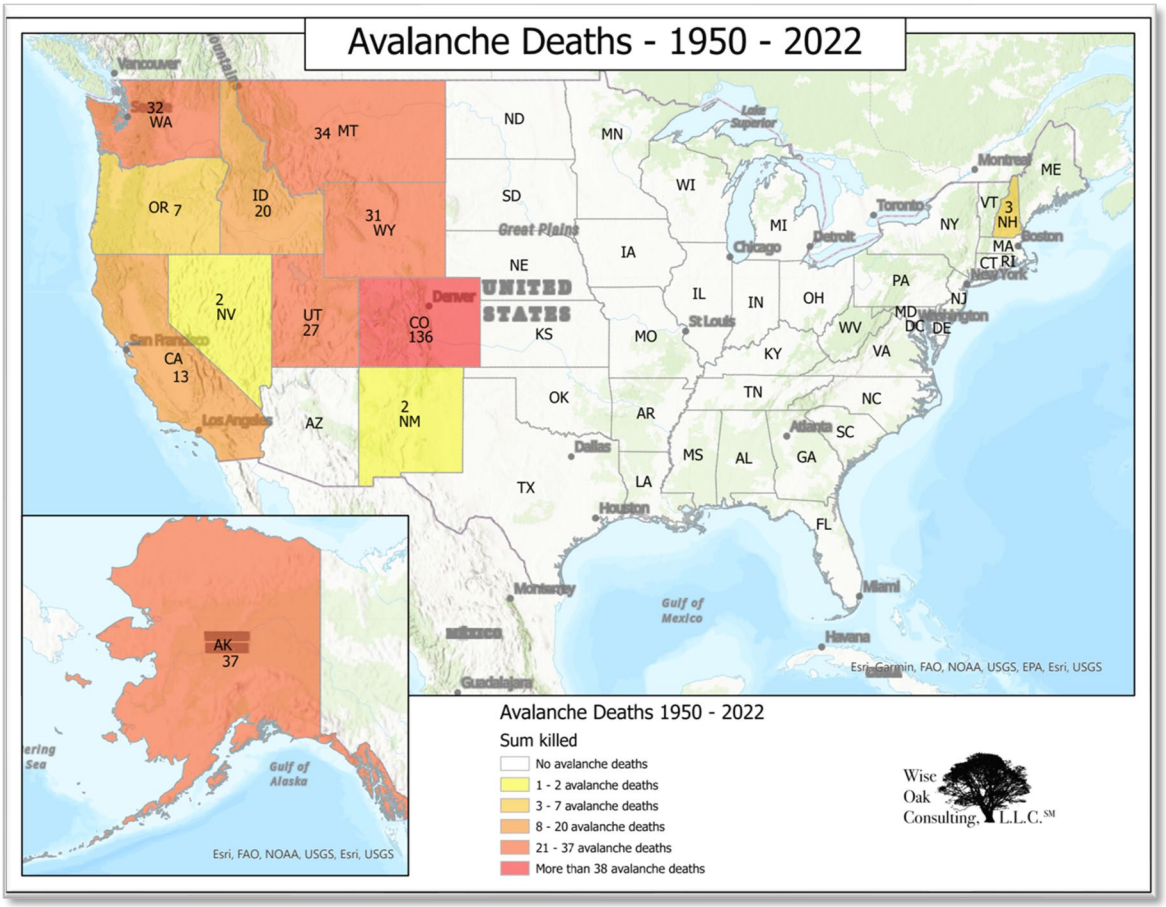


Figure 3-22. Avalanche Fatalities by State, from 1950-2022[36]

Most avalanche-related injuries and fatalities will likely continue to be related to recreationalists drawn to the steep snow-covered slopes prone to avalanches and most developed ski areas have avalanche control measures and rescue teams on site to deal with avalanche-related emergencies. However, an ever-increasing number of outdoor enthusiasts are using snowmobiles in undeveloped areas with no avalanche controls or available emergency personnel. In 2009, twice as many snowmobilers died in avalanches in the U.S. as did participants in any other winter sports activities. Currently, snowmobiles and backcountry tourers are the top activities triggering avalanches, as shown in Figure 3-23. As population increases and as more snowmobilers venture into the winter backcountry, avalanches may become an increasing threat in Nevada in the future, but currently, they do not account for a large number of deaths or injuries in this state. As shown in Figure 3-24, there has been only three snowmobiler fatalities in Nevada between 1950 and 2022.

[36] Colorado Avalanche Information Center, "Statistics and Reporting," February 17, 2023, https://avalanche.state.co.us/accidents/statistics-and-reporting.

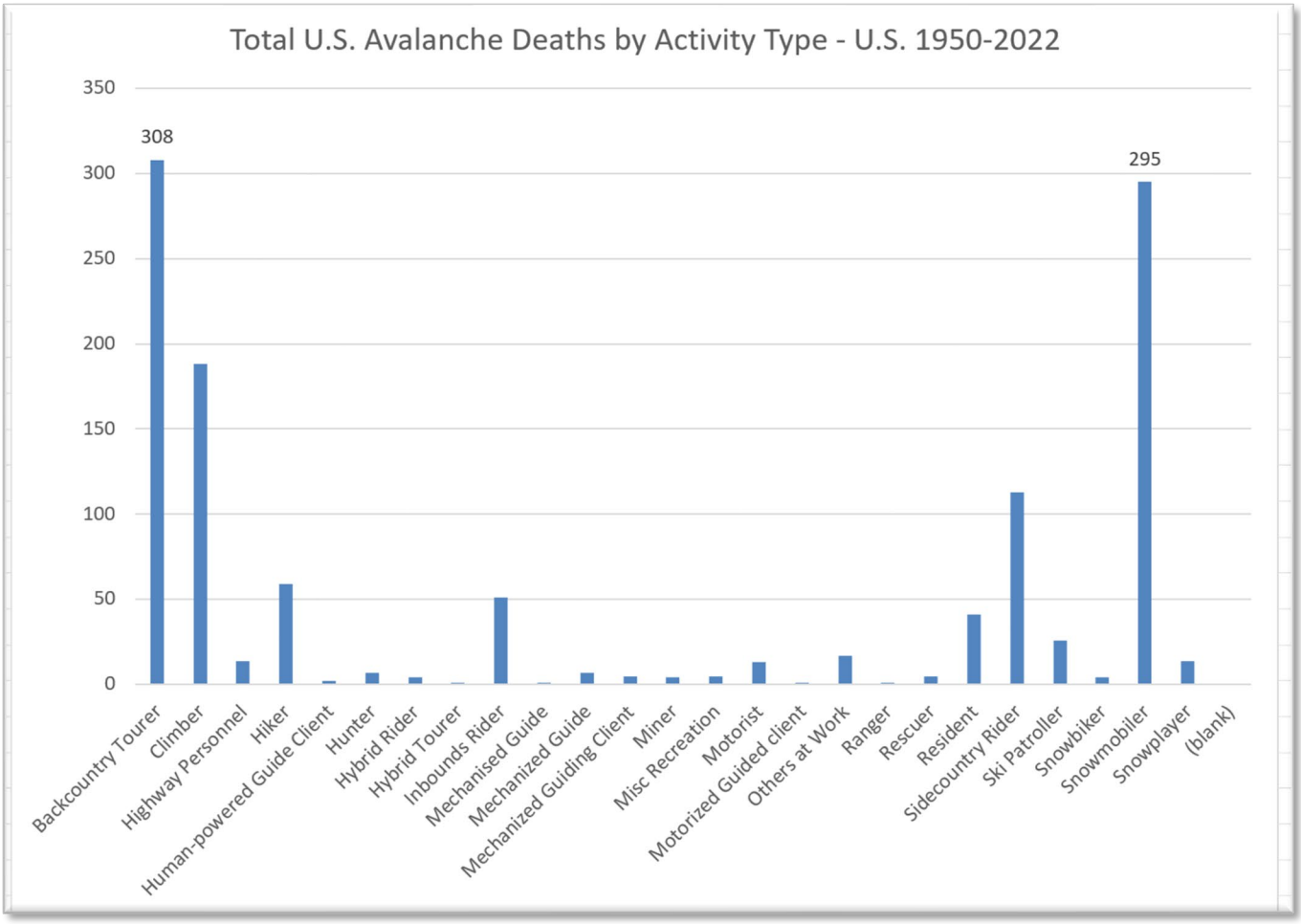


Figure 3-23. Avalanche fatalities by activity in all states, from 1951-2016.[37]

[37] Colorado Avalanche Information Center, "Statistics and Reporting," February 17, 2023, https://avalanche.state.co.us/accidents/statistics-and-reporting.

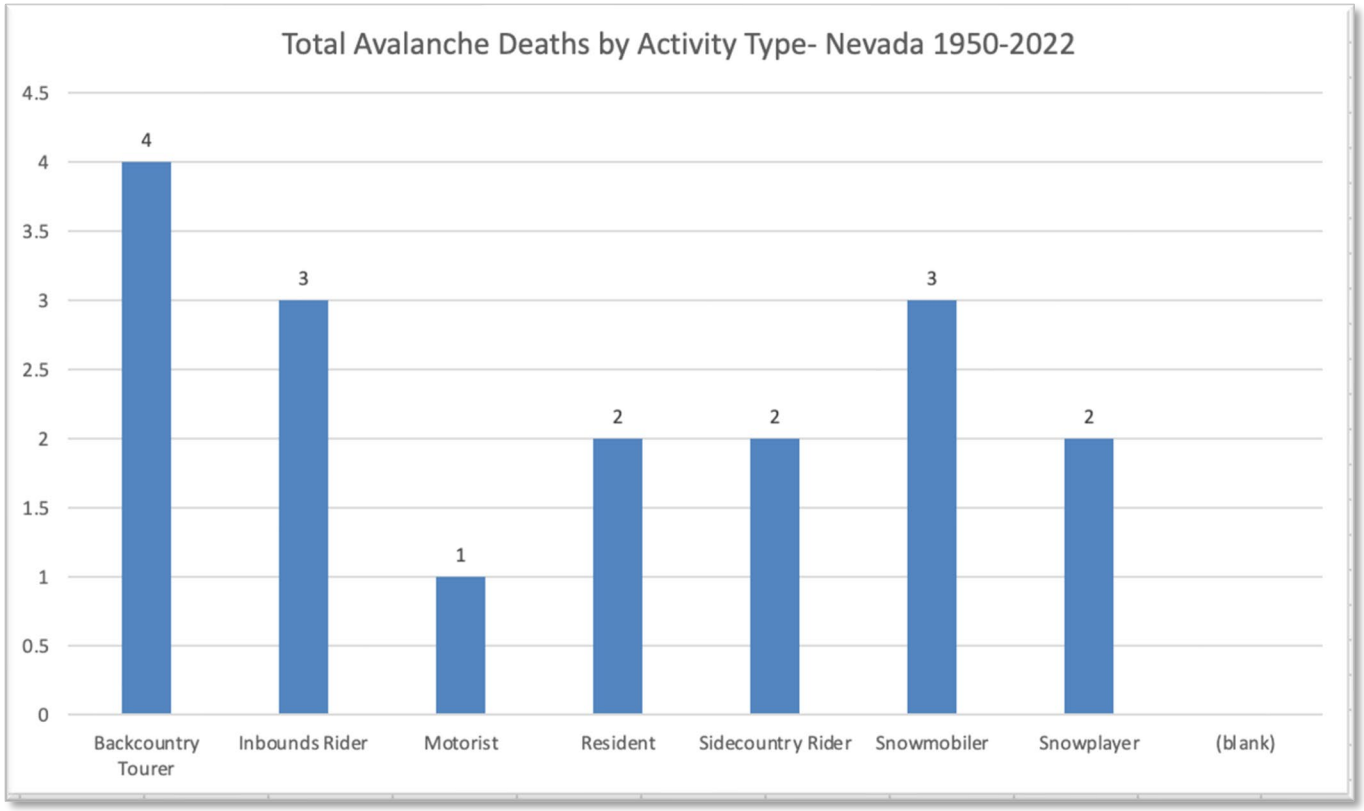


Figure 3-24. Avalanche Fatalities by Activity in Nevada, 1951-2016.[38]

Due to the location and severity of avalanche hazard, mitigation actions are relegated to the local jurisdictions where the hazards exist. The State will support local jurisdiction activities in lessening this hazard where it occurs.

Figures 3-25 and 3-26 depict the NRI Expected Annual Loss due to avalanche. Corresponding with the relatively low losses and risk index, Expected Annual Loss is very low.

[38] Colorado Avalanche Information Center, "Statistics and Reporting," February 17, 2023, https://avalanche.state.co.us/accidents/statistics-and-reporting.

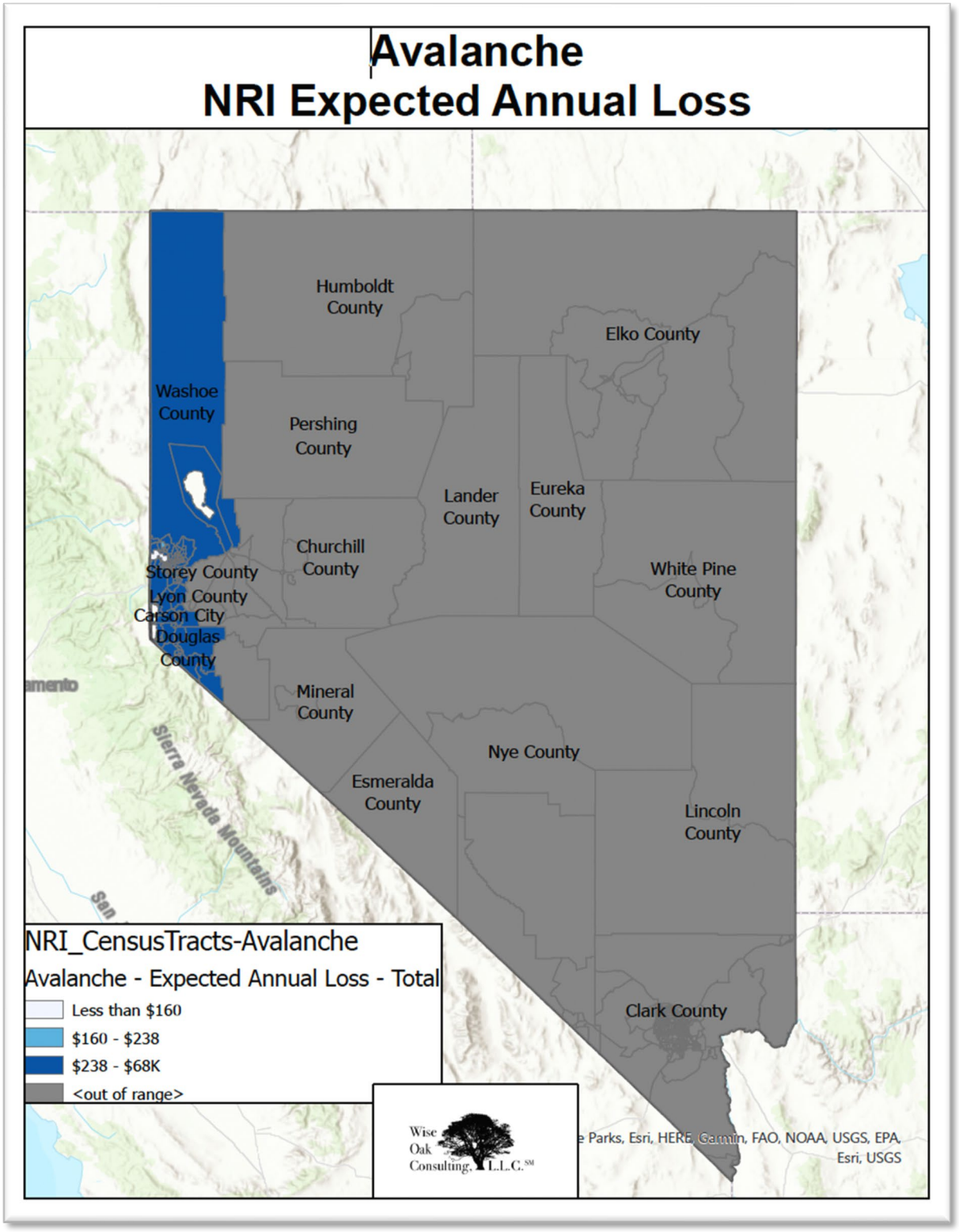


Figure 3-25. Avalanche National Risk Index Expected Annual Loss – Statewide.

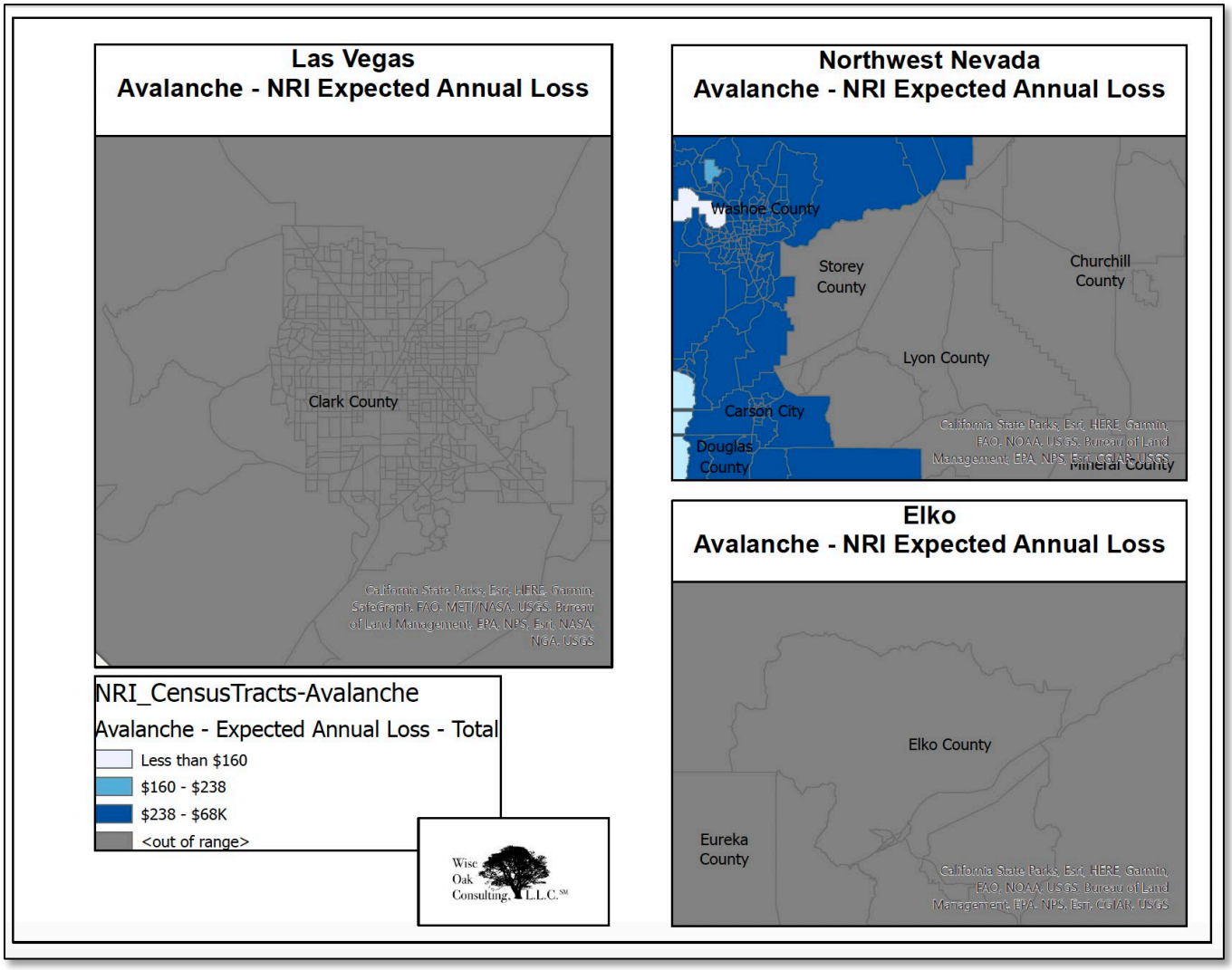


Figure 3-26. Avalanche National Risk Index Expected Annual Loss – More Heavily Populated Areas.

Also corresponding to the relatively few historical avalanche events, Figures 3-27 and 3-28 depict the NRI Annualized Frequency Statewide and in more heavily populated areas respectively.

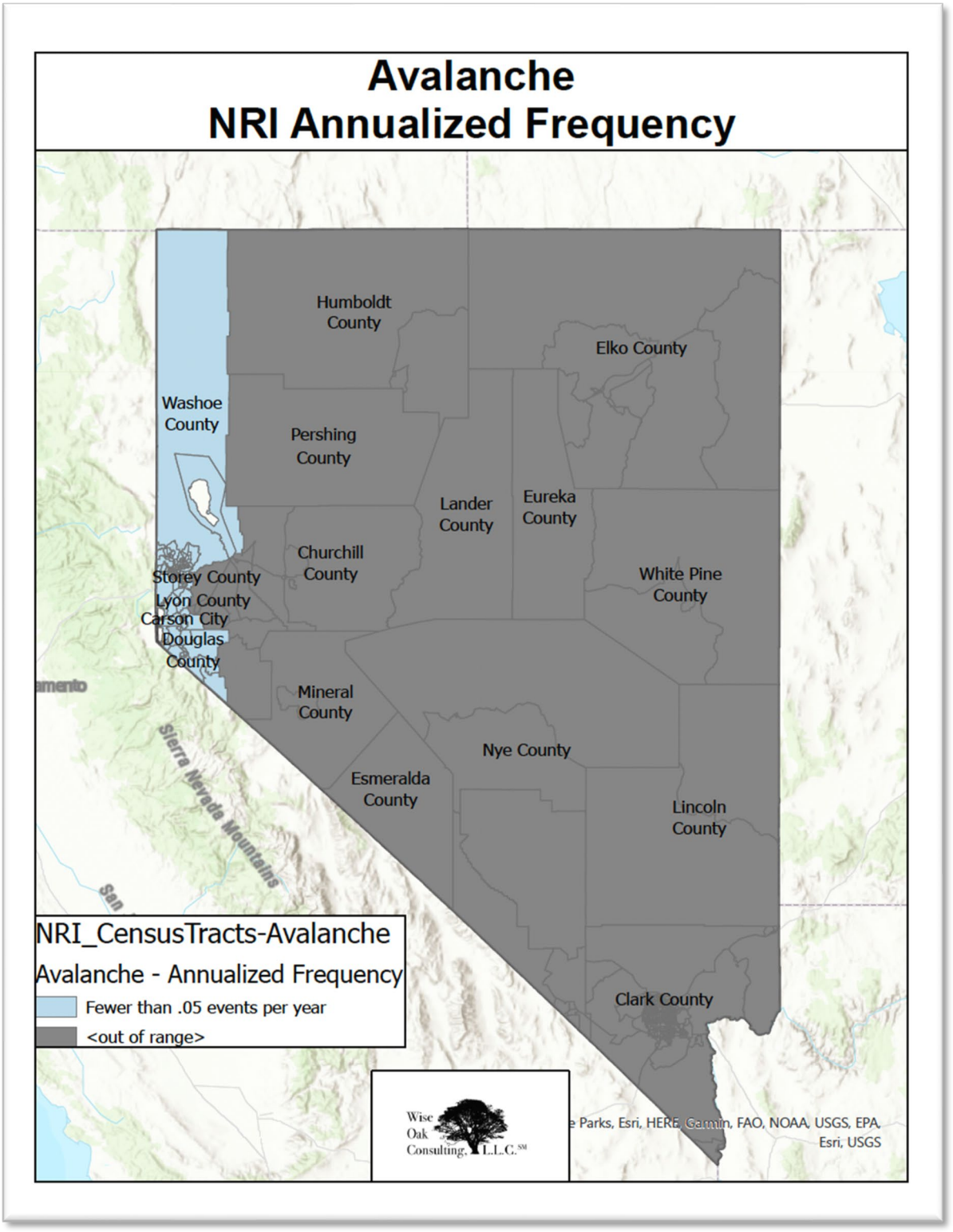


Figure 3-27. Avalanche National Risk Index Annualized Frequency – Statewide.

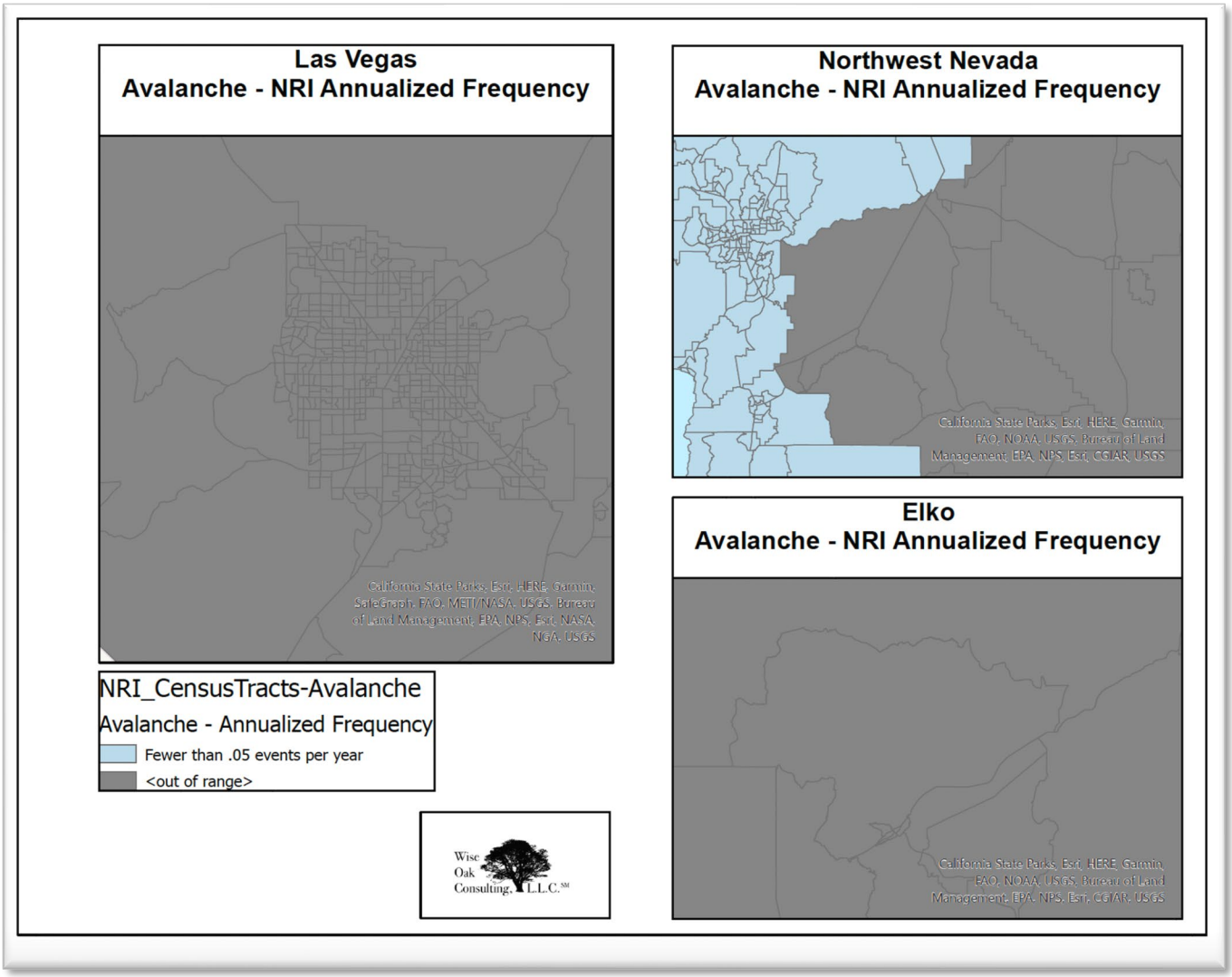


Figure 3-28. Avalanche National Risk Index Annualized Frequency – More Heavily Populated Areas.

3.3.1.4 Climate Change

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

3.3.1.5 Vulnerability of State Assets

As noted above, avalanches occur in remote locations and critical state buildings are not assessed to be at risk.

3.3.1.6 Mitigation

Subject matter experts have assessed that there is no appreciable vulnerability of state assets due to this hazard. Therefore, the hazard profile is for information purposes only and mitigation projects will not be pursued for this hazard in 2023-2028.

3.3.2 **Drought** (Medium/Significant Risk)

3.3.2.1 Nature

Nevada is a generally dry state, with the lowest statewide-average precipitation in the U.S. In much of Nevada, the majority of precipitation falls between autumn and spring. In the northern part of the state less than 20% of the annual precipitation falls during the summer (June – August). Southern Nevada receives slightly more summer precipitation, up to 30% of the expected yearly total. However, Nevada is not continuously in drought or in drought every summer. Drought occurs when it is drier than normal for the location and time of year. The American Meteorological Society defines drought as unusually dry weather that causes negative impacts. Different regions, sectors and individuals within a region can be differently impacted by the same drought.

Typically, lack of precipitation is the primary driver of drought, but higher than normal temperatures can cause or worsen drought. With warmer temperatures, the atmosphere's demand for moisture increases, so evapotranspiration is higher. With higher evapotranspiration, plants and soils dry more rapidly, and water levels in streams, lakes and reservoirs drop more than would be expected given the precipitation shortfall. Drought can also change patterns of water use, increasing the need for agricultural irrigation and residential watering. When winter temperatures are higher, precipitation is more likely to fall as rain instead of snow, and the snowpack can melt earlier. In Nevada, as in much of the West, the winter snowpack is an important reservoir within the water resource system. For example, Figure 3-29 shows that in the later winter and spring, there is more water stored in the Lake Tahoe Basin snowpack than there is in the reservoir portion of the lake (i.e. water levels above the natural rim). As a result, receiving less snow than usual can strain water resources and ecosystems, even if the overall amount of precipitation is normal. This is referred to as snow drought.

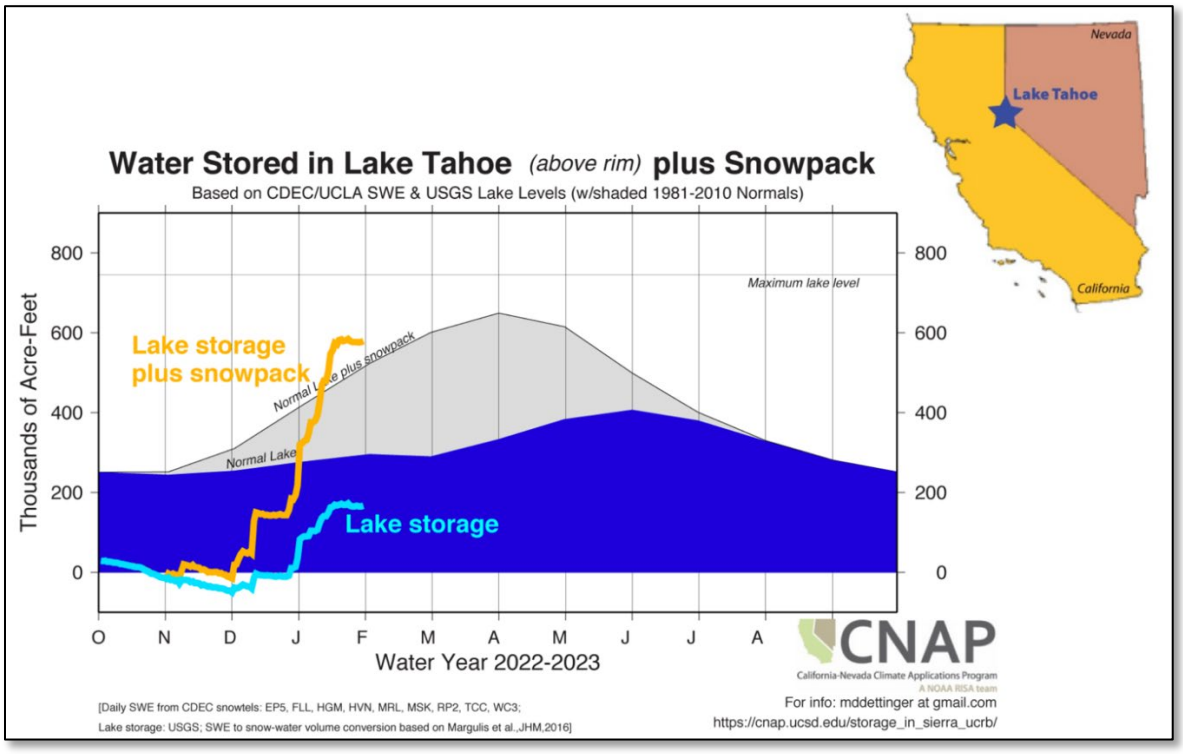


Figure 3-29. Snowpack and Reservoir Storage in the Lake Tahoe Basin.

In Figure 3-30, the average reservoir and lake storage between 1981 and 2010 are shown with blue and gray shading, respectively. The light blue and orange lines show water storage in the lake and in the lake and snow from October 2022 through February 2023.

Drought can be tracked in a variety of ways. Currently the U.S. Drought Monitor is the most commonly used tool. It is a joint effort from the U.S. Department of Agriculture, the National Oceanic and Atmospheric Administration and the National Drought Mitigation Center, located at the University of Nebraska-Lincoln. The U.S. Drought Monitor provides information about drought status as a weekly map and narrative. It has been used to track drought since 2000. To compile the map, authors assess many lines of evidence including information about precipitation, temperature, reservoir storage, soil moisture and crop and vegetation conditions. There are four levels of drought, increasing in severity from D1 – Moderate Drought through D2 – Severe Drought, D3 – Extreme Drought and D4 – Exceptional Drought. In addition, the Drought Monitor also uses the D0 – Abnormally Dry category to highlight areas that are unusually dry for the area or time of year but not yet dry enough to be in drought (Figure 3-30). Since 2012, the U.S. Drought Monitor has been used to designate drought disasters through the Fast Track process. When a drought disaster is declared in a county, farmers and ranchers have access to a range of federal disaster relief programs through the U.S. Department of Agriculture.[39]

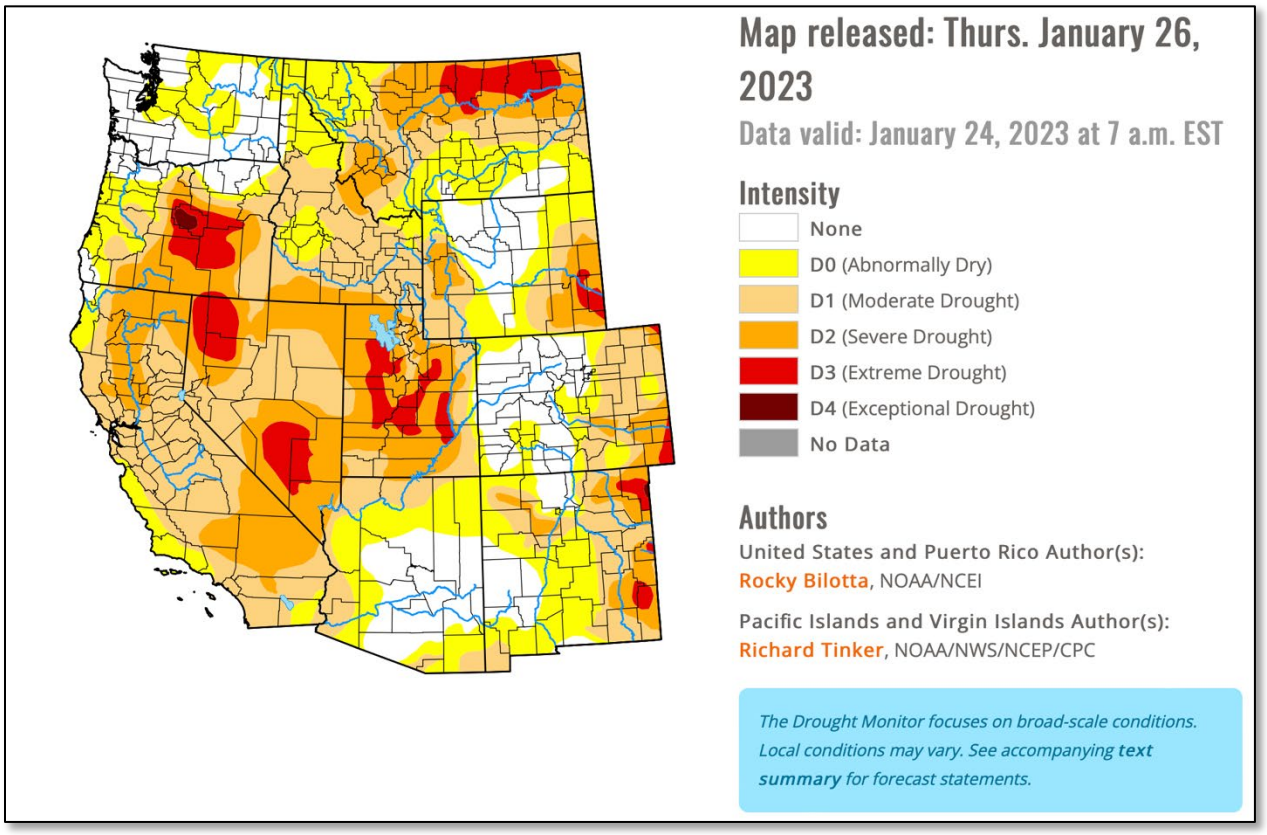


Figure 3-30. US Drought Monitor Map of the West, January 6, 2023.[40]

[39] U.S. Department of Agriculture, "Disaster Designation Information, accessed February 1," 2023, https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index.

[40] U.S. Drought Monitor, accessed February 1, 2023, https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?West.

Figures 3-31 and 3-32 depict the National Risk Index (NRI) Score for Drought statewide and in more heavily populated areas respectively. Given that the Risk Index Scores are higher in rural areas, the largest risk is due to agriculture losses.

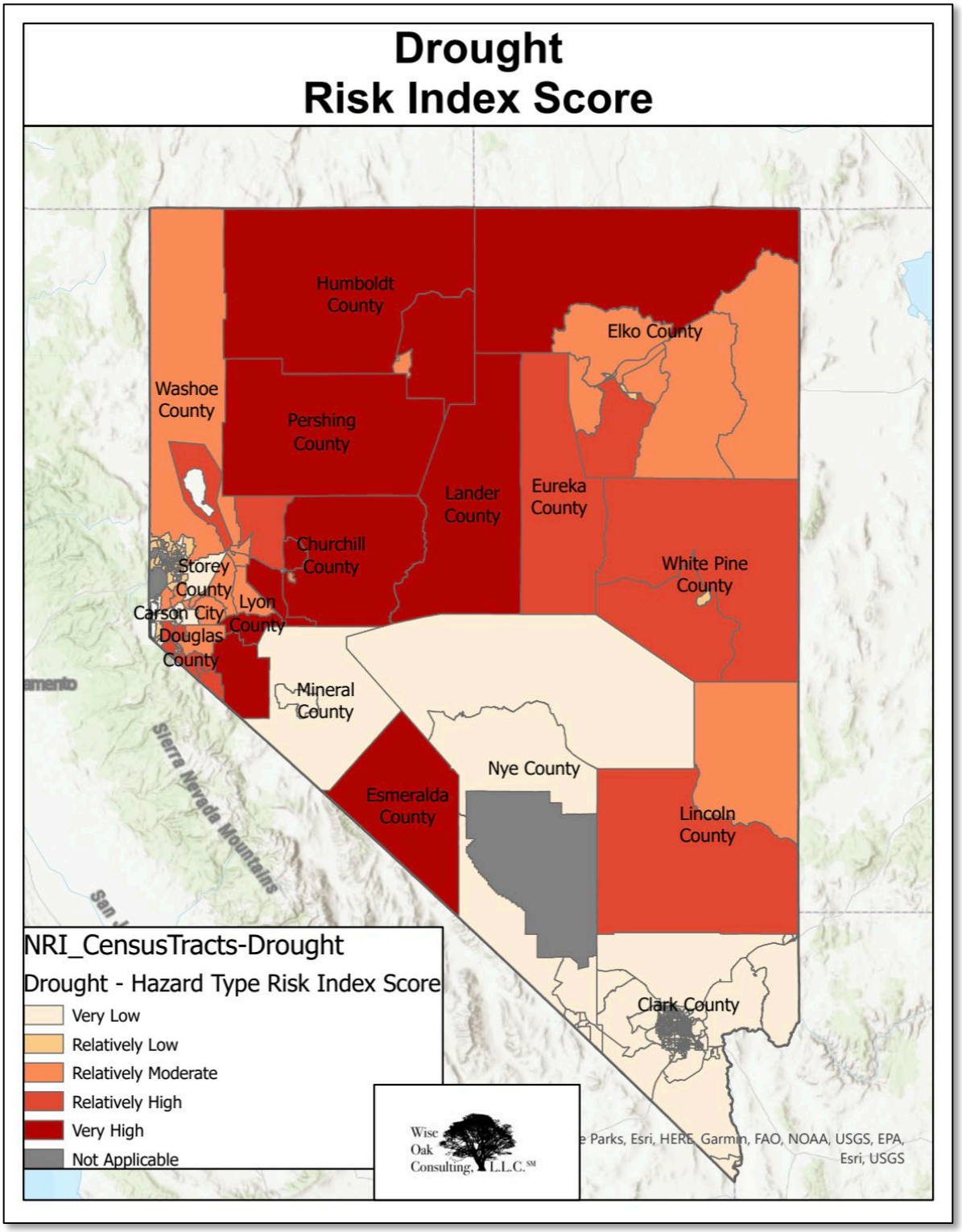


Figure 3-31. Drought National Risk Index Score – Statewide.

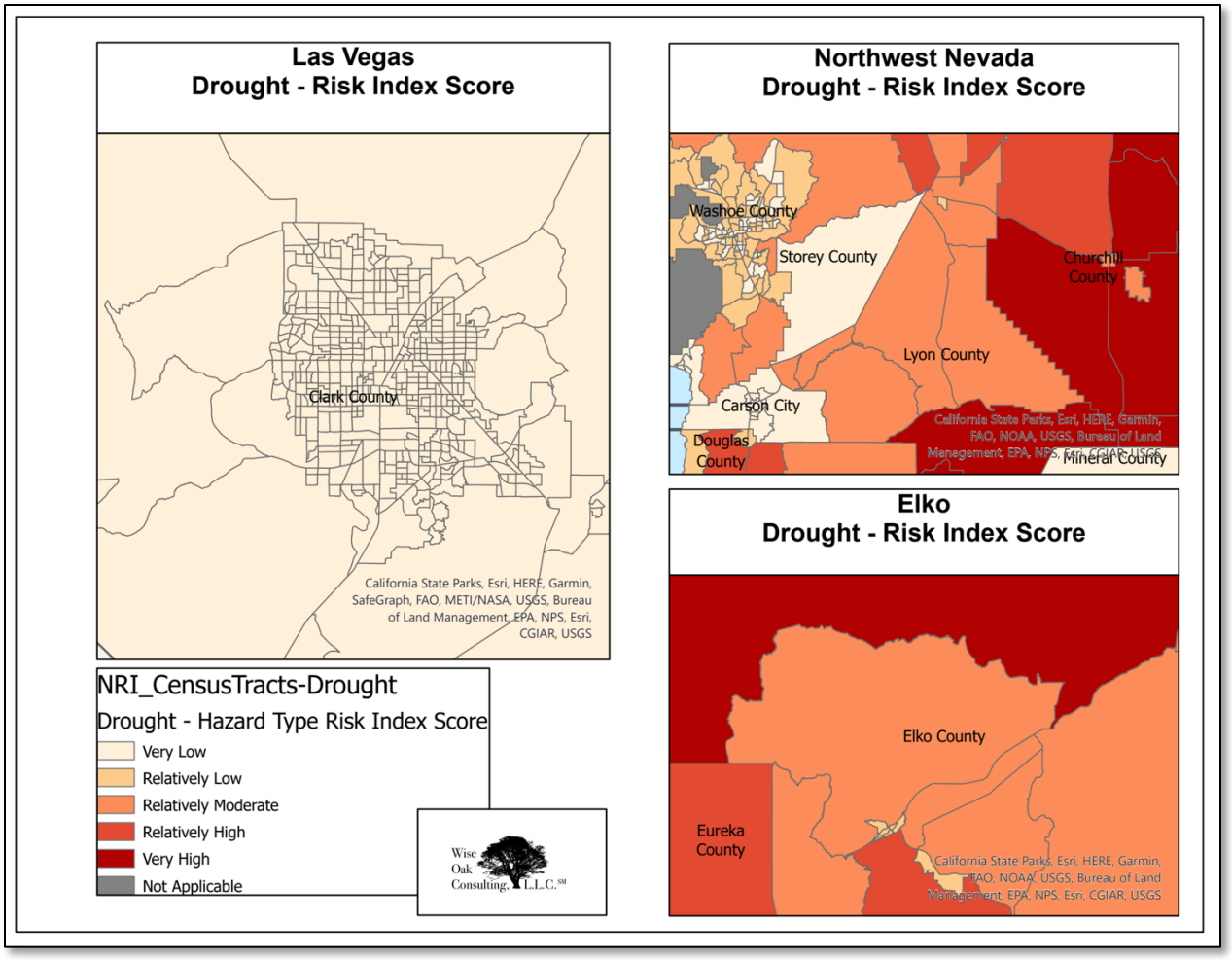


Figure 3-32. Drought National Risk Index Score – More Heavily Populated Areas.

As can be seen by the large swaths of land that have Relatively High and Very High Risk Index Scores (Figures 3-31 and 3-32), Nevada has a higher risk to drought than most of the nation. Figures 3-33 and 3-34 depict the NRI Exposure in dollar values for Drought Statewide and in more heavily populated areas respectively. Similar to the Risk Index, the exposure is largely from agriculture.

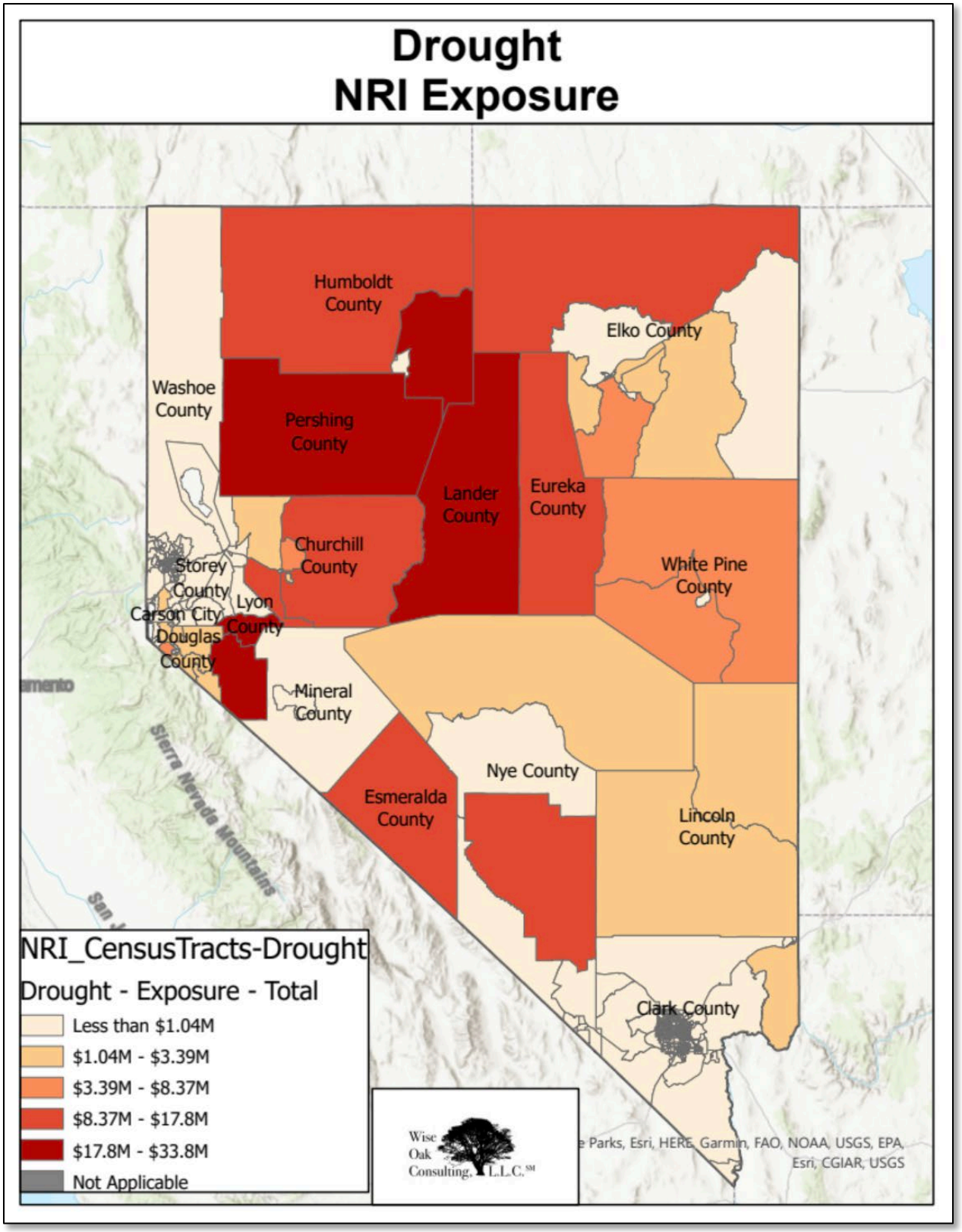


Figure 3-33. Drought National Risk Index Exposure – Statewide.

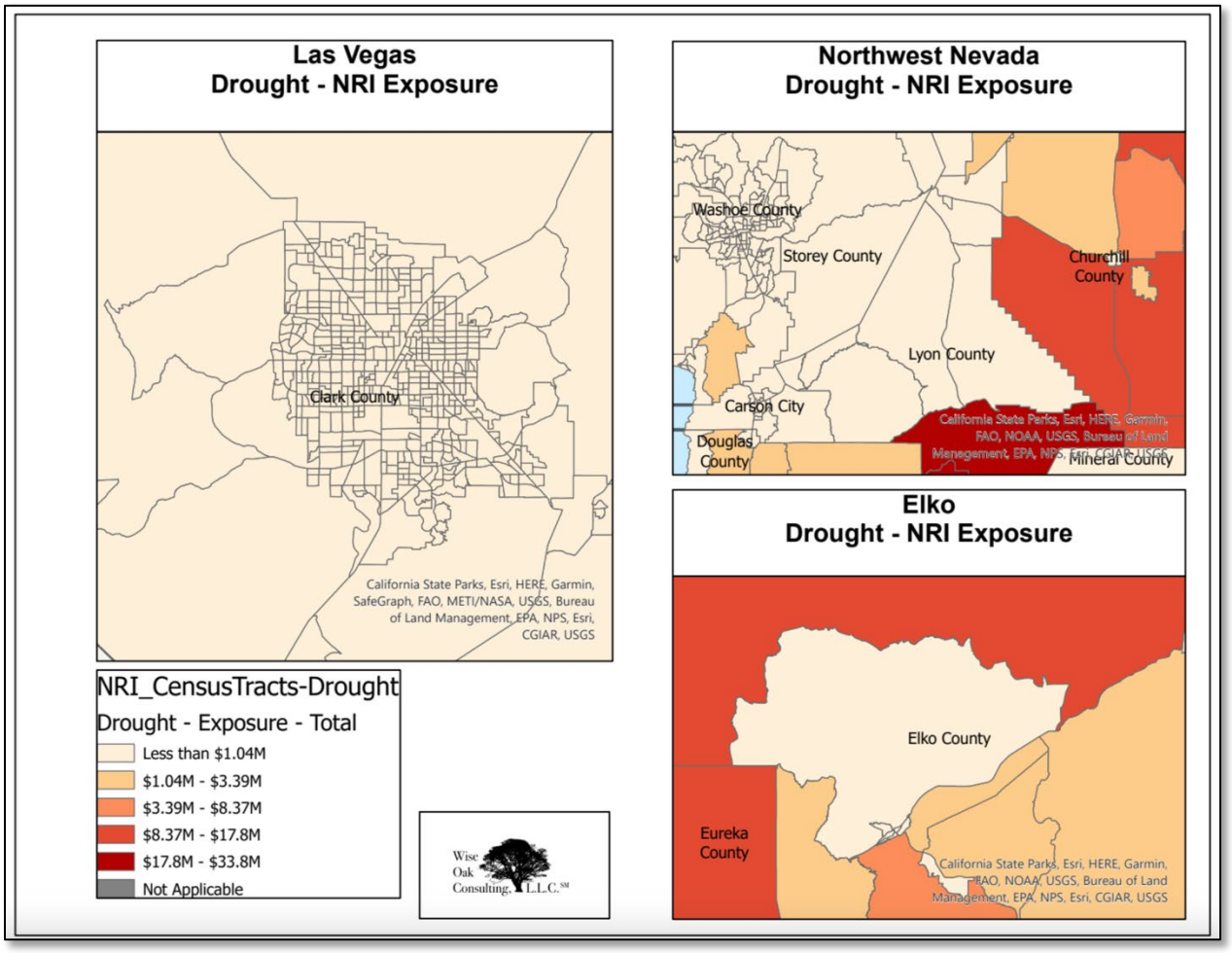


Figure 3-34. Drought National Risk Index Exposure – More Heavily Populated Areas.

3.3.2.2 History

Drought is a reasonably common occurrence in Nevada. It negatively impacts farming and ranching, recreation, wildlife, and ecosystems, and can stress water supplies, although water providers in the state plan for drought.

Drought occurrence in the state from 1895 though 2022 is tracked based on the Palmer Drought Severity Index (PDSI) from the National Centers for Environmental Information (NCEI) Climate at a Glance. The PDSI estimates drought severity on the basis of precipitation and temperature. The PDSI provides a longer record than the U.S. Drought Monitor, although it is a less comprehensive tool. The U.S. Drought Monitor considers a PDSI value of -3 or less indicative of D2-Severe Drought. Figures 3-35 – 3-39 show PDSI values from 1895-2022 for the State of Nevada, and the Northwestern (1), Northeastern (2), South Central (3), and Extreme South (4) Divisions.[41]

[41] National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information, "Climate at a Glance Divisional Time Series," accessed February 1, 2023, https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/time-series/2604/pdsi/all/12/1895-2022?base_prd=true&begbaseyear=1901&endbaseyear=2000&filter=true&filterType=binomial.

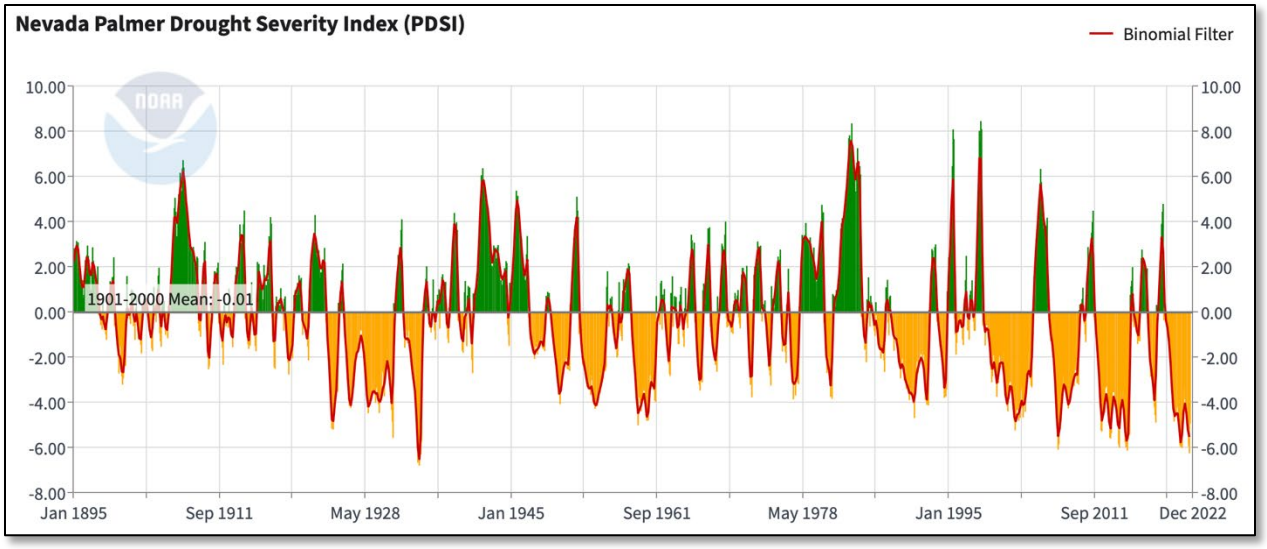


Figure 3-35. State of Nevada Palmer Drought Severity Index (PDSI) 1895-2022.

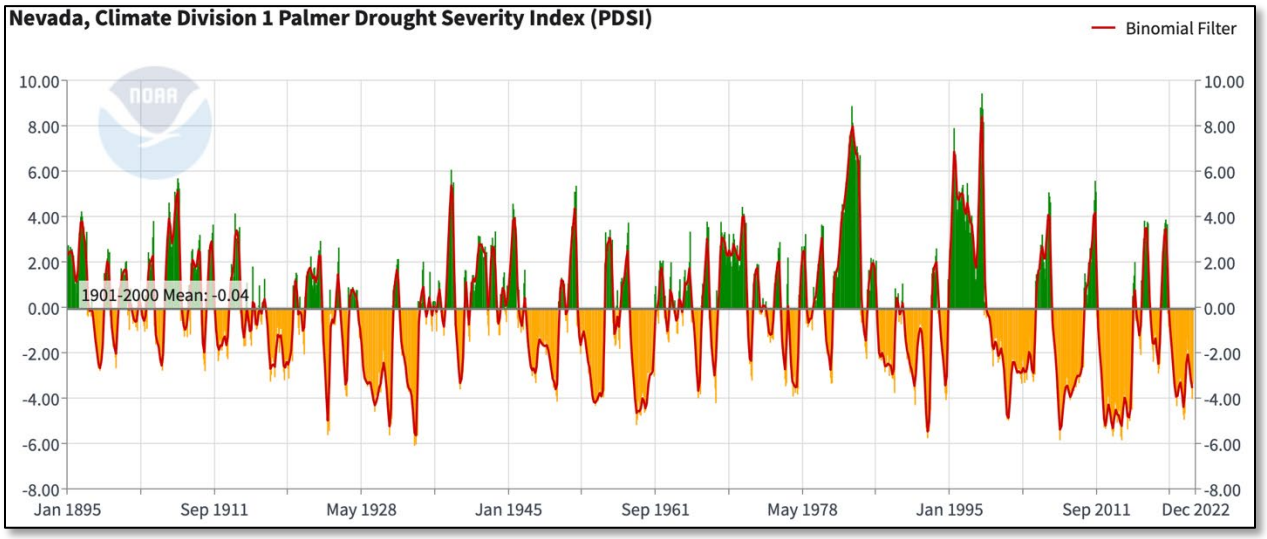


Figure 3-36. Northwestern Nevada (Division 1) Palmer Drought Severity Index (PDSI) 1895-2022.

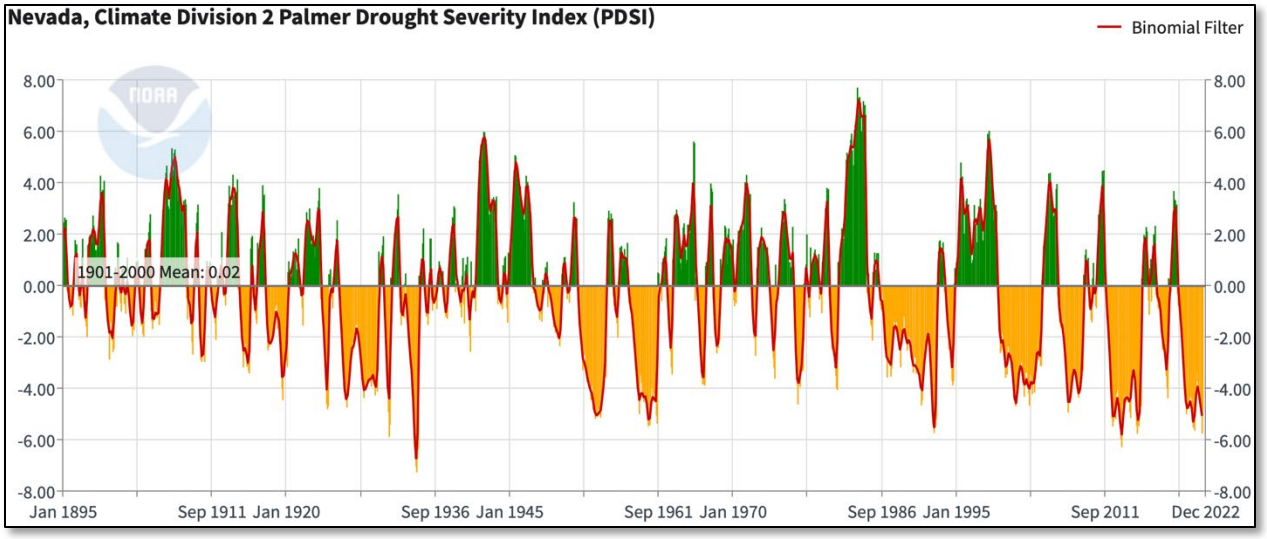


Figure 3-37. Northeastern Nevada (Division 2) Palmer Drought Severity Index (PDSI) 1895-2022.

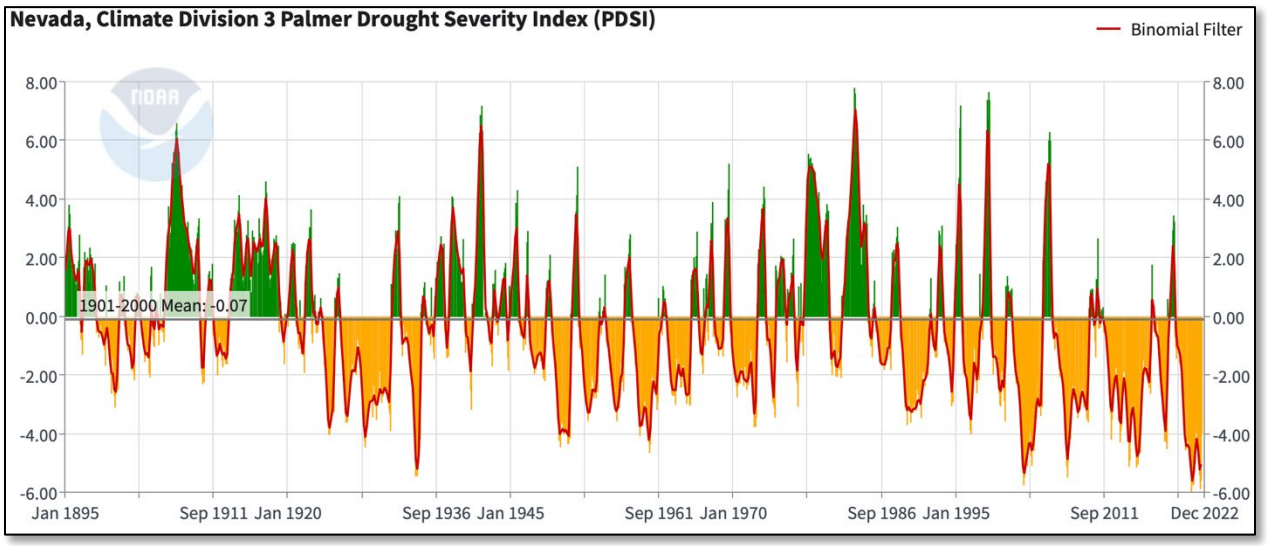


Figure 3-38. South Central Nevada (Division 3) Palmer Drought Severity Index (PDSI) 1895-2022.

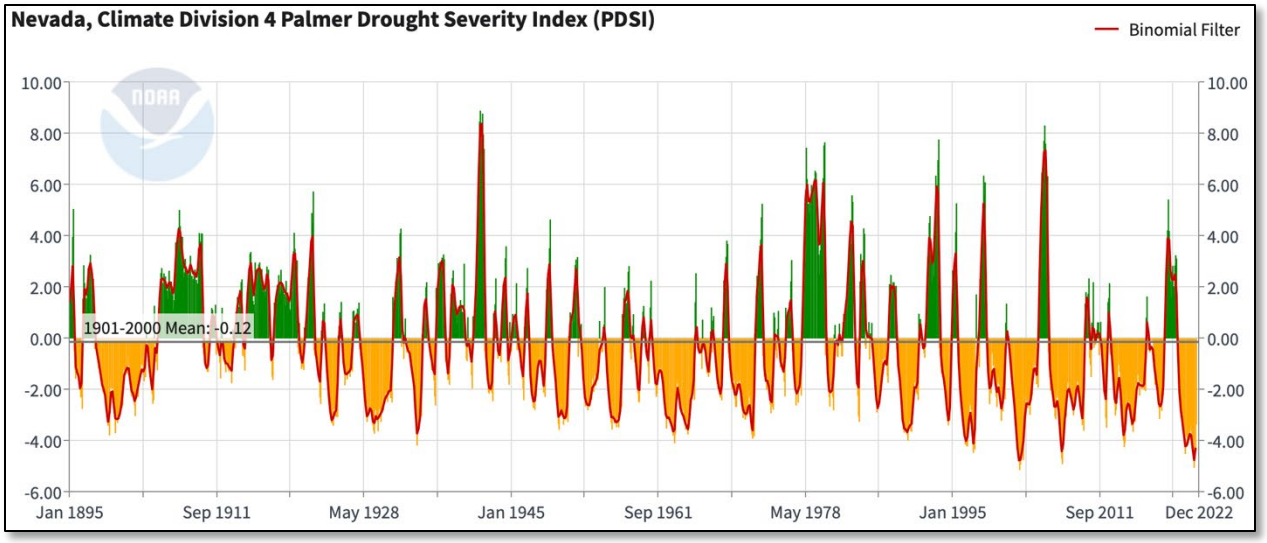


Figure 3-39. Extreme Southern Nevada (Division 4) Palmer Drought Severity Index (PDSI) 1895-2022.

Most of the state experienced drought between the late 1920s and mid 1930s as part of the Dust Bowl and during the 1950s drought. Southern Nevada experienced a brief drought in the early 1970s, while northern Nevada experienced a drought in the mid-1970s. Drought occurred again in the late 1980s and early 1990s. Since the late 1990s, Nevada has experienced more persistent droughts than previously recorded. The most recent drought, which began early in the 2020 water year and worsened rapidly during the summer of 2020 has impacted the entire state but been most severe in southern Nevada. The 2012-2015 drought impacted the entire state at times but was most focused in northern Nevada.

Figures 3-40 and 3-41 depict the NRI Historic Loss Ratio Statewide and for more heavily populated areas respectively. Similar to the NRI Exposure, the Historic Loss Ratio is higher in rural areas, indicating the majority of losses are agricultural and are higher than the majority of the country.

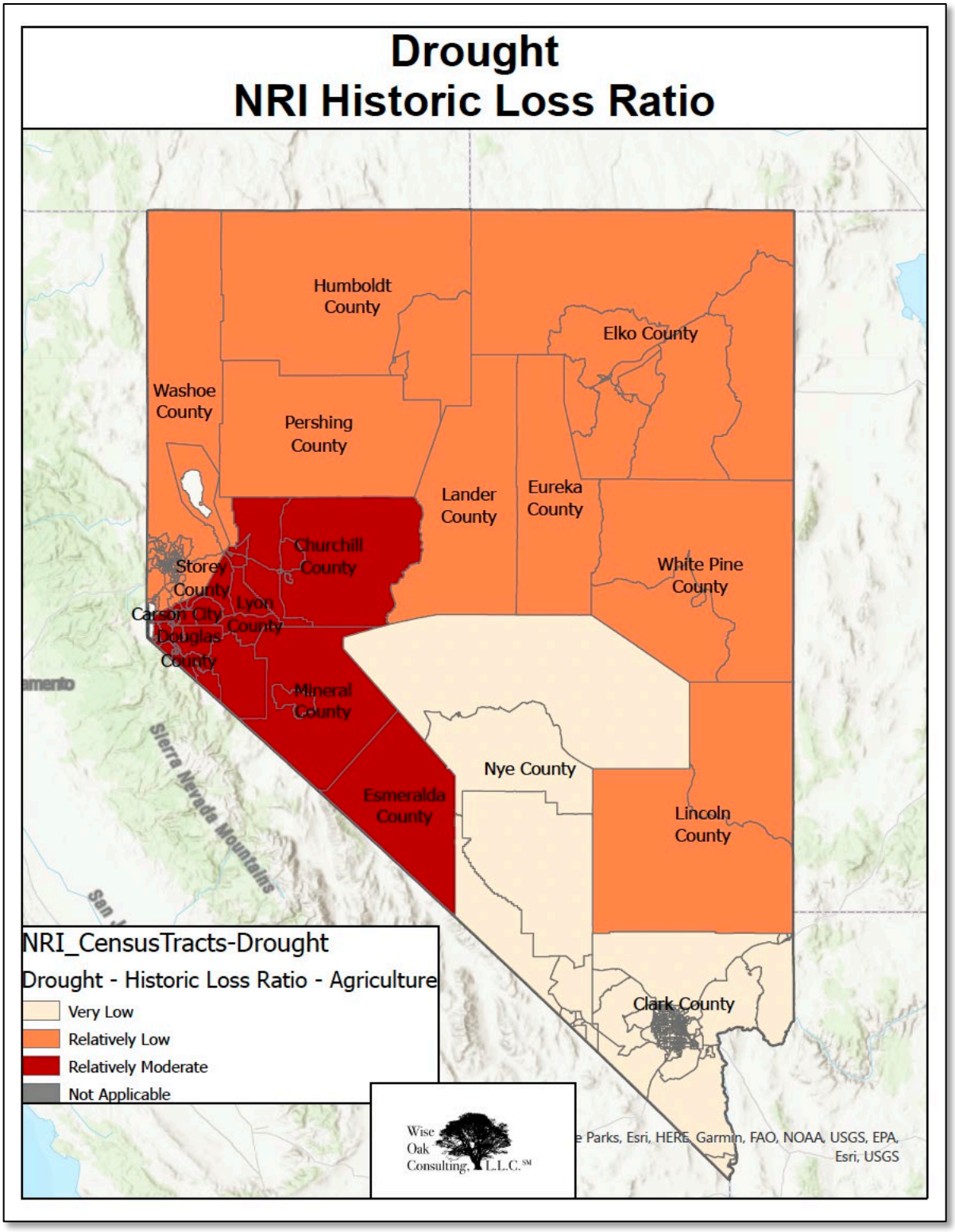


Figure 3-40. Drought National Risk Index Historic Loss Ratio – Statewide.

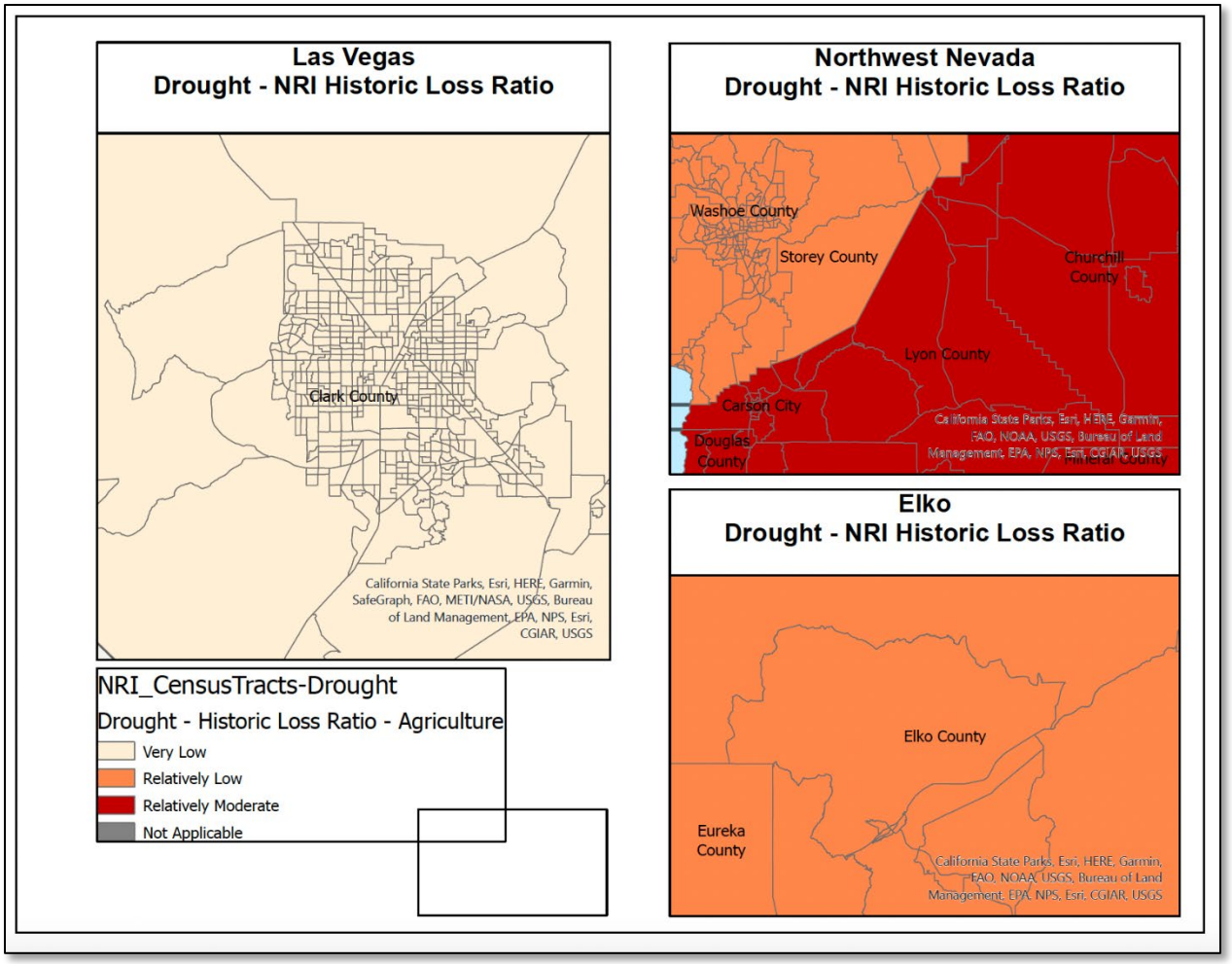


Figure 3-41. Drought National Risk Index Historic Loss Ratio – More Heavily Populated Areas.

3.3.2.3 Location, Severity, and Probability of Future Events

Precipitation in the State of Nevada has been historically difficult to predict, with different models providing varying results. However, the average of projections shown in the State of Nevada Climate Initiative suggest drying and southern Nevada and the potential for slightly more precipitation in northern Nevada (Figure 3-42).[42]

[42] State of Nevada Climate Initiative, "Nevada Climate Strategy," accessed February 1, 2023, https://climateaction.nv.gov/policies/climate-nv/#.

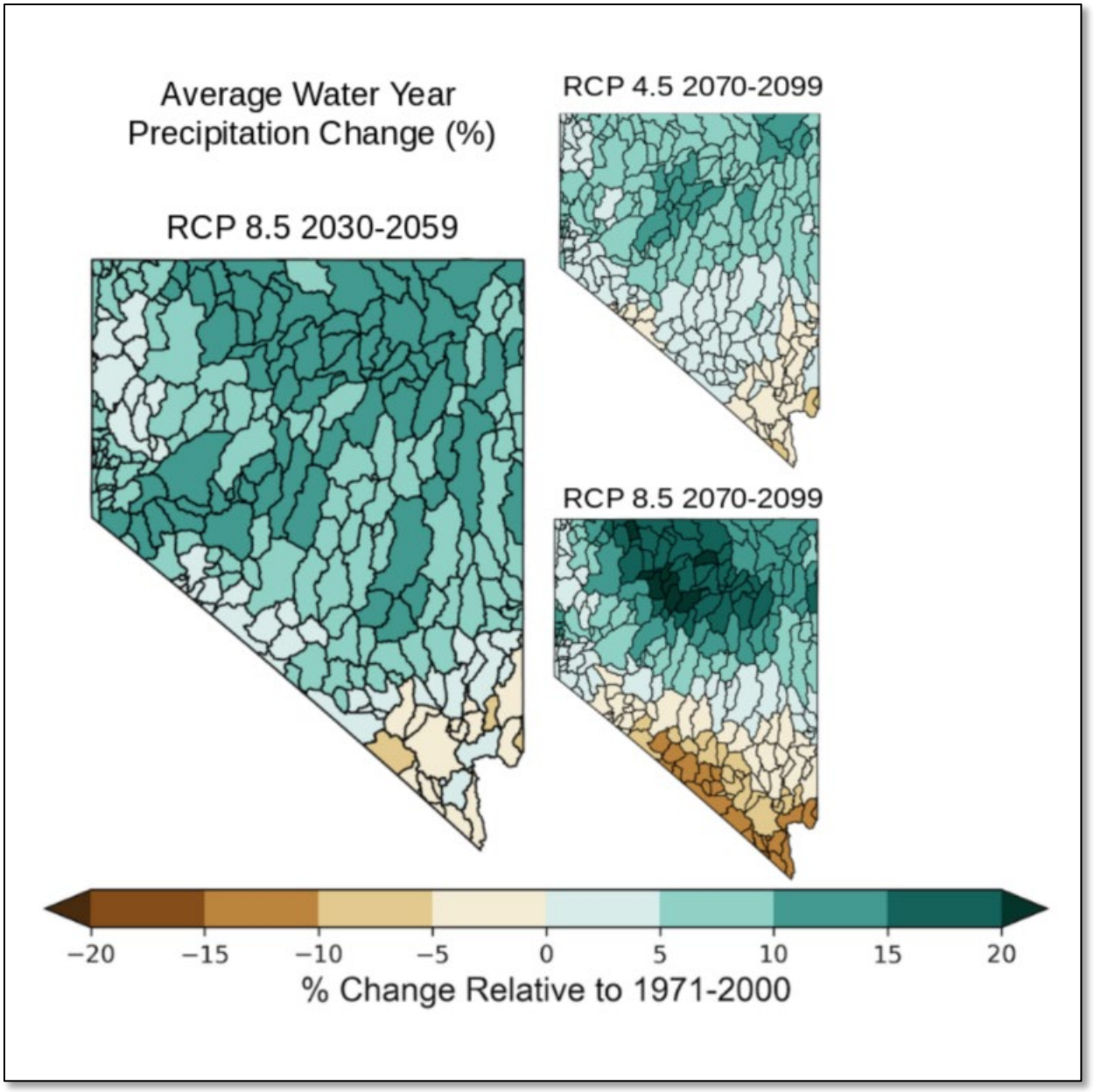


Figure 3-42. Average Water Year Percentage Change (%).

If precipitation does increase, it is not expected to offset the drying effects of higher temperatures (see Figure 3-43). Changes in average temperature and/or precipitation will combine with the occurrence of periodic droughts related to precipitation shortfalls and/or periods of warmer than normal temperature. In much of the state, the occurrence of dry and/or low-snow winters that can precipitate drought are not easy to forecast. Southern Nevada is often drier than normal during La Niña winters and wetter than normal during El Niño winters, providing some predictability about local conditions. Climate projections suggest that there is potential for greater year-to-year variability in precipitation.[43] This may further complicate drought planning in the future.

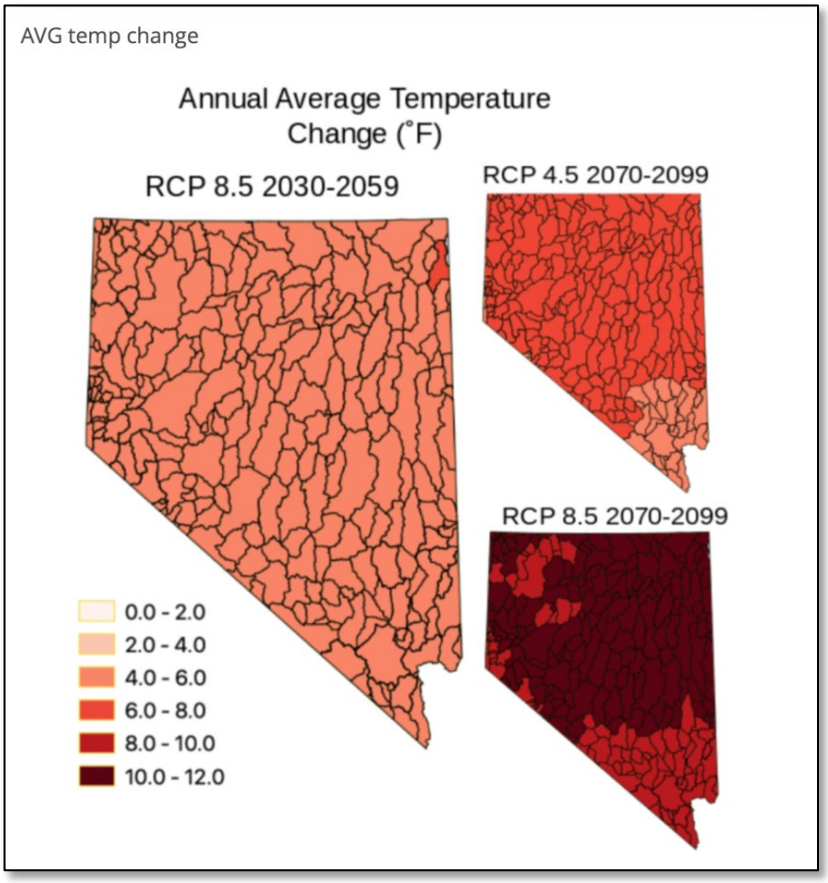


Figure 3-43. Average Annual Temperature Change.

Projections for increasing temperature, irrespective of any changes in precipitation will increase the chance for drought in Nevada over the coming decades because of increased evaporative demand and a shift from rain to snow. By the end of this century (2070-2099), average temperatures in Nevada are expected to increase 4-6 °F if greenhouse gas emissions are low and could increase 10-12 °F if emissions are high (Figure 3-43).[44]

The increase in temperature will contribute to increases in evaporative demand of 5% to more than 20% relative to the 1971-2000 average. According to the State's 2020 climate assessment, average conditions late in the 21st century will be similar to what we currently consider D2-Extreme drought in much of the state and will be similar to current D3-Exceptional Drought in southern and eastern Nevada if emissions are high (Fig. 3-44).[45] Figure 3-44 shows that the State of Nevada is expected to get drier over this century as shown by the map of Standardized precipitation Evaporation Index (SPEI). The SPEI represents normalized difference between precipitation and evaporative demand.

[43] Daniel Swain, et al., "Increasing precipitation volatility in twenty-first century California, accessed February 1, 2023, https://www.sierraforestlegacy.org/Resources/Conservation/FireForestEcology/ThreatsForestHealth/Climate/CI_Swain_etal_2018_Increasing_Precip_Volatility.pdf.

[44] State of Nevada Climate Initiative, "Nevada Climate Strategy," accessed February 1, 2023, https://climateaction.nv.gov/policies/climate-nv/#.

[45] "Nevada Climate Strategy"

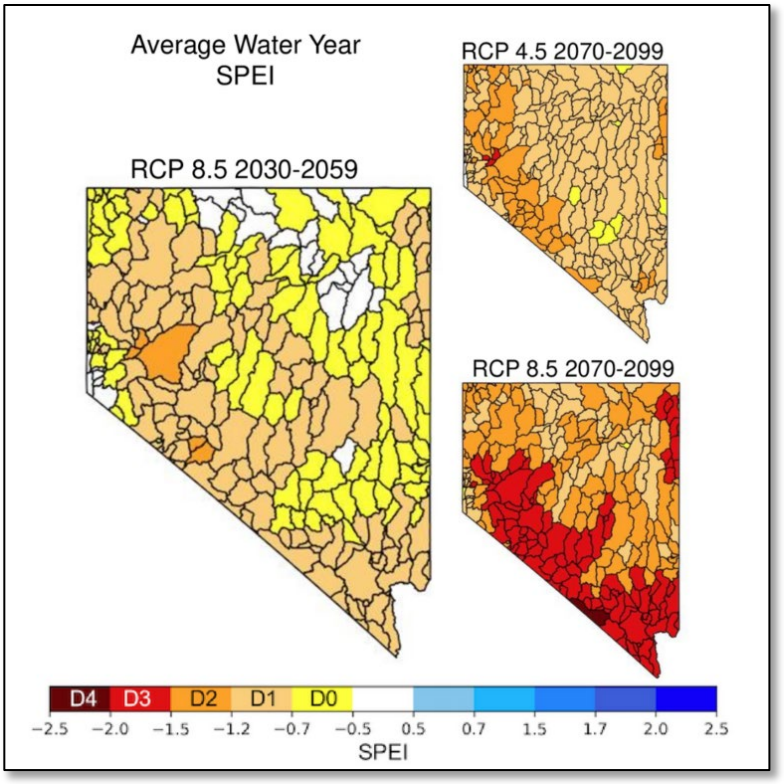


Figure 3-44. Average Water Year SPEI.

With warming temperatures, the state is also likely to experience a shift in the balance between rain and snow, with more of the winter precipitation arriving as rain rather than snow. The State of Nevada could see approximately 10%-15% more precipitation as rain rather than snow under a reduced-emission scenario and 15%-25% more rain under a higher-emissions scenario (Figure 3-45).[46]

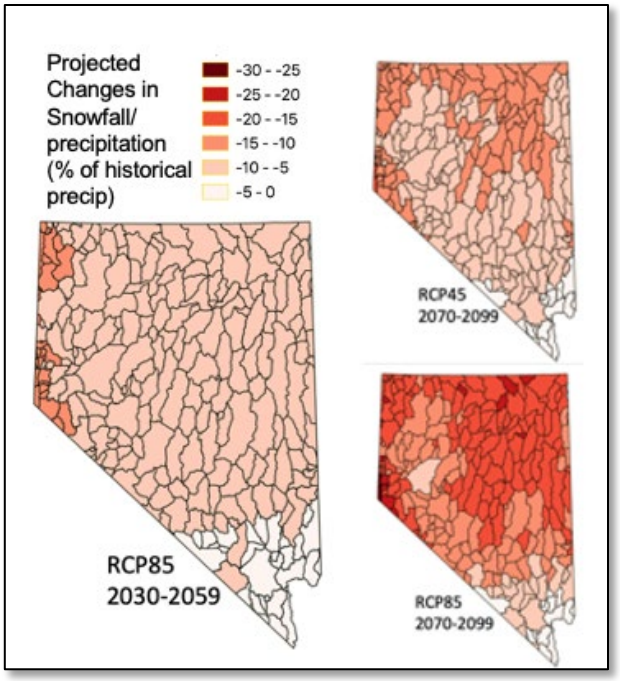


Figure 3-45. Projected Changes in Snowfall Percentage of Precipitation (% of historical precipitation).

As can be seen in Figure 3-45 the shift from rain to snow may be as large as 20%-30% in northern and higher elevation parts of the state that currently receive snow. Although the changes in the ratio of snow to rain will be smaller in the warmer southern parts of the state, they will still be impacted by this change because of the importance of snowpack outside the state in sustaining water resources.

The state has had a drought plan to provide a general framework for coordinating drought response in place since at least 1991. It was revised in 2003 and again in 2012. The current State of Nevada Drought Response Plan is available at: http://water.nv.gov/programs/planning/StateDroughtResponsePlan2012.pdf. It is being revised as of February 2023.

Impacts to Rural and Urban Nevada

In rural Nevada, communities and agriculture rely primarily on groundwater. Groundwater supplies are typically better buffered against drought impacts because of greater storage. A 2016 report on the drought-resilience of groundwater supplies in nine northern Nevada basins defined drought as half the normal groundwater recharge over 15 years, and the analysis was conducted using a widely used groundwater model (see attached report in Appendix P by Pohll et al.). It found that most municipal supplies were robust to drought, although individual domestic wells might experience drought impacts. Drought had the greatest impact on groundwater levels in the mountains. Drought impacts in valleys were much smaller. Overall, pumping was a bigger contributor to declines in groundwater than drought.

Urban areas in Nevada (the Las Vegas metropolitan area and the Reno-Sparks-Carson City region) rely heavily on surface water that falls as snow in the mountains and recharges reservoirs. The Colorado River is primary water supply for Clark County. Colorado River flows and storage in Lake Mead have both been dropping over the last two decades owing to periods drought and higher temperatures. As a result, the first shortage under the 2019 Lower Basin Drought Contingency Plan was declared in summer of 2021. This reduces Nevada's share of water from the Colorado by 7%. Dropping water levels in Lake Mead and other reservoirs can also threaten hydropower production. Although water providers in urban areas, in particular,

[46] "Nevada Climate Strategy"

have taken steps to safeguard the resilience of water systems, increasing temperatures and potentially less predictable precipitation increase potential drought impacts. As of February 2023, six (6) of the seven (7) states who rely upon the Colorado River have developed an agreement to cut Colorado River water usage to stave off mandatory reductions by the Federal government. The State of California has yet to agree to the water usage cuts.

Figures 3-46 and 3-47 depict the NRI Expected Annual Loss due to drought statewide and for more heavily populated areas respectively. Corresponding with the relatively High Risk Index Score and Historic Loss Ratio, Expected Annual Loss is also relatively high in agricultural areas.

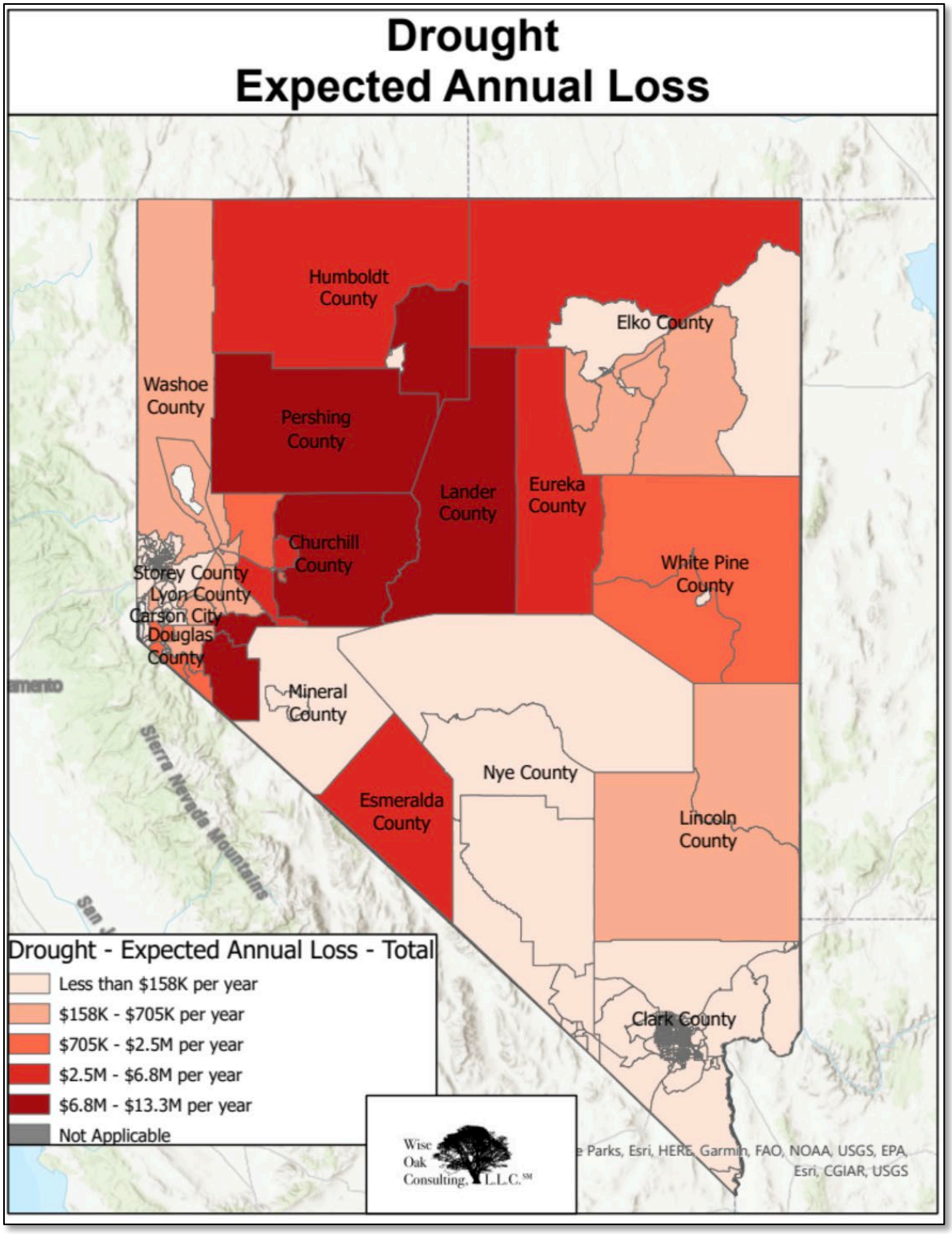


Figure 3-46. Drought National Risk Index Expected Annual Loss – Statewide.

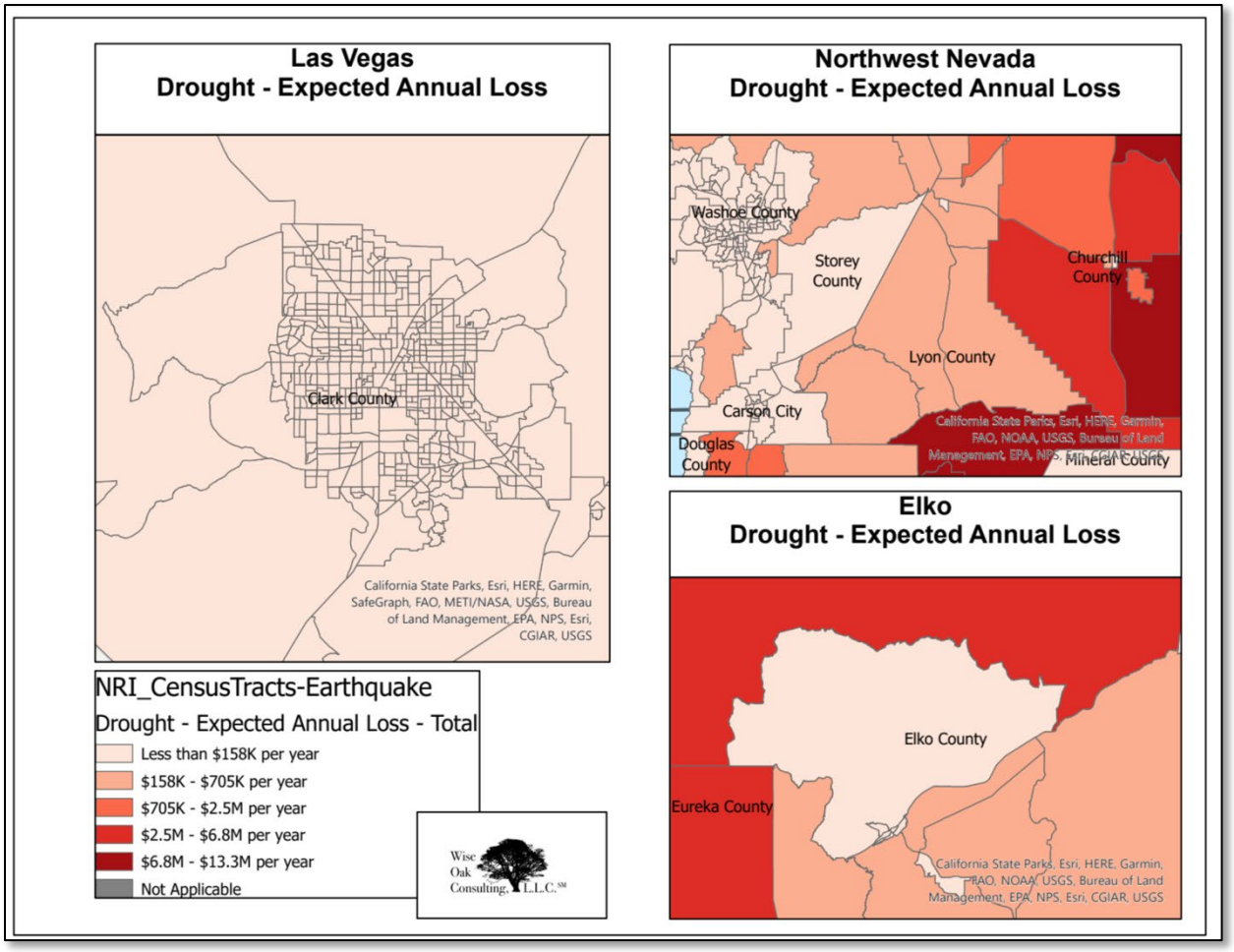


Figure 3-47. Drought National Risk Index Expected Annual Loss – More Heavily Populated Areas.

Given that Nevada is a relatively dry state, the Annualized Frequency of future drought events is also higher than most regions of the country (Figures 3-48 and 3-49)

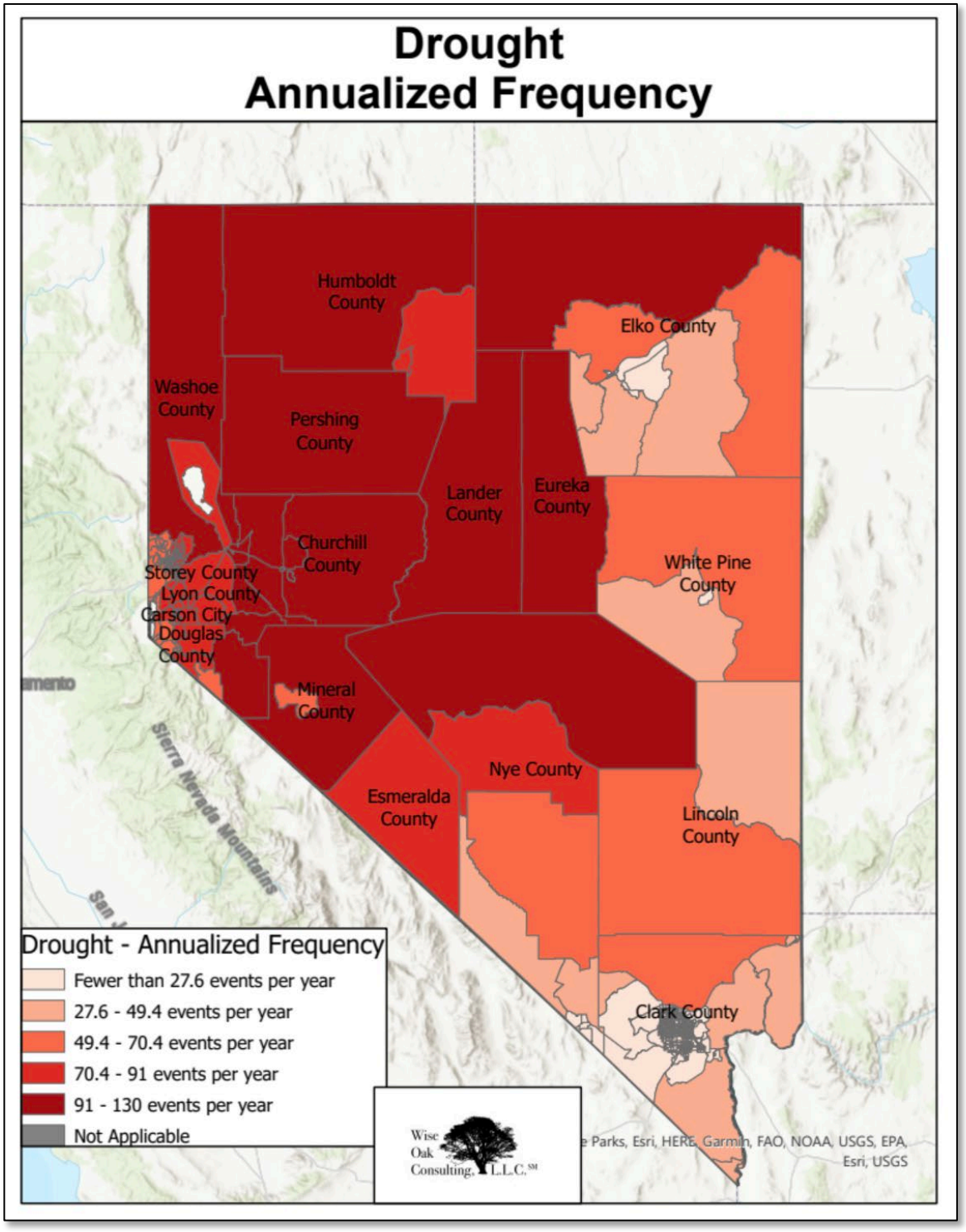


Figure 3-48. Drought National Risk Annualized Frequency – Statewide.

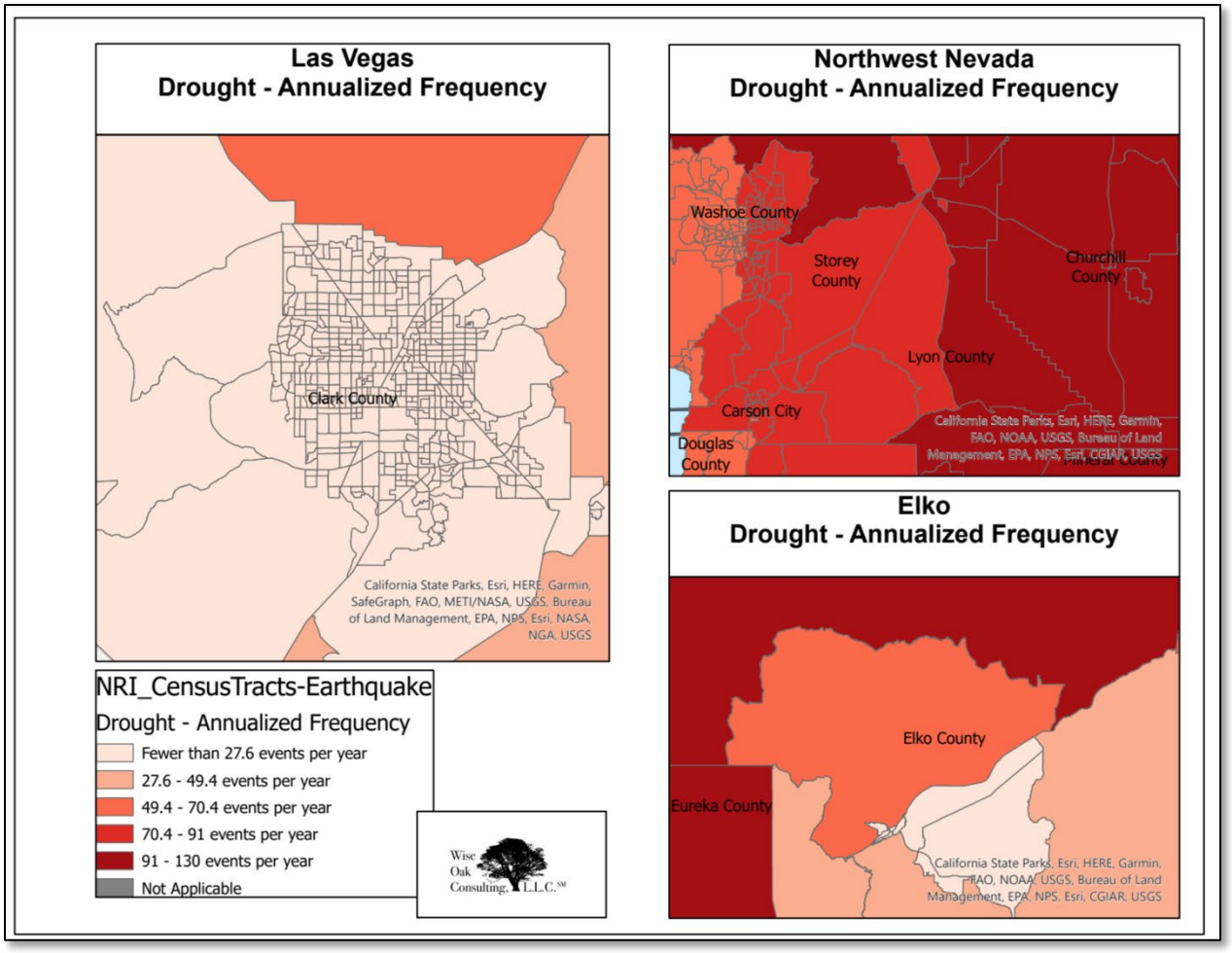


Figure 3-49. Drought National Risk Annualized Frequency – More Heavily Populated Areas.

3.3.2.4 Climate Change

As depicted in Figure 3-12, Nevada's Climate Strategy highlights expected impacts from drought due to climate change (Table 3-8).[47]

Table 3-8. Impacts of Climate Change to Drought

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

[47] Climate Strategy, March 9, 2023.

	• Water hauling needs • Reduction in Federal land • Increased need for feeding hay • Reduction in land available for production

Public Health

According to a 2022 white paper by the Office of Management and Budget (OMB), Federal healthcare costs due to climate change for Valley Fever, southwest dust, and wildfires (respiratory injuries) could range between $169M and $353M by the end of the century.[48] Since these three risks affect Nevada, the State can assume it will also see healthcare costs increase. Drought is a factor in all three of these risks. In 2020, state and local governments healthcare costs represented 14.3% of the $4.1T national healthcare spending.[49] If the same ratio were to hold true, state and local government share of the cost of Valley Fever, southwest dust, and wildfires would be approximately $24M to $50M by the end of the century. With Nevada having 9.5% of the national population, a gross estimate of the cost due to climate change by the end of the century for Valley Fever, southwest dust, and wildfires for state and local jurisdictions is $2.3M to $4.75M.

Leisure and Hospitality

Leisure and hospitality is the leading economic sector in Nevada, accounting for 333,900 jobs – 23% of the wages and salary.[50] In 2022, Tourism generated $317.6B and Casino Hotels generated $28.9B of revenue.[51] In addition, Real Estate and Rental and Leasing (including cars, formal wear, equipment, etc.) and tourism related services accounted for more than 36% of the State's the State's $159.5B in gross domestic product.[52]

Outdoor activities in Nevada include water sports, winter sports, fishing, bird hunting, wildlife watching, hiking, and golfing. The climate change will impact all of these activities. Las Vegas' local golf courses, which are used by 3 out of every 10 tourists, are major consumers of water and could become economically unfeasible.[53]

In 2018, the total economic impact or golf in the State of Nevada was $1.98B.[54] If just 25% of golfers no longer play due to drought-caused impacts, the economic impact would be approximately $495M.

[48] Office of Management and Budget, "Climate Risk Exposure: An Assessment of the Federal Government's Financial Risks to Climate Change," March 10, 2023, https://www.whitehouse.gov/wp-content/uploads/2022/04/OMB_Climate_Risk_Exposure_2022.pdf.

[49] "Climate Risk Exposure: An Assessment of the Federal Government's Financial Risks to Climate Change," March 10, 2023.

[50] U.S. Bureau of Labor Statistics, Economy at a glance: Nevada, March 9, 2023, https://www.bls.gov/eag/eag.nv.htm.

[51] IBISWorld, Nevada Economic Overview, March 9, 2023, https://www.ibisworld.com/united-states/economic-profiles/nevada/.

[52] IBISWorld, Nevada Economic Overview, March 9, 2023, https://www.ibisworld.com/united-states/economic-profiles/nevada/.

[53] University of Maryland, "Economic Impacts of Climate Change on Nevada: 2008," March 9, 2023, http://cier.umd.edu/climateadaptation/Nevada%20Economic%20Impacts%20of%20Climate%20Change.pdf.

[54] TEConomy Partners, LLC, "The Economic Impact of Nevada Golf," p. 23, https://snga.org/wp-content/uploads/NV-Golf-Report-19.pdf.

In 2018, Lake Meade generated $336M for local gateway communities, supporting $149M in labor for 3,990 jobs.[55] Similar to Golf, a 25% drop in Lake Meade-based tourism would result in an $84M economic impact.

Agriculture

Agriculture, Forestry, Fishing, and Hunting generated $433M in GDP for the State in 2022. During 2022, Nevada agriculture producers saw almost $210M in losses (winter weather, freezing, and irrigation system failures have been excluded).[56] Insurance payments to U.S. farmers due to drought increased 400% in the 25 years from 1995 to 2020.[57] If the same trend were to hold true for the next 25 years, Nevada farmers could see more than $840M (2022 dollars) in losses in a year by mid-century. Even a 50% increase would result in over $315M (2022 dollars) in losses per year. A 2021 Stanford study estimates that global warming accounts for 19% of crop losses between 1991 and 2017. At 19% of the total, the impact of climate change on crop loss increases by mid-century of between $315M and $840M would be approximately $60M and $159M per year (Table 3-9). There is a large variance in loss increase in part because it depends on the mitigation measures that jurisdictions put in place.

During 2022, the total crop insurance premiums for agriculture producers amounted to $84.4M on $311M in total liabilities.[58] While insurance premiums will also rise, the interplay between such factors as yield decreases and price increases makes estimating the premium increase extremely difficult.

Table 3-9. Estimated Agricultural Loss Increase Due to Climate Change

County	2022 Loss	2047 Estimated Loss - Low (50% Increase)	2047 Estimated Loss - High (400% Increase)	2047 Loss Due to Climate Change - Low (50% Increase)	2047 Loss Due to Climate Change - High (400% Increase)
Churchill	$10,052,934	$15,079,401	$40,211,736	$2,865,086	$7,640,230
Clark	$322,801	$484,202	$1,291,204	$91,998	$245,329
Douglas	$623,000	$934,500	$2,492,000	$177,555	$473,480
Elko	$39,047,062	$58,570,593	$156,188,248	$11,128,413	$29,675,767
Esmeralda	$7,062,480	$10,593,720	$28,249,920	$2,012,807	$5,367,485
Eureka	$10,170,867	$15,256,301	$40,683,468	$2,898,697	$7,729,859
Humboldt	$7,711,237	$11,566,856	$30,844,948	$ 2,197,703	$5,860,540
Lander	$28,698,121	$43,047,182	$114,792,484	$8,178,964	$21,810,572
Lincoln	$13,955,762	$20,933,643	$55,823,048	$3,977,392	$10,606,379
Lyon	$7,163,988	$10,745,982	$28,655,952	$2,041,737	$5,444,631
Mineral	$3,745,111	$5,617,667	$14,980,444	$1,067,357	$2,846,284
Nye	$19,976,959	$29,965,439	$79,907,836	$5,693,433	$15,182,489
Pershing	$25,926,216	$38,889,324	$103,704,864	$7,388,972	$19,703,924

[55] National park Service, Lake Meade, "Tourism to Lake Mead National Recreation Area Creates $336M in Economic Benefits," March 10, 2023, https://www.nps.gov/lake/learn/news/2019-economic-impact.htm.

[56] Cause of Loss Historical Data Files, March 10, 2023.

[57] Leah Douglas, Rueters, "U.S. crop insurance payouts rise sharply as climate change worsens droughts, floods," January 27, 2022, accessed March 10, 2023, https://www.reuters.com/markets/commodities/us-crop-insurance-payouts-rise-sharply-climate-change-worsens-droughts-floods-2022-01-27/.

[58] U.S. Department of Agriculture, Cause of Loss Historical Data Files, March 10, 2023, https://www.rma.usda.gov/SummaryOfBusiness/CauseOfLoss.

Table 3-9. Estimated Agricultural Loss Increase Due to Climate Change					
County	2022 Loss	2047 Estimated Loss - Low (50% Increase)	2047 Estimated Loss - High (400% Increase)	2047 Loss Due to Climate Change - Low (50% Increase)	2047 Loss Due to Climate Change - High (400% Increase)
Washoe	$10,275,703	$15,413,555	$41,102,812	$2,928,575	$7,809,534
White Pine	$25,416,301	$38,124,452	$101,665,204	$7,243,646	$19,316,389
All Other Counties	$160,358	$240,537	$641,432	$45,702	$121,872
Total	$210,308,900	$315,463,350	$841,235,600	$59,938,037	$159,834,764

In summary, Nevada could see an economic impact of drought due to Climate change could be more than $700M by mid-century.

3.3.2.5 Vulnerability of State Assets

The vulnerability of state critical buildings is provided in Appendix T.

3.3.2.6 Mitigation

The 2015 Drought Forum convened by then-Governor Sandoval outlined a number of recommendations to better prepare for drought in Nevada. These recommendations included:

- Better and more extensive condition monitoring
- Directing water providers to develop water conservation plans that include strategies like water metering, tiered-rating, and outdoor watering guidelines that limit irrigation to cooler times of day
- More efficient use of agricultural water
- Modification and amendment of state water law
- Identifying new water sources, including water reuse
- Improving access to information about drought mitigation and response programs.

The Federal government provides a number of drought response programs for agriculture through the US Department of Agriculture and Natural Resources Conservation Service (see attached FSA Disaster Assistance Programs at a Glace). The US Army Corps of Engineers can also provide technical support during drought.

3.3.3 Earthquakes (High Risk)

3.3.3.1 Nature

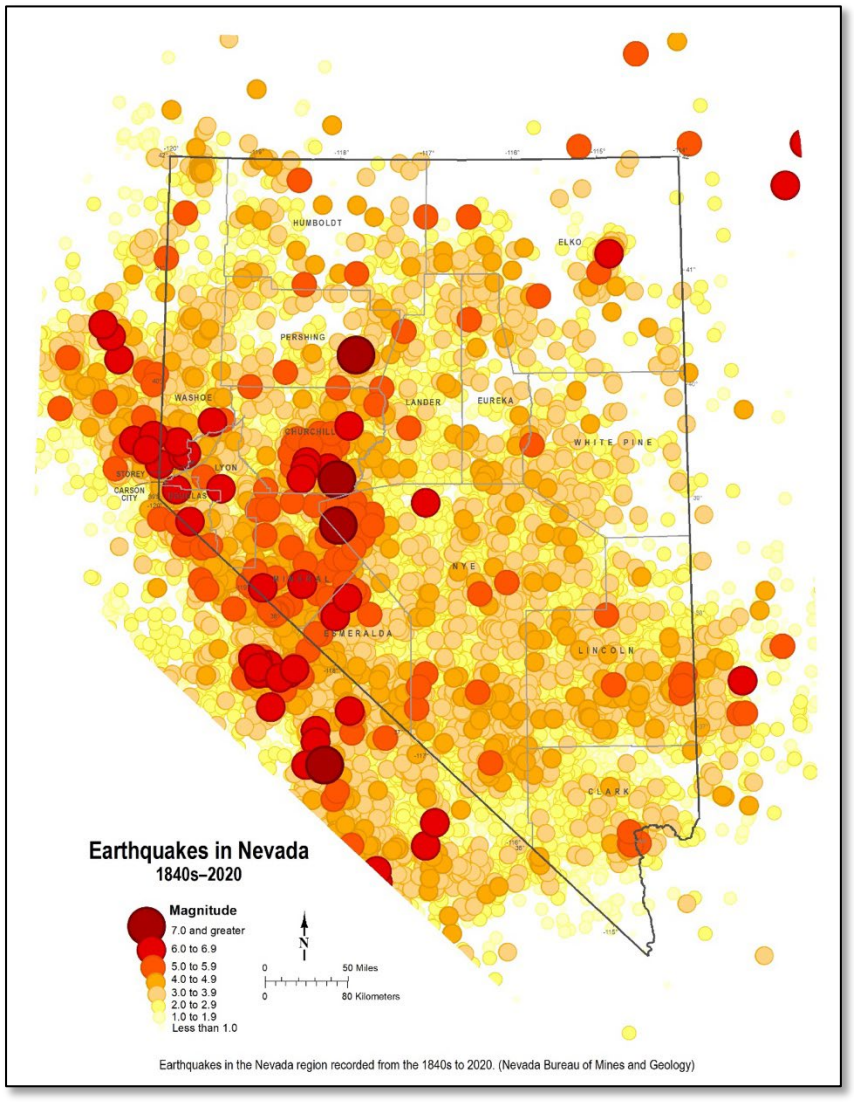
Nevada is earthquake country. Over 250,000 earthquakes have been recorded within or adjacent to the state since 1857. During this same period another one million earthquakes (estimated) occurred but were not recorded. The Nevada Seismological Laboratory records between 8,000 and 17,000 background earthquakes each year in Nevada. The largest earthquakes were over magnitude 7 and shook the entire state. More than 25 Nevada communities have experienced damage from earthquakes during this same time period, at least eight (8) of these communities experienced repetitive earthquake damage, and every community has felt significant shaking (Figure 3-51). Fifteen (15) out of 17 counties have experienced historical earthquake damage or surface faulting. Earthquakes are responsible for the formation of the Nevada mountain ranges, which continue to develop. Seismicity, earthquake faults, and geodetically measured deformation all indicate that future large earthquakes can occur anywhere in the state. In the short term, personal preparedness, emergency response planning, emergency response exercises, and community recovery planning are critical. In the long term, constructing seismically resilient buildings, planning future development around earthquake faults, and developing earthquake early warning systems will help reduce injuries and damage from future earthquakes. Several of the buildings in the photograph of Wells (Figure 3-50) were seismically vulnerable unreinforced masonry buildings, highlighting the damage potential due to legacy buildings. Earthquake insurance is also a good safeguard for resilience and recovery.



Figure 3-50. 2008 Wells, Nevada Earthquake Damage to Front Street.[59]

[59] Photograph by Craig dePolo, Nevada Bureau of Mines and Geology.

Nevada is undergoing two fundamental Earth forces that create the stresses that cause earthquakes. One is extension, or the pulling apart, of the crust. Extension occurs throughout Nevada. As the crust extends, some portions drop down, creating valleys, while other areas are uplifted and become mountains. Normal dip-slip faults, faults with principally downward motion on a dipping surface, bound most mountain ranges in Nevada. The second force is from the boundary between the Pacific Plate and the North American Plate located primarily along the coast of California (where there is also an earthquake hazard). This boundary displays lateral motion and creates strike-slip faults. About a fifth of this plate boundary motion is accommodated in western Nevada in a region known as the Walker Lane belt. This region and has experienced large strike-slip and normal dip-slip earthquakes. The highest earthquake hazard in the state is along the Walker Lane belt. Earthquakes recorded in and around Nevada from the 1840s to 2020 are shown in Figure 3-51. The Walker Lane belt's larger and more numerous earthquakes are depicted on Nevada's western border. While the higher occurrence of earthquakes in the western half of Nevada is real, earthquakes in other regions of Nevada are likely under recorded because of historically poor station coverage.



Earthquakes in the Nevada region recorded from the 1840s to 2020. (Nevada Bureau of Mines and Geology)

Figure 3-51. Earthquakes Recorded in and Adjacent to Nevada: 1840s - 2020.[60]

[60] These data are from the Nevada Seismological Laboratory and the pre-1970 events are from the Nevada Bureau of Mines and Geology.

Earthquakes commonly occur without warning and can damage areas far beyond their place of origin. After just a few seconds, earthquakes can cause massive damage and extensive casualties and injuries. In addition to the shaking, when earthquakes become large enough and/or are close enough to the surface, the ground can be offset by as much as tens of feet along the causative fault. The fault scarp depicted in Figure 3-52 in the Fairview Peak area of Nevada, was formed by the December 16, 1954, Earthquake (Magnitude 7.3). A building cannot survive this kind of deformation so it is best to avoid building overactive faults. Surface faulting can cause severe damage to buildings, highways, railways, pipelines, and tunnels. Several historic Nevada earthquakes have ruptured the ground surface for tens of miles. It is best to avoid construction across earthquake faults. If pipelines or other features must cross a fault, it is possible to design them to survive potential surface displacement. Other earthquake-related hazards include landslides, rock falls, and liquefaction, where saturated ground becomes temporarily fluidized.



Figure 3-52. Fault Scarp in the Fairview Peak area of Nevada: December 16, 1954 Earthquake (Magnitude 7.3).[61]

The severity of ground movement generally increases with the size of an earthquake and decreases with distance from the fault or epicenter. Earthquakes cause waves in the Earth's interior, called body waves, and waves along the Earth's surface, called surface waves. There are two types of body waves: primary and secondary waves. Primary waves (P waves) are longitudinal or compressional waves similar in character to sound waves that cause back-and-forth oscillation along the direction of travel. Secondary waves (S waves) are also known as shear waves. They are slower than P waves and cause the ground to vibrate from side-to-side. There are also two kinds of surface waves: Rayleigh waves, which cause a rolling motion like ocean waves, and Love waves, which shake from side-to-side. Buildings and other structures in Nevada must be designed to withstand the shaking from earthquakes and people must be aware of the potential threat from the contents of buildings being shaken down. Solutions for reducing the seismic risk of contents include securing, relocating, replacing, and removing contents.

The size of an earthquake and its effects are described using earthquake magnitude and earthquake intensity scales, respectively. The size of an earthquake is measured by a magnitude scale, usually moment-magnitude (M_w) based on how large an earthquake rupture is and how much movement occurs across the causative fault. The moment-magnitude scale is logarithmic and there are large

[61] *Photograph from the National Geophysical data Center.*

differences from one magnitude value to the next on the scale. For instance, the amount of shaking caused by a magnitude 5 earthquake would be 10 times that of a magnitude 4 earthquake. In the United States, earthquake intensity is measured by the Modified Mercalli Intensity Scale (MMI). It consists of rankings of human behavior, building effects, and ground deformation in response to an earthquake. The MMI scale uses Roman numerals I-XII as described in Table 3-10 so as not to be confused with earthquake magnitude.

Many factors influence earthquake intensity, especially the seismic response of buildings. Strong shaking in an area with seismically resistant buildings will have a lower intensity than the same level of shaking where buildings are seismically weak. Thus, how much "intensity" results from an earthquake can be influenced by good engineering and planning efforts by a community. Maximum intensities that have occurred historically in Nevada are shown in Figure 3-53. Some small areas of higher intensities occurred locally but are too small to show at this scale.

Earthquake-related ground failure due to liquefaction has occurred during many historical Nevada earthquakes. Liquefaction occurs when seismic waves pass through saturated granular soil, causing the granules to collapse into the empty spaces between grains. The water expelled from these spaces causes water pore pressure to increase sufficiently to make the soil behave like a fluid for a brief period. Liquefaction causes lateral spreads (horizontal ground movements commonly as much as 10 to 15 feet, but can be as much as 100 feet), flow failures (massive flows of soil, typically hundreds of feet), and loss of bearing strength (structures sink into the ground or tip, and buoyant tanks can float upwards). Severe property damage due to liquefaction during an earthquake can be mitigated by identifying potential liquefiable areas, avoiding them, and engineering buildings with preventative features, such as foundation pilings and ground consolidation, in areas that are potentially susceptible to liquefaction.

Table 3-10. Modified Mercalli Intensity Scale

MMI	Description
I	Barely felt.
II	Felt by a few sensitive people, some suspended objects may swing.
III	Slightly felt indoors as though a large truck were passing.
IV	Felt indoors by many people, most suspended objects swing, windows and dishes rattle, and standing autos rock.
V	Felt by almost everyone, sleeping people are awakened, dishes can fall out of cupboards and windows can break.
VI	Felt by everyone, some are frightened and run outside, some chimneys break, some furniture moves, and slight damage.
VII	Considerable damage in poorly built structures, felt by people driving, most are frightened and run outside, some chimney's fall.
VIII	Slight damage to well-built structures, heavy damage to poorly built structures.
IX	Underground pipes breaks, foundations of buildings are damaged and buildings shift off foundations, considerable damage to well-built structures.
X	Few structures survive, most foundations destroyed, water moved out of riverbanks and lakes, avalanches and rockslides, railroad rails are bent.
XI	Few structures remain standing, total panic, large cracks in the ground.
XII	Total destruction, objects thrown into the air, the land appears to be liquid and is visibly rolling like waves, fault displacement of the ground.

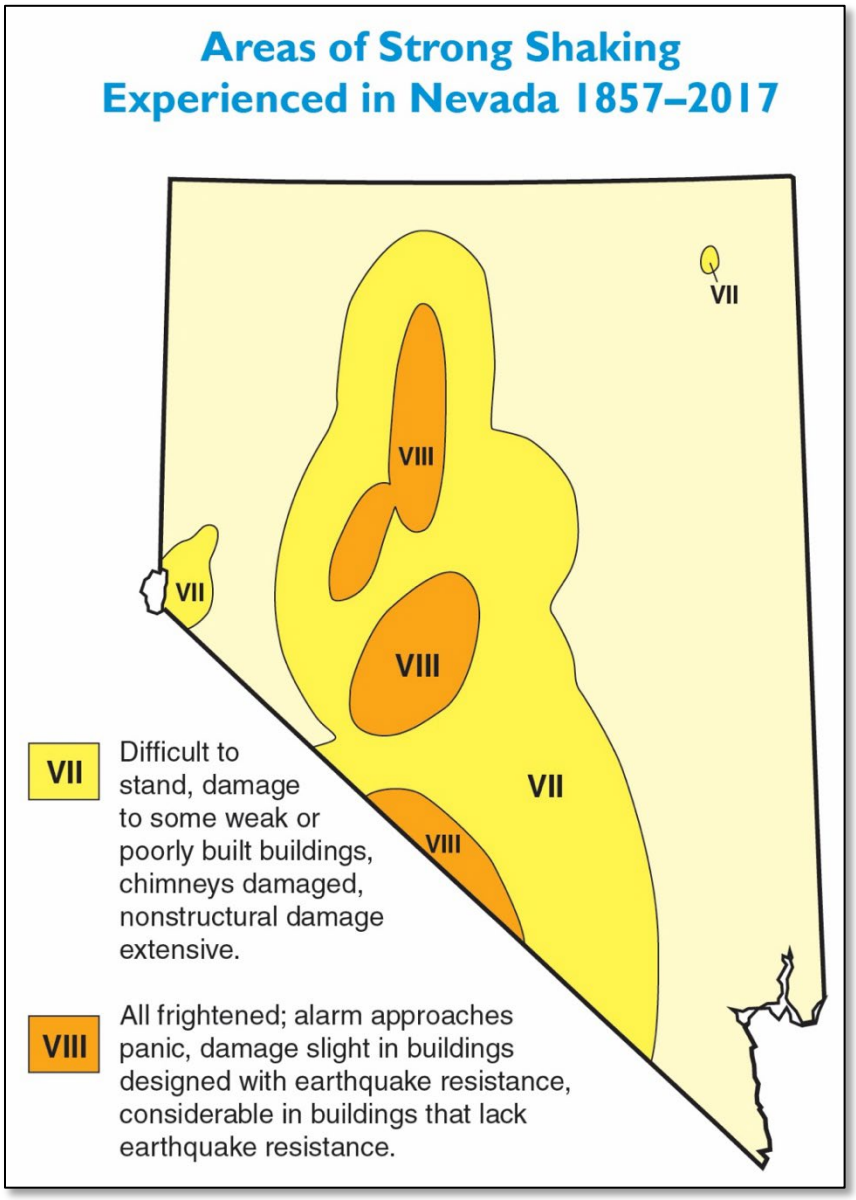


Figure 3-53. Composite Modified Mercalli Intensity Map: Highest Intensities Experienced Since 1857.

Figures 3-54 and 3-55 depict the National Risk Index (NRI) Score for Earthquake statewide and in more heavily populated areas respectively. Again, the elevated risk in the Walker Lane belt is clear.

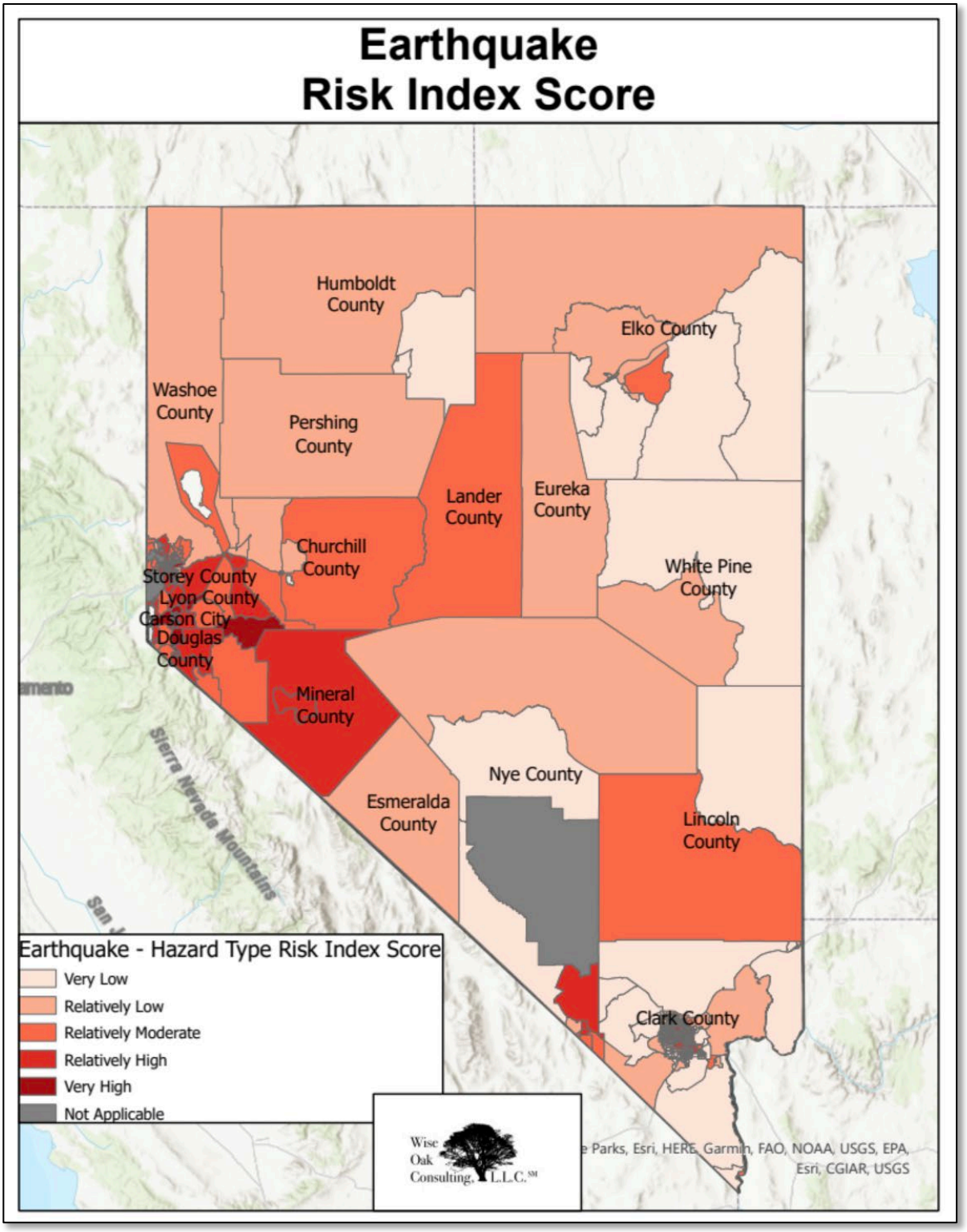


Figure 3-54. Earthquake National Risk Index Score – Statewide.

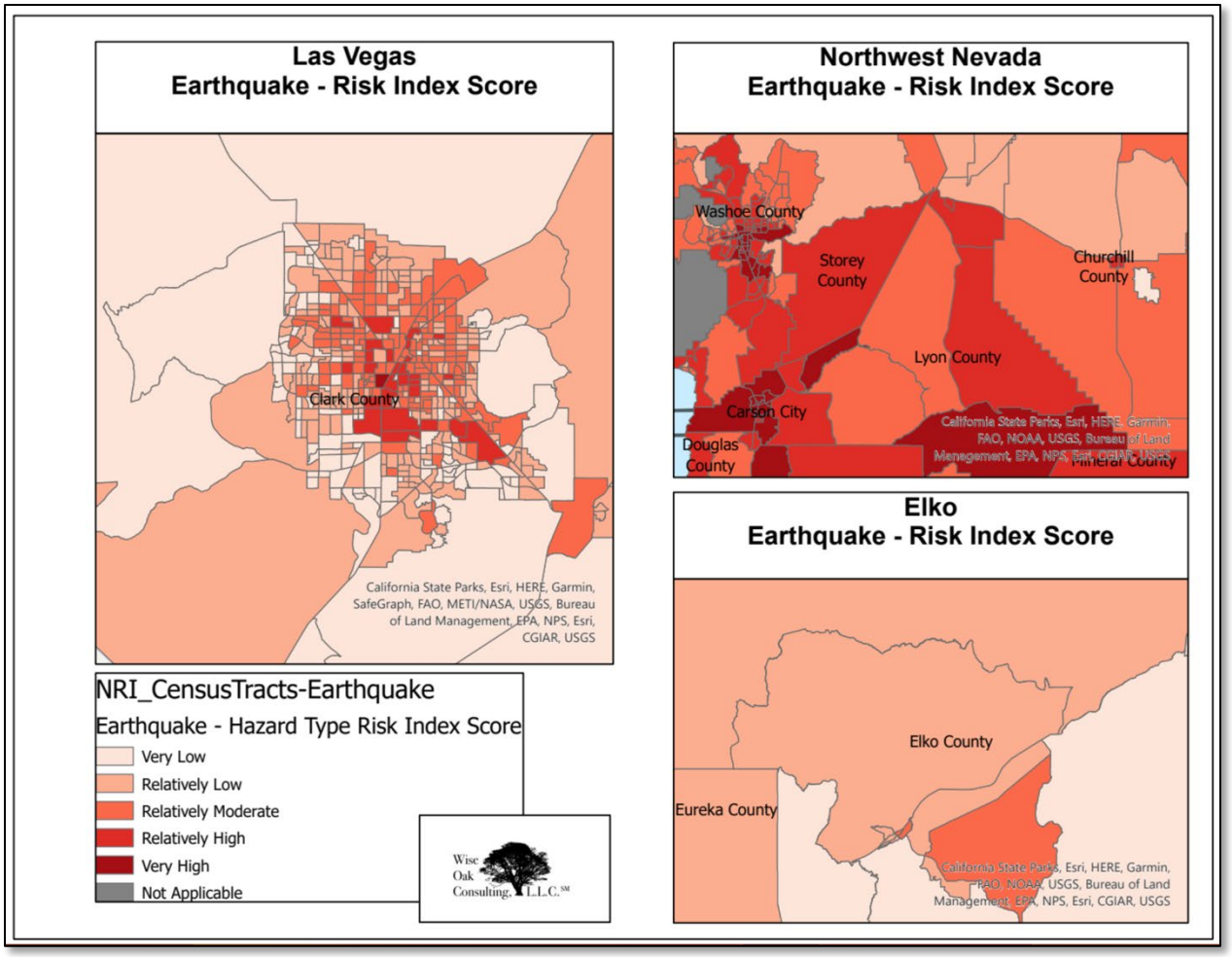


Figure 3-55. Earthquake National Risk Index Score – More Heavily Populated Areas.

Figures 3-56 and 3-57 depict the National Risk Index (NRI) Exposure in dollars for Earthquake statewide and in more heavily populated areas respectively. Again, the elevated risk in the Walker Lane belt is clear.

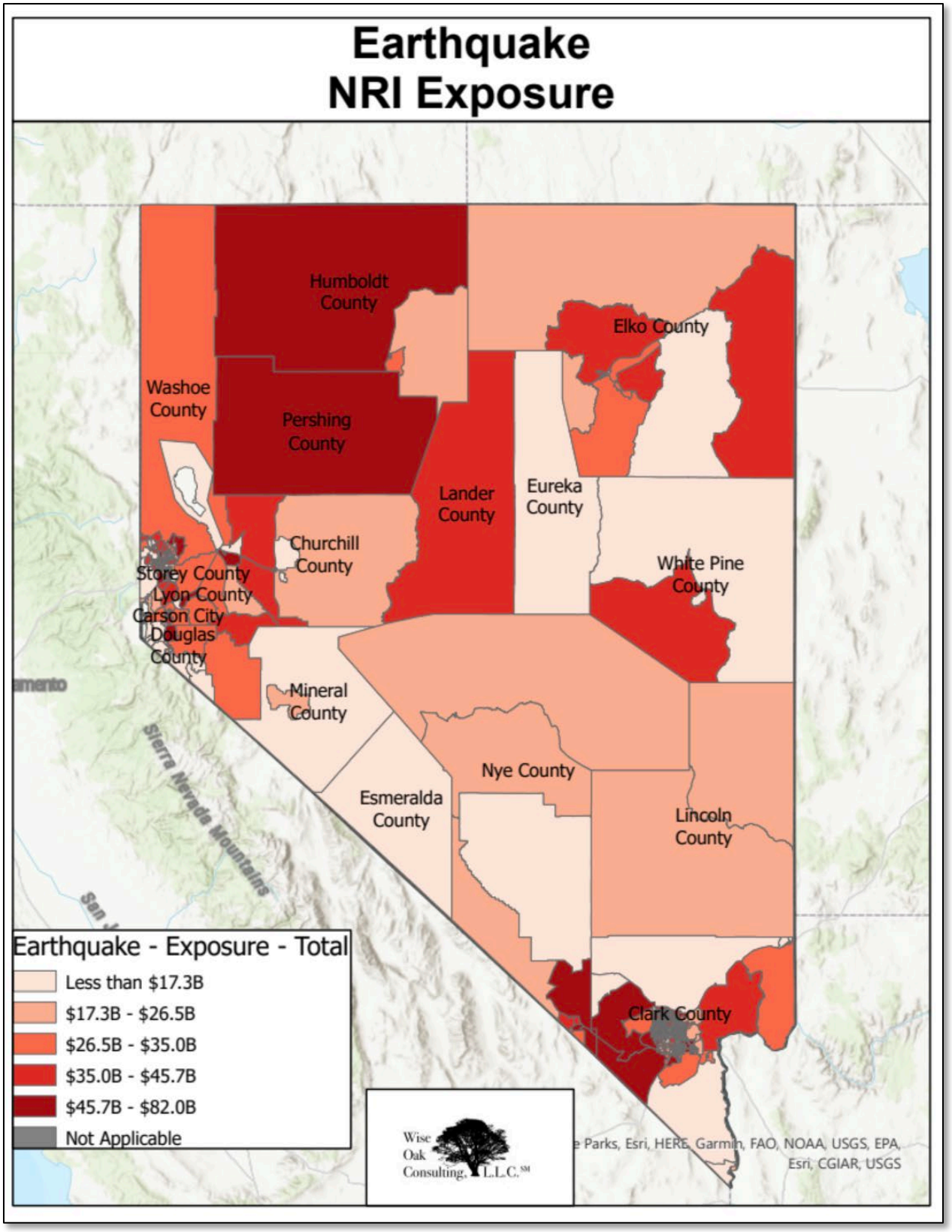


Figure 3-56. Earthquake National Risk Index Exposure – Statewide.

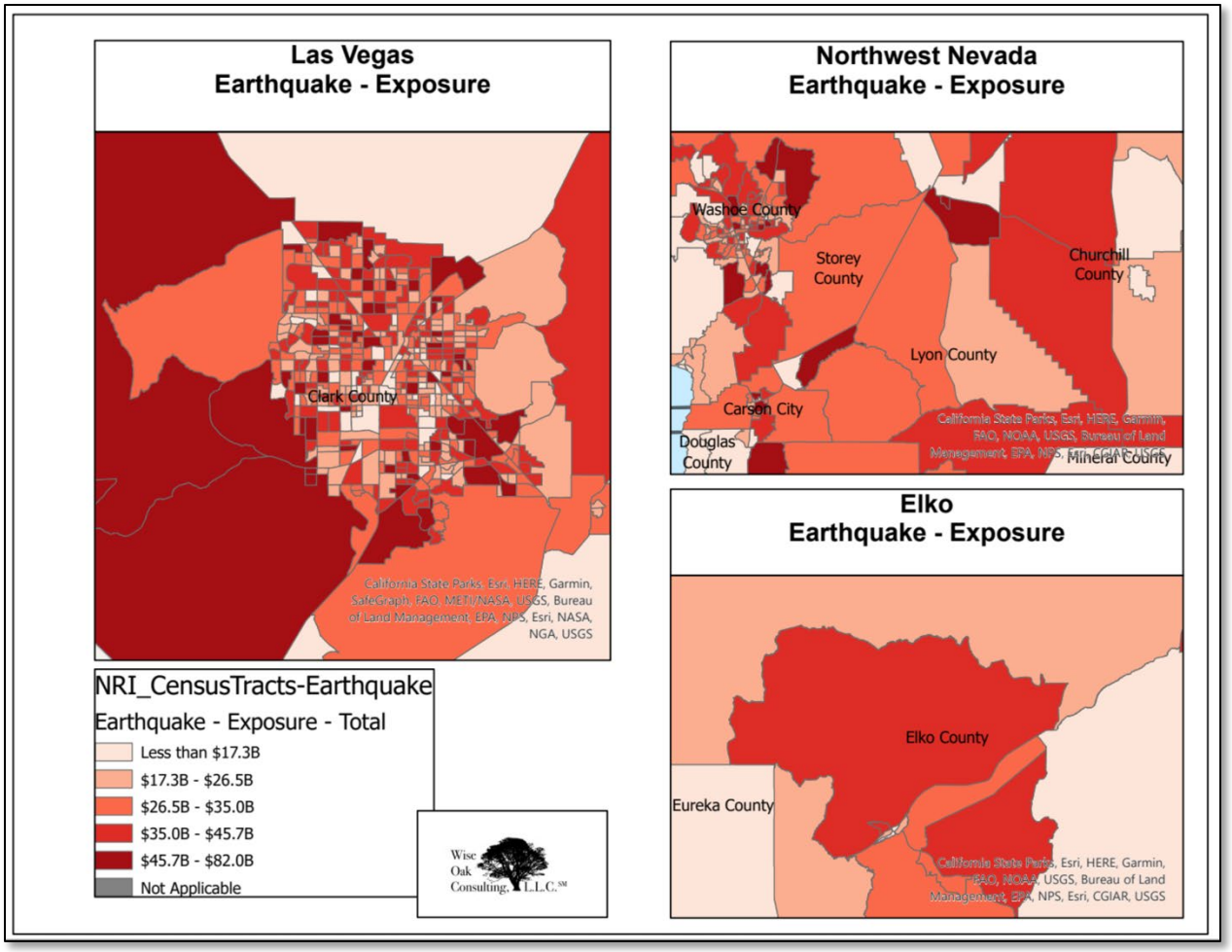


Figure 3-57. Earthquake National Risk Index Exposure – More Heavily Populated Areas.

3.3.3.2 History

Historical earthquakes clearly show that Nevada is in earthquake country (Figure 3-51). The State of Nevada is one of the most seismically active states in the Union. It ranks in the top three states subject to the largest earthquakes over the last 150 years, with only Alaska and California having experienced more events. Figure 3-58 shows the locations of magnitude ≥4 earthquakes in Nevada and adjacent parts of California from the 1840s to 2020. Figure 3-58 shows earthquake activity throughout the state and a high level of activity in the western part of the state.

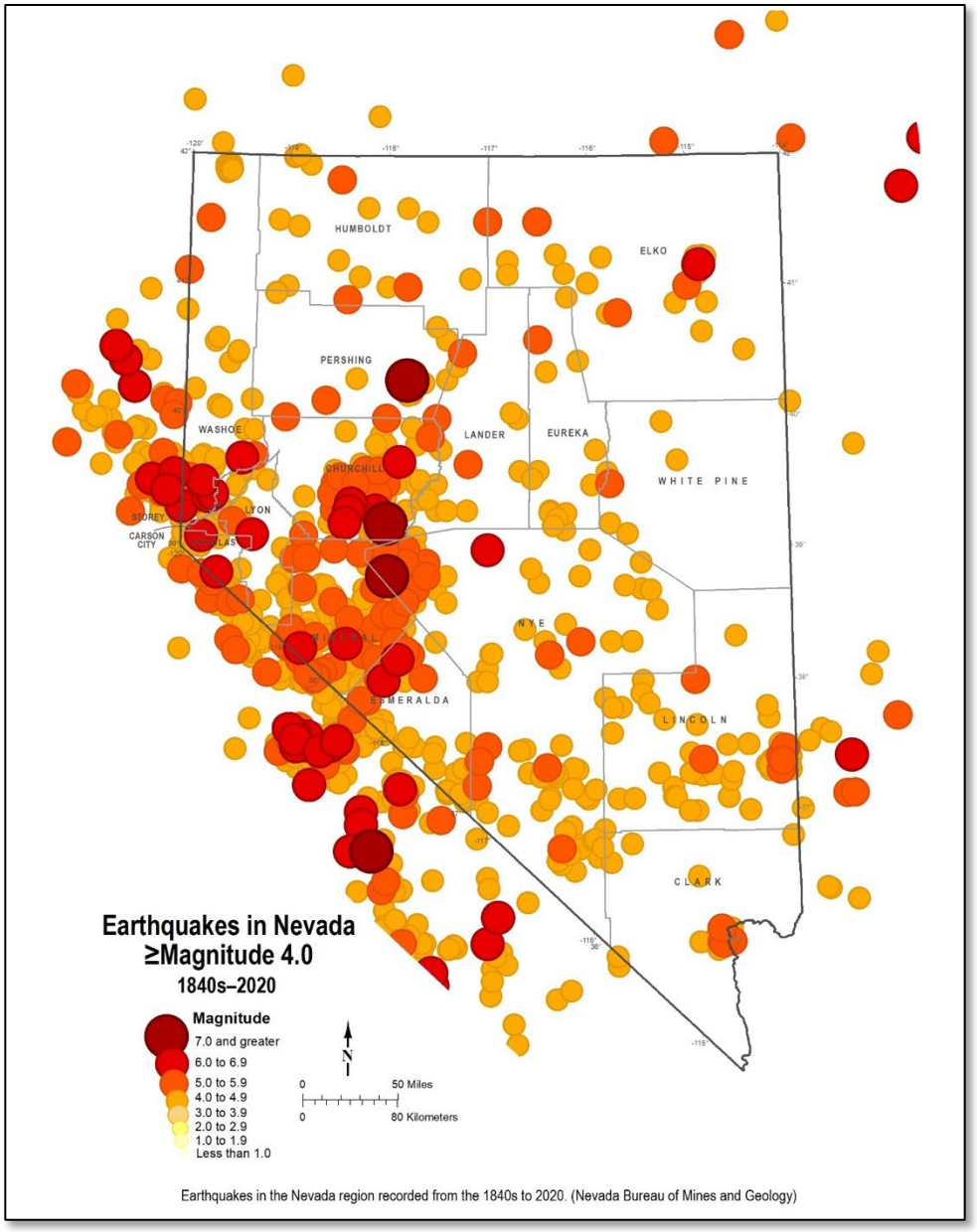


Figure 3-58. Earthquakes of Magnitude ≥4 in Nevada and Adjacent States: 1840s - 2020.[62]

Table 3-11 is a partial listing of significant historical earthquakes in Nevada from 1860 to 2020 with magnitudes of 4.9 or greater.[63] There have been 24 earthquakes of magnitude 6 or greater since 1857 and three events of magnitude 7.1 or greater. This gives an overall average of a magnitude ≥6 event once every 6.8 years and a magnitude ≥7 event once every 54 years. Earthquakes have not occurred regularly though and the shortest time between events of magnitude ≥6 is 4 minutes and 20 seconds. Two major events occurring within several hours of each other in the same area is effectively a double earthquake. Several "double" major earthquakes have occurred in the state. These are especially hazardous for emergency responders who are in the area for the first earthquake.

[62] Earthquake data from the Nevada Seismological Laboratory and the Nevada Bureau of Mines and Geology.
[63] University of Nevada, Reno, Seismological Laboratory, Nevada Bureau of Mines and Geology.

Table 3-11. Significant Historical Earthquakes in Nevada from the 1840s to 2020

Date	Magnitude	Location	Nearest Community[64]
1840s	7+ (?)	Western Nevada	**Winnemucca area**
September, 1857	6.0 (?)	N. Lake Tahoe	**Incline Village**
March 15, 1860	6.8	Western Nevada	**Virginia City**
December 27, 1869	6.7	Virginia Range	**Virginia City**
December 27, 1869	6.1	Virginia Range	**Virginia City**
June 3, 1887	6.3	Carson City	**Carson City**
February 1914	6.0	Reno area	**Reno**
April 24, 1914	6.4	Reno area	**Reno**
October 3, 1915	6.1	Pleasant Valley	**Winnemucca**
October 3, 1915	7.3	Pleasant Valley	**Winnemucca**
Dec. 21, 1932	7.1	Cedar Mountain	**Gabbs**
June, 1933	6.0	Mason Valley	**Wabuska**
January 30, 1934	6.3	Excelsior Mtns.	**Mina**
December 29, 1948	6.0	Verdi area	**Verdi**
May 24, 1952	5.0	Lake Mead area	**Boulder City**
July 7, 1954	6.6	Rainbow Mtn.	**Fallon**
August 8, 1954	7.0	Rainbow Mtn.	**Fallon**
December 16, 1954	7.2	Fairview Peak	**Fallon**
December 16, 1954	7.1	Dixie Valley	**Fallon**
September 22, 1966	6.0	Clover Mountain	**Caliente**
September 12, 1994	5.8	Double Spring Flat	**Gardnerville**
February 21, 2008	6.0	Town Creek Flat	**Wells**
May 25, 2008	4.9	Mogul	**Mogul; W. Reno**
May 15, 2020	**6.5**	**Columbus Marsh**	**Tonoaph**

[64] The communities listed are not necessarily the only ones affected.

Figure 3-59 shows the occurrence of major Nevada earthquakes through our history. Note that Nevada has had major earthquakes year-after-year and multiple major earthquakes in the same year.

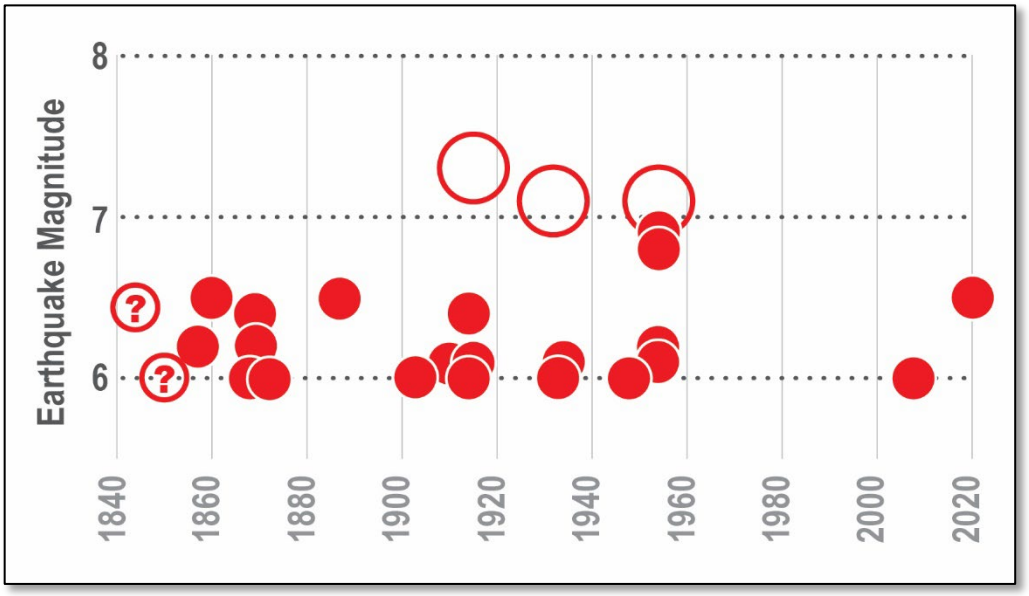


Figure 3-59. Earthquakes in Nevada of Magnitude ≥6: 1840s - 2020.

Table 3-12 presents some earthquakes that have occurred in Nevada in the last decade; many were near populated areas. This table only includes the largest events. In some cases, these events were accompanied by hundreds of microearthquakes.

Table 3-12. Select Nevada Earthquakes in the Last Decade[65]

County; Location	Date; time	Magnitude; description; damage
Washoe County, 4.5 mi NNW of Incline Village	June 22, 2012 20:51 (PDT)	Mw 4.0 earthquake; strike-slip event
Washoe County, 20.9 mi N of Pyramid Lake	August 14, 2012 15:17 (PDT)	Mw 3.7 earthquake; normal oblique-slip event
Clark County, 17.8 mi SW of Moapa	September 25, 2012 09:03 (PDT)	Mw 3.3 earthquake; normal oblique-slip event
Washoe County, 12.7 mi NW of Fernley	October 3, 2012 12:51 (PDT)	Mw 3.4 earthquake; normal oblique-slip event
10.0 mi SSW of Topaz Lake	January 24, 2013 15:25 (PST)	Mw 4.0 earthquake; strike-slip event
Esmeralda County, 24.3 mi N of Dyer	February 12, 2013 16:10 (PST)	Mw 5.1 earthquake; at least 7 aftershocks Mw 3.3 - 3.9 from Feb 12-13, 2013; strike-slip event
24.4 mi S of Mina	February 12, 2013 16:49 (PST)	Mw 3.7 earthquake; normal dip-slip event
18.9 mi SSE of Caliente, NV	April 13, 2013 12:23 (PDT)	Mw 3.7 earthquake; strike-slip event

[65] Source: Nevada Seismological Lab.

Table 3-12. Select Nevada Earthquakes in the Last Decade[65]		
County; Location	**Date; time**	**Magnitude; description; damage**
Carson City, 4.5 mi SE of Carson City	June 05, 2013 05:59 (PDT)	Mw 3.0 earthquake; normal dip-slip event
Washoe County, 7.0 mi NE Sun Valley	August 27, 2013 17:51 (PDT)	Mw 4.1 earthquake; strike-slip event
White Pine County, 35.6 mi WSW of Ely	August 29, 2013 04:20 (PDT)	Mw 3.6 earthquake; normal oblique-slip event
Lincoln County, 20.2 mi WNW of Alamo	September 16, 2013 07:12 (PST)	Mw 3.5 earthquake; strike-slip event
Nye County, 23 mi ENE of Pinnacles Ridge	October 25, 2013 04:29 (PDT)	Mw 3.3 earthquake; normal oblique-slip event
Washoe County, 4.3 mi W of Mt Rose	December 6, 2013 12:20 (PST)	Mw 3.1 earthquake; strike-slip event
Lincoln County, 24.9 mi N of Alamo	December 21, 2013 15:02 (PST)	Mw 3.6 earthquake; normal dip-slip event
Lincoln County, 29.2 mi SE of Caliente	January 28, 2014 17:30 (PST)	Mw 3.9 earthquake; normal oblique-slip event
Mineral County, 10.5 mi ENE of Hawthorne	April 25, 2014 17:12 (PDT)	Mw 3.8 earthquake; normal oblique-slip event
Lincoln County, 5.2 mi ESE of Alamo, NV	August 10, 2014 03:40 (PDT)	Mw 3.7 earthquake; strike-slip event
6.3 mi NNE of Tahoe City, CA	September 10, 2014 17:08 (PDT)	Mw 3.2 earthquake; strike-slip event
Washoe County, 51-52 mi W of Denio	October 1, 2014 05:46 (PDT)	Mw 4.0 earthquake, five events Mw 3.4 – 3.7 between Aug 18 – Sep 14, 2014; normal-oblique event
Clark County, 20.3 mi WSW of Henderson, NV	October 5, 2014 03:11 (PDT)	Mw 3.2 earthquake; strike-slip event
Washoe County, 31 mi SW Gerlach, NV	October 6, 2014 04:01 (PDT)	Mw 3.3 earthquake; lateral normal-oblique event
Esmeralda County, 14.4 mi N of Scotty's Castle	October 12, 2014 20:27 (PDT)	Mw 3.4 earthquake; normal dip-slip event
Nye County, 44.1 mi SSW of Eureka, NV	November 3, 2014 22:20 (PST)	Mw 3.4 earthquake; normal oblique-slip event
Washoe County, 50-52 mi W of Denio, NV	November 4, 2014 23:23 (PST)	Mw 4.6 earthquake, 10 events Mw4.0 – 4.6 from November 6 – December 10, 2014.
Washoe County, 23.2 mi NNE of Vya, NV	January 22, 2015 01:09 (PST)	Mw 4.7 earthquake, Preceded by Mw 4.1 earthquake on 4 January 2015 and Mw 4.0 earthquake on 12 January 2015. Followed by Mw 4.3 earthquake on 29 January 2015; normal oblique-slip and normal dip-

Table 3-12. Select Nevada Earthquakes in the Last Decade[65]		
County; Location	**Date; time**	**Magnitude; description; damage**
		slip events.
Esmeralda County, 8.8 mi NNE of Scotty's Castle	February 13, 2015 18:28 (PST)	Mw 4.7 earthquake; normal dip-slip event
White Pine County, 36.1 mi SW of Ely	February 28, 2015 02:41 (PST)	Mw 3.9 earthquake; normal dip-slip event
5.8 mi W of Mt Rose	April 7, 2015 22:06 (PDT)	Mw 3.4 earthquake; strike-slip event
Nye County, 33.1 mi SSE of Eureka	May 4, 2015 04:56 (PDT)	Mw 3.4 earthquake; normal dip-slip event
Lincoln County, 23.5 mi SSW of Caliente	May 22, 2015 11:47 (PDT)	Mw 4.8 earthquake, felt in Las Vegas, six earthquakes Mw 3.2 – 3.5 from May 22 – June 12, 2015; all strike-slip events
Nye County, 37.3 mi S of Eureka	May 24, 2015 10:06 (PDT)	Mw 3.8 earthquake; normal dip-slip event
Esmeralda County, 22.8 mi W of Goldfield	June 10, 2015 18:50 (PDT)	Mw 3.2 earthquake; normal dip-slip event
Washoe County, 24.1 mi NNE of Vya	July 15, 2015 18:52 (PDT)	Mw 4.5 earthquake, followed 5 minutes later by Mw 4.1 earthquake; normal dip-slip events
1.5 mi ENE of Independence Lake	July 18, 2015 18:36 (PDT)	Mw 3.2 earthquake; lateral oblique-normal-slip event
Washoe County, 23.8 mi NNE of Vya	July 26, 2015 18:05 (PDT)	Mw 4.6 earthquake, followed by Mw 4.0 earthquake on August 13, 2015; normal dip-slip event
Mineral County, 13 mi NW of Hawthorne	September 7, 2015 19:15 (PDT)	Mw 4.0 earthquake; strike-slip event
22 mi NNE of Vya, NV	September 14, 2015 06:55 (PDT)	Mw 4.8 earthquake, followed by three M_W 4.0 – 4.3 earthquakes from September 26 and November 18, 2015; normal oblique-slip event
Washoe County, 2.9 mi NNW of Galena High School	December 22, 2015 22:46 (PST)	Mw 4.3 earthquake; normal dip-slip event
Washoe County, 24.4 mi NE of Vya	December 24,2015 12:30 (PST)	Mw 4.6 earthquake; normal oblique-slip event
Washoe County, 39.4 mi SSW of Denio	December 28, 2015 07:10 (PST)	Mw 4.0 earthquake; normal dip-slip event
Mineral County, 14.4 mi ESE of Hawthorne	March 21, 2016 00:37 (PDT)	Mw 4.1 earthquake, followed by Mw 3.8 on March 22, 2016; strike-slip and normal dip-slip events, respectively

Table 3-12. Select Nevada Earthquakes in the Last Decade[65]		
County; Location	**Date; time**	**Magnitude; description; damage**
Clark County, 22.9 mi S of Mesquite	May 5, 2016 06:49 (PDT)	Mw 3.8 earthquake; normal dip-slip event
Washoe County, 5.2 mi W of Gerlach, NV	May 14, 2016 07:20 (PDT)	Mw 3.8 earthquake; strike-slip event
Eureka County, 8.7 mi NE of Eureka	June 3, 2016 00:19 (PDT)	Mw 3.6 earthquake; normal dip-slip event
Mineral County, 12.6 mi NW of Hawthorne	July 7, 2016 16:40 (PDT)	Mw 4.2 earthquake; preceded by Mw 3.9 earthquake at 16:14 (PDT); both normal oblique-slip events
Lincoln County 20.1 mi SSW of Alamo	September 3, 2016 05:06 (PDT)	Mw 3.5 earthquake; normal dip-slip event
Mineral County, 6.8 mi N of Schurz	December 3, 2016 23:40 (PST)	Mw 3.6 earthquake; normal-oblique-slip event
Mineral County, 18.3 mi SW of Hawthorne, NV	December 28, 2016 00:18 (PST)	Mw 5.6 earthquake; followed by Mw 5.4 earthquake four minutes later, 00:22 (PST) and Mw 5.5 earthquake 55 minutes later at 01:13 (PST); moderate damage to Nine Mile Ranch house and barn; events were strike-slip and normal oblique slip
Douglas County, 2.2 mi SSE of Double Springs Flat, NV	June 6, 2017 15:45 (PDT)	Mw 3.8 earthquake; strike-slip event
Washoe County, 2.7 mi NW of Independence Lake	Jube 27, 2017 02:09 (PDT)	Mw 3.9 earthquake
Clark County, 16.4 mi NW of Indian Springs	July 17, 2017 02:27 (PDT)	Mw 3.9 earthquake
Mineral County, 5.8 mi ENE of Mono Lake	August 11, 2017 20:00 (PDT)	Mw 3.9 earthquake
Clark County, 19.6 mi SSE of Mesquite	August 28, 2017 08:03 (PDT)	Mw 3.4 earthquake
Elko County, 6.7 mi ENE of Carlin	September 04, 2017 03:49 (PDT)	Mw 3.4 earthquake
Mineral County, 18.3 mi SW of Hawthorne	September 26, 2017 01:40 (PDT)	Mw 3.4 earthquake
Mineral County, 11.4 mi E of Mono Lake	November 02, 2017 10:58 (PDT)	Mw 3.4 earthquake
Lander County, 35.9 mi N of Austin	February 04, 2018 05:27 (PST)	Mw 3.3 earthquake
Clark County, 40.0 mi WSW of Las Vegas	July 05, 2018 08:17 (PDT)	Mw 4.1 earthquake
Washoe County, 5.7 mi NNE of	August 30, 2018	Mw 3.7 earthquake

Table 3-12. Select Nevada Earthquakes in the Last Decade[65]		
County; Location	**Date; time**	**Magnitude; description; damage**
Tahoe_City	15:08 (PDT)	
Carson City County, 4.1 mi SSE of Carson_City	December 20, 2018 05:24 (PST)	Mw 3.5 earthquake
Mineral County, 7.6 mi NW of Schurz	April 01, 2019 07:43 (PDT)	Mw 3.6 earthquake
Lander County, **30.9 mi NW of Austin**	April 28, 2019 10:03 (PDT)	Mw 3.9 earthquake
Lander County, **29.9 mi NW of Austin**	April 28, 2019 14:57 (PDT)	Mw 3.9 earthquake
Lander County, 30.4 mi NW of Austin	May 06, 2019 21:59 (PDT)	Mw 3.5 earthquake
Nye County, 20.2 mi NW of Warm_Springs	May 23, 2019 02:54 (PDT)	Mw 3.8 earthquake
Lincoln County, 13.3 mi SE of Alamo	June 01, 2019, 18:53 (PDT)	Mw 3.5 earthquake
Washoe County, 3.8 mi SE of Washoe City	June 06, 2019 21:50	Mw 3.6 earthquake
Nye County, 22.9 mi ENE of Scotty's Junct.	June 11, 2019 00:24 (PDT)	Mw 3.9 earthquake
Lincoln County, 12.7 mi SE of Pioche	June 30, 2019 16:44 (PDT)	Mw 4.0 earthquake
Lander County, 27.4 mi E of Austin	September 09, 2019 21:26 (PDT)	Mw 4.1 earthquake
Carson City County,4.3 mi SSE of Carson City	March 20, 2020 18:34 (PST)	Mw 4.5 earthquake
Mineral County, 15.3 mi E of Mono Lake	April 11, 2020 17:37 (PDT)	Mw 5.2 earthquake, followed two hours later with a Mw 4.5 earthquake and many other aftershocks
Mineral County, 21.0 mi SE of Mina	May 15, 2020 04:04 (PDT)	Mw 6.5 earthquake, followed by thousands of aftershocks the largest was a Mw 5.7. Minor damage occurred in Tonopah. Significant highway damage.
Esmeralda County,14.1 mi W of Lida Junct.	July 08, 2020 14:27 (PDT)	Mw 3.6 earthquake
Mineral County, 14.4 mi E of Mono_Lake	July 13, 2020 22:59 (PDT)	Mw 3.6 earthquake
Mineral County, 25.8 mi ESE of Mono_Lake	January 15, 2021 14:11 (PST)	Mw 3.7 earthquake
Nye County, 27 mi ENE of Tonopah	April 28, 2021 04:57 (PDT)	Mw 4.1 earthquake

Table 3-12. Select Nevada Earthquakes in the Last Decade[65]		
County; Location	**Date; time**	**Magnitude; description; damage**
Elko County, 15 mi S of Wells	**August 31, 2021 10:21 (PDT)**	Mw 4.7 earthquake

The shaking from a strong 2008 earthquake to the west Reno is shown in Figure 3-60. These maps are produced rapidly by the Nevada Seismological Laboratory and can assist in the situational awareness of an earthquake event. Cracking and road damage from the 2020 Monte Cristo Range earthquake is shown in Figure 3-61.

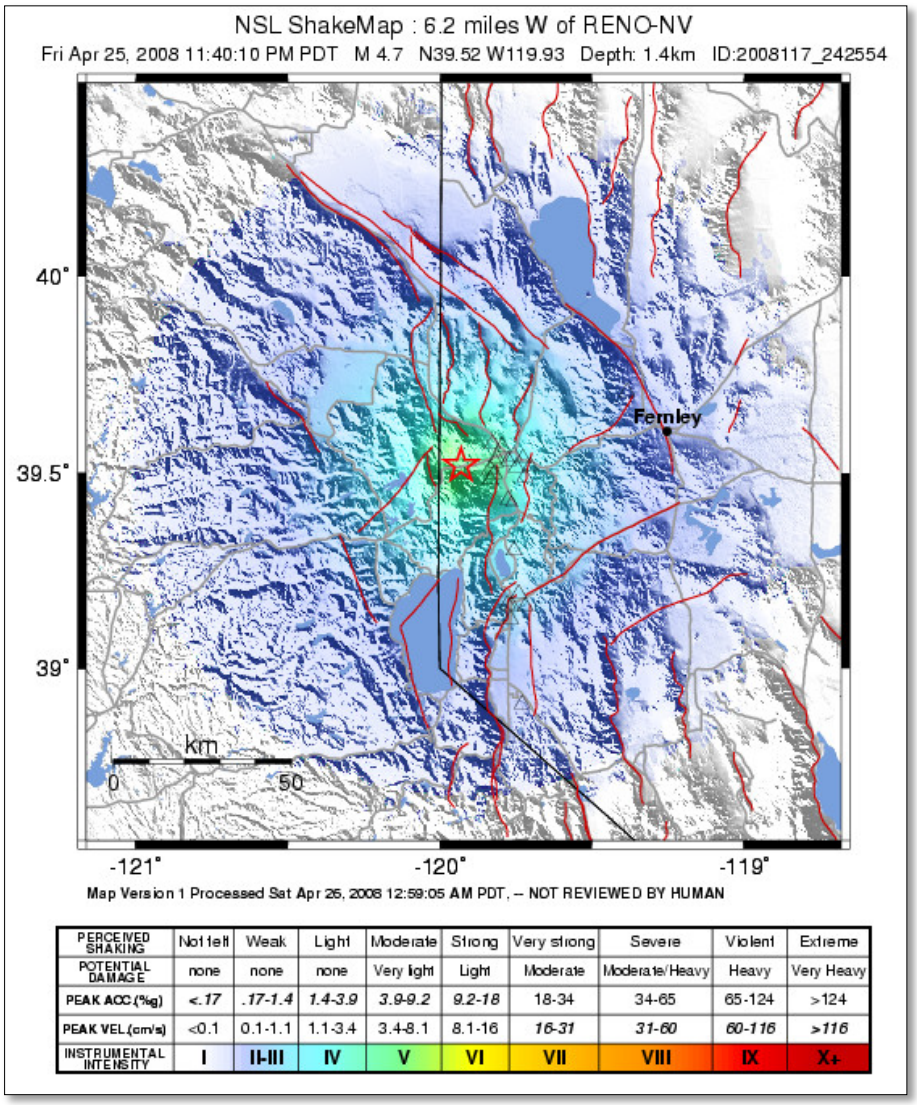


Figure 3-60. Nevada Seismological Laboratory ShakeMap for the 2008 Mogul Earthquake.



Figure 3-61. Highway Damage from the 2020 Monte Cristo Range Earthquake.

Despite the high level of earthquake activity, the State has thus far avoided heavy losses and the NRI Historic Loss Ratio is very low across the state.

3.3.3.3 Location, Severity, and Probability of Future Events

In Nevada, earthquake faults occur along many of the range fronts, within ranges, and within valleys. Normal dip-slip faults, those that down-drop the ground during earthquakes, commonly appear as steps in the landscape because of the vertical offset. Strike-slip faults, that offset the ground sideways, are usually expressed as linear features in the landscape, such as elongate valleys, and alignments of features, such as springs and vegetation. Historical earthquakes have ruptured both kinds of faults in Nevada.

An indicator of future earthquakes is recent past earthquake activity of faults. Faults have been created throughout Earth's history. Old faults are commonly inactive and are not considered threatening. For earthquake hazards, the most recently active faults are of concern. Figure 3-62 shows the known rupture history on Quaternary faults in Nevada and adjacent areas. Quaternary, (the past 2.6 million years), is a common age of faults that are observed to be hazards. Only a small number of the faults shown on Figure 3-62 have been investigated. For many of these faults, activity has been inferred by geomorphic surface expression. Faults with movement in the last 130,000 years are active and considered potential earthquake hazards; some of the other faults that have poor surface expression will fall into this category as well. These faults should be considered when investigating local earthquake hazards and building across them should be avoided, if possible.

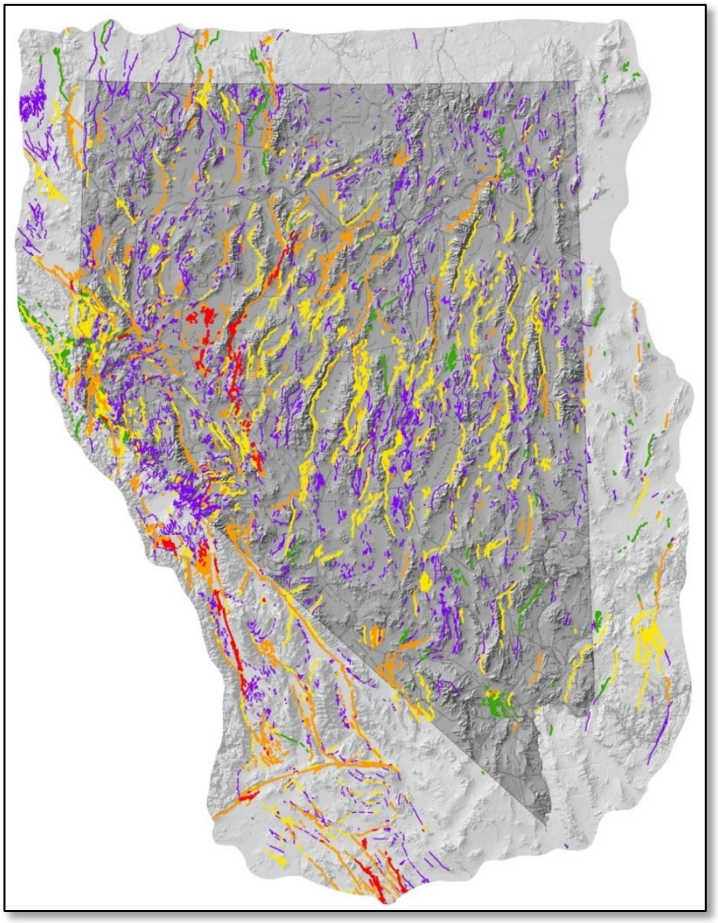


Figure 3-62. Map of Quaternary Fault Activity in Nevada.[66]

[66] NBMG and is based on a database developed by the USGS.

The map is from A probability of having an earthquake can be inferred from the National Seismic Hazard Map and has been done so by the USGS (Figure 3-63). This probability is indexed to a time frame and an area, the later defined as a distance from a location. Figure 3-63 shows the calculated probability for an earthquake of magnitude ≥6 occurring within 50 km (31 miles) and over a 50-year time period in Nevada. Although we know the map is not an exact calculation of the real probability of having an event, it does appear to mimic the earthquake hazard. This map is based on data that was generated before the 2008 Wells, Nevada earthquake. Prior to the event, there was a 12% chance of a M6 earthquake occurring in Wells, within 31 miles and 50 years. This earthquake occurred in February 2008. Figure 3-63 indicates a similar probability was calculated for the Las Vegas Valley area. Figure 3-63 also indicates westernmost Nevada has probabilities of a magnitude 6 or greater event occurring to be well in excess of 50%.

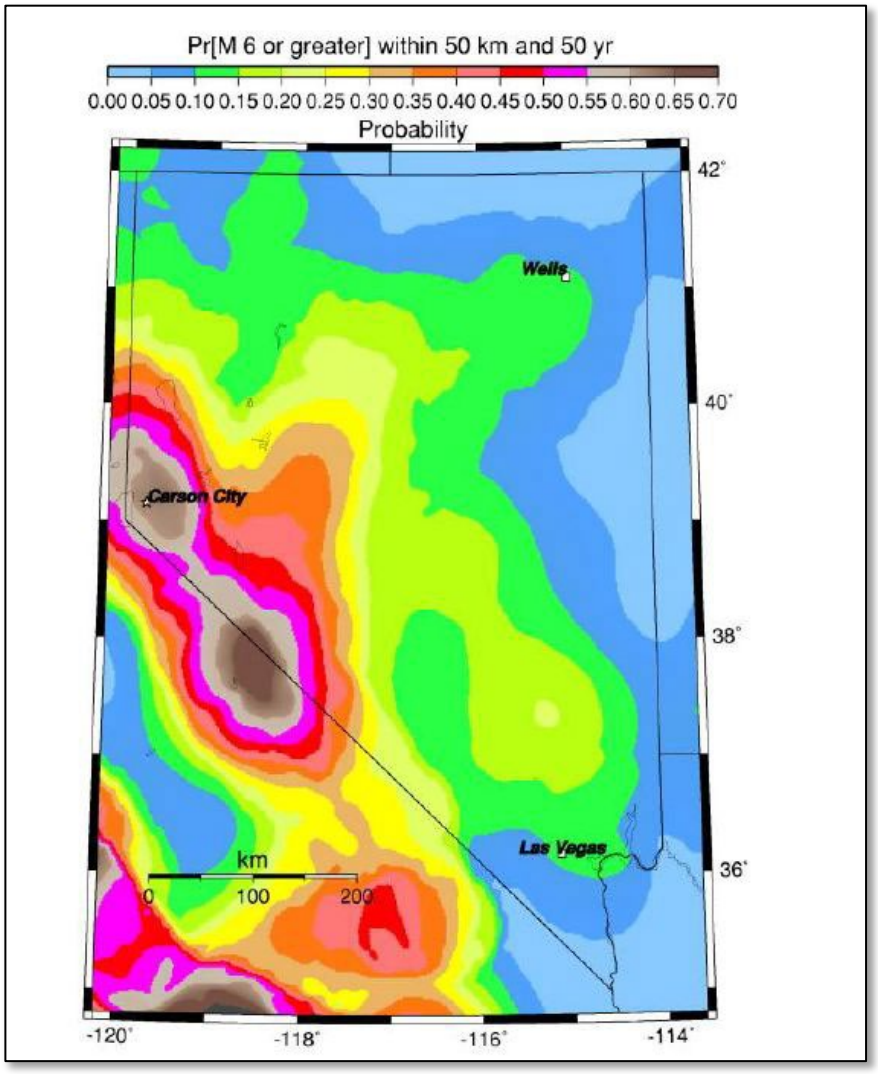


Figure 3-63. Probabilities for a Magnitude ≥6 Earthquake Within 31 Miles and 50 Years of a Location.[67]

Figures 3-64 and 3-65 depict the NRI Expected Annual Loss due to earthquake statewide and for more heavily populated areas respectively. The combination of higher density of building and increased risk due to the Walker Lane belt depict higher expected losses.

[67] This figure was produced by the USGS.

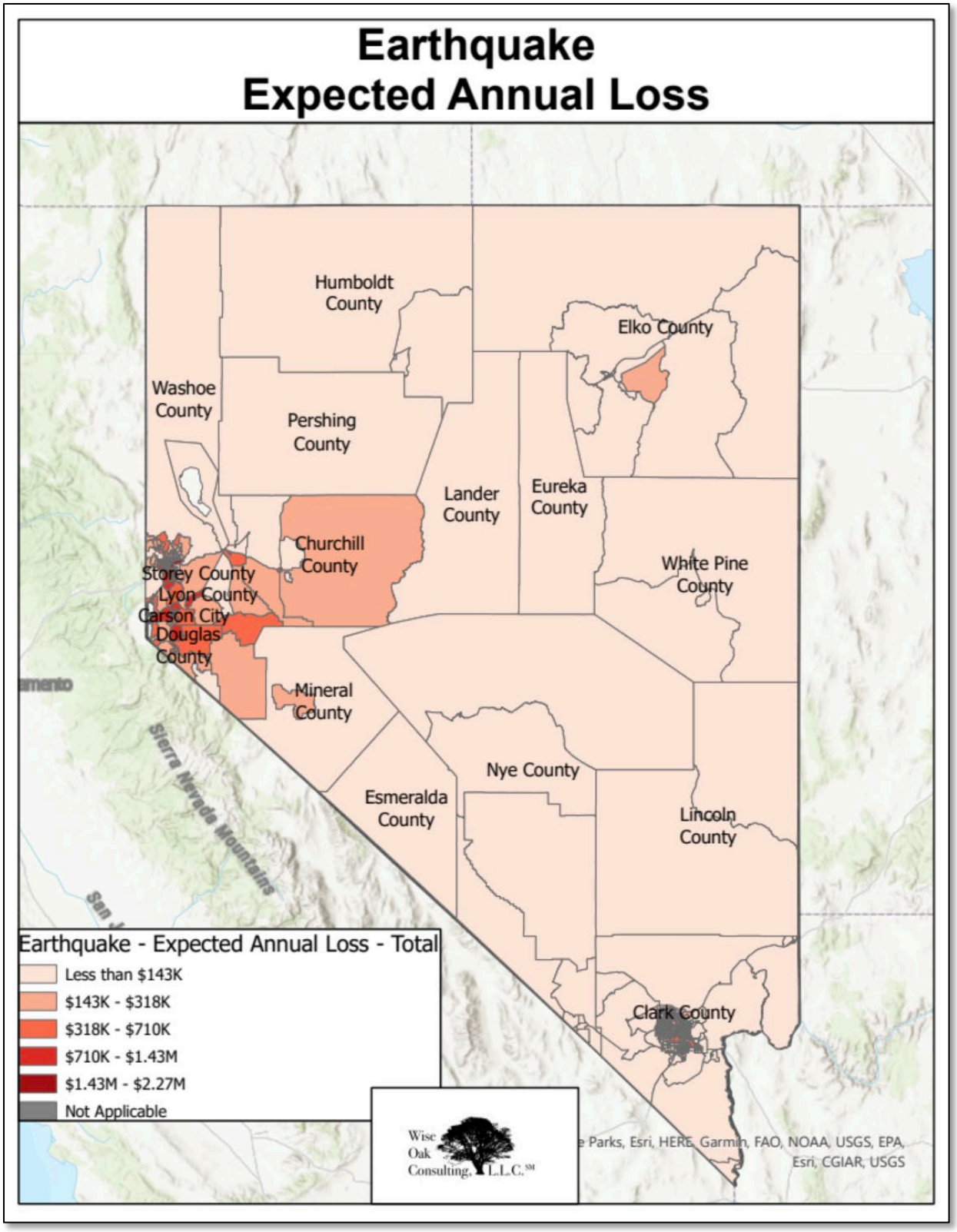


Figure 3-64. Earthquake National Risk Index Expected Annual Loss– Statewide.

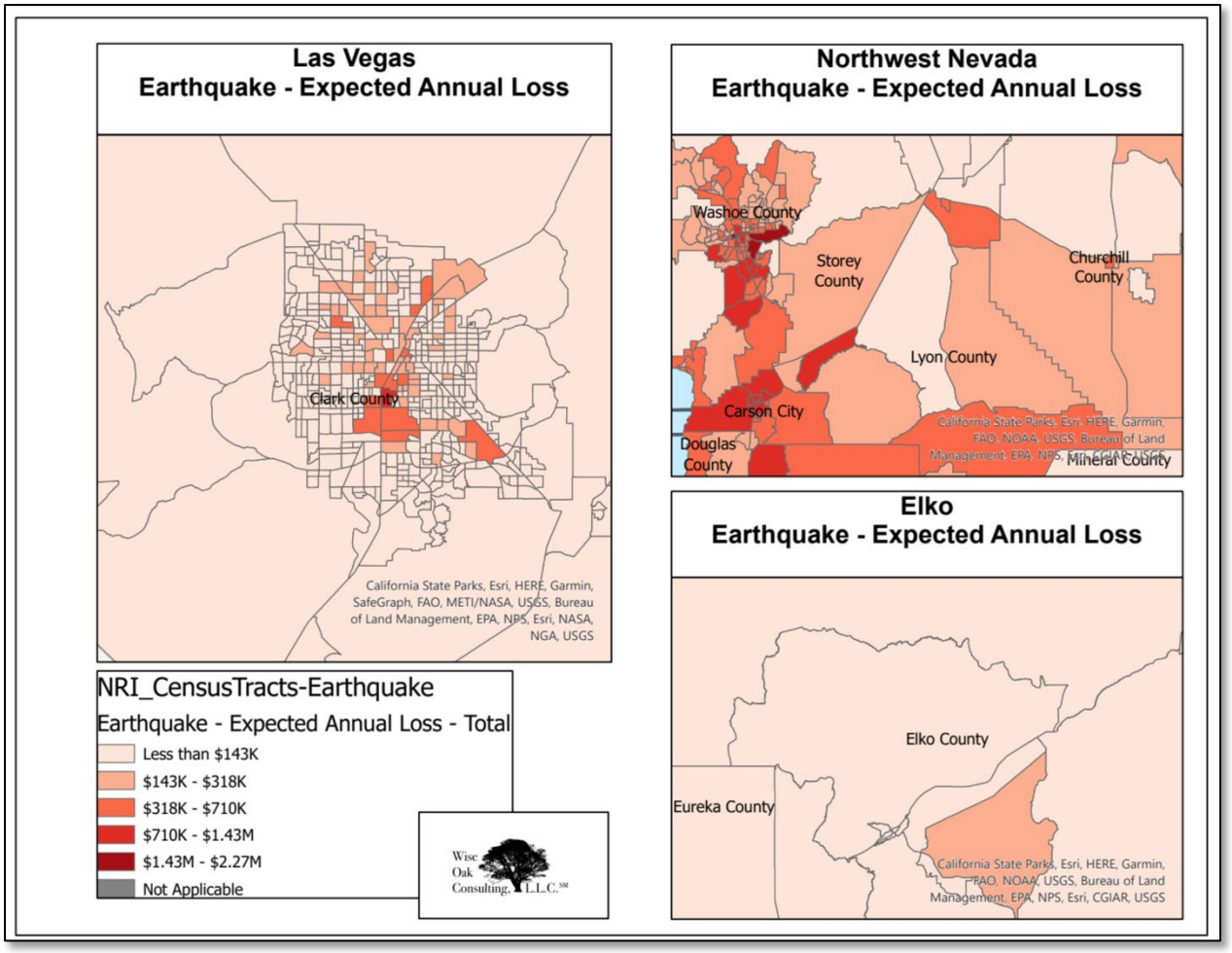


Figure 3-65. Earthquake National Risk Index Expected Annual Loss – More Heavily Populated Areas.

Once again, the impact of the Walker Lane belt is apparent in the Annualized Frequency of future earthquakes as seen in Figures 3-66 and 3-67 statewide and in more heavily populated areas respectively.

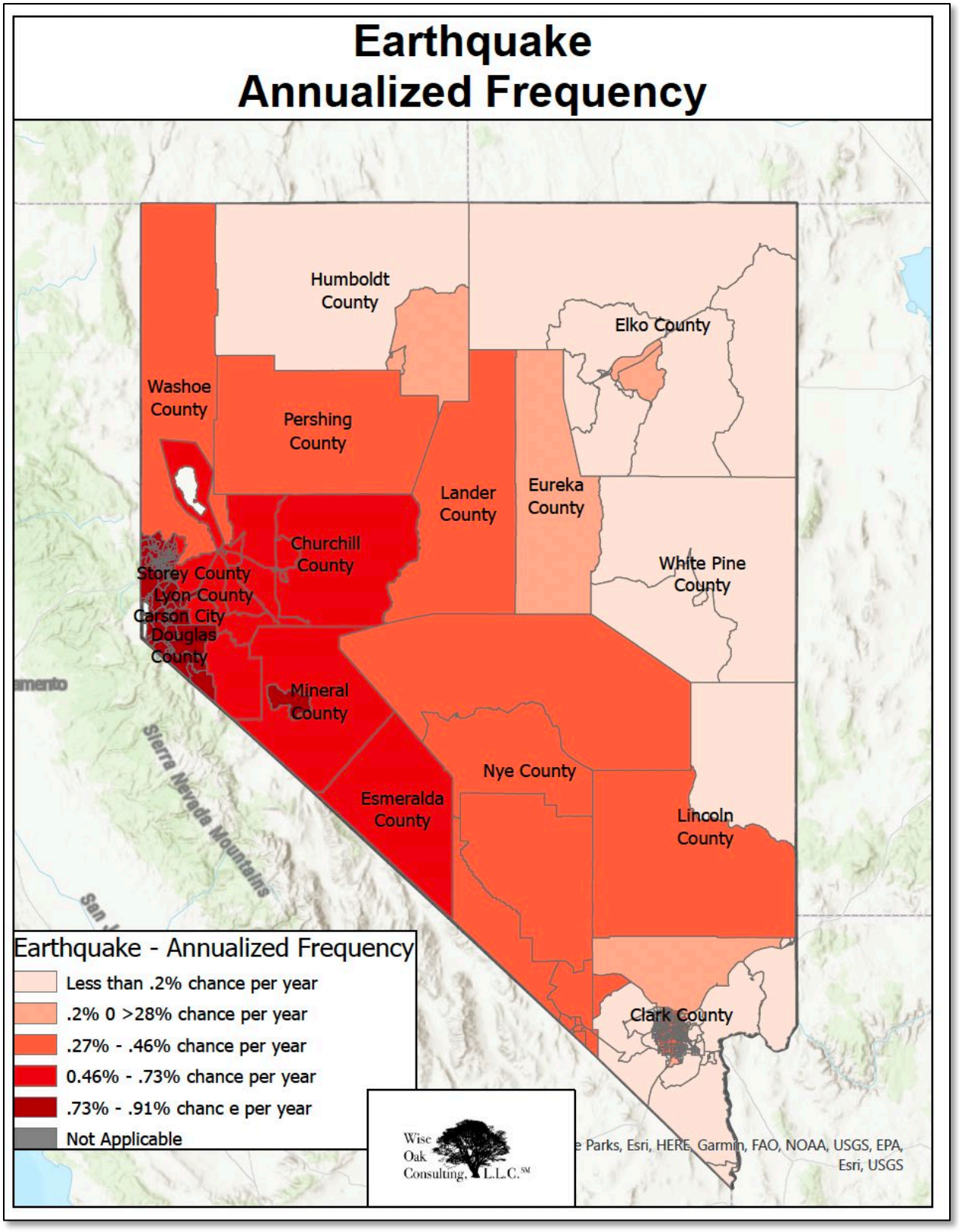


Figure 3-66. Earthquake National Risk Index Annualized Frequency – Statewide.

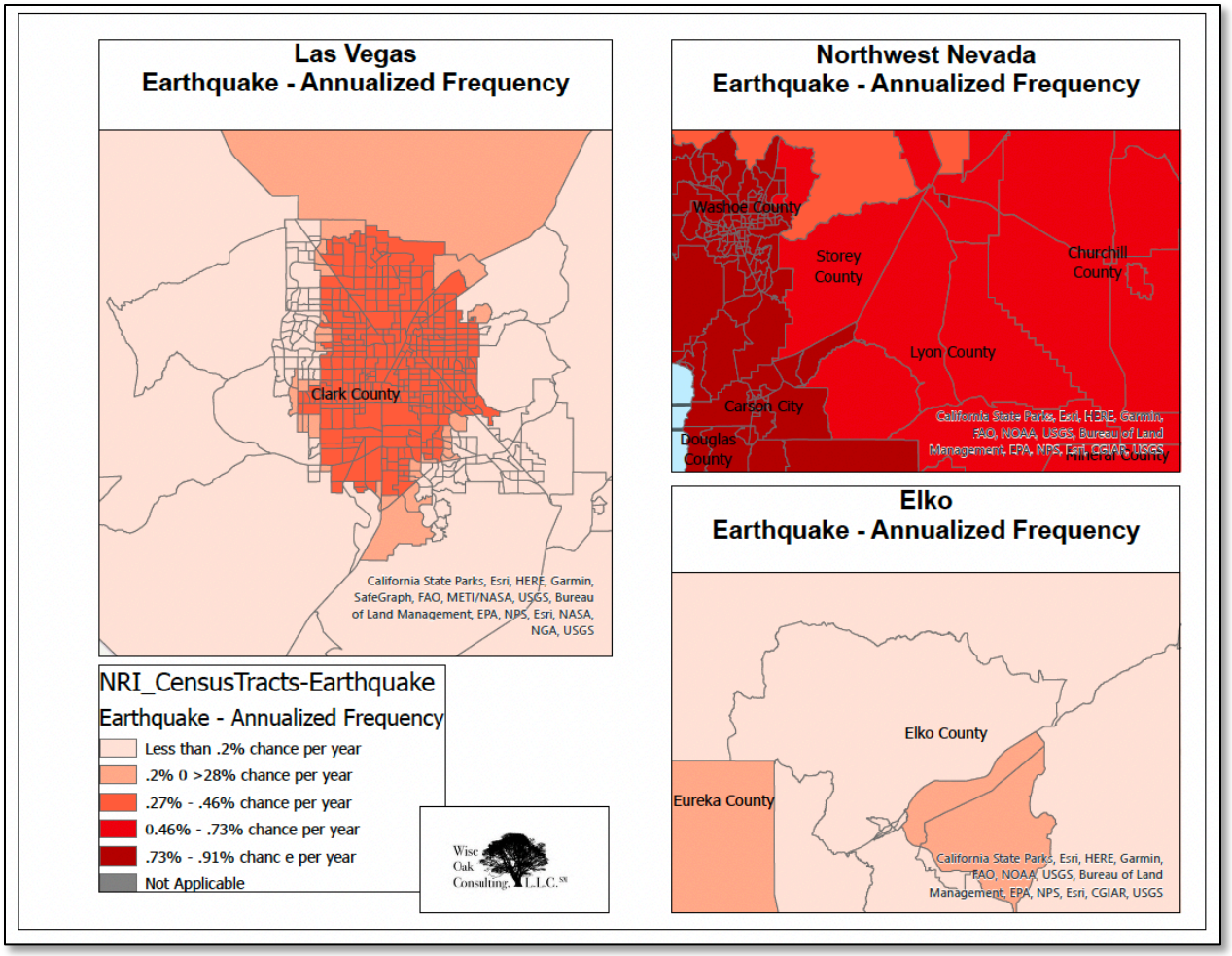


Figure 3-67. Earthquake National Risk Index Annualized Frequency – More Heavily Populated Areas.

Table 3-58 in Section 3.7.1 shows the probabilities of major earthquakes occurring within 50 years within 31 miles of 38 major Nevada communities, based on the USGS's information. A shaking potential map for Nevada is also found in Section 3.7.1, Figure 3-226.

3.3.3.4 Climate Change

Hammond et al. (2019, Jour. Of Geophysical Research, v. 124, p. 6072) made the case that the 2011 drought influenced not only seismicity in western Nevada, but also magmatic inflation of the Long Valley volcanic system near Mammoth Lakes and crustal deformation. Thus, it is plausible that large precipitation trends, in the form of droughts or years of heavy precipitation, could influence earthquake behavior in the short term. Over the long term, tectonics would likely override these shorter-term modulations of earthquake activity. As a result, there is insufficient data to develop a quantitative impact of climate change on earthquakes.

3.3.3.5 Vulnerability of State Assets

The vulnerability of state assets due to this hazard are profiled in detail in sections 3.6 and 3.7. The vulnerability of state critical buildings is provided in Appendix T.

3.3.3.6 Mitigation

This hazard is profiled in detail in sections 3.6 and 3.7. In addition, the state has numerous mitigation actions listed in Section 4.

3.3.4 Expansive Soils (Low Risk)

3.3.4.1 Nature

Expansive soils are soils and soft rock that tend to swell or shrink as a result of changes in the moisture content. Changes in soil volume primarily present a hazard to structures built on top of expansive soils. The most extensive damage occurs to highways and streets, but building foundations are susceptible to distortion if built on expansive soils as well.

In the United States, two major groups of rocks serve as parent materials of expansive soils and occur more commonly in the western part of the country. The first group consists of ash, glass, and other rocks of volcanic origin. Glass and aluminosilicate minerals in these volcanic materials often decompose to form expansive clay minerals (most commonly smectite, a group of clay minerals that incorporates significant amounts of water in their crystal structures). The second group consists of sedimentary rock containing clay minerals. Because clay materials are most susceptible to swelling and shrinking, expansive soils are often referred to as swelling clays. Expansive soils also include soils with sodium sulfate, which occur in the Las Vegas Valley. Expansive soils can be recognized by visual inspection in the field. Shales, claystones, weathered volcanic rocks, and residual soils containing smectite often have characteristic "popcorn" texture or "badlands" topography, especially in semi-arid areas.

Collapsible soils are related to expansive soils, such as soils in Las Vegas Valley that contain gypsum (hydrated calcium sulfate). Gypsum can be dissolved by groundwater and the resulting loss of volume can cause settlement or collapse of the soil.



Most engineering problems caused by swelling clays involve soils underneath areas covered by buildings and slabs or layers of concrete and asphalt, such as those used in construction of highways, walkways, and airport runways. Houses and one-story commercial buildings are more prone to damage from expansive soils than multi-story buildings, which usually are heavy enough to counter the swelling pressures. If constructed on wet clay, multi-story buildings may be damaged by shrinkage of the clay if moisture levels are substantially reduced, such as by evaporation from beneath heated buildings.

Figure 3-68: Example of Axpansive Soils Following a Heavy Rain Event and Subsequent Drying.[68]

3.3.4.2 History

Expansive soils are defined as soils that expand when water is added and contract when the soil dries out. This change in soil volume may cause homes built on these soils to move and foundations to crack. Expansive soils are found throughout the US and cause billions of dollars in damage every year. Expansive soils will not generally cause problems if their water content remains unchanged – the greatest damage from expansive soils occurs when there are repeated or significant moisture content changes to these soils.

[68] Photo credit: Rachel Micander.

Expansive soils and clays occur in and near urban areas of Washoe and Storey Counties where hot waters have altered surrounding rock (hydrothermal alteration associated with volcanic activity several million years ago), converting the volcanic rocks to smectite. The problem has been most acute to date in the hills on the north side of Reno and Sparks, but similar rocks occur in the foothills of Peavine Mountain, the Virginia Range, and the Carson Range. One example of this phenomenon is a section of U.S. 395 between Clear Acre Lane and Parr Boulevard that was reconstructed by NDOT in the early 1990s due to damage from expansive soils in a large road cut made during the freeway's original construction. As development encroaches on higher elevations of surrounding foothills and slopes in the Reno-Sparks area, expansive soils will become more of a risk to homeowners. The Washoe County construction design requirements dictate that "The Footings or foundations placed on or within the active zone of expansive soils shall be designed to resist differential volume changes and to prevent structural damage to the supported structure". In addition, it states that "foundations extending into or penetrating expansive soils shall be designed to prevent uplift of the supported structure" and "foundations penetrating expansive soils shall be designed to resist forces exerted on the foundation due to soil volume changes or shall be isolated from the expansive soil".

In 1957, the Las Vegas and Eldorado Valleys Area Survey of soil was completed. The area had problems with displacement of house roofs up to 18 inches and concrete slab floors rising as much as 3 feet. In the report, the soil scientists found that these homes were destroyed by swelling soils. Salts in the soil became deliquescent at air temperatures of 41° to 45°F (5° to 7.2°C). Upon becoming deliquescent, the salts (sodium sulfate) in the soils took on 10 molecules of water from the atmosphere, causing the damage to homes and other buildings. Areas of collapsible soils in Las Vegas Valley are shown in Figure 3-69.

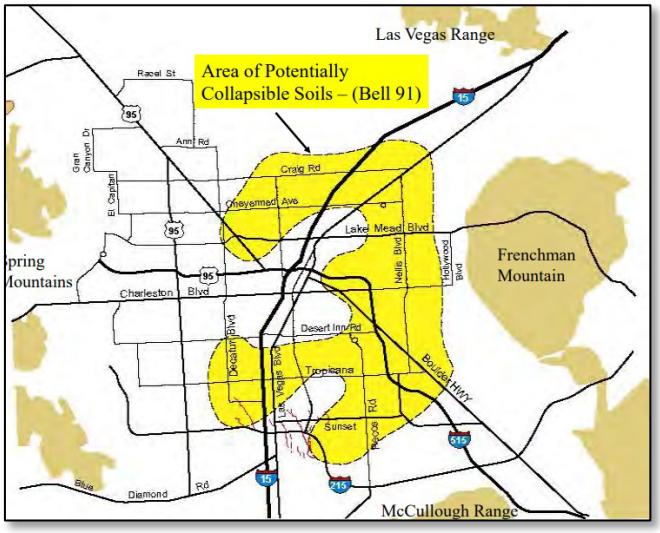


Figure 3-69. Las Vegas Valley Areas with Collapsible Soils Identified and Have the Potential to Occur.[69]

Between 1994 and 1999, Beazer Homes constructed and sold 206 single-family residences on a 40-acre residential subdivision in North Las Vegas. In April 2000, three homeowners filed a complaint against Beazer Homes for construction defects to their homes. The complaint alleged that their houses' foundations and concrete slabs were damaged by expansive soils *Shuette v. Beazer Homes Holding Corp., 121 Nev. Adv. Op. 82* (2005). The amendments to the Clark County building code include a required test to determine where expansive soils exist and that foundation design and special inspection for grading/foundations shall be based upon results obtained from this test.

Significant damage and road repair has occurred along West Cheyenne Avenue in Las Vegas. It has been recognized in recent years that this damage is mostly due to the expansion and

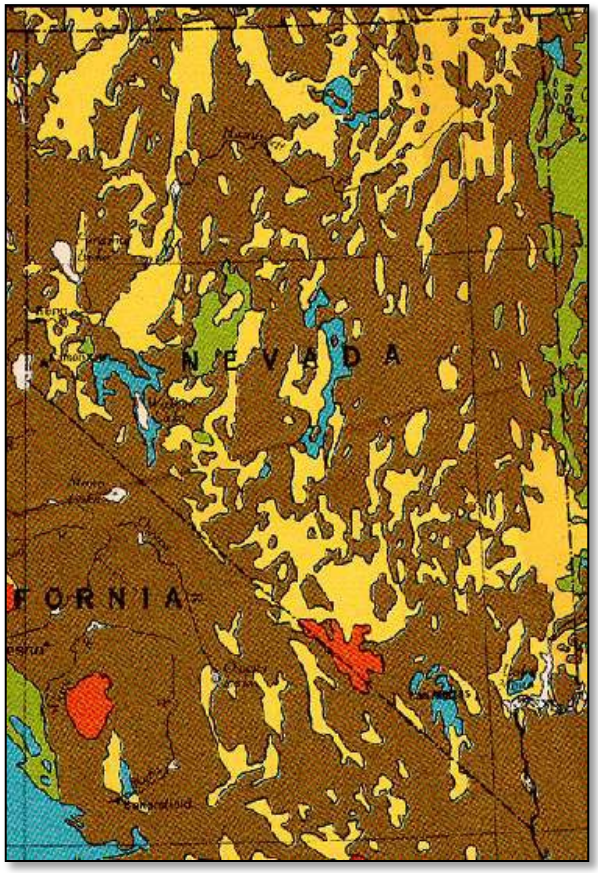
[69] Source, Bell, 1981, Subsidence in Las Vegas Valley, Nevada Bureau of Mines and Geology Bulletin 95.

contraction of clays and subsurface voids related to an early Holocene hot spring deposit. Prior to this discovery the roadway had to be repeatedly repaired, but with this recognition of clays, more permanent fixes could be employed.

In Nye County on the northwest side of Pahrump Valley, expansive soils were blamed for causing foundation and septic damage to homes in the area. Because of the septic damage, some of the land in the area was contaminated. In response, the Nye County Commission passed a bill in October 2006, requiring disclosure of soil conditions to the buyer.

3.3.4.3 Location, Severity and Probability of Future Events

At this time, the risk of damage due to expansive soils occurs near the higher populated areas of Clark, Nye, Washoe, and Storey Counties. Figure 3-70 is a swelling clay soil map of Nevada showing the general location of soils containing a high percentage of high-swelling-potential clay in southern Nevada. More detailed mapping at the local and site-specific scale is necessary to better define the extent of expansive soils in the state.



	Unit contains abundant clay having high swelling potential
	Part of unit (generally less than 50%) consists of clay having high swelling potential
	Unit contains abundant clay having slight to moderate swelling potential
	Part of unit (generally less than 50%) consists of clay having slight to moderate swelling potential
	Unit contains little or no swelling clay
	Data insufficient to indicate clay content of unit and/or swelling potential of clay (Shown in westernmost states only)

Figure 3-70. Swelling Clay Soil Map of Nevada.[70]

Expansive soils are considered to be in the "Low Risk" hazard category from a state perspective because this hazard will most likely be handled efficiently by local authorities through their building codes and by Nevada Department of Transportation through its building practices in areas prone to this hazard.

3.3.4.4 Climate Change

While the impact from climate change on expansive soils is poorly understood, it is possible that soils would become more vulnerable to volume change. Expansive soils are also dispersive. With a boom-and-bust climate cycle and more extreme weather events (i.e., torrential downpours and long periods of drought) more gully erosion and formation of earth fissures is possible with extreme precipitation events. Also, more swelling of clays in untreated foundations that may not have caused significant effects before could become more damaging.

3.3.4.5 Vulnerability of State Assets

Due to insufficient data, it is not possible to accurately estimate the vulnerability of state assets due to this hazard.

3.3.4.6 Mitigation

The best method to prevent or reduce damage from expansive soils is avoidance. When other choices are not possible, applied engineering practices such as removal of the soil, application of

[70] Source: 1989 U.S. Geological Survey, *Swelling Clays Map of the Conterminous U.S.* by W.W. Olive, A.F. Chleborad, C.W. Frahme. Julius Schlocker, R.R. Schneider, and R.I. Shuster; 1989.

heavy loads, compaction of engineered fill, installing moisture barriers, presetting, underpinning, and/or other methods of stabilization are necessary. Subject matter experts have assessed that there is no appreciable vulnerability of state assets due to this hazard. Therefore, the hazard profile is for information purposes only and mitigation projects will not be pursued for this hazard in 2023-2028.



3.3.5 Extreme Heat (Medium Risk)

3.3.5.1 Nature

Extreme heat refers to high day and/or nighttime temperatures, usually during the summer, that endanger human and animal health and can damage infrastructure or cause other disruptions. According to National Weather Service (NWS) statistics, heat is a particularly dangerous kind of extreme weather. In 2021 alone, the National Weather Service (NWS) reported 190 deaths due to extreme heat.[71] This is more than twice as many people as were killed by tornados or flooding (Figure 3-71). Eight (8) of those fatalities occurred in Nevada.[72] While we often think about dangers associated with extremely high daytime temperatures, nighttime temperatures can also have significant health effects. Heatwaves impact some individuals more than others. Children, older adults, people with certain medical conditions, and pregnant people are, on average, more physically vulnerable to the effects of high temperatures. People who work outdoors, take public transportation, or use transportation without cooling, and who do not have access to indoor cooling at home have greater heat exposure. Access to functional home cooling and the resources to run it can reduce exposure to heat.

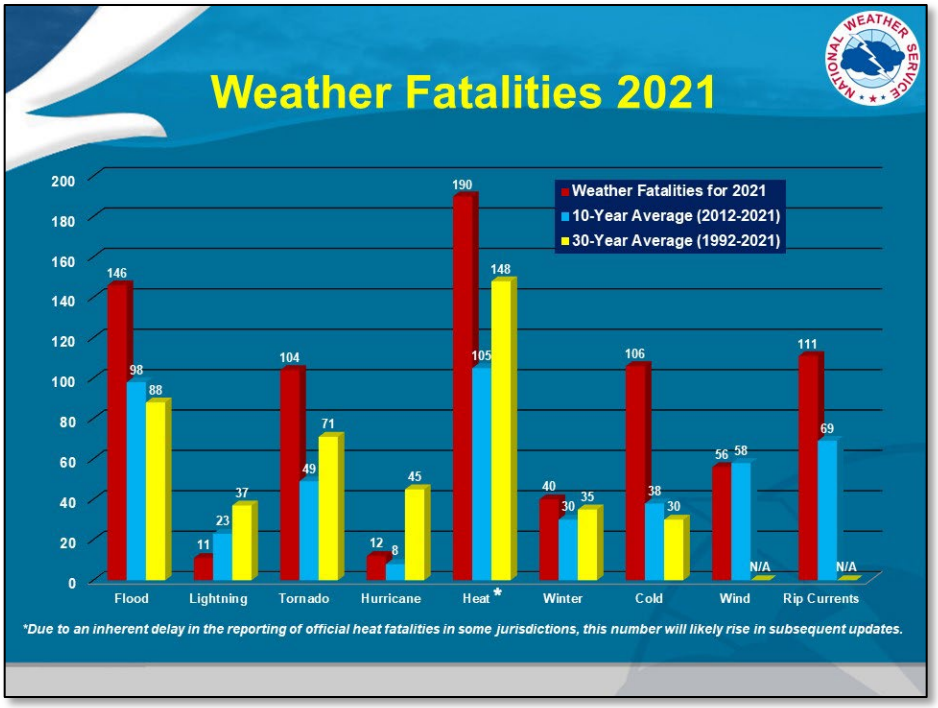


Figure 3-71. U.S. 2021 Weather Fatalities Including 10 and 30-Year Averages.

High temperatures also reduce the reliability of transportation and electrical infrastructure. During heat waves, demand for electricity increases for cooling, but power generation and distribution systems are less efficient. Particularly high temperatures can also disrupt air travel, as happened on July 9, 2021.[73]

[71] National Weather Service, "Weather Related Fatality and Injury Statistics," accessed February 1, 2023, https://www.weather.gov/hazstat/.

[72] National Weather Service, "Heat related Fatalities," accessed February 1, 2023, https://www.weather.gov/media/hazstat/heat21.pdf.

[73] Akers, M. Record-breaking heat causing delays at Las Vegas McCarran airport. Las Vegas Review-Journal. July 9. 2021. Accessed Dec. 16, 2021. https://www.reviewjournal.com/business/tourism/record-breaking-heat-causing-delays-at-las-vegas-mccarran-airport-2396721/.

Figures 3-72 and 3-73 depict the National Risk Index (NRI) Score for Heat Wave statewide and in more heavily populated areas respectively. The combination of climate and impact of the urban environment make the risk higher in southern Nevada than most of the country.

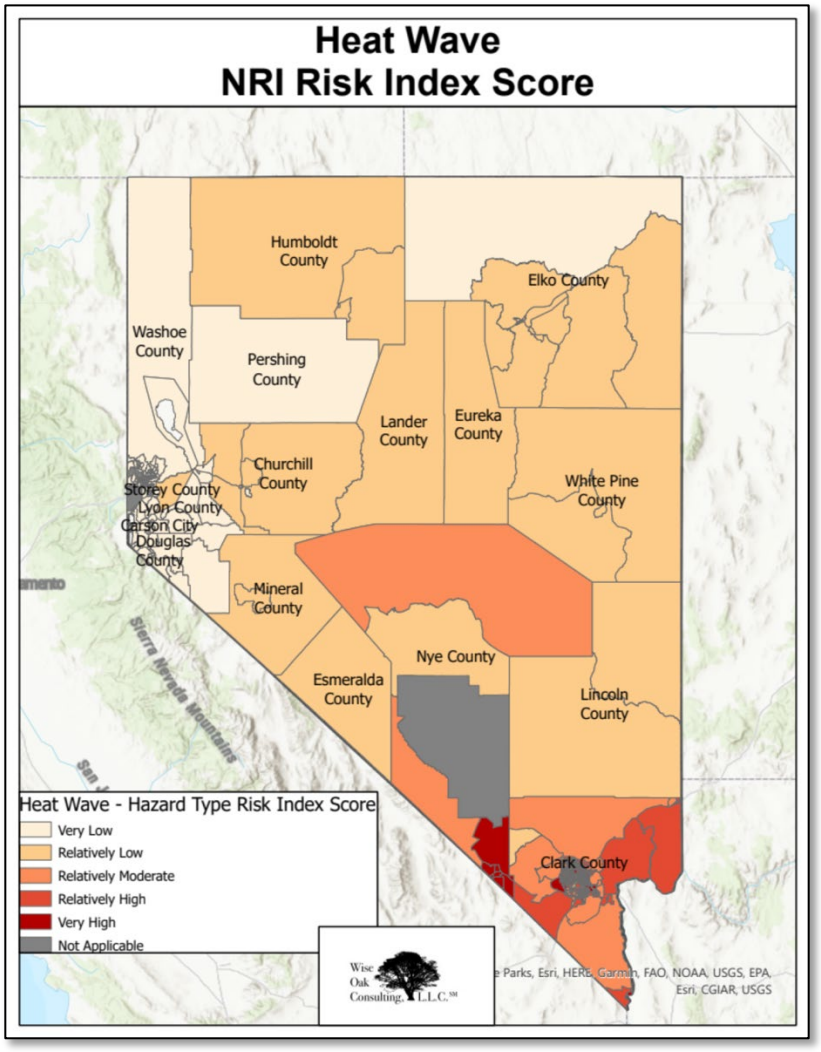


Figure 3-72. Heat Wave National Risk Index Score – Statewide.

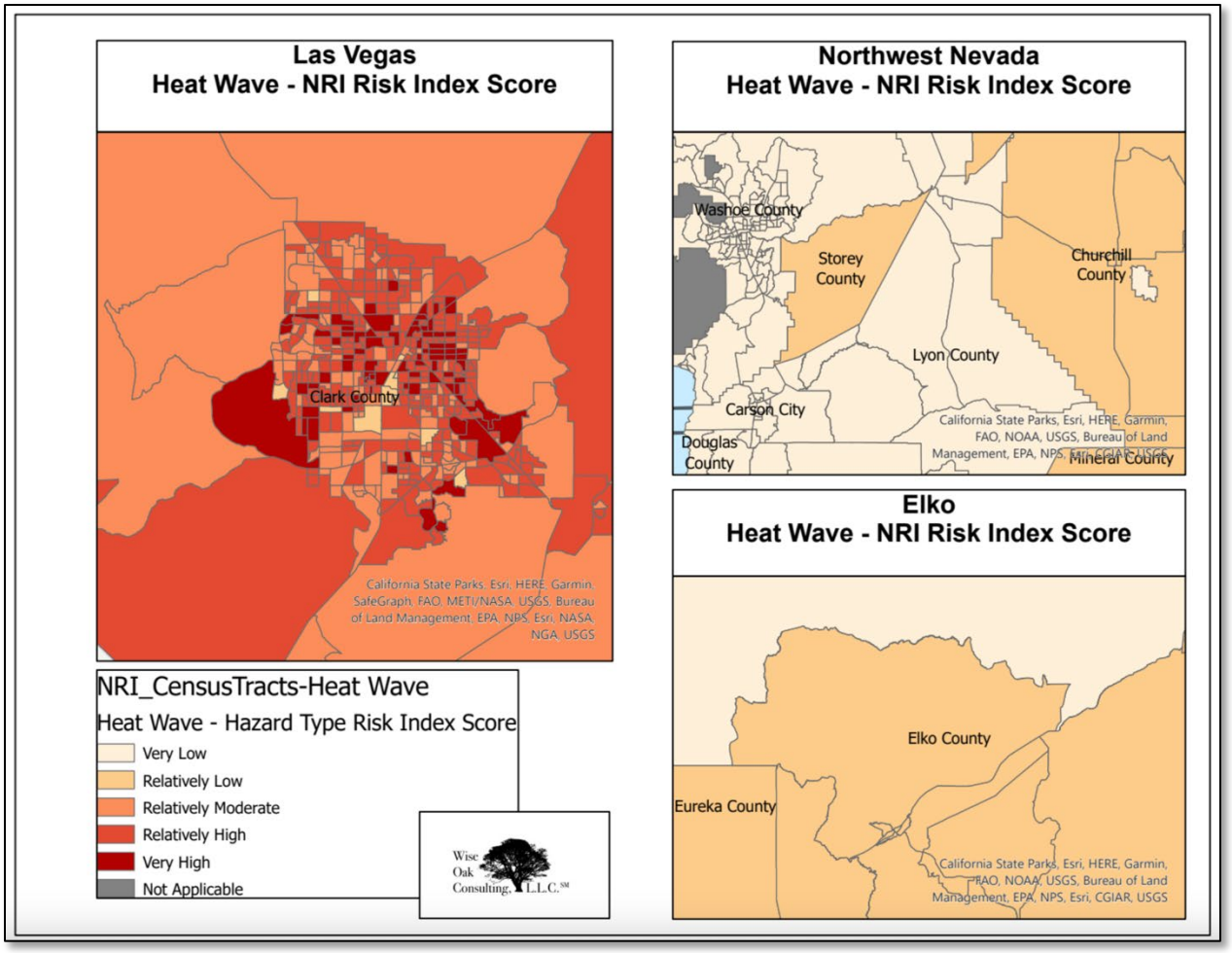


Figure 3-73. Heat Wave National Risk Index Score – More Heavily Populated Areas.

Figures 3-74 and 3-75 depict the National Risk Index (NRI) Exposure for Heat Wave in dollars statewide and in more heavily populated areas respectively. The combination of climate and impact of the urban environment make the exposure in southern Nevada than most of the country.

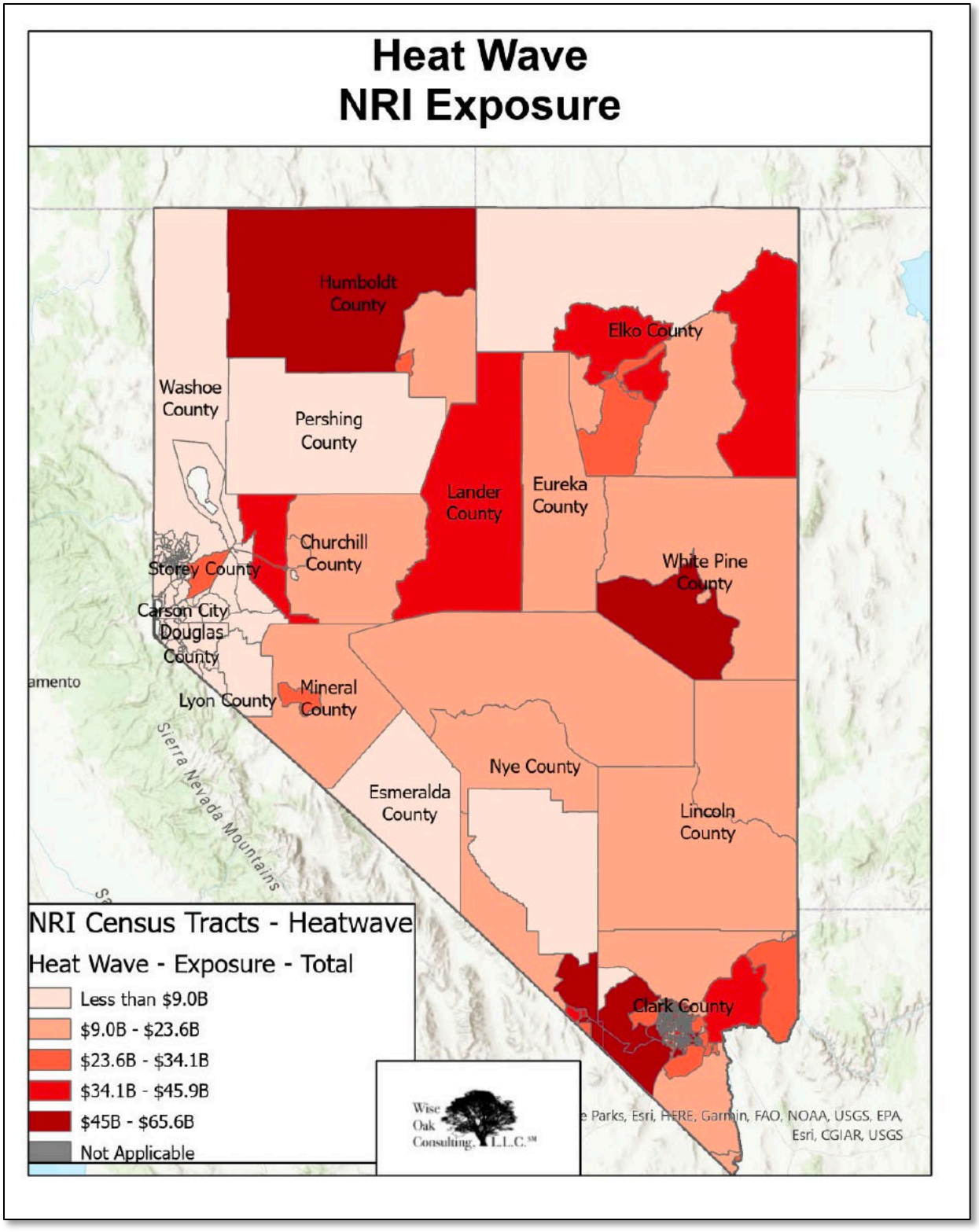


Figure 3-74. Heat Wave National Risk Exposure – Statewide.

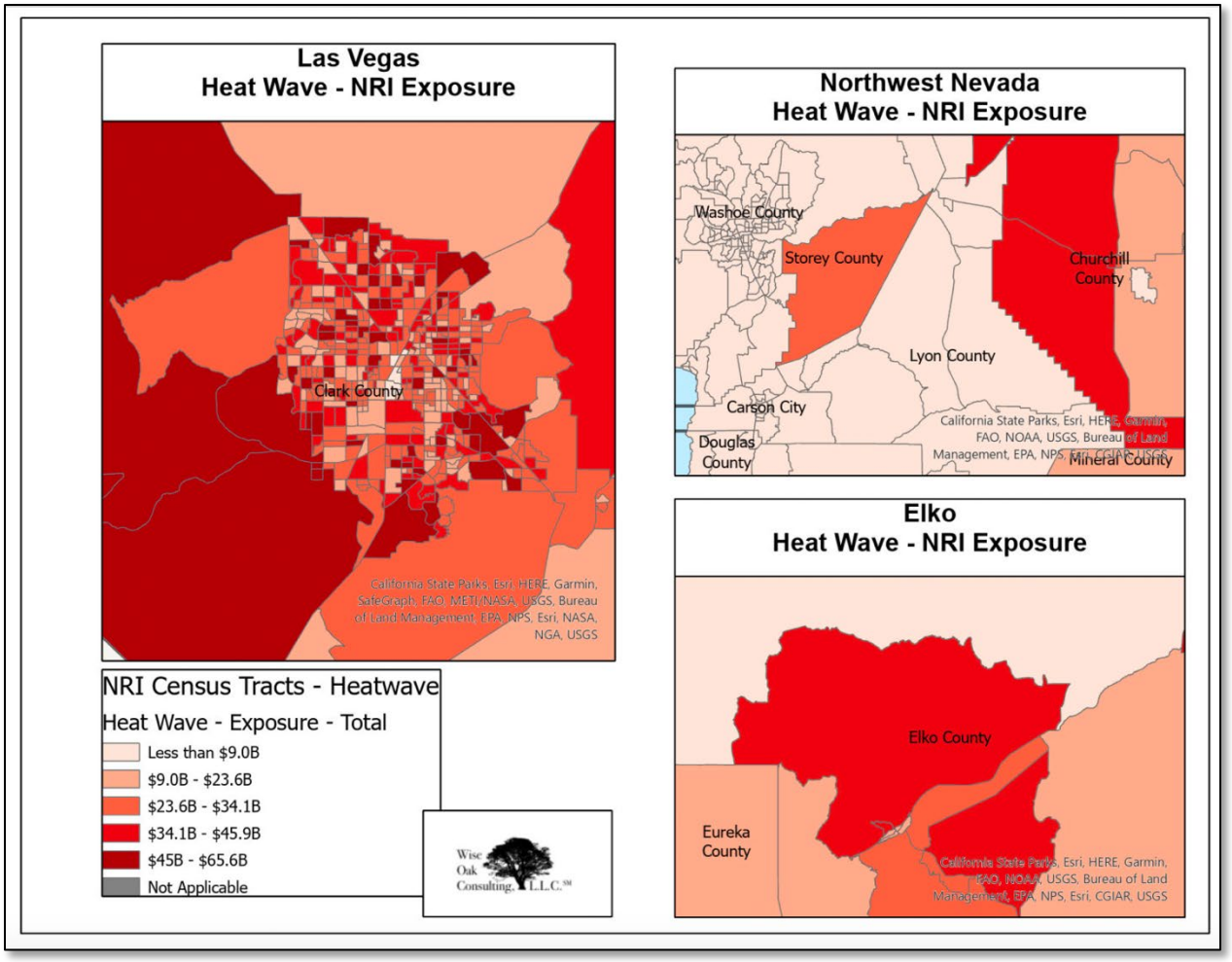


Figure 3-75. Heat Wave National Risk Exposure – More Heavily Populated Areas.

3.3.5.2 History

July average (1981-2010) high temperatures in southern Nevada are above 100 °F (Table 3-13). In northern Nevada, average July high temperatures are in the 80's or 90's, with cooler temperatures in the mountains. Daily high temperatures at the McCarran Airport in Las Vegas regularly exceed 110 °F in June, July, and August. The highest temperatures ever reported in Reno and Elko, in contrast, are below 110 °F. Average July low temperatures in southern Nevada are above 65°F. Nighttime low temperatures are coolest in northeastern and far northwestern Nevada – averaging in the 40s or 50s during July. July nighttime lows average in the 50s or 60s in central Nevada. In Las Vegas, nighttime low temperatures in the 80s or even 90s happen every June, July and August. The highest ever nighttime lows reported at the Reno and Elko airports are 77° and 73°F, respectively.

The number of county-average (1981-2010) hot days per year varies between 1.7 in White Pine County and 74.8 in Clark County. Nights when the temperature remains above 65 °F are rare in most Nevada counties. On average, there are two or fewer extremely warm nights in nine of the State's 17 counties. In contrast, Clark County averages 90.8 days per year when the nighttime temperature was more than 65°F (Table 3-13). There are differences within each county, as well. Cooler portions of the counties will experience fewer extreme warm days and nights and warmer areas more.

Table 3-13. Average (1981 – 2010) Number of Days when the County-Average Daytime Temperature was Over 95° F (a hot day) and When the Nighttime Temperature Remained Above 65°F (a hot night)[74]		
County	**Number of days maximum temperature > 95°F**	**Number of days minimum temperature > 65°F**
Carson City	2.7	0.2
Churchill	20.3	2.7
Clark	74.8	90.8
Douglas	4.6	0.0
Elko	2.6	0.6
Esmeralda	15.5	4.6
Eureka	4.0	0.2
Humboldt	11.4	2.4
Lander	7.1	1.0
Lincoln	22.5	23.3
Lyon	13.5	1.9
Mineral	10.9	1.5
Nye	16.7	9.2
Pershing	16.1	2.8
Storey	5.1	2.9
Washoe	5.8	1.7
White Pine	1.7	0.1

Most of the notable heat events reported since 2015 have occurred in southern Nevada (Table 3-14) . Notable or impactful heatwaves are identified from the NOAA Storm Events Database; a description of the July 2021 heat event in northern Nevada is also described.

Table 3-14. Notable heat waves in Nevada since 2015[75]	
Date and Location of Event Average maximum temperatures at impacted stations	Narrative and Impacts
Las Vegas Valley **June 19 – 30, 2015** **McCarran International Airport: 110.3 °F** **Valley of Fire State Park: 110.3 °F** **Laughlin: 113.4 °F** **Bunkerville: 113.5 °F**	From June 12, 2015 – June 30, 2015, Las Vegas was hot enough to trigger Excessive Heat Warnings on five days. The heat wave caused at least one death, and a number of fatalities in July may also have been caused by the heat wave. Many emergency medical service calls and hospital visits due to the heat were also reported.
Las Vegas Valley and Lake Mead **July 22 – 29, 2016** **Bunkerville: 117.3 °F** **McCarran International Airport: 112.8 °F** **Overton: 115.3 °F** **Searchlight: 103.4 °F**	Very high temperatures in the Las Vegas and Lake Mead area during late July, 2016. Nearly 30 deaths, mostly indoors, were attributed to the heat wave.

[74] Based on PRISM data and summarized by SC-ACIS.

[75] Information about each of the heat waves was retrieved from the National Centers for Environmental Information Storm Events Database and SC-ACIS.

Table 3-14. Notable heat waves in Nevada since 2015[75]	
Date and Location of Event Average maximum temperatures at impacted stations	Narrative and Impacts
Las Vegas Valley **July 6 – 10, 2018** **McCarran International Airport: 107.3 °F** **Valley of Fire State Park: 109.2 °F Laughlin: 112.8 °F** **Red Rock Recreational Area: 99.7 °F.**	Between July 6th and 10th, the Las Vegas area experienced excessive heat leading to nine fatalities.
Las Vegas Valley, Lake Mead and Mojave, and Spring Mountains **June 11 – 14, 2019** **Alan Bible Visitor Center: 104.2 °F** **Kyle Canyon: 77.5 °F** **McCarran International Airport: 102.3 °F** **Mt. Charleston Fire Station: 74.3 °F Overton: 106.2 °F**	Excessive heat in the region peaked in the middle of this period. In addition to temperatures over 100°F in urban areas, temperatures hit 80°F at the Mt. Charleston Fire Station (elevation 7,460') almost 7°F above normal for the time of year.
Esmeralda, Nye, Lincoln, Clark Counties **August 14 – 20, 2020** **Desert National Wildlife Refuge: 108.0 °F** **Laughlin: 117.3 °F** **Mercury: 108.3 °F** **Overton: 114.6 °F** **Silver Peak: 100.7 °F**	In mid-August 2020, a high pressure aloft over much of the US Southwest and Four Corners region allowed high temperatures to reach over 110°F at many locations in southern Nevada.
Greater Reno-Carson City Area **July 9 – 12, 2021** **Carson City: 102.2 °F** **Fallon: 103.3 °F** **Incline Village: 85.3 °F** **Mt. Rose Ski Area: 77.5 °F** **Reno Airport: 103.3 °F** **Virginia City: 93.2 °F**	Several maximum temperature records were broken as part of a weekend heat wave that hit the Northern portions of Nevada. Reno reached 104 °F on July 9, 2021, breaking a record set in 2007. Excessive heat warnings were issued across Washoe, Mineral, and parts of Lyon County. This was part of a larger pattern where Reno recorded temperatures over 100°F for 12 days in a row.

Despite the high level of earthquake activity, the State has thus far avoided heavy losses and the NRI Historic Loss Ratio is very low across the state.

3.3.5.3 Location, Severity, and Probability of Future Events

Weather forecasts are fairly accurate in predicting temperature over the next 7-10 days and are effective tools for identifying extreme heat risk. Seasonal outlooks can be reasonably skillful in forecasting whether average temperatures will be below, near, or above average over the summer. Because those forecasts provide information about three-month average temperatures, they are not always useful in understanding whether periods of extreme heat are likely.

Although using a temperature threshold for extreme heat is not always appropriate, because temperatures that would be notably warm in Elko might be routine in Las Vegas, it is also convenient to do so. The recent State climate assessment defined extremely warm days and nights as days when the high temperature exceeds 95°F and nights when the temperature remains above 65°F. Those definitions are used here. In other parts of the country, a heat index that combines the effects of heat and humidity is often used. Higher humidity levels increase the risk associated with heat. Much of Nevada is dry enough that humidity effects are not a significant concern.

Summer average and annual high temperatures tend to be highest in southern and lower elevation portions of Nevada. Owing to the urban heat island effect, where buildings, pavements and human activity add to and trap heat in cities and large towns, extreme temperatures can also be higher in urban areas (Figures 3-72 – 3-75).

The National Risk Index annualized Heat Wave Annualized Frequencies statewide and for more highly populated areas are depicted in Figures 3-76 – 3-77. As discussed earlier, the largest Heat Wave impacts are in southern Nevada and especially of concern to the densely populated areas.

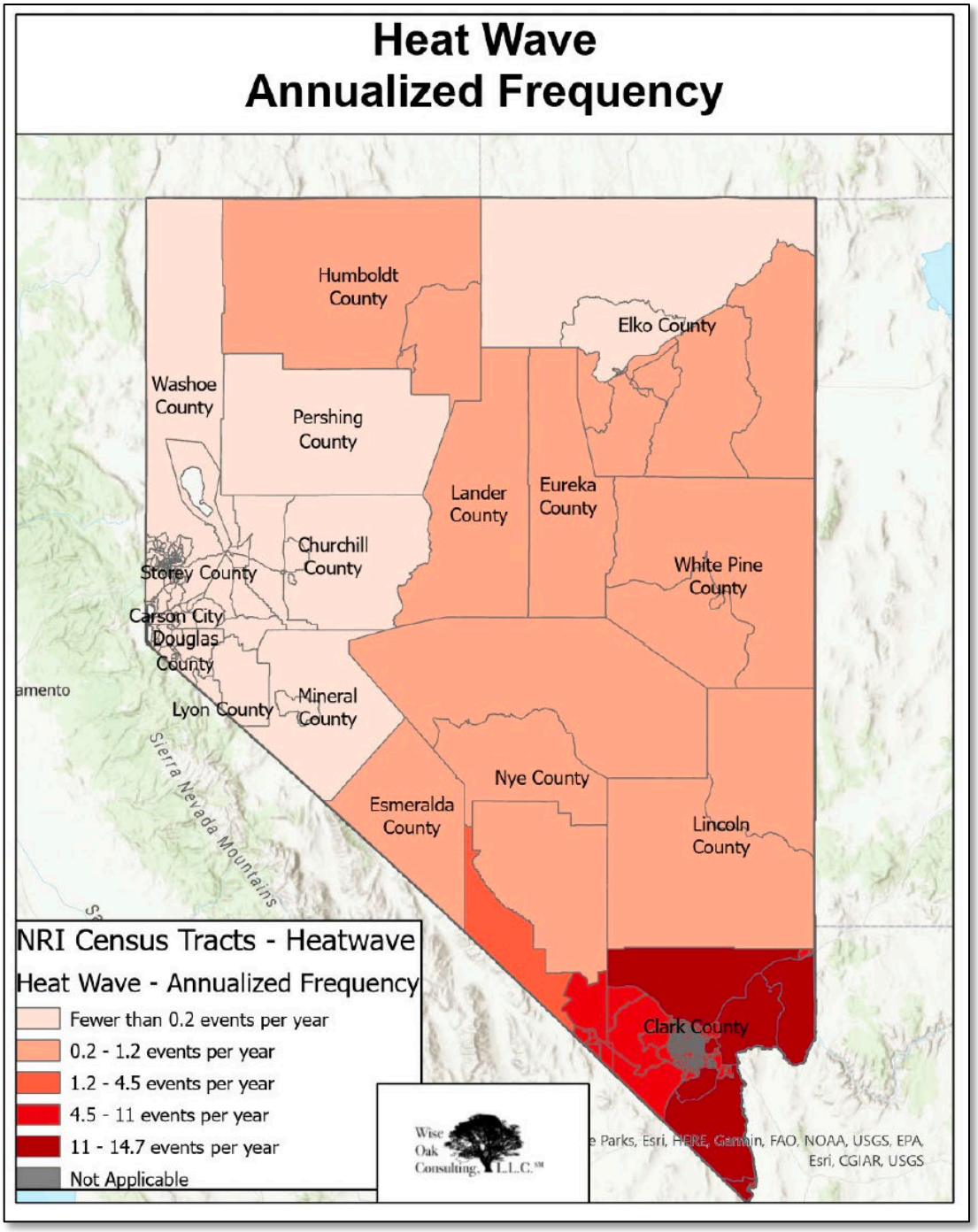


Figure 3-76. National Risk Index Heat Wave Annualized Frequency – Statewide.

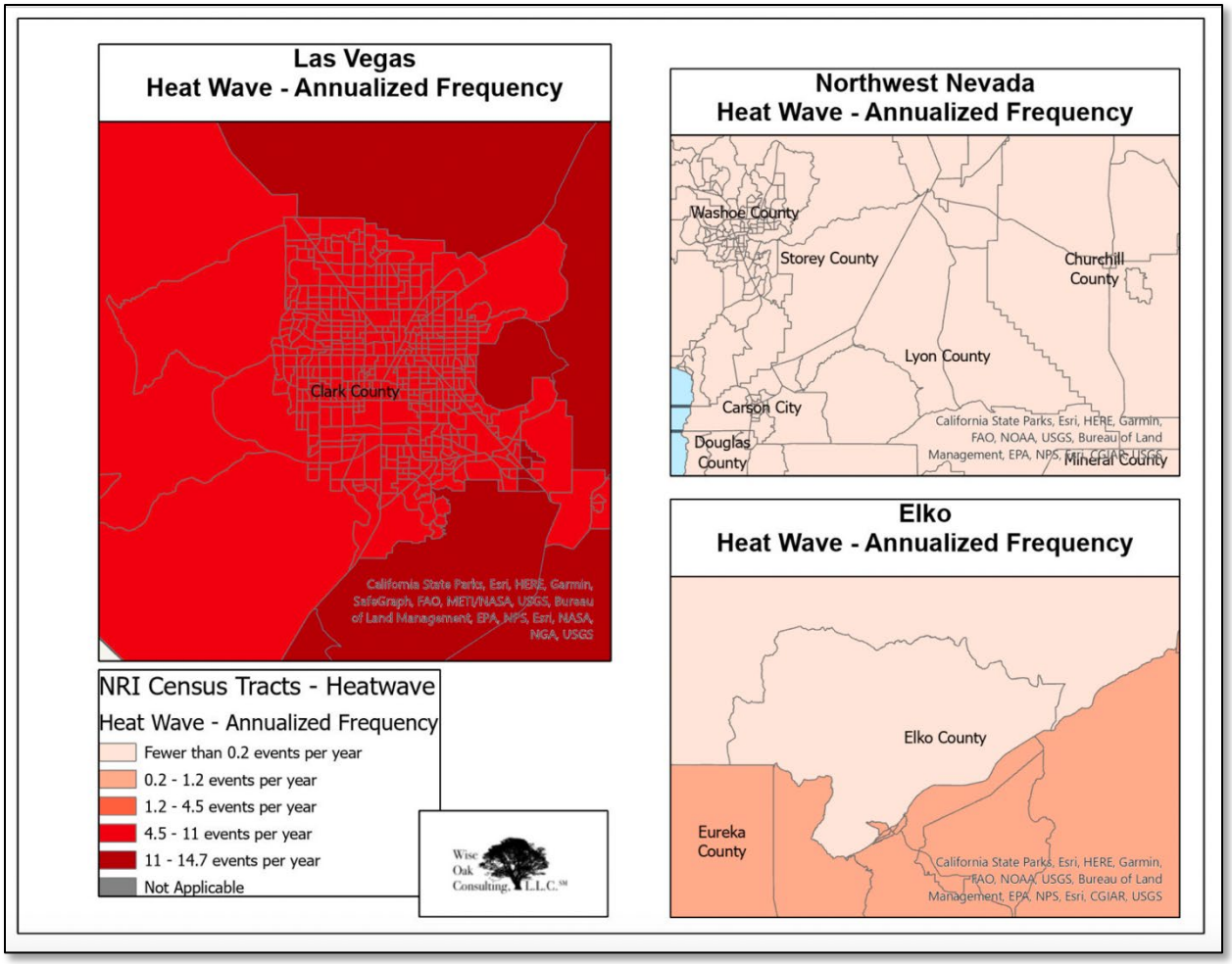


Figure 3-77. National Risk Index Heat Wave Annualized Frequency – More Heavily Populated Areas.

Following the Risk Index Score, Exposure, and Annualized Frequency, the National Risk Index Expected Annual Loss in southern Nevada is significantly higher the rest of the state (Figure 3-78 and 3-79). Not only will the state likely face increased exposure and loss to Heat Waves, but the impact will be greatest in the more densely populated areas where the Social Vulnerability Index is also generally greater.

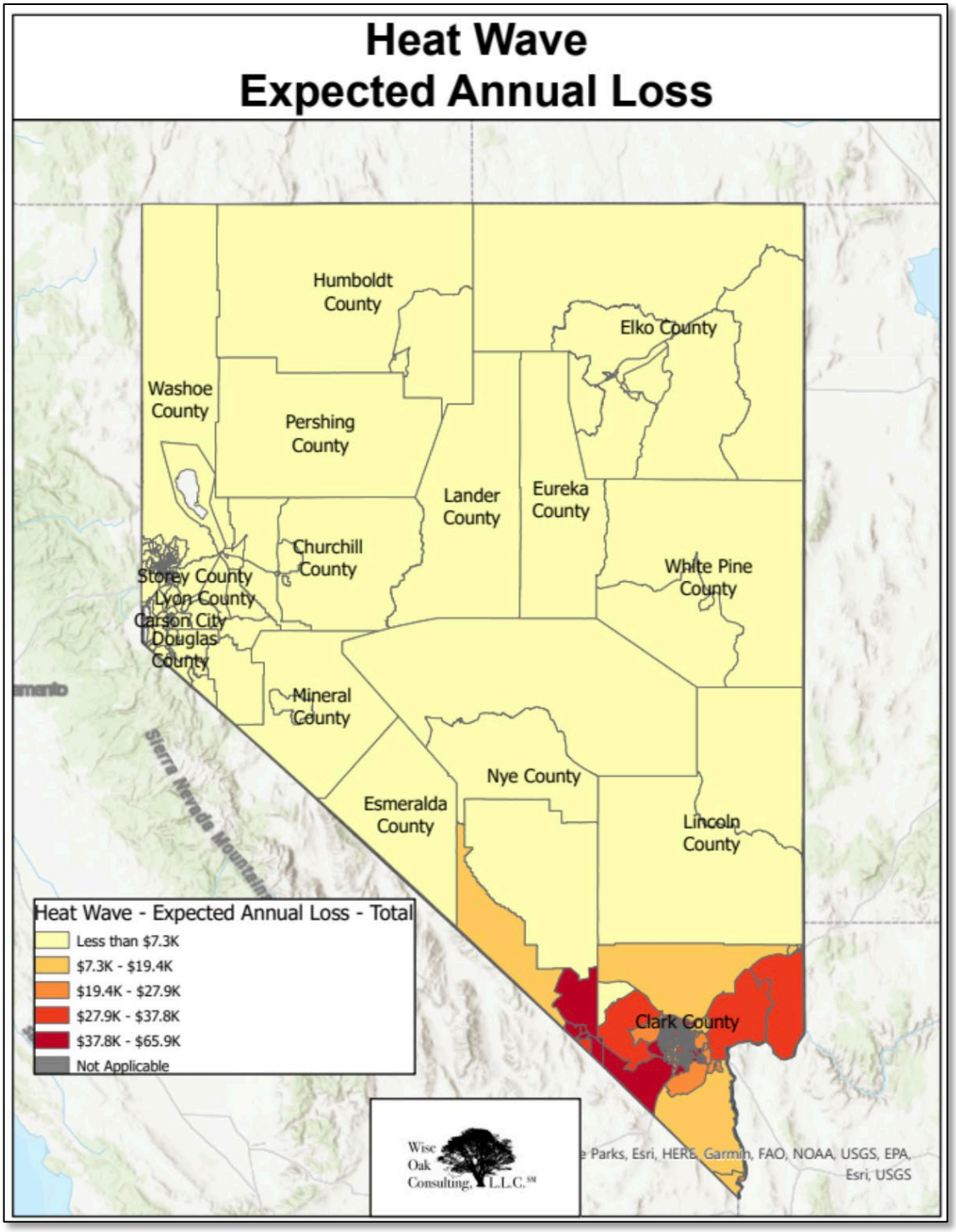


Figure 3-78. National Risk Index Heat Wave Expected Annual Loss - Statewide.

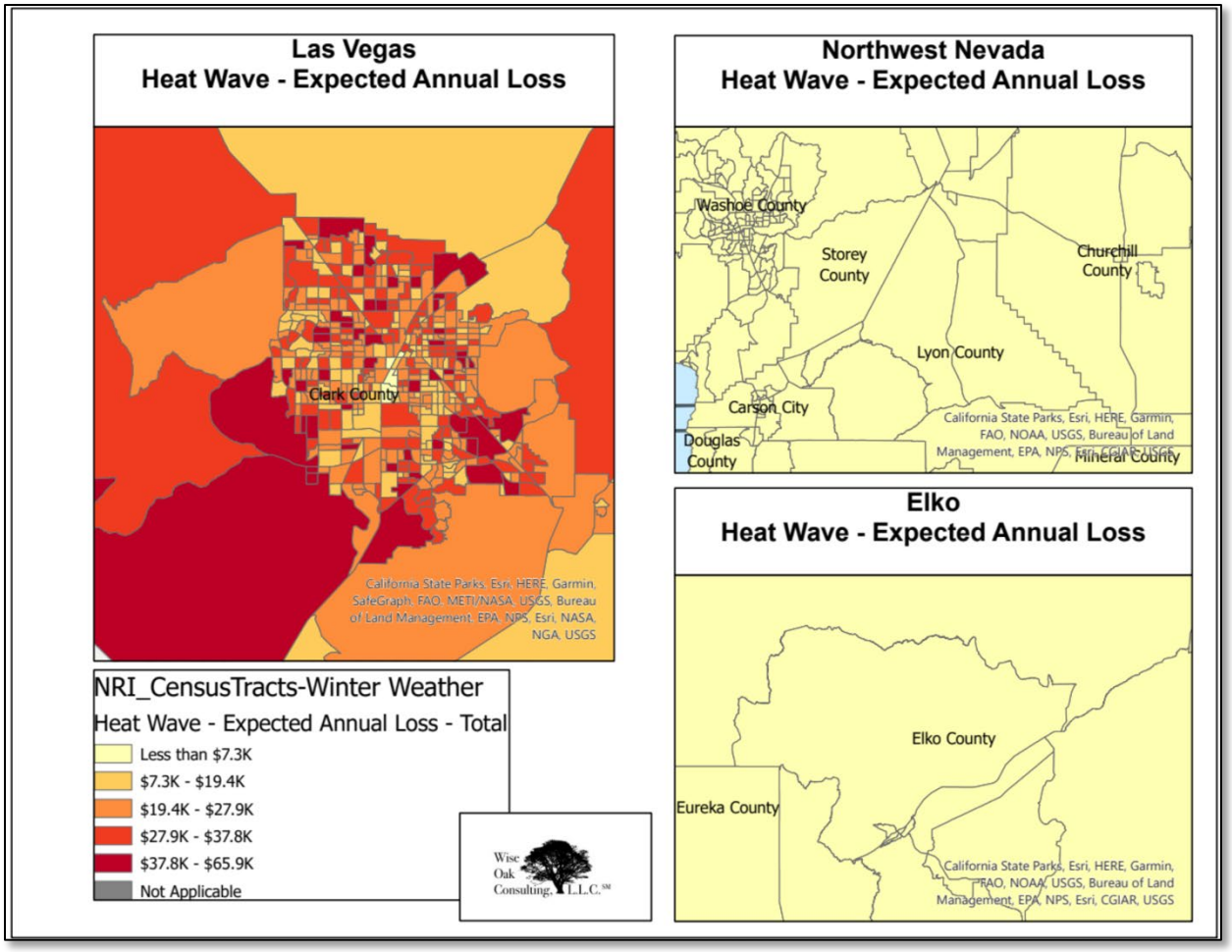


Figure 3-79. National Risk Index Heat Wave Expected Annual Loss – More Heavily Populated Areas.

3.3.5.4 Climate Change

The State climate assessment projects that in the relatively near future – the middle of this century – northern Nevada will experience, on average, 7 – 35 more extremely hot days. In southern Nevada, there may be an additional month or more when daytime maximum temperatures exceed 95°F. In the near-term, the number of warm nights is also expected to increase, with larger increases in the southern part of the State (Figure 3-80).

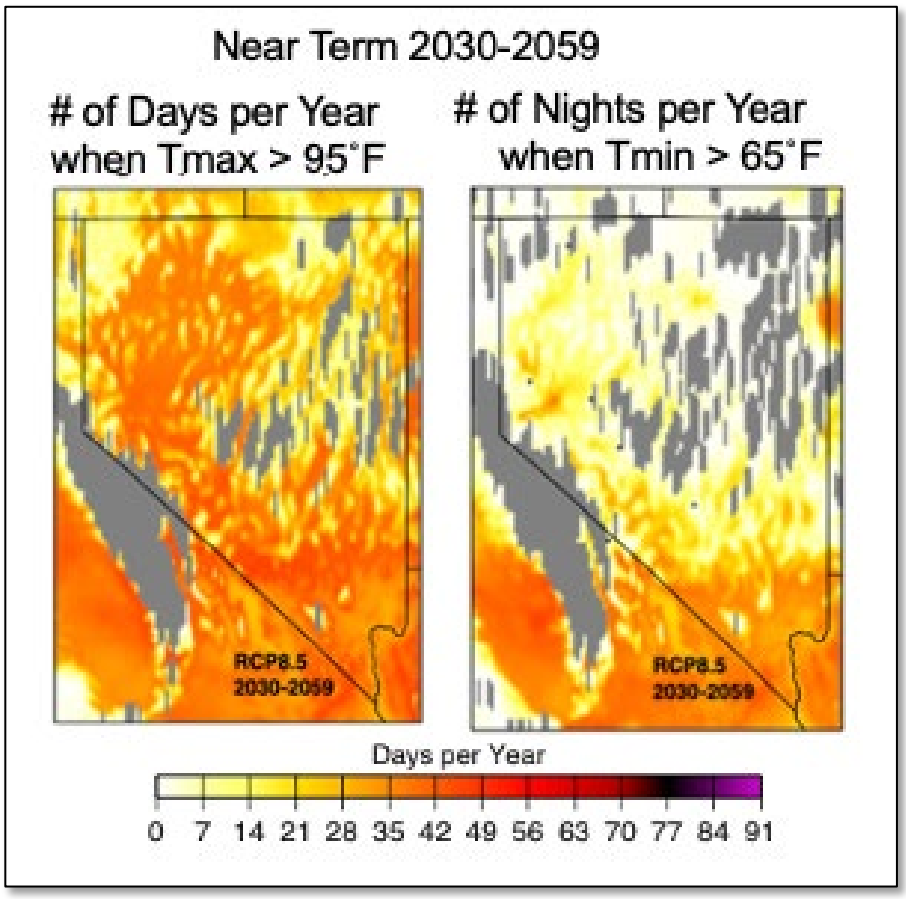


Figure 3-80. Near-Term Increase in Days with Highs Above 95°F and Nighttime Lows Above 65°F.[76]

By the end of this century, southern Nevada is projected to experience extremely hot days for an addition month or so of the year, under a low-emissions scenario. Under higher emissions scenarios, there could be nearly 80 additional days when the temperature exceeds 95°F (Figure 3-81).

[76] Both use the RCP8.5 emissions scenario. This is higher emissions scenario in the long-term, similar to the RCP4.5 scenario in the near-term. Source: Nevada Climate Strategy. Climate Change in Nevada. https://climateaction.nv.gov/policies/climate-nv/.

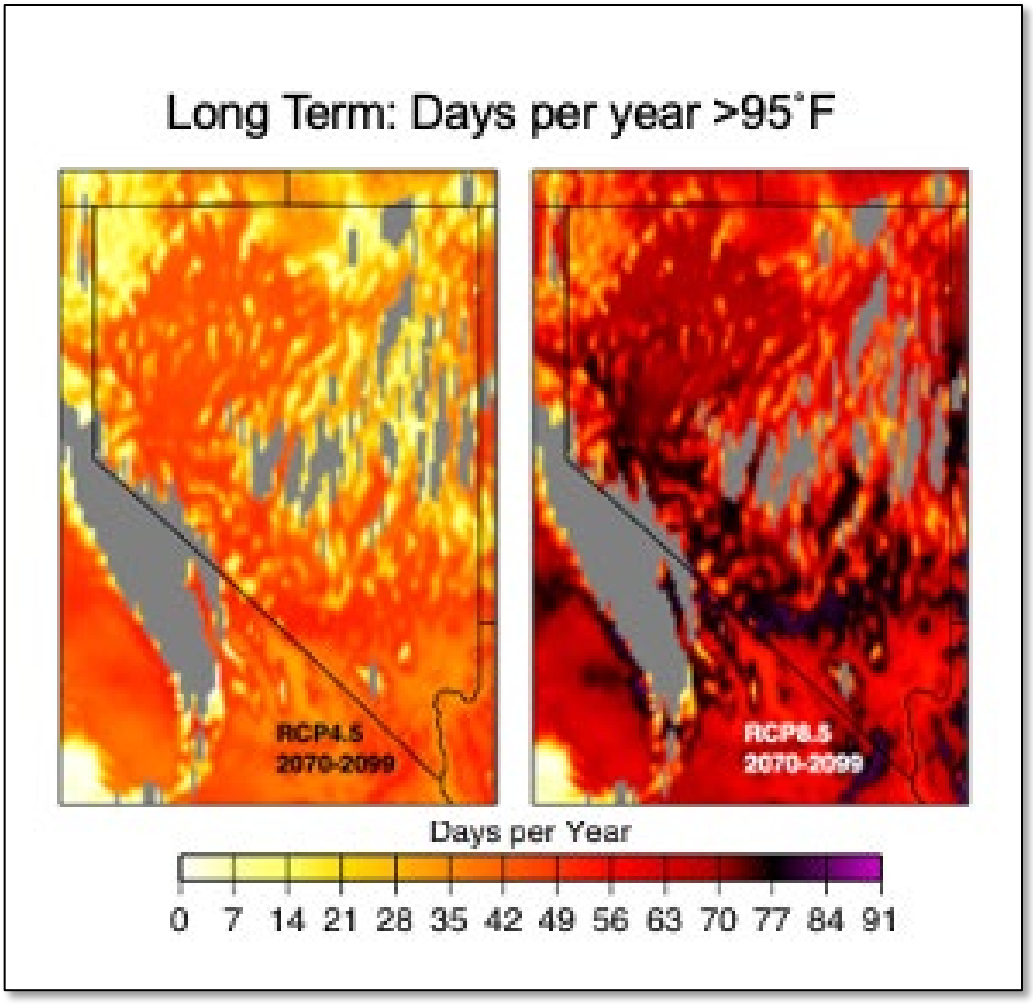


Figure 3-81. Long-Term Increase in Days with Highs Above 95°F and Nighttime Lows Above 65°F.[77]

The State climate assessment projects that in the relatively near future – the middle of this century – northern Nevada will experience, on average, 7 – 35 more extremely hot days. In southern Nevada, there may be an additional month or more when daytime maximum temperatures exceed 95°F. In the near-term, the number of warm nights is also expected to increase, with larger increases in the southern part of the State (Figure 3-80).

[77] Both use the RCP8.5 emissions scenario. This is higher emissions scenario in the long-term, similar to the RCP4.5 scenario in the near-term. Source: Nevada Climate Strategy. Climate Change in Nevada. https://climateaction.nv.gov/policies/climate-nv/.

As depicted in Table 3-15, Nevada's Climate Strategy highlights expected impacts from heat and heat waves due to climate change.[78]

Table 3-15 Impacts of Climate Change to Heat and Heat Waves	
Public Health	• Increased risk of mortality and morbidity • Increase in preterm births
Water Resources	• Degradation of water quality • Increased water loss due to higher evaporative demand
Environment	• Species' ranges will shift • Some local extinctions • Negative impacts on wildlife health including higher mortality
Recreation & Hospitality	• Decrease in time available to be safely outside • Deterrent to attracting visitors
Agriculture & 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

[78] Climate Strategy, March 9, 2023.

Public Health

According to a 2022 white paper by the Office of Management and Budget (OMB),

> *"More frequent, severe, prolonged extreme heat events will lead to elevated temperature exposure and increased heat-related deaths and illnesses (USGCRP, 2016). Exposure to climate or weather-related disasters can cause or exacerbate stress and mental health consequences, with greater risk for certain populations (ibid). Risk of food-borne illness may grow with increased exposure of food to certain pathogens and toxins (ibid). Increases in water temperatures will likely alter the timing and location of water-born illnesses (ibid). Increased growth of pathogens, such as Salmonella, are expected due to increased warmer winters (ibid). Many impacts of climate change will create a greater need for healthcare and related community facilities. They will also create a greater demand for specialists in related medical fields."*[79]

OMB expects both mortality from premature deaths and morbidity from non-fatal health problems to increase, with morbidity having a large impact on healthcare costs. However, OMB notes that the quantitative impact of climate change on morbidity has only been assessed for a subset of morbidity effects. The white paper notes, "Climate change can directly affect human health, but it also interacts with non-climate stressors to indirectly affect individual and community health. These interactions make it difficult to quantify overarching climate impacts on healthcare."[80] However, OMB estimates the impact on mortality for several factors as shown in Table 3-16.

[79] Office of Management and Budget, "Climate Risk Exposure: An Assessment of the Federal Government's Financial Risks to Climate Change," P. 27, March 10, 2023, https://www.whitehouse.gov/wp-content/uploads/2022/04/OMB_Climate_Risk_Exposure_2022.pdf.
[80] Ibid, 28.

Table 3-16. Mid and Late-Century Mortality Estimates					
Sector	Impact Type	RCP 4.5 Mortality[81]		RCP 8.5 Mortality[82]	
		Mid-century annual premature deaths	Late-century annual premature deaths	Mid-century annual premature deaths	Late-century annual premature deaths
Air Quality	Ozone	360	550	510	1,200
	Particulate Matter less than 2.5 micrometers	1,120	1,790	1,580	3,700
Extreme Temperatures	Extreme Heat and Cold	5,000	7,460	6,800	14,780

With Nevada accounting for 9.5% of the national population, premature deaths due to all causes in Table 3-16 may range from 616 (RCP 4.5 mid-century) to 1,870 (RCP 8.5 late-century).

Furthermore, the OMB estimates that the financial risk due to the impact of climate change on air quality could be $700M - $21.5B per year if not mitigated. In 2020, state and local governments healthcare costs represented 14.3% of the $4.1T national healthcare spending.[83] If the same ratio were to hold true, state and local government share of the cost due to air quality for the State of Nevada would be $100M - $3B. In addition to heat related illnesses that include, "…cardiovascular and respiratory complications, renal failure, electrolyte imbalance, kidney stones, negative impacts on fetal health, and preterm birth (NCA, 2018)…Productivity declines 1.7% for each 1 degree C of temperature increase above 15 degrees Celsius (NBER, 2015)."[84] Increased emergency room costs due to hyperthermia could reach $9M - $118M by the end of the century.[85] Again, using a factor of 14.3% of the national expenditure, Nevada could see an increased cost of $1.2M - $16.8M.

Although quantitative estimates are evolving, the impact of extreme heat due to climate change will be significant for Nevada.

Leisure and Hospitality

[81] The RCP 4.5 scenario assumes that global greenhouse gas emissions will peak around the year 2040 and then decline, leading to a stabilization of atmospheric CO2 concentrations at around 540 ppm by 2100.
[82] The RCP 8.5 scenario assumes that global greenhouse gas emissions will continue to increase throughout the 21st century without any significant climate policies to reduce them.
[83] "Climate Risk Exposure: An Assessment of the Federal Government's Financial Risks to Climate Change," March 10, 2023.
[84] Office of Management and Budget, "Climate Risk Exposure: An Assessment of the Federal Government's Financial Risks to Climate Change," P. 30, March 10, 2023, https://www.whitehouse.gov/wp-content/uploads/2022/04/OMB_Climate_Risk_Exposure_2022.pdf.
[85] Ibid.

Leisure and hospitality is the leading economic sector in Nevada, accounting for 333,900 jobs – 23% of the wages and salary.[86] In 2022, Tourism generated $317.6B and Casino Hotels generated $28.9B of revenue.[87] In addition, Real Estate and Rental and Leasing (including cars, formal wear, equipment, etc.) and tourism related services accounted for more than 36% of the State's the State's $159.5B in gross domestic product.[88]

Outdoor activities in Nevada include water sports, winter sports, fishing, bird hunting, wildlife watching, hiking, and golfing. The climate change will impact all of these activities. Increased temperatures are expected to make precipitation more erratic with wetter winters (reduced snowpack), earlier snowmelt, increased runoff, and more arid summers.[89] The increased heat will lead to more drought.

Las Vegas' local golf courses, which are used by 3 out of every 10 tourists, are major consumers of water and could become economically unfeasible.[90] In 2018, the total economic impact or golf in the State of Nevada was $1.98B.[91] If just 25% of golfers no longer play due to drought-caused impacts, the economic impact would be approximately $495M.

In 2018, Lake Meade generated $336M for local gateway communities, supporting $149M in labor for 3,990 jobs.[92] Similar to Golf, a 25% drop in Lake Meade-based tourism would result in an $84M economic impact.

Agriculture

Agriculture, Forestry, Fishing, and Hunting generated $433M in GDP for the State in 2022. During 2022, Nevada agriculture producers saw almost $210M in losses (winter weather, freezing, and irrigation system failures have been excluded).[93] Insurance payments to U.S. farmers due to drought increased 400% in the 25 years from 1995 to 2020.[94] Both annual increases in temperatures and Extreme Heat events affect the drought conditions. If the same trend were to hold true for the next 25 years, Nevada farmers could see more than $840M (2022 dollars) in losses in a year by mid-century. Even a 50% increase would result in over $315M (2022 dollars) in losses per year. A 2021 Stanford study estimates that global warming accounts for 19% of crop losses between 1991 and 2017. At 19% of the total, the impact of climate change on crop loss increases by mid-century of between $315M and $840M would be approximately $60M and $159M per year (Table 3-17). There is a large variance in loss increase in part because it depends on the mitigation measures that jurisdictions put in place.

[86] U.S. Bureau of Labor Statistics, Economy at a glance: Nevada, March 9, 2023, https://www.bls.gov/eag/eag.nv.htm.

[87] IBISWorld, Nevada Economic Overview, March 9, 2023, https://www.ibisworld.com/united-states/economic-profiles/nevada/.

[88] IBISWorld, Nevada Economic Overview, March 9, 2023, https://www.ibisworld.com/united-states/economic-profiles/nevada/.

[89] University of Maryland, "Economic Impacts of Climate Change on Nevada: 2008," P. 7, March 9, 2023, http://cier.umd.edu/climateadaptation/Nevada%20Economic%20Impacts%20of%20Climate%20Change.pdf.

[90] University of Maryland, "Economic Impacts of Climate Change on Nevada: 2008," March 9, 2023, http://cier.umd.edu/climateadaptation/Nevada%20Economic%20Impacts%20of%20Climate%20Change.pdf.

[91] TEConomy Partners, LLC, "The Economic Impact of Nevada Golf," p. 23, https://snga.org/wp-content/uploads/NV-Golf-Report-19.pdf.

[92] National park Service, Lake Meade, "Tourism to Lake Mead National Recreation Area Creates $336M in Economic Benefits," March 10, 2023, https://www.nps.gov/lake/learn/news/2019-economic-impact.htm.

[93] Cause of Loss Historical Data Files, March 10, 2023.

[94] Leah Douglas, Rueters, "U.S. crop insurance payouts rise sharply as climate change worsens droughts, floods," January 27, 2022, accessed March 10, 2023, https://www.reuters.com/markets/commodities/us-crop-insurance-payouts-rise-sharply-climate-change-worsens-droughts-floods-2022-01-27/.

During 2022, the total crop insurance premiums for agriculture producers amounted to $84.4M on $311M in total liabilities.[95] While insurance premiums will also rise, the interplay between such factors as yield decreases and price increases makes estimating the premium increase extremely difficult. However, insurance premiums are expected to rise between 3.5% and 22%, or an increase in premiums of between $2.96M and $18.6M for Nevada producers.[96]

Table 3-17. Estimated Agricultural Loss Increase Due to Climate Change

County	2022 Loss	2047 Estimated Loss - Low (50% Increase)	2047 Estimated Loss - High (400% Increase)	2047 Loss Due to Climate Change - Low (50% Increase)	2047 Loss Due to Climate Change - High (400% Increase)
Churchill	$10,052,934	$15,079,401	$40,211,736	$2,865,086	$7,640,230
Clark	$322,801	$484,202	$1,291,204	$91,998	$245,329
Douglas	$623,000	$934,500	$2,492,000	$177,555	$473,480
Elko	$39,047,062	$58,570,593	$156,188,248	$11,128,413	$29,675,767
Esmeralda	$7,062,480	$10,593,720	$28,249,920	$2,012,807	$5,367,485
Eureka	$10,170,867	$15,256,301	$40,683,468	$2,898,697	$7,729,859
Humboldt	$7,711,237	$11,566,856	$30,844,948	$ 2,197,703	$5,860,540
Lander	$28,698,121	$43,047,182	$114,792,484	$8,178,964	$21,810,572
Lincoln	$13,955,762	$20,933,643	$55,823,048	$3,977,392	$10,606,379
Lyon	$7,163,988	$10,745,982	$28,655,952	$2,041,737	$5,444,631
Mineral	$3,745,111	$5,617,667	$14,980,444	$1,067,357	$2,846,284
Nye	$19,976,959	$29,965,439	$79,907,836	$5,693,433	$15,182,489
Pershing	$25,926,216	$38,889,324	$103,704,864	$7,388,972	$19,703,924
Washoe	$10,275,703	$15,413,555	$41,102,812	$2,928,575	$7,809,534
White Pine	$25,416,301	$38,124,452	$101,665,204	$7,243,646	$19,316,389
All Other Counties	$160,358	$240,537	$641,432	$45,702	$121,872
Total	$210,308,900	$315,463,350	$841,235,600	$59,938,037	$159,834,764

According to a 2022 white paper by the Office of Management and Budget (OMB), crop yields will generally decrease under warming scenarios.[97] Since many of the crops grown are for feed, the decreased yields will have a ripple effect through ranching.

[95] U.S. Department of Agriculture, Cause of Loss Historical Data Files, March 10, 2023, https://www.rma.usda.gov/SummaryOfBusiness/CauseOfLoss.

[96] Leah Douglas, Rueters, "U.S. crop insurance payouts rise sharply as climate change worsens droughts, floods," January 27, 2022, accessed March 10, 2023, https://www.reuters.com/markets/commodities/us-crop-insurance-payouts-rise-sharply-climate-change-worsens-droughts-floods-2022-01-27/.

[97] Office of Management and Budget, "Climate Risk Exposure: An Assessment of the Federal Government's Financial Risks to Climate Change," March 10, 2023, https://www.whitehouse.gov/wp-content/uploads/2022/04/OMB_Climate_Risk_Exposure_2022.pdf.

In summary, Nevada could see an economic impact of drought due to climate change could be more than $700M by mid-century. Increased temperatures and extreme heat events are major factors in drought.

3.3.5.5 Vulnerability of State Assets

The vulnerability of state critical buildings is provided in Appendix T.

3.3.5.6 Mitigation

Strategies for responding to extreme heat typically involve mitigation or management, where mitigation refers to moderating temperatures and management refers to reducing the negative impacts of heat.

Numerous strategies have been suggested for reducing the warming associated with urban development. These include:

- Expanding the urban tree canopy and the amount of urban green space
- Using green, cool and/or reflective building and paving materials
- Reducing waste heat – for example with community design that reduces reliance on cars

These kinds of strategies can be effective, but they may also have costs or unexpected consequences. For example, in desert cities like Las Vegas and Reno, it would be important to evaluate the costs and benefits of using water to maintain outdoor vegetation.

When and where reducing ambient temperatures is not possible or sufficient, approaches to reducing exposure or offsetting impacts can be used. These include:

- Shifting outdoor work and recreation to cooler times of day
- Ensuring access to shade and drinking water for those who have to be outdoors (i.e., people who work outdoors, people who use public transportation, bike, walk, etc.)
- Cooling centers for people who do not have shelter or whose homes lack adequate cooling
- Ensuring adequate cooling on public transportation and in public buildings, such as schools
- Providing subsidies or other programs to help people offset the costs of home cooling and/or weatherization
- Ensuring grid reliability to avoid power outages during extreme heat

Some of these strategies (cooling centers, cooling on public transit) may be more appropriate for cities than for small towns or rural areas. Agricultural areas may also need to consider heat mitigation for livestock. These include many of the same strategies used for people: shade, fans, sprinkler systems, and avoiding activities that are taxing or stressful for the animals when temperatures are high.

Better education and messaging around heat and its impacts has also been used. This approach includes:

- Educating the public or parts of the public about the health impacts of heat, warning signs of heat-related illness, and what to do in the event of heat-related illness
- Providing information about low-cost home and vehicle cooling techniques as well as community resources
- Heat forecasts that include information about what to do to prepare
- Encouraging people to check on high-risk neighbors

The state has numerous mitigation actions listed in Section 4.

3.3.6 Fissures and Subsidence (Low Risk)

3.3.6.1 Nature

In the southwestern United States, agricultural and urban areas that depend on aquifer groundwater pumping are prone to land subsidence. Non-recoverable land subsidence occurs when declining water table levels lead to inelastic compaction of the solid particles in the aquifer (particularly clay minerals). A lesser amount of subsidence occurs with the recoverable compression of coarse-grained sand and gravel deposits. Earth fissures commonly accompany subsidence; these are vertical tension cracks in the sediment above the water table. Figure 3-82 shows the distribution of the aquifers in the state.

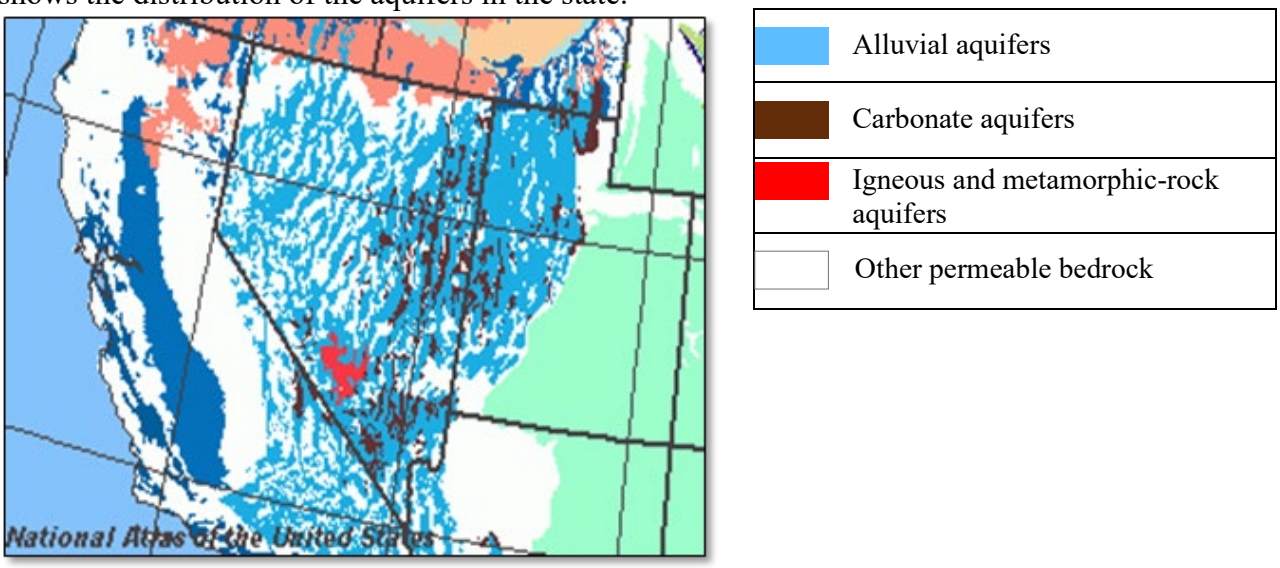


Figure 3-82. Nevada Aquifer Map from USGS and the National Atlas of the United States.

Aquifers in Nevada are composed primarily of three major hydrogeologic units. One is the alluvial aquifer, which is the material that makes up the valleys between mountain ranges. Alluvial aquifers mostly consist of gravels, sands, silts, and clays. Another aquifer in Nevada is a carbonate aquifer, which is mainly made up of limestone and dolomite. These rocks comprise many mountain ranges in eastern and southern Nevada and underlie the alluvial aquifer in places. The third major aquifer type in Nevada consists of volcanic rocks and makes up many mountain ridges and underlies the alluvial aquifer in much of western and northern Nevada.

Land subsidence and earth fissures have developed in Las Vegas Valley. The major aquifer under Las Vegas Valley is an alluvial aquifer. Below the alluvial aquifer, at least in the western side of the valley, is the carbonate aquifer. Over-pumping (taking more water out than is naturally recharged from snow melt and rainwater) of the alluvial aquifer has caused subsidence problems in Las Vegas and Pahrump Valleys. Many earth fissures have developed in response to this groundwater withdrawal. To help mitigate this hazard, the Clark County building department has, as part of its building code, a requirement to conduct special geotechnical investigations near any earth fissures and faults to avoid building directly over these features (earth fissures are found to be concentrated within the vicinity of faults within these valleys). Groundwater withdrawal and recharge has been stabilized in Las Vegas Valley, but some fissures continue to grow as dispersive soils along fissure walls are eroded away. Earth fissures continue to form occasionally in Las Vegas Valley, especially following heavy rainstorms. Since 2018, the Nevada Bureau of Mines and Geology has responded to two public inquiries regarding possible

fissures in the Las Vegas area. The most recent (July 6, 2021) was from a resident in the Wishing Well Estates area in the southeastern part of Las Vegas Valley who reported a possible fissure on their property.

Figure 3-83 contains a map of designated ground water basins of Nevada.

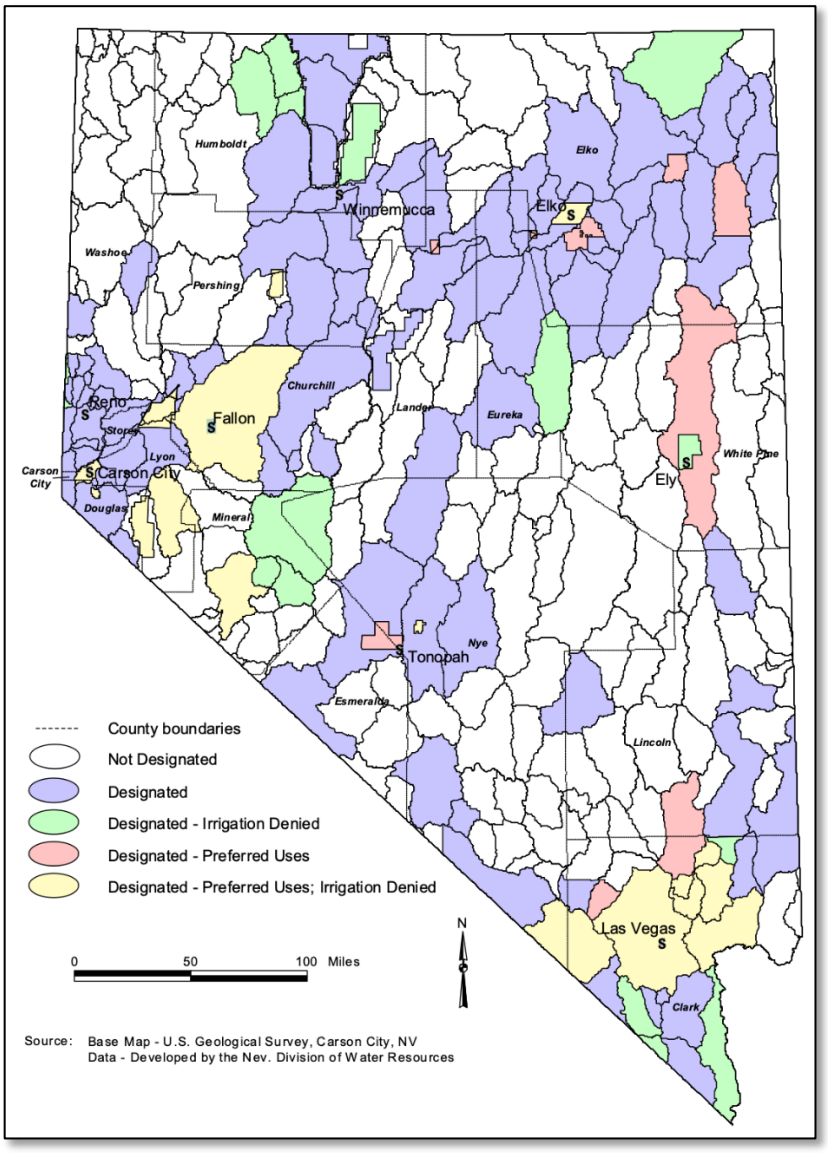


Figure 3-83. Designated Groundwater Basins of Nevada.[98]

3.3.6.2 History

Most subsidence problems in Nevada have developed in the Las Vegas Valley; however, this hazard is now recognized in other parts of Nevada. In a recent survey, Douglas, Nye, Storey, and Washoe Counties recognized that land subsidence is a risk. Evidence of groundwater-withdrawal-related land subsidence and local fissuring has been recognized near some of the large open-pit mining areas in Humboldt, Lander, Eureka, and Elko Counties. Sections of Interstate 80 west of Battle Mountain have been repaired because earth fissures developed in the freeway near one of the mines probably related to groundwater-withdrawal related issues.

[98] http://water.nv.gov/programs/planning/stateplan/documents/fig-s3-7.pdf

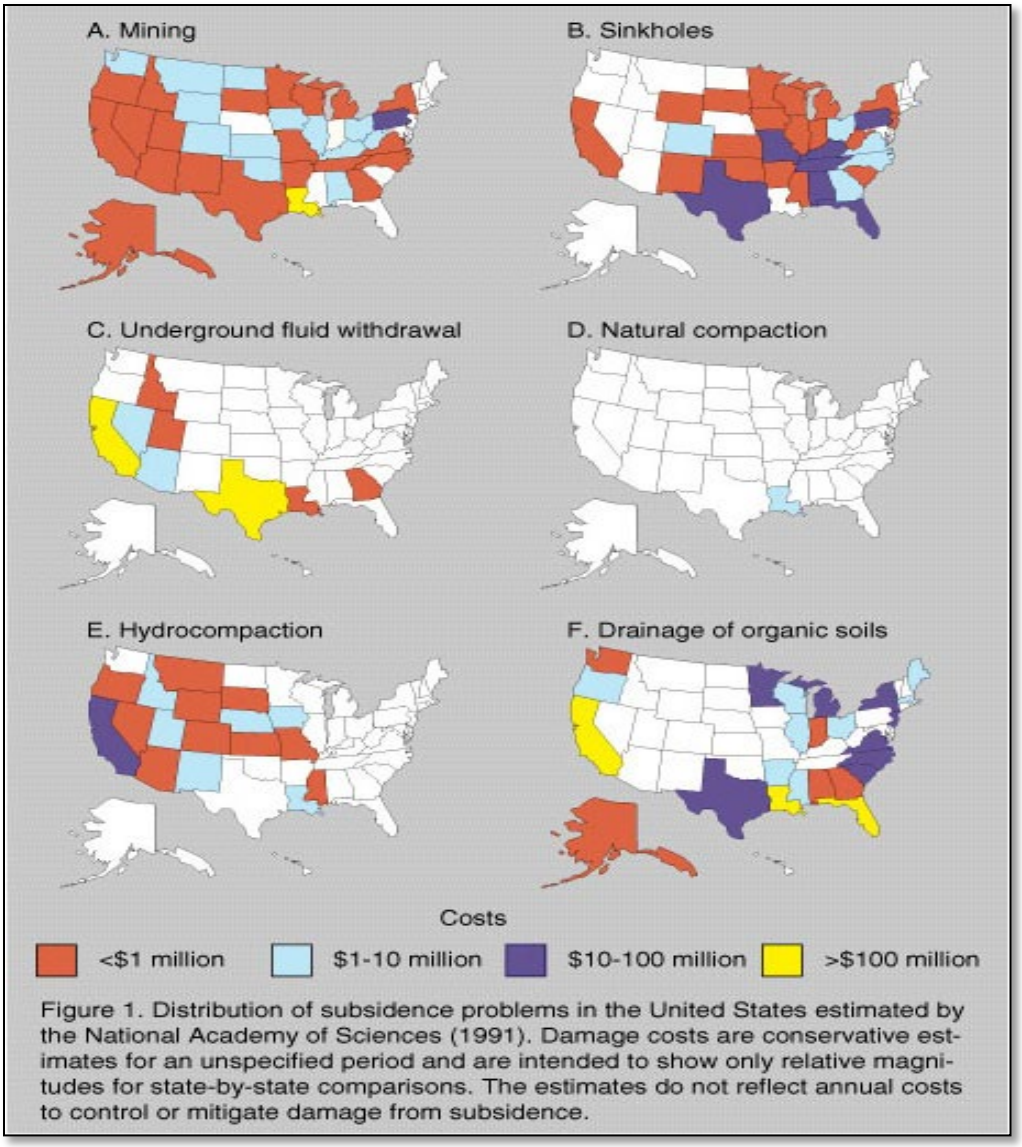


Figure 3-84. Distribution of Subsidence Problems in the U.S.

Figure 3-84 shows that land subsidence can be caused by actions other than overdrafting of water. Mining, hydrocompaction, and underground fluid withdrawal (water, oil, geothermal, or other fluid) can cause this hazard and result in land surface displacements and fissures. Hydrocompaction means that water absorbed on and within clay minerals is removed by withdrawal or drying, and the clays shrink. Shrinkage of clays results in less volume, so the surface will subside as the clays become more tightly compacted. The largest losses in Nevada due to land subsidence that are indicated in Figure 3-84 are from groundwater withdrawal, followed by mining and hydrocompaction.

The primary problem in Storey County is one of collapse into excavations related to old mines on the Comstock Lode in Virginia City. This phenomenon is unrelated to groundwater withdrawal and is a human-caused hazard similar to sinkholes that develop in areas with natural caverns near the surface. Officials in Storey County are well aware of the mine-collapse hazard and have records of collapses and repairs to roads that have occurred in recent years. At a meeting on 25 March 2010, Storey County officials discussed the problem with representatives

of the Nevada Division of Emergency Management, the UNR Seismological Lab, and the Nevada Bureau of Mines and Geology. Maps and models of old workings on the Comstock Lode and other mined areas can be used to locate areas of potential mine collapse. Seismometers that could be located in Virginia City may be able to detect small earthquakes related to pending collapse. More recently, sink holes have occurred in Tonopah in relation to old mining activity including a sink hole that opened underneath a vehicle parked in the parking lot of the Tonopah Historic Mining Park. The town has also expressed concerns about new sink holes developing following the M6.5 Monte Cristo Range earthquake that occurred on May 15, 2020. Some options for mitigation of these hazards include acquiring historic mine maps to determine the extent of underground workings and utilizing different survey methods to identify subsurface cavities and other unstable areas.

3.3.6.3 Location, Severity, and Probability of Future Events

As mentioned in the history section, Clark, Douglas, Nye, Storey, and Washoe Counties have problems with this hazard.

Las Vegas Valley in Clark County has more dramatic problems which include vertical aquifer-system deformation, land subsidence, and earth fissuring that have caused millions of dollars of damage and might have altered boundaries of flood-prone areas. Some areas with earth fissures have lower-rent housing because the land is less valuable, and these are commonly occupied or owned by vulnerable populations, putting them at risk of loss from this hazard (living displacement and/or property value loss).

Land subsidence is considered by Nevada to be a "Low Risk" hazard. Unlike the rapid occurrences of fires, earthquakes, and floods, land subsidence generally occurs slowly, developing over periods of weeks, months, and years and affects localized areas. It can be detected and potentially ameliorated before significant damage in some cases.

Mine-collapse in Storey County is also considered to be "Low Risk" from the State's perspective, because it will likely only affect localized areas and because recent mining in the area has indicated that most of the stopes (large openings) along the Comstock Lode have been filled by clay and weak rock, characteristic of the wall rock of the Comstock Lode, over the years since mining ceased. Nonetheless, the mine-collapse hazard is a serious consideration for officials, businesses, and residents in Virginia City.

Due to Nevada's history of new development, and pressures on water systems related to climate change, the state will most likely see more subsidence problems. However, mitigation may be achievable through education programs; revision of building codes; artificial recharging of groundwater and geotechnical investigation of the land prior to building.

3.3.6.4 Climate Change

Impacts on land subsidence from climate change are poorly understood at this point. It is possible with increased periods of drought that there will be more aquifer draw-down with little to no recharge. This could contribute to more sink holes and fissures in areas where these are a result of water being extracted from the area. Earth fissures have an erosional component to their formation (a tiny tension crack in the ground can be widened into a large fissure from water erosion where there are dispersive soils). Thus, an increase in torrential rains potentially caused by climate change can widen and lengthen earth fissures and increase their hazard.

3.3.6.5 Vulnerability of State Assets

Due to insufficient data, it is not possible to accurately estimate the vulnerability of state assets due to this hazard.

3.3.6.6 Mitigation

Subsidence due to groundwater withdrawal can be detected, measured, and mitigated through managing the subject aquifer by reducing the pumping amounts and/or recharging the aquifer through recharge basins or reinjecting water back into it. Industries or facilities that are particularly sensitive to tilting, leveling, or settlement should avoid or relocated out of areas with significant subsidence (or hydrocompaction potential).

Mine cavities can be detected using mining maps and geophysical techniques, such as ground-penetrating radar, and building over these areas can be avoided. If development has already occurred or an area of potential collapse cannot be avoided, monitoring, such as seismic monitoring, might be used to identify when a collapse hazard might be likely and actions, such as evacuation, might be taken.

Earth fissures can be built over if actions are taken that would counter damage caused by earth fissures, such as over-excavation and the placement of geofabrics that could inhibit a fissure from propagating upwards into a property.

Land subsidence can be detected by techniques such as using such techniques as detecting changes in benchmarks or periodic imaging of regions via radar. Figure 3-85 is an image that shows the subsidence and uplift of the Las Vegas Valley between April 1992 and December 1997 using imagery from a satellite-based interferometric synthetic aperture radar (InSAR) (Calloway and others, 2000). Mitigation measures may then be taken for areas of concern.

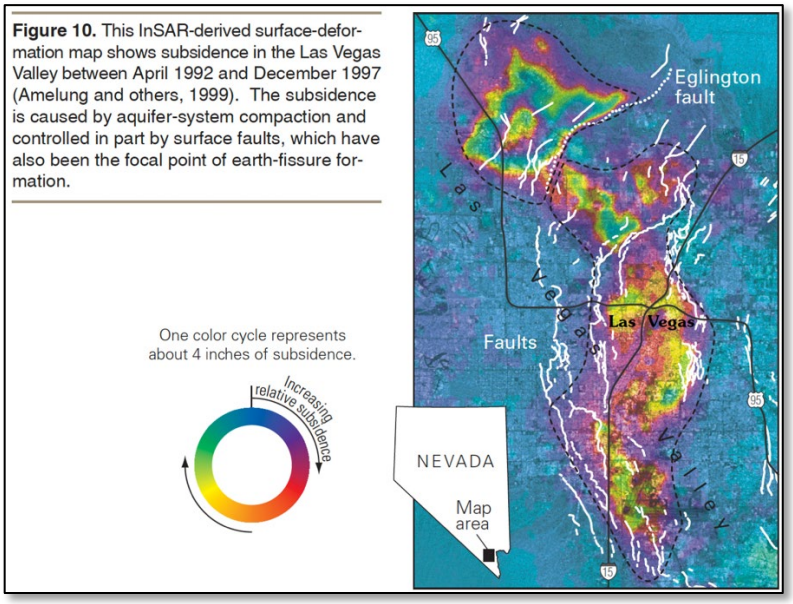


Figure 3-85. InSAR Imagery of Subsidence and Uplifting in the Las Vegas Valley between April 1992-December 1997.[99]

Subject matter experts have assessed that there is no appreciable vulnerability of state assets due to this hazard. Therefore, the hazard profile is for information purposes only and mitigation projects will not be pursued for this hazard in 2023-2028.

[99] Amelung, F., Galloway, D.L., Bell, J.W., Zebker, H.A., and Laczniak, R.J., 1999, Sensing the ups and downs of Las Vegas—InSAR reveals structural control of land subsidence and aquifer-system deformation: Geology, v. 27, p. 483–486.

3.3.7 **Floods** (High Risk)

3.3.7.1 Nature

Flooding is the accumulation of water where there usually is none, or the overflow of excess water from a stream, river, lake, canal, reservoir, or coastal body of water onto adjacent floodplains. Floodplains are lowlands adjacent to water bodies that are subject to recurring floods. Flooding may occur slowly over several days as a result of rainfall or snowmelt, or rapidly due to an event such as an earthquake or dam failure. Flooding due to dam failure is a special case addressed in a separate subsection at the end of the Floods section.

Floods also occur along streams and arroyos (stream channels that are normally dry) that do not have classic floodplains. These include flash floods in mountains (sometimes with rapidly rising water several tens of feet deep) and on alluvial fans, which are typically fan-shaped, gently sloping areas between the steep parts of mountain ranges and the nearly flat valley floors. Because much of Nevada is part of the Great Basin (an area of internal drainage, in which streams are not connected to rivers that flow to the oceans), flood waters commonly drain into interior lakes (e.g. Walker Lake at the terminus of the Walker River, Pyramid Lake at the terminus of the Truckee River), wetland areas (e.g. Carson Sink at the terminus of both the Carson and Humboldt Rivers), or playas (normally dry lake beds, such as Roach Lake, south of Las Vegas, where a new airport is planned).

Floods are described in terms of their extent (including both the horizontal surface area affected and the vertical depth of floodwaters) and the related probability of occurrence.

Factors contributing to the frequency and severity of flooding include the following:

- Time of year and temperature
- Rainfall intensity and duration
- Antecedent moisture conditions
- Watershed conditions, including steepness of terrain, soil types, amount and type of vegetation, and density of development
- Changes in landscape resulting from wildfires (loss of moisture-trapping vegetation and increased sediment available for runoff)
- Climate Change
- The existence of attenuating features in the watershed, including natural features such as swamps and lakes, and human-built features such as dams, irrigation ditches, canals, and roadways
- The existence of flood control features, such as levees, flood control channels, and detention basins
- Velocity of flow
- Availability of sediment for transport, and the susceptibility of the bed and banks of the watercourse to erosion

Floods from snowmelt caused by heavy, long-duration rainfall can occur anytime between October and March. Flooding is more severe when antecedent rainfall has resulted in saturated ground conditions, when the ground is frozen and infiltration is minimal, or when warm rain on the snow in higher elevations of the tributary areas adds snow melts to rain flood run-off. These storms are also known as wet-mantle storms.

Severe but localized flooding may also result from cloudburst storms centered over tributary basins. These storms may occur from late spring to early fall, but generally occur in June, July, and August. Runoff from cloud bursts is characterized by high peak flows with a short

duration. These storms are also known as dry-mantle storms, causing flash floods or debris flows.

Floods are natural events that are considered hazards only when people and property are affected. Nationwide, on an annual basis, floods have resulted in more property damage than any other natural hazard. Physical damage from floods includes the following:

- Injury or loss of life
- 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 rendering them unstable or useless
- 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.
- Inundation of cars, trucks, and other types of vehicles
- 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 severed

Floods also cause economic losses through closure of businesses and government facilities; disrupt communication; disrupt utilities such as water and sewer service; result in excessive expenditures for emergency response; and generally disrupt the normal function of a community. Figures 3-86 and 3-87 depict the National Risk Index Score for Riverine Flooding statewide and in more heavily populated areas respectively.

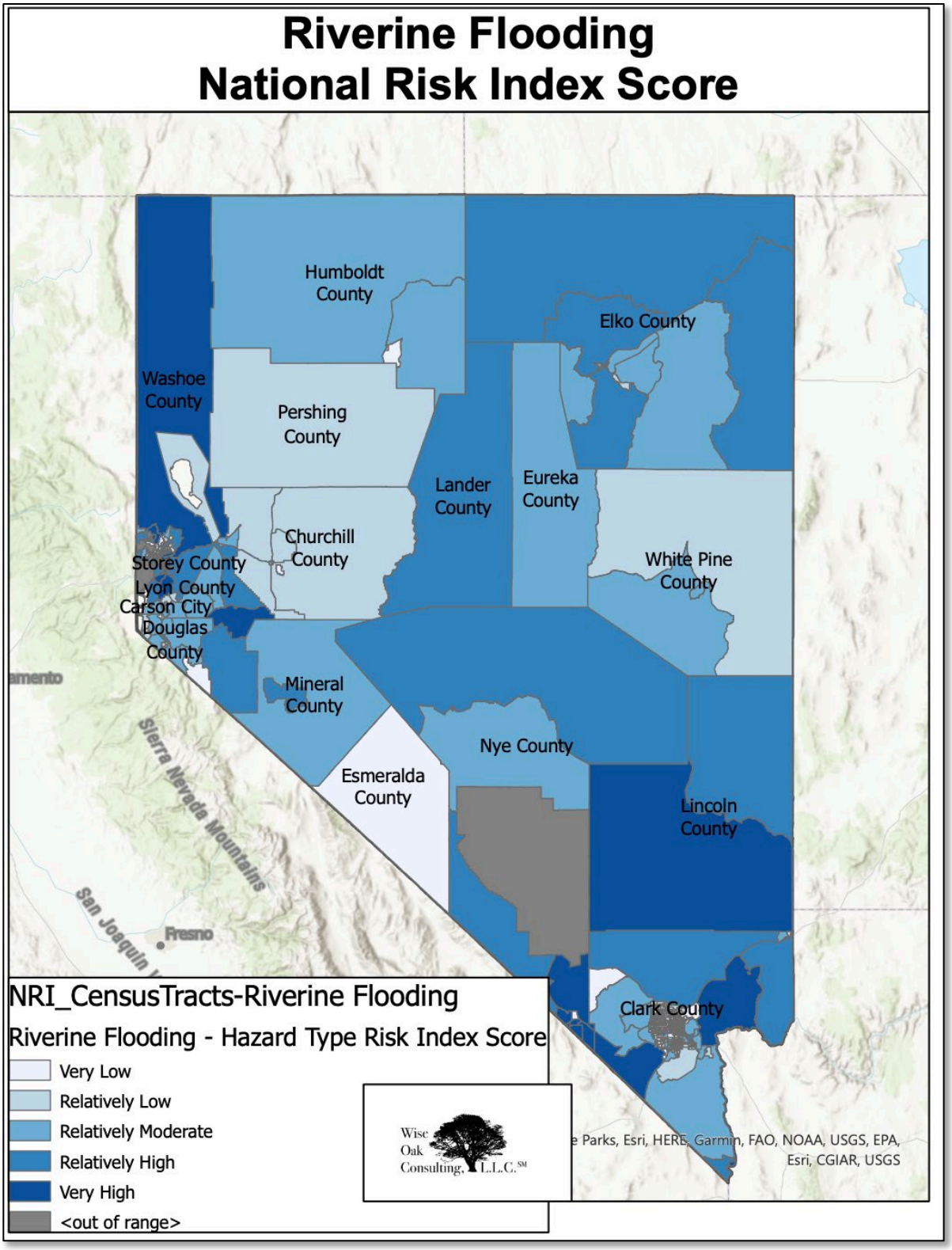


Figure 3-86. Riverine Flooding National Risk Index Score – Statewide.

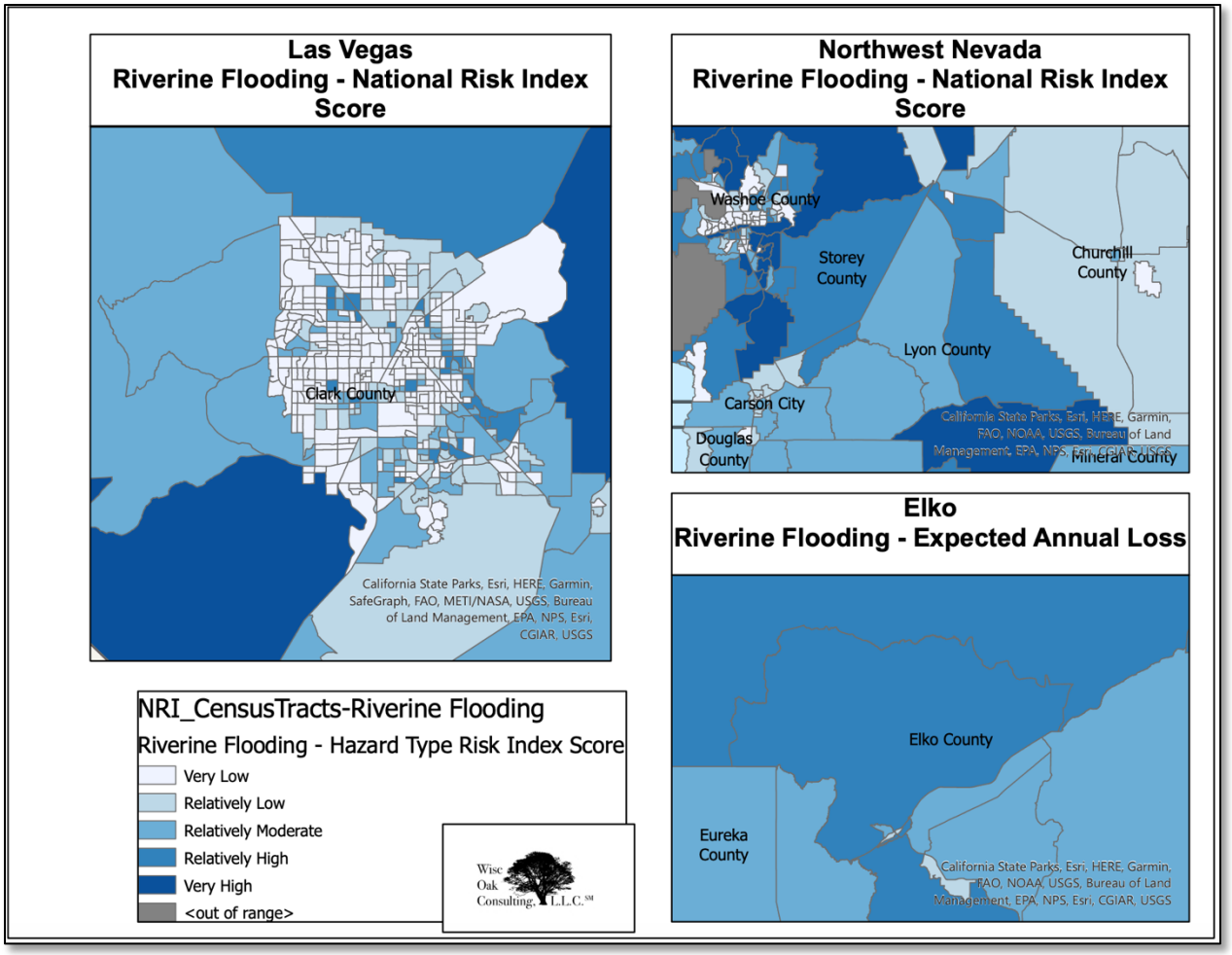


Figure 3-87. Riverine Flooding National Risk Index Score – More Heavily Populated Areas.

Figures 3-88 and 3-89 depict the National Risk Index Exposure dollar values for Riverine Flooding Statewide and in more heavily populated areas respectively.

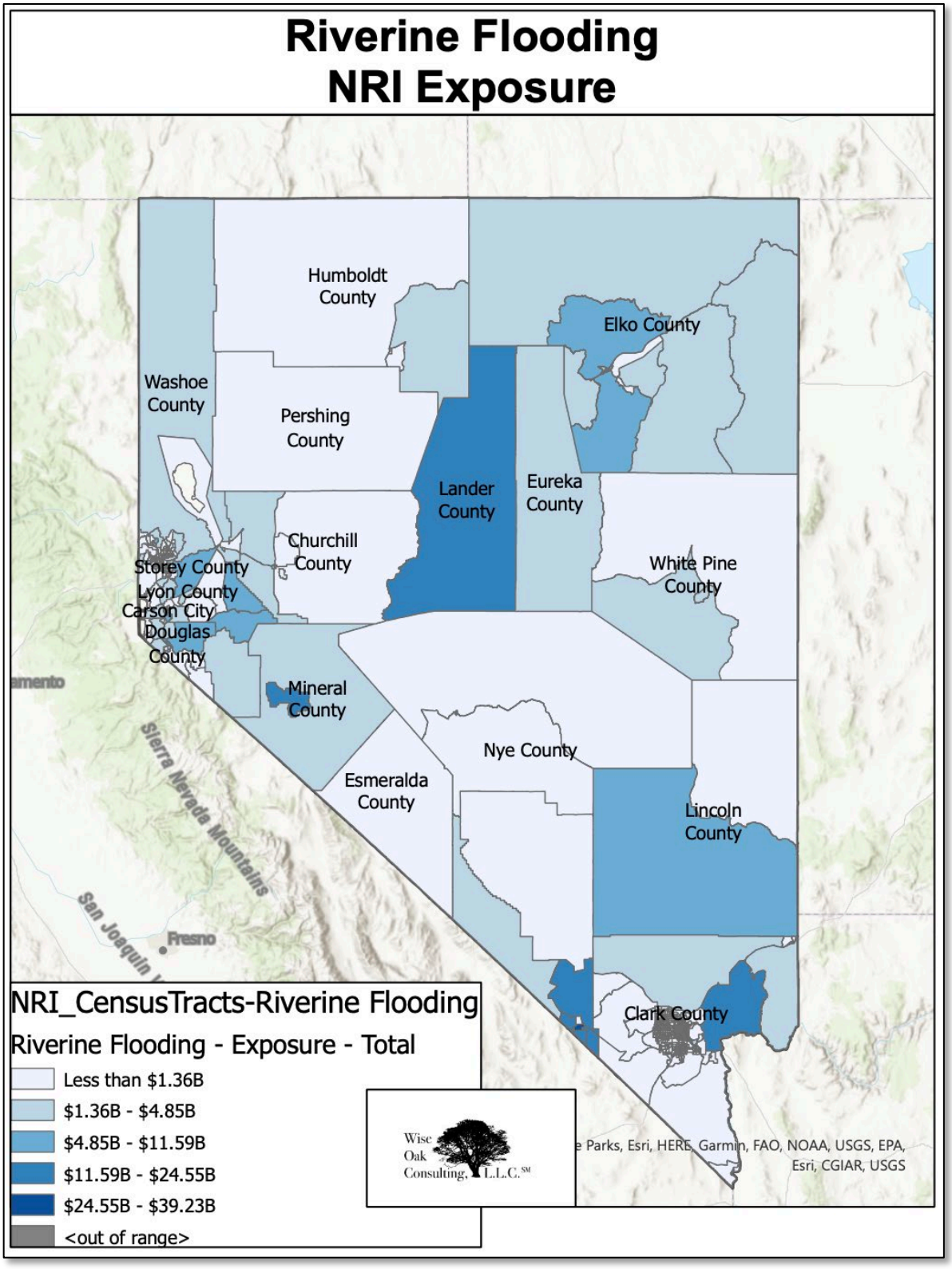


Figure 3-88. Riverine Flooding Exposure – Statewide.

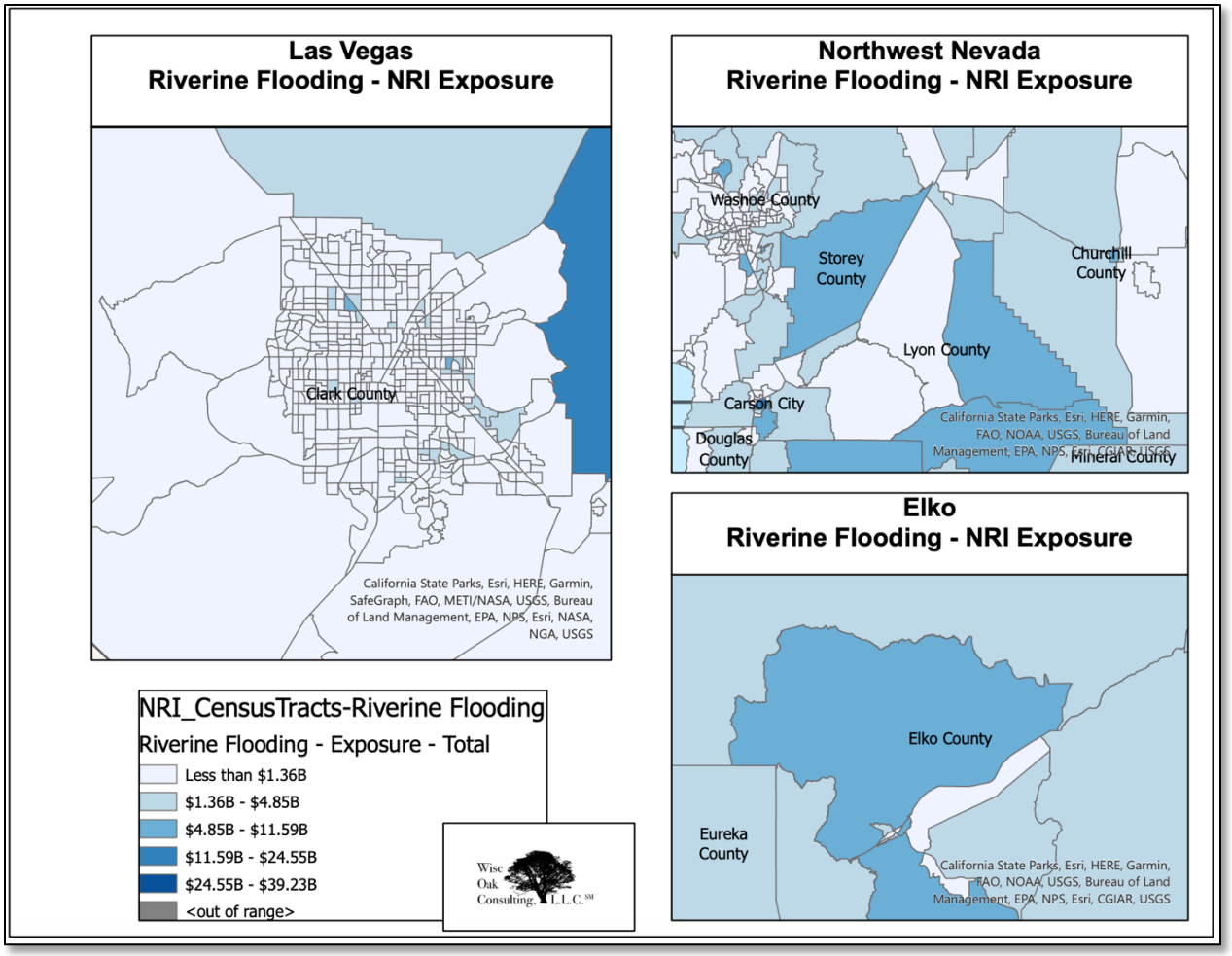


Figure 3-89. Riverine Flooding Exposure – More Heavily Populated Areas.

3.3.7.2 History

The history of flooding on Nevada provides the factual basis for establishing the location, severity, and probability of future flooding in Nevada. Figures 3-90 and 3-91 depict the National Risk Index Historic Loss Ratio for statewide and for more heavily populated areas respectively.

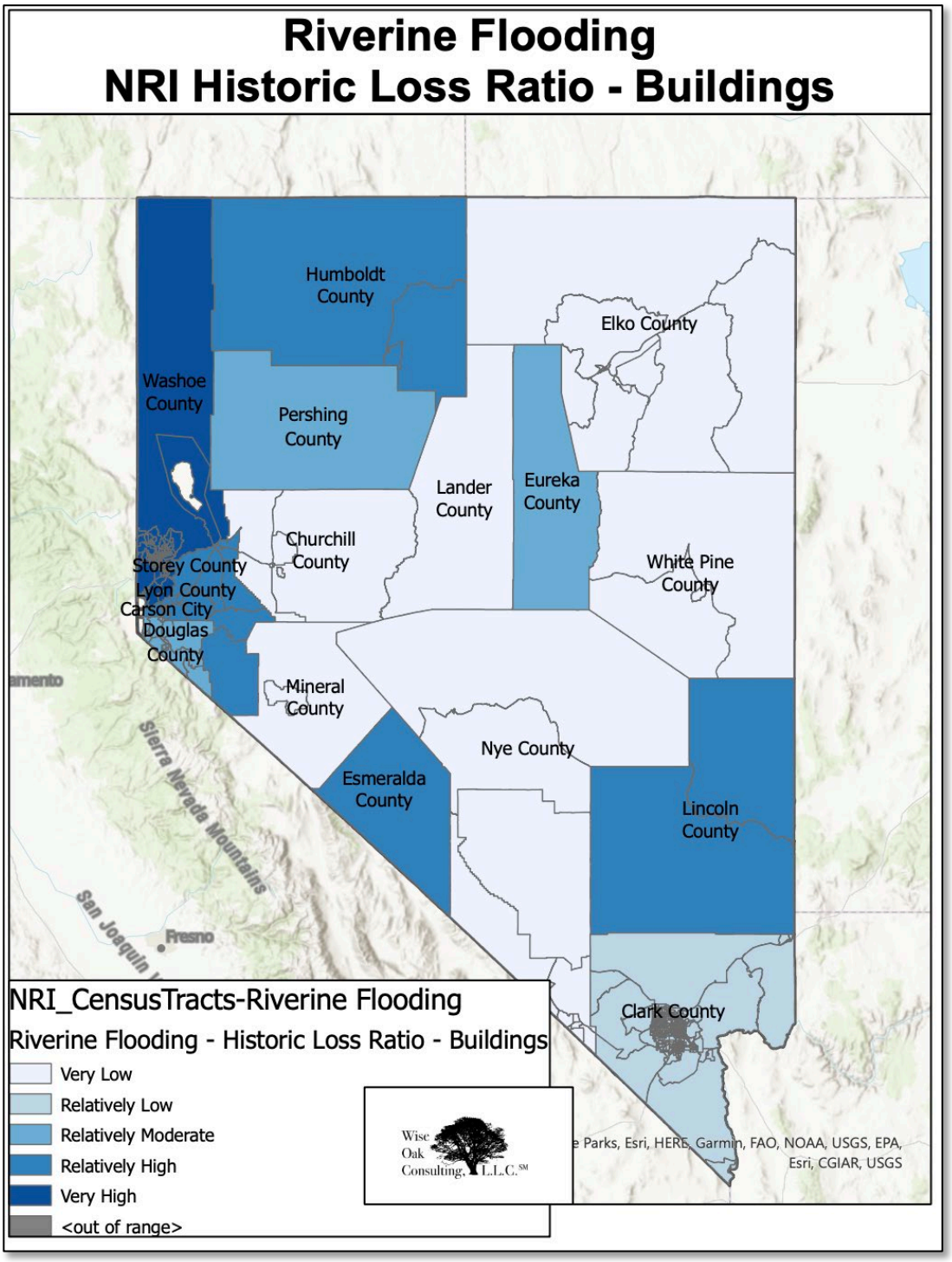


Figure 3-90. Riverine Flooding Historic Loss Ratio – Statewide.

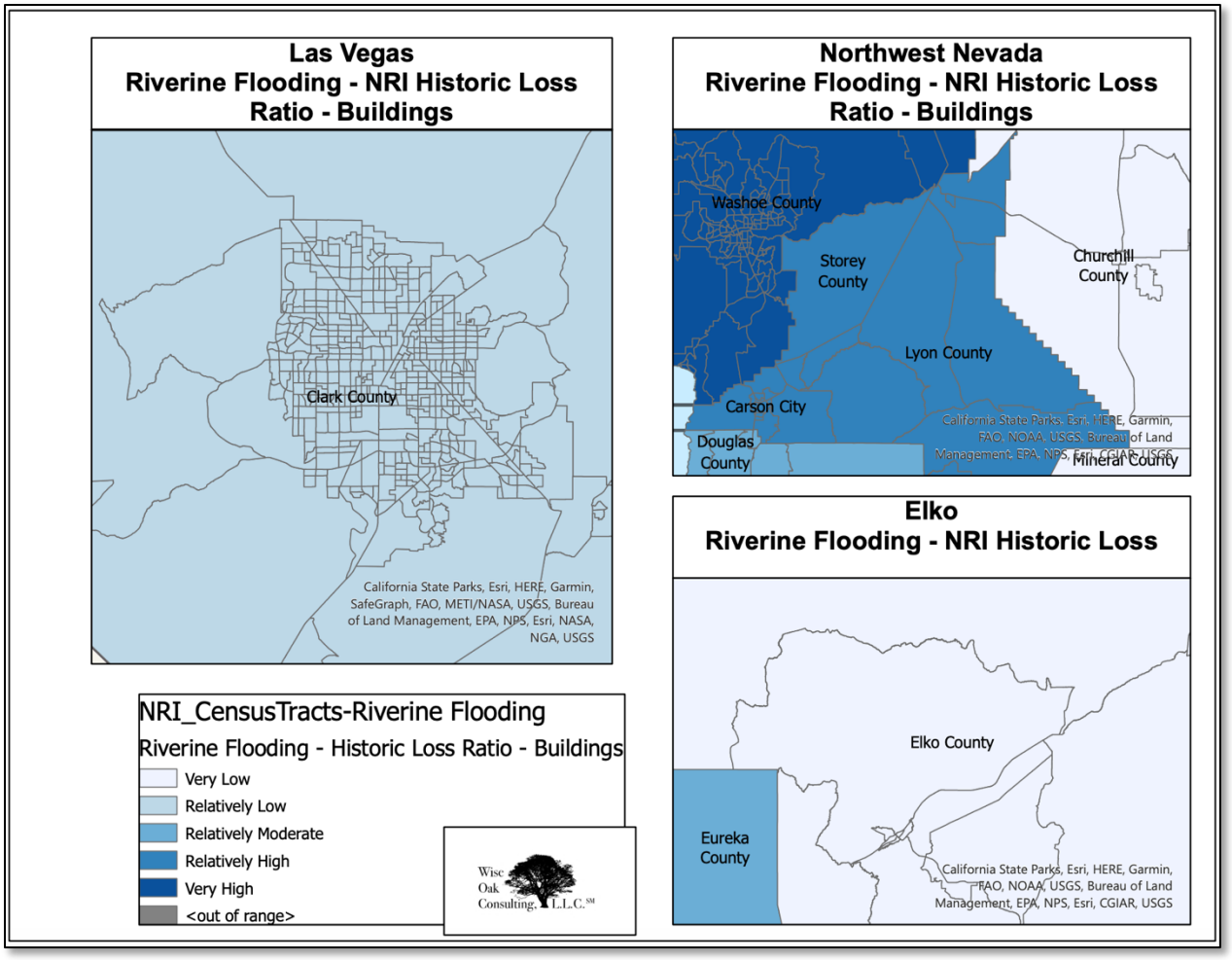


Figure 3-91. Riverine Flooding Historic Loss Ratio – More Heavily Populated Areas.

A chronology of major flooding information is presented in two tables, Table 3-18 for northern Nevada (includes the Truckee, Carson, Walker, and Humboldt watersheds) and Table 3-19 for southern Nevada (includes the Las Vegas area, the lower Colorado River watersheds, and Lincoln County). In addition to major flooding along Nevada's rivers, localized flooding has occurred as a result of dam failure, flash floods, debris flows, and mudslides, and failure of canal walls and other irrigation structures, some of which have caused declarations of disaster in parts of Nevada. Major flooding events of this type are also included in the tabulated flood chronologies. Flood studies often use historical records, such as stream flow gauges, to determine the probability of occurrence for floods of different magnitudes. The probability of occurrence is expressed as a percentage for the chance of a flood of a specific extent occurring in any given year.

Table 3-18. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
December 1852	Carson Valley	Two days of heavy snowfall followed by four days of warm rain caused flooding reported in the Carson Valley and likely along other western Nevada rivers as well.	**Little damage occurred because most settlements were located away from the low areas. No figures available.**
December 1861 - January 1862	Carson and Truckee River Basins	Warm rain following heavy snow in December 1861 caused widespread flooding that caused Carson Valley to become a lake.	**Little reported damage because most settlements were located along the eastern slope of the Sierra Nevada away from the low areas. No figures available.**
1862	Humboldt River Basin	Earliest year in which widespread flooding was recorded throughout the Humboldt River and its sub-basins.	**Due to limited human inhabitation, little is known of the damage or effects of the flood. No figures available.**
December 1867 - January 1868	Carson and Truckee River Basins	Unseasonably warm rain from late December through early January melted heavy snowpack in the Sierra Nevada. Carson Valley became a lake and flooding exceeded the 1861 flood crest. All bridges in the Carson Valley were swept away.	**No figures available.**
December 1867 - January 1868	Humboldt River Basin	Wet-mantle flooding in the South Fork of the Humboldt River and its tributaries caused localized flooding.	**Few records of damage are available.**
January - June 1870	Humboldt River Basin	Wet-mantle flooding in the South Fork of the Humboldt River and its tributaries caused localized flooding.	**Few records of damage are available.**
April 25, 1876	Humboldt River Basin	Failure of an irrigation dam across the Humboldt River at Shoshone Canyon, about 22 miles east of Battle Mountain near present-day Dunphy resulted in a huge volume of water rushing through the canyon and flooding several ranches in the river bottom below.	**No figures available.**
July 23, 1876	Humboldt River Basin	A series of heavy thunderstorms in the headwaters of Maysville, Crum, Dean and Lewis canyons draining Mount Lewis, southeast of Battle Mountain caused severe localized dry-mantle floods downstream. The most severe was the Lewis Canyon flood that	**No figures available.**

Table 3-18. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		destroyed nearly every building in the mining town of Lewis. Heavy rain. Along the stream bottoms, 50-foot-high cottonwoods and willow thickets were uprooted and mixed together with bottom soil and huge boulders into debris flows that traveled up to 10-12 miles downstream.	
August 15, 1878	Humboldt River Basin	Thunderstorm-induced dry-mantle flooding caused a wall of water, mud and rocks up to ten feet high to flow down Pony Canyon and along Main Street in Austin. The flood destroyed both residential and commercial buildings and left a three-foot layer of mud and debris in Austin's streets. It took three months of intense efforts to fully repair the damage.	**No figures available.**
January - May 1881	Little Humboldt River Basin	Sustained rains on heavy winter snowpack caused extensive localized flooding. All reservoir dams along Kelly Creek and in Squaw Valley were completely destroyed and were never rebuilt. Mines were flooded, mill dams and roads were washed out, bridges were damaged and livestock drowned.	**No figures available.**
June 27, 1883	Humboldt River Basin	The last remaining dam on the Humboldt River at Lovelock broke leaving a number of the largest ranchers without irrigation water.	**No figures available.**
May - June 1884	Humboldt River Basin	Rapid snow melt and heavy spring rains caused an extensive period of wet-mantle flooding in the Humboldt River Basin and its tributaries. In Austin, flooding damaged the Manhattan Mill and the sawmill. Reese River washed out the Nevada Central Railroad line 40 miles south of Battle Mountain. Flooding along the lower Humboldt formed a vast lake extending over thirty miles from Beowawe to Battle Mountain, covering the railroad track and damaging the road bridge across the Humboldt River in Battle Mountain. Later in June, the dam at the Humboldt dike outflow of the Humboldt River and Toulon Lakes, was blown up by local ranchers after which it was never rebuilt.	**Few records of damage are available.**
January - February 1886	Reese River sub-basin of the Humboldt River Basin	Heavy rain on snowpack caused flooding along the entire Reese River drainage system and Humboldt from Austin to Battle Mountain causing extensive erosion and	**No figures available.**

Table 3-18. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		sedimentation damage.	
March-June 1890	Humboldt River Basin	Spring melting of the huge snowpack from the 1889-1890 "Winter of White Death" caused flooding that destroyed bridges on the only two main N-S roads between Elko and the White Pine mines, closing those roads. Maggie and Susie Creeks flooded low-lying areas of Carlin. Flooding caused heavy livestock losses along the Reese River drainage, near Battle Mountain, and in Paradise Valley that eventually drove the large cattle companies into liquidation. Two of Lovelock Valley's five irrigation dams along the Humboldt River were completely washed away.	**No figures available.**
May 1906	Humboldt River Basin	Heavy rainfall caused the failure of a reservoir dam with six deaths resulting. Various structures were damaged and horses and mules died. Southern Pacific railroad tracks were undermined.	**Six lives were lost. No figures available on other losses.**
March 1907	Walker, Carson and Truckee River Basins	Snow and later rain from March 16 through March 20 flooded the Truckee, Carson, and Walker Rivers. The Truckee River severely damaged the Electric Light Bridge. In Carson Valley, all bridges on the East and West Forks and the main stem of the Carson River as well as Carson River were destroyed or seriously damaged.	**No figures available.**
February - April 1907	Humboldt River Basin	Heavy rains melted deep winter snowpack in the lower Humboldt River Basin below Battle Mountain caused flooding along the entire lengths of both the Little Humboldt River and the main Humboldt River, and their tributaries. Flooding drowned one person and some livestock.	**No figures available.**
February - April 1910	Humboldt River Basin including Mary's River	Warm rain on snowpack caused the worst flooding in history with a greater than 100-year recurrence interval. Carlin, Elko, Battle Mountain, Winnemucca, and Lovelock areas were all severely flooded. Flooding severely damaged mining camps and all railroad bridges and tracks in the region. All major irrigation dams and canals were washed out throughout the region.	**No figures available.**
July 1913	Little Humboldt River Sub-	Dry mantle flooding from severe thunder and rainstorms. Widespread damage to hay fields in Paradise Valley, Humboldt County. A stranded	**No figures available.**

Table 3-18. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
	basin	automobile was covered with 25 to 30 feet of debris.	
January - April 1914	South fork Humboldt River	Rain on melting snow caused wet mantle flooding that damaged multiple bridges, roads, trestles, reservoirs, diversion channels, and farms.	**No figures available.**
February - March 1917	Humboldt River Basin	Wet-mantle flooding along the lower reaches of the Humboldt River Basin caused considerable road and bridge damage below Lamoille Creek. High water in the South Fork drainages washed out roads and bridges between Jiggs and Elko and lowlands around Ryndon were inundated. Pine Creek flooding damaged or destroyed the railroad grade and bridges disrupting railroad traffic for two weeks.	**No figures available.**
June 22, 1918	Humboldt River Basin	Heavy rains in the Santa Rosa Mountains caused dry-mantle flooding in the Paradise Valley area of the Little Humboldt River sub-basin. There was localized flooding along drainages west and northwest of Paradise Valley.	**No figures available.**
January 1921	Truckee Canal, part of the TCID irrigation system	The Truckee Canal was breached at approximately Station 1100+00. (later identified by the Regional Engineer in field review following 2008 breach).	**No figures available.**
February - March 1921	Humboldt River Basin	Wet mantle flooding caused moderate damage to railroad track and bridges and extensive damage to meadow lands in the basin.	**No figures available.**
April–June 1922	Humboldt River Basin	Wet mantle flood event locally within the Maggie Creek and Little Humboldt River sub-basins. (Maggie Creek experienced its highest flow on record, which stood until 1962).	**No figures available.**
July 1927	Browns Creek, SW of Reno, Washoe County	More than two inches of rainfall per hour caused the Grass Lake irrigation reservoir to fail flooding land below.	**No figures available.**
March 1928	Walker, Carson and Truckee River Basins	Snow and rain from March 23 through March 26 caused flooding in the Carson Valley, where both forks of the Carson River and the main-stem Carson River overflowed their banks, but little damage was caused.	**No figures available.**
March – June 1932	Humboldt River Basin	Rapid heavy snowmelt caused flooding in the Humboldt River Basin, especially in Lovelock Valley. The Big Five Diversion	**No figures available.**

Table 3-18. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		was washed out (damaged earlier in 1910 and 1914)	
December 1937	Carson and Truckee River Basins	Heavy rain on snowpack from December 9 through December 13 caused flooding. On the East Fork Carson River, the Douglas Power (Ruhenstroth) Dam was severely damaged. In the south end of Carson Valley near Gardnerville, the flood on the East Fork Carson River crested at 10,300 cfs late in the afternoon of December 11.	**No figures available.**
December 1937 - May 1938	Humboldt River Basin	Heavy snows and rain caused extensive flooding in the Little Humboldt River sub-basin and bridge damage in Paradise Valley.	**No figures available.**
April - May 1942	Humboldt River Basin	Severe wet mantle event caused extensive flooding in Elko with water several feet deep in the streets, as well as Battle Mountain. Extensive damage to bridges, roads, irrigation structures, dams, canals, ranch buildings and erosion damage to cropland range areas.	**No figures available.**
January 1943	Upper Humboldt River Basin	Severe wet mantle flooding washed out Hot Creek reservoir and levees in Elko County. Flooding closed highways and caused severe damage to railroads, roads, bridges, and structures throughout the basin.	**No figures available.**
November - December 1950	Walker, Carson and Truckee River Basins.	From November 13 to December 8, continued rain and high temperatures melted early snowpack in the Sierra Nevada causing flooding along the Walker, Carson and Truckee Rivers. The greatest discharge was in the urban areas of Reno and Sparks, where water stood 4 feet deep in the main floor of the Riverside Hotel. Over 3,500 acres of agricultural land in the Truckee Meadows East of Reno was flooded.	**The estimate of damages in the three river basins was $4.4 million (USGS, 1954; $27.6 million in 1997 dollars); half in Reno. Two deaths were reported, and about 200 persons were evacuated from their homes.**
February - May 1952	Humboldt River Basin	Wet mantle flood due to rapid melting of the snowpack caused considerable damage throughout the basin to roads, bridges, railroad tracks, ranches. Much watershed erosion and extensive damage to dams and levees.	**No figures available.**
July 1952	Humboldt River	Reese River sub-basin. Violent summer thunderstorms caused extensive mud- and debris flows of water, mud, rocks, and logs on many of the Toiyabe Range drainages south of Austin. Extensive gullying, channel head-cutting and sheet erosion damaged crop irrigation systems.	**No figures available.**

Table 3-18. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
December 1955	Truckee, Carson and Walker River Basins	Intense late December storm dropped 10 to 13 inches of rain that melted snowpack in the Northern Sierra Nevada causing flooding along the Walker, Carson and Truckee Rivers. Downtown Reno area flooding was as extensive as in 1950 but damage to buildings was not as severe as that of the 1950 flood due in part to pumping and erection of sandbag dikes. The Reno airport was flooded to a depth of 4 feet. Derby Dam on the Truckee River east of Vista failed, and Hobart Dam, at the headwaters of Franktown Creek failed and released water that severely damaged U.S. 395.	**The estimate of damages in the three river basins was $3,992,000 ($43,592,491 in 2022 dollars). One life was lost.**
December 1955	Truckee, Carson, and Walker River basins	Flooding on tributary streams draining the area surrounding Reno and Sparks caused damage to property in areas away from the Truckee River.	**No figures available.**
August 6 - 28, 1961	Humboldt River Basin	Battle Mountain sub basin. A series of thunderstorms resulted in severe channel cutting, mud & rock flows and sedimentation in streams draining the western slopes of the Cortez Range in Crescent Valley.	**No figures available.**
February 1962	Humboldt River Basin	Wet mantle flooding caused extensive damage to Battle Mountain, where over 200 residents were evacuated due to water depth of up to 5 feet. Up to 1,500 head of cattle drowned. There was extensive railroad damage and damage to buildings, diversion structures, irrigation ditches, and cultivated fields throughout the basin.	**Estimated 1962 value of losses was approximately $1.5 million ($14,535,844 in 2022 dollars).**
January - February 1963	Truckee, Walker and Carson River Basins	After months of drought, an intense high-temperature storm lasted from January 28 through February 1, dropping up to 13 inches of precipitation. There was extensive flooding in Reno with about 20 square blocks in the downtown area inundated up to 4 feet deep. The airport was flooded as in 1955.	**Damage in the three river basins at the time was estimated at $3,248,000 ($31,062,511 in 2022 dollars).**
December 1964	Truckee and Carson River Basins	Torrential warm rains over December 21-23, melted part of the snowpack causing flooding similar to the December 1955 flood.	**The estimate of damages in these two river basins at the time was $2,236,000 ($21,108,921 in 2022 dollars).**
January 1969	Humboldt River Basin	Heavy rain on snow caused flooding on the Little Humboldt River and on Martin Creek which enters Paradise Valley. Peak outflows of the Little Humboldt were recorded at 2,380 cfs.	**No figures available**

Table 3-18. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
May 1983	Ophir Creek, Washoe Valley, Washoe County	A landslide off Slide Mountain hit Upper Price Lake and sent a 15- to 20-foot-high mudflow of water, mud, and boulders traveling 40 mph, down Ophir Creek into Washoe Valley killing one person and covering a 1,800-foot stretch of U.S. Highway 395 with mud and debris.	**One person was killed, several injured and multiple residences damaged; No figures on damages.**
April - June 1984	Humboldt River Basin	Extensive snow melt with a recurrence interval >100.	**No figures available.**
February 1986	Truckee and Carson River Basins	Unprecedented rains over a 10-day period in February 1986 caused severe flooding along the in the Truckee and Carson River Basins and to a lesser extent along the Walker River. 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 Truckee River in the Reno-Sparks area and in the Carson River at Carson City were the greatest since 1963. Downstream on the Carson River near Fort Churchill, the flow was the greatest since record-keeping began in 1911 in the Truckee Meadows. All but two bridges in Reno over the Truckee Rivers were closed. 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 ($33,911,665 in 2022 dollars).**
March 1995	Long Valley Creek, Truckee River Storey County	Flooding occurred in the Rainbow Bend subdivision at Lockwood where Long Valley Creek enters the Truckee River in Storey County	**Caused over $2.5 million in damage ($4,800,771 in 2022 dollars).**
December 1996	Truckee Canal – part of the Truckee-Carson Irrigation District (TCID) irrigation system	The Truckee Canal (part of the TCID irrigation system) was breached early on in the Truckee River flood event, flooding 60 homes in the Fernley area. Canal breach occurred at approximate Canal Station 800+00 on the north embankment. The breach site was identified by the Regional Engineer in field review following the 2008 canal breach.	**More than 60 homes were flooded.**
December 1996 - January 1997	Truckee, Carson, and Walker River Basins	Heavy snow and rain from December 1996 into January 1997 melted Sierra Nevada snowpack causing widespread flooding over approximately 63,800 acres. Floods inundated many residences and businesses in the Truckee Meadows, closed most bridges across the Truckee in Reno, closed the Reno/Tahoe International Airport, and flooded warehouses up to 6 feet deep in the industrial sections of Sparks and east Reno.	**Two lives were lost: one in Washoe County and one in Douglas County. Direct damages estimated between $167 million and $169 million ($304 million - $308 million in 2022 dollars). Additional hundreds of millions of**

Table 3-18. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
			dollars in lost business and travel.
January 1997	Carson, Douglas, Lyon, Storey and Washoe	Flooding, mudslides, and debris flows along smaller drainages in Carson, Douglas, Lyon, Storey, and Washoe counties were coincident with the flooding on the major rivers in northern Nevada.	**No figures available.**
June 2002	Northern Reno-Sparks area	Flash flood and debris flow/mudslide occurred on the alluvial fan where the new Spanish Springs High School was in the final stages of completion, Washoe County.	**More than $500,000 damage to the new Spanish Springs High School ($813,382 in 2022 dollars).**
December 2005 – January 2006	Elko County	In Elko County, winter flooding damaged two bridges in Jarbidge, the Midas Road, and irrigation structures and cattle guards along the Tuscarora Road.	**No figures available.**
Dec. 31, 2005 - Jan 1, 2006	Truckee River	Up to 6-8 inches of rain in the Lake Tahoe basin caused widespread localized flooding along the eastern Sierra. The Truckee River crested at about 13.6 feet, 2.6 feet above flood stage in downtown Reno, flooding several buildings in the downtown area and an undetermined number of businesses downstream in the Sparks industrial area where it crested at 19.2 feet, 4.2 feet above flood stage. The State EOC was activated and reported that five counties made local declarations.	**No figures available.**
Jan 1, 2006	Carson River Basin including tributaries in Carson Valley, Carson City and the Dayton Valley area	Widespread heavy rain from December 30-31, 2005, caused flooding throughout the Carson River Basin. USGS stream flow data indicate the flow at East Fork Carson River near Gardnerville, Nev., peaked at 8,920 cfs; the flow at Carson River near Carson City, Nev. at 13,200 cfs; and the flow at Carson River at Fort Churchill, Nev. at 10,300 cfs.	**No figures available.**
January 5 - 8, 2008	South of Cottonwood Lane, Fernley area, Lyon County	The Truckee irrigation canal breached at 4:19 AM flooding about 800 homes and displacing about 1,500 residents from flooded homes in the Green Valley, Tuscany Villa, Aspen Meadows, Shady Grove, and Farm Lane areas.	**There were 3.92 million estimated damages to public infrastructure. There was a $ 10 million settlement collectively from insurance, the irrigation companies, and the counties involved. ($13.6 million in 2022 dollars).**

Table 3-18. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
August 2014	Douglas County	Johnson Lane Flash Flooding on an alluvial fan.	**No figures available.**
July 2015	Douglas County flash flooding	Flash Flooding on an alluvial fan.	**No figures available.**
July 2015	Douglas, Lyon, Storey, and Washoe Counties	Flash Flooding.	**No figures available.**
October 2015	Lyon County	Walker River Flooding.	**No figures available.**
January 5 - 14, 2017	Truckee River and Carson River Basins	Winter flooding resulted in a Presidential Disaster Declaration due to Severe Winter Storms, Flooding, and Mudslides. Areas included in this disaster declaration were the independent city of Carson City, Douglas, Lyon, Storey, and Washoe Counties as well as for the Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation, the Reno-Sparks Indian Colony and the Washoe Tribe of Nevada and California.	**Estimated damages from this flood were $12,521,846 ($12,521,846 in 2022 dollars).**
February 5 – 22, 2017	Truckee River, Carson River, and Humboldt River Basins	Winter flooding resulted in a Presidential Disaster Declaration due to Severe Winter Storms, Flooding, and Mudslides. The areas included in this disaster declaration were the counties of Douglas (including the Washoe Tribe of Nevada and California within the State of Nevada), Elko (including the Te-Moak Tribe of Western Shoshone Indians of Nevada – South Fork Band), Humboldt, and Washoe and the independent city of Carson City.	**Estimated damages from this flood were $17,715,152 ($21,150,570 in 2022 dollars).**
June 21, 2017	Lyon County and Mineral County line Yerington	Hot temperatures brought isolated, high-based thunderstorms with strong outflow winds and a very localized flash flood.	**Estimated $25,000 in losses and damage ($29,848 in 2022 dollars). Limited figures available.**
August 7, 2017	Eureka County, Eureka	Flash flooding washed out a road in the extreme southeast portion of Eureka county and damaged some roads near Eureka.	**No figures available.**
May 21, 2018	Douglas County, Topaz Lake	A collapsing core within a thunderstorm produced heavy rainfall over the Slinkard burn scar west of Topaz Lake, which caused two	**No figures available.**

Table 3-18. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		pronounced debris flows off the burn scar onto U.S. Highway 395 near the California/Nevada state line. The debris flows were up to 5 feet deep in a few places and closed the highway for over 18 hours while crews removed the flow. Nearly 200 people from the nearby Topaz Lodge were forced to the second floor as mud hit the exterior part of the first floor. No injuries were reported.	
May 30 – 31, 2019	Elko County	Water from rain showers combined with an above normal snowpack to produce increased runoff into area creeks and rivers. Given how slow rises are in northern Nevada, some of the floods last for weeks.	**No figures available**
June 14 – 30, 2019	Humboldt County, Lander County	An above average snowpack, combined with a wet month of May, produced additional runoff into area creeks and rivers. This slow, but continuous, runoff brought river levels to minor to moderate flood stage.	**No figures available.**
July 25 – 26, 2019	Washoe County, Storey County	Moisture from the eastern Pacific Ocean and the Gulf of California moved northward around the periphery of high pressure centered over the Four-Corners region of the Rockies the 24th into the 25th. This resulted in storms producing heavy rains and flash flooding in these areas.	**No figures available**
August 1 – 2, 2021	**Elko County Lamoille**	**At least 15 different debris flows were caused by previous thunderstorms/heavy rain during the afternoon. The height of debris flows is estimated to be between 4 and 8 feet within a 4-mile length of road.**	**Estimated $800,000 in losses and damage. Limited figures available.**



Figure 3-92. January 9, 2017, Flooding, Sparks Residential Area.[100]

The history of flooding in southern Nevada is summarized below in Table 3-19. Please see Section 7 for flood history sources.

Table 3-19. Summary of Major Flooding in Southern Nevada

Date	Location	Description	Estimated losses
March 31, 1906	Las Vegas Valley	Flooding: 70 miles of track, bridges, and fills were swept away.	No property damage estimate is available.
August 25, 1906	Las Vegas Valley	Heavy rains: the water washed through the streets in heavy torrents.	No property damage estimate is available.
August 15, 1908	Indian Springs area, Las Vegas Valley	Cloudburst: 10 miles west of Las Vegas. Flooding washed out one mile of road.	No property damage estimate is available.
August 21, 1909	Las Vegas Valley	Heavy rains caused flooding that damaged 30 feet of railroad track north of Las Vegas.	No property damage estimate is available.
January 8, 1910	Las Vegas Valley	Melting snow and torrential storms: major flooding, washed away farms, trains, roads, etc. A train was washed away in Caliente area. Muddy Valley had the largest flood in years.	No property damage estimate is available.
January 15, 1910	Virgin Valley area, Las Vegas Valley	Flooding in the Virgin Valley area washed away a home, dams, livestock, and crops.	No property damage estimate is available.
January 18, 1911	Las Vegas Valley	The Salt Lake Railway was washed out by flooding.	No property damage estimate is available.
March 18, 1911	Las Vegas Valley	Snowstorms and rain flooded out the Salt Lake Railway.	No property damage estimate is available.
February 28, 1914	Las Vegas Valley	Several washouts took out the railway. It also took out two farms.	No property damage estimate is available.
May 12, 1917	Las Vegas Valley	Large flood: road between Goodsprings and Jean was damaged.	No property damage estimate is available.
August 4, 1917	Las Vegas Valley	Large flood damaged alfalfa crops on the Moapa Indian Reservation.	No property damage estimate is available.
March 16,	Las Vegas Valley	Large flood damaged farms in Mesquite	No property damage

[100] *Photo courtesy of Jack Hursh.*

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
1918		and Bunkerville.	estimate is available.
July 24, 1920	Las Vegas Valley	Heavy storm: crops and boarding house were destroyed.	No property damage estimate is available.
August 27, 1921	Las Vegas Valley	Heavy torrential rain: Las Vegas had no damage, Moapa Valley had damaged roads, Rio Virgin Valley had a lot of damage.	No property damage estimate is available.
January 7, 1922	Las Vegas Valley	Flashflood through Meadow Valley Wash. Damaged railroad tracks to Caliente.	No property damage estimate is available.
July 14, 1923	Las Vegas Valley	Flashflood: damage to farms, damage to the road from Las Vegas to Searchlight.	No property damage estimate is available.
July 28, 1923	Las Vegas Valley	Thunderstorm in Las Vegas caused damage to commercial, residential, and public buildings. Severe fiscal damage to the railroad company.	No property damage estimate is available.
August 28, 1925	Las Vegas Valley	Heavy storm: Las Vegas to Searchlight road damaged.	No property damage estimate is available.
Sep. 19, 1925	Las Vegas Valley	Flash flood caused considerable damage to farms.	No property damage estimate is available.
August 30, 1927	Las Vegas Valley	Highways around Las Vegas were flooded.	No property damage estimate is available.
August 5, 1929	Las Vegas Valley	Heavy deluge washed out highways around Las Vegas and several roads in the city.	No property damage estimate is available.
August 27, 1929	Las Vegas Valley	Heavy deluge wrecked a state highway near Charleston turnoff.	No property damage estimate is available.
August 23, 1930	Las Vegas Valley	Cloudburst damaged Arrowhead Trail, section of an underpass, and the highway.	No property damage estimate is available.
August 12, 1931	Las Vegas Valley	Heavy rainstorm, cloudburst, caused structural damage to commercial property.	No property damage estimate is available.
July 11, 1932	Las Vegas Valley	Heavy storm caused much structural damage.	No property damage estimate is available.
August 27, 1932	Las Vegas Valley	Lower Virgin River Bridge was washed out from three cloudbursts.	No property damage estimate is available.
August 29, 1932	Las Vegas Valley	Heavy deluge: farms around Mesquite covered in one to three feet of mud.	No property damage estimate is available.
August 21, 1933	Las Vegas Valley	Heavy deluge: Midway residents reported mud in their homes.	No property damage estimate is available.
August 21, 1934	Las Vegas Valley	Heavy deluge: Fremont Street became a raging river.	No property damage estimate is available.
September 24, 1935	Las Vegas Valley	Cloudburst washed away roads on the Los Angeles highway.	No property damage estimate is available.
July 31, 1936	Las Vegas Valley	Cloudburst: two feet of water on Arden Highway. Washed out Charleston Highway.	No property damage estimate is available.
September 24, 1937	Las Vegas Valley	Cloudburst near Glendale washed a car over a culvert.	No property damage estimate is available.
March 3, 1938	Las Vegas Valley	Continuous rain and flooding caused damage to Boulder City.	No property damage estimate is available.

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
June 28, 1938	Las Vegas Valley	Rain at Indian Springs sent flood water to Las Vegas. Telephone lines in Las Vegas were down.	No property damage estimate is available.
September 5, 1939	Las Vegas Valley	Heavy rains in Southern Nevada and Southern Utah; also severe damage to the Moapa Indian Reservation.	No property damage estimate is available.
September 10, 1939	Las Vegas Valley	Heavy rains caused damage to Eldorado Canyon district between Boulder City and Kingman.	No property damage estimate is available.
February 2, 1940	Las Vegas Valley	Heavy rains caused washouts on the Charleston highway.	No property damage estimate is available.
August 13, 1941	Las Vegas Valley	Two railway bridges were swept away in the flood.	No property damage estimate is available.
August 10, 1942	Las Vegas Valley	Rain and hail, trailer camps were devastated.	No property damage estimate is available.
July 9, 1945	Las Vegas Valley	Flooding in Overton. Union Pacific railway main line was washed out.	No property damage estimate is available.
August 1, 1945	Las Vegas Valley	Moapa Valley flooded, damaging crops.	No property damage estimate is available.
July 25, 1946	Las Vegas Valley	Cloudburst in Mesquite, killing one person.	One person died. No property damage estimate is available.
October 13, 1947	Las Vegas Valley	Flooding in Las Vegas; Fremont Street flooded; worst storm since 1945.	No property damage estimate is available.
September 8, 1950	Las Vegas Valley	Torrents of water roared down Fremont Street.	No property damage estimate is available.
July 20, 1951	Las Vegas Valley	Two cloudbursts; standing water in the homes near Boulder highway.	No property damage estimate is available.
August 28, 1951	Las Vegas Valley	Windstorm and cloudburst caused property damage in North Las Vegas.	No property damage estimate is available.
September 21, 1952	Las Vegas Valley	Heavy rainfall caused power outage in Henderson.	No property damage estimate is available.
June 27, 1954	Las Vegas Valley	Heavy rainfall and several cloudbursts, Las Vegas Wash boiled over, several homes were filled with mud.	No property damage estimate is available.
July 26, 1954	Las Vegas Valley	Flood torrents throughout the Las Vegas Valley, affected power lines, roads, and homes.	No property damage estimate is available.
August 25, 1955	Las Vegas Valley	Worst storm, Union Pacific railroad was disrupted for eight hours.	No property damage estimate is available.
July 26, 1957	Las Vegas Valley	Cloudburst, phones out of service, damage to low-level homes near Charleston Blvd.	No property damage estimate is available.
August 21, 1957	Las Vegas Valley	Flooding damaged city streets and shut down highways out of Las Vegas.	No property damage estimate is available.
June 22, 1958	Las Vegas Valley	Flash flood washed out a five-mile section of Nelson Road.	No property damage estimate is available.
November 11, 1958	Las Vegas Valley	Flash flood in Las Vegas.	$60,000 worth of damage to Las Vegas including

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
			debris cleanup **($607,588 in 2022 dollars).**
July 22, 1960	Las Vegas Valley	Flash thunderstorm in Las Vegas; phone lines were downed.	No property damage estimate is available.
August 29, 1961	Las Vegas Valley	Heavy rainfall, some mobile homes had to be evacuated.	No property damage estimate is available.
September 18, 1961	Las Vegas Valley	Lamb Blvd was washed out by the deluge; power was knocked out throughout the valley.	No property damage estimate is available.
April 8, 1965	Las Vegas Valley	Rain washed out roadbeds in Clark County.	No property damage estimate is available.
August 7, 1967	Las Vegas Valley	Flooding in Las Vegas; 14th and 25th Streets caved in.	No property damage estimate is available.
August 19, 1967	Las Vegas Valley	Flash flood: damaged US Highway 95 between Las Vegas and Searchlight.	No property damage estimate is available.
September 6, 1967	Las Vegas Valley	Severe flooding Tonopah Highway (US 95) was damaged.	No property damage estimate is available.
January 24, 1969	Las Vegas Valley	Rainstorms washed out roads and buried cars in mud.	No property damage estimate is available.
February 1969	Amargosa River drainage basin and Amargosa Valley, Nye County	Largest recorded flood in 25 years in the Amargosa River drainage.	No property damage estimate is available.
August 20, 1973	Las Vegas Valley	Las Vegas Wash Marina was severely damaged by a thunderstorm.	No property damage estimate is available.
September 14, 1974	Eldorado Canyon, Las Vegas Valley, Clark County	A flash flood/debris flow swept away mobile homes, cars, a restaurant, and drowned at least nine people in Eldorado Canyon. Water depth was up to 20 feet, and up to 40 feet of sediment was deposited near Nelson's Landing on the shore of Lake Mead.	At least 9 people were killed. No property damage estimate is available.
July 3 - 4, 1975	Las Vegas Valley	Heavy thunderstorm precipitation exceeding 3 inches between Las Vegas and the mountains to the south, west, and north, caused record peak flows of Tropicana Wash, Flamingo Wash, Las Vegas Creek, and Las Vegas Wash.	Two people were drowned. Total property damage was estimated by the Clark County Flood Control District at $4.5 - $5 million **($24.5 - $27.2 million in 2022 dollars).**
August 10, 1981	California Wash, Logan Wash, Overton Wash, Valley of Fire Wash and the lower Muddy River. Moapa Valley area, Lake Mead Recreation	Thunderstorm-related intense rains up to 6.5 inches in less than an hour fell on southern Nevada. Major flooding and record runoff. Record floods in the Moapa Valley area did the most serious damage. California Wash flooding heavily damaged Hidden Valley Ranch dairy farm, where approximately 500 cows drowned, and twenty mobile homes were destroyed or	Tens of millions of dollars' worth of damage to the Moapa Valley area, Overton, Lake Mead Recreation area and Las Vegas **($30+ million in 2022 dollars).**

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
	area and Las Vegas	damaged. Muddy River at Glendale below California Wash overflowed the bridge by 5 to 6 feet.	
August 14 - 16, 1984	Southern Clark County	Fourth episode of flooding in a month. Up to 3.5 inches of rain from southern Las Vegas to Boulder City caused floods the damaged roads, injured people, caused power outages, engulfed vehicles, and flooded four homes in Henderson and 3 units of an apartment complex on East Lake Mead Boulevard.	Officials estimated damage to be more than $2 million **($5.6 million in 2022 dollars).**
June 9 - 10, 1990	Las Vegas Valley, Overton area, Jean area	Floods due to intense rainfall caused road closures in the Overton area and wide-spread damage in the Las Vegas Valley. The most intense rainfall was recorded in an area bounded by Tropicana Avenue, Las Vegas Boulevard, Washington Avenue, and Hollywood Boulevard and approximated a 50-year rainfall event in places. Many streets were flooded and there were widespread power outages.	Two flood-related deaths in the Las Vegas Valley. Wide-spread property damage; no estimate is available.
August 14 - 16, 1990	CalNevAri, Las Vegas Valley, Moapa Valley, Glendale, Muddy River, Meadow Valley Wash	Intense localized rainstorms dropped up to 2.5 inches of rain in Las Vegas Valley and In Moapa Valley causing floods that damaged the roads, bridges, railways, businesses, vehicles and flooded at least 26 homes.	$250,000 in damages to the UPRR tracks near Logandale due to flooding of Logan (Benson) Wash **($559,783 in 2022 dollars).** An estimated $100,000 in damages to public facilities in the Moapa Valley. No estimate of private property damage is available **($223,913 in 2022 dollars).**
September 6-8, 1991	Clark County/Las Vegas Valley	Localized intense rainfall totaling 1.77 inches on the west side of the Las Vegas Valley flooded streets and caused some damage to sidewalk, curbs, gutters, street pavement and a bridge under construction.	The Clark County Public Works Department estimated the cost of cleanup from this event at $6,000 in overtime and equipment **($12,892 in 2022 dollars).**
August 8, 1994	Las Vegas Valley/ Clark County	Intense, localized thunderstorm dropped up to 1.57 inches of rain in NW Las Vegas Valley causing local street flooding and damage to storm drains, vehicles and a number of residences were flooded.	No property damage estimate is available.

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
March 10 - 11, 1995	Amargosa River drainage basin and Amargosa Valley, Nye County	Nevada Test Site area: U.S. 95 was closed, Stockade Wash culverts were damaged at Airport Road, H Road crossing and other roads were covered with sediment, and debris and a Nevada Test Site worker was swept away by the flood waters in Fortymile Wash, but managed to escape.	No property damage estimate is available.
August 22 - 23, 1995	Las Vegas Valley/ County	Two localized intense storms each dumped nearly 3/4" of rain in 15 minutes in the Las Vegas Valley on both August 22 and August 23, causing localized flooding of streets where debris blocked culverts.	One person was swept away and drowned. No property damage estimate is available.
August 9 - 10, 1997	Las Vegas Valley/ County	Line of thunderstorms caused severe flooding in Las Vegas and Boulder City, severe damage to public and private property.	No property damage estimate is available.
February 22 - 23, 1998	Amargosa River drainage, Amargosa Valley, Nye County	A regional storm produced up to 2.81 inches of rain resulting in minor flooding throughout the Amargosa River drainage basin. Floods severely eroded the channel In Fortymile Wash and caused extensive damage to U.S. Highway 95 and to Nevada Test Site roads.	No property damage estimate is available.
July 20 - 24, 1998	Urban areas of the south end of the Las Vegas Valley	Repeated intervals of more than an inch of rainfall in less than an hour in caused localized flooding of streets, damage to drainage systems, and deposition of debris, silt, and sediment on roadways.	Two flood-related deaths were reported. No property damage estimate is available.
September 11, 1998	Las Vegas/County	A storm produced up to 2 inches of rainfall in parts of Las Vegas Valley and more than 3 inches of rain in Moapa Valley, causing extensive flooding.	The Clark County Public Works Department estimated that Moapa Valley sustained damage to roadways amounting to approximately $400,000 **($718,1172 in 2022 dollars).**
July 8, 1999	Las Vegas Valley	Torrential rains deluged the Las Vegas Valley the morning of July 8, 1999, causing wide-spread drainage problems and damages to public and private properties. The rainfall intensities and/or depths recorded in many parts of the Valley exceeded the rainfall criteria used for the design of drainage facilities in the County. Within the Las Vegas Valley, two RFCD rain gages reported over 3 inches of rainfall, five other gages reported over 2 inches of rain, and an additional twelve	**Damages to public property resulting from this storm are estimated at $20,500,000 ($30,010,968 in 2022 dollars). The Clark County Board of Commissioners declared a State of Emergency on July 9,1999. On July 15, the Governor's Office issued a Declaration of**

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
		gages received in excess of 1.5 inches of rain. Most of this rainfall occurred within a 60–90-minute period.	**Emergency for the area and requested assistance from FEMA. President Clinton declared the area a federal disaster area on July 19, 1999.**
August 19, 2003	Las Vegas Valley	An incredibly intense thunderstorm dropped up to three inches of rainfall in northwest areas of the Las Vegas Valley and overwhelmed the capacity of some drainage facilities. At some District gages, rainfall depths and intensities measured during this storm exceeded those of the 100-year design storm.	**The City of Las Vegas estimated $1.2 - $1.5 million in damages to public facilities ($1.9 million - $2.4 million in 2022 dollars). Clark County estimated $330,000 in damages to roadways ($524,870 in 2022 dollars).**
December 2004 - January 10 - 11, 2005	Las Vegas Valley/Lincoln County	Sustained heavy rains in late Dec. 2004 and early Jan. 2005 caused widespread flooding in Las Vegas Valley, along Meadow Valley Wash, Muddy River, and Virgin River in both Clark and Lincoln Counties.	Total flood and storm damage for Lincoln County was estimated at $9.4 million ($14.1 million in 2022 dollars) and $4.5 million for Clark County ($6.7 million in 2022 dollars).
August 27, 2007	SW Las Vegas	Up to 3.11 inches of rainfall caused localized residential flooding and numerous reports of swift water rescues.	No property damage estimate is available.
December 17-23, 2010	Virgin River, and Muddy River	An average of 1.77" of rain fell in a seven day period over Clark and Lincoln Counties. Street closures in Las Vegas Valley and in Moapa. Mesquite on the Virgin River was subject to flooding when the river topped its banks. Two homes were flooded.	City's cost for flood response and clean up was $422,000 ($566,370 in 2022 dollars). Clark County Public Works repairs totaled $170,000 ($228,158 in 2022 dollars).
August 22, 2012	Las Vegas Valley, Clark Co.	1.5" to 2" of rain in four hours caused one death, numerous water rescues, and limited damages to private and public facilities. Clark Co. - approx. 117 buildings flooded with public infrastructure damage in Mesquite and Overton. (Tables 3-18, 3-19)	One death-Henderson: Approximately $976,689 in public infrastructure damage ($1,244,949 in 2022 dollars).
September 11, 2012	Las Vegas Valley, Clark Co.	1.15" of rain in about 2 hours at McCarran International Airport.	Henderson damages estimated at $78,500. Las Vegas Valley damages were estimated at $1.4 million ($1.8 million in 2022 dollars).

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
October 11, 2012	Las Vegas Valley, Clark County	Rainfall totals, measured by at least eighteen of the Regional Flood Control District's Flood Threat Recognition System (FTRS). FTRS rain gages, measured more than two inches of rainfall during this event; an additional sixty-seven gages recorded rainfall totals in excess of one inch. The large volume of rainfall over a large area resulted in wide-spread street flooding and significant flow in some of the area's washes.	No property damage estimate is available.
August 25, 2013	Las Vegas Valley, Clark County	A severe rainfall event in the northwest sector of the Las Vegas Valley resulted in significant runoff, some of which damaged local roadways. The rainfall event is believed to have been exacerbated by the lack of vegetative cover in part of the upstream drainage area, notably the Carpenter 1 burn area. Some locations experienced rainfall totals in less than four hours that exceeded the average annual rainfall for Las Vegas.	No reports of damages to residences, businesses, or public infrastructure.
September 8, 2014	Las Vegas Valley, Clark County	Tropical moisture associated with Hurricane Norbert generated intense rainfall over large areas of Clark County. Rainfall over a large area that drains to the Muddy River, Meadow Valley Wash and Weiser Wash ranged from 2.5" to 4.6" according to Regional Flood Control District rain gauges. Runoff from this large storm event resulted in significant flow across several major roadways and closure of those roadways for varying amounts of time. Flow in Weiser Wash caused extensive damage to approximately 2 miles of travel lanes and the median of I-15 near mile marker 92. The USGS preliminary estimate of the flow in Weiser Wash upstream of I-15 is 12000 cfs (subject to change). The Governor's office and the Clark County Commission declared a state of emergency.	Estimated damages in excess of $1 million to County maintained roadways as a result of the September 8 event ($1.2 million in 2022 dollars). NDOT estimated $5 million in damages to I-15 ($6.2 million in 2022 dollars).
September 8, 2014	Moapa/ Clark County	A dam north of the Moapa River Indian Reservation failed and released an unknown volume of water. A post-event inspection of this facility indicated that the failure was likely due to internal erosion. There were no known injuries	Damages estimated at $5,052,307 ($6,245,703 in 2022 dollars).

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
		resulting from this failure.	
September 26, 2014	Las Vegas Valley, Clark County	Las Vegas Valley and parts of northeast Clark County were flooded by a series of fast-moving narrow bands of intense rain, dropping about 1.50" – 1.75" of rain between 2PM and 5PM. The intense rainfall caused minor street flooding on the west side of the valley and more significant flooding in the rural areas of the Muddy River drainage. Flow in the Muddy River at Warm Springs Road, believed to be one of the largest in the nearly 100 years of record for this site, prompted the evacuation of properties within the Warm Springs Road loop. Sections of I-15 near mile marker 111 suffered damages which resulted in traffic restrictions for several days.	No property damage estimate is available.
July 2015	Caliente, Lincoln County	Flash Flooding.	No property damage estimate is available.
March 2016	Nye County	Flooding.	No property damage estimate is available.
June 30, 2016	Las Vegas Valley, Clark County	Thunderstorms over the Spring Mountains west of the Las Vegas Valley moved eastward into the southern half of the valley. Rainfall was very intense, highly localized, and occurred with little warning. Reported rainfall totals were in excess of 1-inch, most of which occurred in less than 15-30 minutes. There were several instances of debris and localized flooding of roadways in the Las Vegas area, but there were no reports of flooding of residences or businesses. There were two flood-related deaths and several instances of swift-water rescues as a result of rapidly rising runoff.	No property damage estimate is available.

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
August 4, 2017	Las Vegas Valley, Clark County	Afternoon thunderstorms began developing in the Spring Mountains and in the Las Vegas Valley. Flash flood warnings were issued by NWS for Las Vegas Valley, Kyle Canyon and Lee Canyon areas, and Clark County. There were a few road closures as a result of flash flooding. Within the Flamingo Wash, there were multiple rescues of people by Clark County firefighters and the general public. There was one flood related death.	No property damage estimate is available.
July 2018	Clark County Lincoln County	The first monsoon moisture push of the season fueled isolated thunderstorms over the Mojave Desert. Some storms produced severe weather and flash flooding. Followed by more substantial push of monsoon moisture helped trigger widespread thunderstorms across the Mojave Desert and southern Great Basin. Many storms produced severe weather and flash flooding.	**Estimated $235,000 in losses and damage. Limited figures available** ($273,882 in 2022 dollars)**.**
August 15, 2018	Clark County Roach	Southerly flow pulled moisture into the Mojave Desert, fueling scattered thunderstorms. Some storms produced severe weather and/or flash flooding. Flooding caused major damage to Nipton Road between mile markers 2 and 6. The road will be closed for months.	**Estimated $2,000,000 in losses and damage. Limited figures available (**$273,883 in 2022 dollars)**.**
October 3, 2018	Lincoln County Pioche	A strong Pacific low pressure system plus leftover moisture from the remnants of Hurricane Rosa produced thunderstorms over the Mojave Desert and southern Great Basin. Some storms produced flash flooding. Flash flooding on Main Street in Pioche left water and debris in the street and water in several buildings.	**Estimated $50,000 in losses and damage. Limited figures available** ($58,723 in 2022 dollars)**.**

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
July 31, 2019	Clark County Las Vegas Valley Arden	A brief intrusion of monsoon moisture brought spotty thunderstorms to the Mojave Desert. A couple of strong storms caused wind damage and flooding in the Las Vegas Valley. Several hours after a thunderstorm, water flowing through a wash overcame a berm and spilled into a neighborhood. Cars were stranded, and the water was waist deep in places. Water neared, but did not enter, homes. It took until the next morning for the water to recede (thus, this event continued into August).	**No figures available.**
November 20, 2019	Clark County Nelson	Widespread rain and flooding to the Mojave Desert. Eagle Wash Road (a dirt road) was obliterated by flooding and will have to be resurfaced. Nelson Landing Turnaround will also have to be repaired.	**Estimated $20,000 in losses and damage. Limited figures available** ($22,894 in 2022 dollars)**.**
December 8, 2019	Nye County	A cold front brought rain showers to the Mojave Desert. Isolated heavier rain near Pahrump led to flash flooding. About two feet of water and mud flowed over Highway 160 at Roadrunner Rd, with one swift water rescue, at least one vehicle stuck in the mud, and other vehicles stranded due to water.	**No figures available.**

Table 3-19. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
June 29 – July 26 2021	Clark County Lincoln County Nye County	Monsoon moisture slowly seeped into the region under the big dome of high pressure which caused record-breaking temperatures, fueling isolated to scattered thunderstorms. As the moisture increased, the main thunderstorm impact transitioned from high winds to flash flooding. This was followed by ten days of scattered thunderstorms over the Mojave Desert and southern Great Basin. Many storms produced flash flooding and/or high winds.	**Estimated $1,280,000 in losses and damage. Limited figures available** ($1,382,435 in 2022 dollars)**.**



Figure 3-93. April 10, 2016, Flooding, Las Vegas Neighborhood.[101]

3.3.7.3 Location, Severity, and Probability of Future Events

3.3.7.3.1 Location

Section 3.3.7.2 on the history of flooding in Nevada provides the basis for probable location of future flooding in the state. Major river systems in Nevada along which normal riverine flooding

[101] *Photo courtesy of Clark County Regional Flood Control District, Las Vegas, NV.*

(National Risk has occurred in the past and will likely occur again are the Carson, Truckee, Walker, Humboldt, Amargosa rivers and the lower Colorado River including its tributaries, the Virgin and Muddy Rivers. Locations of these rivers as well as the locations of major canals, cities, and towns in the state are shown in Figure 3-94 (Statewide) and in Appendix G. Canals and ditches are listed by county in Appendix N.

Another source for information about the probable location and severity of future flooding in Nevada can be found on the United States Environmental Protection Agency (EPA) website. The EPA compiled data relevant to a set of key climate change indicators from over 40 government agencies, academic institutions, and other organization to look at how the Earth's climate is changing. These indicators were published the 2016 *Climate Change Indicators in the United States* report. The report examines changes in inland riverine flood events which is relevant to Nevada. More information about this report can be found at https://www.epa.gov/climate-indicators.

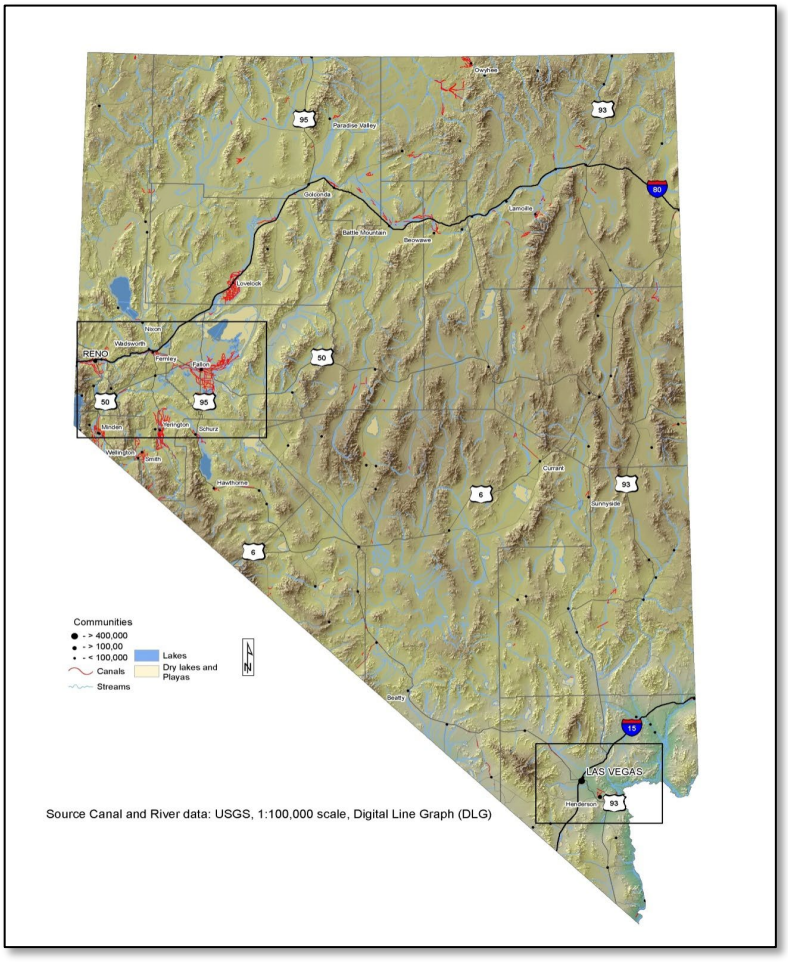


Figure 3-94. Major Rivers and Canals (See Figure 3-95 for inset maps).

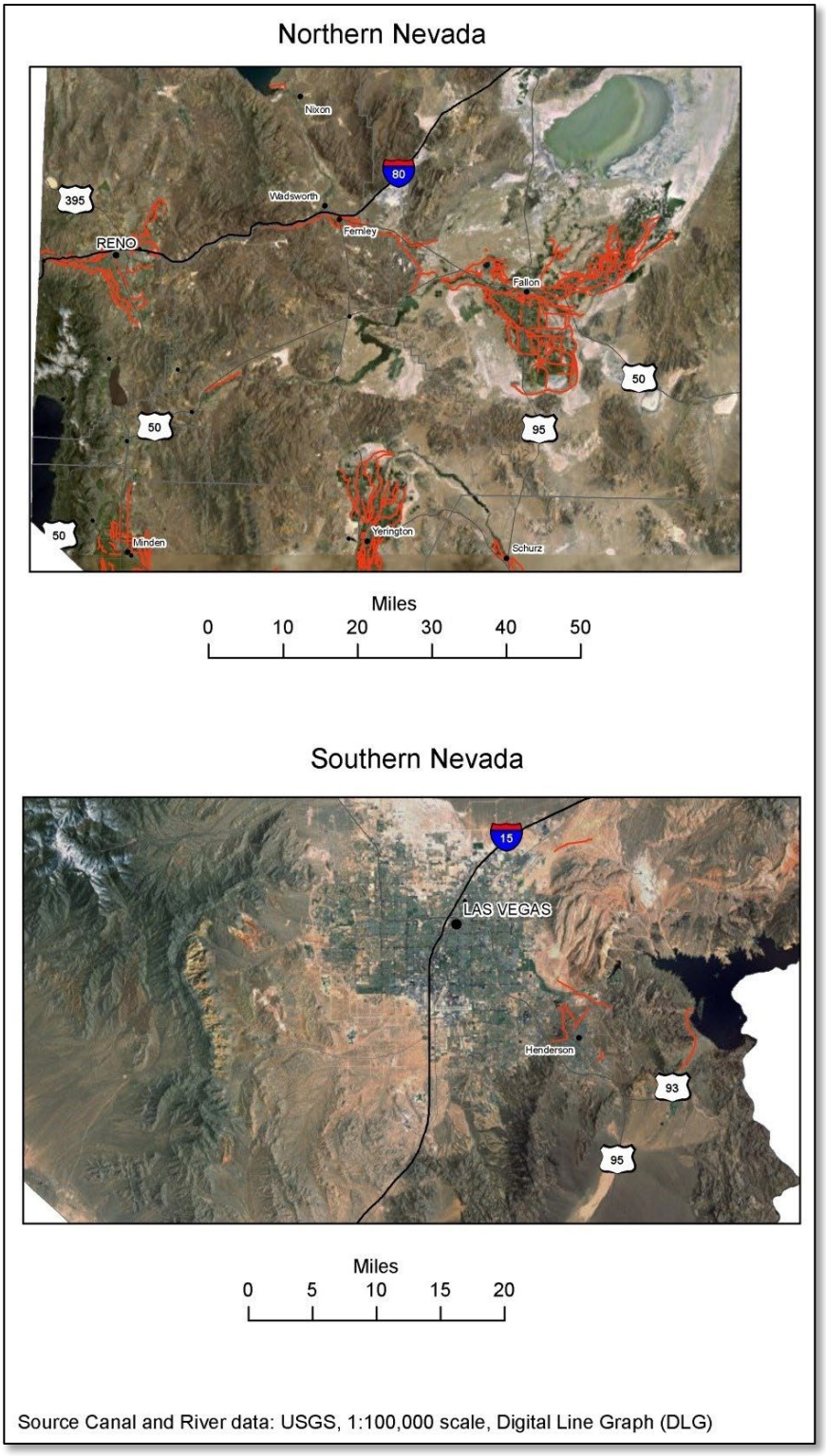


Figure 3-95. Major Rivers and Canals Inset Map.

Another view of the location and probability of future flood damages can be obtained from reviewing where levees and embankments were built to try to control floodwaters. Data from the National Levee database, developed by the USACE and FEMA, are available and enhanced by local knowledge. Many levees do not meet the current standards to be recognized as accredited

by FEMA, and thus are reflected as earthen embankments. To meet the standard of design set out in the Code of Federal Regulations, a Professional Engineer must certify the levee structure in order for FEMA to show the area protected from the 1% annual chance of flood. Table 3-20 below attempts to summarize levee and embankment information in Nevada from best sources available at this time**.**

Table 3-20. Levee and Embankment Names and Lengths by County in Nevada

Levee and Embankment Names by County	Length (miles)	FEMA Accredited Levee?	Notes
Carson City			
Combs Canyon Creek	0.50*	Yes	
Eagle Valley Creek/Combs Canyon Creek	1.4*	Yes	Road Embankment
Kings Canyon Creek	0.10*	No	Road Embankment
Churchill			
Churchill County-1	N/A	No	
Churchill County-3	N/A	No	
Churchill County-4	N/A	No	
Churchill County-7	N/A	No	
Churchill County-7a	N/A	No	
Churchill County-8	N/A	No	
Churchill County-9	N/A	No	
Clark			
Upper Las Vegas Wash Interception Berm (Moccasin Diversion)	1.73	Yes	
Range Wash Fan (West Range Wash Diversion Dike)	5.89	Yes	
Clark County Levee 1 (C-1 Levee Henderson)	0.79	Yes	
Duck Creek Diversion Dike (Equestrian Diversion)	3.1	Yes	
Muddy River Wells Siding (Logandale Levee)	0.48	Yes	
Cottonwood Upper Diversion Levee	0.24	No	
Lower Cottonwood Levee System	0.17	No	
Colorado River Levee	2.16	No	
Nevada Levee	7.5	No	
City of Henderson-2100	N/A	Yes	
Clark County-Tributary K	0.15*	No	
Douglas			
East Fork Carson River	2.1	No	
Elko			
Elko County-21	0.50*	No	Road Embankment
Elko County-32	0.40*	No	Road Embankment
Elko County-51	0.55*	No	Road Embankment

Table 3-20. Levee and Embankment Names and Lengths by County in Nevada			
Elko County-58	2.1*	No	Railroad Embankment
Elko County-71	1.1*	No	Road Embankment
Elko County-73	0.15*	No	Road Embankment
Elko County-76	1.0*	No	Road Embankment
Elko County-79	1.1*	No	Road Embankment
Elko County-86	1.1*	No	Road Embankment
City of Carlin-120	0.25*	No	Road Embankment
City of Carlin-121	0.40*	No	Road & Railroad Embankment
City of Carlin-122	0.75*	No	Railroad Embankment
City of Elko-169	0.25*	No	Road Embankment
Esmeralda	N/A	N/A	
Eureka	N/A	N/A	
Humboldt			
City of Winnemucca-1	1.5*	No	Road Embankment
City of Winnemucca-1a	0.15*	No	Road Embankment
City of Winnemucca-2a	0.20*	No	Road Embankment
Humboldt County-4	0.25*	No	Railroad Embankment
Humboldt County-8	2.8*	No	Railroad Embankment
Humboldt County-9	0.35*	No	Railroad Embankment
Humboldt County-10	2.8*	No	Railroad Embankment
Lander			
Reese River Levee at Battle Mountain	3.6	No	
Lincoln			
Lincoln County-2	N/A	No	
Lincoln County-3	N/A	No	
Lincoln County-6	N/A	No	
Lincoln County-7	N/A	No	
Lincoln County-7a	N/A	No	
Lincoln County-8	N/A	No	
Lincoln County-11	N/A	No	
Lyon			
Truckee Canal	1.725	No	
Walker River	0.91	No	
Lyon County-2	N/A	No	
Lyon County-3	N/A	No	
Lyon County-4	N/A	No	
Lyon County-5	N/A	No	
Lyon County-6	N/A	No	
Lyon County-7	N/A	No	
Lyon County-10	N/A	No	
Mineral			
Hawthorne Diversion Levee	1.82	No	

Table 3-20. Levee and Embankment Names and Lengths by County in Nevada			
Nye			
Hicks Station Wash-10	N/A	No	
The Big Wash-18	N/A	No	
Peavine Creek-21a	N/A	No	
Undetermined-24	N/A	No	
Hunts Canyon Creek-35	N/A	No	
Undetermined-36	N/A	No	
Undetermined-39	N/A	No	
Twin Springs Slough-45	N/A	No	
Undetermined-47	N/A	No	
Undetermined-51	N/A	No	
Amargosa River-54a	N/A	No	
Undetermined-57a	N/A	No	
Undetermined-61	N/A	No	
Undetermined-65	N/A	No	
Undetermined-66	N/A	No	
Undetermined-67	N/A	No	
Undetermined-68	N/A	No	
Wheeler Wash-69	N/A	No	
Pershing			
Humboldt River-5	1.8*	No	
Humboldt River-6	2.5*	No	
Humboldt Lake	21.2*	No	
Pitt-Taylor Diversion Canal	12.4*	No	
Storey			
Storey County-1	N/A	No	
Storey County-2	N/A	No	
Washoe			
Unnamed	0.09	Yes	
Washoe County Levee 2	1.13	No	
I-80 in Sparks Adjacent to Marina	1.69	Yes	
Steamboat Creek-3	0.30	No	
Bailey Canyon Creek-**2 & 3**	N/A	No	
Unnamed Tributaries to Steamboat Creek-6, 9, & 11	N/A	No	
Bailey Canyon Creek-12 & 13	N/A	No	
Truckee River-19	N/A	No	
White Pine			
Steptoe Slough Levee	12.0	No	

***Length Estimated**

Flash floods, debris flows and mudslides have also occurred in the past in the drainages described in the flood chronology tables. However, flash floods, debris flows and mudslides can occur anywhere in the state where there is unstable wet unconsolidated material located on slopes.

3.3.7.3.2 Severity

The National Flood Insurance Program (NFIP) is a Federal program which enables property owners in participating communities to purchase insurance protection against losses from flooding. Data on NFIP flood insurance policies have been collected and compiled by FEMA since 1978. Table 3-21 shows flood insurance policy and claims data from 1978 to 2017 for Nevada counties participating in the NFIP. The dollar amounts of claims paid provides a measure of the severity of flood damages in each county.

As the data indicates, flooding in Washoe County (including the cities of Reno and Sparks) accounts for the largest amount of flood insurance claims paid among counties in Nevada, followed by Clark County (which includes Boulder City, Henderson, Las Vegas, Mesquite, and North Las Vegas) and Douglas County.

Table 3-21. Summary of Total NFIP Insurance Coverage, Premiums Paid and Claims in Nevada Since 1978

NFIP Policy and Claims Report for Nevada as of October 2017

County	Number of Policies	Total Coverage	Total Premiums	Total Claims Since 1978	Total Paid Since 1978	NFIP claims as a % of total policies
Carson City	294	$ 92,392,100	$ 215,526	93	$ 578,250	17.84%
Churchill County	215	$ 53,263,300	$ 171,028	7	$ 24,670	0.74%
Clark County	1,859	$ 594,399,200	$ 1,359,162	619	$ 8,648,248	20.03%
Douglas County	913	$ 267,781,000	$ 708,712	214	$ 3,676,392	18.29%
Elko County	84	$20,019,900	$105,953	31	$141,900	29.29%
Eureka County	10	$ 1,963,400	$13,375	1	$588	9.09%
Humboldt County	6	$1,260,00	$ 2,601	15	$ 63,439	75.00%
Lander County	97	$ 15,227,200	$ 142,103	3	$1,058	2.17%
Lincoln County	82	$ 15,034,000	$ 58,514	3	$0	2.63%
Lyon County	348	$ 88,352,500	$282,621	20	$ 472,591	3.13%
Mineral County	123	$ 20,538,800	$ 99,961	2	$2,663	1.09%
Nye County	3,513	$ 789,526,800	$ 996,341	109	$ 996,341	2.22%
Pershing County	2	$ 700,000	$ 936	4	$18,853	66.67%
Storey County	211	$ 44,694,500	$ 98,800	11	$40,963	5.21%
Washoe County	2,039	$ 630,935,100	$2,827,133	741	$30,566,005	27.30%
White Pine County	105	$ 17,114,600	$98, 648	7	$390	5.11%
State Total:	9,901	$ 2,651,942,400	$7,082,766	1,880	$ 44,654,101	14.24%

Up until 2012, severe repetitive loss and repetitive flood properties were handled under two separate FEMA programs Severe Repetitive Loss (SRL) Program and the Repetitive Flood Claims (RFC) grant program. The SRL Program provided funding to reduce or eliminate long-term risk of flood damage to SRL structures insured under the NFIP. The RFC grant program

assisted States and communities in reducing flood damages to insured properties that had one or more claims to the NFIP.

Since then, legislative changes made in the Biggert-Waters Flood insurance Reform Act of 2012 have redefined severe repetitive loss and repetitive loss properties in the following manner:

A severe repetitive loss property is a structure that:

(a) Is covered under a contract for flood insurance made available under NFIP; and
(b) Has incurred flood-related damage –
    (i) For which 4 or more separate claims payments have been made under flood insurance coverage with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claim payments exceeding $20,000; or
    (ii) For which at least 2 separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

By this definition, Nevada has one severe repetitive loss property.

A repetitive loss property is a structure covered by a contract for flood insurance made available under the NFIP that:

(a) Has incurred flood-related damage on two occasions in which the cost of the repair on the average equaled or exceeded 25% of the market value of the structure at the time of each such flood event; and
(b) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

By this definition, Nevada has two repetitive loss properties.

Table 3-22 below is a summary of repetitive loss and severe repetitive cases and claims paid due to floods for communities in the State of Nevada. As is consistent with NFIP claims data in Table 3-21, the majority of Repetitive Losses have occurred in Clark County and in the Cities of Sparks and Reno and in Washoe County.

Table 3-22. Summary of Repetitive Loss and Severe Repetitive Loss Properties Due to Flood for Communities in the State of Nevada as of 2022

Community Name	Number of RL Properties	Number of SRL Properties	Total Claims Paid
City of Las Vegas	8	0	$805,563
Unincorporated Clark County	52	0	$1,705,220
Henderson	2	0	$20,837
City of Reno	44	0	$7,767,495

Figures 3-96 and 3-97 depict the National Risk Index Riverine Flooding Expected Annual Loss statewide and for more heavily populated areas respectively.

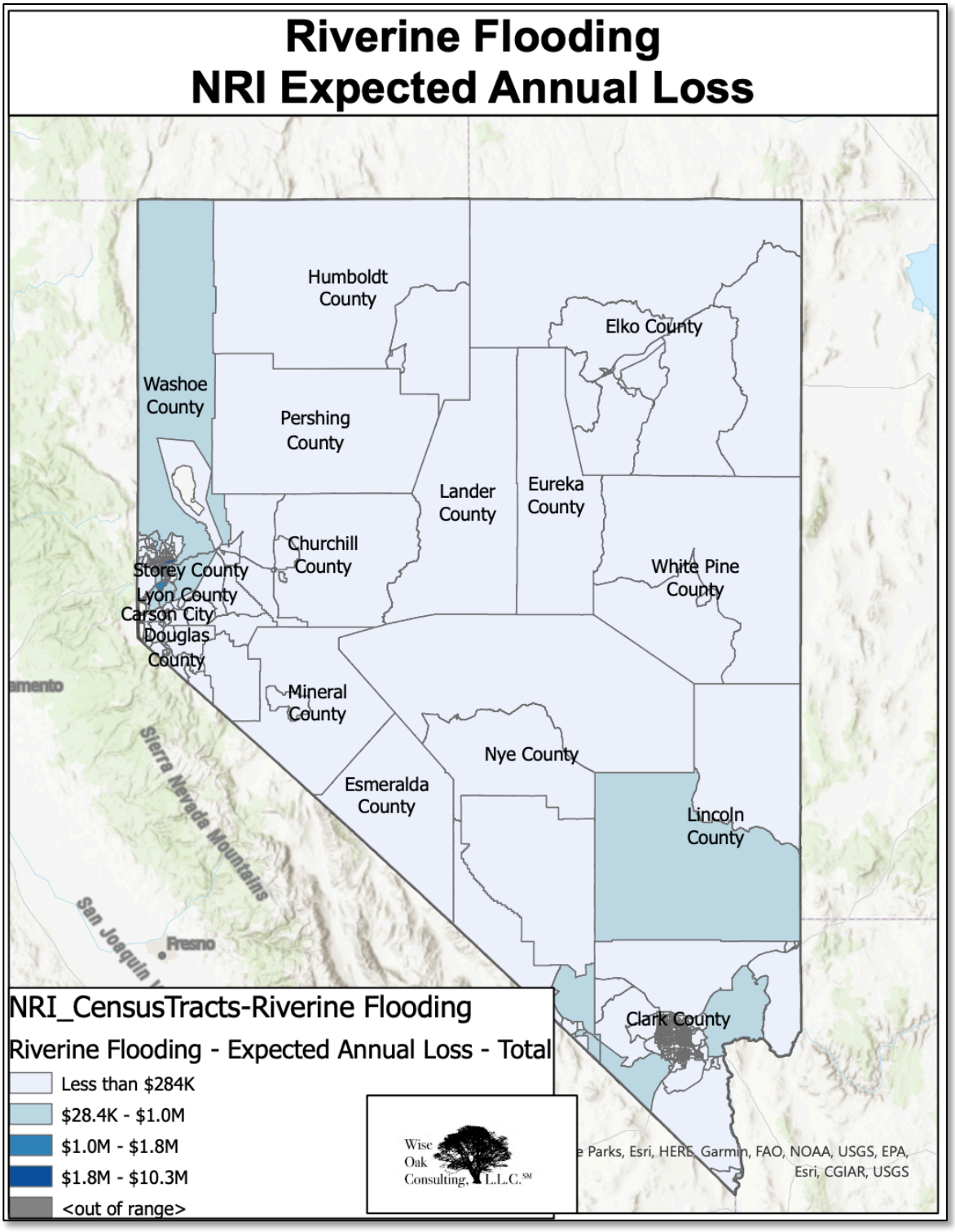


Figure 3-96. Riverine Flooding Expected Annual Loss – Statewide.

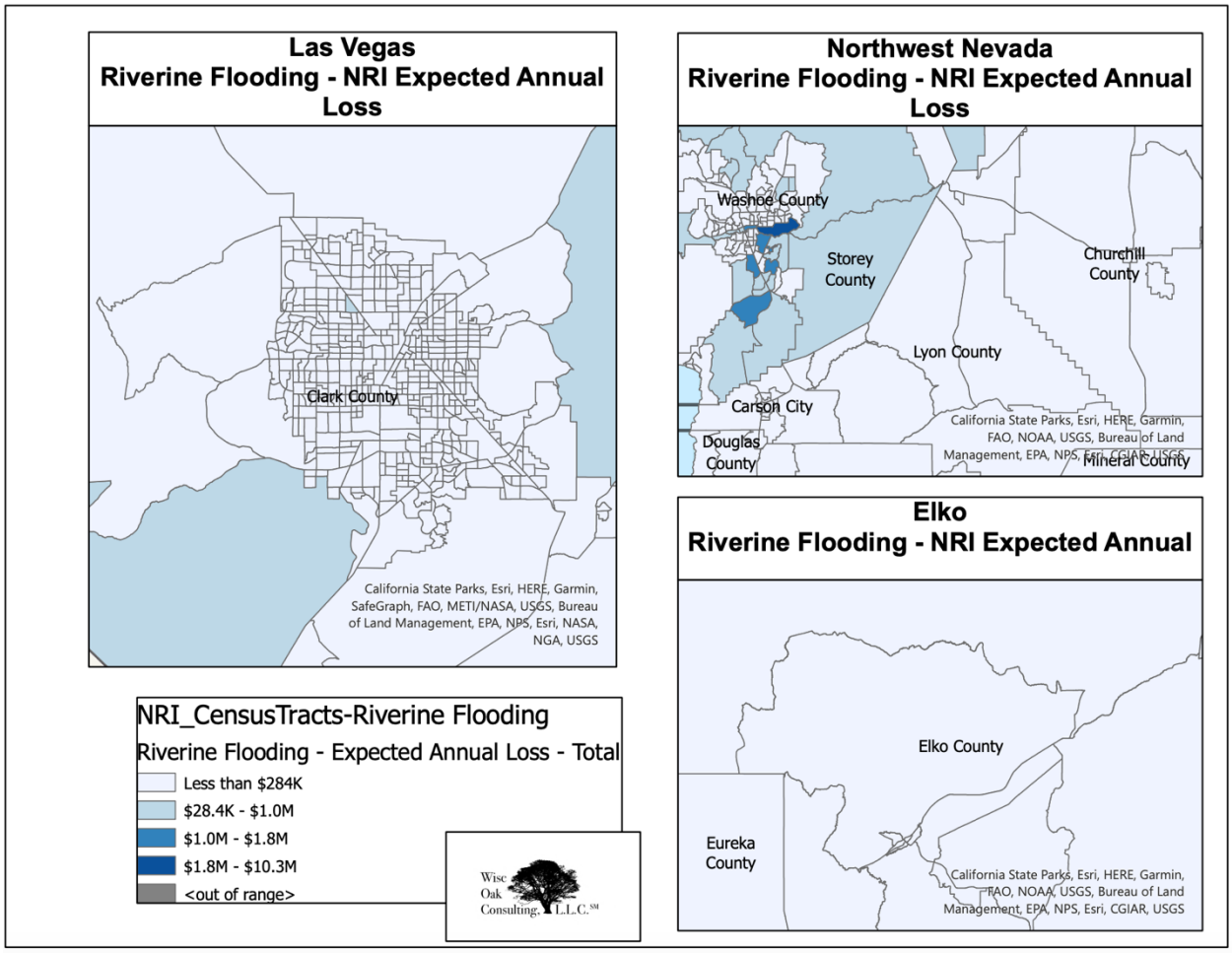


Figure 3-97. Riverine Flooding Expected Annual Loss – More Heavily Populated Areas.

3.3.7.3.3 Probability of Future Events

Figures 3-98 and 3-99 depict the National Risk Index Annualized Frequency statewide and for more heavily populated areas respectively.

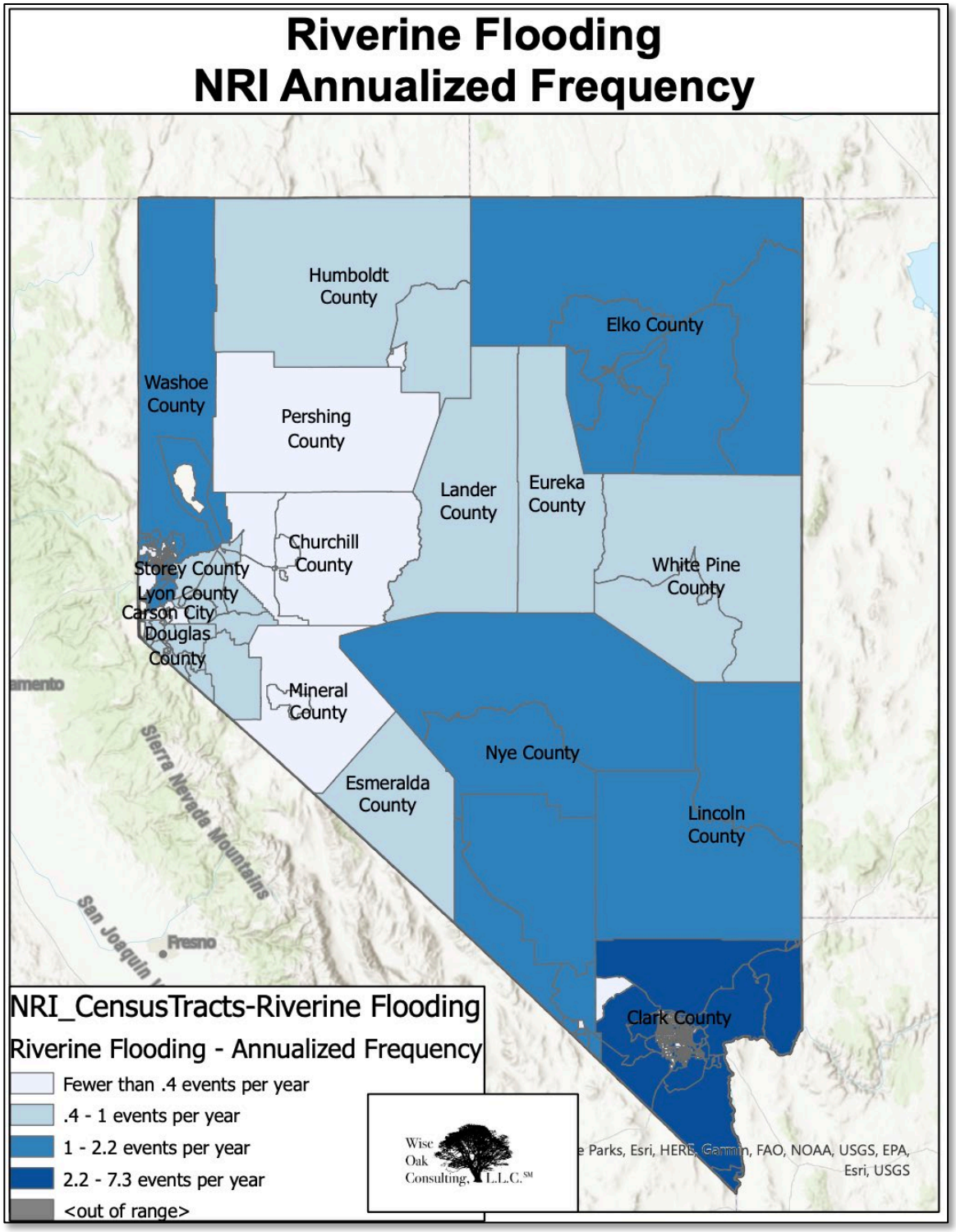


Figure 3-98. Riverine Flooding Annualized Frequency – Statewide.

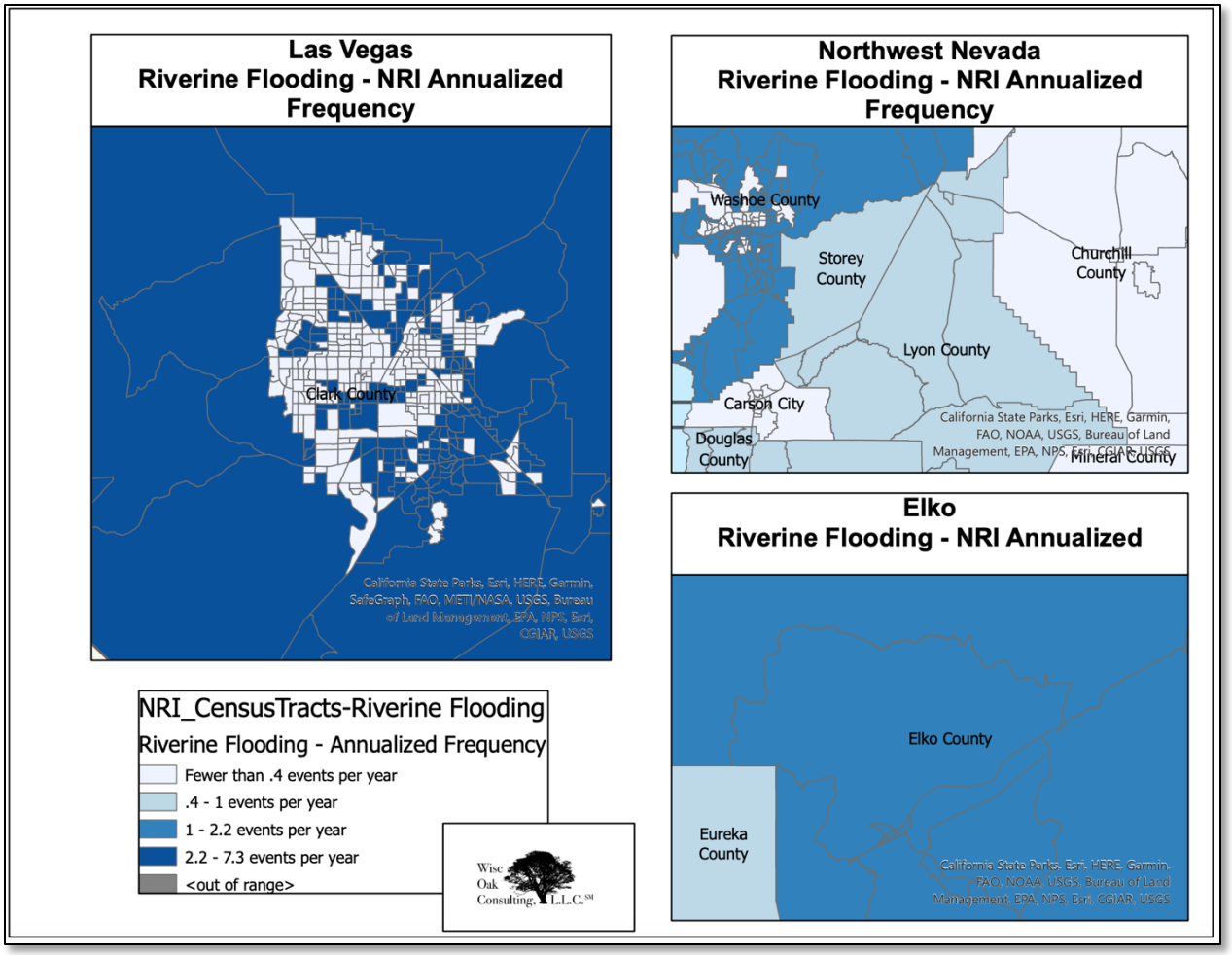


Figure 3-99. Riverine Flooding Annualized Frequency – More Heavily Populated Areas.

3.3.7.3.3 Reducing Flood Damage in Areas of High Flood Probability

The state is working with a variety of stakeholders to reduce the number of properties considered to be at-risk from flooding and to prevent unwise development of properties in high-risk areas due to flooding. If an area has been flooded in the past, it is a best management practice to rebuild infrastructure so it will be more resilient to future flooding. This in turn would result in less threat to life, and damage to property, saving taxpayers money in the long run because money would not be spent on replacing the same buildings and roads over and over again.

An appropriate time for flood risk mitigation activities is often after a recent flood event while the impacted areas are being rebuilt. If a Presidential Disaster Declaration has been made, communities could leverage 406 mitigation grants. The 406 mitigation projects are managed by the Nevada DEM under the Public Assistance, or Infrastructure, program. Mitigating flood risk can be done many ways including having a plan for mitigation activities, floodplain permitting, and adopting higher codes and standards. Flood risk mitigation activities are also discussed during routine NFIP Community audits and used to identify vulnerable populations.

Carson Water Subconservancy District

The Carson Water Subconservancy District (CWSD) is a unique multi-county, bi-state agency dedicated to establishing a balance between the needs of the communities within the Carson River watershed and the function of the river system. The thirteen-member Board of Directors consists of representatives from each of the five counties within the Carson River watershed plus two representatives from the agricultural community. Granted no regulatory authority of its own, the CWSD's mission is to work within existing governmental frameworks to promote cooperative action for the watershed that crosses both agency and political boundaries. One of their guiding principles is to maintain the riverine and alluvial fan floodplains of the Carson River watershed to accommodate flood events. The CWSD strives to involve all counties and communities within the watershed in the efforts to preserve the rich history and unique resources of the Carson River watershed.

Clark County Regional Flood Control District

The Clark County Regional Flood Control District (RFCD) was created in 1985 to develop a coordinated and comprehensive Master Plan to solve flooding problems, to establish and enforce sound drainage design standards, to fund and coordinate the construction of flood control facilities, and to develop and contribute to the funding of a maintenance program for Master Plan flood-control facilities. The District also provides public education regarding flood dangers and monitors rainfall and flow data during storms, disseminating information to appropriate public works and safety crews. The service area for the District includes Clark County and the incorporated cities of Boulder City, Henderson, Las Vegas, Mesquite, and North Las Vegas.

Truckee River Flood Management Authority and the "Living River Plan"

The "Living River Plan" for the Truckee River is a project of cooperative action among state, county, tribal, and PNPs. In the Reno-Sparks-Washoe County area along the Truckee River where the greatest number of repetitive loss properties occurs, several state agencies are cooperating with the Truckee River Flood Management Authority (TRFMA) on their "Living River Plan" which has common goals to reduce flood hazards. The Authority's mission includes preventing the disruption of commerce, transportation, communication, and essential services which have adverse economic impacts; preventing the waste of water resulting from floods; providing for the conservation, development, use and disposal of water and improved quality of water; providing for ecosystem restoration and enhanced recreational facilities; and providing for the safeguarding of the public health. The plan includes replacement of and improvements to many bridges, levees, and floodwalls, as well as construction of terraces and berms. The project will also include the acquisition, elevation, and/or demolition of repetitive loss buildings.

Silver Jackets Program

Federal agencies, including USACE and FEMA are partnering to form a unified forum to address Nevada's flood risk management priorities. Developed at the state level, Nevada DEM and NDWR have formed an active Silver Jackets program that provides a formal and consistent strategy for an interagency approach to planning and implementing measures to reduce the risks associated with flooding and other natural hazards. Involvement from other federal, state, regional, local, and tribal groups within this program will improve and increase flood risk communication with a unified interagency message and help collaboration on flood mitigation, response, and recovery. Vulnerable populations are often prioritized during these efforts as projects are often a vessel to support, create awareness and change in their communities.

Flood Insurance Rate Maps / Special Flood Hazard Areas

The magnitude of flooding used as the standard for floodplain management in the United States is a flood having a 1 percent probability of occurrence in any given year. This 1% annual chance flood is also known as the 100-year flood or base flood. The 100-year floodplain boundaries for identified flooding sources are shown on Flood Insurance Rate Maps (FIRMs) that are prepared by FEMA to show areas with the highest probability of flooding. FIRMs are readily available from FEMA through the Map Service Center website at https://msc.fema.gov/portal/. The areas bounded by 100-year floodplain boundaries are also referred to as SFHAs and are the basis for both flood insurance and floodplain management requirements of the National Flood Insurance Program. The FIRMs also show floodplain boundaries for the 500-year flood, which is the flood having a 0.2 percent chance of occurrence in any given year. Nevada has approximately 3,250 square miles of mapped Special Flood Hazard Areas (SFHAs) (including lakes and reservoirs). Of 3,250 square miles, only about 7% (250 sq. mi.) has had a detailed analysis to determine the base flood (or 100-year flood) elevation or the depth of flooding of the base or 100-year flood. Where available, the base flood elevation or base flood depth is shown on the FIRMs. Locations of mapped SFHAs statewide and for more heavily populated areas are shown below in Figures 3-100 and 3-101 respectively. In Nevada, SFHAs are labeled as Zone A, Zone AO, Zone AH, or Zone AE. Federal mandatory flood insurance purchase requirements apply in each of these zones. The definitions for the various types of SFHAs found in Nevada are:

(a) Zone A – Areas subject to inundation by the 1-percent-annual-chance flood event. Because detailed hydraulic analyses have not been performed, no base flood elevation or depths are shown on FIRMs.
(b) Zone AE – Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base flood elevations are shown on FIRMs within these zones.
(c) Zone AH – Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are 1-3 feet. Base flood elevations derived from detailed hydraulic analyses are shown on FIRMs in this zone.
(d) Zone AO – Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain), including areas of alluvial fan flooding, where average depths are 1-3 feet. Average flood depths derived from detailed hydraulic analyses are shown on FIRMs within this zone.

A SFHA is defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year.

In 2010, FEMA initiated its Risk Mapping, Assessment and Planning (Risk MAP) program for flood hazard mapping. The Risk MAP program builds on flood hazard data and maps produced during the Flood Map Modernization (MapMod) program. During the MapMod program, Nevada's SFHAs, and FEMA's flood maps were brought into the digital age. With the use of GIS, the new maps use aerial imagery and other graphics to communicate flood risks. All of Nevada's counties, except Esmeralda, have or will have Digital Flood Insurance Rate Maps (DFIRMS) shortly. These products are a great tool for flood risk assessment and identifying areas of mitigation interest. In Risk MAP, the vision is to deliver quality data that increases public awareness and leads to action that reduces risk to life and property. Much of the emphasis of Risk MAP is on supporting local communities' planning actions that mitigate flood risks.

Risk Rating 2.0

FEMA's Risk Rating 2.0 methodology delivers flood insurance rates that more accurately reflect flood risk and ensure the National Flood Insurance Program will be here for this generation and

generations to come. Under Risk Rating 2.0, FEMA prices insurance and determines an individual property's flood risk. Individuals will no longer pay more than their share in flood insurance premiums based on the value of their homes. As a result, roughly two-thirds of policyholders with older pre-FIRM homes will see a premium decrease.

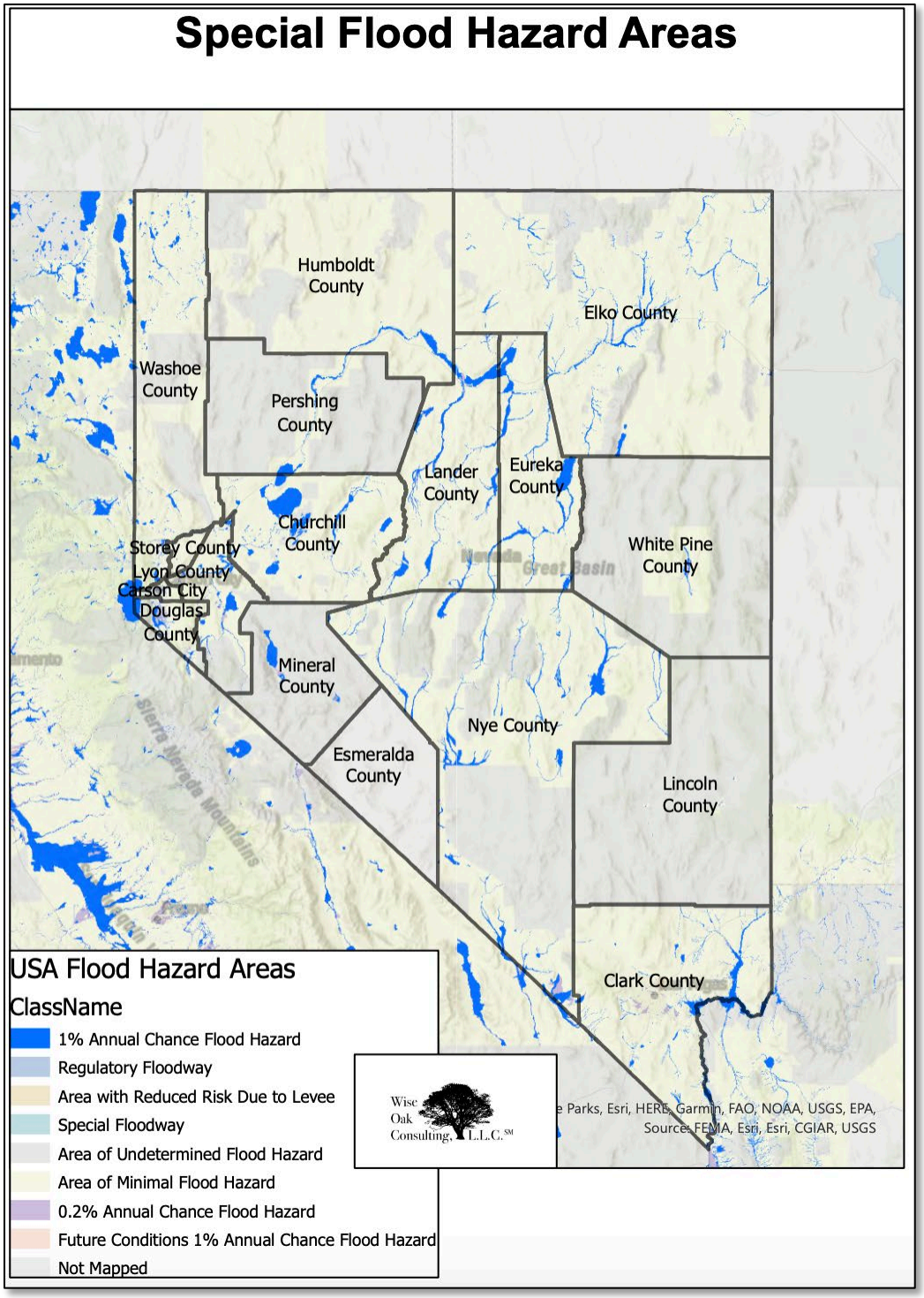


Figure 3-100. Special Flood Hazard Areas - Statewide.

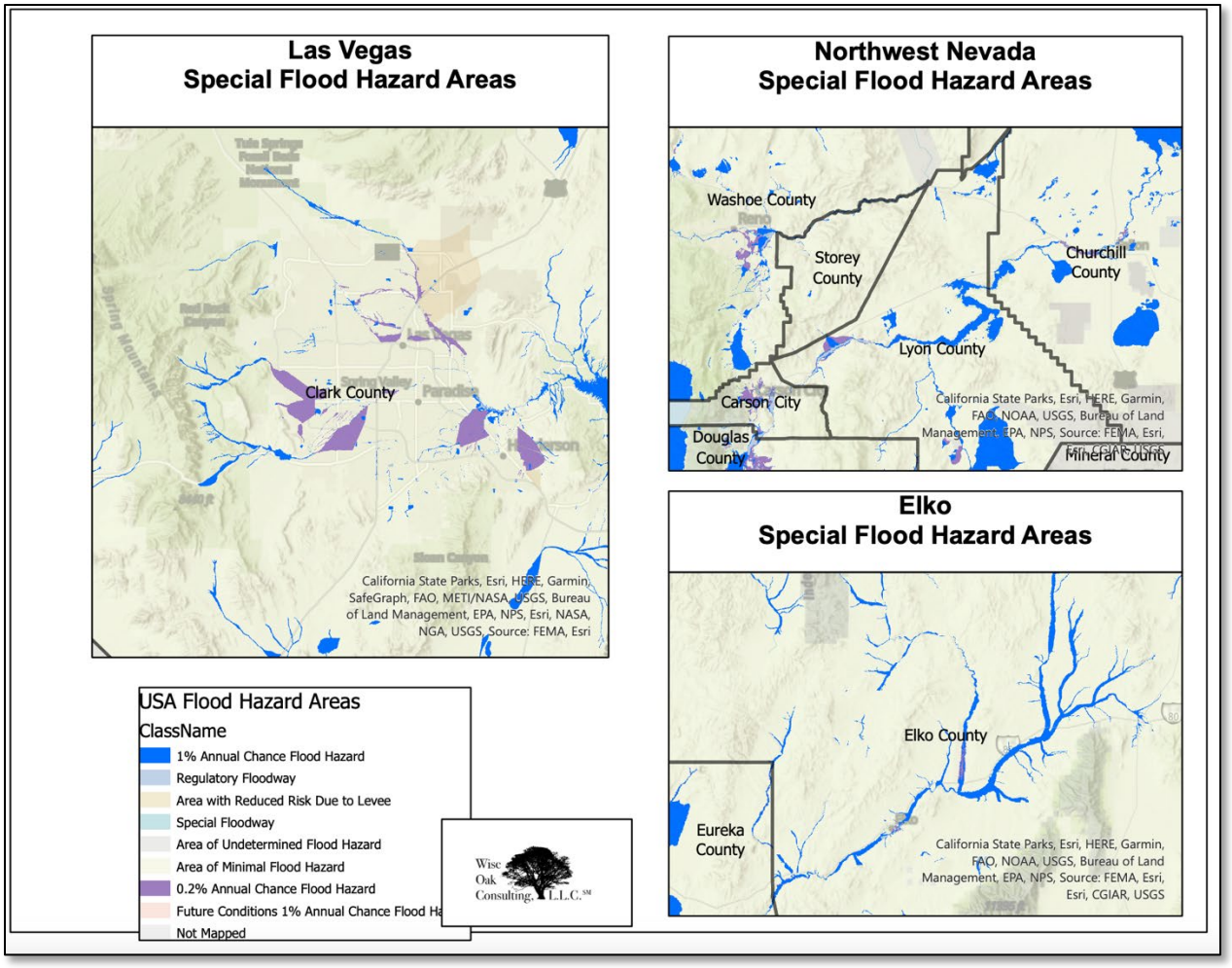


Figure 3-101. Special Flood Hazard Areas – More Heavily Populated Areas.

Flooding caused by dam failure is a special category described in the Section 3.3.7.

3.3.7.4 Climate Change

While Nevada has not had historical flooding trends, analysist have high confidence that there will be more frequent flooding due to a shift from snow to rain and more intense storms – even if precipitation does not increase.[102]

"Fact Sheet FS-21-06," compiled by the University of Nevada, Reno Extension A partnership of Nevada counties; University of Nevada, Reno; and the U.S. Department of Agriculture, 2021, provides a summary of Climate Change in Nevada, a report written as part of Nevada's State Climate Initiative states:

> *"While well known as the driest state, Nevada has experienced many catastrophic floods. Because a warmer atmosphere can carry more water the most extreme storms are expected to become even more extreme. For example, projected near-term and long-term changes in peak annual runoff rates (the maximum daily runoff rate occurring during the average year) are projected to*

[102] University of Nevada, Reno, "Climate Change Impacts in Nevada," March 20, 2023, https://extension.unr.edu/publication.aspx?PubID=3957.

increase more than 25% to 50% above historical peak rates across much of the state, especially in and around many mountain ranges."[103]

Table 3-23. Impacts of Climate Change to Floods[104]	
Public Health	Greater risks to public safety, private property, and public infrastructure
Water Resources	Decrease in water quality May limit the ability to capture rainwater and runoff for water supply (i.e., too much, too fast)
Environment	Increased sheet and riverbank erosion affecting Riparian habitats
Recreation and Hospitality	Flooding impacts downtown areas of Reno and Las Vegas Road closures due to flood and landslide risk following wildfire
Agriculture and Ranching	Increase erosion and soil loss Potential crop loss/damage Damage to water holding and confinement structures Microbial contamination of crops

The State climate assessment projects that warmer temperatures will likely result in more frequent and more intense storms. There will likely be increased flooding due to the warmer temperatures resulting in more precipitation as rain rather than snow. The climate change factors may have a synergistic effect that magnifies the flood risk beyond each factor alone. As seen in Figure 3-102, more precipitation is expected with climate change. The left side of Figure shows an increase of 5% - 15% in the first half of the century for climate change case Representative Concentration Pathways (RCP) 8.5 (little or no action world-wide to reduce greenhouse gases). The right half of Figure 3-102 depicts predicted change in precipitation for both RCP 8.5 and RCP 4.5 (moderate action worldwide to moderate greenhouse gases). While southern Nevada is expected to be dryer, (especially under RCP 8.5), precipitation in much of the state is expected to increase.

[103] Ibid.
[104] Climate Strategy, March 20, 2023.

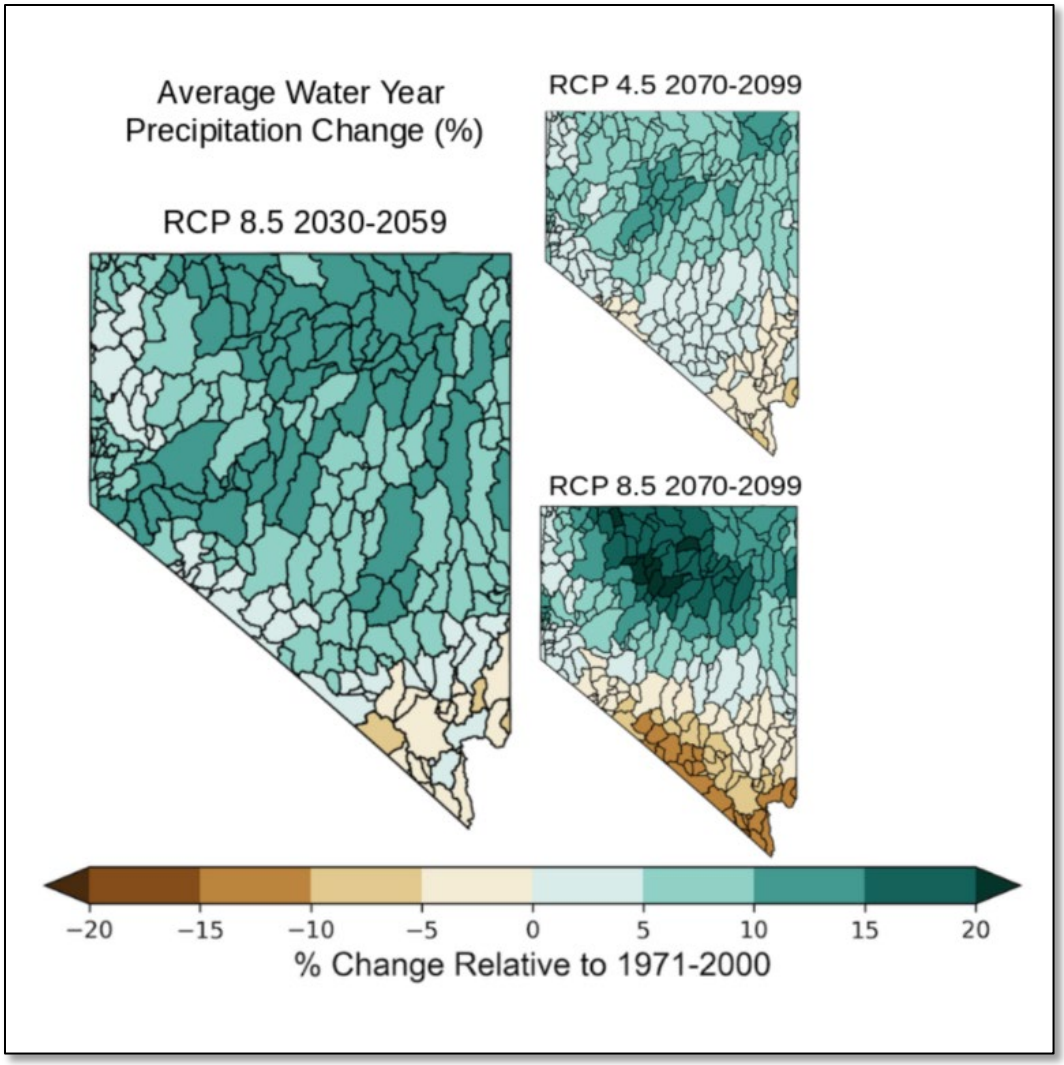


Figure 3-102. Percent Change in Precipitation relative to 1971 – 2000, Due to Climate Change.[105]

In terms of flooding, the OMB cites a 2013 study that predicts that by 2100, the 100-year floodplain area will increase by 40-45%.[106] Since future costs of such a floodplain expansion depend on the full complement of mitigation measures, it is not possible to estimate the increased cost of this actor. The National Flood Insurance Program (NFIP) modelled the increase in average annualize losses (AAL) due to climate change based on a baseline scenario (current losses), based on a 1-in-20 annual loss level, and a 1-in-50 loss level. The 1-in-20 and 1-in-50 annual loss levels are annual loss levels at which the yearly losses are larger than 95% and 98% of loss years, respectively.[107] In 2022, Nevada saw $23.2M in total NFIP payments (losses).[108] Table 3-24 shows estimates of what the annual NFIP payments would be in Nevada under the

[105] Climate Strategy, March 20, 2023.
[106] White House, Office of Management and Budget, "An Assessment of the Federal Government's Financial Risks to Climate Change," April 2020, accessed March 21, 2022, https://www.whitehouse.gov/wp-content/uploads/2022/04/OMB_Climate_Risk_Exposure_2022.pdf.
[107] White House, March 20, 2023.
[108] Federal Emergency Management Agency, "Flood Insurance Data and Analytics," March 21, 2023, https://nfipservices.floodsmart.gov/reports-flood-insurance-data.

OMB's baseline increase, for the 1-in-20, and for the 1-in-50 scenarios.[109] The table assumes the same level of increase for Nevada as for the nation as a whole and uses the same percentage increase over baseline as OMB's calculations. While this may be an over-simplification, it does provide a general picture of the impact of climate change on estimated losses. As can be seen, the baseline estimated losses range anywhere from a 7% increase mid-century for the RCP 4.5 scenario to an 84% increase late-century for an RCP 8.5 scenario. At the extreme, a 1-in-50 loss level, which is already increased over the baseline, increases an additional 54% by the end of the century. All told, this represents almost an eight-fold increase from 2022 losses in Nevada in 2020 dollars.

Table 3-24. Estimated NFIP Average Annualized Loss Due to Climate Change ($1,000s)

Scenario	Baseline	RCP 4.5		RCP 8.5	
		Mid-Century (2050)	Late-Century (2100)	Mid-Century (2050)	Late-Century (2100)
Nevada 2022 NFIP Payments	$23,182	$24,805	$32,455	$26,196	$42,655
Increase over baseline	N/A	7%	40%	13%	84%
1-in-20 loss level	$72,090	$77,136	$97,321	$79,299	$118,228
Increase over baseline	N/A	7%	35%	10%	64%
1-in-50 loss level	$120,264	$128,683	$157,546	$132,290	$185,207
Increase over baseline	N/A	7%	31%	10%	54%

Public Health

Climate change will likely result in greater runoff and flash floods. In addition to the immediate danger to public safety, private property, and public infrastructure from the flooding events, water quality will decrease. The resulting water stagnation that is likely to follow will be conducive to breeding mosquitoes carrying malaria and other water borne diseases such as giardia and cryptosporidium. Such health problems could discourage tourist from choosing Nevada as a destination and impact the economy.

Leisure and Hospitality

Leisure and hospitality is the leading economic sector in Nevada, accounting for 333,900 jobs – 23% of the wages and salary.[110] While much of tourism is focused on gaming, golf, and other summer sports, Nevada, according to the National Ski Areas Association, approximately 113,000 skiers and snowboarders visited Nevada in 2019-2020. The economic impact on leisure and hospitality due to a shorter winter sport season is small.

Agriculture

Agriculture, Forestry, Fishing, and Hunting generated $433M in GDP for the State in 2022. Climate change, with the warming trend and increased expected precipitation in much of Nevada (Figure 3-102), will alter growing regions in Nevada. Yields may actually increase initially in many regions. Higher temperatures and increased annual precipitation may lead to temporary

[109] White House, March 20, 2023.

[110] U.S. Bureau of Labor Statistics, Economy at a glance: Nevada, March 9, 2023, https://www.bls.gov/eag/eag.nv.htm.

increases in productivity and yield, particularly for low irrigation crops. However, flooding results in decreased water quality. In addition, "…the increasing unpredictability of the seasons and competition for water resources are likely to make agriculture a risky economic venture in the future. Milk production and livestock development in general will suffer from heat waves and warmer temperatures..."[111] The conflicting trends prevents making a definitive estimate of the economic impact of floods due to climate change due to floods.

3.3.7.5 Vulnerability of State Assets

The vulnerability of state assets due to this hazard are profiled in detail in sections 3.6 and 3.7. The vulnerability of state critical buildings is provided in Appendix T.

3.3.7.6 Mitigation

This hazard is profiled in detail in sections 3.6 and 3.7. In addition, the state has numerous mitigation actions listed in Section 4. Even though it cannot control the worldwide climate change impact, Nevada can control the increase through mitigation measures such as those in Table 3-25.

Table 3-25. Flood Mitigation Goals and Strategic Actions

Goal/Lead Agency	#	Strategic Action	Changes and reason for (a) modification, or (b) deletion
Goal 1: ***Reduce the loss of life and injuries*** ***Nevada Division of Emergency Management and Nevada Hazard Mitigation Planning Committee***	1.A	Improve awareness of the locations, potential impacts and links among hazards, vulnerability and measures to protect life safety and health.	
	1.B	Provide current information and workshops about hazards, vulnerabilities, mitigation processes and technical assistance for planning and grant availability and application procedures to State and local agencies.	
	1.C	Encourage the incorporation of mitigation measures into repairs, major alterations, new development and redevelopment practices.	
	1.D	Promote the modification of structures to meet life safety standards.	
	1.E	Improve communication, collaboration and integration among stakeholders and promote hazard mitigation as an integrated public policy.	
	1.F	Encourage local governments, special districts and tribal organizations to develop, adopt, implement maintain and update hazard mitigation plans.	The words "maintain and update" were added because a majority of local plans are developed or in progress and will require only maintenance and updating from now on
	1.G	Develop a hazard communication system that can be used to rapidly detect and provide early warning	

[111] University of Maryland, "Economic Impacts of Climate Change on Nevada," March 22, 2023, http://cier.umd.edu/climateadaptation/Nevada%20Economic%20Impacts%20of%20Climate%20Change.pdf.

Table 3-25. Flood Mitigation Goals and Strategic Actions			
		for multiple hazards, including earthquakes and wildfires.	
Goal 2: ***Improve Local Hazard Mitigation Plans Technical Assistance*** ***Nevada Division of Emergency Management and Nevada Hazard Mitigation Planning Committee***	2.A	Provide technical assistance, guidance, resources and tools to local governments and tribal entities to promote hazard evaluation and to develop and update hazard mitigation plans.	Combined 2a and 2b The majority of local plans are developed or area in progress and will require only updating from now on; while most tribes still require plan development.
	2.B	Provide specialized training and exercises to state agency staff and local governments concerning local hazard mitigation planning and the local hazard mitigation plan program.	
	2.C	Maintain a tracking system for local and state government mitigation plans and projects.	Deleted word ”Develop” and added “Maintain” because plan is already developed; and requires only maintenance
	2.D	Provide training to local governments and state agency staff to clarify mitigation measures from response and recovery and preparedness measures.	
	2.E	Maintain a system to allow state agencies with hazard mitigation programs and plans to make recommendations about how local governments can incorporate these in support of the state’s mitigation program efforts.	Deleted word ”Develop” and added “Maintain” because NEHMPC is this system that has been implemented and requires only maintenance
	2.F	Continue to build operational links between hazard mitigation, disaster preparedness and recovery programs with public and private sectors	
	2.G	Promote understanding by the general public of the benefits of hazard mitigation in reducing casualty and property losses and ensuring continuity of businesses, institutional and government functions	
	2.H	Promote coordination among state agencies, local governments and tribal organizations of regional hazard mitigation activities	
	2.I	Identify, enhance, and integrate public education efforts by state and local agencies that have programs directed to hazard mitigation	
Goal 4: ***Reduce the possibility of***	4.A	Protect existing assets, as well as future development, from the effects of flooding.	
	4.B	Identify and prioritize areas in the State where	

Table 3-25. Flood Mitigation Goals and Strategic Actions			
damage and losses due to flooding ***Div. of Water Resources, NEHMPC***		existing flood hazard mapping is inadequate due to planned and existing significant development and conduct flood hazard mapping in those areas.	
	4.C	Conduct flood hazard mapping in piedmont and alluvial fan environments.	
	4.D	Retrofit State buildings to meet NFIP standards.	
	4.E	Assist communities and State with programs to elevate, dry-flood proof or wet-flood proof identified structures to obtain NFIP compliance and/or mitigate repetitive loss structures and severe repetitive loss structures.	Added SRL structures
	4.F	Assist communities and State with programs dealing with repetitive loss structures and severe repetitive loss structures; these programs may involve acquisition and demolition; relocation; elevation or other mitigation strategies.	Added SRL structures and broadened possible mitigation strategies to deal with them.
	4.G	Upgrade State-owned or operated infrastructure (e.g. servicing roads, culverts, bridges, channels, and structures) related to State-owned or operated critical facilities to protect critical facilities from flood damages or disruption of essential services.	
	4.H	Protect existing assets as well as future development from the effects of dam failure.	
	4.I	Maintain inventory of existing dams and add to the inventory as dams are discovered or constructed.	Added "Maintain" because inventory is already developed; and requires only maintenance
	4.J	Inventory and inspect existing dams for structural and hydraulic adequacy and implement operational constraints, if warranted.	
	4.K	Install early warning weather stations in watersheds with dams above populated areas.	
	4.L	Assist communities and State in structural mitigation measures, updates, repairs and maintenance to dams, ditches, and canals.	Added the words "maintenance, ditches, and canals" to incorporate mitigation activities for canals and ditches.
	4.M	Encourage local ordinances and regulations to reduce encroachment into flood-prone zones resulting from dam impoundment or high (non-failure) releases.	
	4.N	Identify hazards of flooding from man-made structures, such as irrigation ditches and canals, and integrate these into local zoning ordinances.	
	4.O	Develop laws and regulations that ensure reasonable standards of design and construction to reduce flood	

Table 3-25. Flood Mitigation Goals and Strategic Actions			
		hazards.	
	4.P	Develop Emergency Action Plans to ensure swift coordinated response in the event of an emergency.	



3.3.8 Infectious Diseases (High Risk)

3.3.8.1 Nature

An infectious disease (aligns with the Nation Risk Index hazard Pandemic) that appears suddenly or presents in greater than normal numbers for a particular location is considered an outbreak. An infectious disease that occurs in greater than normal numbers in several communities or that crosses geographical boundaries is considered an epidemic. The same infectious disease that involves a large population in several countries or continents is considered a pandemic. The use of these terms is somewhat subjective and frequently used interchangeably. Infectious diseases emerge, suddenly or gradually, in various environments, and may spread across a region or even the world. If the disease was previously unknown, then the disease is said to be a *novel disease*. If the disease had never occurred in the region before, it is considered a virgin soil outbreak. If the disease is continuing to spread, or rapidly increasing in incidence or range, it is considered an emerging disease.

These terms are used to illustrate the number of occurrences, size, or scope of the disease impact and the healthcare sector's familiarity with the disease; the terms do not indicate the virulence, mortality, or morbidity of a particular illness. Epidemics are described as contemporary health catastrophes by the World Health Organization (WHO). Epidemics are commonplace in the world. According to the WHO, every country on earth has experienced at least one epidemic since the year 2000. Some epidemics such as the H1N1 (2009), SARS, Ebola and, COVID-19 have developed into pandemics with a global reach, but far more often epidemics strike at lessor geographic levels causing loss of life and livelihoods on a more regional or local level.

Although epidemics and outbreaks of disease have traditionally been associated with disease caused by infectious agents, in the second half of the 20th century the term epidemic has also become associated with non-infectious disease such as obesity and diabetes, or disease caused by lifestyle and environmental factors such as smoking-related heart disease and cancer clusters. In this plan, we will address only epidemic disease caused by infectious agents.

The impact of outbreaks of pathogens on communities differs depending upon the disease, the population of the community, the age of the primary targets, socio-economic situation of the community affected and the public health and medical response capabilities of the affected community. For example, 100 cases of meningitis across Las Vegas may be a concern, but 10 cases of the same meningitis may close the entire school system in Fallon. Four deaths from an infectious disease may not stretch public health resources in Reno but may create an emergency in Yerington.

"Epidemics almost always produce unanticipated questions and novel problems which are likely to vary over the course of the outbreak. Recognizing these problems when they arise and formulating effective responses requires adequate and timely situational awareness."[112] "There is an observable pattern of indicators associated with the demand placed on healthcare and public health infrastructures by routine verses non-routine infectious disease. Indicators of a health security crisis evolve as the extent of the impact to a given community change from that of an event to crisis to disaster. Different patterns of indicators are associated with different types of infectious diseases (e.g., respiratory disease verse mosquito-transmitted disease) and some

[112] iqt. "Roundtable Report: Identifying, Collecting and Analyzing Actionable Intelligence in an Outbreak Event." January 2023. https://assets.iqt.org/pdfs/IQT_Public_Health_Data_Roundtable_Report_Jan_2023_Final.pdf/web/viewer.html

indicators are considered critical and especially characteristic for health security crisis and cannot be missed due to the potential for high consequences."[113]

Disease outbreaks and epidemics are not confined to human populations. Diseases such as hoof-and-mouth disease and mad cow disease, if introduced into the livestock population, could decimate the beef industry for decades. In the past, global pandemics involving avian influenza and birds have also occurred.

Pandemic influenza and other emerging diseases present a major threat to life, economies, and security in an increasingly globalized world. The impact of disease epidemics has increased dramatically as the world becomes ever more interconnected. In the past 25 years, emerging diseases have included: HIV/AIDS, Hepatitis C, Ebola, Lyme disease, Hantavirus, SARS, MERS, COVID-19, Enterovirus D68 Ebola, and Chikungunya virus. Additionally, some "old-school" diseases are now re-emerging as the disease becomes resistant to anti-microbial medications and vaccines. These diseases include things such as: measles, TB, pertussis (whooping cough) and bacterial pneumonia. Trade, commerce, and financial markets are increasingly interrelated.

Some challenges presented by epidemics:

- Epidemics associated with emerging and re-emerging infectious diseases are now occurring in historically unprecedented numbers.
- Inconsistent leadership and politicization of a health crisis creates considerable obstacles to emergency response and efforts to unify public trust[2].
- Warning operations are not specifically funded[2] limiting maintenance of "warm" capabilities and public health and healthcare resources have to acquiesce to the "panic and neglect" cycles that characterize grant funding[1].
- Public health and hospital systems are weak in many areas and vulnerable populations are further stressed by social determinants of health.
- Climate change is believed to be contributing to emerging diseases progressing into new geographies such as Zika, Chikungunya, and other vector borne diseases.

In Nevada, we have seen occurrences of anthrax, whooping cough, and measles. Some of our rodents carry the plague bacteria and the Hantavirus pathogen. In 2009-2010, the H1N1 influenza affected the population in each county and strained our public health capacity. In 2019-2023, COVID-19 affected the Nevada population in ways which included more than ten thousand deaths; 900,000 sick individuals and tens of thousands of hospitalizations. The entire state economy was effectively shut down and international air travel closed. The COVID-19 pandemic is the worst naturally occurring event in the history of Nevada both in terms of lives lost and in terms of economic damage.

3.3.8.2 History

Table 3-26 presents 20th and 21st Century incidences of pandemics, epidemics, and major infectious disease affecting people in the U.S.

Table 3-26. 20th and 21st Century U.S. Pandemics and Epidemic Occurrences

Date	Details
1918-1919	The influenza pandemic of 1918 and 1919, known as the Spanish Flu or Swine 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 (CDC, October 1998).

[113] Wilson, J.W., Lake, C., Matthews, M., Southard, M., Leone, R., McCarty, M. "Health security warning intelligence during first contact with COVID: an operational perspective." *Intelligence and National Security* 37, no. 10 (2022) 216-240.

Table 3-26. 20th and 21st Century U.S. Pandemics and Epidemic Occurrences	
Date	**Details**
1916, 1949	Polio epidemics prior to the advent of the polio vaccine killed over 7,000 people in 1916 and over 3,000 in 1949.
1957, 1968	In the 20th century the world also experienced influenza pandemics in 1957 and 1968, which although were less virulent than the 1918 Spanish Flu, caused millions to be infected and many deaths.
1999, 2002	West Nile Virus (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 4,156 reported cases, including 284 deaths, in 2002 (CDC, July 8, 2003).
1980 – 2000	Physicians began seeing immunodeficiency disorders in gay men. This was the beginning of the AIDS pandemic. In twenty years, AIDS claimed over 40 million people worldwide.
2003	Severe acute respiratory syndrome (SARS) was estimated to have killed 915 and infected 8,422 worldwide by mid-August 2003 (WHO, August 15, 2003). In the U.S., there were 175 suspect cases and 36 probably cases, although no reported deaths (CDC, July 17, 2003).
2003-present	Although most cases go unrecognized, Norovirus is believed to affect over 20 million people in the U.S. each year. Norovirus accounts for 96 percent of all non-bacterial outbreaks of gastroenteritis (Arizona Department of Health Services, March/April 2003).
2009 – 2010	In April of 2009, novel H1N1 influenza virus started to circulate in Mexico. It soon spread to the United States and within 2 months of its first isolation the virus became a global pandemic.
2014-2015	Enterovirus D68 (EV-D68), a non-polio enterovirus, re-emerges in the US. More than 1,150 patients in 49 states experience severe respiratory illness. Most of these cases are in children with a previous history of asthma. 14 deaths occurred and likely millions of others had a mild form of the disease but didn't seek medical attention.
2015	An outbreak of Measles tracked back to an amusement park in CA, resulted in 104 confirmed cases in 14 states. The majority of cases were not vaccinated or did not know if they had ever been vaccinated.
2015	West Africa experiences an epidemic of Ebola which effects more than 28,000 people and results in more than 11,000 deaths worldwide. Cases spread to multiple continents via the air transportation grid, including the USA. Ebola becomes an occupational illness in the US spreading to 2 healthcare professionals who were treating an Ebola patient.
2015	Chikungunya virus was discovered in MX and 29 other countries, after spreading from the Caribbean. CDC adds this to the National Notifiable Disease Surveillance System as a reportable condition starting in Jan. 2016.
2015	Prior to 2015, Zika virus outbreaks occurred in Africa, Southeast Asia, and the Pacific Islands. In July of 2015, Brazil reported an association between Zika and Guillain-Barre syndrome. The Zika virus is spread through mosquito bites and can cause birth defects and neurological disorders. In the U.S., Zika local mosquito-borne transmission has been reported in Brownsville, Texas and South Florida. There has been one symptomatic disease case in Nevada.
2019-current	COVID-19 pandemic starts. This affected the Nevada population in ways which included more than ten thousand deaths; 900,000 sick individuals and tens of thousands of hospitalizations. The entire state economy was effectively shut down and international air travel closed. The COVID-19 pandemic is the worst naturally occurring event in the history

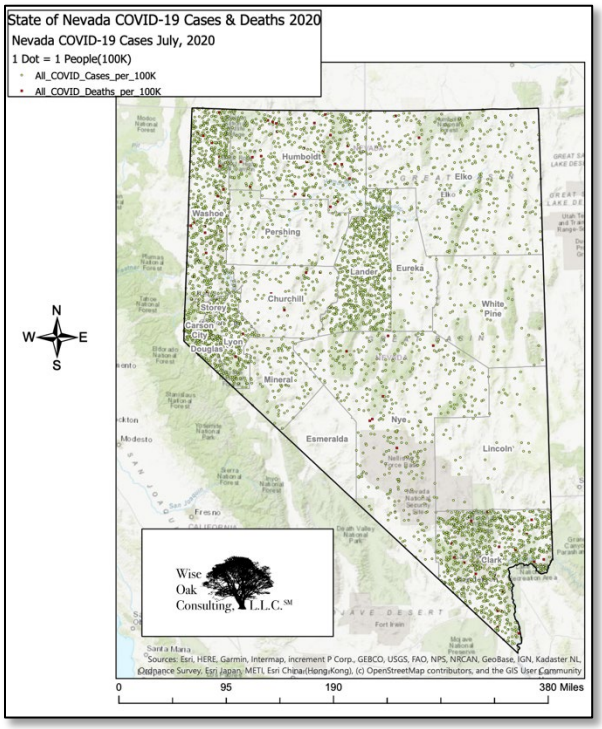
Table 3-26. 20th and 21st Century U.S. Pandemics and Epidemic Occurrences	
Date	**Details**
	of Nevada both in terms of lives lost and in terms of economic damage.
2021	Africa experiences another epidemic of Ebola.
2021	The, world, United States, and Nevada experience outbreaks of Monkeypox, now renamed MPOX. This outbreak had a new transmission method, primarily occurring as a sexually transmitted disease or via close contact.
2022-current	Measles outbreak in Ohio. Currently there are more than 100 reported cases including some requiring hospitalization.
2022-2023	Influenza and RSV cases exceed normal seasonal levels throughout the nation and along with the concurrent COVID-19 pandemic, hospitals exceed capacity including pediatric units and PICUs. This was referred to in the press as a, "Tridemic".

Table 3-27 presents recent historical occurrences or outbreaks in Nevada.

Table 3-27. Recent Historical Occurrences or Outbreaks in Nevada	
Date	**Details**
February 1992	Cholera outbreak confirmed. At least 26 passengers from Aerolineas Argentina 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 were 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 preventing the spread of the disease.
October 2004	Norovirus confirmed at a major public accommodation facility on the Strip in Las Vegas.
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. 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.
2009 - 2012	The novel H1N1 influenza virus became a global pandemic and in Nevada thousands of people were infected leading to 40 deaths.
2014-current	Outbreaks of Bovine Trichomoniasis are frequently dealt with by the Nevada Department of Agriculture.
2015	While no cases of Ebola were present in Nevada, the heightened awareness and, to some extent, fear within the public causes the governor to form an Ebola Task Force to monitor the situation and develop medical response plans. Approximately, 32 persons in NV required active monitoring during this timeframe.
2015	Nevada healthcare personnel treat multiple cases of Measles related to the CA outbreak. Approximately 11 Nevadans were diagnosed or evaluated for measles.

Table 3-27. Recent Historical Occurrences or Outbreaks in Nevada	
Date	**Details**
2019-current	The COVID-19 pandemic starts. This affected the Nevada population in ways which included more than ten thousand deaths: 900,000 sick individuals and tens of thousands of hospitalizations. The entire state economy was effectively shut down and international air travel closed. The COVID-19 pandemic is the worst naturally occurring event in the history of Nevada both in terms of lives lost and in terms of economic damage.
2021	Nevada experienced an outbreak of MPOX. This outbreak had a new transmission method, primarily occurring as a sexually transmitted disease or via close contact. **While most patients could be treated at home, several people required hospitalization, and a few died.**
2022-2023	Influenza and RSV cases exceed normal seasonal levels **in Nevada** and along with the concurrent COVID-19 pandemic **and other respiratory viruses**, hospitals exceed capacity including pediatric units and PICUs. **Nevada was not forced to declare an emergency, however several regulations related to hospital staff licenses and hospital operations had to be relaxed on an urgent basis.**

Figures 3-103 and 3-104 show the rapid spread of COVID-19 across Nevada from July 31, 2020, to October 30, 2020.



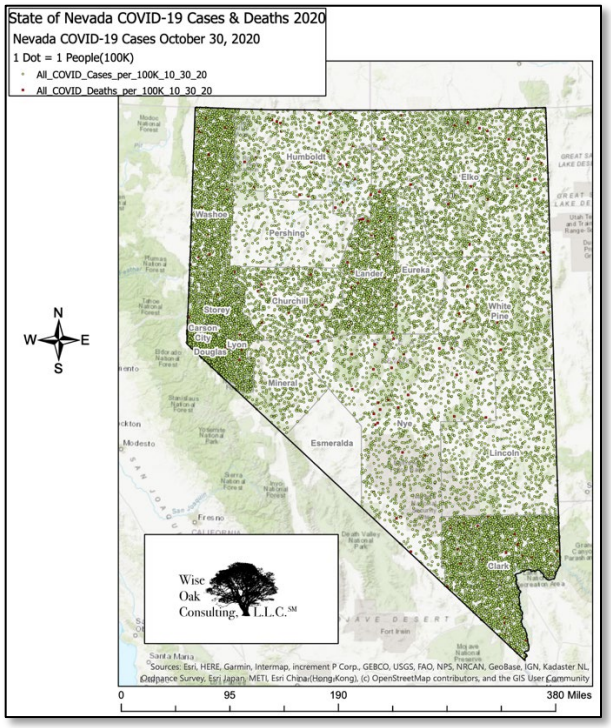


Figure 3-103. COVID-19 Nevada Cases July 2020. **Figure 3-104.** COVID-19 Nevada Cases October 2020.[114]

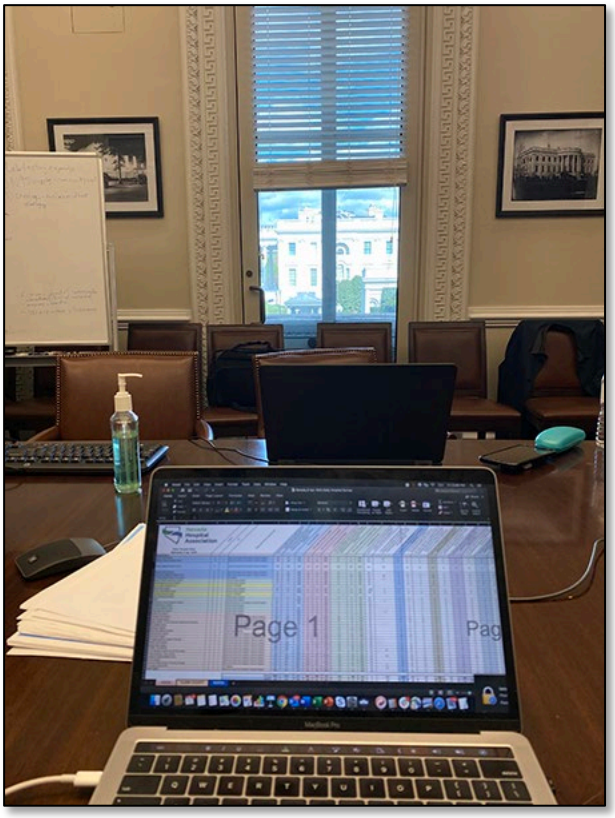
3.3.8.3 Location, Extent, and Probability of Future Events

The recent history and experience of the COVID-19 pandemic has taught us that the location of a pandemic doesn't have to be proximal to Nevada to have major impacts to commerce, supply-chains or to our visitor and travel industries. The COVID-19 pandemic, while isolated to China was creating havoc on supply-chains in the United States even before the disease reached our

[114] Wise Oak Consulting, L.L.C., COVID-19 Case Tracking for the State of Nevada 2020 THIRA/SPR.

shores. Once COVID-19 was detected within Nevada, illness, hospitalizations, death, and economic and political turbulence wasn't far behind.

Nevada has seen three major health crises or public health emergencies within the past five years, making epidemics a very high probability based on the Nevada Hazard Prioritization Criteria. During these events Nevada experienced significant loss of life and individual's quality of life. Emergency response capabilities, economic damage, and geographic effects of all these occurrences were of such a magnitude as to require federal assistance. This places the magnitude of these events in the very high category as well. Warning times are greater than 48 hours in almost all cases of disease outbreak which places the warning time category in the very low category, however very little mitigation progress can be achieved with 48 hours' notice, unlike other natural disasters. The event duration is usually measured in months or years for epidemics, as opposed to days. This also makes the criterion very high on our Nevada Hazard Prioritization Criteria scale. Based on these criteria, and moving away from the "worst-case" scenario, epidemics are evaluated to be a high-risk event.



In Nevada, the Nevada Division of Public and Behavioral Health (DPBH) and Local Health Authorities (LHAs) have surveillance systems in place, in cooperation with CDC to actively test for communicable diseases. Local sentinel providers send specimens to the Nevada State Health Laboratories and are required to report findings to DPBH. Epidemiologists track symptoms and diseases to determine if outbreaks are occurring and if mitigation practices need to be employed.

The Nevada Hospital Association's Community Resilience Program, has created a reactive surveillance program that collects daily information from hospitals in the western United States, including from 100% of Nevada's hospitals. This information monitors hospitalizations of three respiratory viruses (COVID, Flu, and RSV) as well as staffing levels, staff illness occurrences, bed and ICU utilization and availability, as well as inventories of critical supplies. During initial vaccine deployment, the NHA system also monitored the frequency of vaccinated patients requiring hospitalization and intensive care.

Figure 3-105. NHA daily data being analyzed by Vice Presidential staff in the Eisenhower Executive Office Building. **(White House visible through the window)**

Much of the information relevant to understanding a disease outbreak emerges from data created by hospitals. This information includes identification of the pathogen, severity level of the illness, counts and trends of persons infected, number of people seen in emergency rooms, effective clinical treatments, and rate of spread within the hospital. At the outset of the pandemic, few "ready-to-use" data sets existed that public health officials could quickly access and analyze.

The Nevada Hospital Association's reactive surveillance data was one of the few "ready-to-use" sources of data and was pushed daily to the Governor's Update Briefings, the Vice President's COVID Task Force (Figure 3-105) and other local, state, federal and international partners. Today, this information is provided daily to the Nevada Office of Health Analytics, the Southern Nevada Health District Office of Epidemiology, Washoe County Health District, Southern Nevada Fusion Center, and the US Center for Disease Control (US-CDC). It is used to power health district COVID dashboards, metropolitan risk meters and the National Healthcare Safety Network.

Public health professionals have mitigation methods to help keep communicable diseases from becoming epidemics. These methods work to varying degrees based on public cooperation and trust. Required immunizations are the most effective way to protect a community from some infectious diseases, however during the COVID-19 pandemic, civil disobedience, court proceedings and politicization impeded some vaccine mandates. Other ways include public information, personal hygiene, social distancing and in certain cases, isolation and quarantine measures are employed.

In instances when a vaccine or pharmacological counter measure is not available and hospitals are overwhelmed, then the state relies on crisis standards of care (CSC) to manage the numbers of patients. This CSC plan is a public-private partnership that allows the entire medical community of Nevada to come together and modify systems, regulations, and laws in short order to efficiently care for the sick and injured.

For animal disease mitigation, immunizations and disease screenings are used to protect domesticated animals. A large majority of the animals imported into the state of Nevada are required at a minimum to have an examination performed by a licensed veterinarian and a health certificate issued to further aid in animal disease mitigation (pasture to pasture movements are excluded).

If a disease outbreak is present in a localized herd, quarantines, movement restrictions, and possibly culling are options that may be utilized to prevent the spread of disease.

3.3.8.4 Climate Change

It is unknown how climate change will affect the frequency or occurrences of an epidemic in Nevada. Additional monitoring and research will be necessary to quantify any effects. The collection of heat-related hospitalization data is scheduled to start in the summer of 2023 as a first step toward problem recognition and understanding. The health effects of to Extreme Heat due to climate change are in Section 3.3.5.

The World Health Organization (WHO) has reported that, "Vectors, pathogens, and hosts each survive and reproduce within a range of optimal climatic conditions: temperature and precipitation are the most important, while sea level elevation, wind, and daylight duration are also important. Specifically, the WHO has recorded a five-fold increase in malaria epidemic risk the year after El Nino events. Because moisture and temperature are such significant factors, elevated temperatures and extreme rain events resulting from climate change increase the risk. WHO models have shown that climate change increases the transmission of malaria and dengue fever worldwide, and encephalitis in the U.S.

One measured impact due to climate change is the number of days of the mosquito season is growing. As temperatures and humidity increase, so do the number of mosquito days. As seen in the Extreme Heat Floods Sections, Nevada expects both increased temperatures and increased rain in much of the state.

Climate change could lead to an increase in the incidence and spread of infectious diseases in Nevada, especially those transmitted by vectors such as mosquitoes and ticks, as warmer temperatures and changes in precipitation patterns create more favorable conditions for their survival and reproduction. For example, climate change is believed to be contributing to emerging diseases progressing into new geographies such as Zika, Chikungunya, and other vector borne diseases. West Nile virus, which is transmitted by mosquitoes, has been found to increase in areas where temperatures are warmer and more humid. Additionally, tick-borne diseases such as Lyme disease may become more prevalent in Nevada as the range of ticks expands due to warmer temperatures. Climate change could also affect water quality and availability (discussed in Drought and Floods Sections), leading to the emergence and spread of waterborne diseases such as cholera and cryptosporidiosis.

It is important for public health officials in Nevada to monitor the impact of climate change on infectious diseases and take appropriate measures to prevent and control their spread. This may include implementing effective vector control strategies, promoting public education and awareness, and improving surveillance and early warning systems for infectious diseases. More studies and analysis are needed to develop more specific quantitative analysis.

3.3.8.5 Vulnerability of State Assets

While infectious diseases impact state operations, they generally do not caused damage to assets. The most significant impact is on cleaning and disinfecting facilities and equipment.

3.3.8.6 Mitigation

Mitigation actions are focused on preparedness actions rather than permanent facility actions. As such they are funded through health and prepearendess grants rather than mitigation grants.

3.3.9 Infestation (Low Risk)

3.3.9.1 Nature

An "invasive species" is defined as a species that is:

1) Non-native (or alien) to the ecosystem under consideration and
2) Whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Invasive species can be plants, animals (including aquatic species) and other organisms (e.g., microbes). Source: USDA, National Agriculture Library (10/5/2007)

Infestations impact Nevada's economy through the destruction of crops and natural resources, which also impacts recreation and tourism. Some of the plant infestations are highly flammable and assist in the spread of wildfires. Human actions are the primary means of introduction and spread of invasive species.

3.3.9.2 History

The Nevada Department of Agriculture (NDA) monitors the introduction and spread of noxious weeds in the state. They have developed a categorization scheme for control of noxious weeds with Category "C" being the most .widespread. Below is the NDA's Noxious Weed List as designated by application of NRS 555.010.

Nevada Noxious Weed List:

NRS 555.130 Designation of noxious weeds. The State Quarantine Officer may declare by regulation the weeds of the state that are noxious weeds, but a weed must not be designated as noxious which is already introduced and established in the State to such an extent as to make its control or eradication impracticable in the judgment of the State Quarantine Officer.

NAC 555.010 Designation and categorization of noxious weeds. (NRS 555.130)

Regardless of category, per statutes, all landowners are responsible to control any noxious weeds found on their property. The plants listed below are designated noxious weeds and categorized as follows:

- **Category A** weeds are generally not found or limited in distribution throughout the State. Such weeds are subject to active exclusion from the State and active eradication wherever found and active eradication from the premises of a dealer of nursery stock.
- **Category B** weeds are generally established in scattered populations in some counties of the State. Such weeds are subject to active exclusion where possible and active eradication from the premises of a dealer of nursery stock.
- **Category C** weeds are generally established and widespread in many counties of the State and are subject to active eradication from the premises of a dealer of nursery stock. Abatement is at the discretion of the state quarantine officer.

Table 3-28 contains a listing of noxious weeds that threaten Nevada; it is maintained online by NDA at this link: http://agri.nv.gov/Plant/Noxious_Weeds/Noxious_Weed_List/

Table 3-28. Noxious Weeds that Threaten Nevada

Category A Weeds	
African rue	*(Peganum harmala)*
Austrian fieldcress	*(Rorippa austriaca*
Barbed goatgrass	*(Aegilops triuncialis)*
Buffelgrass	*(Pennisetum ciliare)*
Camelthorn	*(Alhagi pseudalhagi)*

Table 3-28. Noxious Weeds that Threaten Nevada	
Common crupina	*(Crupina vulgaris)*
Curly leaf pondweed	*(Potamogton crispus)*
Desert knapweed	*(Volutaria tubuliflora)*
Dyer's woad	*(Isatis tinctoria)*
Eurasian water-milfoil	*(Myriophllum spicatum)*
Flowering rush	*(Butomus umbellatus)*
Giant salvinia	*(Salvinia molesta)*
Goats rue	*(Galega officinalis)*
Green fountain grass	*(Pennisetum setaceum)*
Houndstongue	*(Cynoglossum officinalis)*
Hydrilla	*(Hydrilla verticillate)*
Iberian starthistle	*(Centaurea iberica)*
Jointed goatgrass	*(Aegilops cylindrical)*
Klamath weed	*(Hypericum perforatum)*
Malta starthislte	*(Centaurea melitensis)*
Mediterranean sage	*(Salvia aethiopis)*
Purple loosestrife	*(Lythrum salicaria & virgatum)*
Purple starthistle	*(Centaurea calcitrapa)*
Rush skeletonweed	*(Chondrilla juncea)*
Stinkwort	*(Dittrichia graveleons)*
Squarrose knapweed	*(Centaurea virgata)*
Sulfur cinquefoil	*(Potentilla recta)*
Syrian bean caper	*(Zygophyllum fabago)*
Swainsopea	*(Sphaerophysa salsula)*
Ventenata	*(Ventanata dubia)*
Yellow starthistle	*(Centaurea solstitialis)*
Yellow toadflax	*(Linaria vulgaris)*
Category B Weeds	
Black henbane	(Hysocyamus niger)
Carolina horse nettle	*(Solanum carolinense)*
Dalmatian toad flax	(*Linaria dalmatica)*
Diffuse knapweed	(*Centaurea diffusa)*
Giant reed	*(Arundo donax)*
Leafy spurge	*(Euphorbia esula)*
Medusahead	(Taeniatherum caput-medusae)
Mayweed chamomile	*(Anthemis cotula)*
Perennial sowthistle	(Sonchus arvensis)
Sahara mustard	*(Brassica tournefortii)*
Silver leaf nightshade	*(Solanum elaegnifolium)*
Spotted knapweed	*(Centaurea maculosa)*
Category C Weeds	
Canada thistle	(*Cirsium arvense*)
Hoary cress	(*Cardaria draba*)
Johnsongrass	(*Sorghum halepense*)

Table 3-28. Noxious Weeds that Threaten Nevada	
Musk thistle	(*Carduus nutans)*
Perennial pepperweed	(*Lepidium latifolium)*
Poison hemlock	(*Conium maculatum)*
Puncture vine	*(Tribulus terrestris*)
Russian knapweed	(*Acroptilon repens)*
Salt cedar	*(Tamarix spp.)*
Scotch thistle	*(Onopordum acanthium)*
Water hemlock	*(Cicuta maculata)*

Other invasive plants that are too widely distributed in Nevada to be included in the noxious weed list but present problems in Nevada are listed below:

- *Bromus tectorum* L. or Cheatgrass: is an annual grass that forms tufts up to 2 feet tall. The leaves and sheathes are covered in short soft hairs. The flowers occur as drooping, open, terminal clusters that can have a greenish, red, or purple hue. These annual plants will germinate in fall or spring (fall is more common) and senescence usually occurs in summer. Cheatgrass invades rangelands, pastures, prairies, and other open areas. Cheatgrass has the potential to completely alter the ecosystems it invades. It can completely replace native vegetation and change fire regimes. It occurs throughout the United States and Canada, but is most problematic in areas of the western United States with lower precipitation levels such as Nevada. Cheatgrass is native to Europe and parts of Africa and Asia. It was first introduced into the United States accidentally in the mid-1800s.
- *Bromus rubens L*. or Red brome*:* In the North American region red brome is reported to be invasive because it faces low herbaceous competition. Once established, it has the potential to compete with other grasses. The accumulation of litter and necromass has the potential to increase fire frequency in the desert. Red brome-fueled fires result in the loss of native perennial species in invaded areas, resulting in disturbed areas that are ideal for increased growth of red brome.

For further information or comments specific to noxious or invasive plants and/or the NDA Noxious Weed Programs please contact https://agri.nv.gov/Divisions/.

Animal infestations - Insects

The USDA National Invasive Species Information Center maintains a website with up-to-date information on invasive species affecting each state at the following link:
http://www.invasivespeciesinfo.gov/animals/main.shtml

Invertebrate Species

Invertebrate species are animals which lack a spine or backbone. Example species include spiders and other insects; round, segmented, and flat worms; jellyfish; squids; sponges; and others.

The following is a list of invasive invertebrate species infestations currently affecting or are threats to Nevada:

Africanized Honeybee (Apis mellifera scutellata)
Asian Citrus Psyllid (Diaphorina citri)
Asian Long-Horned Beetle (Anoplophora glabripennis)
Asian Tiger Mosquito (Aedes albopictus)
Brown Marmorated Stink Bug (Halyomorpha halys)
Cactus Moth (Cactoblastis cactorum)
Chilli Thrips (Scirtothrips dorsalis)
Citrus Longhorned Beetle (Anoplophora chinensis)
Common Pine Shoot Beetle (Tomicus piniperda)
Emerald Ash Borer (Agrilus planipennis)
European Gypsy Moth (Lymantria dispar)

European Spruce Bark Beetle (Ips typographus)
Formosan Subterranean Termite (Coptotermes formosanus)
Giant African Snail (Lissachatina fulica)
Glassy-Winged Sharpshooter (Homalodisca vitripennis)
Hemlock Woolly Adelgid (Adelges tsugae)
Light Brown Apple Moth (Epiphyas postvittana)
Mediterranean Fruit Fly (Ceratitis capitata)
Mexican Fruit Fly (Anastrepha ludens)
Pink Bollworm (Pectinophora gossypiella)
Pink Hibiscus Mealybug (Maconellicoccus hirsutus)
Red Imported Fire Ant (Solenopsis invicta)
Russian Wheat Aphid (Diuraphis noxia)
Silverleaf Whitefly (Bemisia argentifolii)
Sirex Woodwasp (Sirex noctilio)
Soybean Cyst Nematode (Heterodera glycines)

Vertebrate Species

Vertebrate species are animals with backbones or spinal columns. In some cases, closely related species such as the hagfish which lack a spine but have a bony skull or cranium are included in the group. Example species include bony fish, sharks, rays, amphibians, reptiles, mammals, and birds.

The following is a list of invasive vertebrate species infestations currently affecting Nevada:

Burmese Python *(Python molurus bivittatus)*
Brown Tree Snake *(Boiga irregularis)*
Cane Toad *(Rhinella marina)*
European Starling *(Sturnus vulgaris)*
Wild Boar *(Sus scrofa)*

Although not listed as an invasive species, *Anabrus simplex* or Mormon crickets are flightless, ground- dwelling insects native to the western United States that cause periodic infestations in Nevada. They eat native, herbaceous perennials (forbs), grasses, shrubs, and cultivated forage crops, reducing feed for grazing wildlife and livestock. In large numbers, their feeding can contribute to soil erosion, poor water quality, nutrient depleted soils, and potentially cause damage to range and cropland ecosystems. Drought encourages Mormon cricket outbreaks, which may last several years (historically 5 to 21 years) and cause substantial economic losses to rangeland, cropland, and home gardens. Regional distribution of Mormon crickets is shown in Figure 3-106.

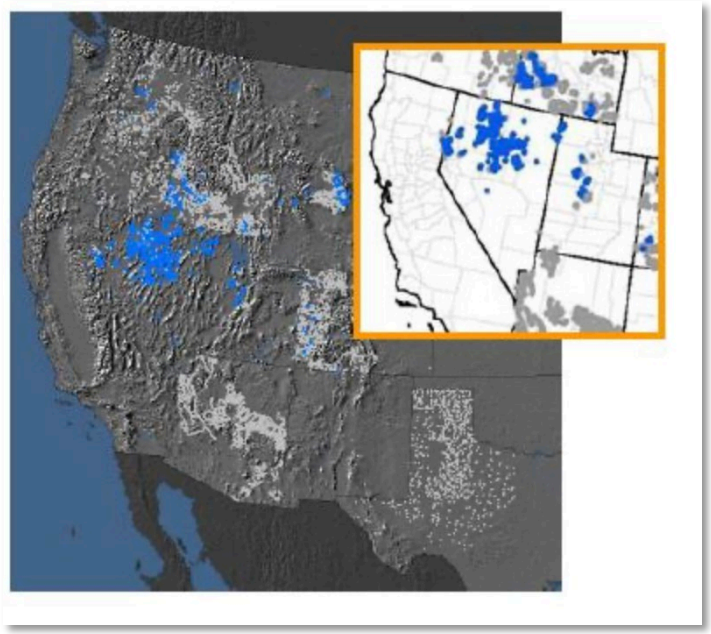


Figure 3-106. Regional Distribution of Mormon Crickets (Blue = high density, gray = low density).[115]

[115] University of Nevada Cooperative Extension, Identification and Management of Mormon Crickets, March 24, 2024, https://extension.unr.edu/publication.aspx?PubID=2346.

Animal infestations – aquatic species

In June 2011, AB 167 was passed directing the Nevada Department of Wildlife (NDOW) to develop a coordinated statewide aquatic invasive species (AIS) management plan to control and prevent the spread of species such as quagga mussels and many others. The bill makes it illegal to deliberately introduce any aquatic invasive species into Nevada waters. NDOW has implemented a statewide boat inspection and decontamination program for high-risk waters, exclusive of the Lake Tahoe basin where that program is conducted by the Tahoe Regional Planning Agency (TRPA). NDOW also has implemented an early detection monitoring program and a rapid response plan for new invasions. A comprehensive Nevada AIS Management Plan was completed in 2017. NAC 503.074 identifies certain species as aquatic invasive species:

NAC 503.074 Aquatic invasive species: Mollusks. (NRS 501.105, 501.181, 503.597) For the purposes of NRS 503.597, the following species are classified as aquatic invasive species:

1. Golden mussels.....*Limnoperna fortunei*
2. New Zealand mud snails.....*Potamopyrgus antipodarum, P. jenkinsi*
3. Quagga and zebra mussels.....All species in the genus *Dreissena*

At this time 144 nonindigenous aquatic species are tracked by USGS in Nevada with regular updates reported online on this website: http://www.invasivespeciesinfo.gov/unitedstates/nv.shtml These include many fish, several plants, and a few invertebrate aquatic species that have become of particular concern in Nevada in recent years such as zebra mussels, quagga mussels, Asian clams, and New Zealand mud snails.

Quagga mussels, *Dreissena bugensis,* were first found at Lake Mead in 2007. Since that time, the population has exploded, now numbering in the trillions. The closely related zebra mussel, *Dreissena polymorpha*, has not been confirmed to occur in Nevada but both mussels are nuisance invasive species that are reproducing quickly and in large numbers. They are biofoulers that obstruct pipes in municipal and industrial raw-water systems, requiring millions of dollars annually to maintain. They produce microscopic larvae that float freely in the water column, and thus can pass by screens installed to exclude them. Monitoring and control of these mussels cost millions of dollars annually. As filter feeders, zebra and quagga mussels remove suspended material from the habitat in which they live. This includes the planktonic algae that are the primary base of the food web. Thus, these mussels may completely alter the ecology of water bodies in which they invade. In 2010, New Zealand mudsnails were found at a Lake Tahoe Basin inspection, and UNR research has determined that Lake Tahoe water can support quagga mussels. Proactive measures are being taken by a number of groups to prevent the spread of these species into Lake Tahoe and other high risk waters statewide.

The **Asian clam**, *Corbicula fluminea,* has been present in the Colorado River basin in Nevada for many years but is now becoming established in Lake Tahoe. Asian clams can impact Lake Tahoe's environment by:

- Releasing nitrogen and phosphorus to the lake, resulting in algal blooms.
- Negatively impacting drinking water by clogging intake pipes.
- Littering beaches with their sharp shells, negatively impacting recreation.

Asian Clam Removal Project

There is an ongoing aquatic invasive species mitigation project initiated in 2010 by the Tahoe Resource Conservation District (Tahoe RCD) to physically remove Asian clams from south shore areas of Lake Tahoe by installing two-½ acre plots of plastic 45 mil pond liner and thin rubber matting on the lake bottom along the southeast shore of the lake in Marla Bay near Lakeside Marina, to cover and terminate Asian clam populations by reducing oxygen and food

availability. The project is a multi-agency collaborative effort with multiple funding sources including: UNR, University of California, Davis (UC Davis), USFWS, TRPA, CA State Parks, NDEP, Lahontan WQCB, and Lake Tahoe Water Purveyors. The forty-two 10' x 100' barriers were then removed in early November, 2011 and researchers from UC Davis and UNR will monitor the experimental plots for the next year to determine whether or not Asian clam populations are reestablishing. The goals of the project have been to understand the effects of the mats on Asian clams and the feasibility of using the treatment in other areas of the lake. In 2011, the project expanded to Emerald Bay where a small population of Asian clams has colonized at the mouth of the bay. Tahoe RCD will continue to manage and coordinate these efforts in collaboration with its partners and funders.

New Zealand Mudsnail, *Potamopyrgus antipodarum* is a nuisance aquatic species now reported in a few Nevada streams along the periphery of the state, (see map in Figure 3-107) with the addition most recently in 2012 and 2013 of documentation in the Truckee River from Mayberry Park to the East McCarran bridge in Reno and on Maggie Creek, a tributary to the Humboldt River near Carlin in Elko County. It is reported in all western states, except New Mexico, and is listed as an invasive species in California. It reproduces rapidly and competes for food with native gastropods and other species and is detrimental to trout populations because of its lack of nutritional value. It is not yet a huge problem but is being monitored in the state and may become more of a problem in the future.

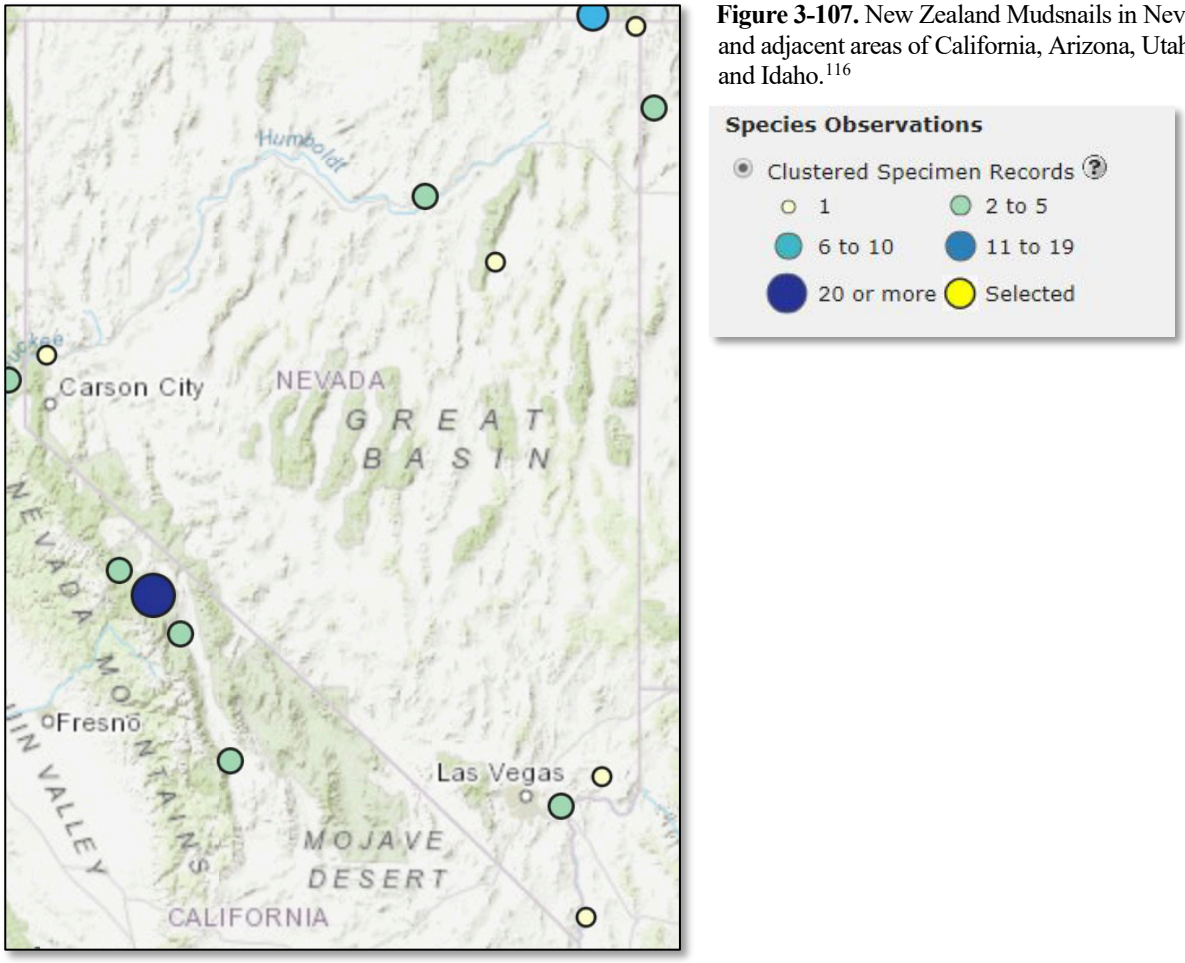


Figure 3-107. New Zealand Mudsnails in Nevada and adjacent areas of California, Arizona, Utah, and Idaho.[116]

[116] US Geological Survey, "NAS – Nonindigenous Aquatic Species," March 24, 2023, https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=1008.

The Tahoe Resource Conservation District (RCD) has a program to prevent and control (remove) various species as depicted in Table 3-29.[117]

Table 3- 29. Lake Tahoe Invasive Species Program

Program	Flora	Fauna
Control (Remove)	Eurasian watermilfoil	Largemouth bass
	Curly-leaf pondweed	Smallmouth bass
		Black crappie
		Bluegill
		Brown bullhead
		Goldfish
Prevention	All invasive species	All invasive species
		Quagga mussels
		Zebra mussels
		New Zealand mudsnails

Aquatic weed removal

A second AIS mitigation project by Tahoe RCD involved aquatic weed removal (particularly Eurasian watermilfoil, Category A noxious weed, as well as Curly leaf pondweed) begun in April and September 2010 at Elks Point Marina and summer of 2011 in Emerald Bay near the Vikingsholm swim beach and pier, the Parson's Rock area, and near Avalanche Beach. The removal effort is a collaborative effort between the Tahoe RCD, TRPA, and the California Department of Parks and Recreation. The work was accomplished by deploying over 20,000 square feet of bottom barrier and by significant diver-assisted hand removal of invasive weeds resulting in near-eradication of weeds in part of the affected area.

The Truckee Meadows Water Authority (TMWA) is continuing and expanding its boat inspection program at Lake Tahoe that began with a $231,000 from the Truckee River Fund, money collected from utility bills to pay for projects and protect the Truckee River in spring 2010. The program efforts have included monitoring lakes and reservoirs within the Truckee River system for the presence of adult or juvenile mussels. It expanded at Lake Tahoe in 2012 to six highway boat inspection stations located at Spooner, North Star, Alpine Meadows Road, Homewood Ski Resort parking lot, and Myers at the intersection of U.S. 50 and 89 and the Diamond Peak parking lot in Incline Village.

The Southern Nevada Water Authority (SNWA), in cooperation with the Lake Mead National Recreation Area, UNLV, UNR, and other agencies have developed an Interagency Monitoring Action Plan to coordinate the collection and sharing of quagga mussel data for Lake Mead. No live adult quaggas have been found at SNWA treatment facilities and improvements are being implemented to prevent the colonization of the intake structures by mussels. Although quagga larvae have been found in the raw Lake Mead water as it comes into the treatment plants, SNWA's water treatment processes have been successful in destroying all quagga before they get into the drinking water system.

3.3.9.3 Location, Severity, and Probability of Future Events

[117] Lake Tahoe Resource Conservation District, "Aquatic Invasive Species Program," March 24, 2023, https://tahoercd.org/our-work/aquatic-invasive-species/.

Noxious weed species distribution has a high probability to expand outward from currently known geographic locations as described above and as shown on species distribution maps throughout the state at the following link: http://www.eddmaps.org/distribution/

The severity of noxious weed infestations is continuously monitored by NDA's A, B, and C categorization of noxious weeds described in the previous section. In order to combat the spread of noxious weed infestations, the NDA continues to work with counties to enforce sections of statute for the abatement of noxious weeds. An increase in the need for regulatory enforcement is expected in future years to address problems associated with expanding noxious weed infestations. Locations of infestations of some other insects and aquatic species are described in the previous section as well.

The NHM Working Group agreed that plant, insect, and aquatic organism infestations will continue to occur throughout the state as recreation and commerce continue to move people and property across state lines. Cooperative efforts are necessary among state, federal, agencies and other interested regional groups to implement programs to control and mitigate the effects of infestations on all aspects of the state's environment and economy.

The Western Regional Panel on Aquatic Nuisance Species submitted the "Quagga-Zebra Mussel Action Plan for Western U.S. Waters" to the Aquatic Nuisance Species Task Force in February 2010 by the Western Regional Panel on Aquatic Nuisance Species.[118] It details a plan for control and outlines initial costs, and charts current states' progress on control efforts including developing their own management plans for quagga and zebra mussel control. The Panel updated its recommendations in 2020.[119]

The Nevada Aquatic Invasive Species Management Plan was completed in September 2017 and has been submitted to the Aquatic Nuisance Species Task Force for approval.[120] The plan is intended to present a comprehensive and realistic approach to minimizing AIS impacts to Nevada and regionally, using a multi-stakeholder approach and focusing on the species with the highest potential to have negative economic, ecological and recreational impacts. The goals of the AIS plan are to:

1. prevent new introductions of AIS to Nevada,
2. limit the spread of existing AIS populations and eradicate or control existing AIS populations, and to
3. minimize harmful impacts resulting from AIS.

These efforts have been strengthened since the last iteration of the plan by the passage or amendment of specific statutes and regulations including:

- NRS 488.530 identifies requirements to comply with watercraft AIS inspections and the authority of peace officers to enforce those requirements.
- NRS 488.533 provides authority to impound or quarantine infested watercraft until aquatic invasive species or aquatic plant material is completely removed.
- NRS 503.597 makes it illegal to transport any aquatic invasive species in the state and provides specific penalties for intentional introductions.
- NAC 488.520 identifies requirements to decontaminate a vessel or conveyance
- NAC 503.072 defines Injurious aquatic species

[118] Western regional Panel on Aquatic Nuisance Species, "Quagga-Zebra Mussel Action Plan for Western U.S. Waters," May, 2009, accessed March 24, 2024, https://www.waterboards.ca.gov/water_issues/programs/swamp/ais/docs/qzap051109.pdf.
[119] Western Regional Panel on Aquatic Nuisance Species, "Updated recommendations for the Quagga and Zebra Mussel Action Plan for Western U.S. Waters," September 29, 2020, accessed March 24, 2023, https://westernregionalpanel.org/wp-content/uploads/2020/12/QZAP-2.0-Final.pdf.
[120] Nevada Department of Wildlife, "2017 Nevada Aquatic Invasive Species Management Plan," accessed March 24, 2023.

- NAC 503.074 defines aquatic invasive species

NDOW conducts early detection monitoring at high-risk waters statewide outside of the Colorado River Basin. That monitoring is focused on quagga and zebra mussels and consists of both visual (adult) surveys and plankton tows which are analyzed using both microscopy and DNA techniques to identify possible presence of mussel veligers. Most target waters are sampled multiple times each year during the active recreational boating season. Designated high-use waters have seasonal watercraft inspection stations during the boating season to intercept and inspect incoming watercraft to prevent AIS introductions, in addition to two highway inspection stations targeting watercraft that could be transporting AIS from the Colorado River basin or other locations to central/northern Nevada waters or adjacent states.

3.3.9.4 Climate Change

While further study and analysis is required to quantify the impact of climate change on infestations, there are clear impact due to climate change. Climate change can have significant impacts on invasive species in Nevada, affecting their distribution, abundance, and ecological interactions with native species. Warmer temperatures, changes in precipitation patterns, and increased frequency and severity of extreme weather events can create new opportunities for invasive species to establish and thrive in new areas, as well as expand their ranges and outcompete native species.

One example of this is the impact of climate change on cheatgrass (Bromus tectorum), an invasive plant that has already caused extensive ecological and economic damage in Nevada and other western states. Studies have shown that warming temperatures and reduced snowfall associated with climate change have led to earlier and more rapid cheatgrass growth, which can increase the frequency and intensity of wildfires and further promote the spread of this invasive species.[121] [122]

Another example is the impact of climate change on invasive aquatic species in Nevada, such as quagga and zebra mussels (Dreissena rostriformis bugensis and Dreissena polymorpha). These species can disrupt native ecosystems and cause significant economic damage to water infrastructure, and warming water temperatures associated with climate change can increase their reproductive rates and range expansion.[123]

Overall, the impacts of climate change on invasive species in Nevada are complex and multifaceted and can have far-reaching ecological and economic consequences. Effective management and mitigation strategies will require a comprehensive understanding of the interactions between climate change, invasive species, and native ecosystems.

3.3.9.5 Vulnerability of State Assets

Subject matter experts do not assess that there is appreciable vulnerability to state assets due to this hazard.

3.3.9.6 Mitigation

Subject matter experts have assessed that there is no appreciable vulnerability of state assets due to this hazard. Therefore, the hazard profile is for information purposes only and mitigation projects will not be pursued for this hazard in 2023-2028.

[121] Balch, J. K., Bradley, B. A., D'Antonio, C. M., & Gómez-Dans, J. (2013). Introduced annual grass increases regional fire activity across the arid western USA (1980–2009). Global change biology, 19(1), 173-183.

[122] Bradley, B. A., Mustard, J. F., & Fleishman, E. (2016). Climate change, cheatgrass, and the fate of sagebrush ecosystems. Biological Conservation, 204, 48-57.

[123] Karatayev, A. Y., Burlakova, L. E., & Padilla, D. K. (2015). Impacts of climate change on aquatic invasive species. In Biological Invasions and Its Management in China (pp. 217-236). Springer, Singapore.

3.3.10 Landslides and Debris Flow (Low Risk)

3.3.10.1 Nature

A landslide is the movement of rock, soil, and/or debris downslope. Landslides occur when the force of gravity overcomes the strength of earth materials on the slope, resulting in failure. A stable slope can be made unstable by an increase in the gravitational force or a decrease in the strength of the slope (resisting force). Increases in gravitational forces may be caused by added weight to the slope including human activity or heavy rain. Decreases in the strength of supporting materials include weathering, 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 results in reduced friction and may lead to slope failure. Landslides may be induced by shaking from earthquakes, heavy rainfall (especially on fire-burned slopes and vegetation-stripped areas where large amounts of runoff can occur), and volcanic activity (accompanied by earthquakes and ash and debris deposition on slopes). Debris flows — moving masses of rock fragments, soil, and mud, with more than half of the particles being larger than sand size — are considered a type of landslide in this risk assessment. Flash floods can initiate debris flows especially in areas where wildfires have burned off vegetation that previously stabilized the slope. Landslides may also occur in areas cut by perennial streams. As the stream water erodes the channel banks, the sediment and rocks are undercut and destabilized resulting in a collapse of the material above the channel. Another common type of landslide in Nevada is a rock fall. Rock falls occur when a fragment of rock detaches from the hillslope or cliff face and continues downslope, possibly dislodging other materials along the way. They are commonly triggered by heavy rainfall, earthquakes, and anthropogenic activities. Rock falls can directly injure or kill people, can damage structures, and can block transportation routes in mountainous areas.

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). Some examples of different kinds of landslides are shown in Figure 3-108. Identifying different parts of a landslide is useful when surveying an area for this hazard.

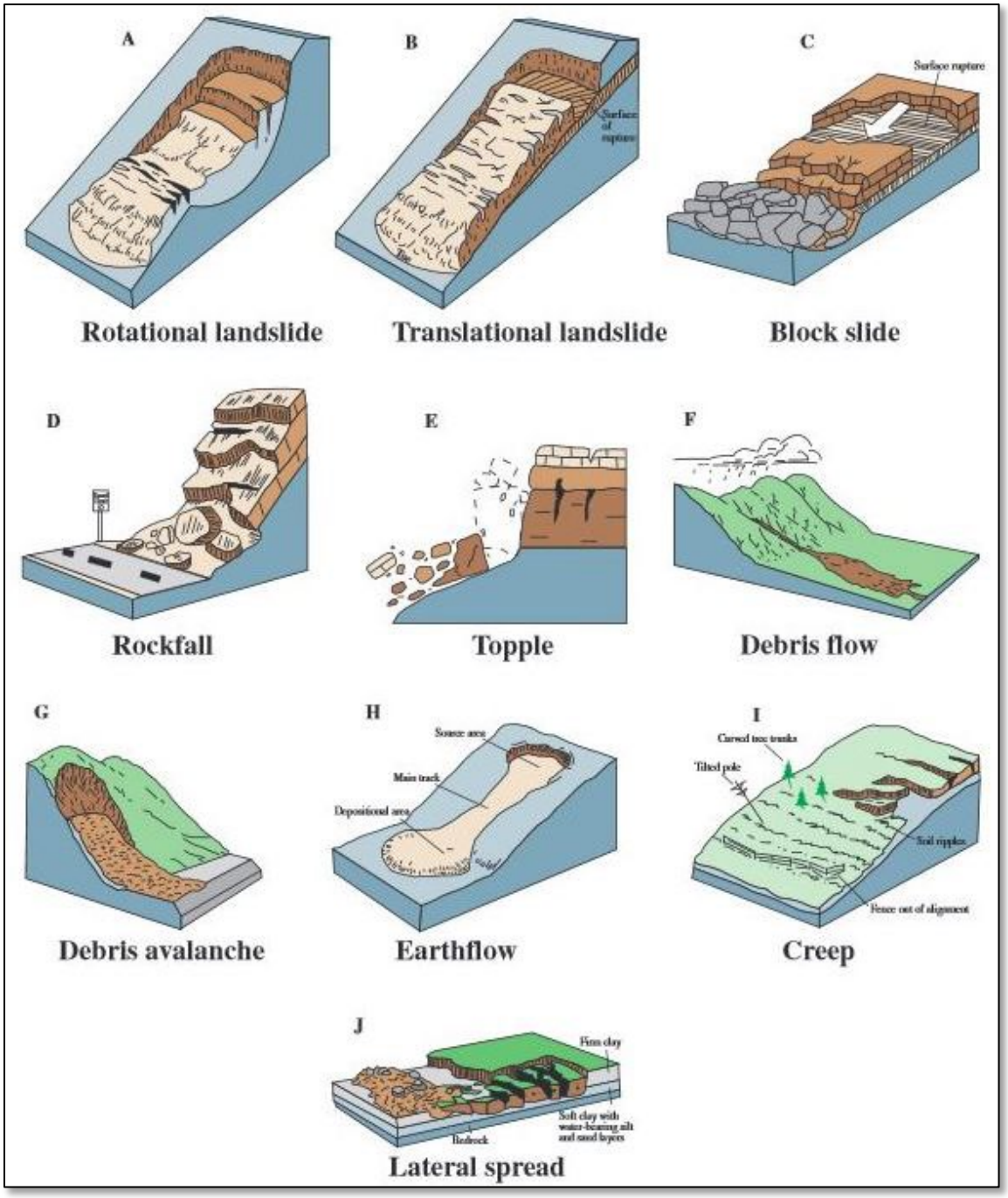


Figure 3-108. Schematic Illustrations of Different Types of Landslides.

Different parts of a rotational earth slide are shown in Figure 3-109. Figure 2-109 depcics 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.

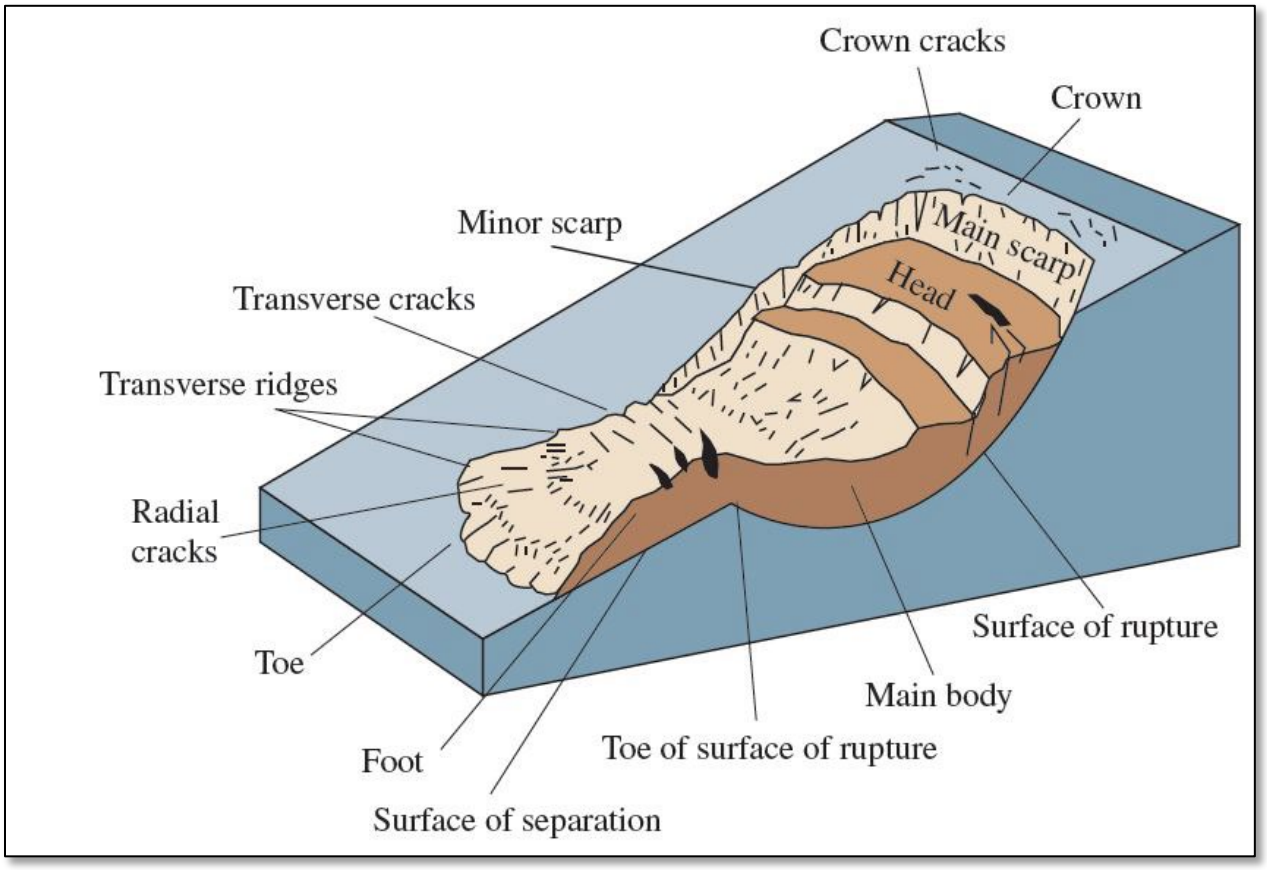


Figure 3-109. An Idealized Earth Rotational Slump with the Different Features of the Slide Identified.

In general, steeper slopes have greater gravitational potential and are more susceptible to landslides. Landslides in Nevada tend to be localized and usually have less damaging economic impact than hazards of a widespread nature.

Figures 3-110 and 3-111 depict the National Risk Index Score statewide and for more heavily populated areas respectively. Nevada's mountainous nature is noteworthy as landslides represent a statewide hazard.

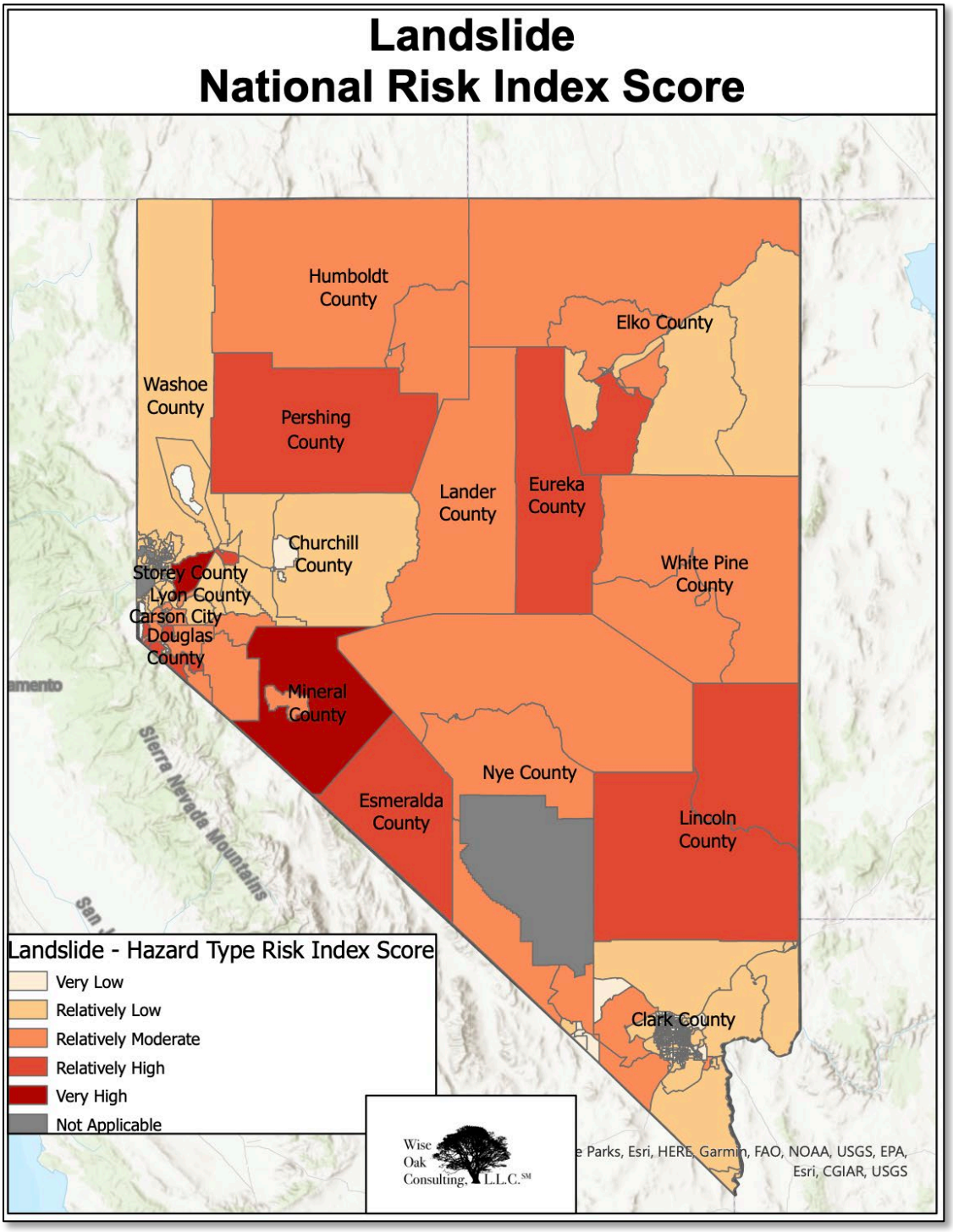


Figure 3-110. Landslide National Risk Index Score – Statewide.

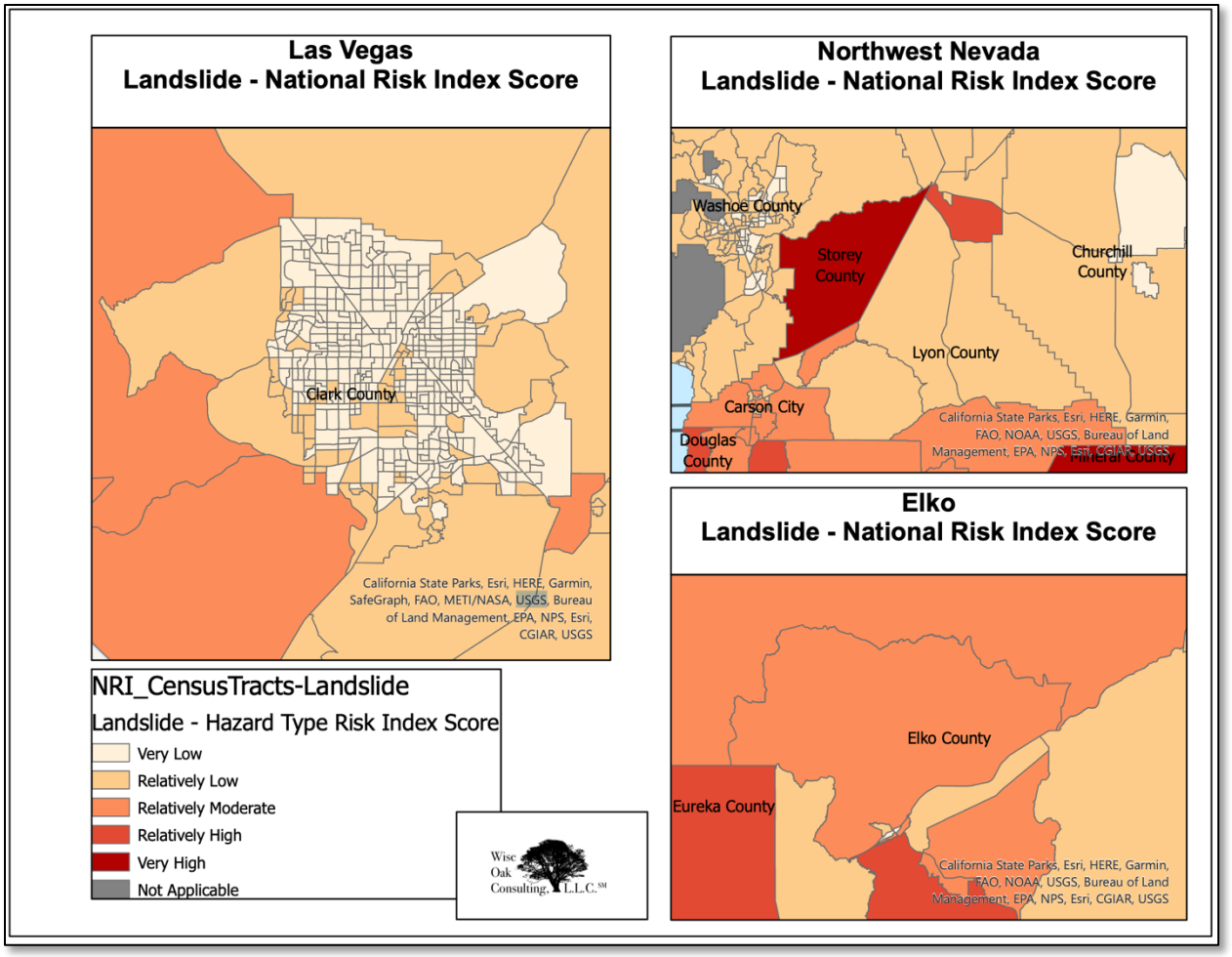


Figure 3-111. Landslide National Risk Index Score – More Heavily Populated Areas.

Figures 3-112 and 3-113 depict the NRI Exposure due to landslide in dollars statewide and in more heavily populated areas respectively.

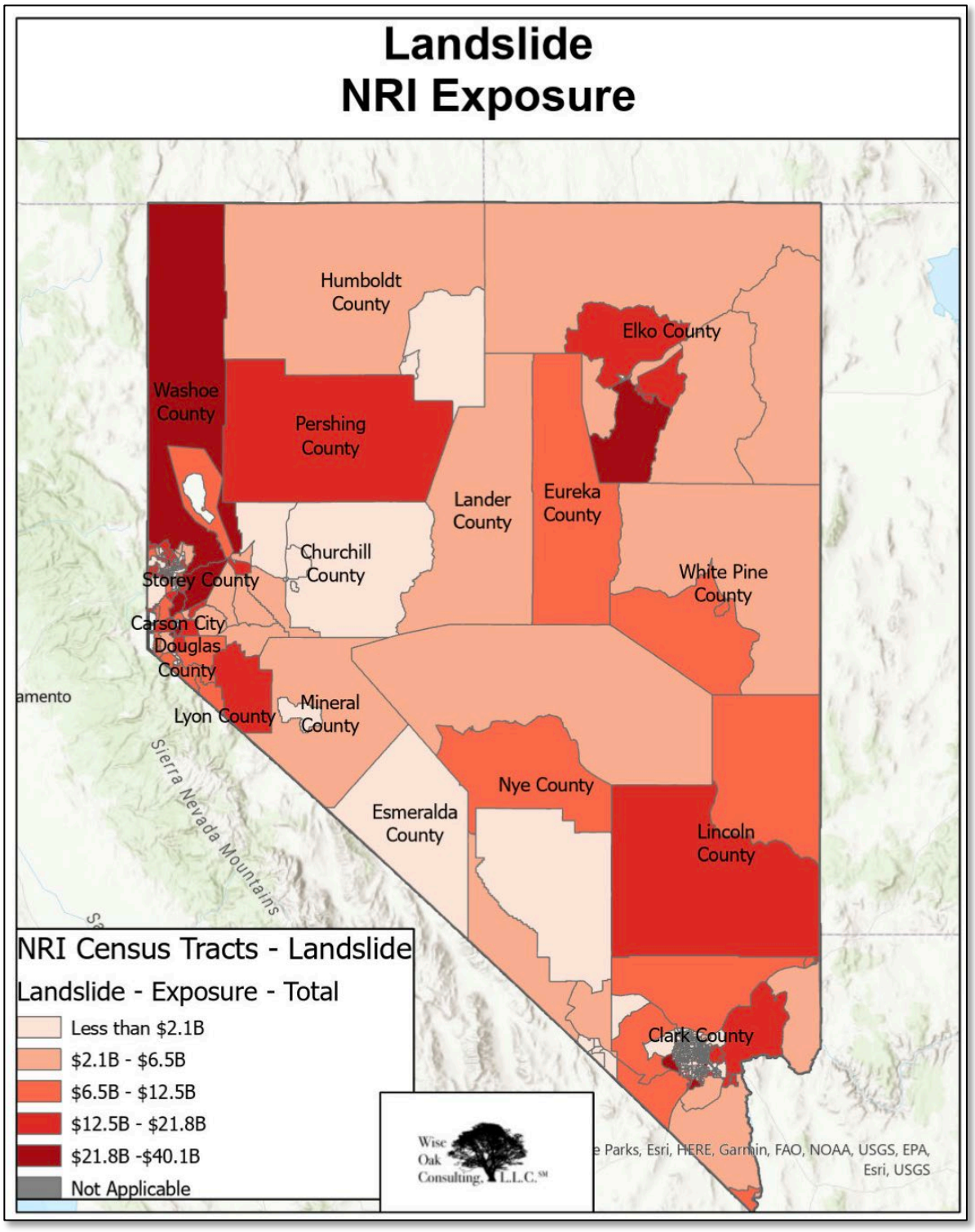


Figure 3-112. Landslide National Risk Index Exposure – Statewide.

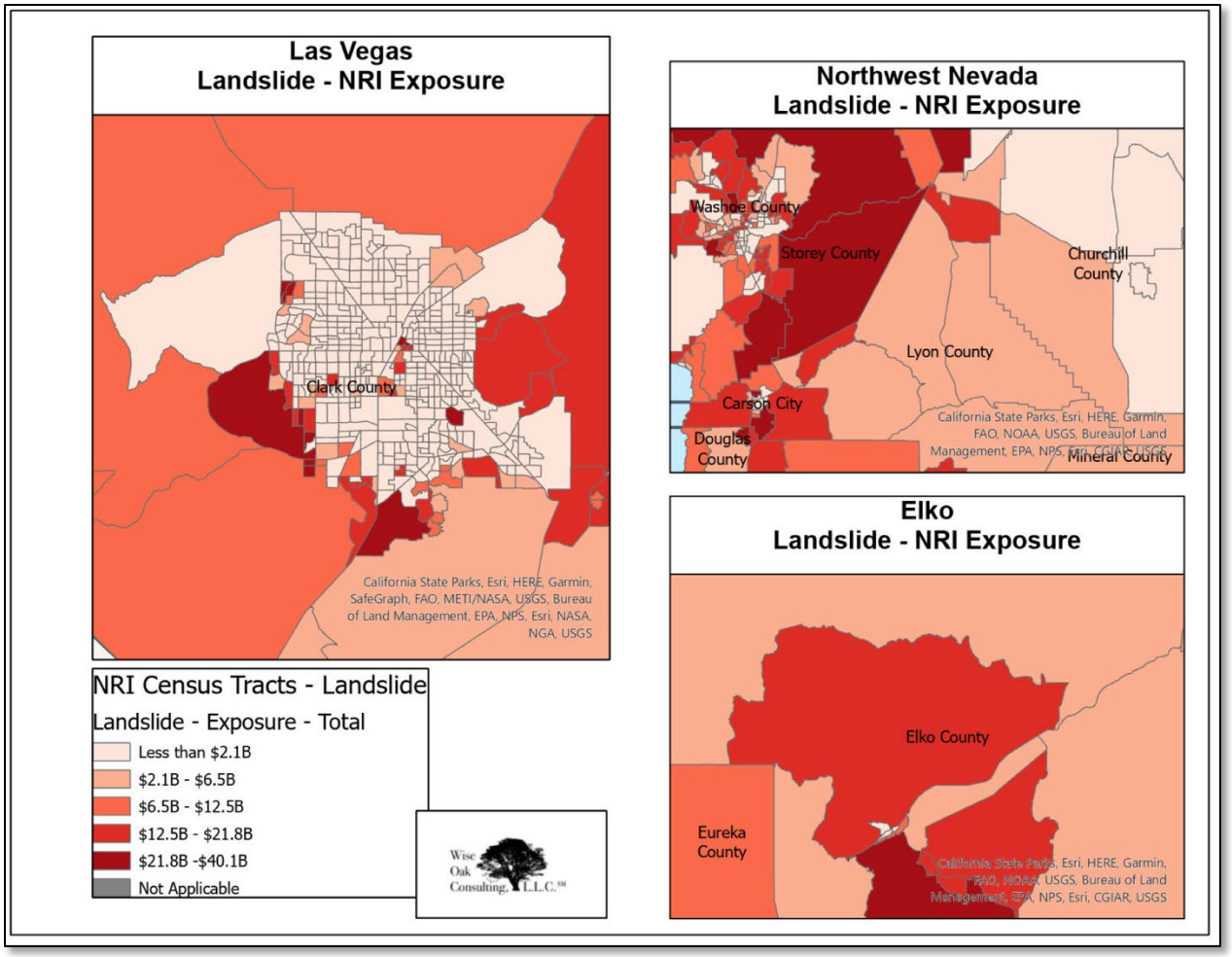


Figure 3-113. Landslide National Risk Index Exposure – More Heavily Populated Areas.

3.3.10.2 History

An example of landslides caused by the undercutting of material in a perennial stream/river occurs along the Truckee River near Mogul, west of Reno. As floodwaters have eroded the channel banks, the river has undercut clay-rich sedimentary rocks, destabilizing the ground, and causing the overlying material to slide repeatedly into the channel.

The largest recorded event of a damaging landslide in Nevada occurred on May 30, 1983, on Slide Mountain in the Carson Range southwest of Reno (Figure 3-114). A large granodiorite slab as much as 30 meters thick, 90 meters wide, and several hundred meters long detached from the southeast face of Slide Mountain and slid downslope about 75 meters into Upper Price Lake, a small reservoir on Ophir Creek. As a result, most of the lake water was displaced and overtopped a low dam. The water then breached the dam of Lower Price Lake and sent a flood down Ophir Creek, where the rapidly moving water picked up rocky debris in the steep canyon, becoming a thick, fast-moving debris flow. The flow emerged from the canyon four miles downstream and spread out over the alluvial fan of Ophir Creek in Washoe Valley. The debris flow destroyed and damaged houses, caused one fatality, covered old U.S. Highway 395, and caused at least $2 million in property damage to the area. It was reported that at least two other people were caught up in the debris flow but managed to escape.



Figure 3-114. Aftermath of the Slide Mountain Landslide and Ophir Creek Debris Flow in 1983.

Figure 3-115 is the landslide resulting from the winter storms in December 2022 – January 2023. Heavy rainfall on top of snow created rapid infiltration into bedrock fractures creating hydrostatic pressure build-up that triggered a planar to wedge type failure of the natural rock slope.



Figure 3-115. Landslide on Highway 208 in Wilson Canyon, NV.[124]

Similar landslide and debris flow events have occurred in this area in the past. Deposits from these events are documented on the geologic map of the Washoe City Quadrangle published by NBMG in 2019 (Open-File Report 2019-04). The USGS reports that similar slides can occur

[124]Source: NDOT.

south of Kingsbury Grade in Douglas County and along Second Creek where populated neighborhoods of Incline Village exist today.
Figures 3-116 and 3-117 depict the NRI Historic Loss Ratios due to landslide in dollars statewide and in more heavily populated areas respectively.

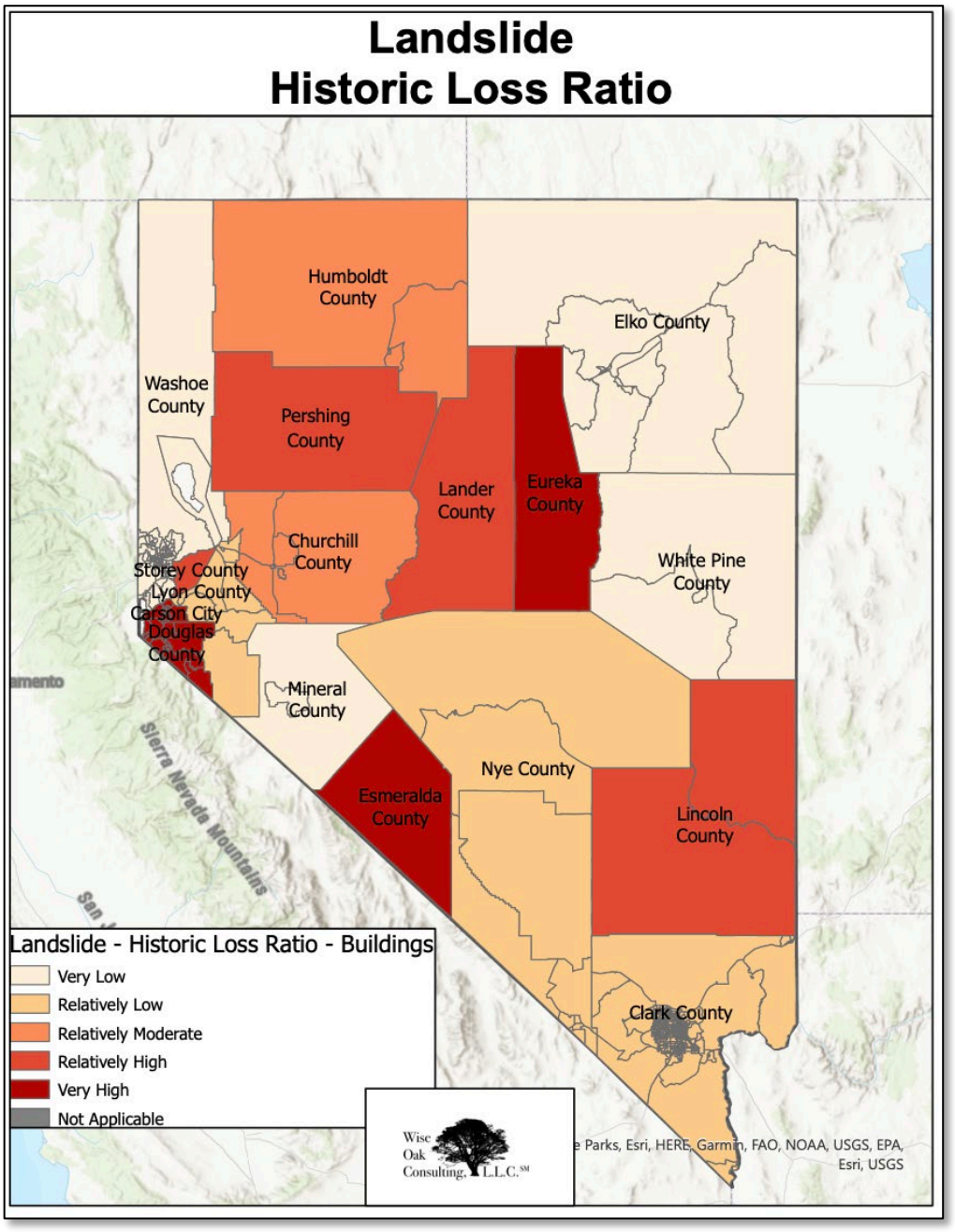


Figure 3-116. Landslide National Risk Index Historic Loss Ratio – Statewide.

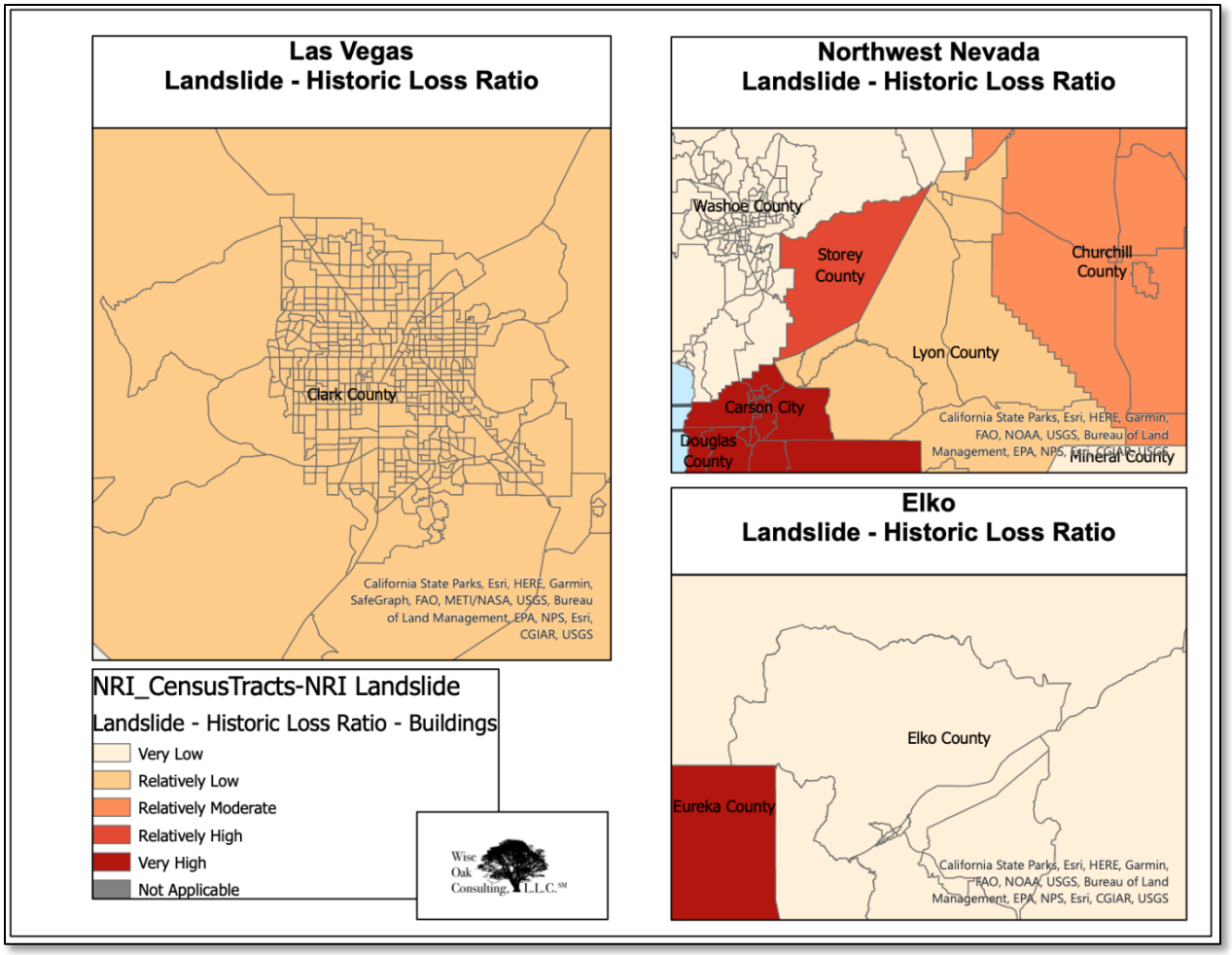


Figure 3-117. Landslide National Risk Index Historic Loss Ratio – More Heavily Populated Areas.

3.3.10.3 Location, Severity, and Probability of Future Events

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, including momentum gained traveling downslope, and if air becomes trapped underneath the slide material resulting in a decrease of basal friction. Lateral spread is a type of landslide that does not need a steep slope to originate. The USGS defines lateral spread or flow as a landslide that commonly forms on gentle slopes and have rapid fluid-like flow movement. These are special situations where shallow levels of groundwater and uncompacted subsurface sediment are pressurized during earthquakes, and the overlying ground flows sideways. This type of lateral spread is also 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. Figure 3-118 shows areas of susceptibility to landslides in Nevada that are currently known.

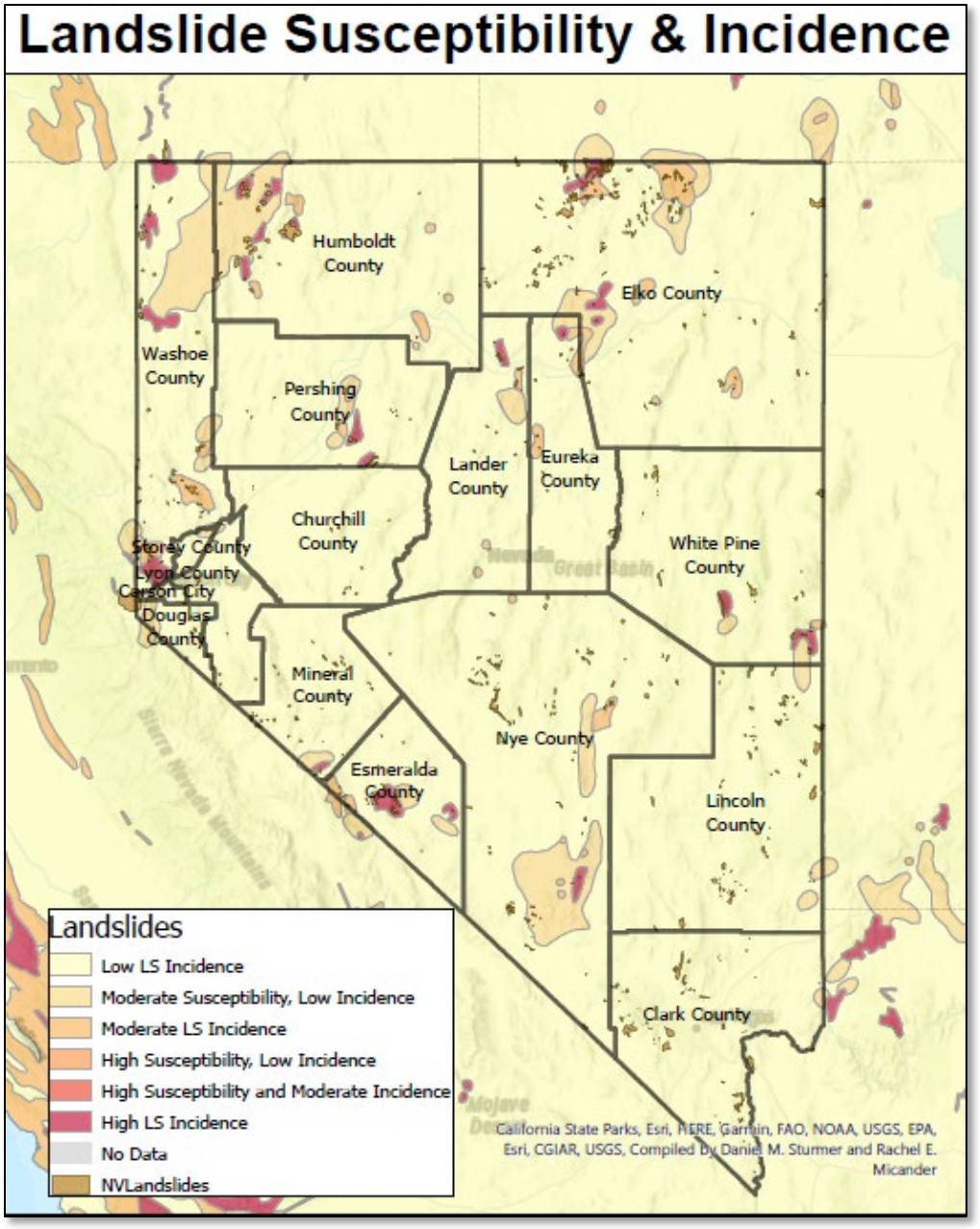


Figure 3–118. Map of Known Landslide Areas in Nevada and their Potential Susceptibility.[125]

A possible approach in evaluating areas of future landslide potential may include examining the slope and terrane of an area and searching for existing landslide scars and/or landslides and rock falls. For example, landslides and landslide scars can be seen along range fronts (such as in the Kings Canyon and Ash Canyon areas in western Nevada), in drainage basins (such as Ash Canyon and the Truckee River), and in the upper parts of the Carson Range. Landslides can be observed on hill slopes throughout Nevada, but no systematic survey has been conducted to date. Such a survey would be a useful tool for planning future development and infrastructure. Thus, Figure 3-118 is incomplete.

[125] Source: ESRI map services – UNR, NBMG, USGS.

Landslide mitigation involves careful placement of structures to avoid being involved in 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 can work to stabilize the slope. 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 downslope from a 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 to reduce the chances of further movement.

In the Nevada Survey, Carson City, Douglas, Storey, and Washoe Counties reported landslides as a danger. Slide Mountain, Kingsbury Grade, and Incline Village areas are noted as being particularly vulnerable.

The chances of having a landslide are the highest in mountainous areas with steep slopes and substantially increase when triggering factors such heavy rain or earthquakes occur. Landslides are considered a “Low Risk Hazard” in Nevada primarily because Nevada is arid, and a limited number of people live in landslide prone areas. As development encroaches on areas that are higher in elevation than the valley floors, such as alluvial fans, it is likely that landslides and debris flows will become more significant hazards. Due to the limited geographic extent of this hazard, management and mitigation are best handled at the local level. Support and technical assistance to local entities are available from state agencies in response to this type of hazard.

Figures 3-119 and 3-120 depict the NRI Expected Annual Loss statewide and in more heavily populated areas respectively.

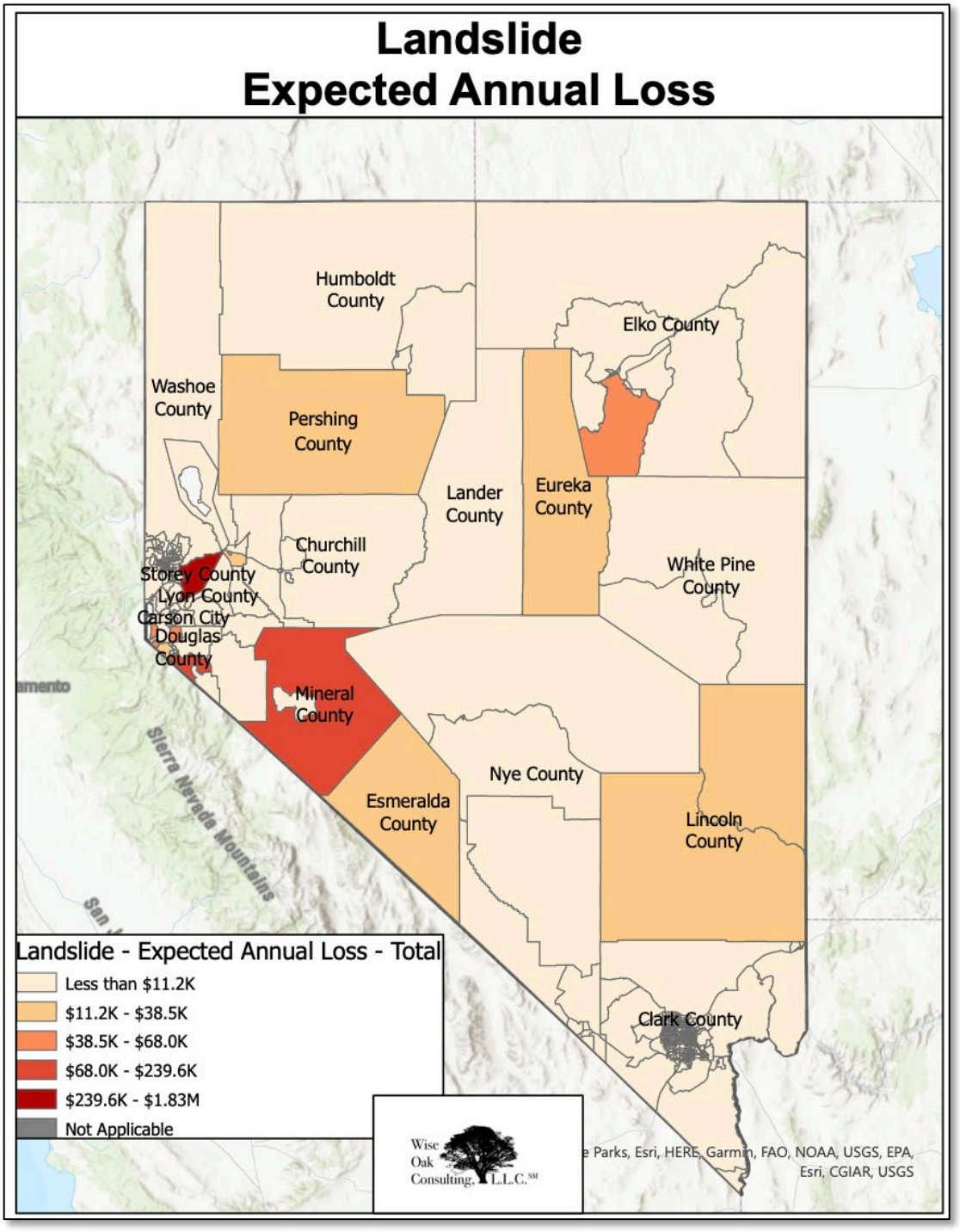


Figure 3-119. Landslide National Risk Index Expected Annual Loss – Statewide.

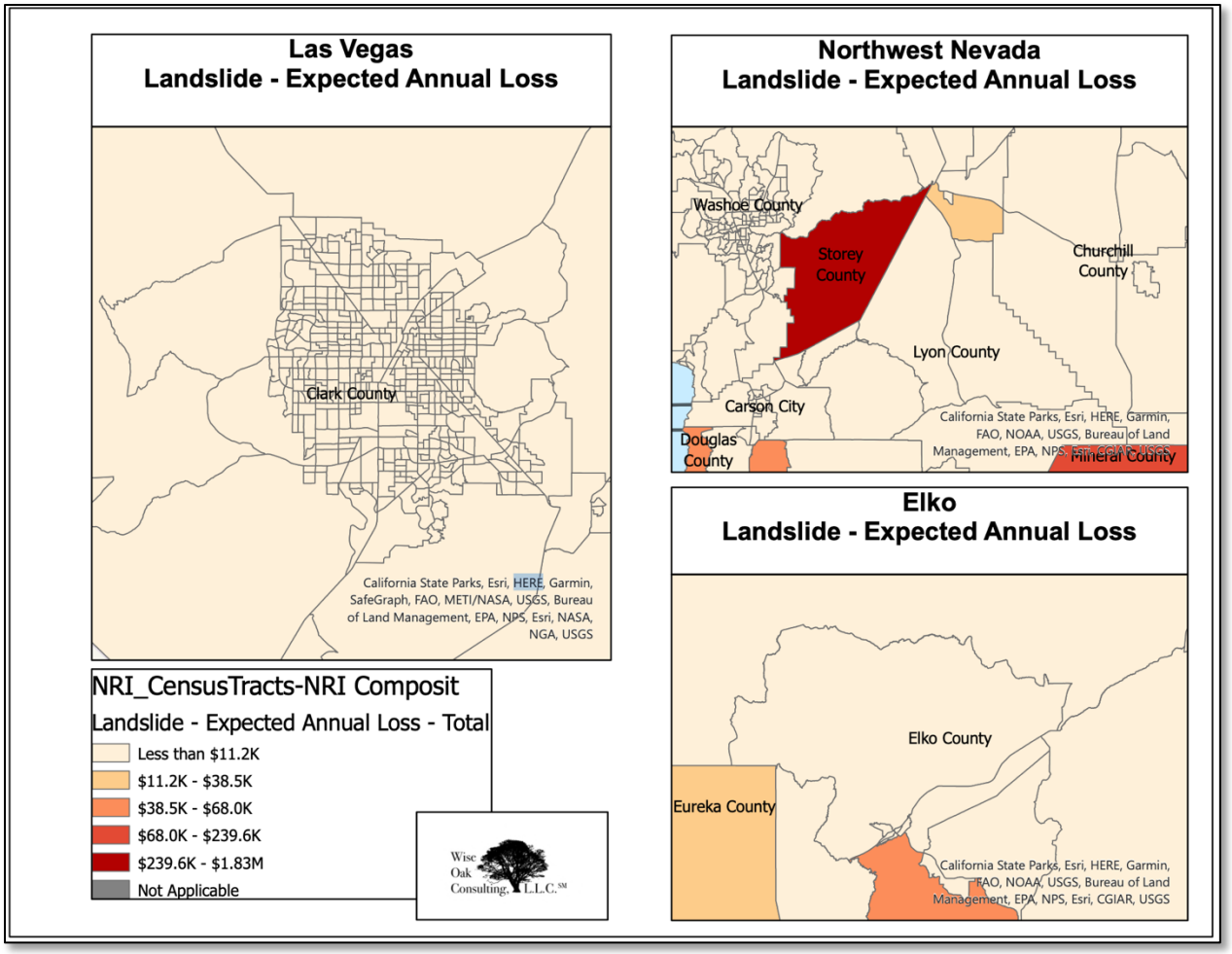


Figure 3-120. Landslide National Risk Index Expected Annual Loss – More Heavily Populated Areas.

Figures 3-121 and 3-122 depict the NRI Annualized Frequency for landslide in terms of number of events statewide and in more heavily populated areas respectively.

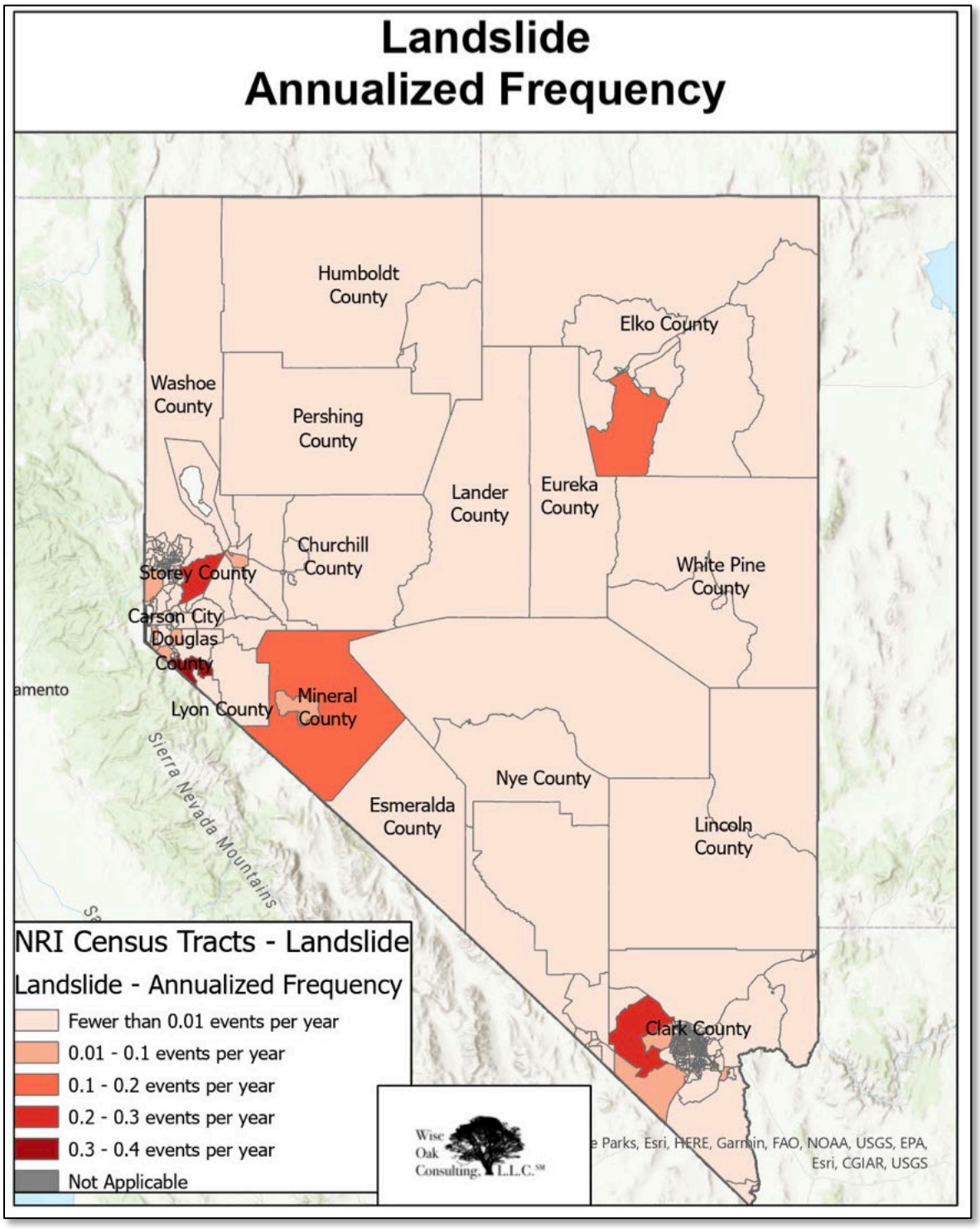


Figure 3-121. Landslide National Risk Index Annualized Frequency – Statewide.

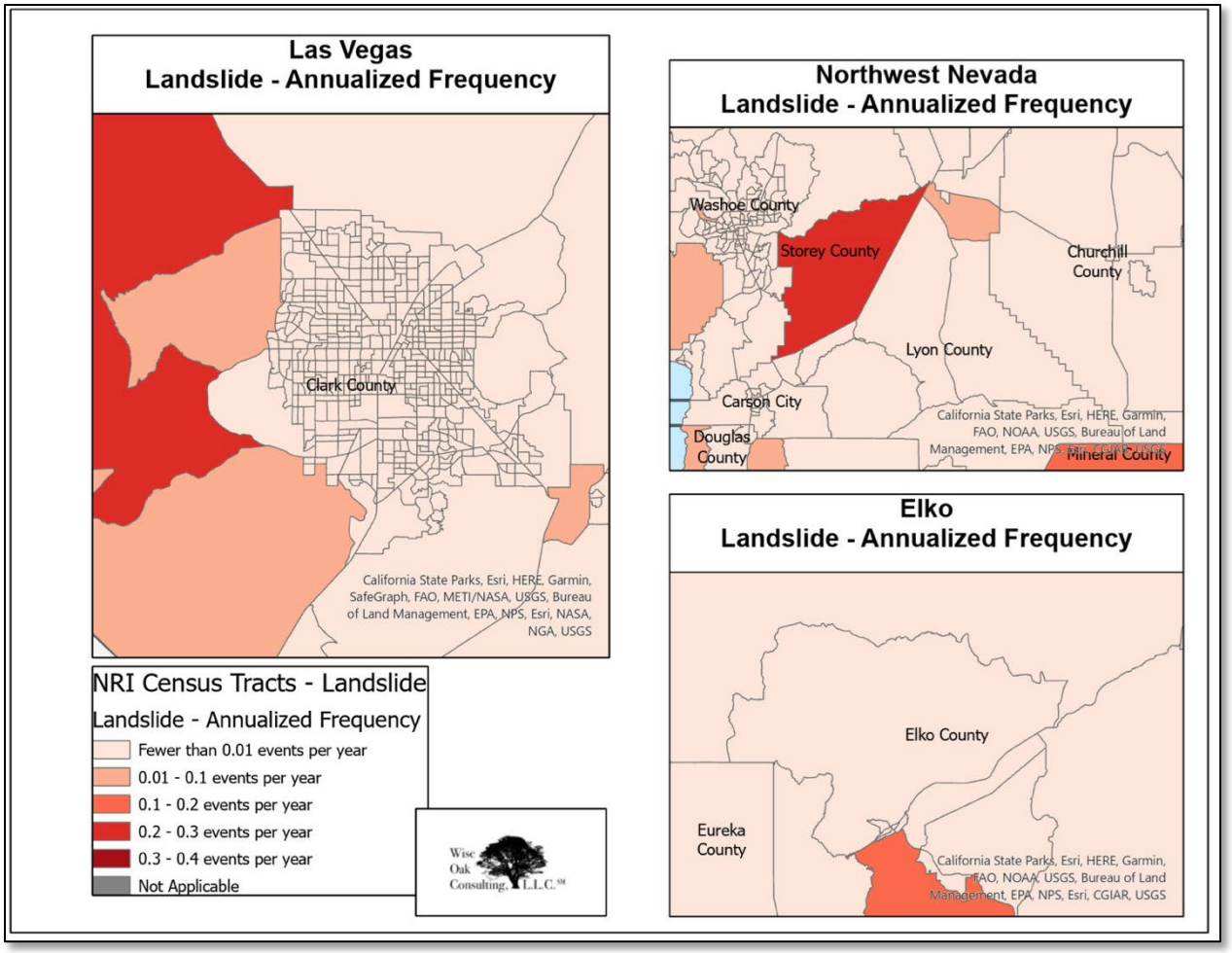


Figure 3-122. Landslide National Risk Index Annualized Frequency – More Heavily Populated Areas.

3.3.10.4 Impacts from Climate Change

Climate change has resulted in warmer temperatures and higher snow levels in the western U.S. and Nevada. As a result, more precipitation is expected to fall as rain, leading to higher occurrences of ground saturation and increased runoff in areas susceptible to landslides and debris flows, and consequently leads to a higher probability of landslide failure. Further, droughts induced by climate change can decrease vegetation that helps anchor soils/deposits to a hillside. This coupled with potentially more intense rainstorms can dramatically increase the probability of slope failure and lead to landslides in places that where they have not previously occurred.

3.3.10.5 Vulnerability of State Assets

The vulnerability of state critical buildings is provided in Appendix T.

As noted above, avalanches occur in remote locations and critical state buildings are not assessed to be at risk.

3.3.10.6 Mitigation

Landslide mitigation involves careful placement of structures to avoid being involved in 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 can work to stabilize the slope. 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 downslope from a 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 to reduce the chances of further movement.



3.3.11 Seiche (Low Risk)

3.3.11.1 Nature

A seiche (pronounced saysh) is a standing wave oscillating in a lake, and is generally initiated by wind, earthquake, or a change in atmospheric pressure. Seiches rarely exceed a few meters in height with the most dramatic seiches being observed following earthquakes.

A tsunami (pronounced sue-ná-mee) is described by NOAA as:

> *"A tsunami is a series of extremely long waves caused by a large and sudden displacement of the ocean, usually the result of an earthquake below or near the ocean floor. This force creates waves that radiate outward in all directions away from their source, sometimes crossing entire ocean basins. Unlike wind-driven waves, which only travel through the topmost layer of the ocean, tsunamis move through the entire water column, from the ocean floor to the ocean surface."*[126]

Tsunamis are primarily associated with earthquakes in oceanic and coastal regions. Landslides, volcanic eruptions, nuclear explosions, and meteorites can also generate tsunamis. A tsunami can move hundreds of miles per hour in the open ocean and run up onto land with waves exceeding 100 feet (30 meters) in height. In Nevada tsunamis can occur where large bodies of water have earthquake faults beneath them that can abruptly offset the floor of a lake or trigger a large landslide that goes into a lake.

From the area where the tsunami originates, waves travel outward in all directions and build in height as they approach the shore. The size of the wave is influenced by the topography of the shoreline and sea floor or lake floor which can result in different wave heights at different locations. In addition to differing wave heights, a tsunami may generate more than one wave and succeeding waves may be larger than previous ones.

If a major earthquake or landslide occurs close to shore, the first wave in a series could reach the shoreline in seconds to a few minutes – even before a warning can be issued. Areas are at greater risk if they are less than 30 feet above sea or lake level and within a mile of the shoreline. Drowning is the most common cause of death associated with a tsunami. Tsunami waves and the receding water are very destructive to structures in the run-up zone (the area where the tsunami pushes water on shore above the regular water level). Other hazards associated with a tsunami include flooding, contamination of drinking water, and fires from broken gas lines or ruptured tanks.

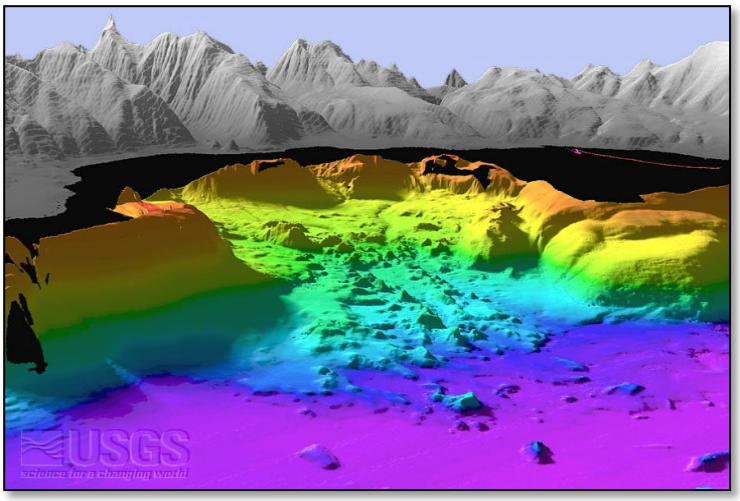


Figure 3-123. USGS Bathymetric View of Western Lake Tahoe, McKinney Bay.

[126] National Oceanic and Atmospheric Administration, Tsunamis, accessed February 8, 2023, https://www.noaa.gov/education/resource-collections/ocean-coasts/tsunamis.

Although Nevada is landlocked, tsunamis can occur in Nevada lakes that have faults that bound or cross below them, and in lakes that have steep sides that could collapse, generating a landslide. This landslide would cause large amounts of water to be displaced, resulting in a tsunami. Seiches can occur in any Nevada lake, including smaller reservoirs and lakes. Lake Tahoe, Pyramid Lake, Walker Lake, Lake Mead, Lake Lahontan, Rye Patch Reservoir, Lake Mojave, and other lakes throughout the state all could be at risk of a tsunami and/or seiche. It is difficult to estimate a probability for this hazard. The probability would be tied to the likelihood that a causative fault would have a surface-rupturing earthquake in addition to the chances of other surrounding faults having events that could trigger landslides into a water body. These probabilities would have to be convolved with the consequences of a tsunami or seiche based on how many people are around the lake at any one time and how much lakeside development there is. Being aware that a tsunami or seiche can occur, considering the possible impacts for important structures and facilities that are proximal to water bodies, and informing people around lakes to know how to react, can save lives and property should a tsunami or seiche occur. Although tsunamis and seiches can't be predicted, just as earthquakes can't be predicted, there may be times of heighted local earthquake activity at a lake when extra precautions might be considered for a period of time.

3.3.11.2 History

There have been few historical instances of tsunami and seiche in the region around Nevada. In 1959, a tsunami and seiche occurred on Hebgen Lake, Montana following a magnitude M7.3 earthquake. Hebgen Lake is located in the hanging wall of the normal fault that generated the earthquake. The earthquake produced an initial tsunami that overtopped the Hebgen Lake Dam by approximately one foot (30 cm) of water (Myers and Hamilton, 1964). Oscillatory waves formed the resulting seiche and continued for at least 12 hours with a period of approximately 15 minutes. During this time, the dam was overtopped three to four times (Myers and Hamilton, 1964). The seiche formed as a result of the initial tsunami and lake surface working to re-establish equilibrium. A tsunami formed in Owens Lake following the great 1872 Owens Valley, California earthquake (Smoot and others, 2000) and a probable seiche set up in Mono Lake, California after the 1932 M7.1 Cedar Mountain, Nevada earthquake (Reno Evening Gazette, 12/23/1932). Similar tsunami and seiche phenomenon can be expected in lakes throughout the state.

While there have been no historical occurrences of tsunamis within Nevada, University of Nevada geologists have found deposits between Sunnyside and Tahoma, California that indicate a tsunami with 30-foot (~10 meter) waves inundated the area as recently as 7,000 years ago. In 2012, a seiche was observed at Devils Hole, northwest of Pahrump, Nevada. This seiche was caused by a magnitude 7.4 earthquake in Oaxaca, Mexico. Devils hole is a collapsed cave located within the Ash Meadows National Wildlife Refuge, which provides a window into the vast aquifer below the surface. Another seiche occurred and was documented at Devils Hole on January 23, 2018. The seiche was caused by a large M7.9 earthquake 2000 miles away off the coast of Alaska. The waves from this earthquake caused the water in Devil's Hole to slosh back-and-forth. Large earthquakes, in Japan, Indonesia, Chile, and Mexico, have caused seiches in Devils Hole, with potential for waves to splash as high as two meters. For more information and videos of seiches at Devil's Hole, refer to:

- https://www.nps.gov/deva/learn/nature/devils-hole.htm
- https://www.scientificamerican.com/article/earthquake-at-devils-hole/
- https://www.youtube.com/watch?v=a6h82PIi_-0&feature=youtu.be

These instances illustrate the potential threat of tsunamis and seiches as a result of earthquake and landslide activity within Nevada.

A 2014 study by Santa Clara University, USGS, and UNR has shown that a tsunami or seiche induced by an earthquake and landslide occurred at Lake Tahoe between 12,000 and 21,000 years ago. This landslide - known as the McKinney Bay landslide (Figure 3-124) - displaced approximately 12 km^3 of sediment and generated waves possibly up to 330 feet (100 meters) high. This landslide and resulting tsunami are also believed to have lowered the lake level by ~33 feet (10 meters). Although an incident such as this is incredibly rare, this research shows that under the right conditions, a tsunami/seiche is possible in the Lake Tahoe Basin. Evidence for other tsunamis in Lake Tahoe includes a 2006 study that showed evidence of a tsunami triggered by an earthquake and massive underwater landslide that deposited ridges of glacial boulders and smaller volcanic rocks on the "Tahoe City Shelf," a triangular region fifty feet below the western shore of the lake and twelve miles from the "McKinney Bay slide" (Figure 3-124).

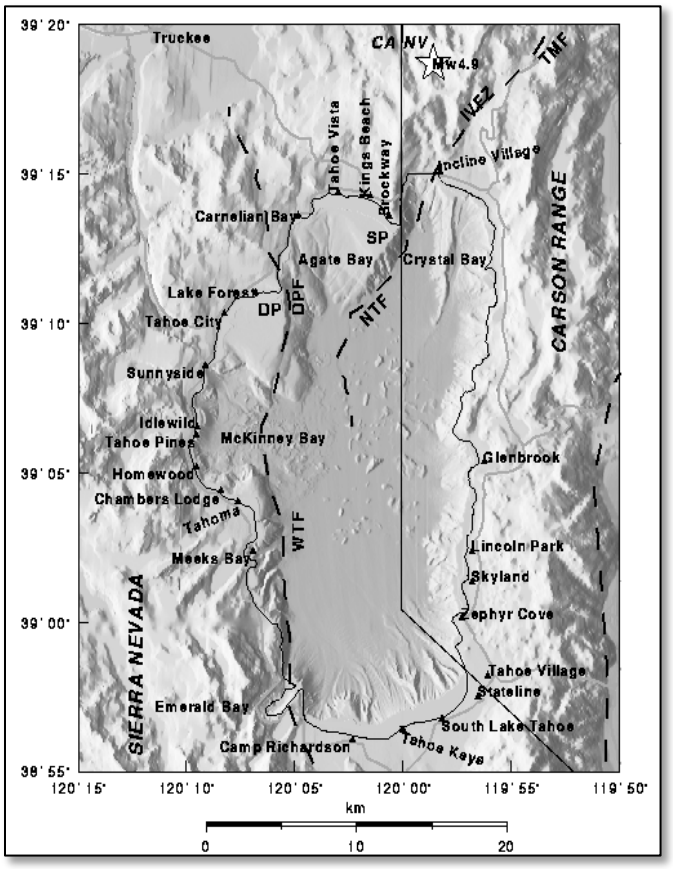


Figure 3-124. Lake Tahoe Fault Map.[127]

The relief map in Figure 3-124 of Lake Tahoe shows faults and debris on the floor of the lake resulting from landslides and debris flows spreading out from McKinney Bay across the floor of the lake. (SP= Stateline Point, NTF=North Tahoe fault line, IVFZ=Incline Village fault zone, TMF=Truckee Meadows fault, WTF=West Tahoe fault, DPF=Dollar Point fault).

[127] *The Potential Hazard from Tsunami and Seiche Waves Generated by Future Large Earthquakes within the Lake Tahoe Basin*, California-Nevada, 1999-2000; Gene A. Ichinose, Kenji Satake, John G. Anderson, Rich A. Schweickert, and Mary M. Lahren; Seismo Lab; University of Nevada; (University of Nevada 2000 study).

3.3.11.3 Location, Severity, and Probability of Future Events

While tsunamis and seiches can occur in any lake in Nevada, Lake Tahoe displays the largest risk for these types of events. Faults beneath the surface of Lake Tahoe contribute to the tsunami hazard within the basin. These faults are dip-slip faults (faults that exhibit vertical displacement where one side moves down relative to the other). Movement along these faults could cause displacement in the water column above the fault rupture; if the displacement is large enough, a damaging tsunami could be generated. A large, rapid landslide, either underwater within the lake or into the lake from the surrounding topography, could also generate a tsunami. It is possible a landslide such as this could be triggered by an earthquake.

In 1999, researchers at the University of Nevada conducted a study to determine if a magnitude 7 earthquake could generate a tsunami or seiche that would pose a hazard to shoreline communities of the Lake Tahoe Basin. They concluded from their scenarios that such a quake would likely generate a wave as small as 10 feet (~3 meters) and as large as 30 feet (~10 meters) in amplitude that would threaten shoreline communities. The two faults underneath the lake are capable of producing M7.1 earthquakes are the West Tahoe-Dollar Point fault and the North Tahoe-Incline Village fault. Earthquakes of this size could result in a displacement of the lake floor and water column of up to 13 feet (4 meters).

Wave heights of potential Lake Tahoe tsunamis have been modeled and are shown in Figure 3-125.[128] 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 (~4.6 to 7 meters) were generated along the lake shore in Carson City County, but to the south, wave heights as high as 30 feet (~9 meters) were generated. These are reasonable wave heights to consider when developing ideas for the tsunami/seiche hazard along the Lake Tahoe shoreline.

[128] [128] Gene A. Ichinose, John G. Anderson, Kenji Satake, Rich A. Schweickert, Mary M. Lahren, "The potential hazard from tsunami and Seiche waves generated by large earthquakes within Lake Tahoe, California-Nevada," April 15, 2000, accessed March 29, 2023, https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/1999GL011119.

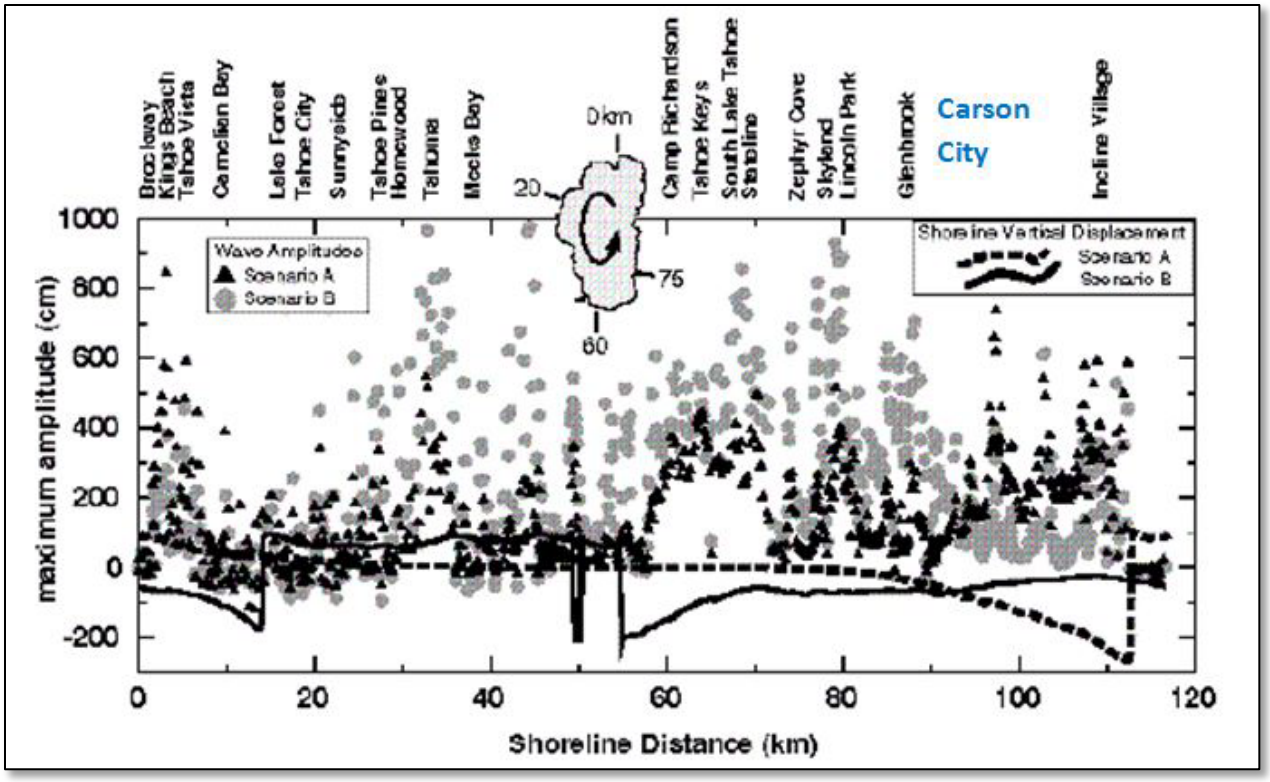


Figure 3-125. Potential Tsunami Wave Heights Around Lake Tahoe (Locations indicated along top).[129]

Strike-slip faults (faults in which one side moves horizontally relative to the other side) are also found in Nevada. Motion generated along strike-slip faults may not create significant vertical displacements in the water column, but they can have a significant normal component. Although strike-slip faults are found near or underneath Pyramid Lake and Lake Mead, geological evidence at this time does not indicate the presence of active normal (dip-slip) faults capable of producing tsunamis in these or other large lakes in Nevada (other than Lake Tahoe). Strike-slip earthquakes can induce seiches, however, as occurred in the 1932 Cedar Mountain earthquake. While there is good bathymetric evidence of a major landslide that spread large blocks from McKinney Bay across the floor of Lake Tahoe (Figure 3-124 and 3-125), it appears that similarly large landslides have not occurred at the other large lakes in Nevada.

Tsunamis are considered a low-risk hazard in Nevada primarily because the earthquakes that would likely cause sizeable tsunamis on Nevada lakes, either directly by fault displacement or indirectly by a large landslide, occur only once every few thousand years.

If a tsunami does occur, most of the near-shore portions of communities surrounding lakes in Nevada would be at risk. There would be little or no warning, other than perhaps feeling the ground shake from the earthquake before the first wave of water hits. As is the case along the Pacific Northwest coast, the most effective tsunami-hazard mitigation may be training people to run to high ground as soon as possible after feeling strong shaking from an earthquake.

It must be noted that a tsunami/seiche is a limited exposure event that would affect a finite population, specifically impacting shoreline residents and visitors to lakes within the state. With that being said, the resulting local property damage value could be extensive. The risk of

[129] Gene A. Ichinose, John G. Anderson, Kenji Satake, Rich A. Schweickert, Mary M. Lahren, "The potential hazard from tsunami and Seiche waves generated by large earthquakes within Lake Tahoe, California-Nevada," April 15, 2000, accessed March 29, 2023, https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/1999GL011119.

tsunamis and seiches exist in and are incorporated into the hazard mitigation plans of Washoe, Carson City, and Douglas Counties.

3.3.11.4 Impacts from Climate Change

The impact of climate change on the tsunami/seiche hazard in Nevada would be somewhat indirect and hard to anticipate. Increased precipitation would fill lakes and possibly suppress local earthquakes but might increase chances for landslides around a lake. An opposite effect could occur with persistent drought drying up lakes, possibly inducing an earthquake, and more susceptible lakeside landslides because of a loss of anchoring vegetation.

3.3.11.5 Vulnerability of State Assets

Subject matter experts do not assess that there is appreciable vulnerability to state assets due to this hazard.

3.3.11.6 Mitigation

The hazard profile is for information purposes only and mitigation projects will not be pursued for this hazard in 2023-2028. Tsunami mitigation strategies that might make sense for such a rare, but impactful event would include mapping out and putting up signage for Tsunami evacuation routes and possibly putting vertical escape/safety structures in beach areas that could be used in an emergency but also have everyday day uses, such as for vistas or a restaurant area. Local public education about tsunamis is critical because there are short warning times and individual decision making and response is important.

3.3.12 Straight-Line Winds (Low Risk)

3.3.12.1 Nature

Straight Line Winds align with the National Risk Index Strong Wind hazard. Winds are horizontal flows of air that move 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 steep pressure gradient causing strong winds can result from a large pressure difference or a short distance between a high- and low-pressure system, or a combination of these factors. Strong and/or severe winds often precede or follow frontal activity, including cold fronts, warm fronts, and drylines. Generally, in the western United States, frontal or downslope winds can become sustained at 30-50 mph for several hours with wind gusts of 60 to 100 mph. Severe winds are defined as those greater than or equal to 58 mph.



Figure 3-126. Windstorm Damage in Las Vegas February 13, 2021.[130]

In addition to strong and/or severe winds caused by large regional frontal systems, local thermal winds are caused by the differential heating and cooling of the regional topography. In a valley/mountain system, as the rising ground air warms, it continues upslope as wind and is replaced by inflow from outside the valley. The intensity of the resulting wind depends on a number of factors, including the shape of the valley, amount of sunlight, and presence of a prevailing wind. The ―Washoe Zephyr‖ afternoon winds that occur along the Sierra Front of western Nevada during the warm season are some of the most well recognized locally driven wind regimes in Nevada. Local wind patterns driven by the extreme terrain of the state often lead to dangerous fire weather and firefighting conditions.

[130] Lauren Clark, "Storm causes damage across the Las Vegas Valley," news 3 Live, accessed February 7, 2023, https://news3lv.com/news/local/gallery-wind-damage-in-the-las-vegas-valley.

Winter Weather can bring heavy rain or snow, high winds, extreme cold, and in rare cases ice storms. In Nevada, the primary weather pattern for a winter storm is the jet stream slamming into California and Nevada coupled with an atmospheric river (Figure 3-127). A significant portion of the winter snowpack is generated by these Pacific atmospheric river winter storms.

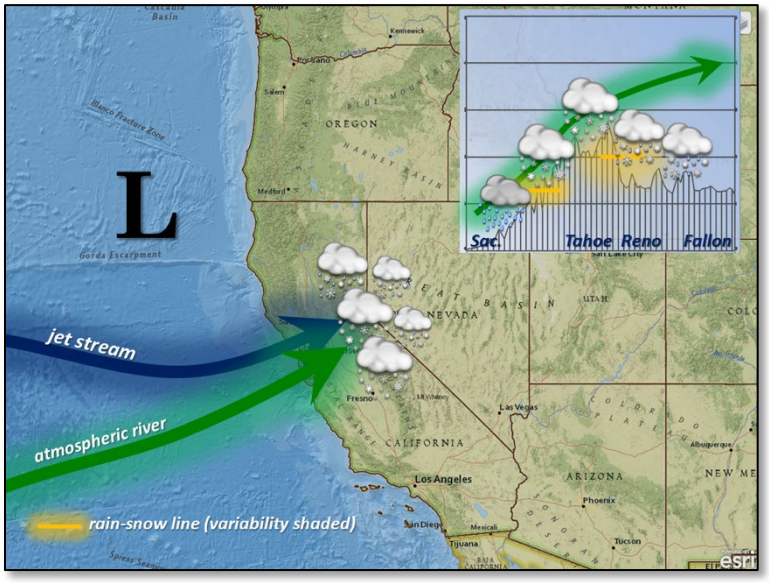


Figure 3-127. Typical Winter Weather Storm Atmospheric River Scenario.

Atmospheric river storm systems can bring heavy rain or snow to Nevada (if there's no rain shadowing by the Sierra Nevada or other California mountains), flooding (if the storm is warm enough for a rain on existing snow event), or widespread high winds (if there is rain shadowing – which is common). The high wind events are focused in areas immediately downwind of large mountain ranges, most notably along Highways 395 and 95 in Northern and Central Nevada. High wind events are also common across the entire state in the spring and autumn associated with strong cold fronts that can produce widespread gusts over 60 MPH and large areas of blowing dust. This is Las Vegas's primary high wind scenario.

The current predictability of winter season heavy rain, snow, or high windstorms is generally good, with broad warning often possible 5-10 days in advance and with more specific details and potential impacts 1-4 days ahead. River forecasts of potential flooding can be seen out to 5 days into the future, but these are only for mainstream rivers such as the Truckee, Carson, and Humboldt.

It should be noted that high winds and windstorms can occur at any time of year and are not limited to winter weather but can also be associated with severe thunderstorms in summer. However, these particular wind events are much more localized.



Figure 3-128. Lenticular Wave Clouds, a Common Feature with High Windstorms Across Nevada.

Figures 3-129 and 3-130 depict the National Risk Index Score statewide and for more heavily populated areas respectively. The maps have historic damaging wind paths overlayed.

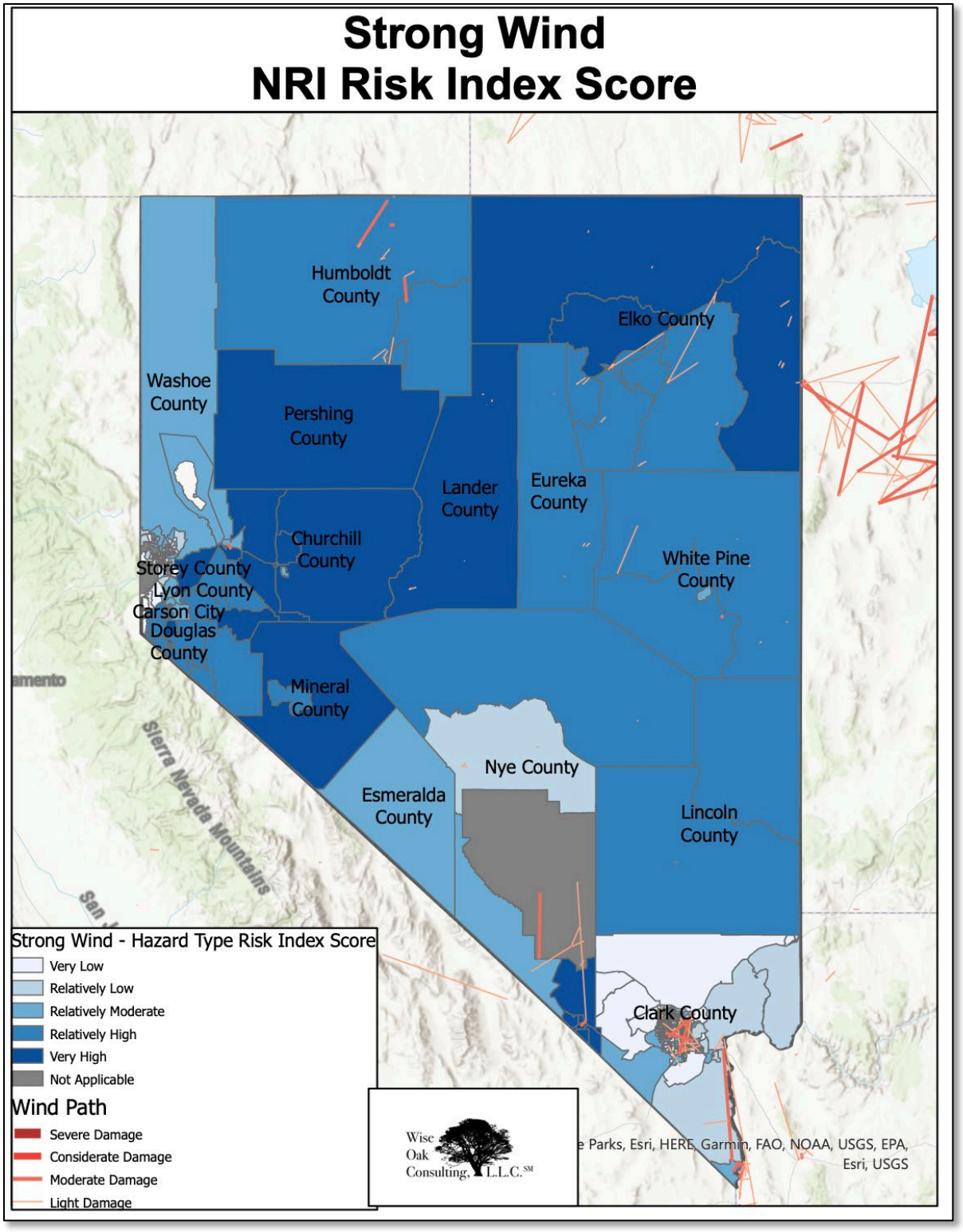


Figure 3-129. Strong Wind National Risk Index Score – Statewide.

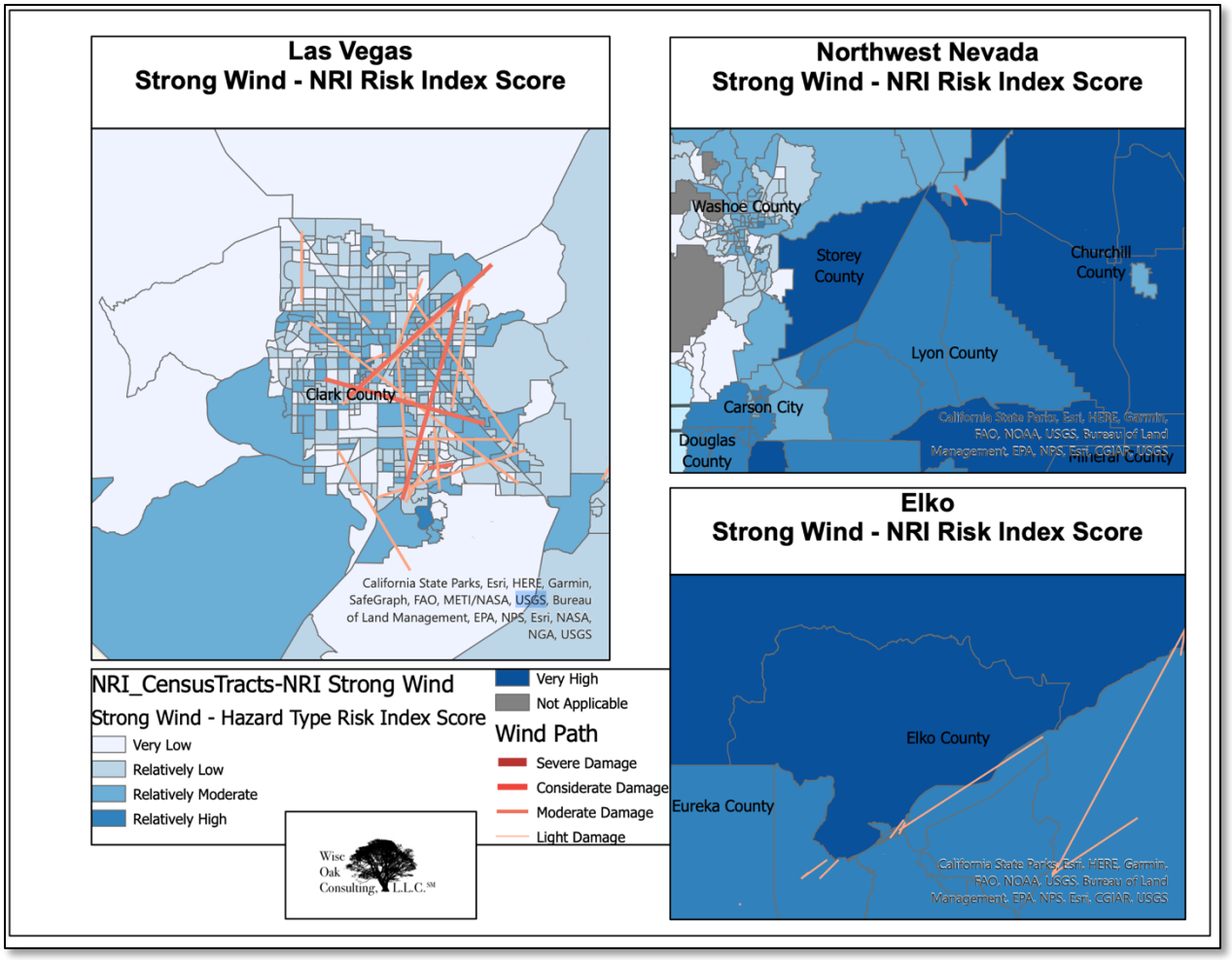


Figure 3-130. Strong Wind National Risk Index Score – More Heavily Populated Areas.

Figures 3-131 and 3-132 depict the NRI Exposure due to strong wind in dollars statewide and in more heavily populated areas respectively. The maps have historic damaging wind paths overlayed.

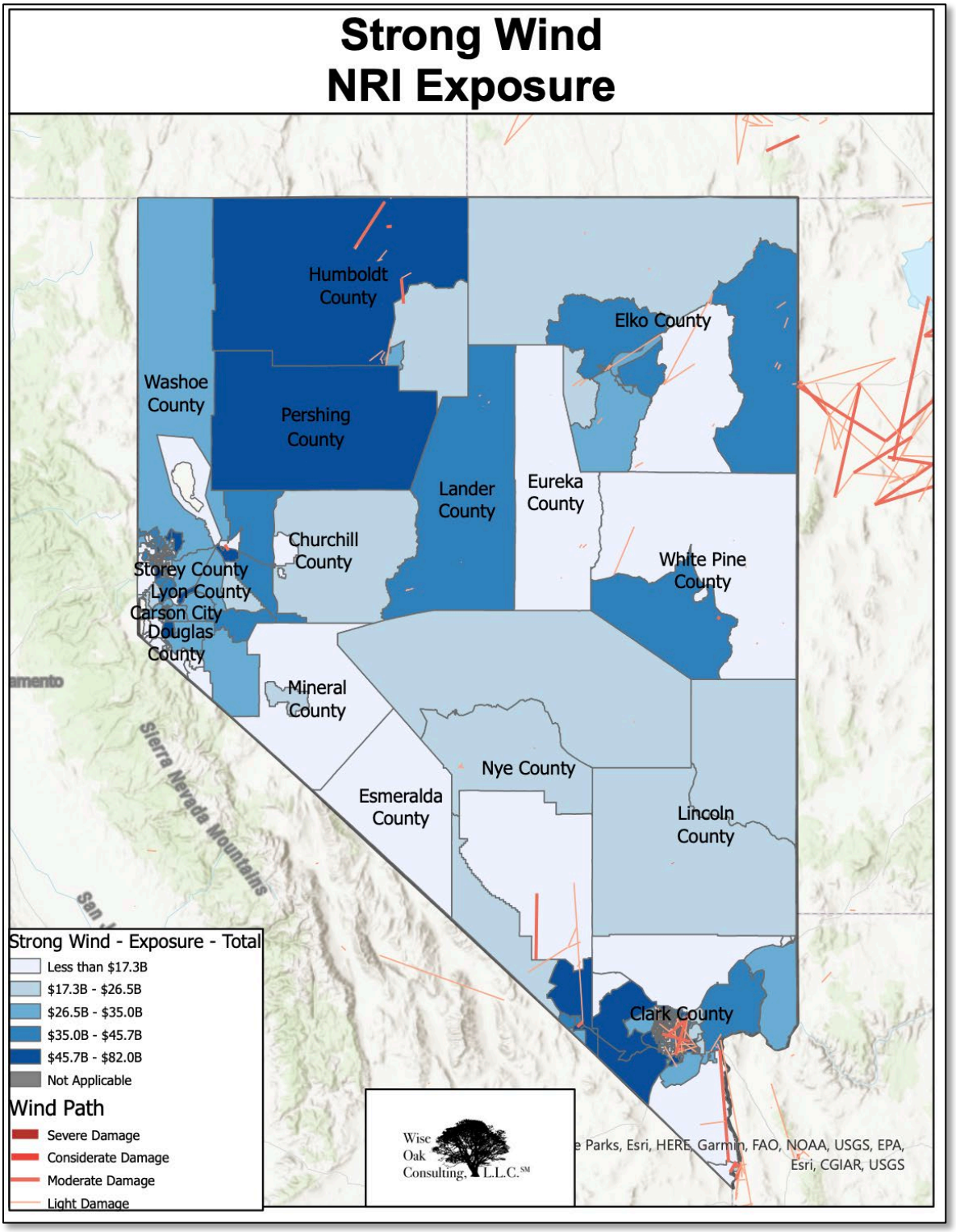


Figure 3-131. Strong Wind National Risk Index Exposure – Statewide.

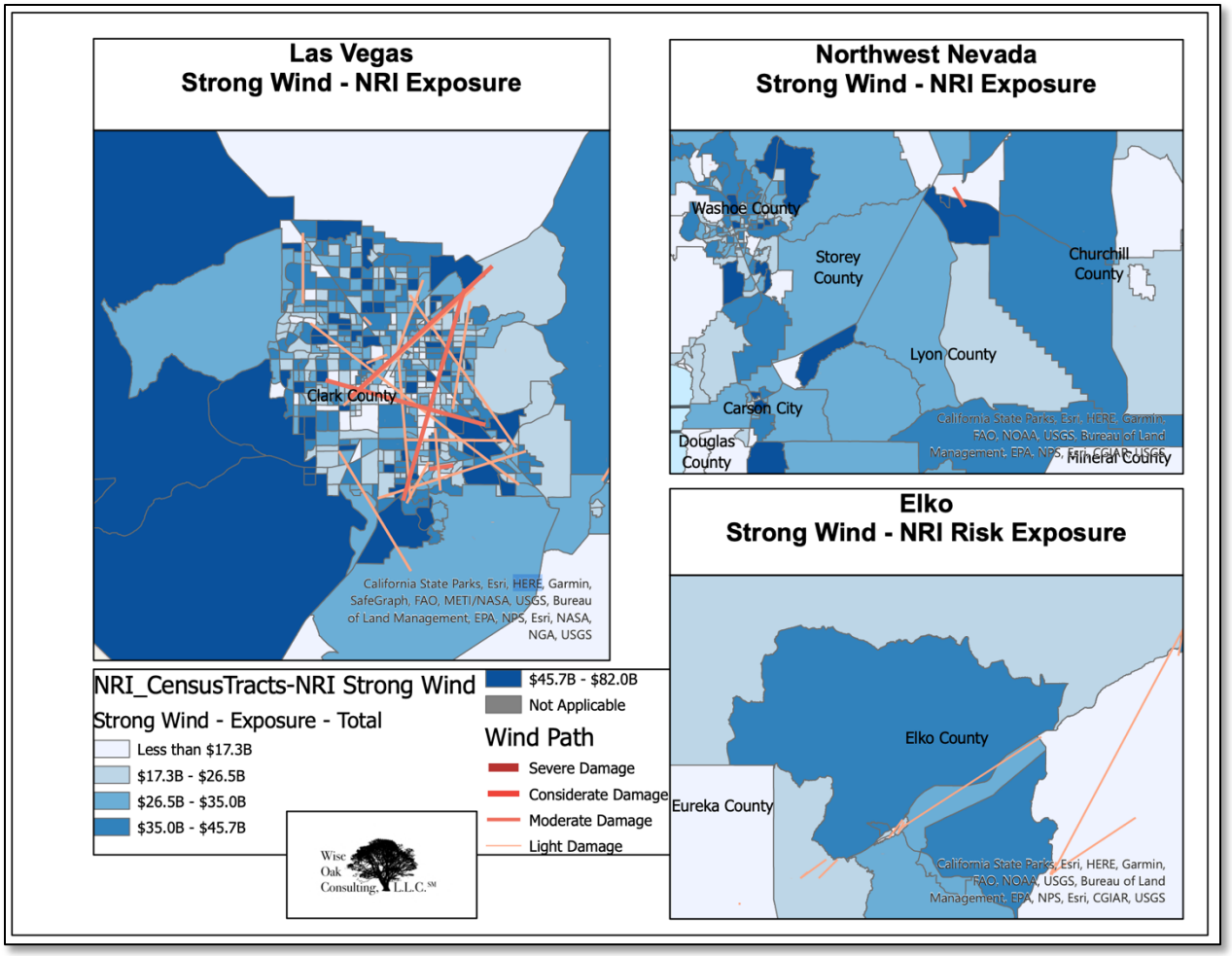


Figure 3-132. Strong Wind National Risk Index Exposure – More Heavily Populated Areas.

3.3.12.2 History

Wind and windstorms are common events in Nevada, especially during the winter and spring months. An example of high wind is the nighttime down-slope wind that blows out into the Reese River Valley at Austin. At times, when there is a large pressure change over a short distance, these winds become strong causing extensive damage.

Mobile homes, power lines, billboards, airplanes, vehicles, roofs, and other structures have been damaged by severe winds. Due to the high incidence of damage to mobile homes, insurance companies in Nevada have adopted policies that require tie-downs. The Nevada Department of Commerce enforces regulations requiring mobile homes to be securely anchored (NRS 289.280). Unfortunately, until recently extreme wind events were poorly recorded, if at all, and only anecdotally. Table 3-30 describes some damage-causing extreme wind events recorded in Nevada.

Table 3-30. Chronology of Some Severe Destructive Windstorms in Nevada[131]		
Date	**Location**	**Description of event/injuries, damages**
1873	Moodyville, a small smelter, mill, and tent camp in Dry Valley near Echo Canyon in Lincoln County	A severe windstorm destroyed the entire camp, population 60, and nothing remains of the site. While it is noted that this was a tent camp, it is the only recorded event where a windstorm erased an entire community.
July 20, 1994	Las Vegas, Clark Co.	The top quarter of the 362-foot-tall sign atop the Las Vegas Hilton was destroyed as winds of 78 m.p.h. were recorded in the Las Vegas Valley. The sign was engineered to withstand winds up to 130 mph.
February 3, 1998	Gabbs and western side of the Paradise Range, Nye County, 90 miles SE of Reno	A down-slope windstorm produced sustained winds of 70- 80 mph with gusts of 100 mph. Several mobile homes were either overturned or blown off their moorings and numerous mature trees were uprooted. There was also widespread structural damage to small buildings around the nearby magnesite mine.
December 14, 2002	Reno – Sparks area, northern Nevada	A record-breaking windstorm with 82 mph winds caused widespread roof, tree, and fence damage. Approximately 140,000 customers in the Reno-Sparks area were without power after the storm.
December 2004	Washoe Valley 15 miles south of Reno, southern Washoe County	A trailer southbound on Old Highway 395 was blown into the pathway of incoming traffic and was shredded. Another truck that had stopped for the collision was overturned by the winds. At least four other big rigs were toppled by gale-force winds in the same area.
September 16, 2006	Hoover Dam bypass project, Clark County	A windstorm toppled the cranes on the Hoover Dam bypass project. The windstorm also knocked down 2,300-foot strands of steel cable. A construction site cleanup was required before the engineers could continue the project. U.S. Highway 93 was closed for two days because of falling debris.
November 14, 2006	Northern NV, Elko County	Strong winds to 83 mph affected much of northern Nevada, particularly Elko County. In Ruby Valley, a home was completely destroyed by wind and a pickup truck moved 20 feet. $100,000 total damage.

[131] National Oceanic and Atmospheric Administration, Storm Events Database, accessed February 8, 2023, https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=32,NEVADA.

Table 3-30. Chronology of Some Severe Destructive Windstorms in Nevada[131]		
Date	**Location**	**Description of event/injuries, damages**
December 26-27, 2006	Much of eastern California and western Nevada affected; Washoe, Storey, Mineral, and Lyon counties; Lake Tahoe basin, Washoe Valley	The strongest windstorm in over four years produced 60- 80 mph winds with, gusts over 160 mph along the Sierra crest. Downed power lines sparked brush fires spread by the strong winds; U.S. Highway 395 was closed by the Nevada Highway Patrol due to the many semi rollovers. Reno area had $45,000 in damages. Virginia City-Gold Hill area reported $50,000 in property damages; 70-mph-winds near South Lake Tahoe caused $15,000 in property damage; Regional damages totaled over $125,000.
December 27, 2006	Near Walker Lake, Mineral County	A separate period of strong winds near Walker Lake during the early morning overturned two tractor trailers on Highway 95 with $30,000 in damages.
February 22, 2007	Reno, Carson City, Minden areas to Mineral, Lyon and southern Nye Counties	Winds gusting up to 67 mph; five miles north of Hawthorne, a semi-truck was blown over by the strong winds near Walker Lake with $30,000 in damage done.
April 15, 2007	Lovelock & Imlay area, other parts of western NV; Pershing County	Strong winds knocked trees down in Lovelock and Imlay. Also, a sign at the Lovelock Nugget Motel was damaged by wind gusts, and a carport at the Brookwood Trailer Park was picked up and blown into a neighboring yard causing a total of about $10,000 in damage.
October 4, 2007	Western Clark and Southern Nye Counties	A Pacific storm system brought strong southwest winds to portions of the Mojave Desert and Southern Great Basin. An Emergency Services communications tower was blown down in Pahrump, NV by a measured gust to 61 mph; damages were estimated at $10,000.
January 4, 2008	Baker, White Pine County	northern Nevada with a wind gust in Baker reported at 82 mph and Ely reported wind gusts of 74 mph. The high winds partially blew off a roof from the Baker Elementary School and caused a power outage in the town of Baker. Total damages were estimated at $27,000.
January 5, 2008	Las Vegas Valley	Localized downslope winds off the Spring Mountains gusting to about 65 mph caused damage 10 miles northwest of downtown Las Vegas. Ten homes lost roof tiles. Total damages were estimated at $50,000.
February 13, 2008	Las Vegas Valley; Clark, Esmeralda, and Nye Counties	A strong cold front brought high winds and damage to portions of southern Nevada. The airport was closed where a Port-A-Potty blew across the main runway, damaging runway lighting and a parked vehicle. A mobile home was blown into a neighboring house in Las Vegas Valley, and a large tree crushed a truck. In North Las Vegas 5 street light poles, 8 stop signs, and 3 traffic lights were blown down. Many street vendors who were selling Valentine's Day gifts had much of their inventory blown away. The instrument tower at Yucca Mountain measured a gust of 115 MPH and then was blown down shortly thereafter. Total regional damages were estimated at over $280,000.

Table 3-30. Chronology of Some Severe Destructive Windstorms in Nevada[131]		
Date	**Location**	**Description of event/injuries, damages**
April 14th and 15th, 2008	Northern and central Sierra Nevada and western Nevada; Washoe, Storey, Lyon, Churchill counties	A strong cold front with winds that caused some damage in Reno, a portion of a roof was blown off a house, a tree was blown over onto a house, and a carport was blown into a house. Winds damaged signs and construction sites around the Reno-Sparks area. Numerous reports of tree limbs down and uprooted trees. Numerous power poles were down on the west side of Reno and in the North Valleys area 6 miles north of Reno causing power outages. Total damage estimated at about $50,000.
September 1, 2008	East Las Vegas, Clark County, NV	Strong winds up to 43 knots damaged carports on two mobile homes, and blew down a fence, with total damage estimated at $15,000.
March 22, 2009	North Las Vegas, Clark County	A cold Pacific storm system brought high winds to the Mojave Desert and southern Great Basin. Gusts at the North Las Vegas Airport (KVGT) were measured at 55 mph. Winds knocked down two power poles in North Las Vegas, one of which fell onto and damaged a vehicle with total damage estimated at $10,000.
April 14, 2009	Esmeralda, central Nye, and western Clark counties, Amargosa Valley	High winds in southern Nevada; severe wind gust in Amargosa Valley caused roof damage to several homes and businesses, and power lines were blown down. Wind knocked down seven power poles 13 miles N of Amargosa Valley. Total damage estimated at $70,000.
May 11, 2009	Boulder City, Clark County, NV	A strong dust devil moved through the Gingerwood Mobile Home Park on the edge of Boulder City, damaging several mobile homes; total damage estimated at
June 2, 2009	East Las Vegas, Clark County, NV	Wind damaged several mobile homes and a car in the Desert Inn Estates Mobile Home Park; Total damages were estimated at $10,000.
October 4, 2009	Las Vegas Valley, Clark County	Several 8-10 foot trees were blown down, and a large sign was destroyed by high winds in the extreme southwest corner of the Las Vegas Valley. Total damages were estimated at $15,000.
November 20, 2009	Western and west-central Nevada: Washoe County, Carson Valley, Carson City	A fast-moving storm brought strong and damaging winds gusting to 83 mph that damaged trees, fences, and power lines and caused power outages including 2,780 people in Carson City. In addition, there were 4 flight cancellations and about a dozen flight delays at the Reno-Tahoe International Airport. Total damages were estimated at $10,000.
March 29, 2010	Reno-Carson City, Dayton, Minden, Gardnerville areas; Esmeralda and Central Nye Counties	Wind gusting to 72 mph caused power outages and caused difficulty controlling a fire that damaged a furniture store and a hair salon. In Esmeralda and Central Nye Counties, the same windstorm downed trees and power lines, blew a roof off a mobile home, and blew over an irrigation pivot. Visibility was near zero in blowing dust, sand, and gravel. Up to $650,000 total wind-related damages.
April 20, 2010	Goldfield, Esmeralda County, NV	Strong winds blew down power lines in Goldfield, causing power outages; total damage estimated at $50,000.
April 27, 2010	Reno- Lake Tahoe area, Washoe County, NV	Winds up to 63 mph with gusts to 125 mph caused power outages to about 5,000 homes and businesses, ripped shingles off roofs, toppled fences, overturned vehicles, and uprooted hundreds of trees, and canceled over a dozen flights at Reno-

Table 3-30. Chronology of Some Severe Destructive Windstorms in Nevada[131]		
Date	**Location**	**Description of event/injuries, damages**
		Tahoe International Airport. Wind-whipped power lines caused a fire at an apartment complex in Stead just north of Reno. Total damage estimated at $250,000.
April 28, 2010	Las Vegas Valley, Clark County	A powerful storm system brought widespread high winds up to 55 knots that blew down light poles and several trees, knocking out power to at least 300 people. Winds also blew several shingles off roofs, and destroyed a carport at a condominium complex. Total damage estimated at $75,000.
May 10, 2010	Henderson, Green Valley, Las Vegas Valley; Clark County	A Pacific low pressure system brought locally high winds up to 68 mph to southern Nevada and southeast California. Damage reported to the Henderson Pavilion in the Green Valley section of Henderson. Green Valley also reported tree limbs blown down, and a large wooden walking deck blown over. Total damage estimated at $300,000.
May 23, 2010	Mesquite, NV	A dust devil flipped over a Cessna on the tarmac at Mesquite Municipal Airport causing $50,000 in damage.
August 17, 2010	Alunite, NV, Clark County	Thunderstorm winds blew a big rig off U.S. Hwy. 95 near the Eldorado Dry Lake Bed.
August 26, 2010	Henderson, NV, Clark County	Monsoon moisture fueled several rounds of severe thunderstorms over the Mojave Desert and resultant windstorms and flash flooding. A carport on a mobile home sustained $15,000 worth of wind damage.
October 24, 2010	Greater Reno/Carson City, Minden Area; Washoe, Douglas, Carson City Counties	Storm brought rain and strong, gusty winds to western Nevada with gusts to 102 mph at Galena Creek Bridge, 110 to 130 mph on Slide Mountain , and 79 mph in Washoe Valley, with overturned tractor trailer causing $10,000 in damage.
February 14-15, 2011	Greater Reno/Carson City, Minden Area; Washoe, Douglas, Carson City Counties	A cold front system brought strong winds gusting 66-85 mph to portions of western Nevada. Wind damage reports include: an overturned semi truck near Verdi, four- to 6- inch tree limbs down near Gardnerville, a power line down in southwest Reno which sparked a fire (no damage from fire).
March 7, 2011	Las Vegas Valley, Clark County, NV	Storm with strong west to southwest 45 knots winds ahead of it blew out a transformer in the north part of the Las Vegas Valley. Damages totaled about $5000.
March 20, 2011	Western Clark /southern Nye County, NV	Storm system produced high winds; 63-mph wind gust in Sandy Valley collapsed a structure, injuring four people and killing one horse. Damages were estimated at $75,000.
April 6-7, 2011	Mineral, Lyon, Esmeralda, Southern Nye, Lincoln, Las Vegas Valley, Clark County, NV	Storm system brought high winds to Mojave Desert and southern Great Basin; winds 60 mph with gusts to 90 mph. Wind damage in Las Vegas, North Las Vegas, and Henderson, included several trees down and at least two business signs damaged or destroyed totaling $50,000. Several power lines were blown down in the Fish Lake Valley-Dyer area totaling $15,000 in damages. High winds blew over two tents and caused $5,000 in total property damage at the Clark County Fair and Rodeo in Logandale. Total reported damage for this widespread windstorm event was $70,000.
May 15, 2011	White Pine, Lincoln, Counties	A strong cold front brought strong winds to 63 mph with gusts up to 76 mph to portions of eastern Nevada. A power pole in Ruth was blown down with total damage

Table 3-30. Chronology of Some Severe Destructive Windstorms in Nevada[131]		
Date	**Location**	**Description of event/injuries, damages**
		estimated at $5,000.
July 3, 2011	Henderson, Las Vegas Valley, Clark County, NV	Thunderstorm winds gusting to 62 mph caused damage in a large area of the Las Vegas Valley. The storm blew over several mobile homes, blew down numerous trees (one of which damaged a car), blew down several power poles and lines, causing power outages for at least 10,000 people, and destroyed at least one fireworks stand. Total damage estimated at $1,000,000.
July 9, 2011	Logandale, Clark County, NV	Thunderstorm winds blew down four power poles in Logandale, knocking out power to about 500 homes and causing a total of about $40,000 damage.
July 10, 2011	Las Vegas area, with damage in Valley Siding, Riverside, and Boulder City, Clark County, NV	Winds gusting up to 64 mph. At least two trees were blown down, one onto a house; numerous power poles and lines were blown down; and one child suffered minor injuries when part of a roof blew off an apartment building, into the building next door. Also, a wind gust blew over a semi truck on Interstate 15 near Riverside. In Boulder City area, wind broke apart two docks and damaged 20 vehicles, primarily by lofting gravel which broke windshields. Total wind damage estimated at $315,000.
November 17th-19th, 2011	Reno-Sparks area, Washoe County, NV	High winds in the SW Reno foothills began late on the 17th, with gusts to 80 mph at the Hwy 50 and 395 Jct. in Carson City. High winds caused the arcing of power lines which started the Caughlin Fire just after midnight on the 18th, resulting in one of the most damaging fires in Reno history on the 19th, causing one fatality, destruction of 26 homes, and 8 million dollars in damage and firefighting costs (Table 3-32, Figure 3-133).
November 30-December 1, 2011	Esmeralda, Western Clark, Lincoln, Southern Nye Counties; Las Vegas Valley	A strong cold front brought high winds to the southern Great Basin and caused damage across several southern Nevada counties. High winds in Amargosa Valley blew down several trees and damaged some older roofs and metal buildings causing a total of $50,000 damage. In the Pahrump area, a boat, RV, and greenhouse were damaged, shingles were blown off roofs, power lines and a radio tower were blown down, and a carport torn down by the wind fell on a woman, injuring her. Total Pahrump damages were estimated at $100,000. In Las Vegas Valley, a wind gust of 67 mph collapsed an aircraft shelter, causing minor injuries to eight personnel. Winds disrupted four electricity distribution lines in Las Vegas, knocking out power to about 5000 customers and causing $10,000 in damages. Large trees were also knocked down near downtown Las Vegas and Summerlin. Total combined damage for this widespread severe windstorm event was about $160,000 with at least nine injuries.
January 19, 2012	Reno-Sparks-Carson Valley area, Washoe County, Carson City, and Douglas County	Winds gusted between 60 and 84 mph south of Reno and were responsible for blowing over a tractor trailer along U.S. Highway 395 near Red Rock Road in the north valleys of Reno, which caused 3 injuries, damage to 13 vehicles, and the shutting down of the highway. Strong winds and the

Table 3-30. Chronology of Some Severe Destructive Windstorms in Nevada[131]		
Date	**Location**	**Description of event/injuries, damages**
		improper disposal of fireplace ashes caused the rapid spread of a wildfire originating at the north end of Washoe Valley early in the afternoon on the 19th. Thousands of people were forced to evacuate from the swift-moving fire. About 3177 acres were burned with 28 homes destroyed, 7 damaged, and one fatality was attributed to the fire. Damage and firefighting costs were estimated at over 4 million dollars.
January 12, 2012	Las Vegas Valley	A strong storm system brought high winds up to 57 knots to the Las Vegas Valley. A skylight window blew out in the Galleria Mall; signs, a power line, and several trees were blown down, and a construction trailer was damaged. Total losses were estimated at $40,000.
Feb 25, 2012	Humboldt, Elko, northern Lander and Eureka Counties	A powerful storm system brought high winds across much of northern Nevada with widespread gusts of up to 76 mph. In Orovada, winds damaged trees, blew gated pipelines apart, broke them, and scattered pieces more than 1/2 mile across fields. A large barn was blown down in Diamond Valley, Humboldt Co. where total damage was estimated at $30,000.
March 6, 2012	Las Vegas Valley, Clark Co.; Esmeralda County, So. Nye County	Cold front brought high winds to southern Great Basin; many trees were blown down and at least two fell onto houses. In the Las Vegas Valley, at least two roofs, one awning, and one carport were torn off buildings; two light poles were blown down; one fell on a vehicle, large panes of glass were blown out; three solar panels on the roof of City Hall were damaged; one truck and one street sign blew over; several NASCAR race tents were blown down. Damages directly attributable to the wind event in the Las Vegas Valley were estimated at over $500,000. Approximately 14,000 customers lost power after high winds damaged equipment near Jean, resulting in $20,000 of damage. In southern Nye Co., a porch was torn off a home in Beatty by wind and a wind-observation tower 17 miles ESE of Beatty was blown down after registering a 78 mph gust. This damage was reported at $20,000.
March 31, 2012	Much of northern NV with damage in areas of Churchill, Mineral, Lyon, Humboldt, and Pershing Counties, NV	Sustained winds in the 40-65 mph range with gusts to 83 caused blowing dust which reduced visibility to 1/4 mile or less at times in Lovelock and Fallon and blew vehicles off roadways. In addition, a window was reported broken by the wind (not debris) in Lovelock and a single-wide trailer was blown over near Rye Patch Reservoir in Pershing County. Total estimated damage of $10,000 in Pershing Co. area. At Paradise Hills, a ham radio operator lost $3000-$4000 worth of towers, antennas, feed-lines, and house roofing and ventilation. Also in Humboldt County, strong winds blew over a semi-truck traveling westbound on Interstate 80 west of Golconda Summit as well as a pickup truck hauling a 33 foot trailer on U.S. Highway 95 north of Orovada. Total wind damage in Humboldt County was estimated at $10,000. In Mineral and Lyon Counties, winds gusted to 76 mph on Hwy 359 from Anchorite Summit to Yerington and along Hwy 95 near Schurz.

Table 3-30. Chronology of Some Severe Destructive Windstorms in Nevada[131]		
Date	**Location**	**Description of event/injuries, damages**
		NDOT reported a dust storm that closed Hwy 95 from Hawthorne to Luning late in the afternoon. Finally, the Yerington sheriff's office reported power lines and 2 telephone poles down, 3 transformers on fire, and the entire town without power at 1530PST. Total wind damage in Mineral and Lyon Counties due to this wind event was estimated at $30,000.
May 7, 2012	Las Vegas Valley: Sunrise Manor, Paradise, North Las Vegas Clark County, NV	At least four dust devils developed over the Las Vegas Valley in the afternoon, causing significant damage; in Sunrise Manor they tore shingles off the roofs of a bank and multiple units of an apartment complex, damaged several cars, knocked down a cinder block wall and a light pole, and damaged several telephone poles, with total wind damage in Sunrise Manor estimated at $40,000. In Paradise, a dust devil tore numerous tiles from the roof of a business, damaged a large ceramic fountain and a sign, and collapsed an awning causing $10,000 in damage. In North Las Vegas, a dust devil uprooted trees and then struck a retail store, tearing off part of the roof and breaking water lines to the building's sprinkler system. Power was also knocked out to about 2,000 customers. North Las Vegas damage was estimated at $50,000, for a total of about $100,000 in damage due to this series of wind events.
May 25, 2012	Esmeralda County and Amargosa Valley, Nye County	Peak gust of 62 knots occurred 40 miles east of Beatty. In Amargosa Valley, some metal buildings were destroyed, older roofs were damaged, tree limbs were torn down, and power was knocked out causing total estimated damage of $50,000.
June 4, 2012	Fernley, Silver Springs, Stagecoach, Yerington areas in Lyon & Churchill Counties, and Schurz and Hawthorne areas, Mineral County NV	Winds to 55 mph with gusts to 69 mph blew down trees onto roads with a total of 16-20 trees downed around Fernley. Also, some fences were downed and power was out along with visibility reduced to 0.5 mile in Fernley. Total wind damage in Fernley area was estimated at $35,000. In addition, a few trees and power lines were downed in Yerington where visibility was down to 100 yds. In Hawthorne, visibility was down to 0.5 mile at the airport. Fourteen miles south of Walker Lake along US Hwy 95, low visibility was responsible for a 3-car pile-up and closure of the highway between Fallon and Luning. Total wind damage in this area was estimated at $35,000.
May 10, 2014	Southern Nevada	A strong cold front brought high winds to much of the Mojave Desert and southern Great Basin. In the Callville Bay area, damage included 17 house trailer skirts; nine trailer awnings; several trailer roofs; flying debris damage to some vehicles, one houseboat, and a dock; a 25 foot sailboat which was flipped off a trailer; and damage to NV Energy infrastructure. At the Las Vegas Boat Harbor, one dock was pushed 20 feet and the bridge leading to it was damaged. Two other docks and private boats were also damaged. One man was presumed drowned in Lake Mead after high winds blew away his boat and caused waves in the lake.

Table 3-30. Chronology of Some Severe Destructive Windstorms in Nevada[131]		
Date	**Location**	**Description of event/injuries, damages**
December 11, 2014	Northern Nevada	Widespread wind gusts over 65 mph were noted on the December 11, 2014, 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.
February 6, 2015	Northern Nevada	Widespread wind gusts of 60 to 79 mph were recorded from Minden north to the Palomino Valley. Higher gusts of 80 to 90 mph were noted in the Virginia Range and southwest of Gardnerville, with gusts over 100 mph at the Galena RAWS. Numerous roof and fences were damaged and several 4-foot diameter trees were downed on power lines in Gardnerville. Longtime residents of the area said this was the worst windstorm they had experienced in over 10 years. As many as 21,000 were without power around the area, with the worst damage to power lines in Douglas County. Finally, the high winds were blamed for the loss of power to two emergency communications repeaters critical to Lyon County. Alternate highway 95 east of Yerington was closed for a few hours due to several accidents, with high winds and very low visibility due to blowing dust reported by the Lyon County EM.
March 6, 2016	Southern Nevada	Around the Las Vegas Valley, a tree blew down and landed on a vehicle; a rooftop air conditioner blew into power lines, breaking the power pole; a light post blew down; and a few large tree branches snapped.
March 13, 2016	Northern Nevada	Winds of 40 and 55 mph with gusts 60 to 80 mph were recorded in and just east of the foothills of the Carson Range south of Reno on the 13th. The high winds caused a big rig to overturn on highway 395 near Stead. Finally, severe turbulence aloft near the Reno-Tahoe airport caused delays and cancellations on the morning of the 13th.
March 30, 2017	Las Vegas Area	An unusually powerful low-pressure system and cold front brought high west to southwest winds ahead of it and high north winds behind it as it tracked through the southern Great Basin and the Mojave Desert. Red Rock Canyon gusted to 82 MPH. Gusts 60-70 MPH in the Las Vegas valley resulted in widespread damage to trees, power poles and lines, streetlights, and billboards. Some of the trees and poles damaged homes and cars. There were also numerous power outages.
March 12, 2019	Near Elko	A strong downslope wind event developed east of the Ruby Mountains. Wind gusts over 90 MPH were observed by the Ruby Valley RAWS fire weather station.
June 12, 2022	**Fernley**	A fast moving cold front with an anonymously deep upper trough brought another round of windy conditions, increased chances for showers and thunderstorms, and cooler temperatures that dampened summer recreation activities and travel across the area. Several sections of wood fences were blown down in Fernley,

Table 3-30. Chronology of Some Severe Destructive Windstorms in Nevada[131]		
Date	**Location**	**Description of event/injuries, damages**
		NV. Mesonet station (SLIDE), Mount Rose summit (DRI), located 0.9 mi E of the Mount Rose Summit area reported a peak wind gust of 103 mph.

Strong Winds can lead to cascading disasters beyond immediate damage. For example, the 2011 Caughlin Fire near Reno was ignited by high winds arcing power lines. Pushed along by 50-60 miles per hour winds, gusting to 85 miles per hour, the fire destroyed 28 homes and damaged 13 more. Thousands fled to shelters with the rapidly advancing flames (Figure 3-133). Power infrastructure is at risk of high wind events, however to this point widespread prolonged outages have not been observed. Outages during high wind events have been localized to city or county levels.



Figure 3-133. Caughlin Fire in West Reno on November 18, 2011.[132]

Similarly, the Pinehaven Fire in November 2020, was caused by a high voltage arc flash during a Strong Wind event. The Pinehaven Fire destroyed five (5) homes, damaged 24 homes, and caused 1,300 people to evacuate.

[132] Photo Credit: Alex Hoon NWS/NOAA.

Figures 3-134 and 3-135 depict the NRI Historic Loss Ratios in dollars statewide and in more heavily populated areas respectively. The maps have historic damaging wind paths overlayed.

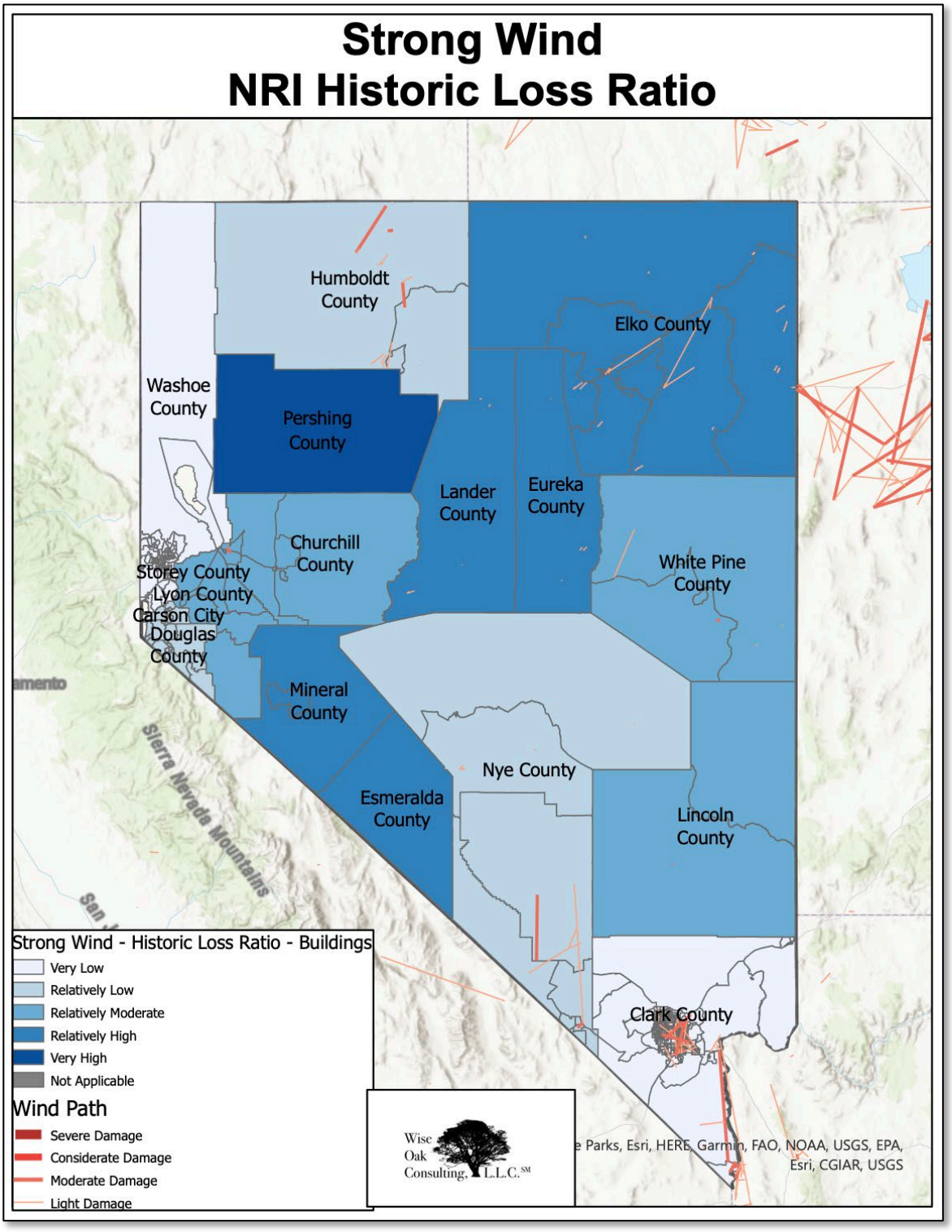


Figure 3-134. Strong Wind National Risk Index Historic Loss Ratio – Statewide.

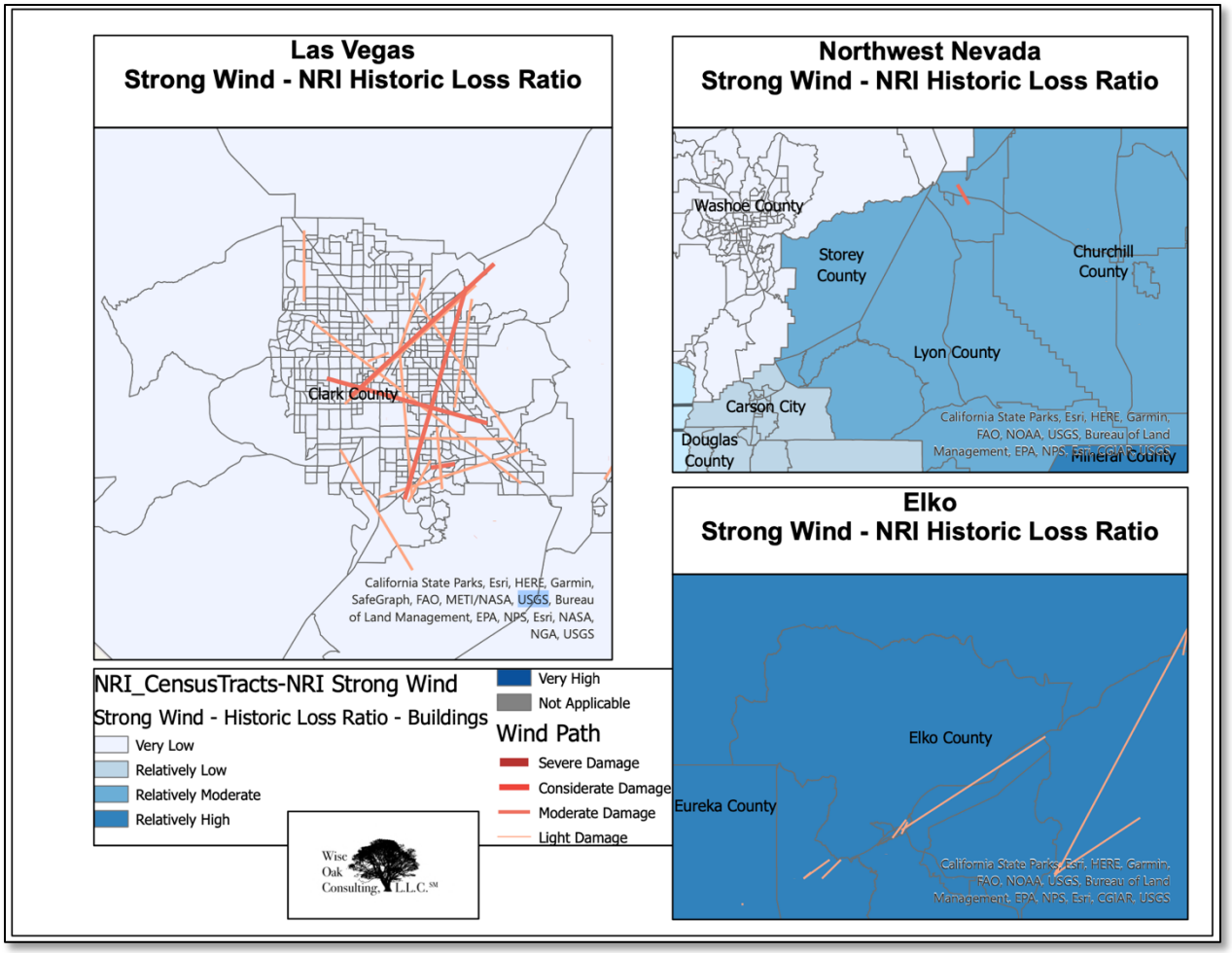


Figure 3-135. Strong Wind National Risk Index Historic Loss Ratio – More Heavily Populated Areas.

3.3.12.3 Location, Severity, and Probability of Future Events

Severe storms are considered to be "Medium/Significant Risk" hazards. They occur frequently and can cause significant damage to structures that have not been built to meet current building codes. Because the transportation infrastructure within the state is rather robust, weather-related events do not generally have much long-lasting effect on the transportation network. Severe weather events may cause temporary closures, but generally do not cause damage. The exception is severe flooding, that can be caused when storms bring large amounts of rain or warm rain on top of already heavy snowpacks. These floods can cause significant damage to roads, railways, and airports.

Power infrastructure is at risk of high wind events. Similar to California's Pacific Gas, and Electric (PG&E), NV Energy now has a Public Safety Outage Management (PSOM) program to de-energize power lines when certain conditions exist to protect high fire risk areas.

Because winter snow, rain, and windstorms occur each year in northern and central Nevada, most local and state jurisdictions are able to manage these types of events. Only when the storms are severe and repeated is there a possibility of these hazards causing damage and prolonged disruption. More research is necessary to determine and prioritize actions that will mitigate these hazards. The Subcommittee will assist in the development of strategies to mitigate this hazard as new data become available.

Figures 3-136 and 3-137 depict the NRI Expected Annual Loss statewide and in more heavily populated areas respectively. The maps have historic damaging wind paths overlayed.

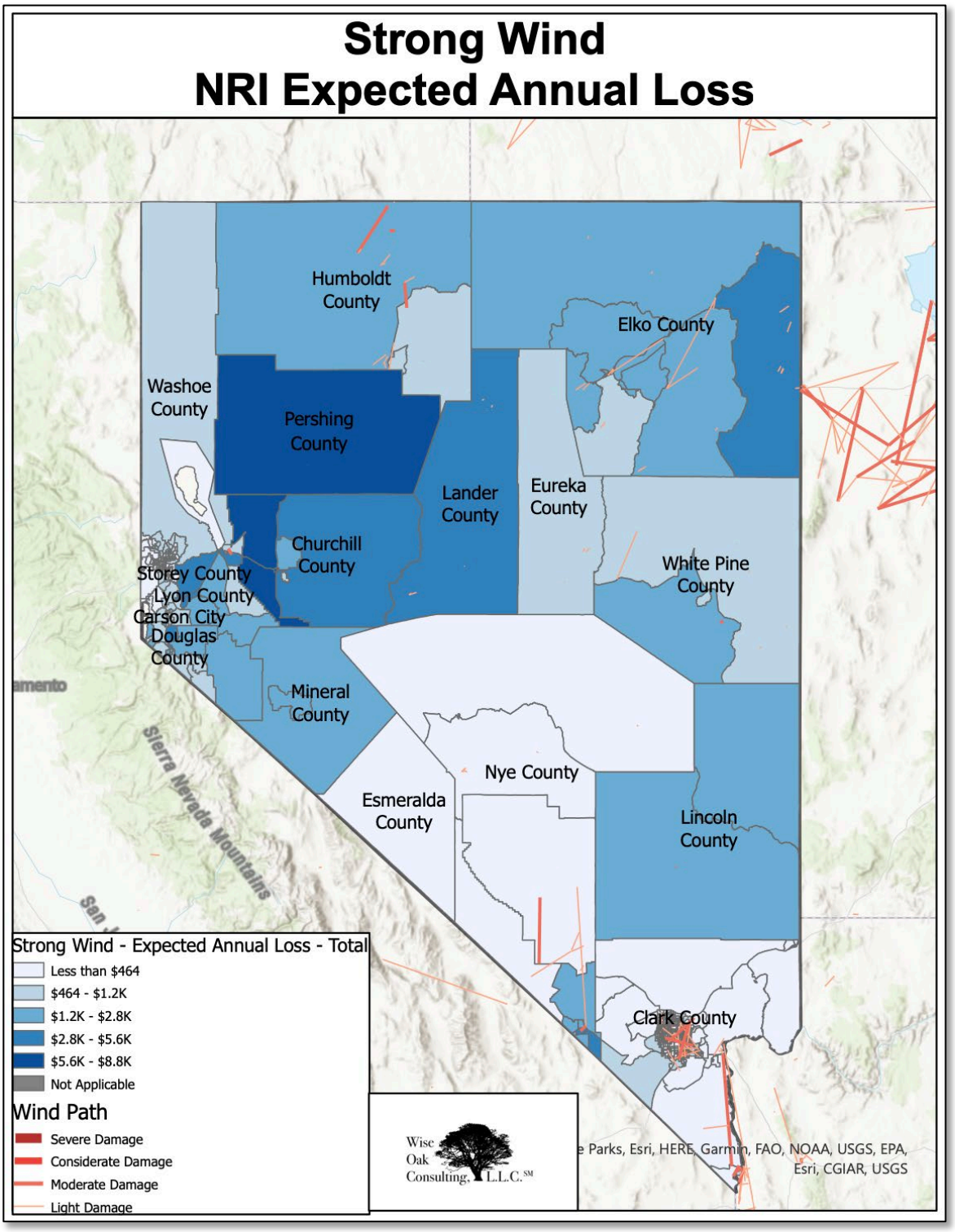


Figure 3-136. Strong Wind National Risk Index Expected Annual Loss – Statewide.

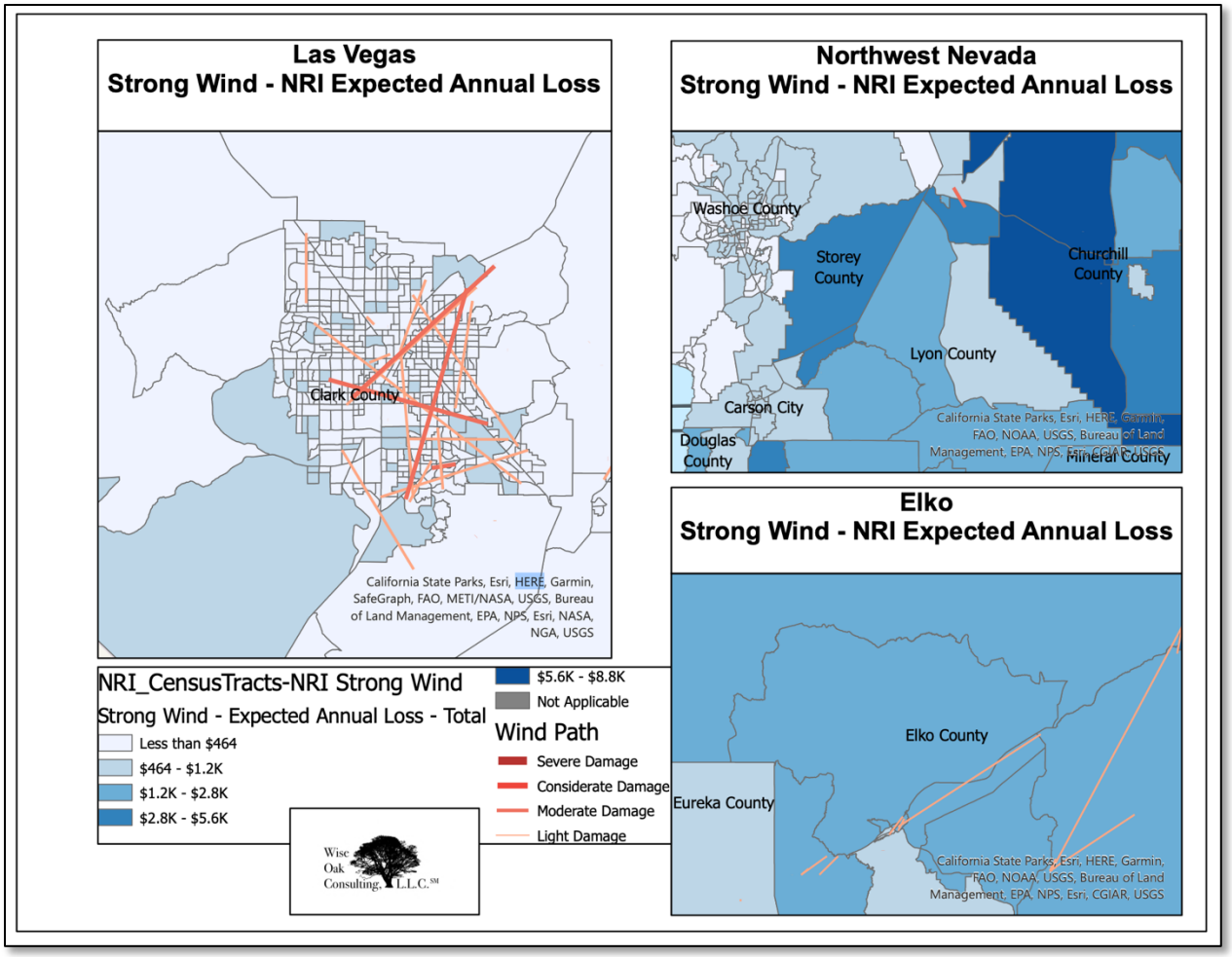


Figure 3-137. Strong Wind National Risk Index Expected Annual Loss – More Heavily Populated Areas.

Figures 3-138 and 3-139 depict the NRI Annualized Frequency for Strong Wind in terms of number of events statewide and in more heavily populated areas respectively. The maps have historic damaging wind paths overlayed.

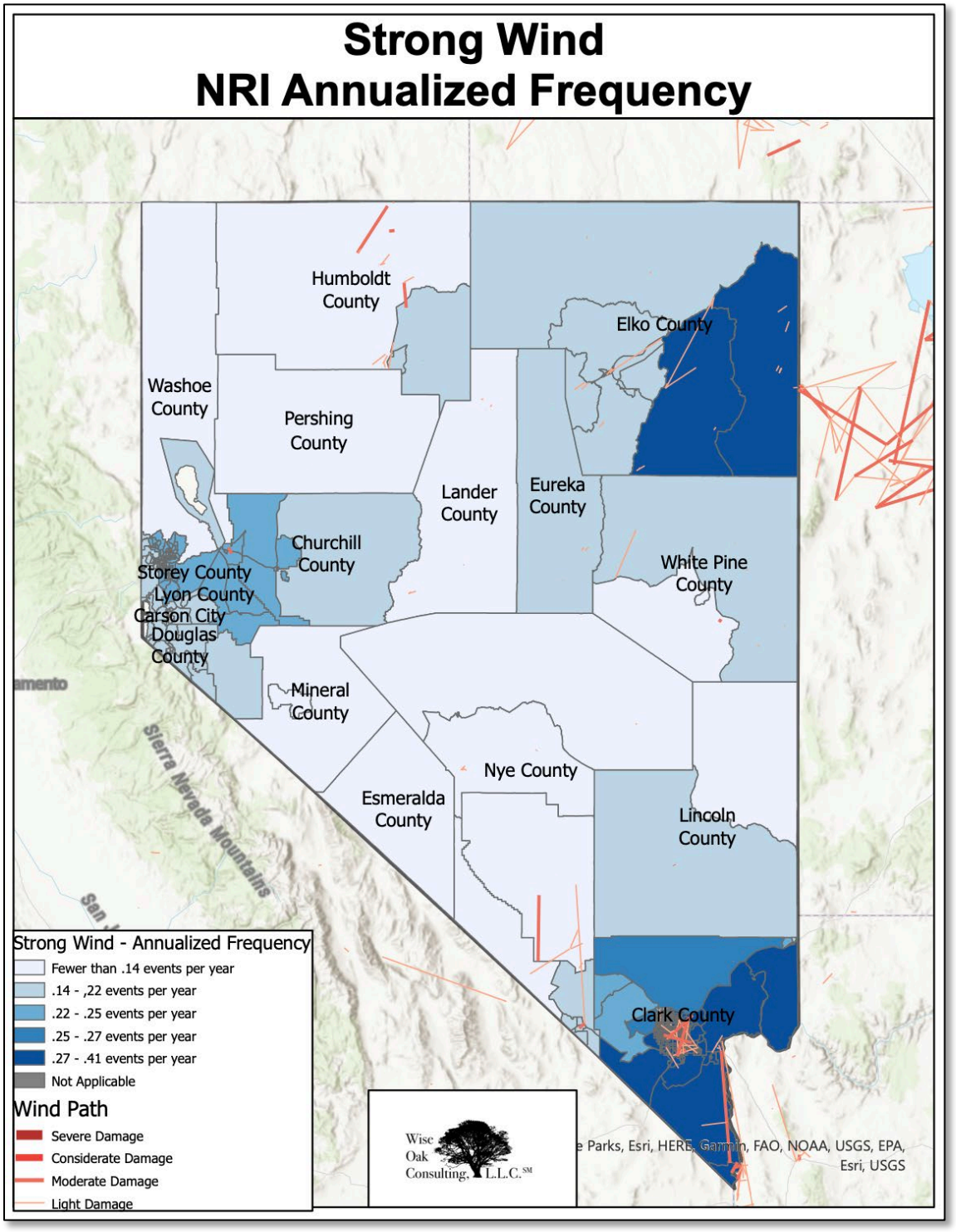


Figure 3-138. Strong Wind National Risk Index Annualized Frequency – Statewide.

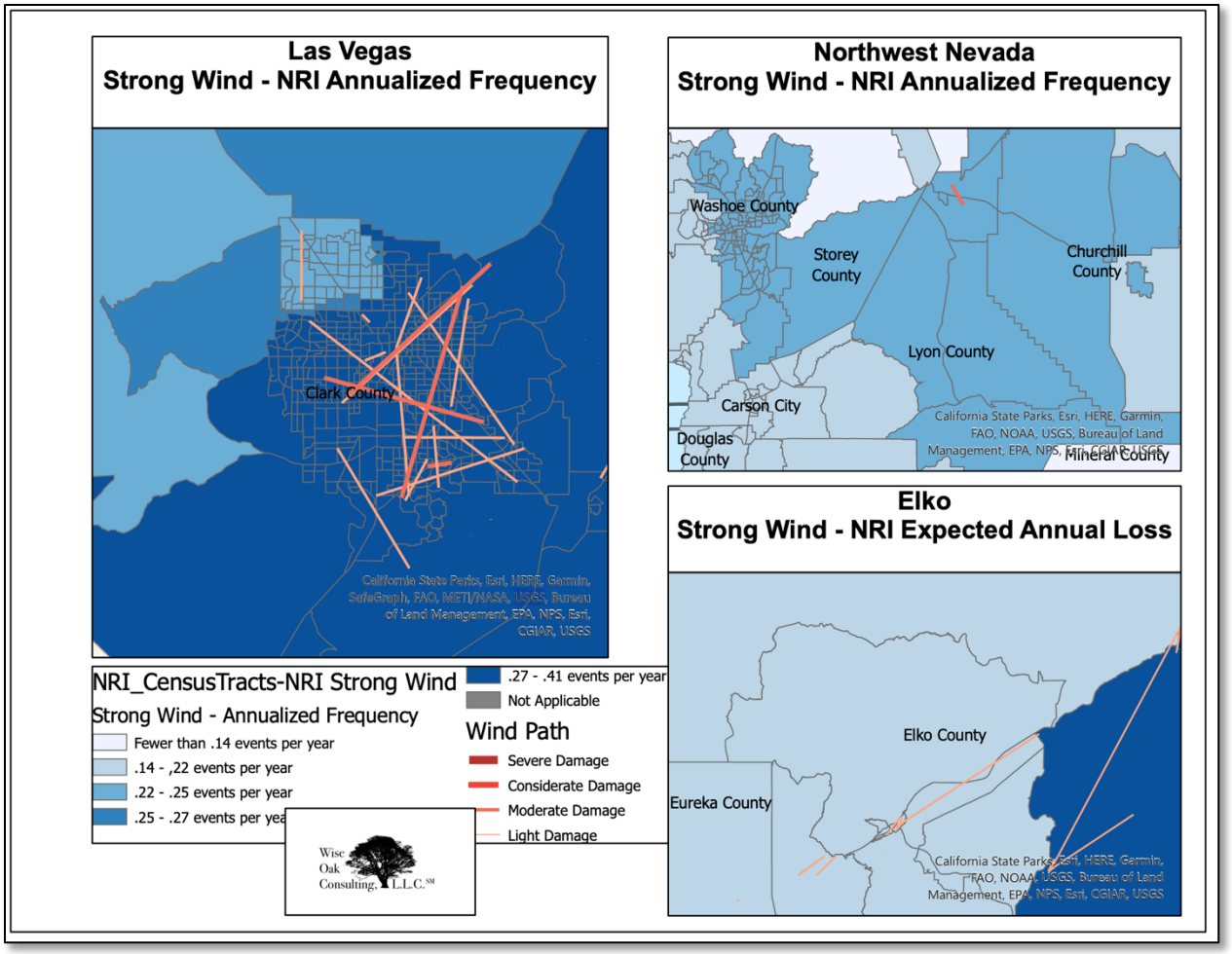


Figure 3-139. Strong Wind National Risk Index Annualized Frequency – More Heavily Populated Areas.

3.3.12.4 Impacts from Climate Change

There is no reliable data on whether or not Nevada windstorms will increase or decrease in frequency and intensity in the coming decades due to climate change.

3.3.12.5 Vulnerability of State Assets

Subject matter experts do not assess that there is appreciable vulnerability to state assets due to this hazard.

3.3.12.6 Mitigation

Subject matter experts have assessed that there is no appreciable vulnerability of state assets due to this hazard. Therefore, the hazard profile is for information purposes only and mitigation projects will not be pursued for this hazard in 2023-2028.

3.3.13 Thunderstorms, Hail, and Microbursts (Low Risk)

This section takes into account the primary risks of hail and thunderstorms, not secondary risks. Many of Nevada's flash floods and wildfires are caused by thunderstorms. These hazards are covered in their respective sections in this report.

3.3.13.1 Nature



Thunderstorms are formed from a combination of moisture, rapidly rising warm air, and a force capable of lifting air, such as warm and cold fronts or a mountain. A thunderstorm can produce lightning, thunder, and rainfall that may also lead to the formation of tornados, hail, downbursts, and microbursts of wind. Thunderstorms 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.

Figure 3-140. Thunderstorm Developing over Mt Rose near Reno, 6/4/2013.[133]

Thunder and lightning are most commonly associated with thunderstorms. Lightning occurs when the rising and descending motion of air within clouds produces a separation of positively and negatively charged particles. This separation produces an enormous electrical potential both within the cloud and between the cloud and the ground. Lightning results as the energy between the positive and negative charge areas is discharged. As the lightning channel moves through the atmosphere, heat is generated by the electrical discharge to the order of 20,000 degrees (three times the temperature of the sun). This heat compresses the surrounding clear air, producing a shock wave that decays to an acoustic wave as it moves away from the lightning channel, resulting in thunder.



Figure 3-141. Cloud to ground lightning near Spanish Springs, Nevada.[134]

[133] Credit: NWS Reno.
[134] Credit: Scott McGuire, NWS Reno.

In addition, hail can occur as part of a severe thunderstorm. Hail develops within a low-pressure front as warm air rises rapidly in the upper atmosphere and is subsequently cooled, leading to the formation of ice crystals. This cycle continues until the hailstone is too heavy to be lifted by the updraft winds and falls to the earth. The higher the temperature at the earth's surface, the stronger the updraft, thereby increasing the amount of time the hailstones are developed. As hailstones are suspended longer within the atmosphere, they become larger. Other factors impacting the size of hailstones include storm scale wind profile, elevation of freezing level, and the mean temperature and relative humidity of the downdraft air.

Also, downbursts and microbursts are associated with thunderstorms. Downbursts are strong, straight-line winds created by falling rain and sinking rain that my reach speeds of 125 miles per hour (mph). Microbursts are more concentrated than downbursts, with speeds reaching up to 150 mph. Both downbursts and microbursts can typically last 5 to 7 minutes. Microburst wind gusts of 50-70 mph are very common with Nevada thunderstorms due to the extremely dry lower layers near the surface being able to evaporate precipitation, creating strong winds. Typical microburst damage is to power lines and trees being blown down, roof and fence damage to homes and businesses.

Damaging microburst winds are fairly common in Nevada thunderstorms, while large damaging hail is less of a risk. That being said, there have been isolated large hail events recently which have resulted in property and vehicle damage. By far the greatest threats imposed by thunderstorms in Nevada are the associated lightning-caused wildfires and flash flooding due to cloudbursts. These risks are more completely discussed in the sections on Flood and Wildfire.

The current predictability of severe thunderstorms is marginal to poor. The current state of the science and forecasting technologies results in a broad heads up of days with numerous or severe thunderstorms to about 1-3 days in advance. Specific storm-scale warning lead time of severe thunderstorms and flash flooding is generally 15-30 minutes but can be zero.

Figures 3-142 and 3-143 depict the National Risk Index Score for lightning statewide and for more heavily populated areas respectively.

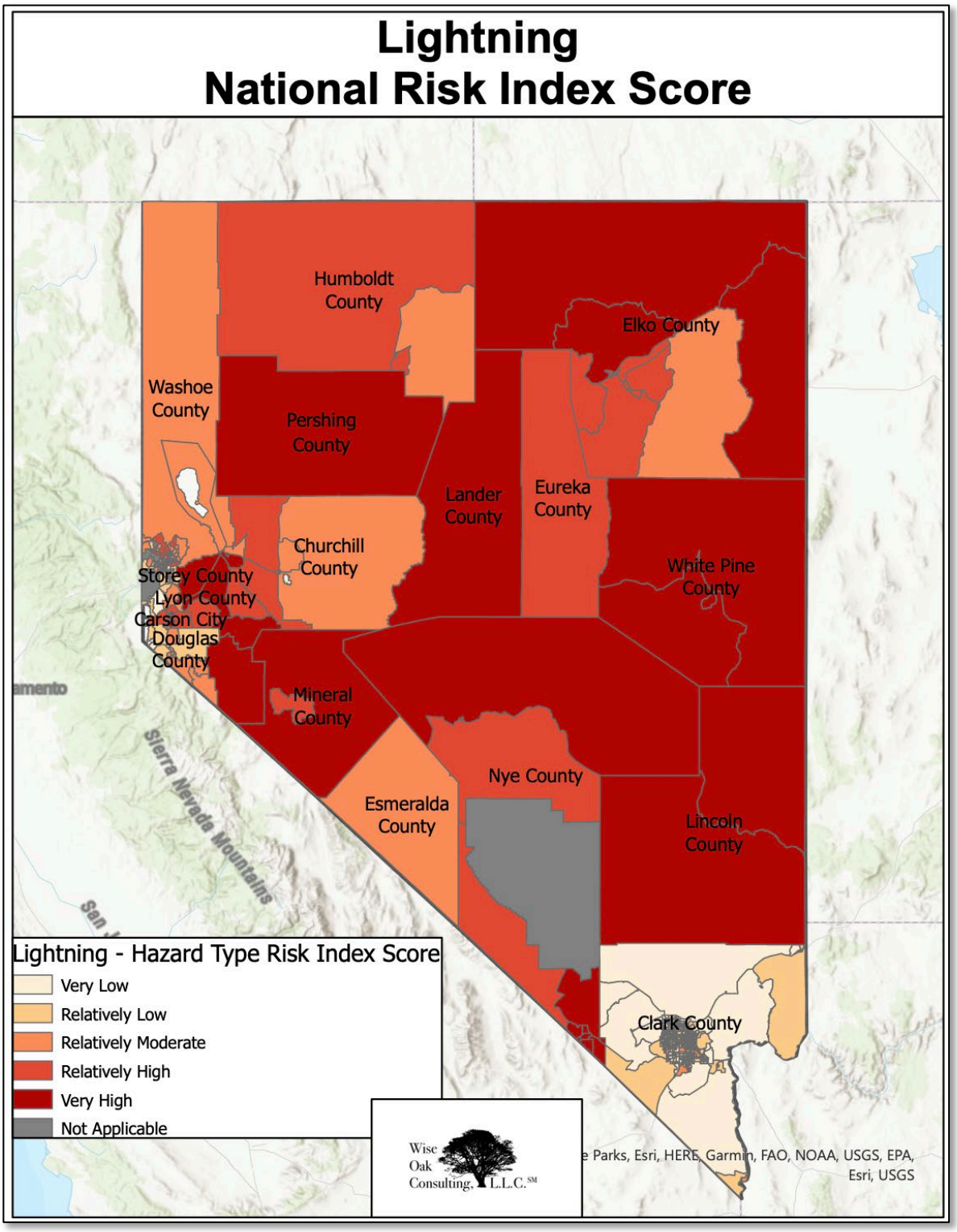


Figure 3-142. Lightning National Risk Index Score – Statewide.

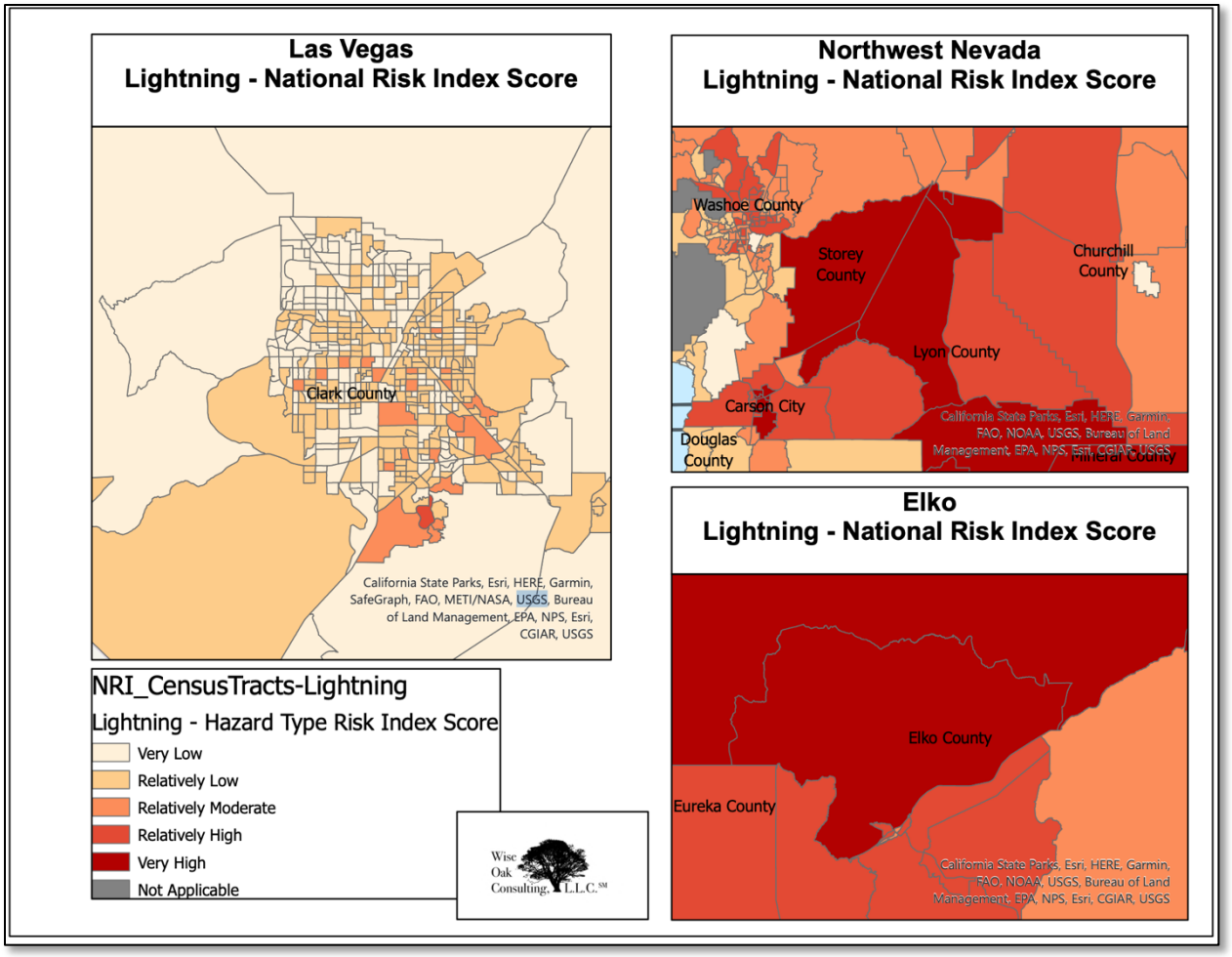


Figure 3-143. Lightning National Risk Index Score – More Heavily Populated Areas.

Figures 3-144 and 3-145 depict the NRI Exposure in dollars statewide and in more heavily populated areas respectively.

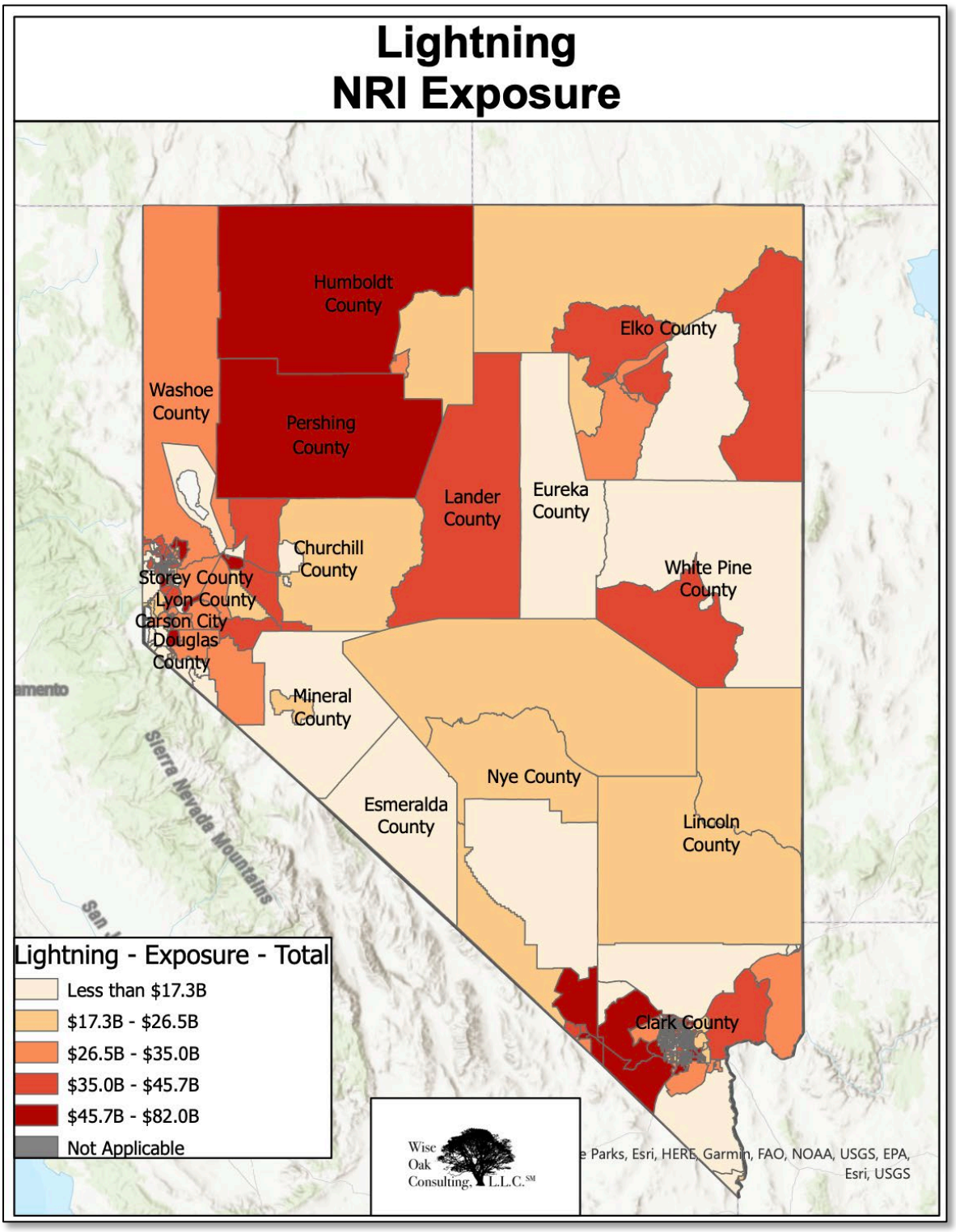


Figure 3-144. Lightning National Risk Index Exposure – Statewide.

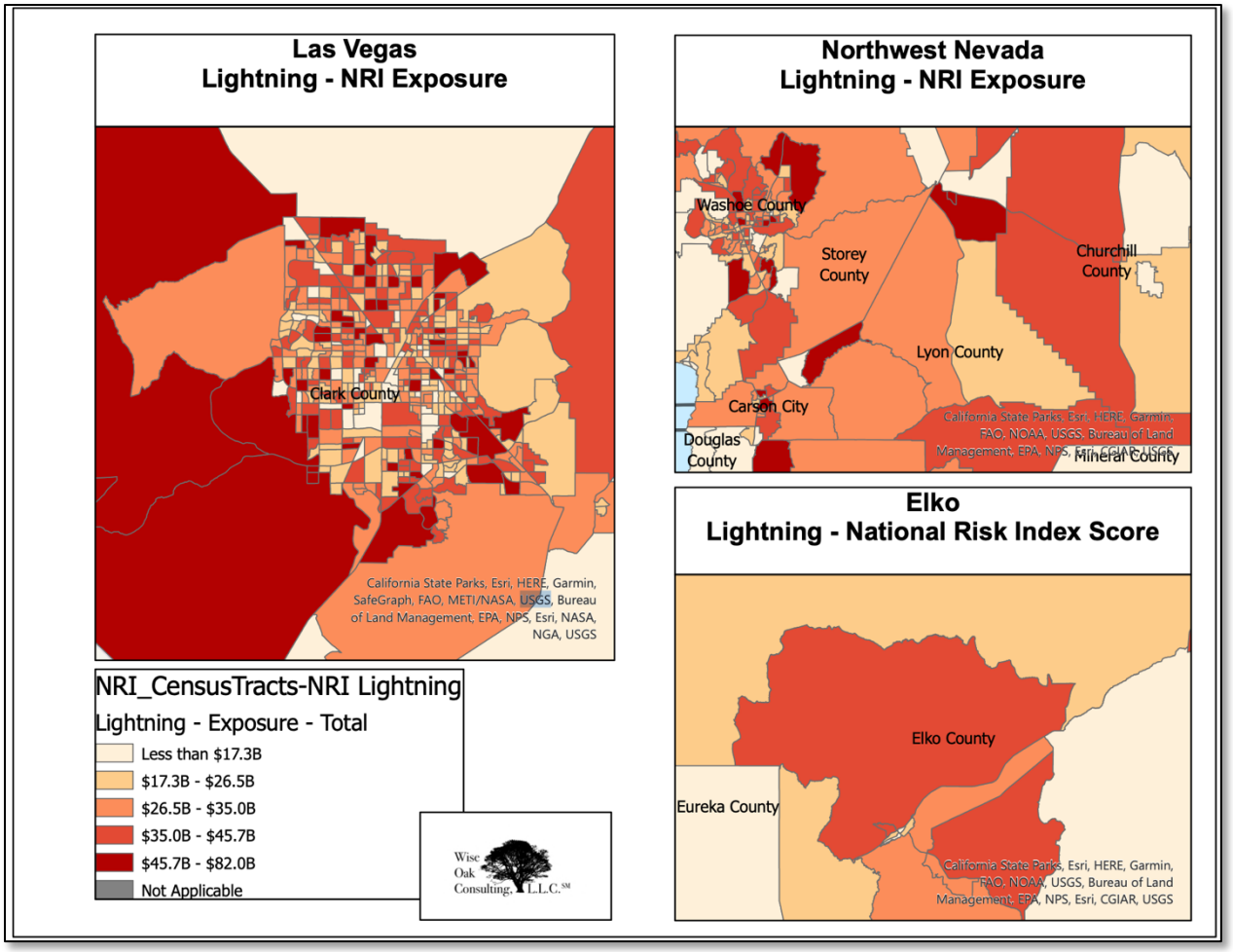


Figure 3-145. Lightning National Risk Index Exposure – More Heavily Populated Areas.

Figures 3-146 and 3-147 depict the National Risk Index Score for hail statewide and for more heavily populated areas respectively.

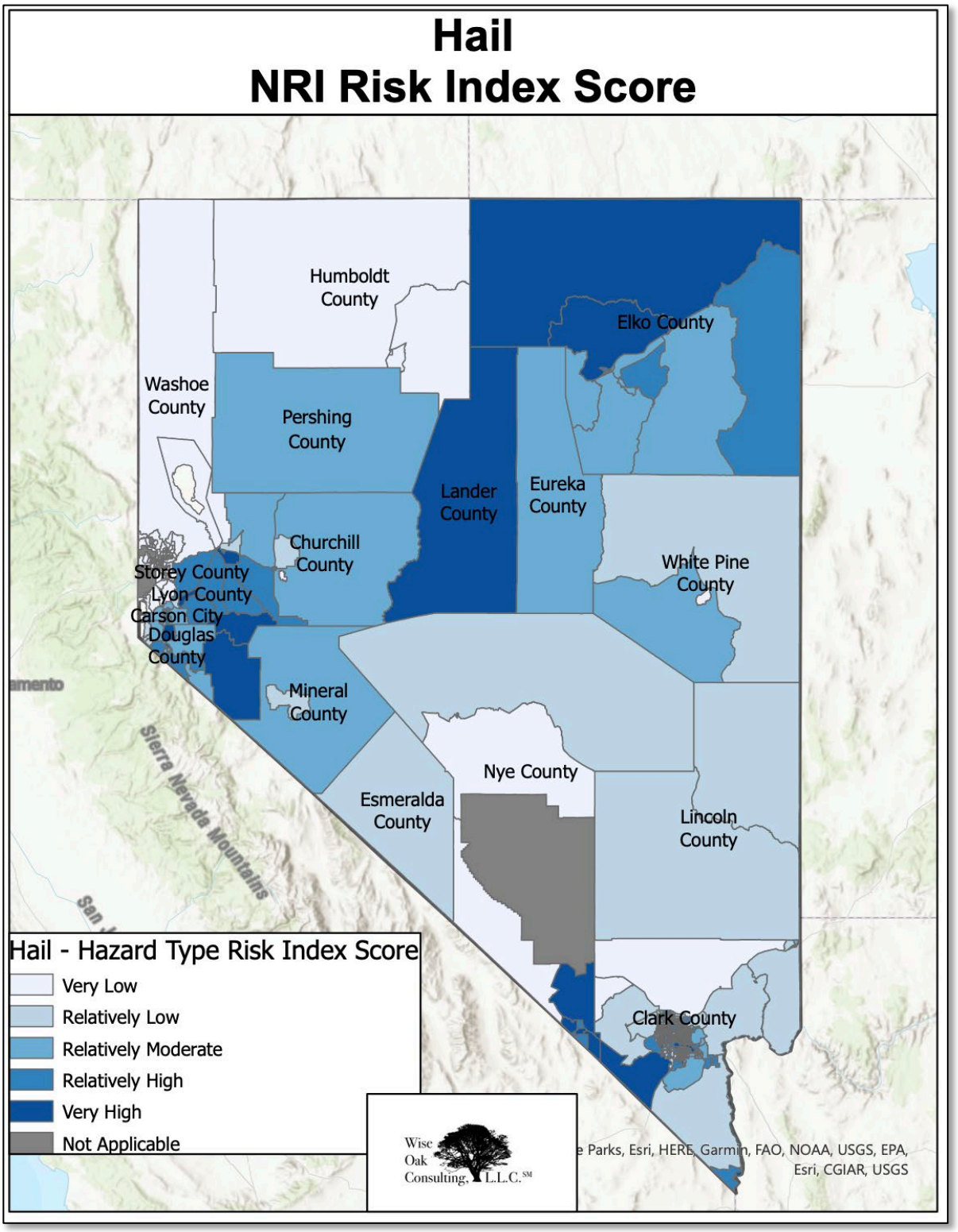


Figure 3-146. Hail National Risk Index Score – Statewide.

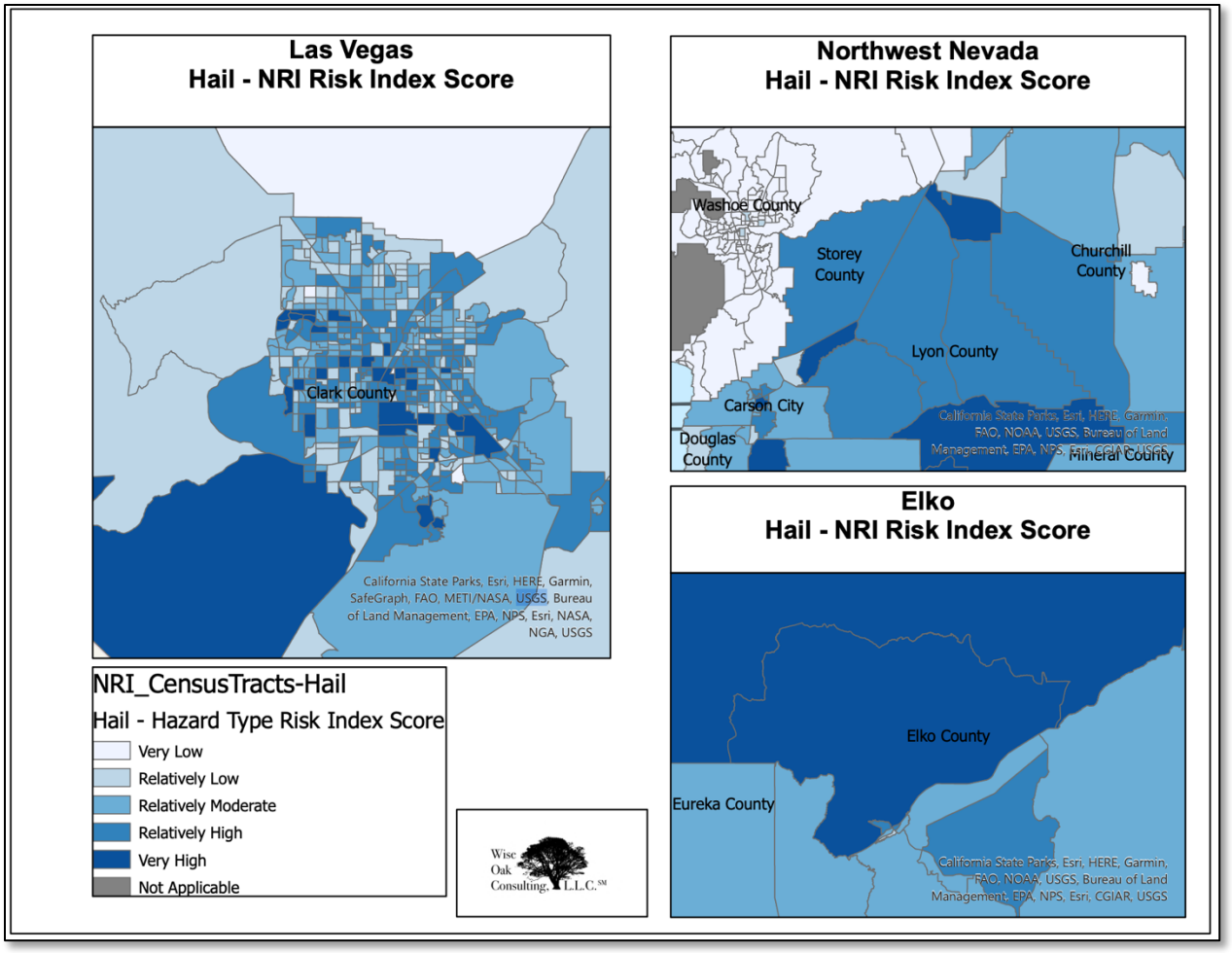


Figure 3-147. Hail National Risk Index Score – More Heavily Populated Areas.

Figures 3-148 and 3-149 depict the NRI Exposure in dollars statewide and in more heavily populated areas respectively.

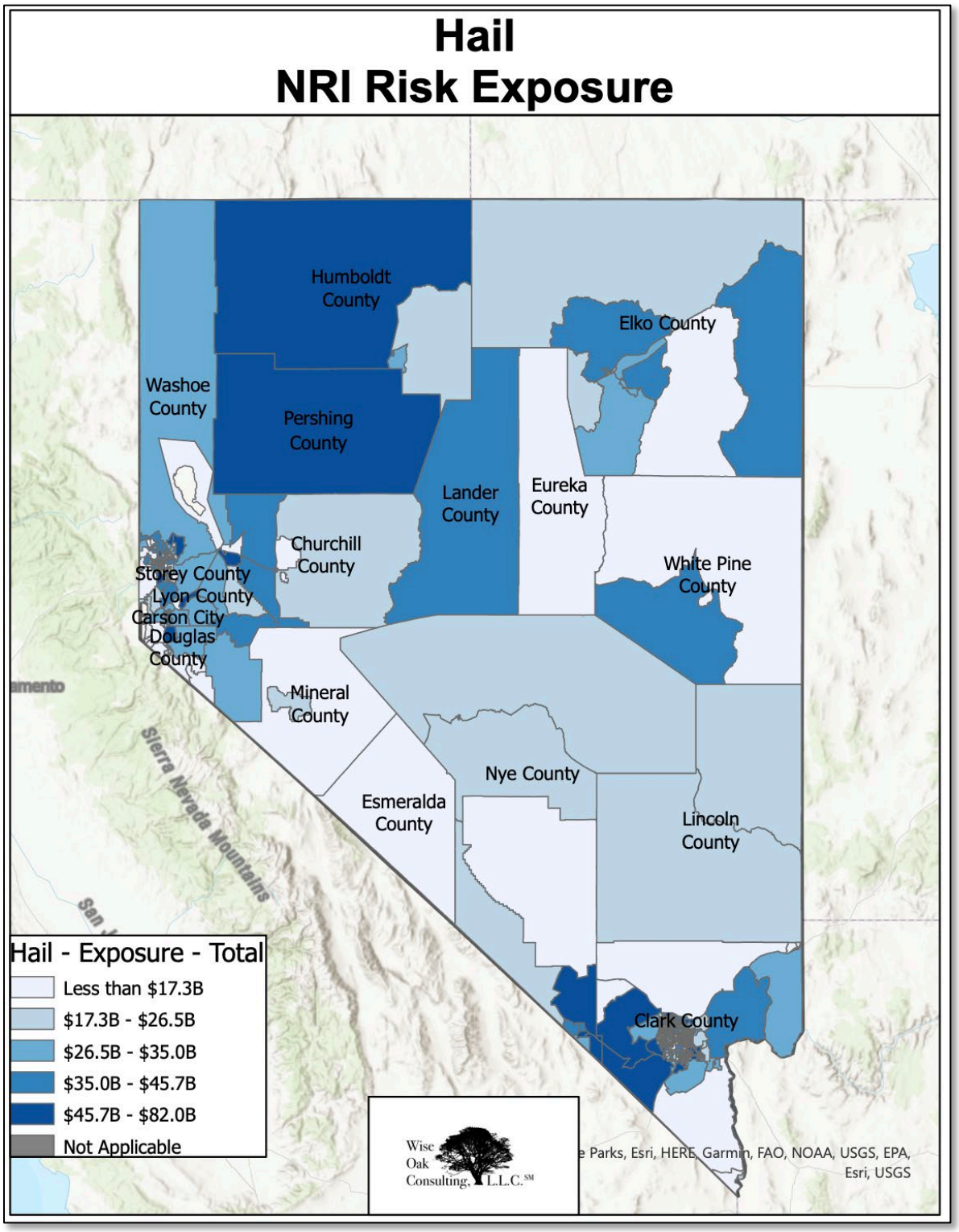


Figure 3-148. Hail National Risk Index Exposure – Statewide.

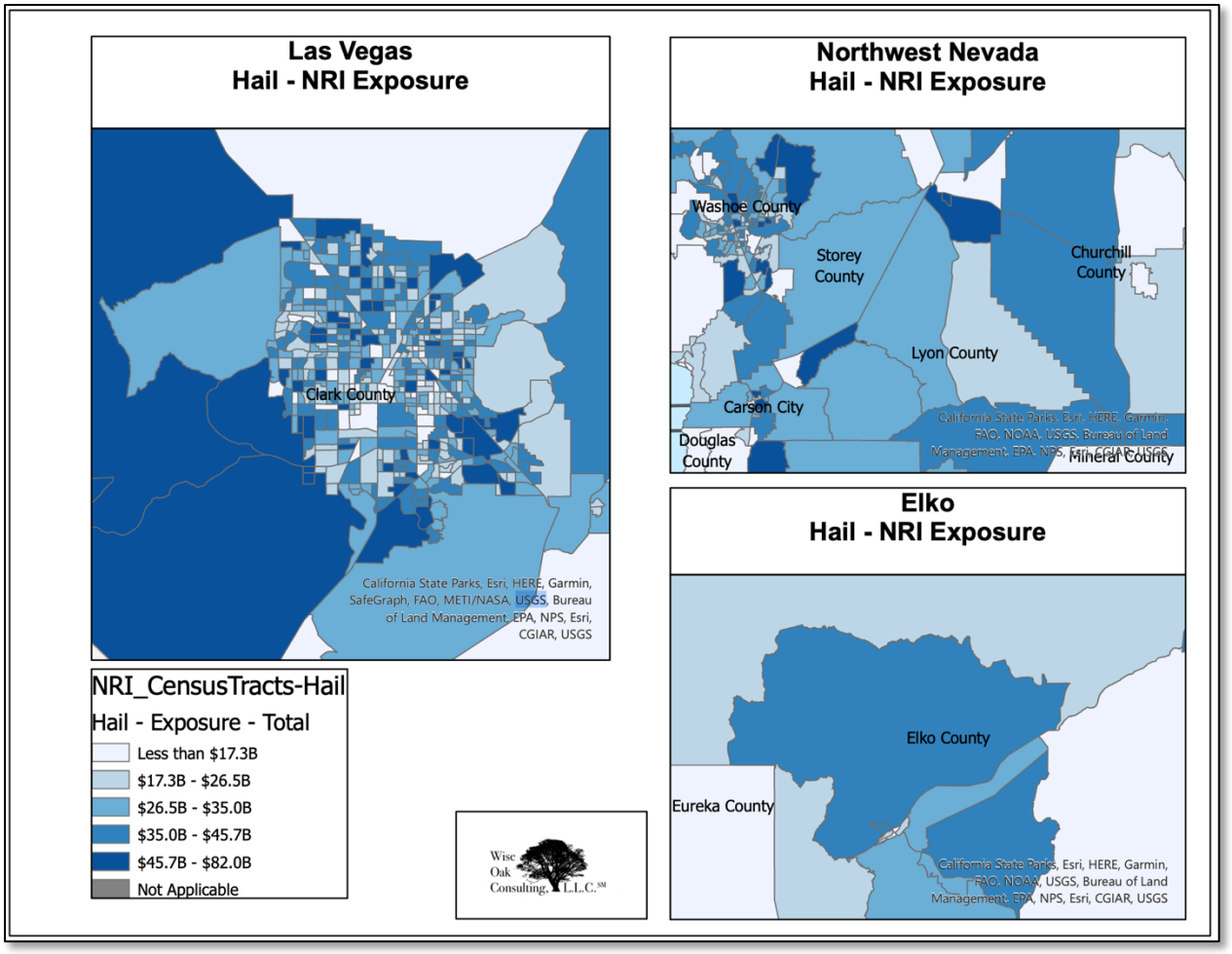


Figure 3-149. Hail National Risk Index Exposure – More Heavily Populated Areas.

3.3.13.2 History

In Nevada, thunderstorms usually occur from the spring to the fall. The most dangerous thunderstorms are during the summer due to the low humidity and high lightning and microburst potential.

Table 3-19 in the flood section shows that much of the historic flooding in Las Vegas Valley was caused by thunderstorms and cloudbursts. This is not unique to the Las Vegas Valley, but true for the entire state.

Table 3-31 below documents the various effects that some thunderstorms have had in recent years on the State of Nevada:

Table 3-31. Significant Nevada Hail and Thunderstorm Events, 2001-2016

Date	Event
August 9, 2001	FEMA authorized the use of federal funds today to help Nevada fight the uncontrolled lightning-caused Antelope fire burning in Washoe County. The state's request for federal fire suppression assistance was approved immediately after the blaze threatened farm areas and 150 homes in the Antelope Valley subdivision, located about eight miles northwest of Reno. The fire started by

Table 3-31. Significant Nevada Hail and Thunderstorm Events, 2001-2016	
Date	**Event**
	lightning and burned 800 acres of land, forcing the evacuation of 100 people at the time of the request.
July 12-13, 2002	Numerous high wind and downburst reports in western NV with areas of blowing dust.
August 2, 2002	Thunderstorm-induced flash floods over parts of Reno, and near Virginia City and Dayton.
June 26, 2006	Elko - A lightning storm touched off at least nine fires in northeastern Nevada, forcing interstate closures and threatening the small ranching community. A wildfire about 20 miles west of Elko burned about 5,000 acres, while another blaze had scorched about 3,000 acres northeast of Elko and forced residents in nearby Elburz to evacuate. Two sections of Interstate 80 were closed as a result.
July 10, 2011	A severe thunderstorm developed near downtown Las Vegas and moved through North Las Vegas. The ASOS at North Las Vegas Airport (KVGT) measured a gust to 64 mph. At least two trees were blown down, one onto a house; numerous power poles and lines were blown down; and one child suffered minor injuries when part of a roof blew off an apartment building, flew into the building next door, and broke two windows and damaged four doors.
September 30, 2011	Lightning-caused wildfires burned about 205,000 acres and threatened the towns of Tuscarora and Midas. An unspecified number of cattle and horses were lost, as well as a recreational vehicle.
July 15, 2012	Hail up to 1.25 inches in diameter fell in a swath from Summerlin to North Las Vegas. According to a local body shop, ten thousand insurance claims were filed for hail damage to vehicles.
August 13, 2012	Thunderstorm winds downed 16 power poles along U.S. highway 95 about 15 miles north of Orovada. The downed wires then started a fire. Based on damage, wind gust was estimated to be 78 knots.
June 28, 2013	Five lightning strikes associated with a severe thunderstorm hit the Washoe County Emergency Operations Center's communications tower. The strikes disabled the primary communications repeater although backups were not disabled. Hail between 0.75 and 1.5 inches in diameter was reported by several spotters in the North Valleys of Reno. The largest hail report was near the Stead airport which had between 1.25 and 1.50 inch diameter hail. Cold Springs (northwest part of hail track) only had hail to 0.75 inches in diameter.
July 19, 2013	A cluster of severe thunderstorms raked the Las Vegas Valley for over an hour, and also produced widespread flash flooding. Numerous trees were blown down, including 243 at the Desert Pines Golf Course. Some trees fell onto and damaged buildings and vehicles, and some ripped out gas and water lines as they were uprooted. Numerous power lines blew down, and several buildings were damaged. The peak measured gust of 62 knots occurred at Nellis AFB at the onset of the event.
July 8, 2014	Thunderstorm winds over Lake Mead triggered swells up to eight feet that sank at least one vessel. Eleven people had to be rescued.
August 13, 2014	Hail did significant damage to vehicles parked at the end of the road in Lamoille Canyon in Elko County.

Table 3-31. Significant Nevada Hail and Thunderstorm Events, 2001-2016	
Date	**Event**
June 27, 2015	Thunderstorms brought severe outflow winds on the 27th. Peak wind gusts of 68 knots were reported.
July 1, 2015	A thunderstorm gust of 73 mph was measured five miles WNW of Laughlin, and a gust of 100 mph was measured at the mid-span of the Hoover Dam Bypass Bridge.
July 16, 2015	Thunderstorm winds snapped 10 power poles southwest of Austin.
August 13, 2015	Las Vegas area severe thunderstorms. A wooden fence, an awning, a large metal billboard, several trees, and 27 power poles were blown down. Minor roof damage also occurred.
January 31, 2016	Rare winter severe thunderstorm in southern Nevada. Lightning set fire to a house and tree at the Las Vegas Country Club. Damage estimated $200K.
June 5, 2016	Near Orovada in Humboldt County. Downburst winds from collapsing thunderstorm damaged buildings, bee houses, irrigation sprinklers, as well as blew down trees. The observer estimated that winds were over 50 mph. Time estimated based off radar and nearby wind observations. Damages are estimated.
June 30, 2016	One to two inch hail fell in a swath across the Las Vegas Valley. Numerous vehicles were damaged. Damages were estimated near $50M.

These reports listed are merely a summary of severe thunderstorm impacts in Nevada. A more extensive listing of data can be found at NOAA's National Centers for Environmental Information website. Note that there are severe limitations in the coverage of severe weather reports in Nevada due to large areas of low or no population, so the reports are heavily biased toward populated areas and transportation routes.

The data provided in Table 3-32 below by the State Climatologist demonstrate the common frequency of thunderstorms in Nevada.

Table 3-32. County Thunderstorm Historical Data

County	Average number of thunderstorms per year
Carson City	No data
Churchill	19
Clark	26
Douglas	No data
Elko	38
Esmeralda	No data
Eureka	No data
Humboldt	12
Lander	23
Lincoln	No data
Lyon	No data
Mineral	No data
Nye	42
Pershing	10
Storey	No data
Washoe	20
White Pine	57

Figures 3-150 and 3-151 depict the NRI Historic Loss Ratios due to lightning in dollars statewide and in more heavily populated areas respectively.

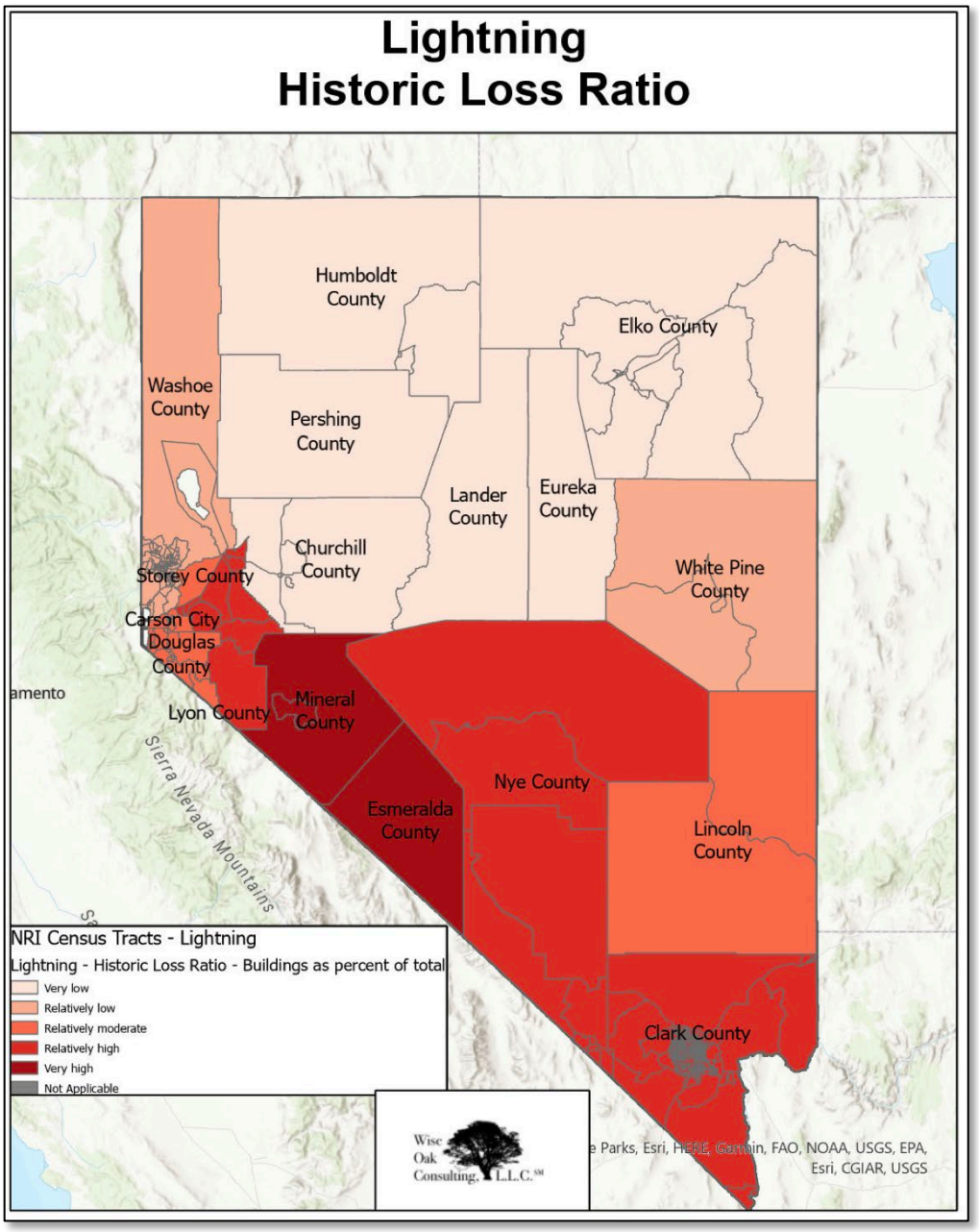


Figure 3-150. Lightning National Risk Index Historic Loss Ratio – Statewide.

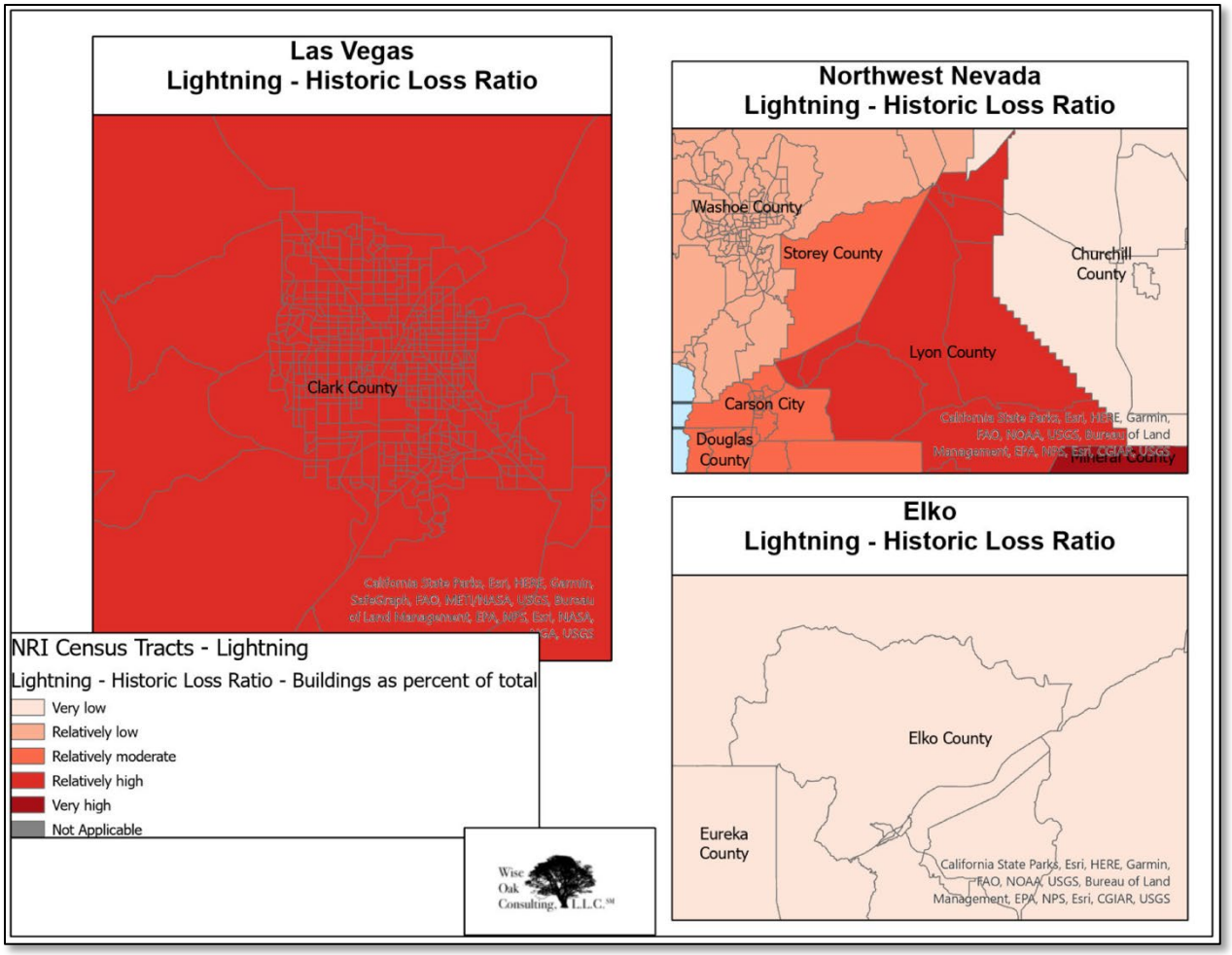


Figure 3-151. Lightning National Risk Index Historic Loss Ratio – More Heavily Populated Areas.

Figures 3-152 and 3-153 depict the NRI Historic Loss Ratios for agriculture due to hail in dollars statewide and in more heavily populated areas respectively.

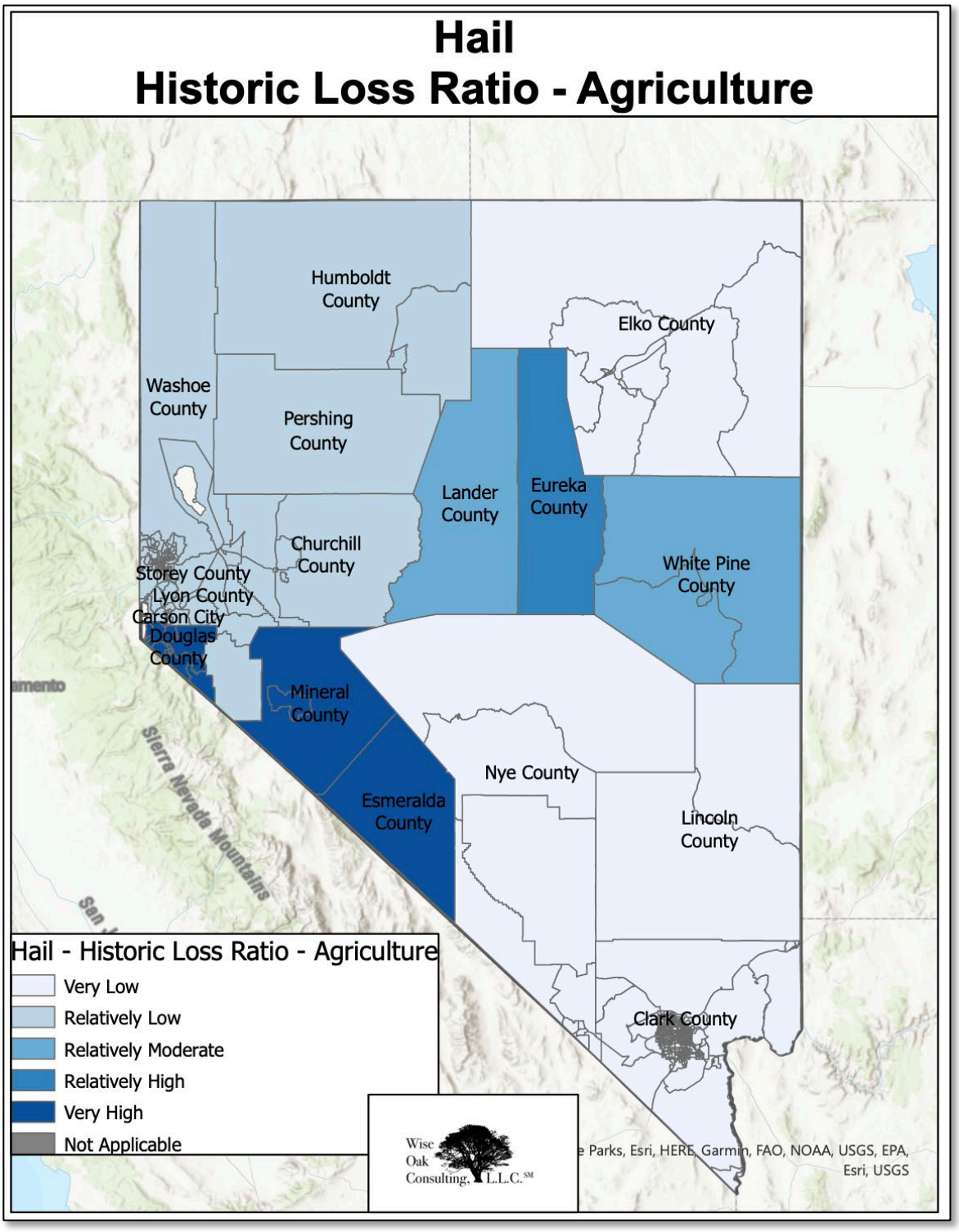


Figure 3-152. Hail National Risk Index Historic Loss Ratio – Statewide.

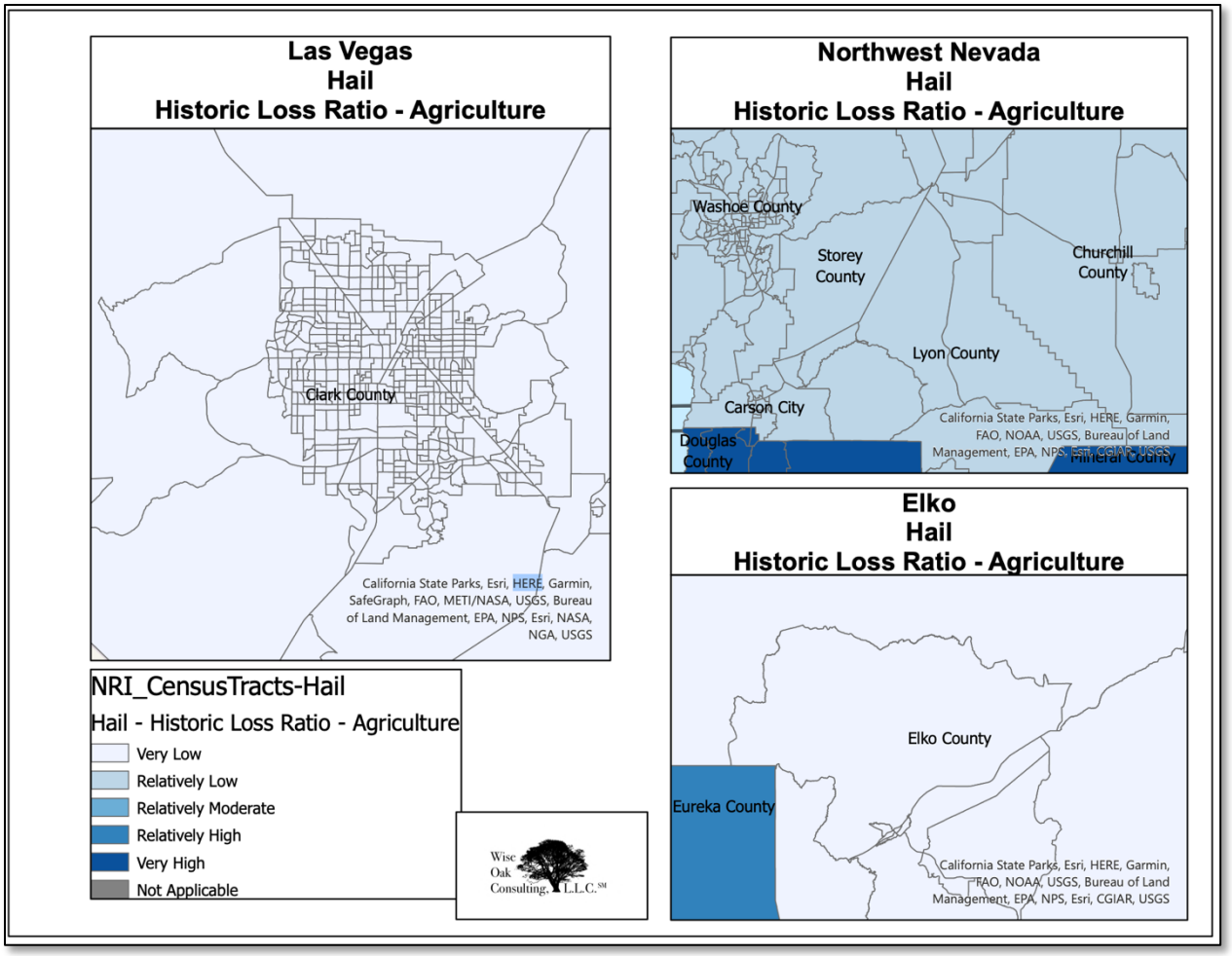


Figure 3-153. Hail National Risk Index Historic Loss Ratio – More Heavily Populated Areas.

3.3.13.3 Location, Severity, and Probability of Future Events

The location and frequency of this hazard by county were compiled by the State Climatologist and are summarized in Table 3-31. Based on these data of past occurrences, the probability of future events in all locations in the state is high. There is probably a slight favoring toward central and southern sections of Nevada where, based on National Weather Service experiences, severe thunderstorms are more common.

Hazards directly associated with hailstorms and thunderstorms were considered by the Subcommittee to be a "Low Risk" hazard. Although these events are common, their consequences are usually concentrated in small areas and don't affect enough people to normally warrant a request for federal assistance, unless they start large wildfires or cause significant flash floods.

The probability of future events for this hazard overall is high. Hailstorms are not as high a threat in the State and are generally very localized. NDOT reports that as the transportation infrastructure within the state is rather robust, weather- related events such as severe thunderstorms and hail do not generally have much effect on the state highway system; such weather events may cause temporary closures, but generally do not cause damage. An exception is severe flooding, which may be caused by such a weather event, which can cause significant damage to roads, rail, airports, etc.

Figures 3-154 and 3-155 depict the NRI Expected Annual Loss for lightning statewide and in more heavily populated areas respectively.

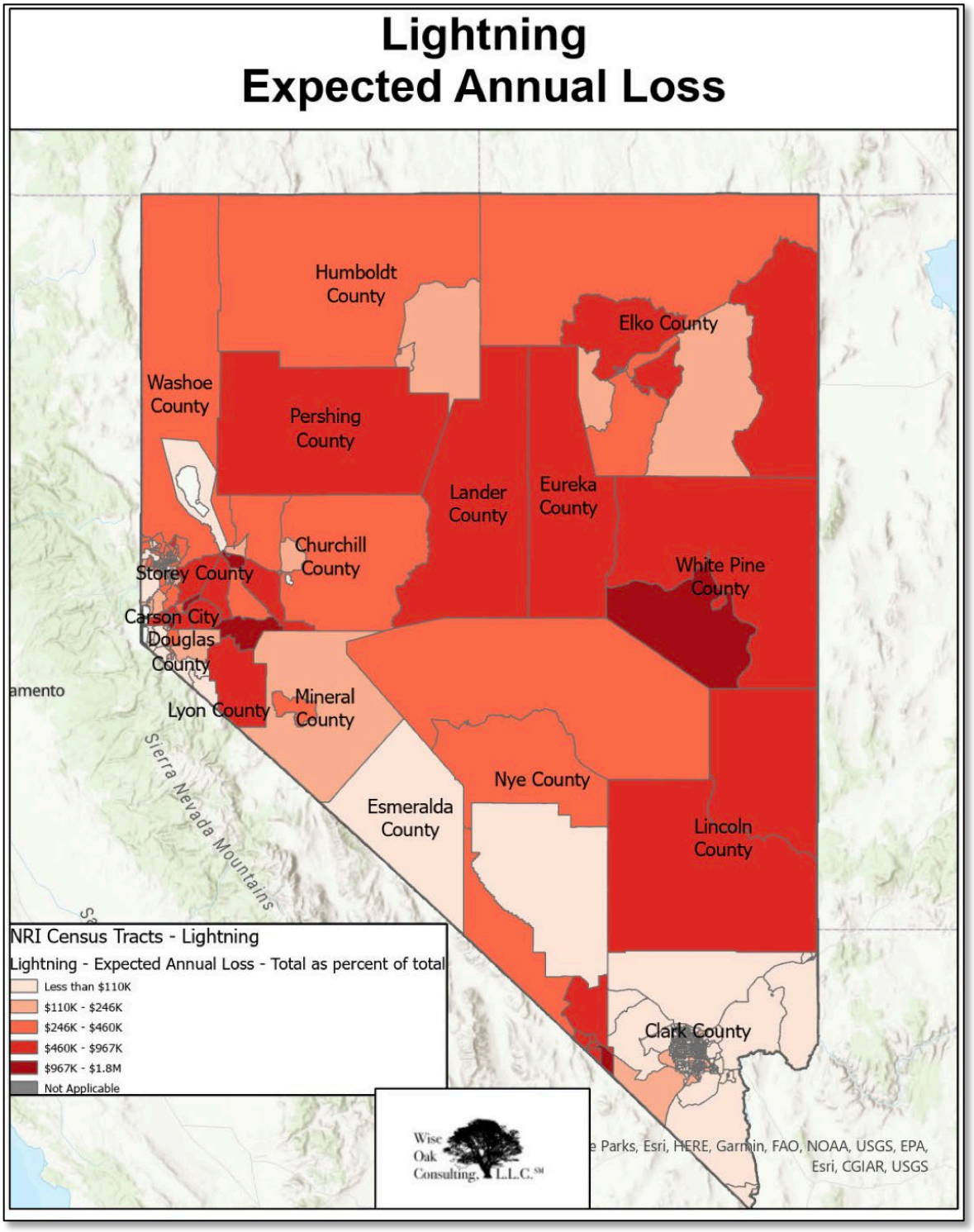


Figure 3-154. Lightning National Risk Index Expected Annual Loss – Statewide.

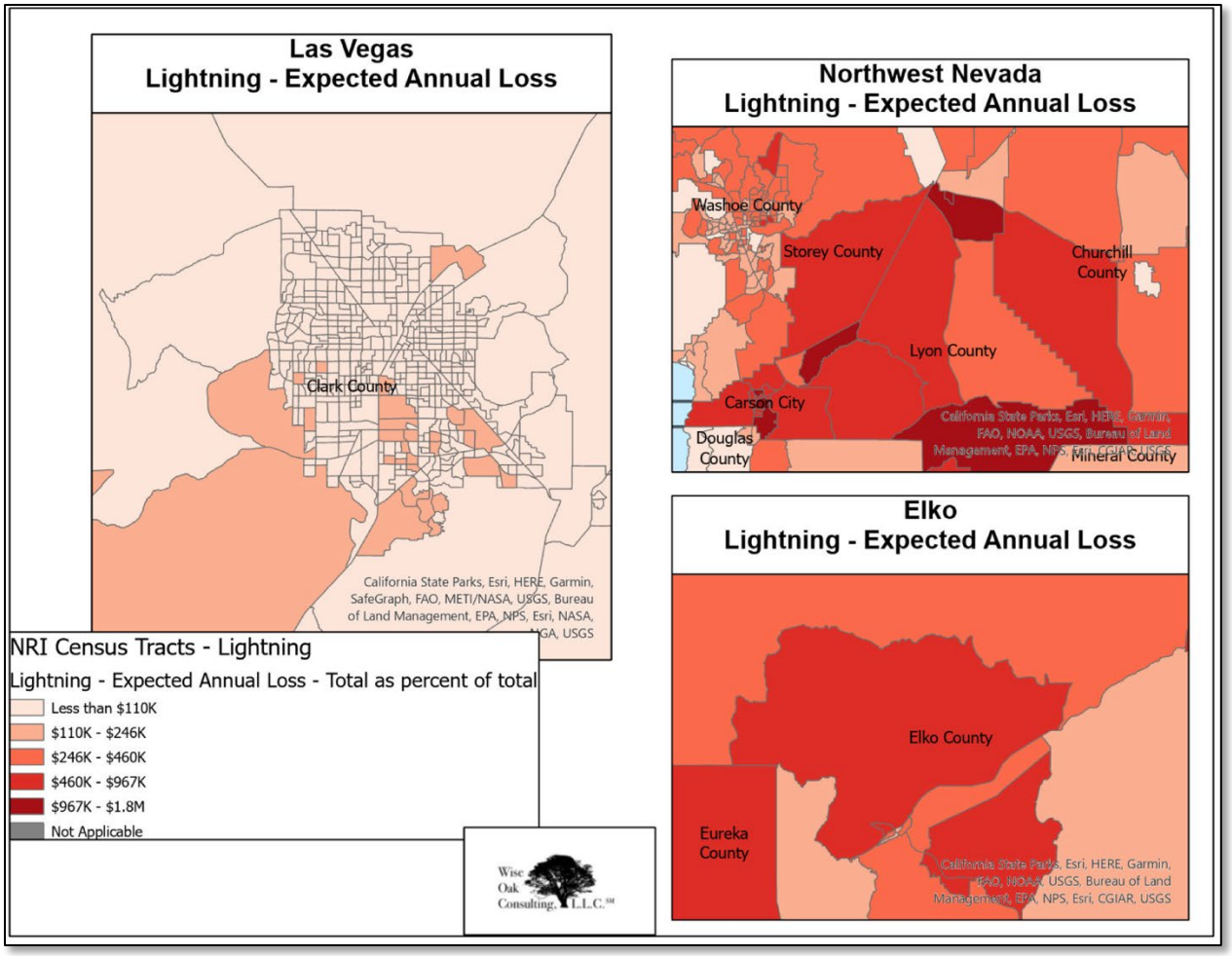


Figure 3-155. Lightning National Risk Index Expected Annual Loss – More Heavily Populated Areas.

Figures 3-156 and 3-157 depict the NRI Annualized Frequency for lightning in terms of number of events statewide and in more heavily populated areas respectively.

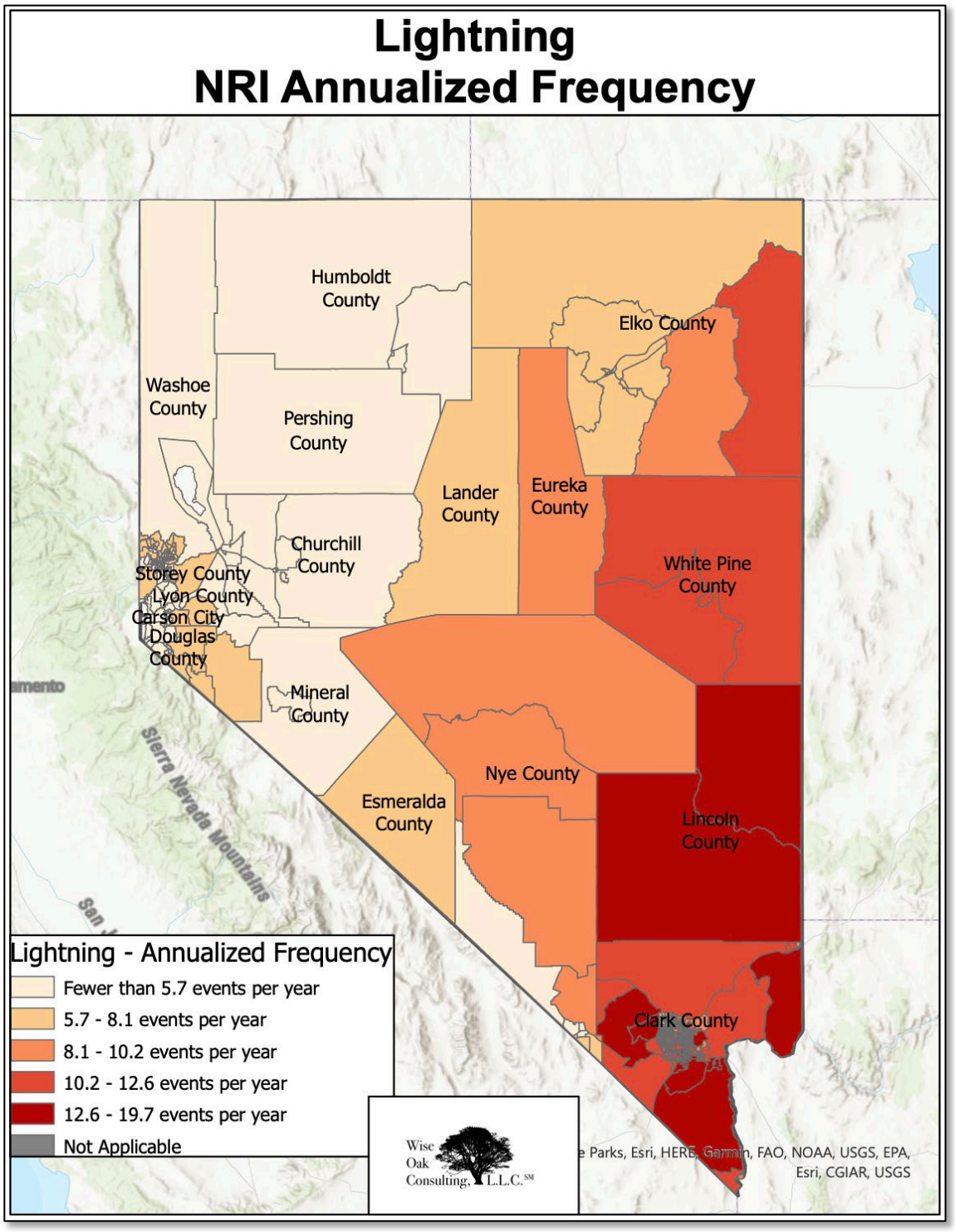


Figure 3-156. Lightning National Risk Index Annualized Frequency – Statewide.

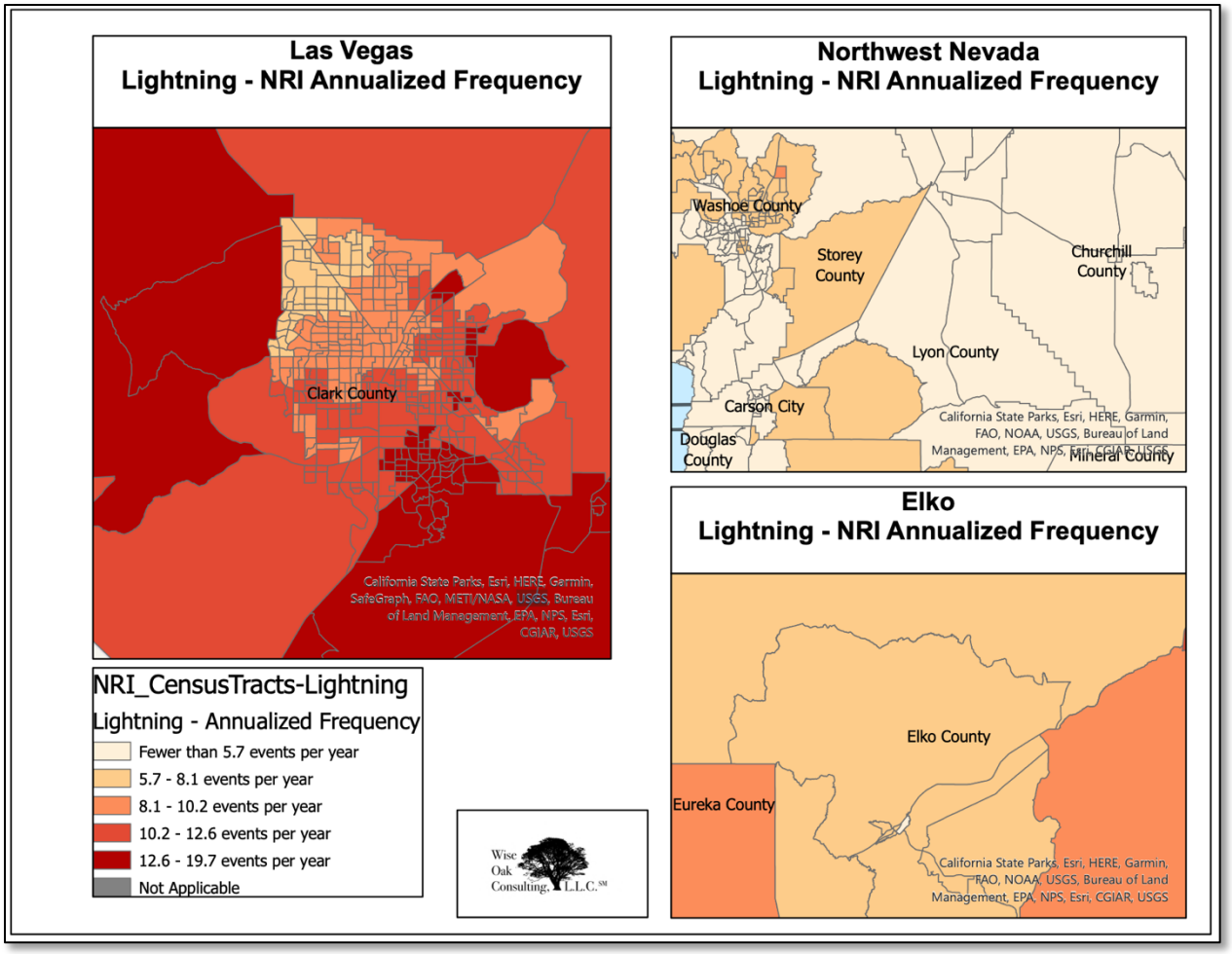


Figure 3-157. Lightning National Risk Index Annualized Frequency – More Heavily Populated Areas.

Figures 3-158 and 3-159 depict the NRI Expected Annual Loss due to hail statewide and in more heavily populated areas respectively.

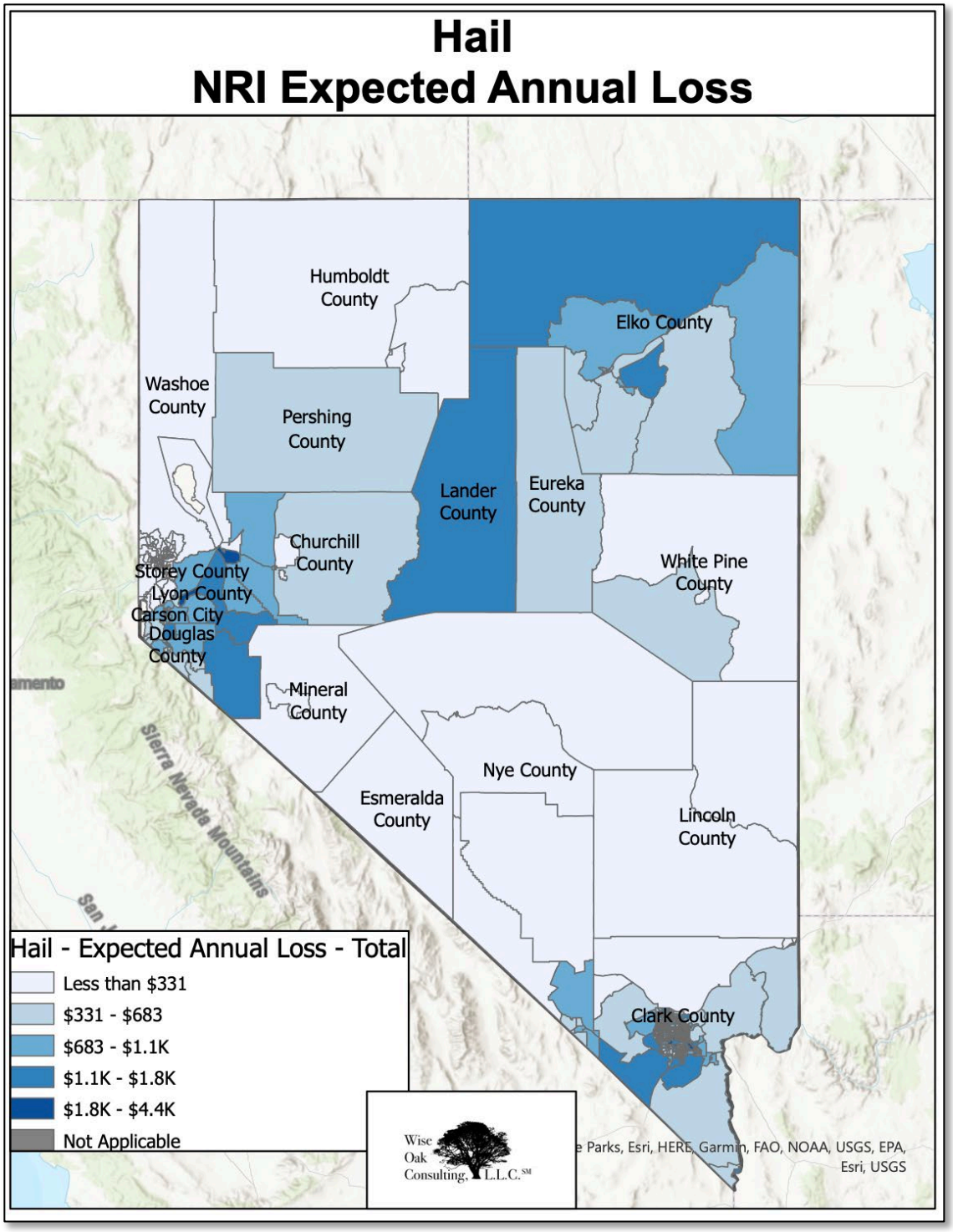


Figure 3-158. Hail National Risk Index Expected Annual Loss – Statewide.

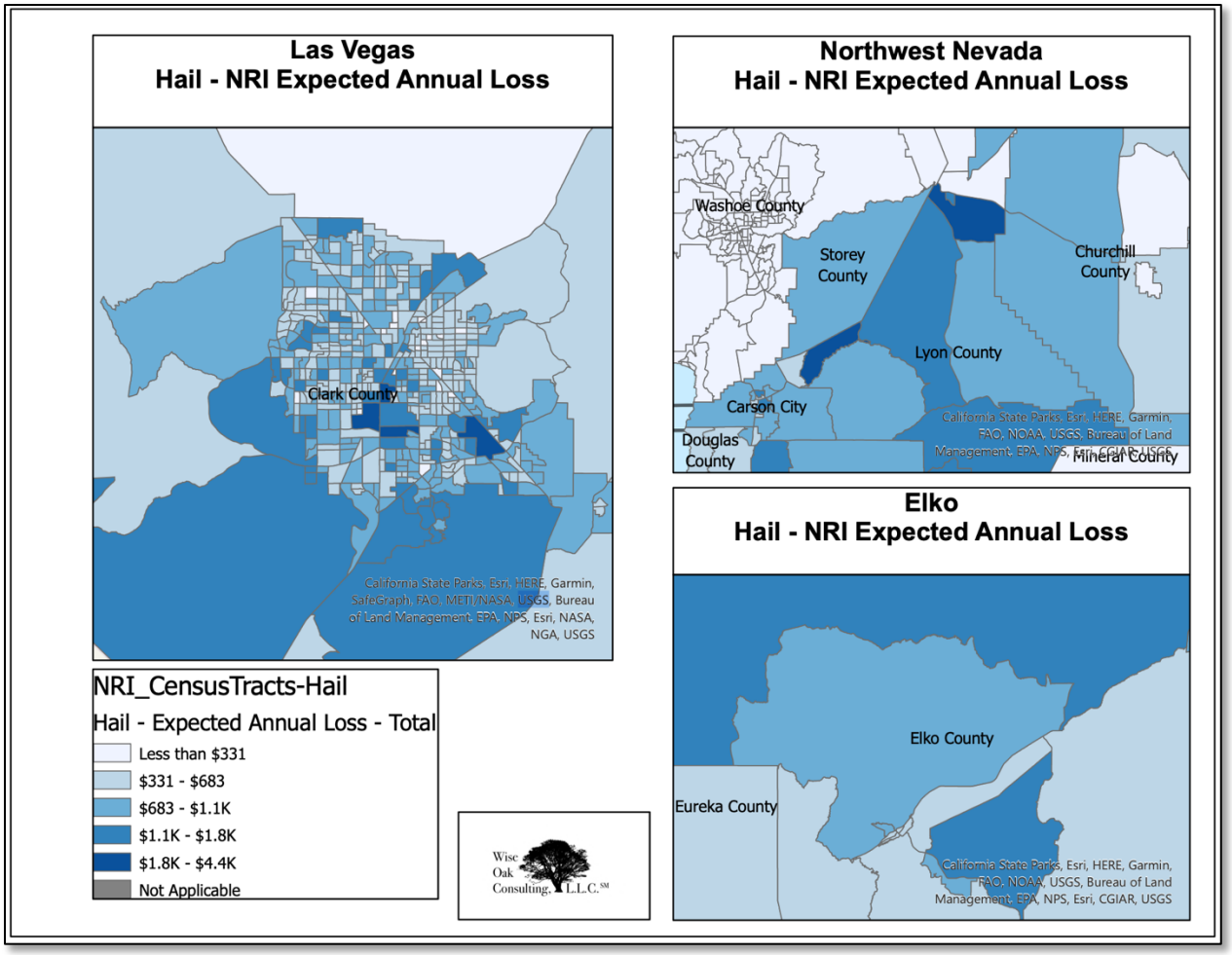


Figure 3-159. Hail National Risk Index Expected Annual Loss – More Heavily Populated Areas.

Figures 3-160 and 3-161 depict the NRI Annualized Frequency for hail in terms of number of events statewide and in more heavily populated areas respectively.

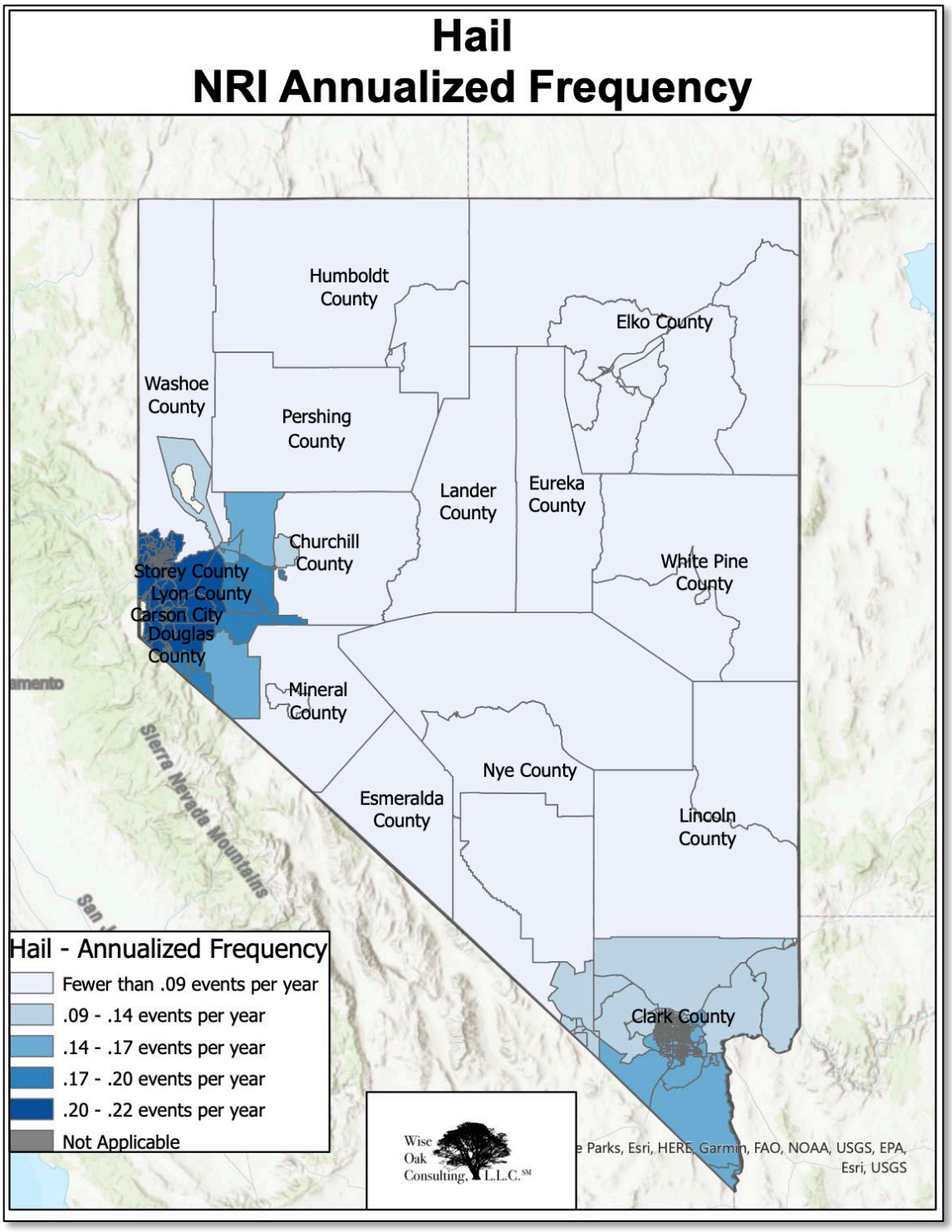


Figure 3-160. Hail National Risk Index Annualized Frequency – Statewide.

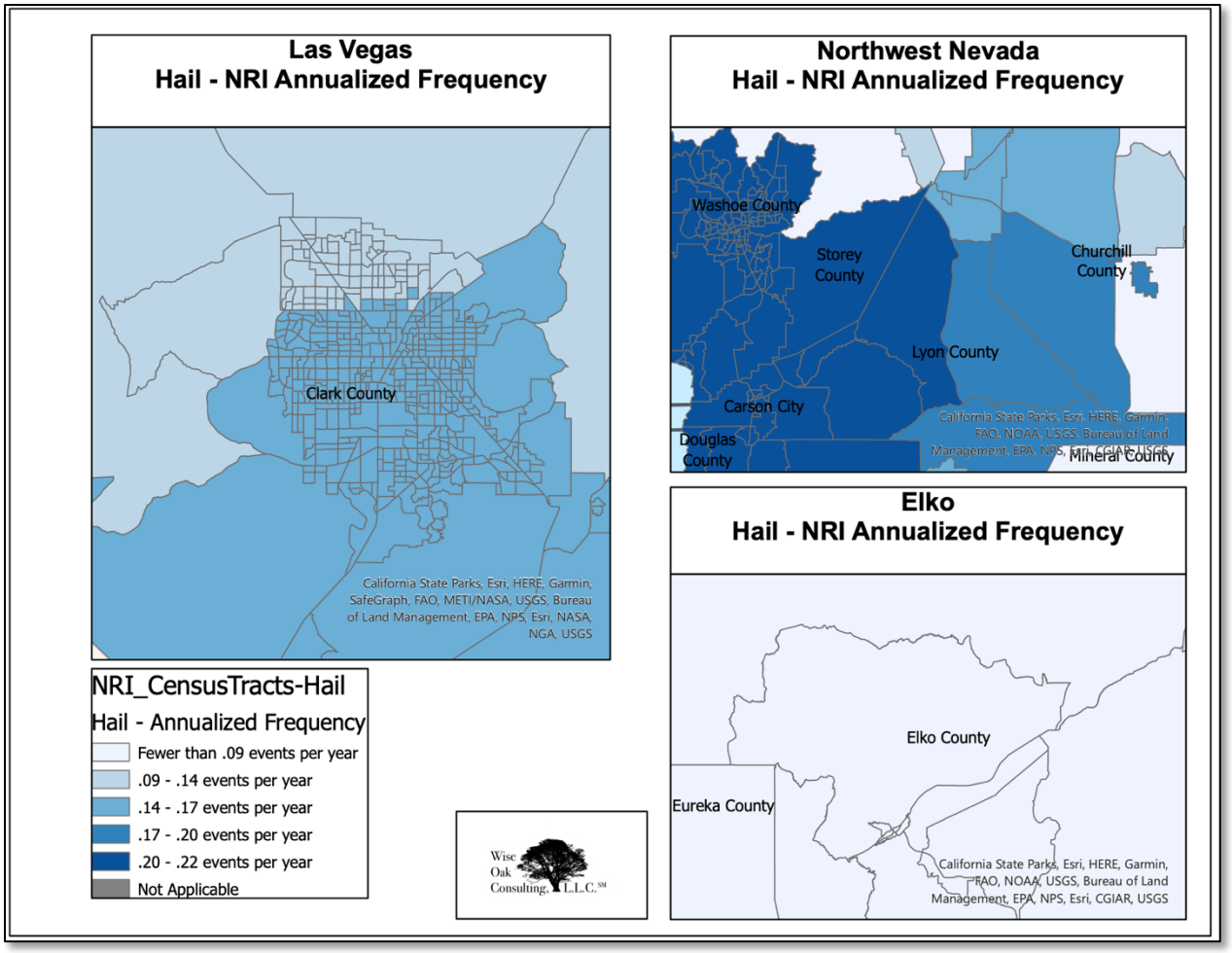


Figure 3-161. Hail National Risk Index Annualized Frequency – More Heavily Populated Areas.

3.3.13.4 Impacts from Climate Change

It is unknown how climate change will affect the frequency and intensity of Nevada 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.

3.3.13.5 Vulnerability of State Assets

Due to insufficient data, it is not possible to accurately estimate the vulnerability of state assets due hail. The vulnerability of state critical buildings due to Lightning is provided in Appendix T. As noted above, avalanches occur in remote locations and critical state buildings are not assessed to be at risk.

3.3.13.6 Mitigation

Subject matter experts have assessed that there is no appreciable vulnerability of state assets due to this hazard. Therefore, the hazard profile is for information purposes only and mitigation projects will not be pursued for this hazard in 2023-2028.

3.3.14 Tornado (Low Risk)

3.3.14.1 Nature

Tornadoes are one of nature's most violent storms. A tornado is defined as a rapidly rotating column of air extending from the base of a thunderstorm to the ground. In an average year, approximately 1,000 tornadoes are reported across the United States, resulting in an average of 80 deaths and over 1,500 injuries. The most violent tornadoes, with wind speeds of 250 mph or more, are capable of tremendous destruction. Damage paths can be more than 1 mile wide and 50 miles long. Tornadoes can occur anywhere in the United States, but they are most common in the Great Plains region that includes parts of Texas, Oklahoma, Kansas, and Nebraska. Tornadoes are responsible for the greatest number of wind-related deaths each year in the United States. Tornadoes come in all shapes and sizes. In the southern states, peak tornado season is March through May; peak months in the northern states are during the summer. Tornadoes can also occur in thunderstorms that develop in warm, moist air masses in advance of eastward-moving cold fronts. These thunderstorms often produce large hail and strong winds, in addition to tornadoes. Tornadoes are extremely rare in Nevada due to the low frequency combination of an unstable air mass plus sufficient wind shear needed for tornado formation, thunderstorm cloud bases typically 5-10,000 feet off the ground which limit capability of the vortex to reach the ground, and the plethora of mountain ranges make it difficult for the circulations that spawn tornadoes to sufficiently develop.

The current predictability of tornadoes in the western United States is poor. The current state of the science and forecasting technologies results in a broad heads up of days with increased tornado potential in Nevada to 1-2 days in advance. Specific storm-scale warning lead time of severe thunderstorms with tornadoes is optimistically 15 minutes but is often zero in Nevada. A particular challenge to warning for tornadoes in Nevada is the limited low-altitude weather radar coverage in the state, so often many tornadoes go undetected and unwarned for.

Figures 3-162 and 3-163 depict the National Risk Index Score for tornado statewide and for more heavily populated areas respectively.

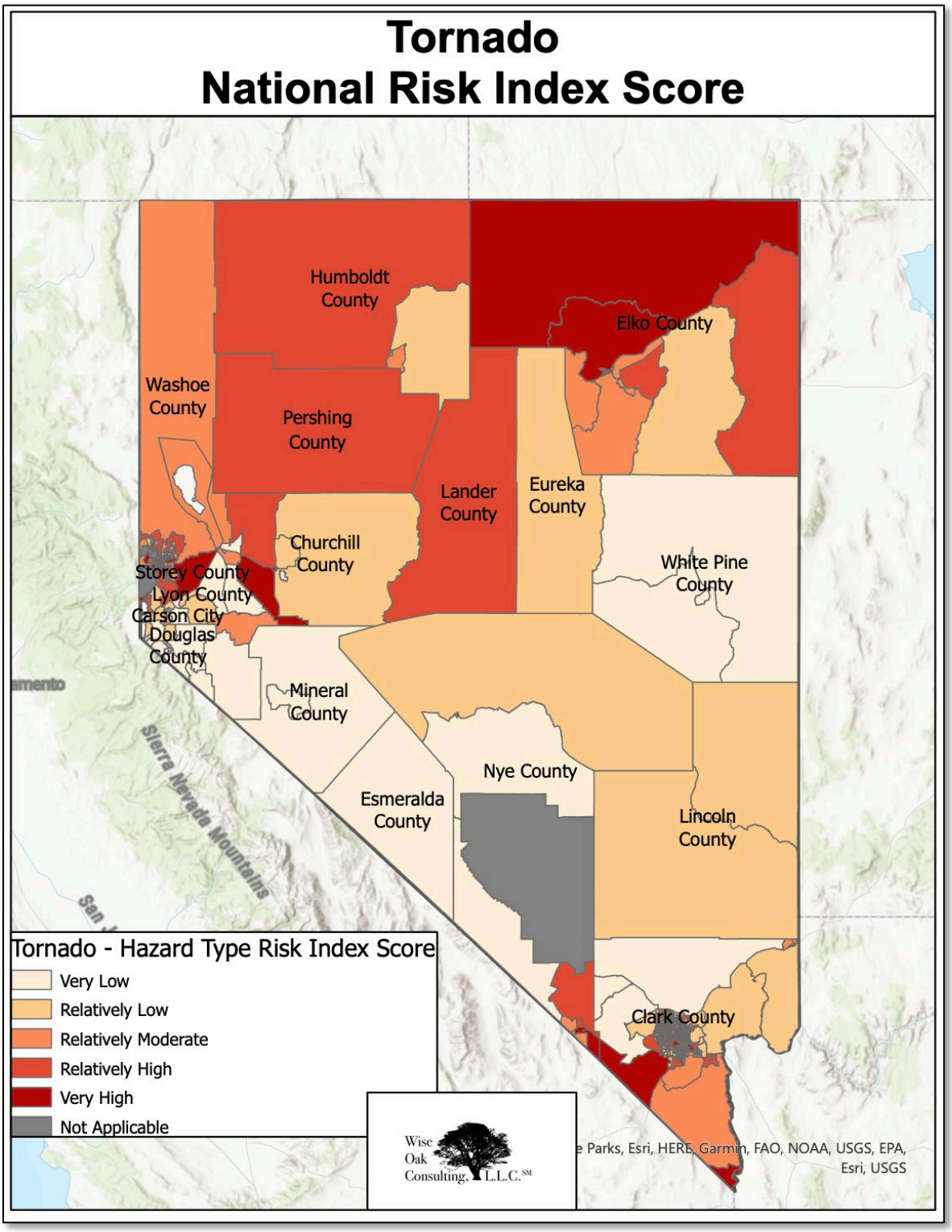


Figure 3-162. Tornado National Risk Index Score – Statewide.

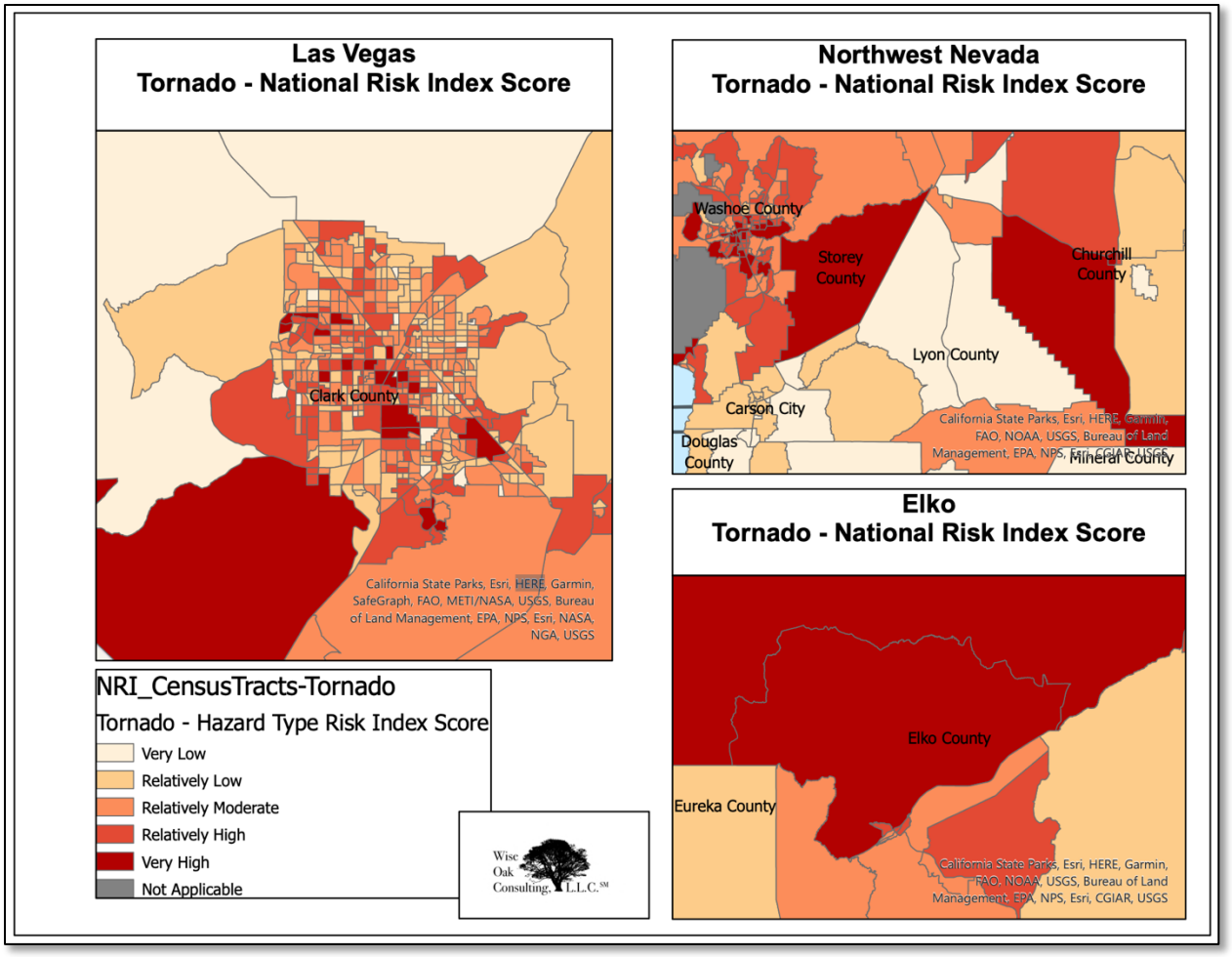


Figure 3-163. Tornado National Risk Index Score – More Heavily Populated Areas.

Figures 3-164 and 3-165 depict the NRI Exposure in dollars statewide and in more heavily populated areas respectively.

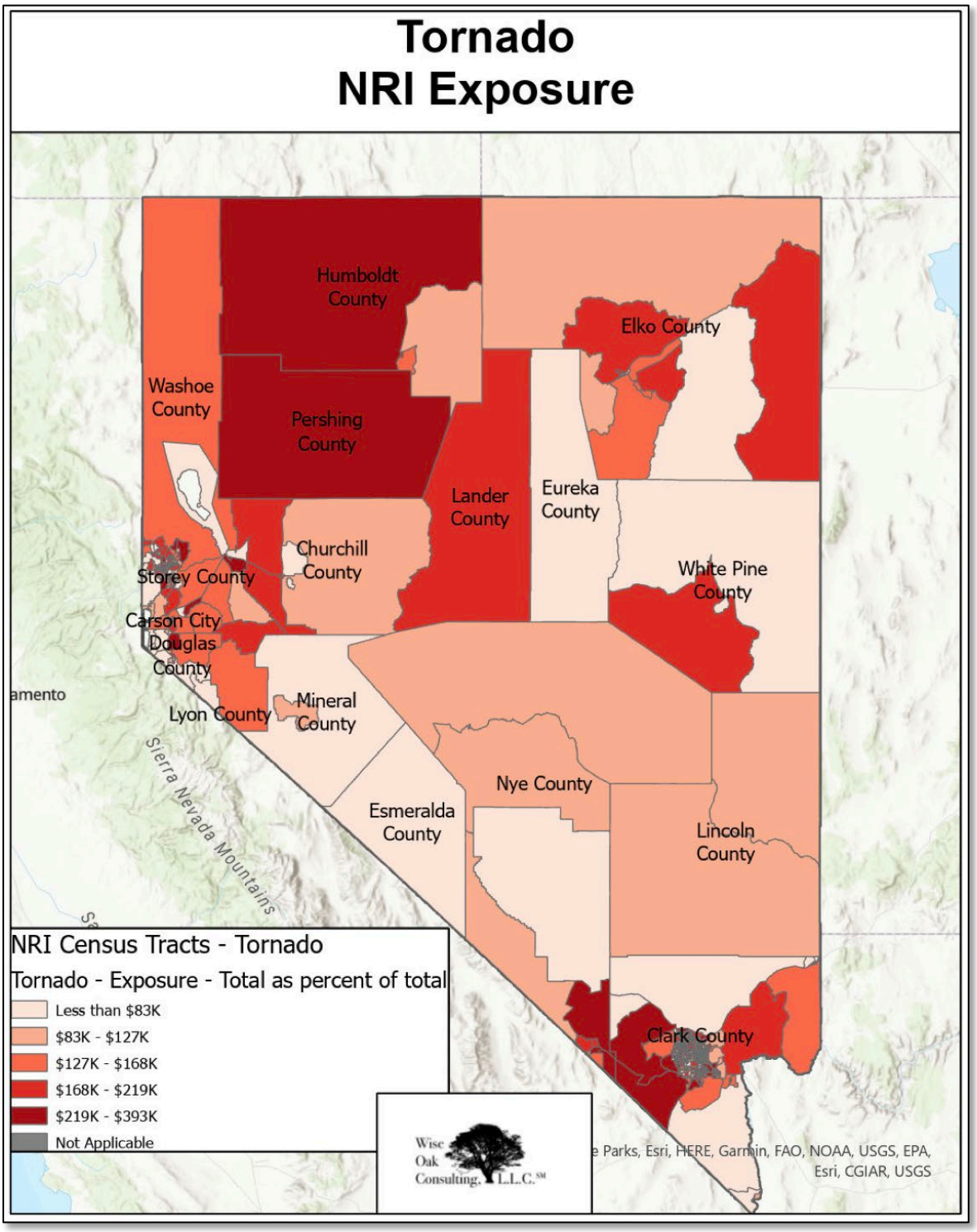


Figure 3-164. Tornado National Risk Index Exposure – Statewide.

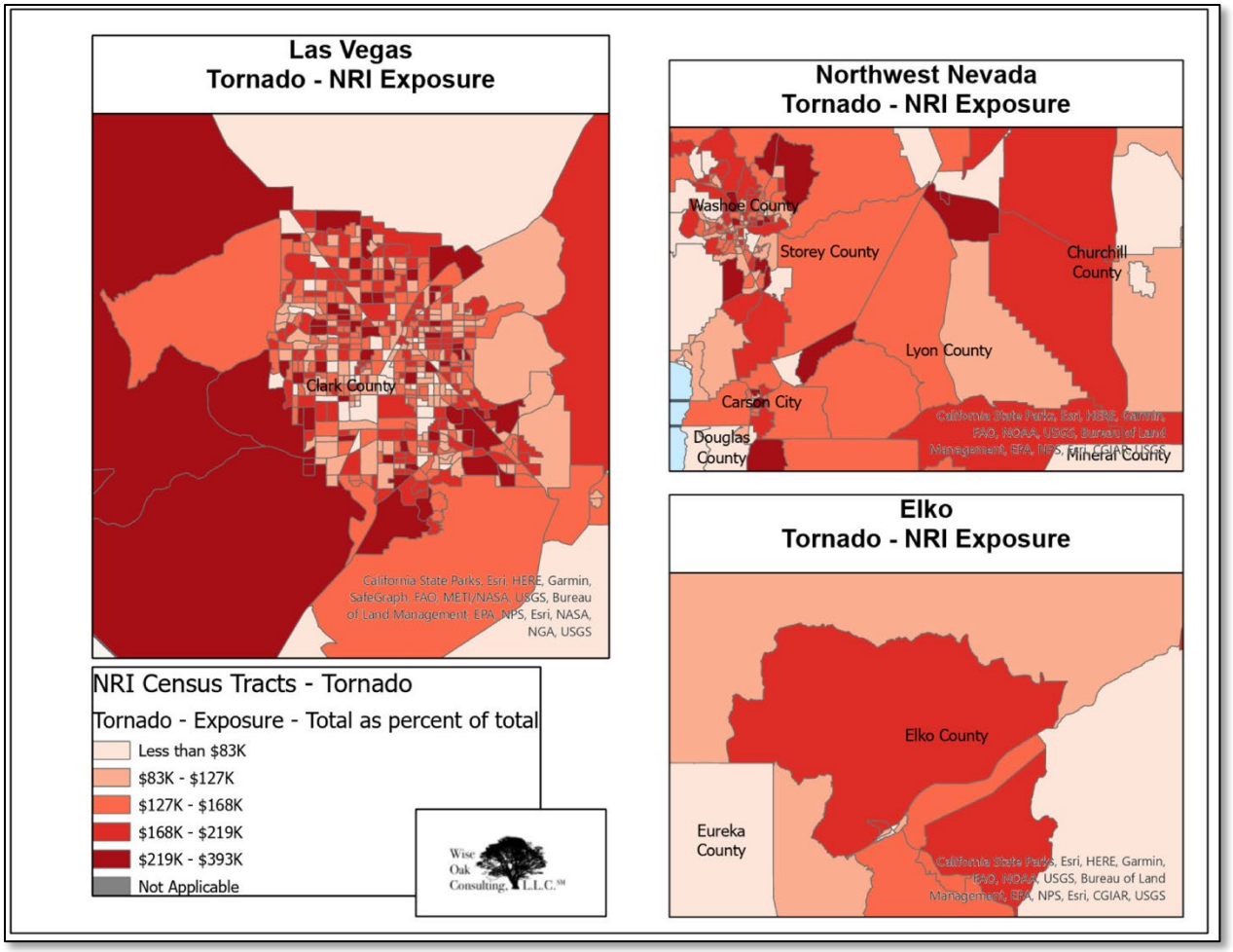


Figure 3-165. Tornado National Risk Index Exposure – More Heavily Populated Areas.

3.3.14.2 History

Although tornadoes are rare in Nevada, they do occur. Based on modern data from 1991-2015, Nevada ranks 41st out of 50 states with roughly 1-2 tornado touchdowns recorded in an average year. Only Alaska, Hawaii, and several states in the northeast U.S. have lower frequencies. The majority of reported tornadoes have occurred in the central and northern parts of Nevada. It is believed there are more tornadoes that occur in Nevada per year, but they are rarely witnessed due to lack of population in rural areas.

Data from NOAA's National Centers for Environmental Information were used in this analysis. Over the last two decades, since 1995 Nevada has had 39 reported tornado events of EF0 and higher. Table 3-33 contains a list of tornadoes in Nevada that have caused injury or property damage. All were ranked at EF-0 to EF-2 on a scale of EF-0 to EF-5, using the Enhanced Fujita Scale. Typically, tornadoes EF-1 and higher will result in property damage. The most recent damaging tornado hit Hawthorne in Mineral County June 5, 2015, resulting in property damage to 10-15 homes and businesses.

Table 3-33. Nevada Tornado History		
Date	**Location**	**Description /injuries/damage**
May 26, 1964, 2:45 p.m.	Near Yerington	A small tornado damaged outbuildings on a ranch. One man was struck by flying debris. 0 dead, 1 injured
July 16, 1973, 12:23 p.m.	Six miles north of Reno	A small tornado touched down. 0 dead, 1 injured
March 30, 1992, 11:45 a.m.	Extreme south edge of Las Vegas	One home was shifted and another partially unroofed. 0 dead, 0 injured.
June 24, 2004, 4:00 p.m.	5 miles north of Lamoille, Elko County	0 dead, 0 injured.
June 25, 2004, 4:15 p.m.	Paradise Valley, Humboldt County	Trained weather spotter reported a rope-like tornado. 0 dead, 0 injured, no damage.
June 25, 2004, 4:25 p.m.	West side of the Sonoma Range, Winnemucca, Humboldt County	Trained weather spotter observed a tornado. 0 dead, 0 injured, no damage.
June 27, 2004, 1:15 p.m.	Near Winnemucca, in Humboldt County:	Trained weather spotter observed tornado. 0 dead, 0 injured, no damage.
July 24, 2004, 2:30 p.m.	Cold Springs, north of Reno	The weak tornado lasted less than 2 minutes. 0 dead, 0 injured, no damage.
April 27, 2005, 5:30 p.m.	Near Carson-Tahoe Hospital, in Carson City.	0 dead, 0 injured, no damage.
June 9, 2006, 11:05 a.m.	About 1 mile west of the Eureka Airport, Eureka County.	A rope-like tornado was observed and photographed over open country. 0 dead, 0 injured, no damage.
July 21, 2008, 3-4:00 p.m.	Near Fallon, Churchill County.	Two EF0 tornadoes were reported by trained NWS weather spotters. 0 dead, 0 injured, no damage.
June 20, 2009, 2-3 p.m.	Near Wild Horse Reservoir, Elko County	Two EF0 tornadoes were observed, one by Nevada Highway Patrol and the other by a trained NWS weather spotter. 0 dead, 0 injured, no damage.
April 24, 2011, 9:55 a.m.	Southern Humboldt County	An EF0 tornado touched down in a rural area and was photographed by several eyewitnesses. An NWS storm survey could find no visible damage. 0 dead, 0 injured, no damage.
May 21, 2014, 11:40 a.m.	Elko, Elko County	A thunderstorm moving from east to west across Elko produced two EF0 tornadoes. The first tornado touched down on Manzanita Lane behind JC Penny's. The second tornado touched down on Aspen Way near the Post Office. It uprooted a large tree. The tornado then moved into the Smith's parking lot where it tore some shingles off a car wash and tossed shopping carts into the air.
June 5, 2015, 2:30 p.m.	Hawthorne, Mineral County	The tornado was determined to be EF-1 for 0.3 miles on the east side of Hawthorne (near 5th street) and EF-0 elsewhere. Approximately 10 to 15 homes and

Table 3-33. Nevada Tornado History		
Date	**Location**	**Description /injuries/damage**
		businesses were severely damaged along with power lines and road signs. One 2 foot diameter tree was blown over onto a mobile home and two vehicles were severely damaged.

Note. The National Risk Index Historic Loss Ratio is Very Low across the state so no stattewide map is included.

3.3.14.3 Location, Severity, and Probability of Future Events

There were 87 tornadoes reported in Nevada between the years 1959 and 2016. There have been no tornado-related deaths and two injuries in that period of record. While the vast majority of Nevada tornados produce no damage there has been a total of at least $1.6M in damages. Most of this was in a couple tornados that hit Clark County in 1989 and 1992. According to the data from the NOAA site, fifteen of the seventeen counties in Nevada have had one or more tornadoes since 1950. As new developments continue to be built, this hazard may become more evident.

Tornadoes are considered a "Low Risk" hazard in Nevada because few are reported each year anywhere in the state, the ones that do occur tend to be low in intensity, and they usually occur in unpopulated areas. Emergency response is likely to be handled without federal or state assistance. Structures built to modern building codes should be able to withstand the gusts of an EF0 tornado, the most likely intensity of tornado to hit Nevada.



Figure 3-166. June 9, 2006, Tornado in Diamond Valley near Eureka, NV.[135]

Figures 3-167 and 3-168 depict the NRI Expected Annual Loss for tornado statewide and in more heavily populated areas respectively.

[135] *Photo courtesy of Cheryl Morrison from Sheriff's office in Eureka.*

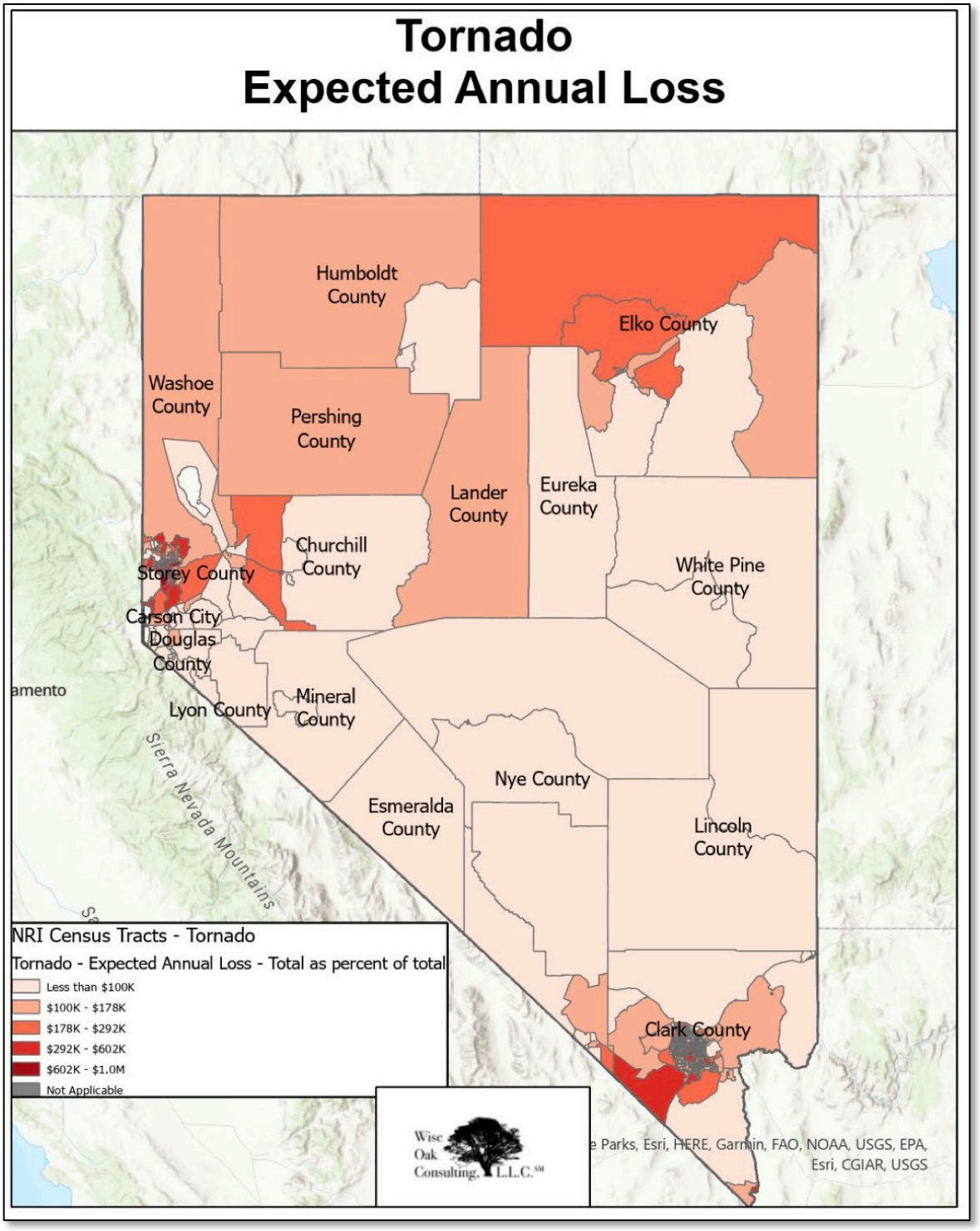


Figure 3-167. Tornado National Risk Index Expected Annual Loss – Statewide.

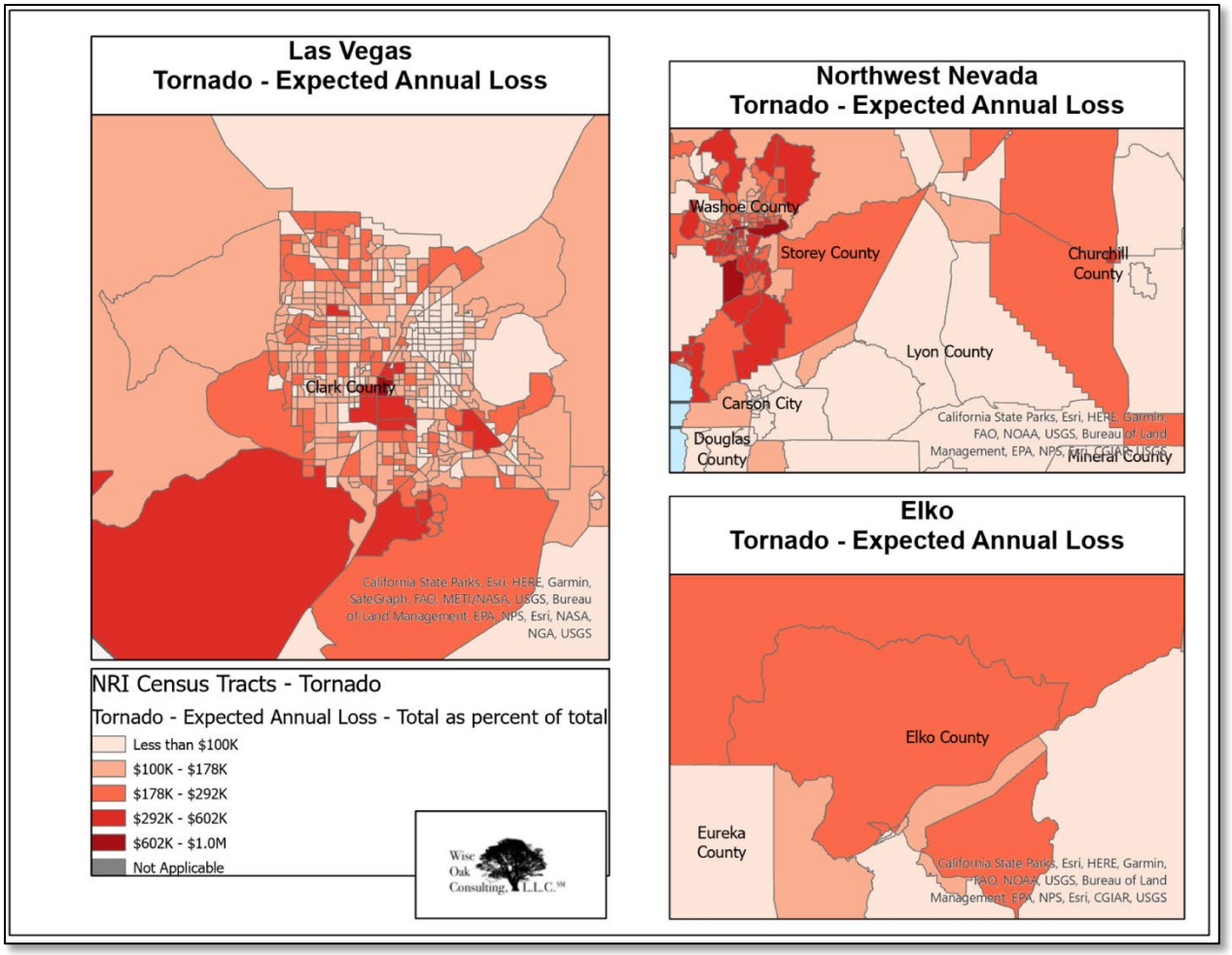


Figure 3-168. Tornado National Risk Index Expected Annual Loss – More Heavily Populated Areas.

Figures 3-169 and 3-170 depict the NRI Annualized Frequency for tornado in terms of number of events statewide and in more heavily populated areas respectively.

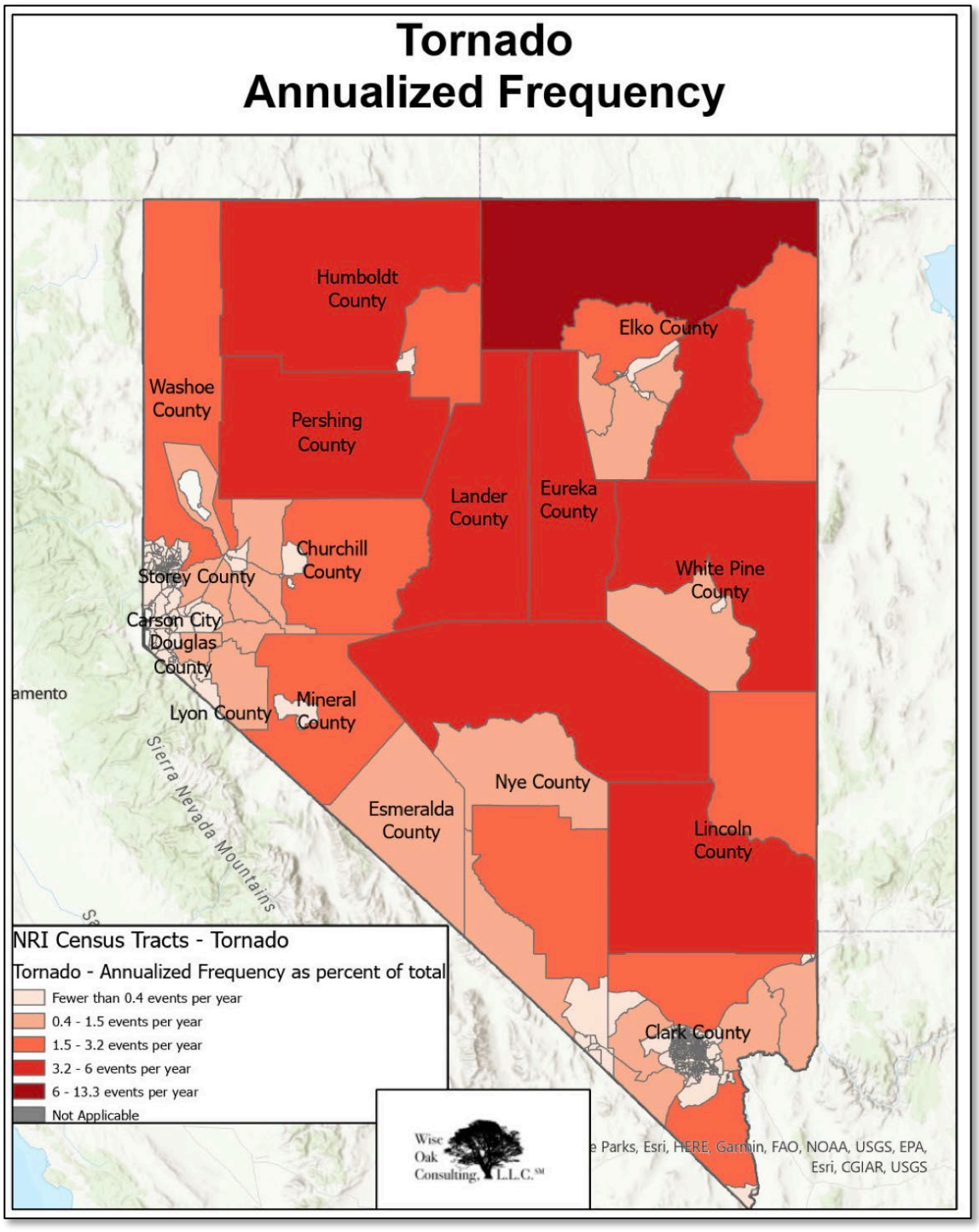


Figure 3-169. Tornado National Risk Index Annualized Frequency – Statewide.

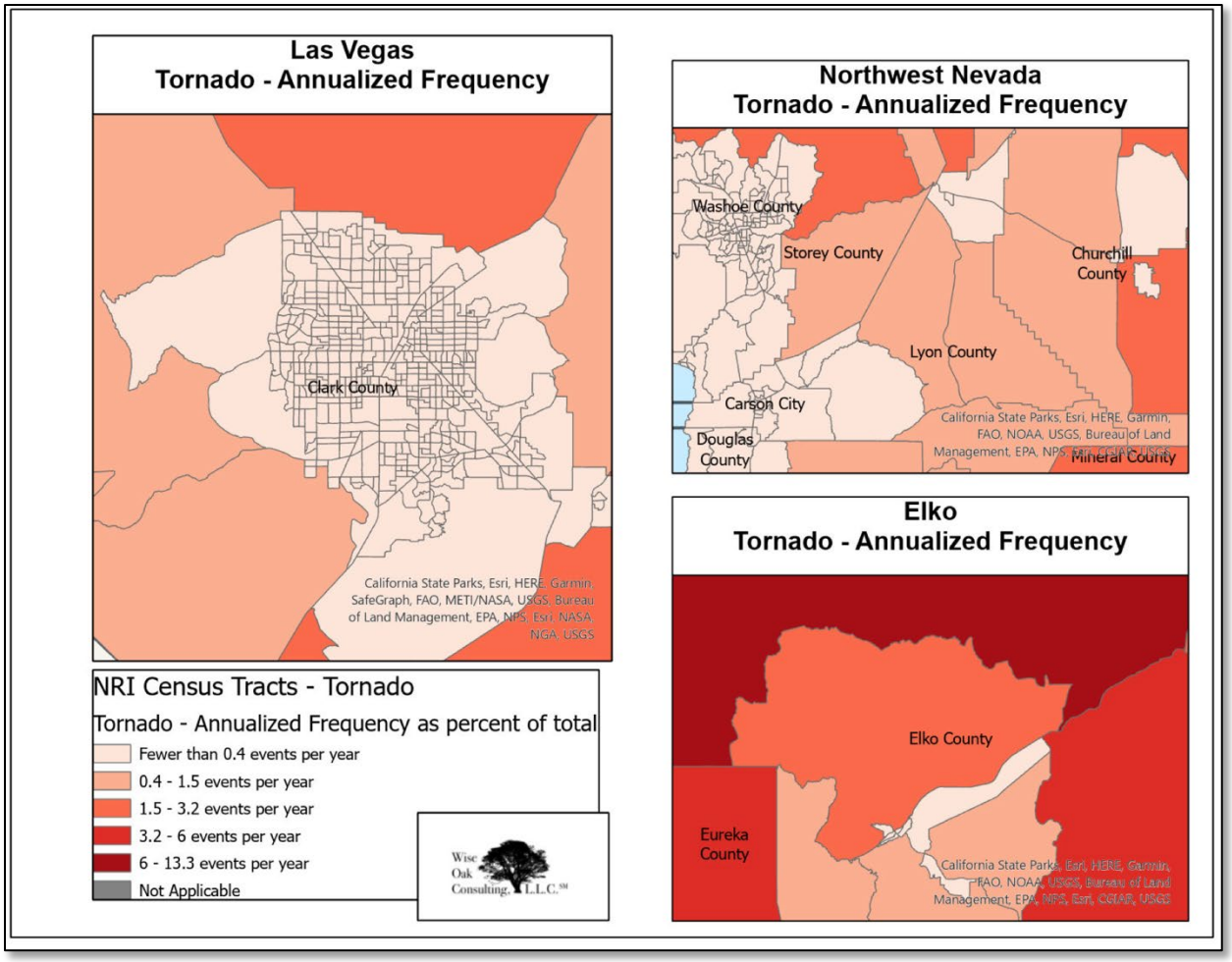


Figure 3-170. Tornado National Risk Index Annualized Frequency – More Heavily Populated Areas.

3.3.14.4 Climate Change

It is unknown how climate change will affect the frequency of Nevada tornadoes. This is due to uncertainties in the future frequency of strong thunderstorms and sufficient wind shear in the atmosphere, the two main ingredients to create tornadoes.

3.3.14.5 Vulnerability of State Assets

Subject matter experts do not assess that there is appreciable vulnerability to state assets due to this hazard.

3.3.14.6 Mitigation

Subject matter experts have assessed that there is no appreciable vulnerability of state assets due to this hazard. Therefore, the hazard profile is for information purposes only and mitigation projects will not be pursued for this hazard in 2023-2028.

3.3.15 Volcano (Low Risk)

3.3.15.1 Nature

Volcanoes are created when internal forces in the earth cause heated, melted rock (magma) to rise to the surface. First collecting in magma chambers, some of the magma pushes upward through cracks and eventually vents to the Earth's surface. As the magma reaches the surface, it can erupt violently due to escaping gases (e.g., Mount St. Helens in 1980, Figure 3-171), it can erupt less spectacularly as a lava flow (e.g., Hawaiian eruptions), or it can expand slowly as a lava dome (similar to the filling of the crater of Mount St. Helens in recent years).

Volcanoes have varied shapes and sizes but are divided based on the type of material that reaches the surface and the type of eruption that ensues.

1. Composite or Stratovolcanoes

Composite volcanoes (stratovolcanoes) develop from repeated explosive and non-explosive eruptions of tephra (airborne lava fragments that can range in size from tiny particles of ash to house-sized boulders) and lava that build up layer by layer. These volcanoes are the largest and form symmetrical cones with steep sides. Mount Shasta, Mount Rainier, and Mount St. Helens are examples of stratovolcanoes.



Figure 3-171. Mount St. Helens 1980 Eruption.[136]

2. Shield Volcanoes

Shield volcanoes form from "gentle" or non-explosive eruptions of flowing lava. The lava spreads out and builds up volcanoes with broad, gently sloping sides. They are named for their low-profile shape that resembles a warrior's shield. Currently, active volcanoes of this type are found in the Hawaiian Islands.

3. Cinder Cones

Cinder cones build up from lava that is blown violently into the air and breaks into fragments. As the lava pieces fall back to the ground, they cool and harden into cinders (lava fragments about ½ -inch in diameter) that pile up around the volcano's vent at the angle of repose. Cinder cones are the smallest volcanoes and are cone shaped. Cinder cones are found in many areas of the western U.S., including Nevada.

4. Phreatic Eruptions

Phreatic eruptions occur when rising magma contacts ground or surface water. The extreme temperature of the magma (anywhere from 1110°F to 2140 °F (600-1170 °C)) causes near-instantaneous boiling (flashing) of groundwater resulting in an explosion of steam, water, ash, rock, and volcanic bombs. A less intense geothermal event may result in a mud volcano. This kind of activity is also described as steam-blast eruptions. Phreatic eruptions typically include steam and rock fragments and seldom erupt lava. The temperature of the fragments can range from cold to hundreds of degrees Fahrenheit. If molten material is included, the term phreato-

[136] Source: USGS Photograph by Austin Post.

magmatic is used. These eruptions occasionally create broad, low-relief craters called maars. Phreatic explosions can be accompanied by carbon dioxide or hydrogen sulfide gas emissions. The former can asphyxiate at sufficient concentration; the latter is a broad-spectrum poison. A 1979 phreatic eruption on the island of Java killed 149 people, most of whom were overcome by poisonous gases. Examples of phreatic explosions include Soda Lake near Fallon, a crater at Steamboat Springs near Reno, and Lunar Crater in central Nevada.

5. Calderas

Calderas are large volcanoes that produce violent eruptions of ignimbrites – hot ash that wipes out areas tens to thousands of square miles in size. Although many calderas existed in Nevada tens of millions of years ago, none are active today. However, the Long Valley Caldera near Mammoth Lakes, California, deposited ash in much of western Nevada when it erupted approximately 760,000 years ago. Similarly, Mount Mazama, a stratovolcano in Oregon, deposited ash in Nevada approximately 7,700 years ago, when it erupted to create Crater Lake, a relatively small caldera.

Figure 3-172 depicts the National Risk Index Score for volcano statewide.

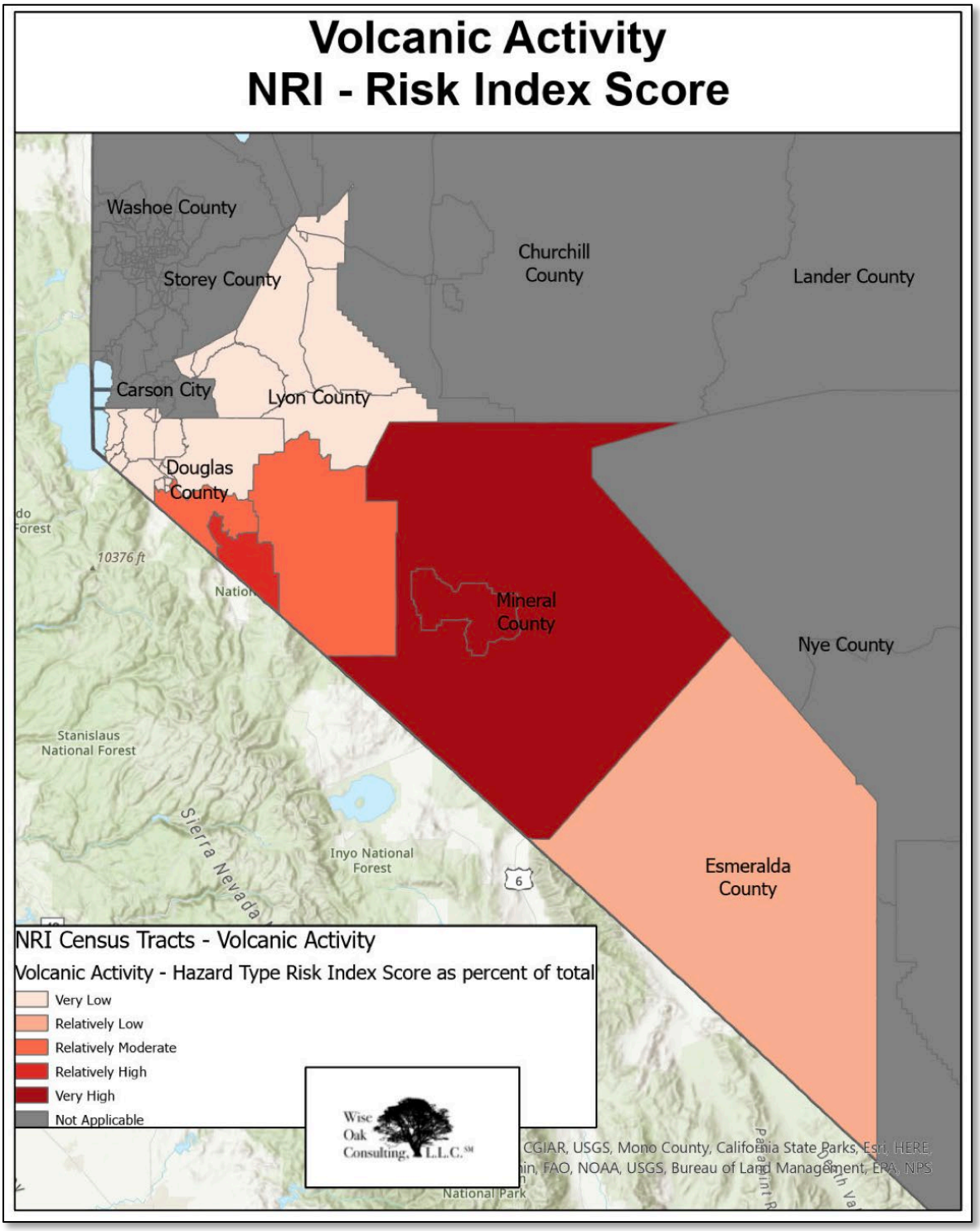


Figure 3-172. Volcano National Risk Index Score – Statewide.

Figure 3-173 depicts the NRI Exposure in dollars statewide.

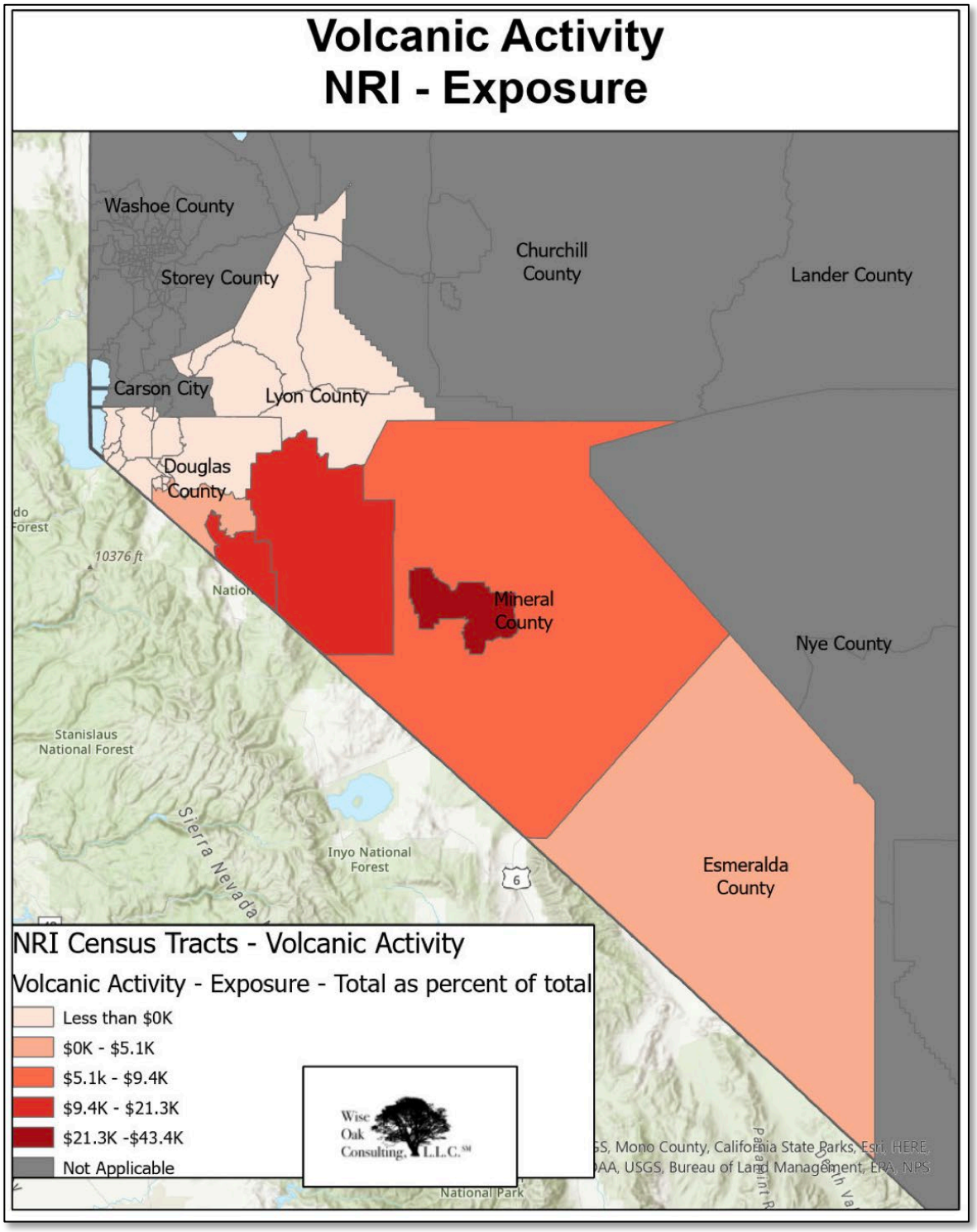


Figure 3-173. Volcano National Risk Index Exposure – Statewide.

3.3.15.2 History

Nevada has a long history of volcanism. In western Nevada, the most recent episode was between 2.6 to 1 million years ago (Henry and Cousens, 2013). At about 1.36 million years ago, two lava flows erupted out of a volcanic cone at McCellan Peak and "flowed ~6 km [3.6 mi] into what is now suburbs of Carson City and across U.S. Highway 50" (Henry and Cousens, 2013). It has been a long time since these eruptions, but still renewed activity is not out of the question. Volcanic activity from surrounding states, particularly California and Oregon, has created ash clouds that have drifted over Nevada, as evidenced by numerous young ash beds in western Nevada. Small eruptions from the Mono Craters area near Lee Vining and Mono Lake in eastern California have sent ash into Nevada as recently as about 260 years ago; an eruption from these volcanoes presents the most likely current volcanic hazard for Nevada. Other volcanoes that have erupted in recent history and could deposit ash in Nevada include Lassen Peak, Mount Shasta, the Long Valley Caldera in California, and volcanoes in the Cascade Mountains in Oregon. Ash from the 1915 eruption of Lassen Peak traveled at least 200 miles northeast to Winnemucca. The eruption of Mount St. Helens in 1980 deposited up to several centimeters of ash several hundred kilometers away from the volcano. The biggest threat to Nevada from eruptions in California and Oregon is damage to flying aircraft.

A massive eruption from the Long Valley Caldera near Mammoth Lakes, California about 760,000 years ago devastated a considerable area in Owens Valley when thick, hot flows of ash were deposited as far south as Bishop. Air-fall ash from these eruptions did collect as thick piles of ash in parts of Nevada, and some of the ash may have been hot enough or thick enough to locally devastate the landscape. Scientists would expect to see strong indications from seismographs before another eruption of this magnitude. The USGS continues to monitor the area around Mammoth Lakes and will issue warnings prior to any subsurface changes that could precede a major eruption.

Seismic and geodetic data at the north end of Lake Tahoe have been interpreted by researchers at UNR (K.D. Smith and others, 2004, Evidence for deep magma injection beneath Lake Tahoe, Nevada-California: Science, v. 305, p. 1277-1280). These data indicate active magma at a depth of approximately 19 miles (30 kilometers). There does not appear to be a near-term threat of volcanic eruption from this area, in part because the last documented eruption in the area was approximately one million years ago.

A preliminary study indicates there are as many as 140 Quaternary volcanic centers in Nevada (Figure 3-174). More may be present but this is probably close to the total number of vents. The history of most of these volcanic centers is not currently known, but there are several that are close to Nevada communities.

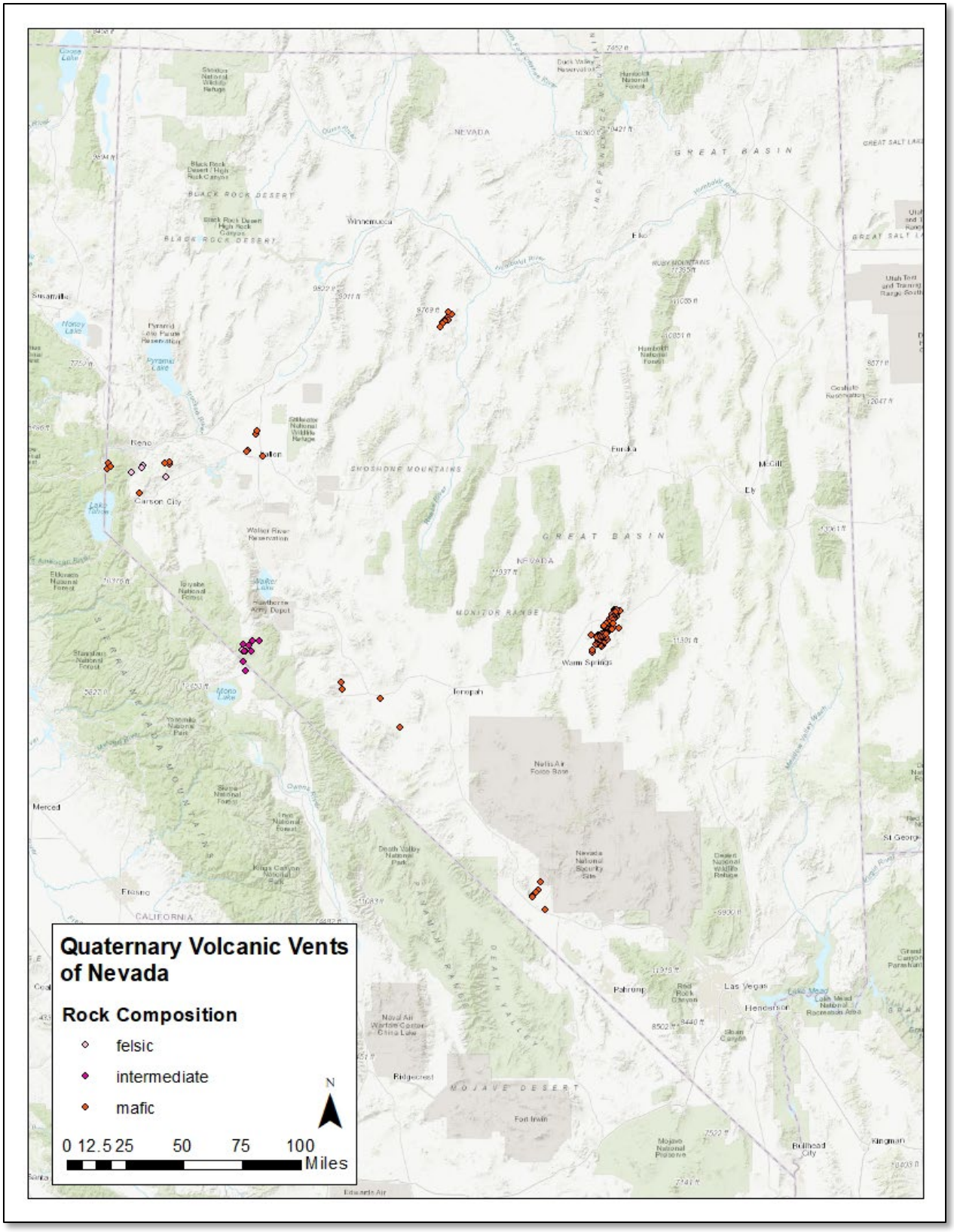


Figure 3-174 A preliminary map of volcanic centers in Nevada.

Soda Lake and Little Soda Lake near Fallon in Churchill County are maars, volcanoes that form by explosions when magma rises near the surface of the earth and flashes the groundwater into steam. Phreatic eruptions such as these pose a risk of concussion blast waves and asphyxiation from the volcanic gases released. Soda Lake and Little Soda Lake are probably the youngest volcanoes within the borders of the State. They have not erupted in recorded history, although sediment deposited during the last high stand of glacial Lake Lahontan is overlain by volcanic sediments indicating that they are younger than 13,000 years old. On the basis of preliminary helium isotopic studies (Thure Cerling, University of Utah, personal communication, 1997), the eruption at Soda Lake may be younger than 1,500 years before present. Somewhat similar phreatic events, but without magma, have occurred at the Steamboat geothermal area just south of Reno. The youngest volcanic rocks exposed at the Earth's surface in the Steamboat area are approximately one million years old.

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 (Smith, E.I. Keenan, D.L., Plank, T. 2002, 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); 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.

Although geothermal power plants in many parts of the world are associated with active volcanoes, the 26 geothermal power plants in northern Nevada do not appear to be associated with magma. With the possible exception of the Steamboat geothermal system at the south end of Reno, the geothermal areas in Nevada appear to derive their heat from deep circulation of groundwater rather than direct connections with magma or cooling igneous rock. A hazard that is recognized in the Steamboat area is violent eruption of steam, mud, and rock from geysers. As indicated on the geologic map of the Mt. Rose NE Quadrangle (NBMG Map 4Bg), such eruptions have occurred during the Quaternary Period near the Mount Rose Highway (Nevada Route 431), west of the intersection with U.S. Highway 395, and could occur again there or in other parts of the Steamboat area.

Figure 3-175 depicts the NRI Historic Loss Ratio statewide.

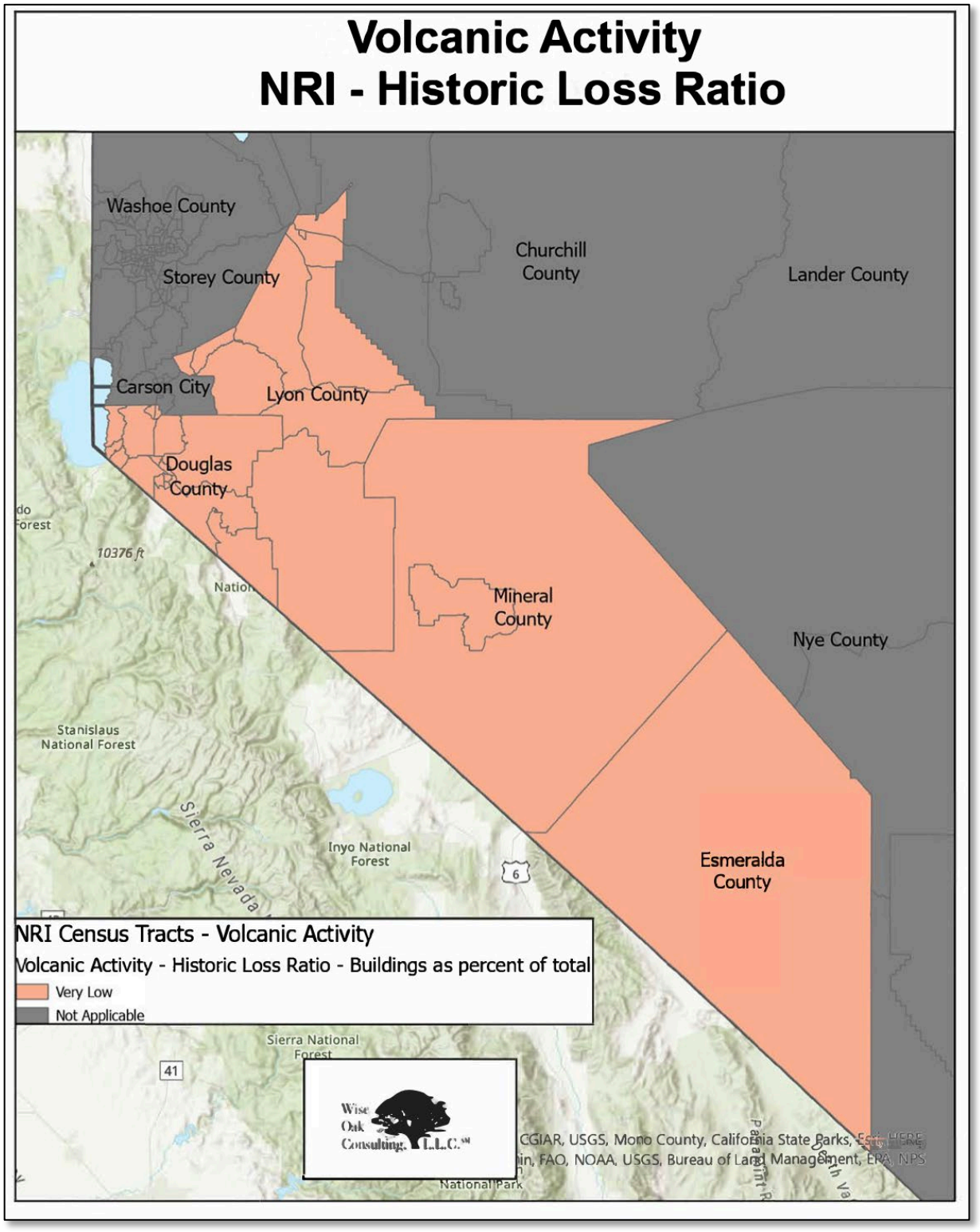


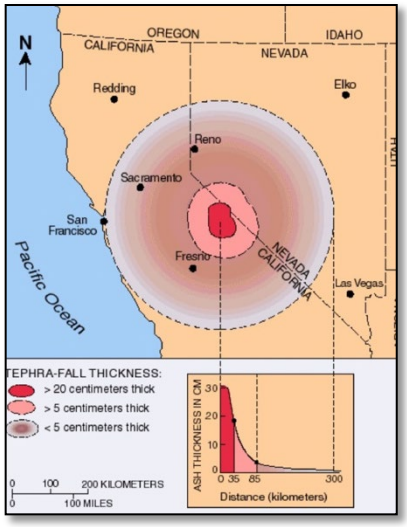
Figure 3-175. Volcano National Risk Index Historic Loss Ratio – Statewide.

3.3.15.3 Location, Severity, and Probability of Future Events

There are many Quaternary volcanoes in Nevada (Figure 3-174). There is clearly some potential for ash from the Mono Craters, Inyo Craters, and Mammoth Mountain, which have had late

Holocene eruptions, that will likely affect airplanes, air quality, and highway driving in Nevada, particularly in near-downwind areas of Esmeralda, Mineral, and Nye Counties. In the event of an eruption in this region, planes flying between Reno and Las Vegas would have to be re-routed west of the Sierra Nevada. Similarly, there is some potential for ash from Cascade volcanoes in northern California (Lassen Peak and Mount Shasta areas) and Oregon to affect airplanes, air quality, and highway driving in northern Nevada, particularly Washoe, Humboldt, Pershing, and Elko Counties. Air travel between Reno and Portland and Reno and Seattle would be re-routed in the event of an eruption in this area. Geologic evidence of past eruptions from these volcanoes, recognized as ash deposits of particular ages and distinct chemical compositions, is abundant in Nevada. Volcanic gases associated with phreatic eruptions could pose a localized threat of asphyxiation to humans in poorly ventilated spaces in the immediate vicinity of these vents. At Mammoth Mountain, several CO_2 related deaths occurred when a skier and rescuers became trapped in a snow pocket that was filled with CO_2 gas. The emission of CO_2 gas in this area is associated with volcanic unrest in between more dramatic eruption cycles. Elevated CO_2 levels in the soil were first observed by the USGS in 1989 after a swarm of small earthquakes occurred beneath Mammoth Mountain. It is noted that the ski resorts in that region are located in close proximity to volcanoes.

Volcanic eruptions may also trigger a "volcanic blast" or an atmospheric shock wave that creates a pressurized burst of moving air which travels away from the eruption center. Shock waves from eruptions may injure people, flatten trees (e.g. Mount Saint Helens), and break windows in buildings. Effects of these shock waves are more destructive near the eruption center.



It is likely that seismic instruments will detect any imminent eruption in time to warn people to avoid the hazard. Our ability to monitor small tremors associated with magma at depth is limited by the currently small number of seismographs that are operated in Nevada. The Nevada Seismological Laboratory and the U.S. Geological Survey have joint responsibilities for earthquake monitoring and warnings. Figure 3-176 depicts the region that could be affected by tephra accumulations on the ground following an eruption in the Long Valley – Mono Lake area. Thickness and distribution of tephra is dependent upon wind speed and direction during the eruption.

Figure 3-176. Potential Tephra Accumulations Following an Eruption in the Long Valley – Mono Lake Area.[137]

Volcanic risk is low but can change to high in a matter of months to a year as a volcano becomes active. The probability is low but the consequences can be locally severe. Mitigation actions are limited to public awareness and evacuation procedures at the local level.

Examples of response plans for volcanic eruptions include (and are referenced in Section 7):

1. Mount St. Helens – Mount Adams Volcanic Region Coordination Plan (2014): https://www.mil.wa.gov/uploads/pdf/PLANS/mount-st.-helens---mount-adams-volcanic-region-coordination-plan-october-2014.pdf
2. Mount Rainier Volcanic Hazards Plan (2008): http://www.co.pierce.wa.us/DocumentCenter/View/3499

[137] Source: USGS Volcano Hazards Program: *Potential Tephra Fall Hazards for Small to Moderate-Sized Eruptions in the Long Valley – Mono Lake Area, California*.

3. Mt. Hood Coordination Plan (2013): http://www.oregon.gov/OEM/Documents/Mount_Hood_Volcano_Coordination_Plan.pdf
4. Central Cascades Volcano Coordination Plan (2007): http://www.oregon.gov/OEM/Documents/Central_Cascades_Coordination_Plan.pdf

Figure 3-177 depicts the NRI Expected Annual Loss statewide.

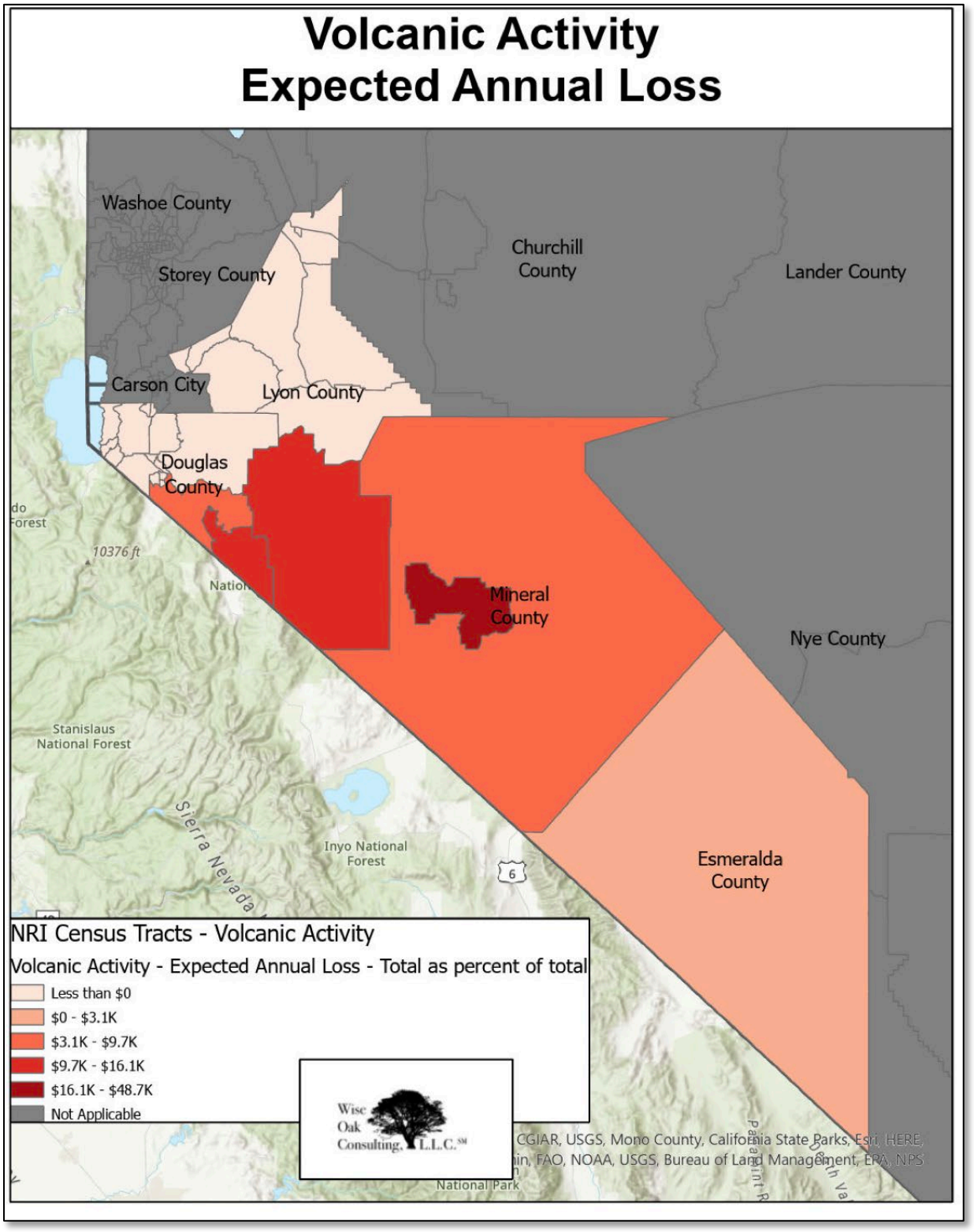


Figure 3-177. Volcano National Risk Index Expected Annual Loss – Statewide.

Figure 3-178 depicts the NRI Annualized Frequency statewide.

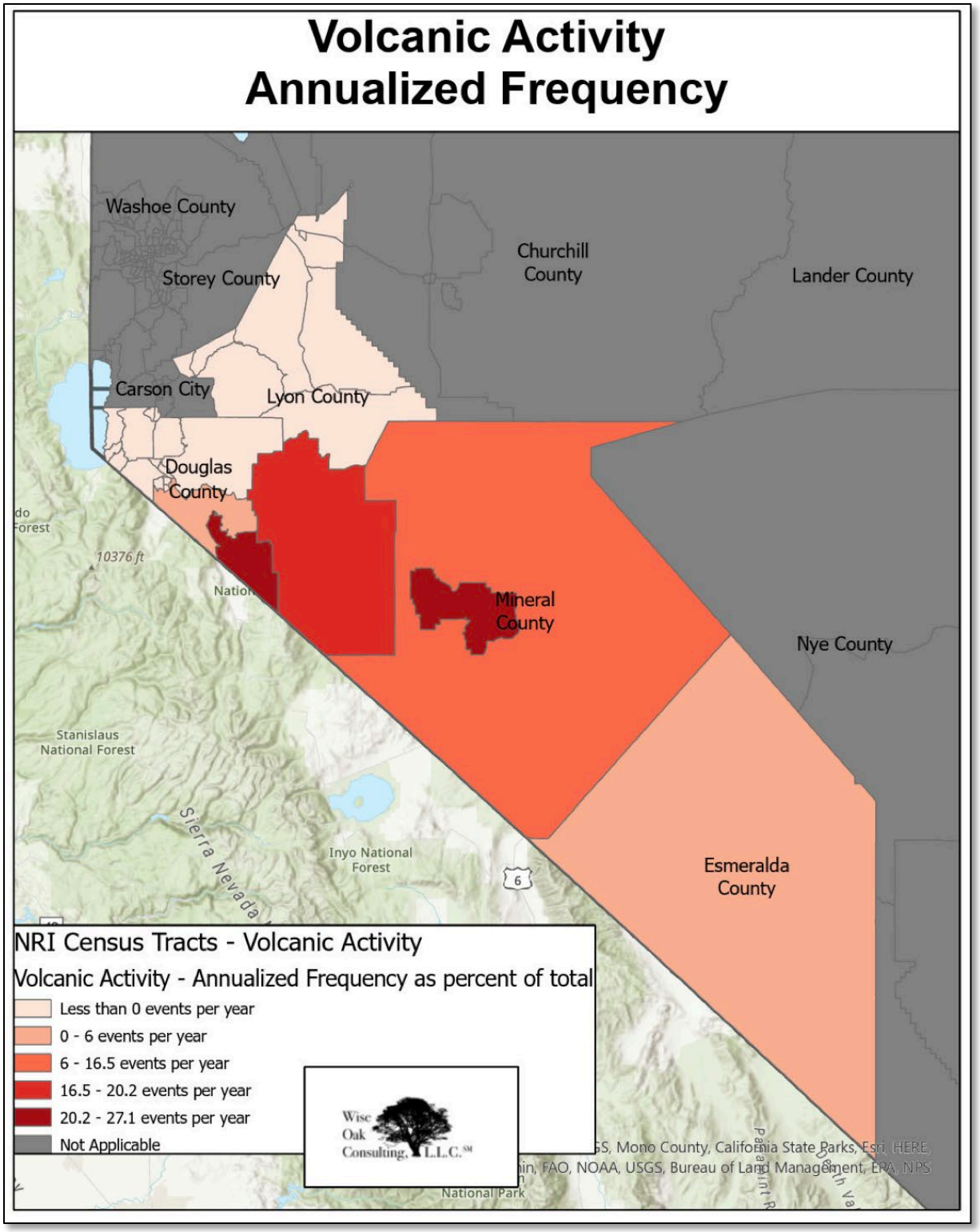


Figure 3-178. Volcano National Risk Index Annualized Frequency – Statewide.

3.3.15.4 Impacts from Climate Change

Volcanic activity is driven by tectonics and magma movement towards the surface and would not be impacted by climate change. However, large volcanic eruptions can put huge volumes of ash and gases into the atmosphere and affect the climate significantly. An example of this was the 1991 Mt. Pinatubo eruption in the Philippines, which cooled the climate of Earth for about three years. In 536 A.D., Europe underwent a "volcanic winter" with temperatures being dropped by nearly 5° F (2.7° C) when volcanic ash and gases reduced the sun's energy input into Earth's atmosphere. Volcanoes also release huge amounts of carbon dioxide. So, it is conceivable that following the cool down from aerosols and volcanic ash, carbon dioxide from an eruption could contribute to the overall CO2 budget in the atmosphere and exacerbate an increase in temperatures.

3.3.15.5 Vulnerability of State Assets

Subject matter experts do not assess that there is appreciable vulnerability to state assets due to this hazard.

3.3.15.6 Mitigation

Subject matter experts have assessed that there is no appreciable vulnerability of state assets due to this hazard. Therefore, the hazard profile is for information purposes only and mitigation projects will not be pursued for this hazard in 2023-2028.

3.3.16 **Wildfire** (High Risk)



Figure 3-179. Wildland Urban Interface Fire Outside of Pioche, NV.

3.3.16.1 Nature

A wildfire is a type of fire that spreads by consumption of vegetation. It often begins unnoticed, spreads quickly, and is usually signaled by dense smoke that may be visible from miles around. Wildfires can be caused by human activities such as arson or campfires or by natural events such as lightning. Wildfires are not confined to forests but can easily ignite in other areas with adequate vegetation or fuel volumes and continuity such as sagebrush or cheatgrass. Additionally, wildfires can be classified as Wildland-Urban Interface (WUI) or non WUI fires based on their juxtaposition to structures and communities. WUI wildfires can then be further classified into urban fires, interface, or intermix fires based on the density of structures and amounts of fire fuel between the structures.

Nevada is susceptible to weather that may range from prolonged periods of drought to periods that are marked by above average precipitation. These weather fluctuations result in millions of acres of dead or dying vegetation, which rapidly dry out under normal summer weather conditions. The dry, hot conditions and windy weather patterns characteristic of Nevada's summers combine with vegetation conditions that fuel fast-moving, high-intensity wildland fires. Nevada also experiences off-season wildfires in drier fall and winter conditions when adequate herbaceous fuels loads exist and are not covered by snow. These can easily be as devastating to communities in the WUI as wildfires occurring in the traditional wildfire season.

Wildfires are generally considered to be a damaging event. However, the Great Basin and Sierra pine forest types are ecosystems that have evolved with fire being an essential process to achieve

diversity, health, and stability in ecosystem components. The ecosystem is dependent upon such factors as vegetation, soils, water quality, water quantity, and wildlife habitat. Given the fire suppression policy of the last century and the increased presence of invasive annual grasses, Nevada's ecosystems now have a mixture of too much wildfire in some ecosystems, like the sagebrush rangelands. Correspondingly, there have been too few fires in other regions such as the Sierra pine, pinyon-juniper, and mountain brush ecosystems. Any wildfire on State or private lands is suppressed fully as fast as possible due to the desire to avoid loss of life and damage to property and values on those lands.

The following three factors contribute significantly to wildfire behavior and can be used to identify wildfire hazard areas:

- **Topography:** Topography is the configuration of the earth's surface, including its relief and the position of its natural and man-made features. Topography has a direct bearing on fire behavior. As slope increases, the rate of wildfire spread increases. A slope's aspect correlates with the amount of moisture, quantity, and type of vegetation. South-facing slopes are also subject to more solar radiation, making them drier, thereby intensifying wildfire behavior. However, a ridgetop may stop a wildfire from spreading since fire spreads more slowly or may be unable to spread downhill.
- **Fuel:** Fuel characteristics determine the potential fire intensity and influence the rate of spread. The type and condition of vegetation play a significant role in the occurrence and spread of wildfires. Certain types of plants are more susceptible to burning or 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 important. The risk of fire is increased significantly in ecosystems with woody fuels during periods of prolonged drought as the moisture content of both living and dead plant matter decreases. Ecosystems dominated or co-dominated by herbaceous vegetation are often times more flammable and can create larger wildfires in years following above normal amounts of precipitation because the plants grow greater amounts of biomass that dries out during the summer wildfire season. The fuel's continuity, both horizontally and vertically, is also an important factor.
- **Weather:** The most variable factor affecting wildfire behavior is weather. Temperature, humidity, wind, and lightning can affect both the ignition and spread of fire. Extreme weather, such as high temperatures, low humidity, and strong winds can lead to extreme wildfire activity. By contrast, cooling, higher humidity, and calm atmospheric conditions often reduce wildfire occurrence and rates of spread, thereby making containment easier. Wind has the greatest impact on fire behavior of any of the weather factors. The passage of a warm front will usually bring a wind direction shift of 45 to 90 degrees. The passage of a cold front will shift wind direction from less than 45 degrees to as much as 180 degrees. Great Basin valley heating causes downslope winds in Nevada mountain ranges. As wind flows downslope in the atmosphere it is compressed, becoming warmer and dryer. This causes the fuels to dry out. As the temperature increases, wind speed may reach 50 to 70 miles per hour. Thunderstorms are another common extreme weather condition in Nevada. A thunderstorm's effect may extend 25 to 30 miles from the actual storm. A downburst is caused by the collapse of a thunderstorm, causing cool air to be released in a downward direction. When this occurs, it adversely affects fire behavior and fire suppression efforts by causing a highly unpredictable wind event.

The frequency and severity of wildfires also depend on other hazards such as lightning, drought, and infestations of diseases or insects in vegetation. If not promptly controlled, a wildfire may grow into an emergency or disaster. Fires that break out immediately following earthquakes can be particularly devastating, because the earthquake may have impaired the ability of first responders to reach or combat an urban or urban interface fire. Lack of access and suppression tools such as water are commonplace in post-quake fire response scenarios. Even small fires can threaten or destroy lives, resources, and improved properties.

In addition to affecting people, wildfires may severely affect wildlife, livestock, and pets. Such events may require emergency watering/feeding, evacuation, and shelter. Evacuating animals can complicate the general evacuation procedures, logistics, and compliance of the public due to financial and emotional connections with their animals. This complication has the potential to put responders and the public at increased risk for injury and death. It is not uncommon for NDOW to extend hunting seasons and tags for animal harvest following large wildfires in key habitats to mitigate large winter starvation-related die offs of wildlife in fire affected areas.

The indirect effects of wildfires can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, intense fires can harm the soil, waterways, wildlife, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life for years. Exposed soils erode quickly and increase siltation of rivers and streams, increasing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris-flow hazards. All of these results can cause communities to lose their municipal water sources as well as damage water conveyance and control structures ineffective. When these structures become non-functional, common outcomes can include road washouts, houses flooded, as well as loss of irrigation water for crops and livestock watering. Local economies are often based on agricultural production, which can be eliminated for the short-term on federal lands that are used by private livestock ranching operations as a source of livestock feed for most of the year. Additionally, there is a large economy in Nevada that is dependent upon outdoor recreation such as hiking, hunting, camping, fishing, and other activities that can be detrimentally affected by the lasting effects of a wildfire.

Figures 3-180 and 3-181 depict the National Risk Index Score for wildfire statewide and for more heavily populated areas respectively.

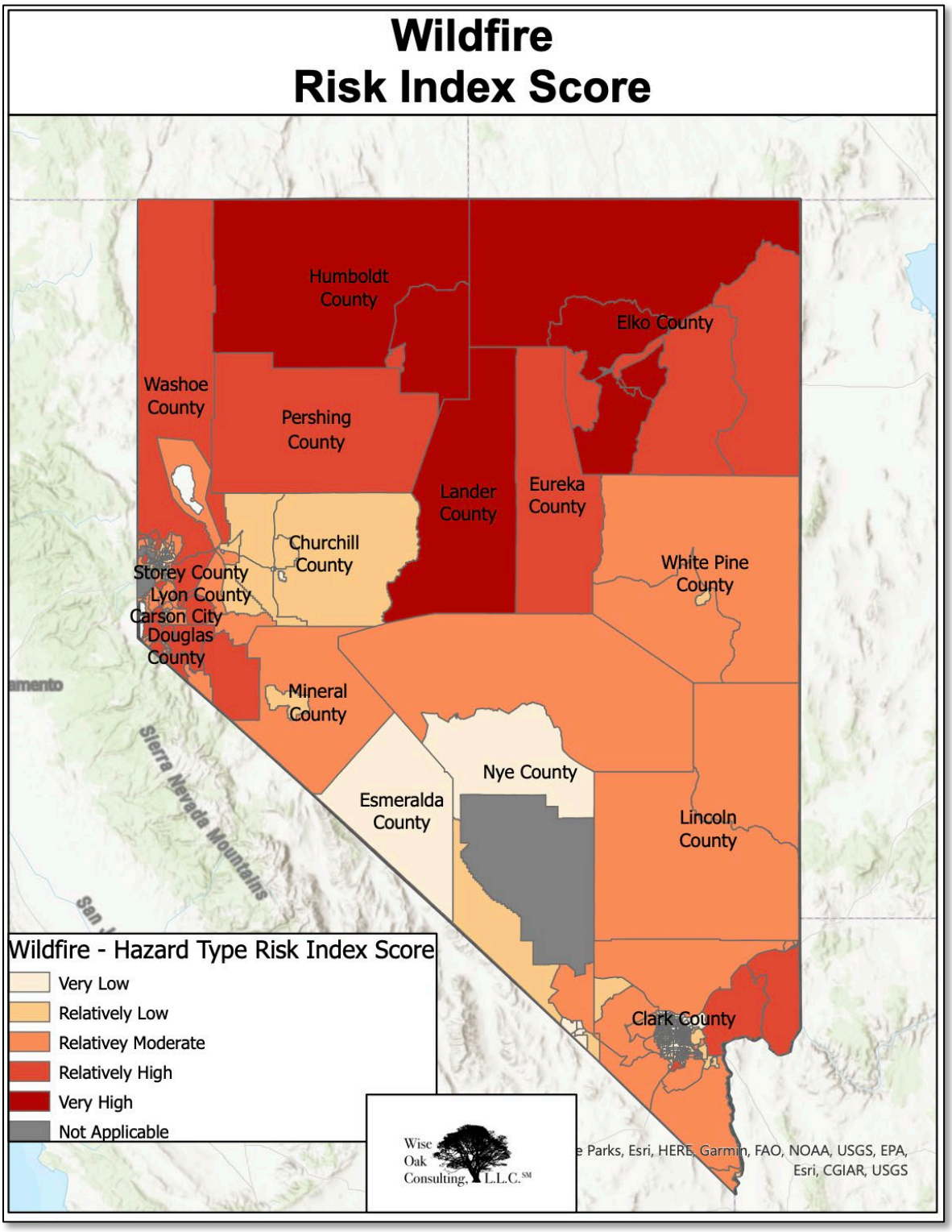


Figure 3-180. Wildfire National Risk Index Score – Statewide.

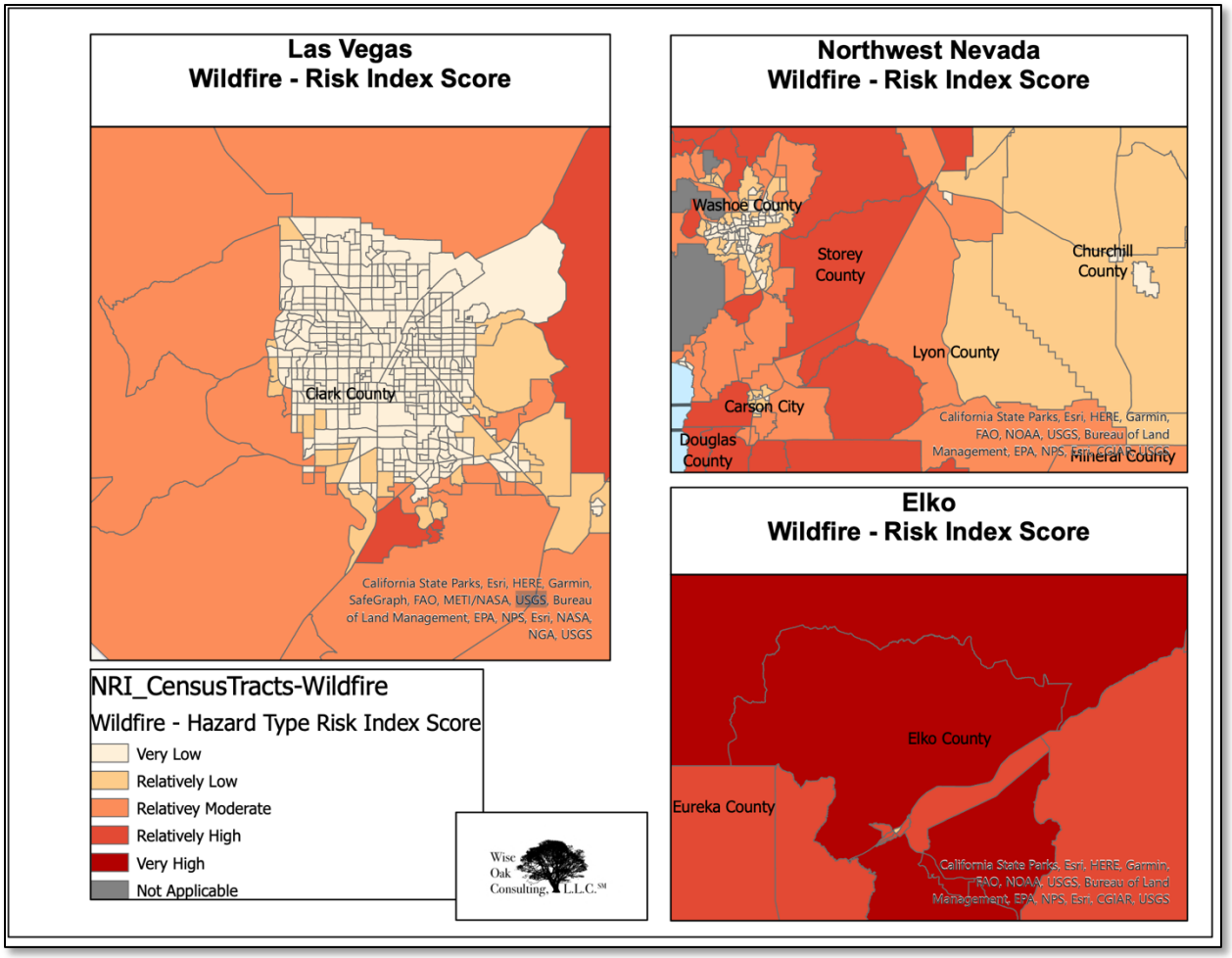


Figure 3-181. Wildfire National Risk Index Score – More Heavily Populated Areas.

Figures 3-182 and 3-183 depict the NRI Exposure in dollars statewide and in more heavily populated areas respectively.

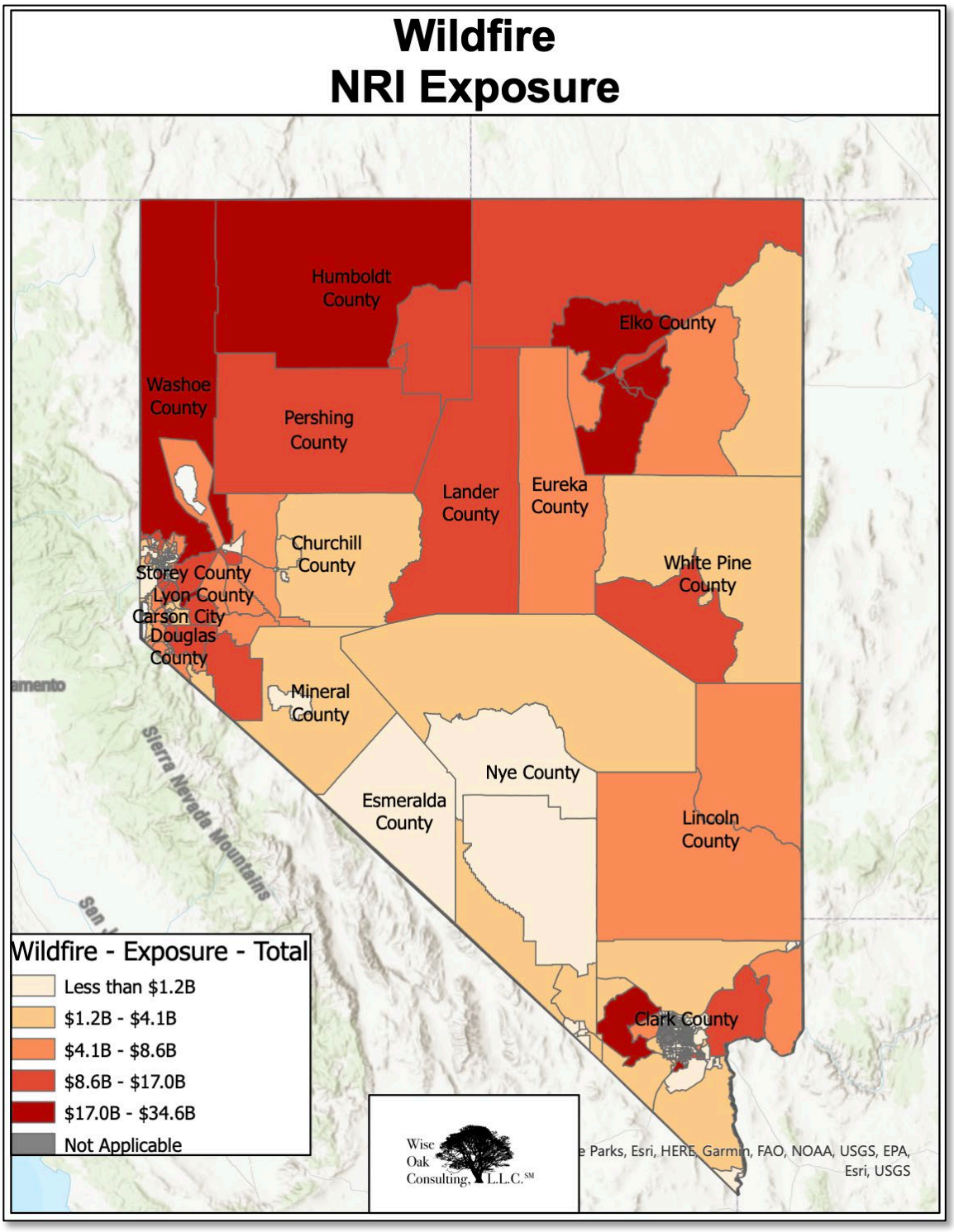


Figure 3-182. Wildfire National Risk Index Exposure – Statewide.

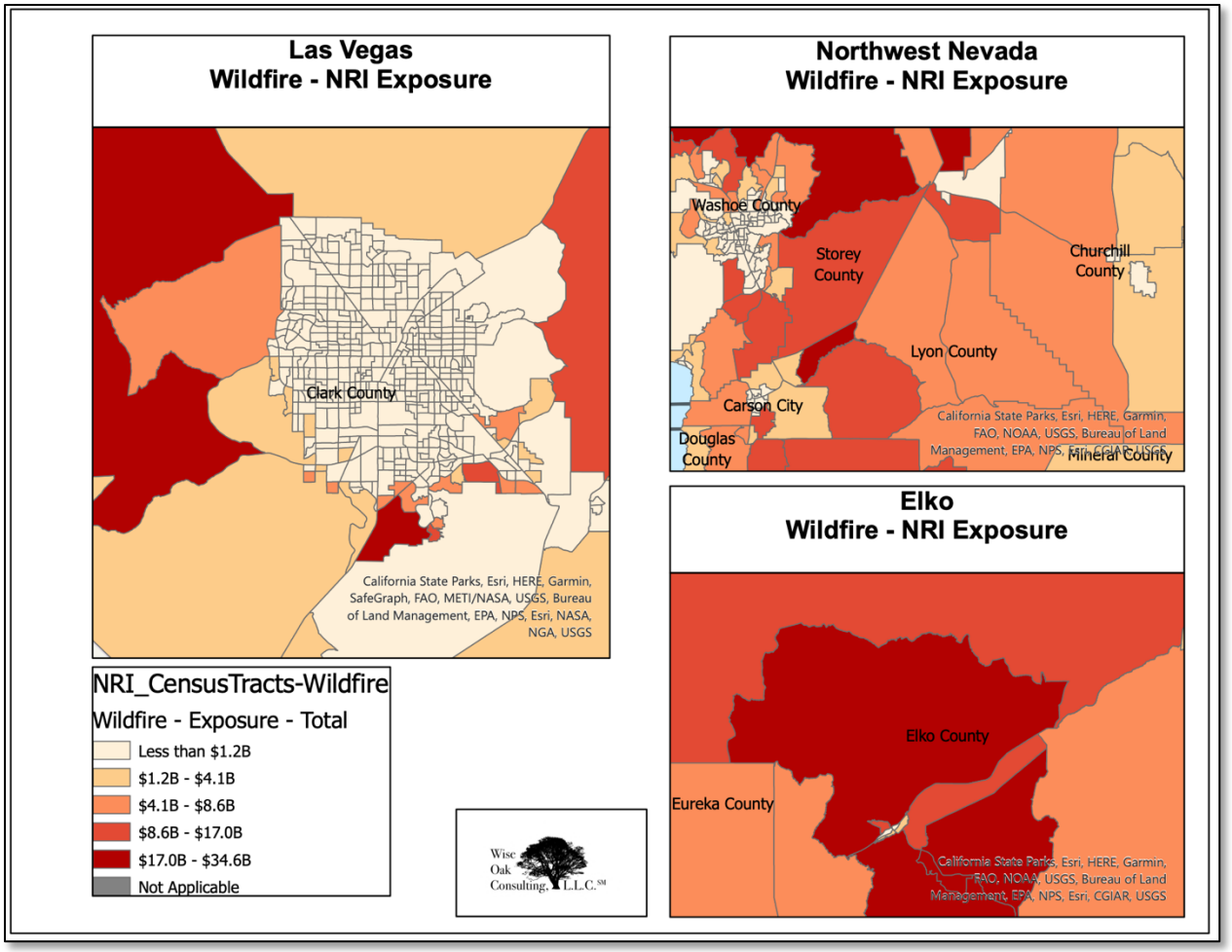


Figure 3-183. Wildfire National Risk Index Exposure – More Heavily Populated Areas.

3.3.16.2 History

Wildfires and human-caused fires have been the primary landscape shaping events for thousands of years in Nevada. Some ecosystems, such as the Eastern Sierra pine forests and valley bottom wetlands were managed actively by Native Americans through the application of fire to the landscape. In areas not regularly burned by Native Americans, such as salt desert scrub and sagebrush rangelands, wildfires burned in areas where natural ignitions and wildfire fuel buildup coincided. In some ecosystems, this occurred as frequently as every 25 years at the same site to greater than 400 years. Ecosystems in Nevada evolved with wildfire as a part of those systems. Based on a century of full fire suppression, most of our forested and woodland types have an over-abundance of woody fuels that have fueled larger and more intense wildfires of the last two decades. Sagebrush rangelands followed this trend as well, though many of them have now been converted to annual grasslands that burn many more times frequently than they did traditionally in history. The presence and expansion of invasive annual grasses has caused fire return intervals to decrease to three to five years in many locations across Nevada.

In Nevada, particularly in the northern half of the state, wildfires are a common yearly event. Nevada's traditional fire season starts in May and ends in October, but wildfires can occur at any time of the year depending on fire and weather conditions. The Nevada Division of Forestry (NDF) recently conducted a GIS analysis on Nevada wildfire occurrences over a 11-year period (2012 thru 2022). Results of the analysis indicate that over the 2012-2022 time period, Nevada

wildfires are trending towards more distribution throughout the seasons, occurring more frequently in non-summer months. For the time period 2012-2022 the West Region, 73% of wildfires occurred in summer months, with 27% occurrence for all other seasons combined. North and South Regions showed very similar results to the Western Region. For the three regions combined, 28 wildfires occurred over the winter months over 2012-2022. Nevada's fire regime is outside the range of historical variation which means that wildland fires have become larger, more destructive, and more frequent, especially starting in the mid-1980s. Since 1985 there have been nine fire years exceeding 500,000 acres burned in Nevada.

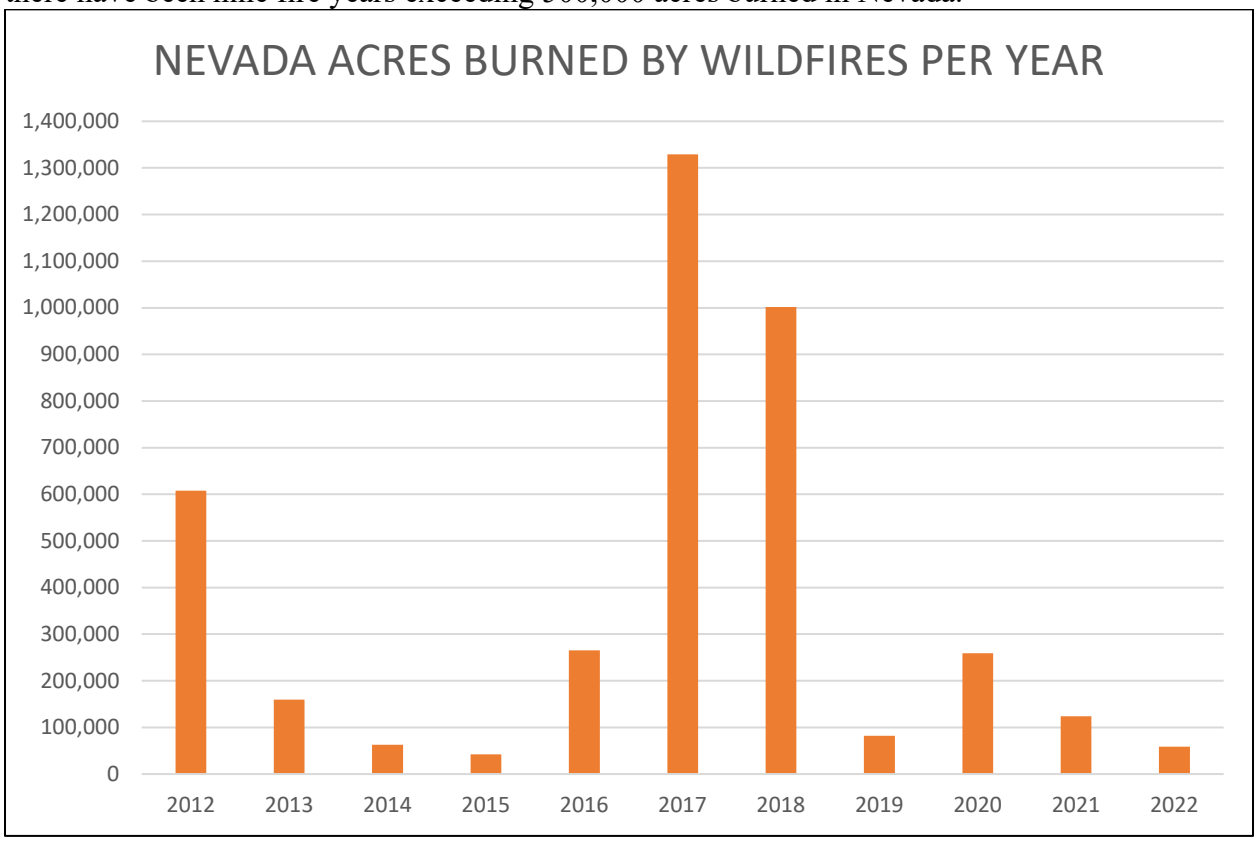


Figure 3-184. Historical Nevada Acres Burned by Wildfires, by Year.

The trend of having large wildfire years has continued since the mid-1980s with regular cycles of a few lesser fire years in between larger years, singly or aggregated sequentially in small groups. Much of this variation can be explained by the cyclic nature of our precipitation and the response of vegetation growth and conversion to wildfire fuels as they dry in the summer. Wildfire fuels can build to levels two to six times the annual average depending on the precipitation timing and amount each year. Figure 3-185 depicts the correlation between the amount of the mean flow of the Humboldt River and number of acres burned.

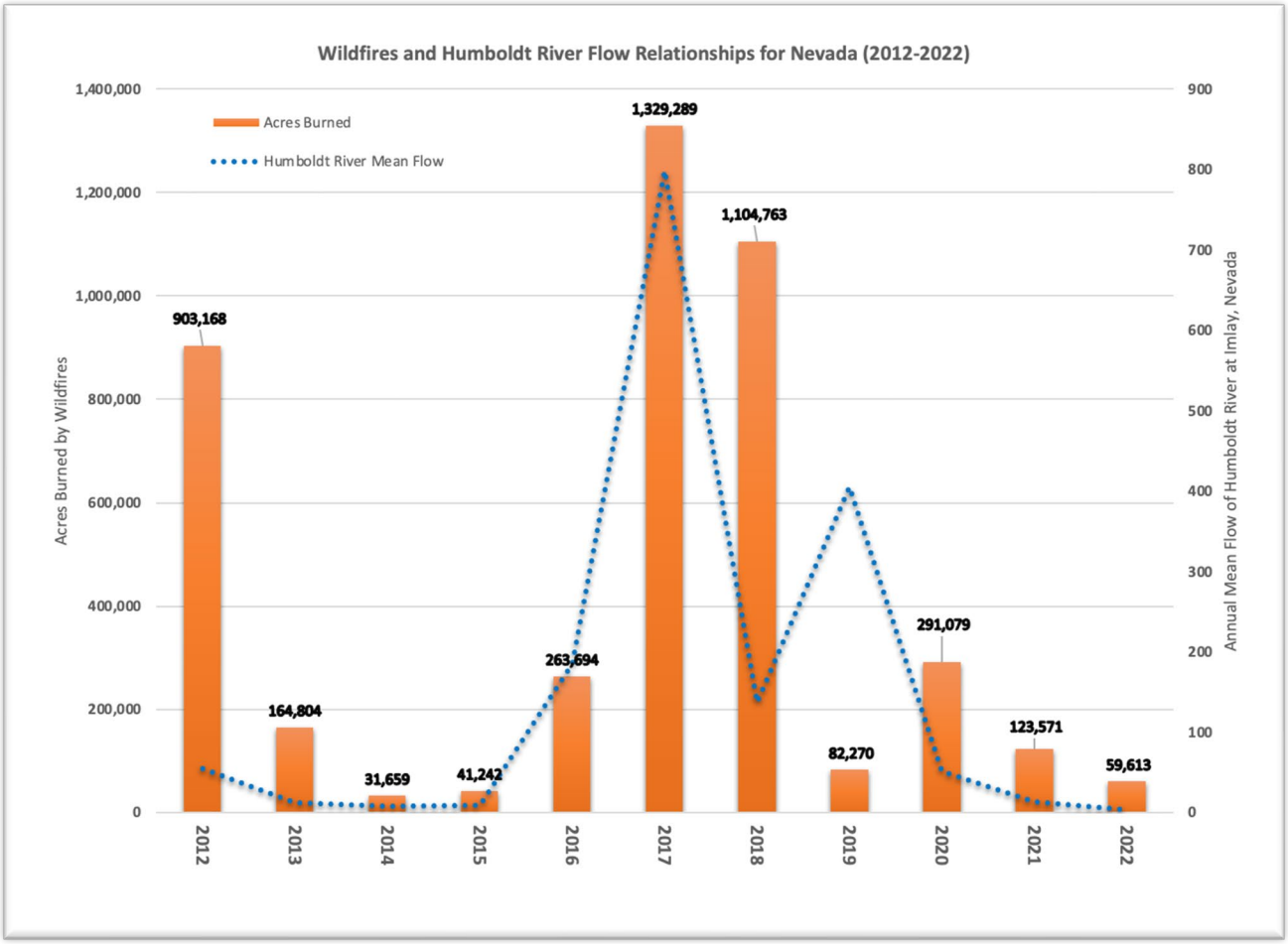


Figure 3-185. Correlation Between Precipitation, Runoff Levels, and Nevada Fire Season Cycles.[138]

Based on a 11-year average from 2012 to 2022 over 3 million acres burned. These fires devastated ranches, watersheds, homes, business, human lives, and wildlife habitat. Additionally, large fires destroy native plant communities that are replaced by invasive species, such as cheatgrass and red brome. In many cases, these invasive species are more fire prone than native species and will fuel larger, more intense fires.

In recent years this fire-invasive species-fire cycle is accelerating and posing serious threats to the health of some Nevada ecosystems. The spread of these invasive annual plants perpetuates the cycle of destructive fires and the loss of native plant communities.

The Tamarack Fire burned on both sides of Highway 395 on July 22, 2021. More than 1.5 million acres burned in the Sierra Nevada in 2021 – a new record. It broke the previous record set in 2020. Historically, human-caused fires tend to account for 40% - 50% of the ignitions, while natural causes account for 50% - 60%. The number of fires also appears to be correlated to the amount and timing of precipitation. Comparing Figure 3-184 and 3-185, wet years in 2017 and 2019 were followed by more fires per year that trended downward until another wet year once again increased the fuel load. the total number of fires in Nevada appears to be trending down over time. Although more than 95% fires are suppressed and controlled during initial attack (first 24 hours following report), the five or less percent that escape initial attack control account for most of the damage and acres consumed. Additionally, damage incurred does not

[138] Produced by the Nevada Division of Forestry, Adapted from Swanson 2015.

always correlate with the size of the fire. For instance, many of the large fires in northeastern Nevada are within critical wildlife habitats, though much smaller fires on the Sierra front can destroy many homes, take lives, and impair community watersheds.

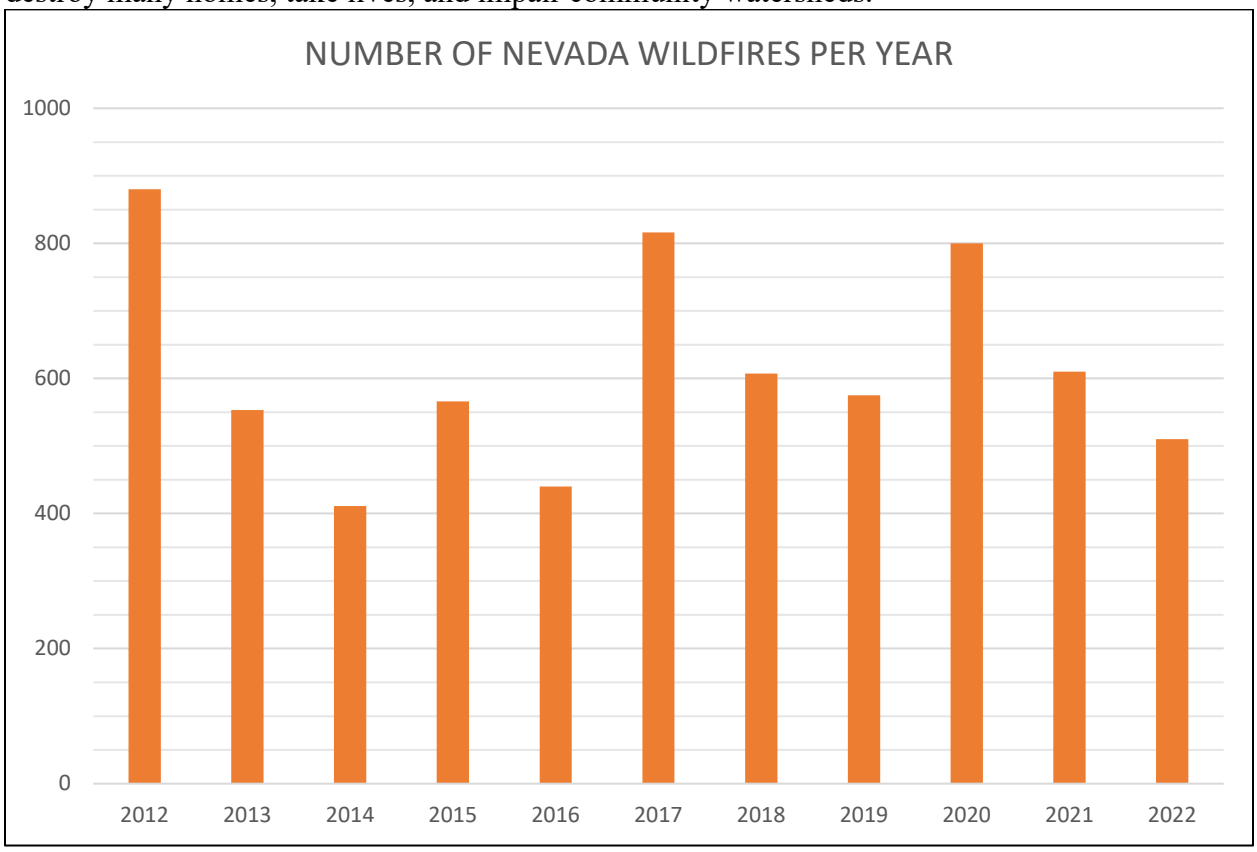


Figure 3-186. Number of Wildfires in Nevada by Year.[139]

[139] XX, http://gacc.nifc.gov/gbcc/intell.php.

Table 3-34 presents a brief history of some of the most destructive Nevada wildfires.

Table 3-34. Destructive Wildfire History			
Date	**Place**	**Acres**	**Description**
1926	Kings Canyon	Unknown	5 firefighters fatally burned over
1934	Long Point	Unknown	1 firefighter fatality from falling snag.
1939	Humboldt County	Unknown	5 firefighters fatally burned over
1973	Eureka County	Unknown	2 firefighters killed in air tanker crash
1976	Carson City	Unknown	3 firefighters killed in helicopter crash
1980	White Pine County	Unknown	4 firefighters killed in an aircraft crash
1983	Unknown	Unknown	1 firefighter fatally burned over
2000	Churchill County	Unknown	1 firefighter killed in a helicopter crash
2000	Elko County	Unknown	1 firefighter killed in a helicopter crash
2005	Elko County	6,000+	Chance Fire. The fire, which started August 28, consumed more than 6,000 acres and resulted in the voluntary evacuation of approximately 200 residents. The fire burned near the communities of Ryndon, Osino, and Elburz in Elko County.
2006	Elko County	78,300	Suzie Fire. This fire burned more than 78,300 acres about five miles from Elko. This fire threatened rangeland, homes, and highways. A five-member strike team from California, composed of personnel and engines from fire departments in Sacramento, Placer and Nevada counties was involved in fighting this fire.
2006	Humboldt	102400	Oregon Fire. This fire burned more than 160 square miles of Nevada rangeland near the Oregon border. Also, this fire on the Oregon side threatened the major transmission lines that carry power between California and the Pacific Northwest.
2006	Washoe County, Carson City	8,000	Linehan Fire Complex. This fire burned about 8,000 acres, threatening homes in Carson City. One federal Type I incident response team moved in to battle the 8,000-acre Sierra-Tahoe complex of fires in western Nevada near Reno and Carson City.
2006	Washoe County	6000	The Verdi Fire burned 6,000 acres west of Reno, Nevada threatening the Somersett home subdivisions. It significantly depleted the winter forage food for the deer in this area.
2006	Elko County	3,000+	The Mud Fire on the outskirts of Elko burned more than 3,000 acres. It threatened 300 homes and forced mandatory evacuations of about 1,000 persons. It was a human–caused fire that threatened businesses and a number of state and Federal facilities. A Fire Management Assistance Grant (FMAG) was approved August 23, 2006.
2006	Washoe County	300	The Pine Haven Fire. This fire was caused by power lines and windy conditions. Firefighters held the blaze

Table 3-34. Destructive Wildfire History			
Date	**Place**	**Acres**	**Description**
			to approximately 300 acres with wildland fire engines, structure fire engines, water tenders, several hand crews and other equipment. Although the fire briefly threatened homes near Caughlin Ranch near Reno, no structures were damaged or lost during the fire.
2007	Washoe County	2,710	The Hawkens Fire was caused by construction crews working in the Caughlin Ranch subdivision near Reno. The fire threatened numerous homes and structures.
2007	Elko County	71,340	The Red House Complex of multiple fires in Elko County burned 71,340 acres total.
2007	Humboldt County	18,806	The Kelly Creek fire threatened several rural ranches in the Humboldt County area.
2007	Elko County	61,070	The West Basin Fire threatened several local ranches in the area.
2007	Elko County	19,959	The Eccles Fire threatened several ranches and structures.
2007	Elko County	648,154	The Murphy Complex, the Wine Cup Complex, and the Highway 93 Complex fires together burned 648,154 acres. Resources in the surrounding area and around the state were at maximum drawdown.
2008	Nye County	6,198	The Elkhorn fire
2008	Washoe County	3,042	The Gooseberry fire threatened several outbuildings.
2008	Washoe County	Unknown	3 firefighters killed in air tanker crash
2008	Elko County	40,937	The East Slide Rock Ridge fire threatened the town of Jarbidge.
2009	Washoe County	10,549	The Red Rock Fire and threatened several subdivisions in the Red Rock community.
2009	Churchill County	10,670	The Hoyt fire burned 10,670 acres. There was one pilot fatality in this fire.
2010	Washoe County	5,298	Rock Creek fire
2010	Pershing County	3,852	Seven Troughs fire
2010	Elko County	2,681	Bailey fire
2010	Eureka County	1,300	Grass Valley fire
2011	Elko County	4,780	Salmon fire
2011	Douglas County	3,895	Ray May fire
2011	Washoe County	2,377	Great Stone fire
2011	Lincoln County	1,721	Jumbo fire
2011	Lander County	1,041	Ellison fire
2011	Lincoln County	12,087	Vigo fire
2011	Pershing County	1,091	Willow Canyon fire
2011	Elko County	1,496	Wells fire
2011	Lyon County	1,062	Burbank fire
2011	Humboldt County	38,055	Hot Springs fire

Table 3-34. Destructive Wildfire History			
Date	**Place**	**Acres**	**Description**
2011	Elko County	116,875	Indian Creek fire
2011	Elko County	42,190	Izzenhood fire
2011	Elko County	51,390	Chukar Canyon fire
2011	Humboldt County	24,000	Eden Valley fire
2011	Humboldt County	18,468	China Garden fire
2011	Humboldt County	5,125	Tom Basin fire
2011	Elko County	2,363	Signboard Pass fire
2011	Lander County	2,000	Fire Creek fire
2011	Humboldt County	11,624	Big Antelope fire
2011	Washoe County	1,935	Caughlin fire
2012	Washoe County	3,177	Washoe Drive fire
2012	Clark County	1,086	White Rock fire
2012	Lincoln County	4,123	Pahroc fire
2012	Lander County	6,007	Antelope Complex fire
2012	Churchill County	17,200	Wall fire
2012	Douglas County	7,152	TRE fire
2012	Douglas County	1,070	Preacher fire
2012	Lincoln County	6,355	White Rock fire; two fatalities in Tanker 11 crash
2012	Lyon County	3,871	Weeks fire
2012	White Pine County	12,047	North Schell fire
2012	Pershing County	1,010	Mine fire
2012	White Pine County	4,000	Pinto fire
2012	Lincoln County	1,815	Boyd fire
2012	Humboldt County	2,478	Buffalo fire
2012	White Pine County	4,600	Range fire
2012	White Pine	7,238	Egan fire
2012	Elko County	13,149	20-mile fire
2012	Elko County	1,435	Palisades fire
2012	Douglas County	1,193	Springs fire
2012	Pershing County	1,600	Jupiter fire
2012	Elko County	4,597	Chimney fire
2012	Lincoln County	7,300	Gregerson fire
2012	Lincoln County	6,057	Basin fire
2012	Lincoln County	23,680	Dell fire
2012	Elko County	43,271	Willow fire
2012	Humboldt County	460,850	Holloway fire
2012	Elko County	1,200	Lutz fire
2012	Eureka County	12,091	Frazier fire
2012	Humboldt County	1,500	Slumbering fire
2012	Humboldt County	43,271	Eleven fire
2012	Eureka County	1,035	Four Tanks fire
2012	Lander County	31,652	Gilbert fire
2012	Elko County	6,000	Homer fire

Table 3-34. Destructive Wildfire History			
Date	**Place**	**Acres**	**Description**
2012	Elko County	7,590	Lime fire
2012	Elko County	12,500	Browns Gulch fire
2012	Lincoln County	4,246	Kane fire
2012	Elko County	2,680	Greenhorn fire
2012	Lander County	7,402	Cain fire
2012	Humboldt County	25,000	Long Canyon
2012	Elko County	6,738	Stud fire
2012	Lander County	2,532	Indian Creek fire
2012	Humboldt County	12,469	Hanson fire
2012	Elko County	16,797	Mustang fire
2012	Humboldt County	6,000	Buckskin fire
2012	Humboldt County	5,500	Coyote Point fire
2012	Douglas County	3,454	Carter Springs fire
2013	Humboldt County	36372	Crescent Dunes
2013	Elko County	2901	Wieland
2013	Elko County	2777	Smith Ranch
2013	Elko County	3888	Cattle Guard
2013	Elko County	16184	Red Cow
2013	Elko County	3031	Waterpipe
2013	Nye County	4028	Willow Creek
2013	Lander County	1093	Ferguson
2013	Lander County	1998	Goat Peak
2013	Lincoln County	4886	Black
2013	Lincoln County	6714	Eightmile
2013	Lincoln County	2783	Gregerson
2013	White Pine County	1100	North Creek
2013	White Pine County	1051	Snow Creek
2013	Nye County	1292	White Pine
2013	Clark County	27865	Carpenter 1
2013	Lincoln County	1216	DOD 4
2013	Washoe County	5369	Red Rock
2013	Lyon County	24140	Bison
2013	Nye County	4219	Chestnut
2014	Humboldt County	1983	Denio Basin
2014	Lincoln County	11279	Middle Ridge
2014	White Pine County	2168	Sampson fire
2014	White Pine County	9235	Lages fire
2014	Nye County	1383	Cottonwood fire
2015	Elko County	4986	Annie fire
2015	Eureka County	2231	Boulder fire
2015	Churchill County	4013	Cold Springs fire
2015	White Pine County	7112	Diamond fire
2016	Churchill County	6591	Horseshoe fire

Table 3-34. Destructive Wildfire History			
Date	**Place**	**Acres**	**Description**
2016	Clark County	440	Lovell fire
2016	Elko County	122390	Hot Pot fire
2016	Eureka County	9367	Maggie fire
2016	Humboldt County	1130	Sand Pass fire
2016	Lander County	6543	Izzenhood fire
2016	Lincoln County	832	Line fire
2016	Pershing County	11227	Monroe fire
2016	Storey County	1271	Shooting Range fire
2016	Washoe County	36125	Tule fire
2016	White Pine County	7693	Overland fire
2017	Churchill County	27485	Draw fire
2017	Clark County	431	Potosi fire
2017	Douglas County	5383	Preacher fire
2017	Elko County	154575	Snowstorm fire
2017	Eureka County	13270	Cottonwood fire
2017	Humboldt County	9879	Dune fire
2017	Lander County	205038	Roosters Comb fire
2017	Lincoln County	1769	Nat Out Nine fire
2017	Lyon County	1626	Lyons fire
2017	Nye County	10541	Timber Peak fire
2017	Pershing County	22376	Mm 155 fire
2017	Washoe County	98954	Truckee fire
2017	White Pine County	1169	Hatchery fire
2018	Carson City County	517	Voltaire fire
2018	Churchill County	324	Gray fire
2018	Elko County	233608	South Sugarloaf fire
2018	Eureka County	12987	County Line fire
2018	Humboldt County	432093	Martin fire
2018	Lander County	59789	Sheep Creek fire
2018	Lyon County	3437	Chaves fire
2018	Nye County	3200	Area 19 fire
2018	Pershing County	3758	Kumiva fire
2018	Storey County	435	Arc fire
2018	Washoe County	51369	Perry fire
2018	White Pine County	31015	Goshute Cave fire
2019	Churchill County	1212	Wood Canyon fire
2019	Clark County	4456	Bonelli Peak fire

Table 3-34. Destructive Wildfire History			
Date	**Place**	**Acres**	**Description**
2019	Douglas County	440	Canyon fire
2019	Elko County	16533	Corta fire
2019	Eureka County	1480	Horse fire
2019	Humboldt County	6414	Buffalo fire
2019	Lander County	603	Whirlwind fire
2019	Lincoln County	3332	Gregerson fire
2019	Nye County	735	Green Springs fire
2019	Pershing County	6447	Summit fire
2019	Washoe County	1165	Jasper fire
2019	White Pine County	3496	Cherry fire
2020	Clark County	2817	Cottonwood fire
2020	Douglas County	18380	Numbers fire
2020	Elko County	7154	Ibapah fire
2020	Eureka County	866	Pine fire
2020	Humboldt County	1117	Clover fire
2020	Lincoln County	59265	Meadow Valley fire
2020	Nye County	4840	Timber Mountain fire
2020	Storey County	306	10 Mile 2 fire
2020	Washoe County	13606	Poodle fire
2020	White Pine County	8268	Brown fire
2021	Clark County	1380	Sandy Valley fire
2021	Elko County	1471	Huff fire
2021	Lincoln County	4434	Big Rocks fire
2021	Nye County	26431	Cherrywood fire
2021	Washoe County	528	Petrilla fire
2021	White Pine County	477	Chin fire
2022	Churchill County	309	East Road fire
2022	Elko County	21429	Wildcat fire
2022	Eureka County	1024	Emigrant fire
2022	Humboldt County	15780	Cherry Gulch fire
2022	Lander County	305	Rooster fire
2022	Lincoln County	5644	Dodge Springs fire
2022	Nye County	710	Ellsworth fire
2022	White Pine County	5989	Becky Peak fire

Figure 3-187 depicts the location and area of wildfire perimeters from 2012 – 2022.

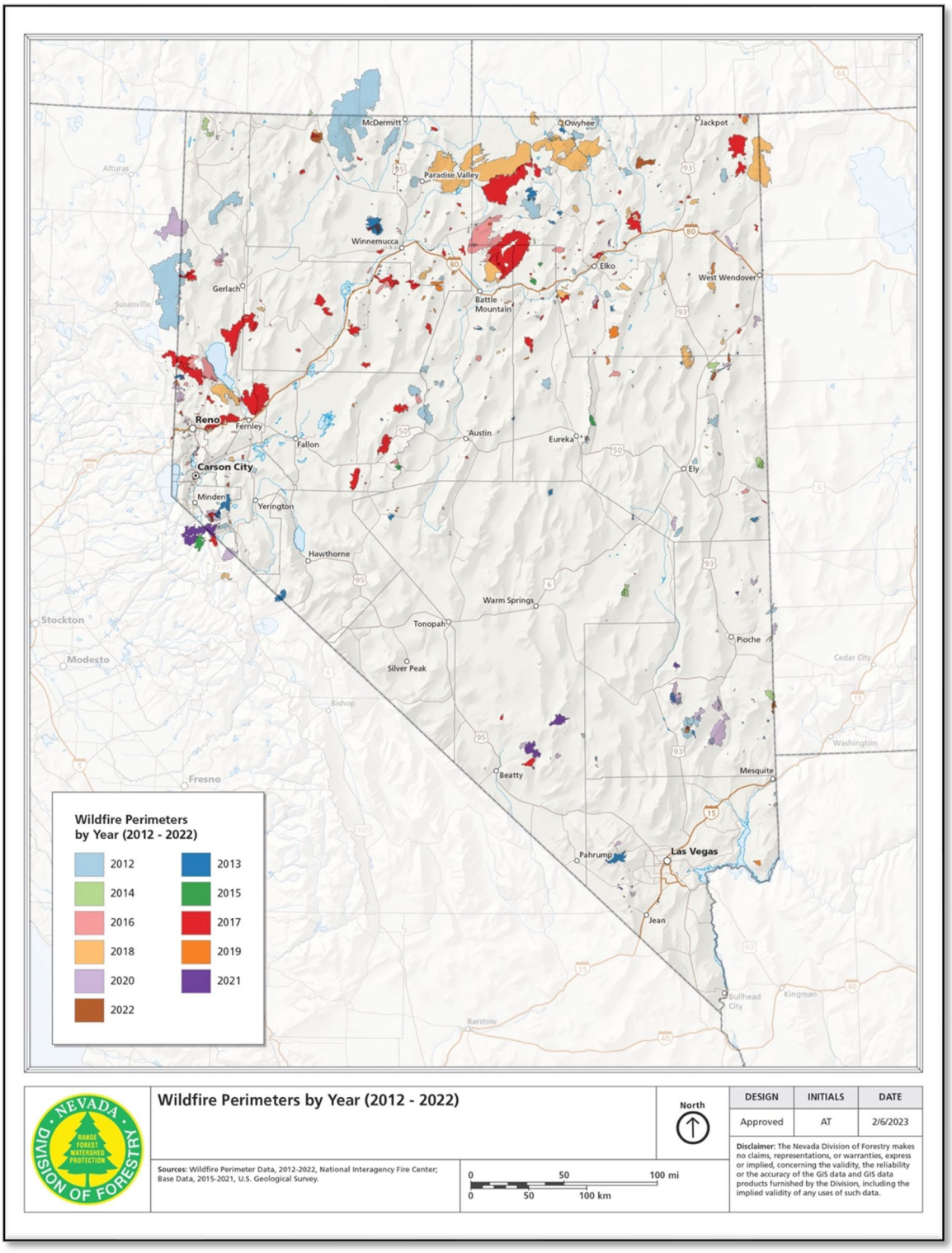


Figure 3-187. Nevada Wildfire Perimeters from 2012-2022**.**

Figure 3-188 depicts wildfire locations and causes from 2012 – 2022.

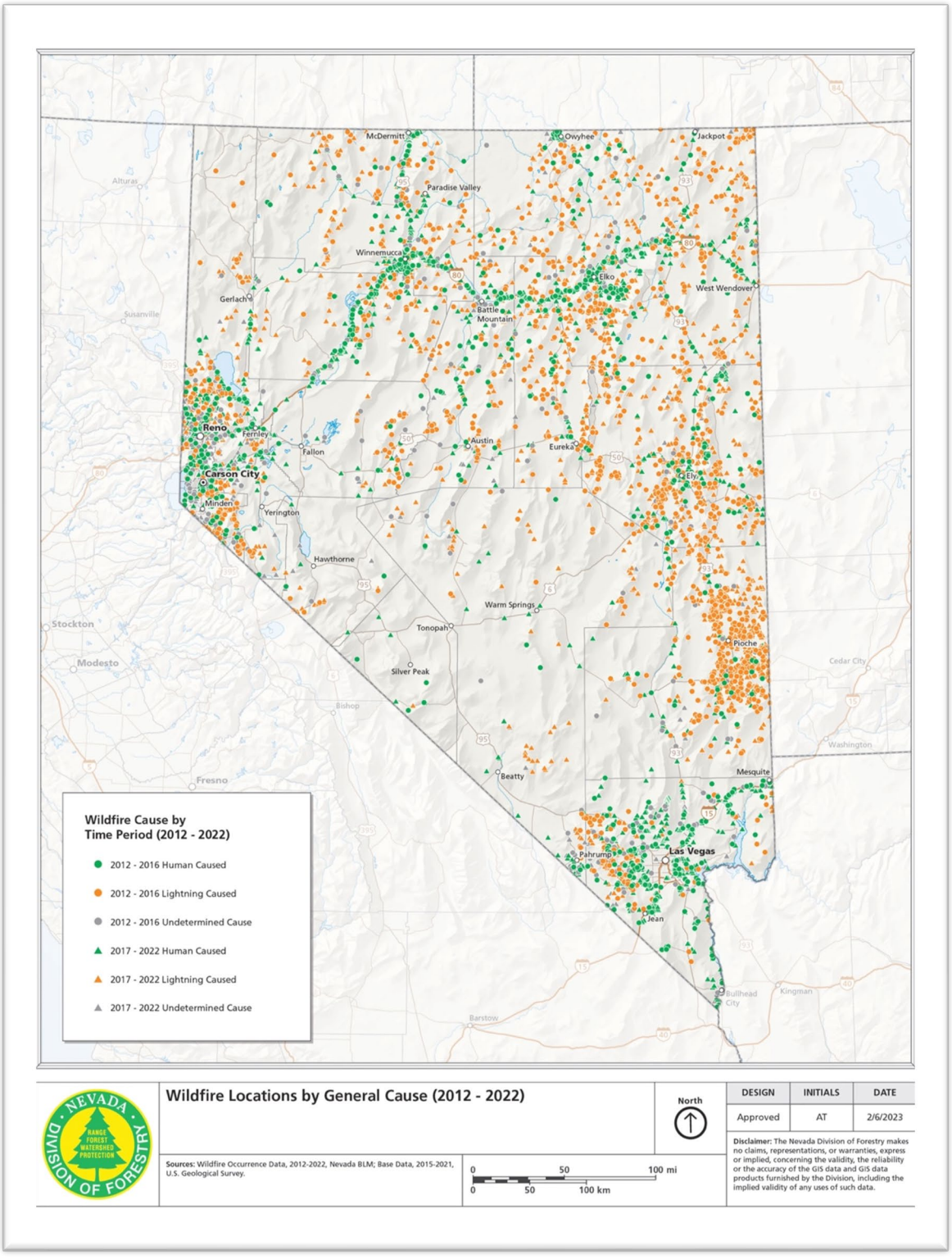


Figure 3-188. Wildfire Locations and Causes for 2012-2022.

Figures 3-189 and 3-190 depict the National Risk Index Historic Loss Ratio for wildfire statewide and for more heavily populated areas respectively.

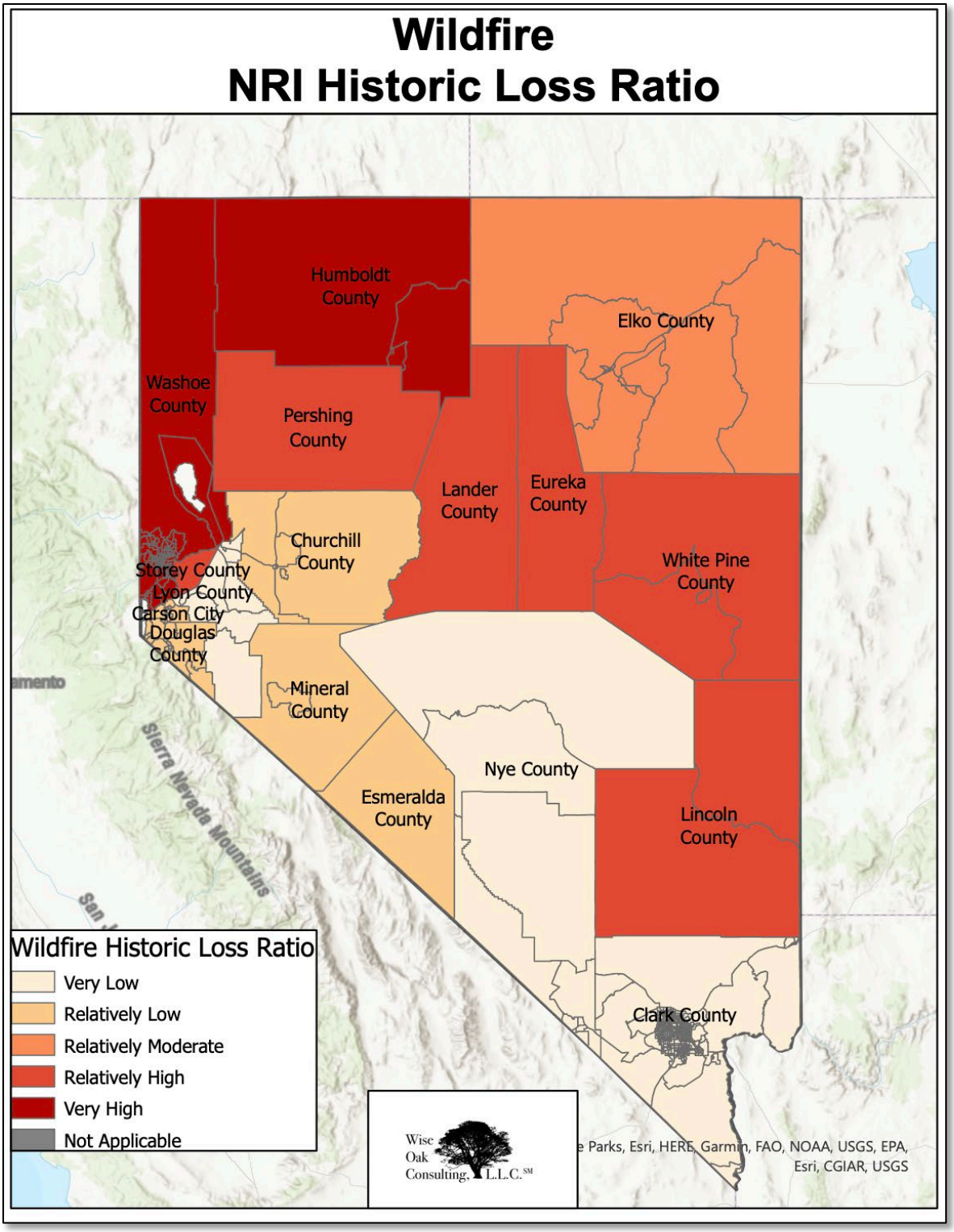


Figure 3-189. Wildfire National Risk Index Historic Loss Ratio – Statewide.

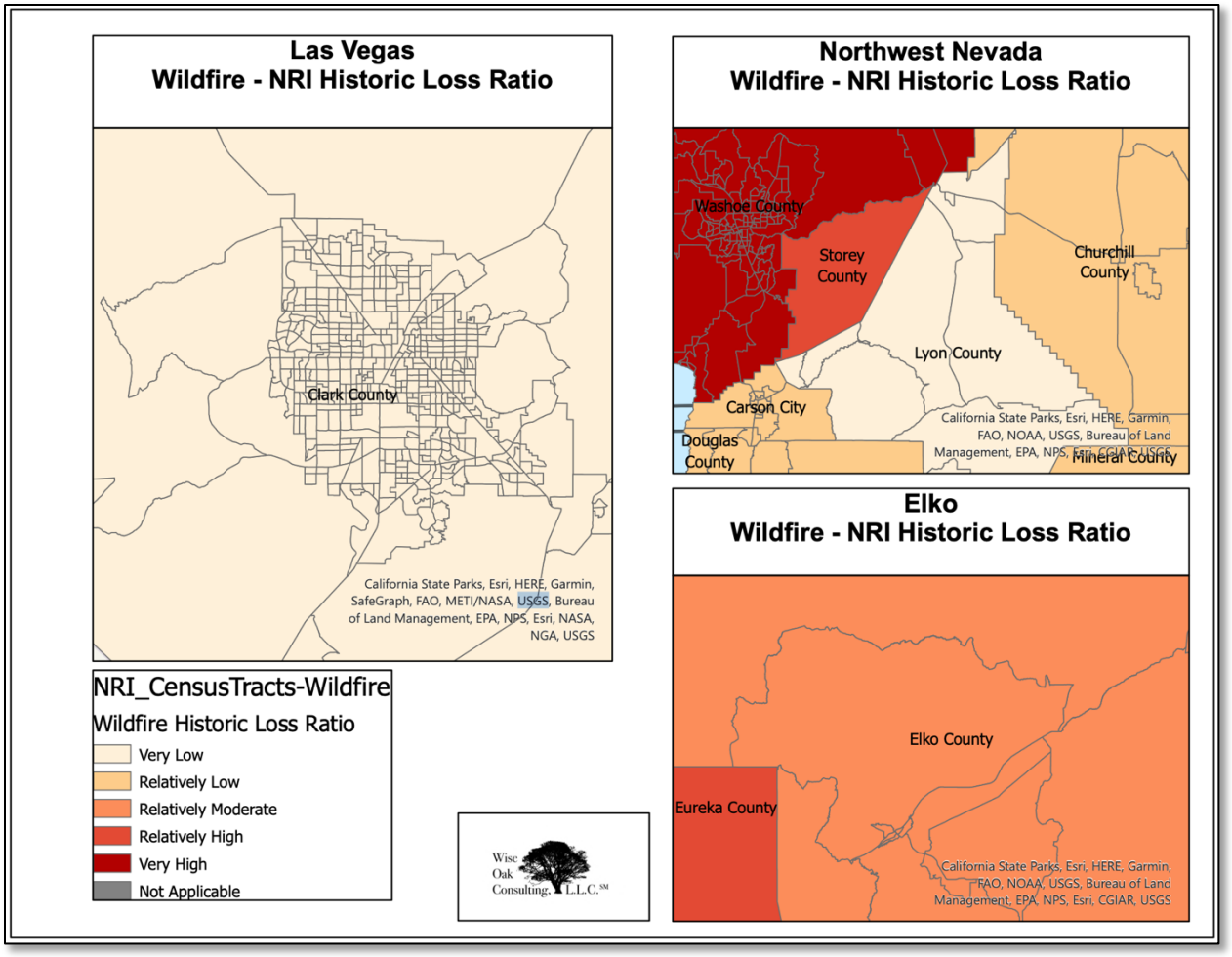


Figure 3-190. Wildfire National Risk Index Historic Loss Ratio – More Heavily Populated Areas.

3.3.16.3 Location, Severity, and Probability of Future Events

Nearly the entire State of Nevada is at risk to wildfires due to fuel-loading, ignition risk, weather, and topography. No specific area of the state are immune to this risk other than playas, lakes, and parking lots. Based on reported locations, wildfires are clustered largely near human population centers, though that is also where the best detection methods and suppression resources are located. This phenomenon results in increased reported starts and increased successful suppression. Human related starts are increased in these areas which includes recreation areas, highways, and power line rights-of-way. As populations continue to grow in the state, so will the number of fires in these and other areas.

Based on historical data and current trends (including climate change), scale, severity and probability for large wildfires are increasing in all parts of the state. For example, the Martin Fire started on Monday July 5, 2018. The fire burned a total of 439,230 acres. It was the largest fire in Nevada's history and one of the biggest in the United States. The fire destroyed six ranches, grazing land and wildlife habitat including sage grouse and mule deer. Several springs and streams were also affected. The fire was human caused. The combination of dry, hot, and windy conditions and high fuel load caused the rapid extension of the fire. The fire erupted Seven (7) miles north of Paradise Valley in Humboldt County and spread east into Elko County. The Hot Pot fire in July of 2016 burned at a rate of roughly three (3) acres burned every second, 166 acres

every minute, and 10,000 acres every hour — for a total of 56,000 acres in one continuous run. This kind of fire behavior is becoming normal for many different fuel types and regions in Nevada. The State Climate Strategy (updated in 2020) highlights climate change impacts such as future increases in both frequency and severity of heat waves, droughts, flooding, and wildfire risk.[140] Specifically, the State Climate Strategy highlights that four (4) of the five (5) years with the most acres burned have occurred since 2005.

The strategy outlines factors that increase wildfire risk:

- Land use – greater exposure and increased risk factors
- Habitat – cheatgrass is more prevalent after fires and also increases fire risk
    - A lack of fire recurrence helps native sagebrush to recover and dominate cheatgrass
- Weather – weather before fires explains 27%-43% of variation Great Basin acres burned
- Climate – Winter precipitation, and spring and summer evaporation, are projected to increase
    - Wet weather flowed by a dry spring increases fire risk
    - Seasonal drought is more important than multi-year drought in Great Basin fires

While fire service agencies, cooperators, and the public take many actions to mitigate risks associate with wildfire, there is no actions that can change the natural conditions that make wildfire possible in Nevada. What most mitigation impacts seek to achieve is decreasing the amount of damage caused by wildfires. Some mitigation actions on wildlands include creating natural landscapes that are resilient to wildfire, meaning that they can regenerate and survive wildfires and not become totally destroyed in the process. Other actions also seek to protect developed areas by creating fire-adapted-communities, which are communities that can survive wildfires without becoming destroyed. This is essential due to the limited amount of suppression response in some areas that can be expected with existing suppression resources. Increasing the amount and the effectiveness of suppression resources is also a damage mitigating action. The only mitigation action that seeks to reduce the number of fires is prevention education which attempts to teach the public how to avoid accidental wildfire starts.

The State of Nevada Division of Forestry cooperates with other federal (Bureau of Land Management, US Forest Service, Bureau of Indian Affairs), State (University of Nevada Reno-University of Nevada Cooperative Extension) and county-based fire protection districts to provide wild-land urban interface fire planning, mitigation, and response. NDF's mission is to provide professional natural resource and fire services to Nevada's citizens to enhance and protect forest, rangeland, and watershed values; conserve endangered plants and other native flora; provide effective collaborative fire protection and emergency management; assist in the creation of fire adapted communities; and maintain a robust statewide wildland fire/emergency response system.

In a collaborative effort, government agencies at all levels, tribes, communities, volunteers, and a variety of other participants have reduced the threats posed by wildland fire since adoption of the Western Governor Association's A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment - *10-Year Strategy, Implementation Plan*.[141]

The revision of the *10-Year Strategy* in December of 2006 gives direction for a collaborative framework that crosses agency jurisdictions and program boundaries. It strongly emphasizes the following:

- Information sharing and monitoring of accomplishments and forest conditions to improve transparency.

[140] State of Nevada Climate Initiative, February 18, 2023, highlights that four (4) of the five (5) years with the most acres burned have occurred since 2005. .

[141] A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment - *10-Year Strategy, Implementation Plan* (December 2006), February 18, 2023, https://www.forestsandrangelands.gov/documents/resources/plan/10-yearstrategyfinal_dec2006.pdf.

- Long-term commitment to maintaining the essential resources for project implementation.
- Landscape-level approach to the restoration of fire adapted ecosystems.
- Use of fire as a management tool (wildland fire use, prescribed fire).
- Improve collaboration on all levels consistent with the *10-Year Strategy*, the *Implementation Plan*, and individual agency goals and objectives.

The severity of wildfires in the State of Nevada has been determined by NEHMPC using a hazard ranking system and vulnerability rating explained in section 3.2.1XX and 3.2.2XX. The rating for wildfires in Nevada is a "High Risk" hazard. Wildfire is being addressed by a variety of strategies and projects in the State.

Nevada's Extreme Wildfire Hazard Communities. A key element of the **Healthy Forests Initiative** announced by the White House in 2002 is the implementation of core components of the ***National Fire Plan Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-year Comprehensive Strategy***. Federal agencies and western state governors adopted the Plan in the spring of 2002 in collaboration with county commissioners, state foresters, and tribal officials. The Plan calls for more active forest and rangeland management to reduce the threat of wildfire in the wildland urban interface.

The Healthy Forest Restoration Act (H.R. 1904) was signed into law in December of 2003. The act creates provisions for expanding the activities outlined in the National Fire Plan. In this year, the Nevada Fire Safe Council received National Fire Plan funding through the BLM to conduct a Community Risk/Hazard Assessment in at-risk communities across Nevada. The communities to be assessed were among those named in the 2001 Federal Register list of Communities-at-Risk within the vicinity of Federal lands (66 FR 160). The list identified Nevada communities adjacent to Federal lands that are most vulnerable to wildfire threat in Nevada. During 2004, field teams comprised of fire behavior specialists, foresters, rangeland fuels specialists, and field technicians visited over 250 communities in Nevada's seventeen counties to assess both the risk of ignition and the potential fire behavior hazard. Using procedures accepted by Nevada's wildland fire agencies, these specialists focused their analysis on the wildland urban interface areas where homes and wildlands meet. This effort was known as the Nevada Community Wildfire Risk/Hazard Assessment Project. The reports generated by the Nevada Community Wildfire Risk/Hazard Assessment Project for each of the 17 counties in Nevada, as well as two reports for Lake Tahoe communities and a Fire-Safe plan for Virginia City Highlands may all be viewed on the website: http://www.rci-nv.com/home/rci-reports/.[142]

Upon completion of the Community Wildfire Protection Plans (CWPP), the plans were approved by County Commissioners, local fire chiefs, and the State Forester. These plans serve as the basis for risk assessment ratings and development of wildfire mitigation strategies for the assessed communities.

Specific goals of the Nevada Community Risk/Hazard Assessment Project in developing the CWPPs are the following:[143]

- Reduce the threat of wildland fire to the communities.
- Raise the level of public awareness about ignition risk factors and fire-safe practices in the wildland urban interface.
- Improve local coordination for suppression activities.

[142] Resource Concepts, Inc. February 18, 2023, https://www.rci-nv.com/projects/.

[143] XX *Nevada Community Wildfire Risk / Hazard Assessment Project, Resource Concepts, Inc., 1.0 Introduction.*

- Identify and pursue firefighting resource needs (equipment and infrastructure).
- Describe proposed risk and hazard mitigation projects in enough detail to aid communities in applying for future implementation funds.

The Community Risk/Hazard Assessments were conducted systematically. The assessment teams observed and recorded the factors that significantly influence the risk of wildfire ignition along the WUI, and inventoried features that can influence hazardous conditions in the event of a wildfire. Interviews with local fire agency and emergency response personnel were completed to assess the availability of suppression resources and identify opportunities for increased community preparedness. A description of the existing fuel hazard and fire behavior potential was discussed and presented with photos for each community.

Four primary factors that affect potential fire hazard were assessed to arrive at the community hazard assessment score:

1. Community design
2. Structure survivability
3. Availability of fire suppression resources
4. Physical conditions such as the vegetative fuel load and topography

An ignition risk rating of low, moderate, or high was assigned to each community. The rating was based upon historical ignition patterns, interviews with local fire personnel, field visits to each community, and professional judgment based on experience with wildland fire ignitions in the Great Basin.

The results of each community assessment were formatted to facilitate ease of reference and reproduction for individual communities. Each community was mapped and recommendations to improve fire safety were described and summarized in table form. Summary sheets highlighting important aspects of Defensible Space and Homeowner Responsibilities are formatted for widespread distribution. These tools will aid local, state, and federal agencies in strategic planning, raising public awareness, and seeking funding for future risk and hazard reduction projects. Mitigating the risks and hazards identified by these assessments is crucial not only to the long-term goals of the National Fire Plan, but also to the short and long-term viability of Nevada's communities, natural resources, infrastructures, and watersheds. All Nevada counties have signed and approved their plans. There are additional assessments of wildfire risk that have been completed to address the rest of the state outside the communities. There is also a Western States Wildfire Risk Assessment that was published in March 2013 and revised in March 2016.[144]

The initial CWPP assessment covered communities at risk as defined in the 2001 Federal Register in the interface, intermix and occluded conditions. To date, several communities and subdivisions within communities-at-risk have updated their CWPPs to reflect current fuels management work that has been completed. These assessments simply represent a snapshot in time of the conditions in the identified communities. However, wildland fire conditions continue to change, and new and existing communities impact the wildland environment causing a need for ongoing collaborative review and update of the original assessments as well as a need for creation of new assessments. Grants are being provided for many ongoing mitigation efforts such as fuels reduction programs and awareness, education and outreach programs that are ongoing in many communities of extreme risk as shown in Figure 3-191 and Table 3-35.

The preparation of CWPPs for each county in the State is a part of the State of Nevada Division of Forestry's fire planning, mitigation, and response. The University of Nevada Cooperative

[144] West Wildfire Risk Assessment, February 18, 2023, https://www.thewflc.org/sites/default/files/WWA_FinalReport_3-6-2016-1.pdf.

Extension (UNCE) reviewed these CWPPs and prepared a report, *Course of Study Reports for Nevada's Extreme Wildfire Hazard Communities,* outlining the risk factors that identify communities with wildfire risks. The risk factors used to rate the State of Nevada's communities are the following:

1. Contributing factors
    a. History of lightning strikes
    b. Camping activities
    c. High level of visitors/recreational activities
    d. Understory provides receptive fuel bed for ignition
    e. Thick brush/trees provide receptive fuel bed for ignition
    f. Improperly maintained power line corridors
    g. High fuel loads
    h. High winds
2. Community design
    a. Wildland-urban interface condition
    b. Number of homes
    c. Ingress/egress
    d. Width of road
    e. Accessibility
    f. Secondary roads
    g. Visible street signs
    h. Visible address
    i. Utilities-ignition risk
3. Construction materials
    a. Non-combustible roof
    b. Non-combustible siding
    c. Unenclosed structures
4. Defensible space
    a. Lot size
    b. Defensible space
5. Fire behavior
    a. Fuels
    b. Fire behavior
    c. Slope
    d. Aspect
6. Suppression capability
    a. Available water source
    b. Fire protection
    c. Primary fire protection service
    d. Supporting fire protection service
    e. Additional support
7. Additional Factors
    a. Fire Adapted Nevada

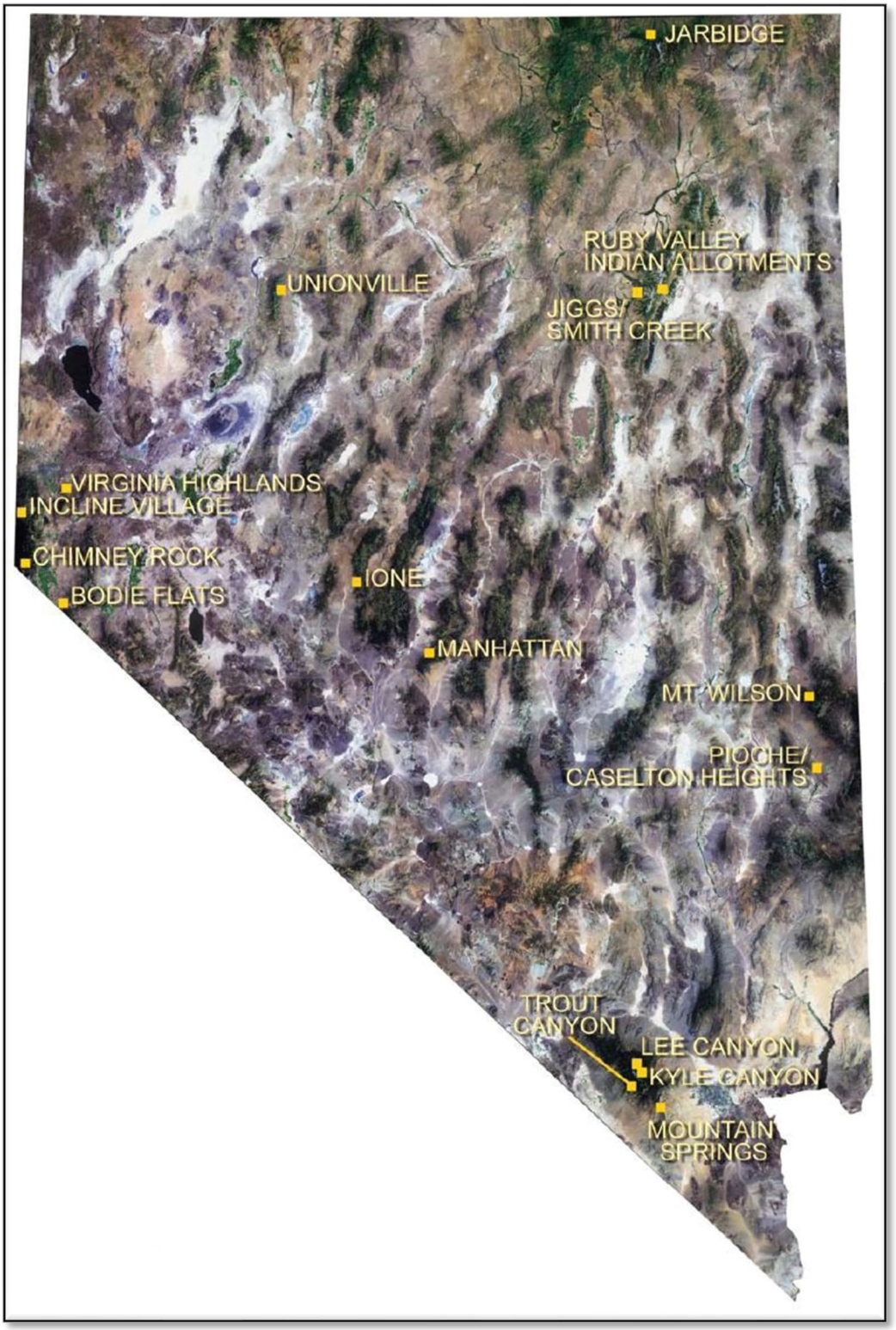


Figure 3-191. Map Showing Communities with Extreme Wildfire Risk

Table 3-35 lists all the communities that were rated using the information provided by the CWPPs, grouped by county, and the hazard rating for each community, as well as a column to indicate ongoing or completed fuels reduction programs and/or public awareness and education projects in each community in the past 10 years.

Table 3-35. Wildfire Hazard Ratings for Nevada Communities by County	Wildfire Mitigation programs completed in 2011-2022 period: 1. Fuels reduction projects 2. Education, awareness, outreach programs	
County/Community	**Hazard rating**	**Type**
Carson City		
Clear Creek	Extreme	1,2
Carson Colony-Voltaire Canyon	High	1,2
Edmonds-Prison Hill	High	1,2
Kings Canyon-Upper	High	1,2
Lakeview	High	1,2
Mexican Dam	High	1,2
North Carson	High	1,2
Pinion Hills	High	1,2
Ash Canyon-WNCC	Moderate	1,2
C-Hill	Moderate	1,2
Stewart-South Carson	Moderate	1,2
Timberline	Moderate	1,2
Kings Canyon-Lower	Low	1,2
Churchill		
Eastgate	High	
Cold Springs	Moderate	
Middlegate	Moderate	
Fallon	Low	
Fallon Naval Air Station	Low	1
Fallon Outskirts	Low	1
Clark		
Kyle Canyon Summer Home Area	Extreme	1,2
Lee Canyon Summer Home Area	Extreme	1,2
Mountain Springs	Extreme	1,2
Trout Canyon (not geocoded)	Extreme	1,2
Cold Creek (not geocoded)	High	1,2
Nelson	High	
Torino Ranch (not geocoded)	High	2
Cactus Springs	Moderate	
Goodsprings	Moderate	
Moapa Valley	Moderate	1,2
Sandy Valley	Moderate	2
Searchlight	Moderate	
Arden	Low	
Blue Diamond	Low	1,2
Boulder City	Low	
Bunkerville	Low	1,2
Cal-Nev-Ari	Low	
Cottonwood Cove (not geocoded)	Low	
Glendale	Low	1
Henderson	Low	1,2
Indian Springs	Low	1
Las Vegas	Low	2
Laughlin	Low	1,2
Logandale	Low	1,2
Mesquite	Low	1,2
North Las Vegas	Low	1,2
Overton	Low	1,2
Palm Garden Estates (not geocoded)	Low	
Primm	Low	
Sloan	Low	

Table 3-35. Wildfire Hazard Ratings for Nevada Communities by County	Wildfire Mitigation programs completed in 2011-2022 period: 1. Fuels reduction projects 2. Education, awareness, outreach programs	
County/Community	**Hazard rating**	**Type**
Douglas		
Bodie Flats (not geocoded)	Extreme	
Chimney Rock (not geocoded)	Extreme	1,2
China Springs (not geocoded)	High	1,2
Double Springs (historical)/Spring Valley	High	1,2
Elk Point/Zephyr Heights/Round Hill	High	1,2
Fish Springs (not geocoded)	High	
Genoa	High	1,2
Glenbrook	High	1,2
Holbrook Junction	High	2
Kingsbury	High	1,2
Job's Peak Ranch (not geocoded)	High	2
Logan Shoals (not geocoded)	High	1,2
North Foothill Road Corridor (not geocoded)	High	2
Pine Nut Creek (not geocoded)	High	
Sheridan	High	2
Skyland/Cave Rock	High	1,2
Topaz Ranch Estates	High	1,2
Alpine View (not geocoded)	Moderate	2
Dresslerville	Moderate	
Indian Hills/Jacks Valley	Moderate	1,2
Johnson Lane	Moderate	
Ruhenstroth (not geocoded)	Moderate	
Stateline	Moderate	1,2
Topaz Lake	Moderate	
East Valley (not geocoded)	Low	
Gardnerville	Low	
Gardnerville Ranchos	Low	
Minden	Low	
Elko		
Jarbidge	Extreme	1,2
Jiggs/Smith Creek	Extreme	1,2
Ruby Valley Indian Reservation	Extreme	
Adobe Heights (not geocoded)	High	
Adobe Ranchos (not geocoded)	High	
Contact	High	
Deeth/Starr Valley	High	1,2
Lamoille	High	1,2
Lee/South Fork Indian Reservation	High	
Lucky Nugget I & II (not geocoded)	High	1,2
Midas	High	1,2
Mountain City	High	
Osino	High	1,2
Ruby Lake Estates	High	1,2
Ten Mile (not	High	

Table 3-35. Wildfire Hazard Ratings for Nevada Communities by County	Wildfire Mitigation programs completed in 2011-2022 period: 1. Fuels reduction projects 2. Education, awareness, outreach programs	
County/Community	**Hazard rating**	**Type**
geocoded)		
Tuscarora	High	1,2
Carlin	Moderate	1,2
Currie	Moderate	
Elburz	Moderate	
Elko	Moderate	1,2
Gold Creek- moderate	Moderate	
Hidden Valley/Coal Mine (not geocoded)	Moderate	
Humboldt Ranchettes (not geocoded)	Moderate	
North Fork	Moderate	
Oasis	Moderate	
Owyhee	Moderate	1,2
Pilot Valley (not geocoded)	Moderate	
Ruby Valley	Moderate	1,2
Ruby Lake National Wildlife Refuge & Hatchery	Moderate	
Ryndon	Moderate	1,2
Spring Creek	Moderate	1,2
Wild Horse Estates- (not geocoded)	Moderate	
Jackpot	Low	
Montello	Low	
Wells	Low	2
West Wendover	Low	2
Charleston	Rural	1,2
Clover Valley	Rural	
Independence Valley (not geocoded)	Rural	
Goose Creek- rural	Rural	

Table 3-35. Wildfire Hazard Ratings for Nevada Communities by County	Wildfire Mitigation programs completed in 2011-2022 period: 1. Fuels reduction projects 2. Education, awareness, outreach programs	
County/Community	**Hazard rating**	**Type**
(not geocoded)		
Esmeralda		
Gold Point	Moderate	
Goldfield	Moderate	
Lida	Moderate	1
Silver Peak	Moderate	
Dyer/Fish Lake Valley	Low	2
Eureka		
Eureka	High	1,2
Beowawe	Moderate	
Crescent Valley	Low	2
Dunphy	Low	
Shoshone		
Diamond Valley	Moderate	1,2
Humboldt		
McDermitt	High	
Denio	Moderate	
Golconda	Moderate	
Paradise Valley	Moderate	1,2
Valmy	Moderate	
Winnemucca	Moderate	1,2
Denio Junction	Low	
Paradise Hill/Paradise Ranchos	Low	2
Quinn River Crossing	Rural	1,2
Lander		
Austin	High	1

Table 3-35. Wildfire Hazard Ratings for Nevada Communities by County	Wildfire Mitigation programs completed in 2011-2022 period: 1. Fuels reduction projects 2. Education, awareness, outreach programs	
County/Community	**Hazard rating**	**Type**
Kingston	High	
Battle Mountain	Low	
Hilltop	Low	
Grass Valley	Rural	
Battle Mountain Colony	Low	
Lincoln		
Pioche/Caselton Heights	Extreme	1,2
Ursine/Eagle Valley	High	1,2
Alamo	Moderate	2
Caliente	Moderate	2
Panaca	Moderate	2
Rachel	Moderate	2
Ash Springs	Rural	2
Hiko	Rural	2
Mount Wilson	Extreme	1,2
Lyon		
Silver City	High	
Dayton	Moderate	1,2
Mark Twain Estates	Moderate	1,2
Mason Valley	Moderate	1
Mound House (historical)	Moderate	1,2
Smith Valley	Moderate	1
Wabuska	Moderate	
Weed Heights	Moderate	
Weeks (historical)/Fort Churchill	Moderate	1,2

Table 3-35. Wildfire Hazard Ratings for Nevada Communities by County	Wildfire Mitigation programs completed in 2011-2022 period: 1. Fuels reduction projects 2. Education, awareness, outreach programs	
County/Community	**Hazard rating**	**Type**
Fernley	Low	
Silver Springs	Low	
Stagecoach	Low	1,2
Yerington	Low	
Mineral		
Marietta	High	
Luning	Moderate	
Mina	Moderate	
Schurz	Moderate	
Walker Lake	Moderate	
Hawthorne	Low	
Nye		
Ione	Extreme	2
Manhattan	Extreme	1,2
Belmont	High	1,2
Amargosa Valley	Moderate	
Beatty	Moderate	
Carvers	Moderate	
Gabbs	Moderate	
Hadley/Round Mountain	Low	
Pahrump	Low	1,2
Tonopah	Low	1,2
Pershing		
Unionville	Extreme	1,2
Humboldt	High	
Imlay	Moderate	
Lovelock	Moderate	
Mill City	Moderate	

Table 3-35. Wildfire Hazard Ratings for Nevada Communities by County	Wildfire Mitigation programs completed in 2011-2022 period: 1. Fuels reduction projects 2. Education, awareness, outreach programs	
County/Community	**Hazard rating**	**Type**
Oreana	Moderate	
Rye Patch	Moderate	1,2
Storey		
Virginia City Highlands	Extreme	1,2
Gold Hill	High	1,2
Virginia City	High	1,2
Lockwood	Moderate	
Washoe		
Crystal Bay	Extreme	1,2
Incline Village	Extreme	1,2
Antelope Valley (not geocoded)	High	
Rancho Haven (not geocoded)	High	
Red Rock (not geocoded)	High	2
Warm Springs Valley (not geocoded)	High	
Anderson Acres (not geocoded)	Moderate	
Cold Springs	Moderate	
Galena (not geocoded)	Moderate	1,2
Gerlach	Moderate	
Golden Valley	Moderate	
Lemmon Valley	Moderate	
Mogul/I-80 Corridor West	Moderate	
Nixon	Moderate	
Palomino Valley (not geocoded)	Moderate	
Pleasant Valley	Moderate	
Reno	Moderate	1,2
Reno Northwest	Moderate	
Reno Southeast	Moderate	1,2
Silver Knolls (not geocoded)	Moderate	
Spanish Springs	Moderate	
Steamboat	Moderate	
Sun Valley	Moderate	
Sutcliffe	Moderate	
Verdi	Moderate	1
Washoe City	Moderate	1,2
Washoe Valley East	Moderate	1,2
Empire	Low	
Reno Southwest	Low	1,2
Reno-Stead	Low	
Sparks	Low	
Wadsworth	Low	
White Pine		
Cherry Creek	High	
Baker	Moderate	1,2
Ely	Moderate	1,2
Lund	Moderate	
McGill	Moderate	
Pleasant Valley (historical)	Moderate	
Preston	Moderate	1
Ruth	Moderate	1
Shoshone	Rural	
Strawberry	Rural	

Table 3-35. Wildfire Hazard Ratings for Nevada Communities by County	Wildfire Mitigation programs completed in 2011-2022 period: 1. Fuels reduction projects 2. Education, awareness, outreach programs	
County/Community	**Hazard rating**	**Type**
(historical)		
Total number of communities		**230**
Total number of extreme wildfire hazard communities		**17**
Total number of high wildfire hazard communities		**55**
Total number of moderate wildfire hazard communities		**98**
Total number of low wildfire hazard communities		**51**
Rural communities assessed (not rated)		**9**

Principals of Nevada's "Living with Fire" program (administered by the UNCE) did a study of Nevada's Extreme and High-Risk communities to determine the possible effectiveness of education and increased awareness programs in reducing wildfire risk in those communities as already identified by the CWPP program. The study identified not only those extreme and high-risk communities that would most likely benefit from targeted education and increased awareness programs, but also prioritized the communities where grant resources would likely have the most positive effects in reducing wildfire risks. The assessment laid the groundwork for ongoing statewide multiagency wildfire education and awareness programs that are now being implemented in several of the extreme/high-risk communities, supported by both state and federal grants.

In July 2017, a partnership with USFS, BLM, NDF and LWF implemented Fire Adapted Nevada (FAN) to reconstitute the success of the Fire Safe Council while adjusting the approach to avoid the failure points experienced in the past. The goal is to support the creation of fire adapted communities for all the communities-at-risk in Nevada. The program will be following the model set forth by the Fire Adapted Communities Network (FAC Learning Network) (https://fireadapted.org/), NFPA FirewiseUSA®, IAFC Ready, Set Go! Programs which include ensuring that communities have the following components in place:

- Programs that educate and provide awareness of fire risks and threats to communities and homeowners.
- Programs that incentivize proactivity on the part of the landowners to mitigate risks on their lands.
- Fuel reduction projects planned and implemented where needed.
- Management of ecosystems for fire-resilience surrounding communities.
- Safety zones established within communities for use during wildfire events.
- Model defensible space standards for all structures in the WUI and technical inspections and advice for residents from local resources.
- Wildfire prevention education activities, events and programs implemented.
- Communities creating and updating CWPPs regularly for their community.
- Cooperative firefighting agreements between jurisdictions that have resources in the area.
- Residents have prepared for wildfire by following codes, standards and ordinances for building construction and defensible space.
- Residents have a system in place to be ready for wildfire events and way to stay informed of the latest details if a fire threatens their community.
- Residents are ready to evacuate and follow their personal wildfire action plan when they are ordered to evacuate.

At the end of 2022 there were 34 registered FirewiseUSA® communities throughout the State. In September 2007, the UNCE coordinated the first Nevada WUI Fire Summit and is held annually. The purpose of the conference is to bring state, local and federal agencies together to provide information to communities rated as extreme risks for wildfire hazard and to promote awareness that would stimulate the communities' desire to mitigate wildfire risk through a grassroots approach. Since 2007, the Nevada WUI Fire Summit has continued to convene fire service personnel, county managers, and other emergency managers annually for those Nevada communities ranked as "extreme", "high" and "moderate" for wildfire hazard to discuss how to lower their hazard ratings and to promote action at the local level. As part of the "Living with Fire" program, this event is made possible with funding from the BLM, Sierra Front Wildfire

Cooperators, and NDF in cooperation with the USFS. Major goals of the annual summit are to decrease the wildfire-hazard rating of Nevada's at-risk communities and create fire-adapted communities capable of surviving wildfire with little or no firefighter assistance, getting community members informed and engaged, recognizing that wildfire survival takes a community, and that we all have a role to play in it.

In recent years, there has been an important shift from protecting communities from wildfire at all costs to preparing them to withstand wildfire. This is largely driven by the fact that not all structures can depend on fire suppression personal and apparatus to respond during a wildfire event, as well as the fact that many homes have survived wildfires without direct action from firefighters if preparedness and mitigation actions were implemented prior to the fire. Education of all community stakeholders in wildfire preparedness is one of the most critical and effective initial steps to saving structures from wildfires. There is a role not only for firefighters but also for homeowners, landscapers, construction workers, and politicians as well as for proactive housing developers who can make decisions when designing and building new communities capable of withstanding wildfire. Techniques include creating defensible space, providing adequate road access for resident evacuation and fire engines, using ignition-resistant building materials, installing water sources for fighting fires, and situating homes so fire racing up steep slopes would be less likely to ignite them. Upon these realizations and the need to be more effective, the National Cohesive Strategy was initiated in 2009 and was adopted in Nevada in 2015. The Strategy addresses three main challenges relating to wildfire:

- Managing vegetation and fuels;
- Protecting homes, communities, and other values at risk;
- Managing human-caused ignitions;

The strategy to address these challenges includes three goals:

- Restore and maintain resilient landscapes;
- Create fire-adapted-communities; and
- Ensure safe and effective wildfire response.

When the National Cohesive Strategy was adopted, state, local and federal resources agreed that this was a good pathway and are in the process of creating action plans to reach each of the three goals in Nevada. Figure 3-192 illustrates the basic relationship between national goals, challenges, options, spatially prioritized opportunities, and national priorities.

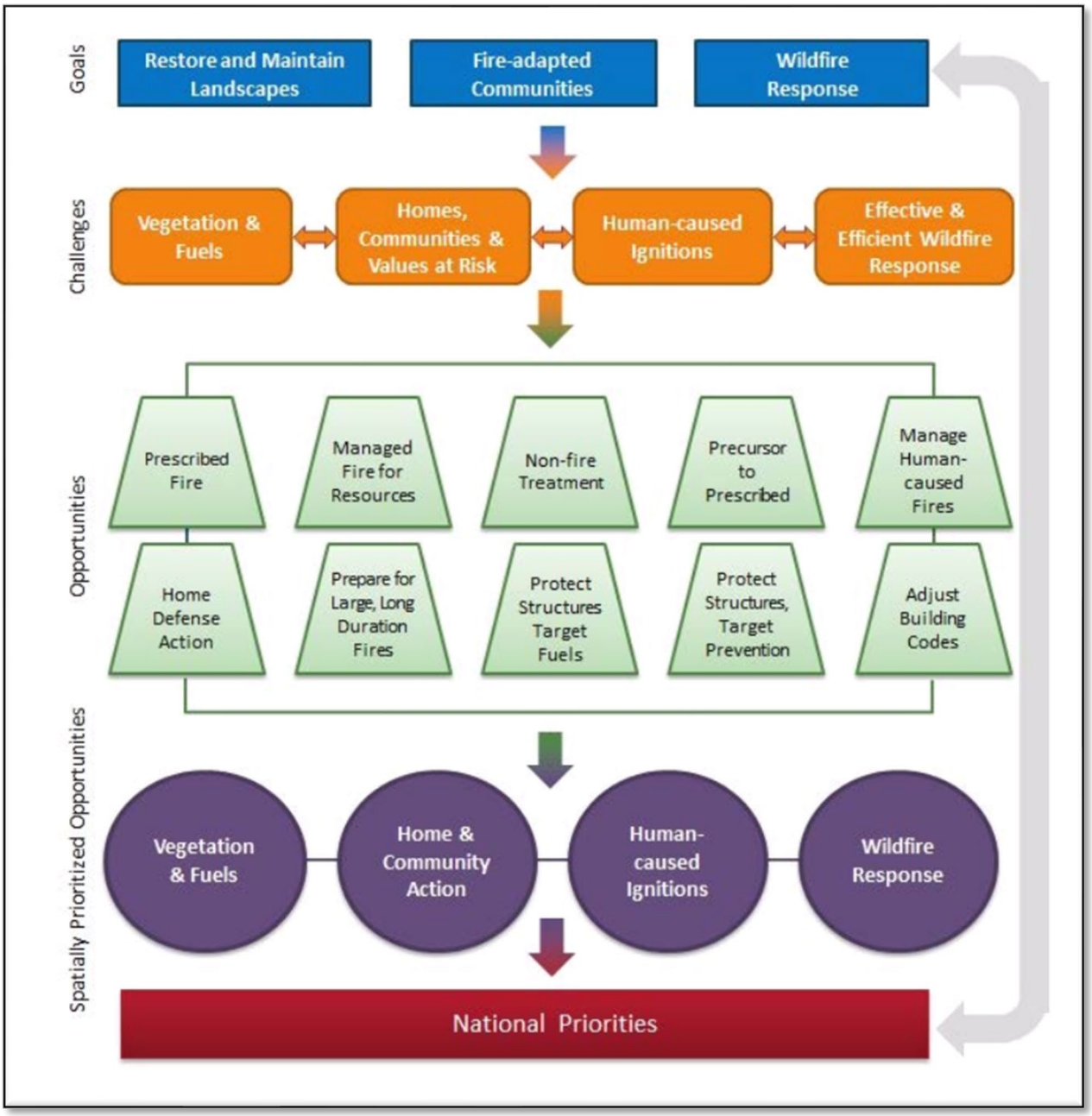


Figure 3-192. National Cohesive Strategy - Goals, Challenges, Options, Spatially Prioritized Opportunities, National Priorities.[145]

Wildland fire suppression in Nevada is a partnership between Federal, tribal, state, and local fire services. Historically, some counties have 473 fire districts whereby NDF provided wildland fire and all-risk emergency support on behalf of the county through professional and volunteer fire personnel and resources. Fire suppression in Nevada has evolved since the passage of the FY 2012-2013 State budget, which disallowed the 473 districts and created NDF's Wildland Fire Protection Program. Through this change, County Fire Protection Districts assumed responsibility for all of the all-risk emergency management in their jurisdictions as well as the

[145] (https://www.forestsandrangelands.gov/strategy/thestrategy.shtml)

administration of local volunteer fire departments. The program allows member counties access to the State wildfire suppression fund to cover costs of large and expensive fires. In addition, NDF works to add wildland fire suppression capacity and capability is in the best interest of state and local governments. The program focuses response capabilities where historical fire occurrences and "values at risk" intersect. The program provides suppression resources historically difficult to fill, develops more Type 3 Incident Commanders and associated staff, and provides technical assistance with FEMA's FMAG program, as well as fuel reduction projects, cost share agreements and training. The program is voluntary. Counties pay an annual assessment to help fund the program based on wildland fire risk. Participation allows the State to provide financial assistance with wildland fire costs, use NDF resources on other emergencies that threaten human life and property, increase availability of suppression forces for all, enhance fuels reduction projects and improve restoration of burned areas. Other benefits include incident management assistance, wildfire prevention programs, and public education and training. The Wildland Fire Protection Program provides the State of Nevada and participating jurisdictions enhanced capability:

- Before a wildfire occurs through fuels management projects (e.g., green strips, thinning, reductions, defensible space, and community infrastructure) and fire prevention activities (e.g., public education, compliance with rules, regulations, and restrictions);
- During a wildfire through increased suppression resources and coordination, Incident Management capability, technical expertise for FMAGs and cost share agreements and logistics;
- After the wildfire with Burned Area Rehabilitation and Restoration.

Nevada currently has approximately 85 fire departments with around 276 fire stations that house more than 800 firefighters. There are nearly 250 fire engines, 90 water tenders, and 130 brush trucks in the state to respond to wildland fires at any given time. There are around 4,000 calls for wildfires per year between all fire districts in the state. The State and Federal fire services in Nevada interoperate using the Master Cooperative Wildland Fire Management and Stafford Act Response Agreement that is signed annually. The purpose of this agreement is to improve efficiency by facilitating the coordination and exchange of personnel, equipment, supplies, services, and funds among the Agencies to this Agreement. The state and the federal agencies may jointly conduct mutual interest projects within their authority to maintain or improve fire protection capability of the agencies. These projects may be in such activities as suppression, preparedness, fuels management, training, prevention, public affairs, and other beneficial efforts. Such projects will be documented in operating plans, agreements, or other appropriate written documents. Documentation will include the objectives, role of each agency, and each Agency's share of costs. The state and local districts work cooperatively through auto, mutual, and cooperative aid agreements to ensure collaborative suppression can occur efficiently and effectively between jurisdictions.

Nevada's state and local fire management agencies protect approximately 9.5 million acres of state and private land. During 2022, over 496 wildfires burned 59,613 acres in Nevada. NDF responded to 128 fires, cost-shared on five, assisted with securing two Fire Management Assistance Grants and incurred suppression costs of $21.2M. In 2022, NDF maintained cooperative wildfire protection agreements with 31 fire protection districts in all 17 counties, continuing cooperation between state, local and federal wildfire response and wildfire mitigation. NDF enhanced coordination with federal, state, and local cooperators occurred by attending 92 critical Nevada FY 2023 meetings. The Division maintained a statewide inventory of

approximately 530 pieces of equipment. In 2022, allocated funds supported maintenance on multiple existing apparatus used by local cooperators and a Rural Fire Protection Associations. NDF held 30 public wildfire prevention education events both in person and virtual, contacting approximately 21,870 people. NDF sent 161 personnel through wildfire-related training and provided 30 instructors for interagency trainings. Additionally, 726 inmate hand crew members received wildfire-related training through a partnership with the Department of Corrections. NDF completed 6,554 acres of fuel reduction and resilient landscape projects, improving protection for dozens of communities. Pass-through funds were awarded to at-risk communities with current Community Wildfire Protection Plans, using an interagency competitive process. NDF established a new Community Wildfire Defense Grant program, and nine applications were submitted by the NDF for various entities within the state to assist in defending their communities against wildfire threats.

Based on trends in wildfires, budget increases are being outpaced by expenditures for most fire service organizations. Some of these organizations have mitigation budgets and programs, but most do not, which means that fuel reduction, mitigation education and defensible space inspections are not occurring for most of the residences in the wildland urban interface. To put the status of community protection alone into perspective, NDF treats around 4,000 acres per year for fuel reduction, yet the total need of treatments for community fuel breaks around the state is approximately double what NDF and other local fire districts are funded to achieve. This is the most active portion of mitigation besides suppression activities, so others are getting even less support and therefore progress toward mitigating wildfire hazards and losses.

As mentioned in previous sections, there are indirect and latent impacts of wildfires that cost Nevada from a financial and resource value perspective. There can be short term risks to life and property from debris flows, compromised water quality, and fugitive dust. The methods of rehabilitation to mitigate post-wildfire emergency events are intensive, and therefore have significant costs, which are largely unfunded. For example, the waterfall fire in 2004 was projected to have rehabilitation costs that exceeded $6,000,000, while the suppression costs exceeded $10,000,000. Additionally, there are other resource objectives such as wildlife habitat restoration and prevention of invasion by fire-prone vegetation types such as annual grasses. These activities are largely handled by federal partners and NDOW, though budgets dictate that only the highest priority acreage receives rehabilitation treatment. The general trend is that there is still a net increase in negative fire impacts and net loss of native vegetation communities. Federal wildfire suppression costs in the United States have spiked from an annual average of about $425 million from 1985 to 1999 to $1.6 billion from 2000 to 2019, according to data from the National Interagency Fire Center. State suppression costs have also risen. The average annual suppression cost has nearly doubled over the past decade compared to the previous one, reaching about $400 million. All money spent on suppression means less money for prevention efforts, which is key to addressing the problem of wildfire losses. The economic burden represents the impact wildfire has on the U.S. economy. Tracking the economic burden of wildfire could be used to assess return-on-investment into wildfire interventions. The economic burden is decomposed into:

- intervention costs;
- prevention/preparedness, mitigation, suppression, and cross-cutting; and
- into direct and indirect wildfire related (net) losses.

The annualized economic burden from wildfire is estimated to be between $71.1 billion to $347.8 billion ($2016 US). Annualized costs are estimated to range from $7.6 billion to $62.8 billion. Annualized losses are estimated to range from $63.5 billion to $285.0 billion.
Due to Nevada's geography and environment, wildland fires will continue to occur, and if trends continue, it can be expected that larger, more intense, and less seasonally predictable wildfires can be expected.

Figures 3-193 and 3-194 depict the NRI Expected Annual Loss for wildfire statewide and in more heavily populated areas respectively.

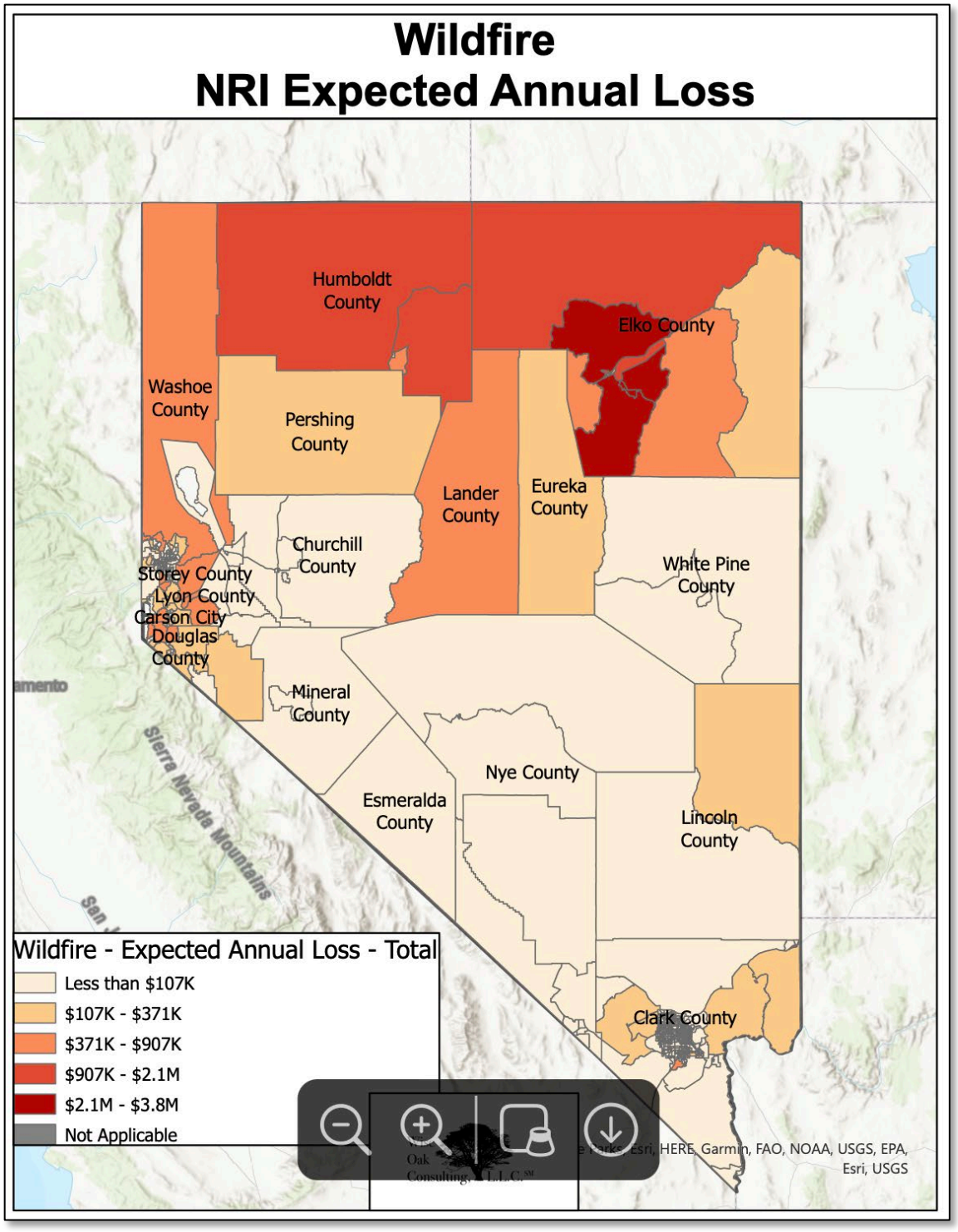


Figure 3-193. Wildfire National Risk Index Expected Annual Loss – Statewide.

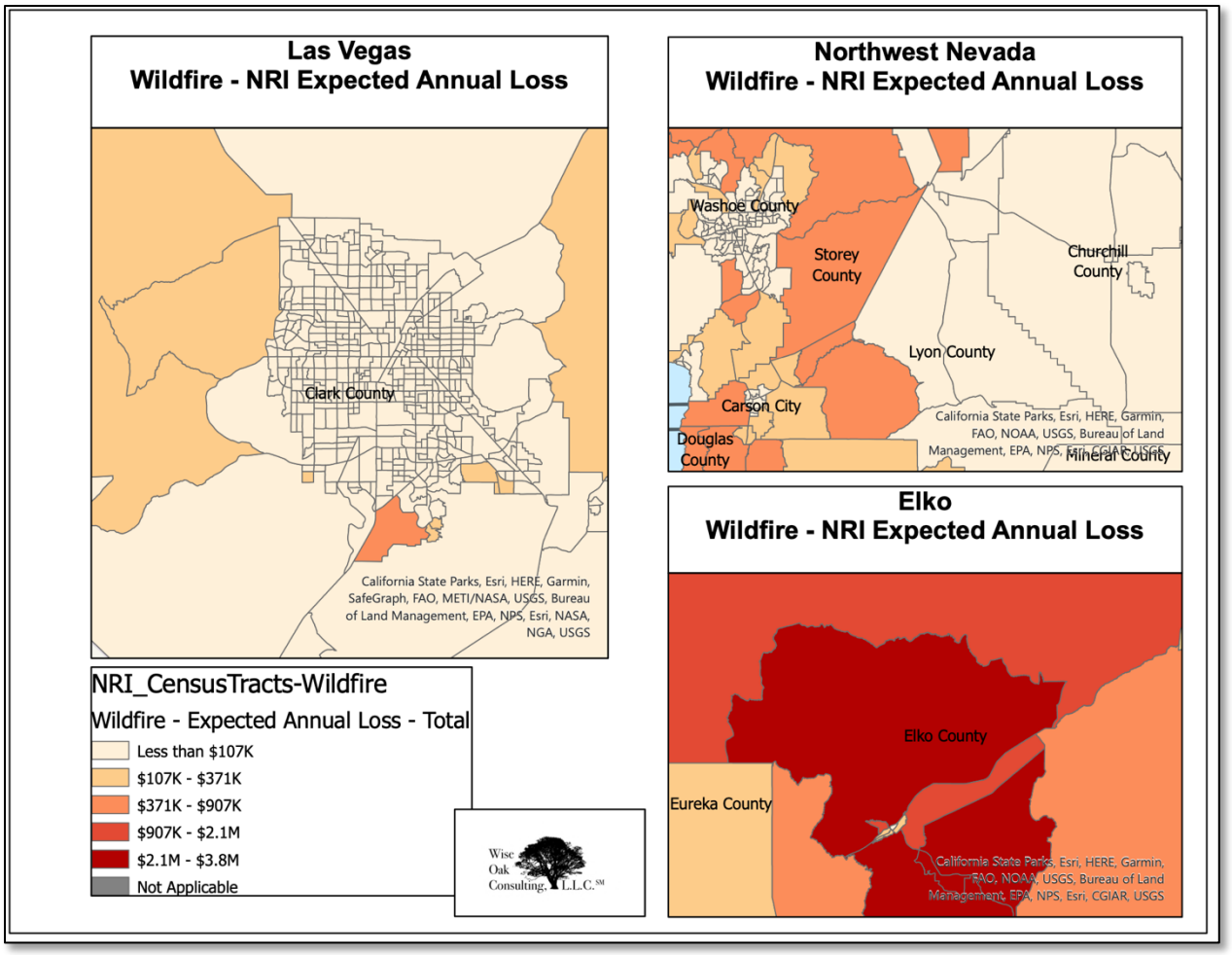


Figure 3-194. Wildfire National Risk Index Expected Annual Loss – More Heavily Populated Areas.

Figures 3-195 and 3-196 depict the NRI Annualized Frequency for wildfire in terms of number of events statewide and in more heavily populated areas respectively.

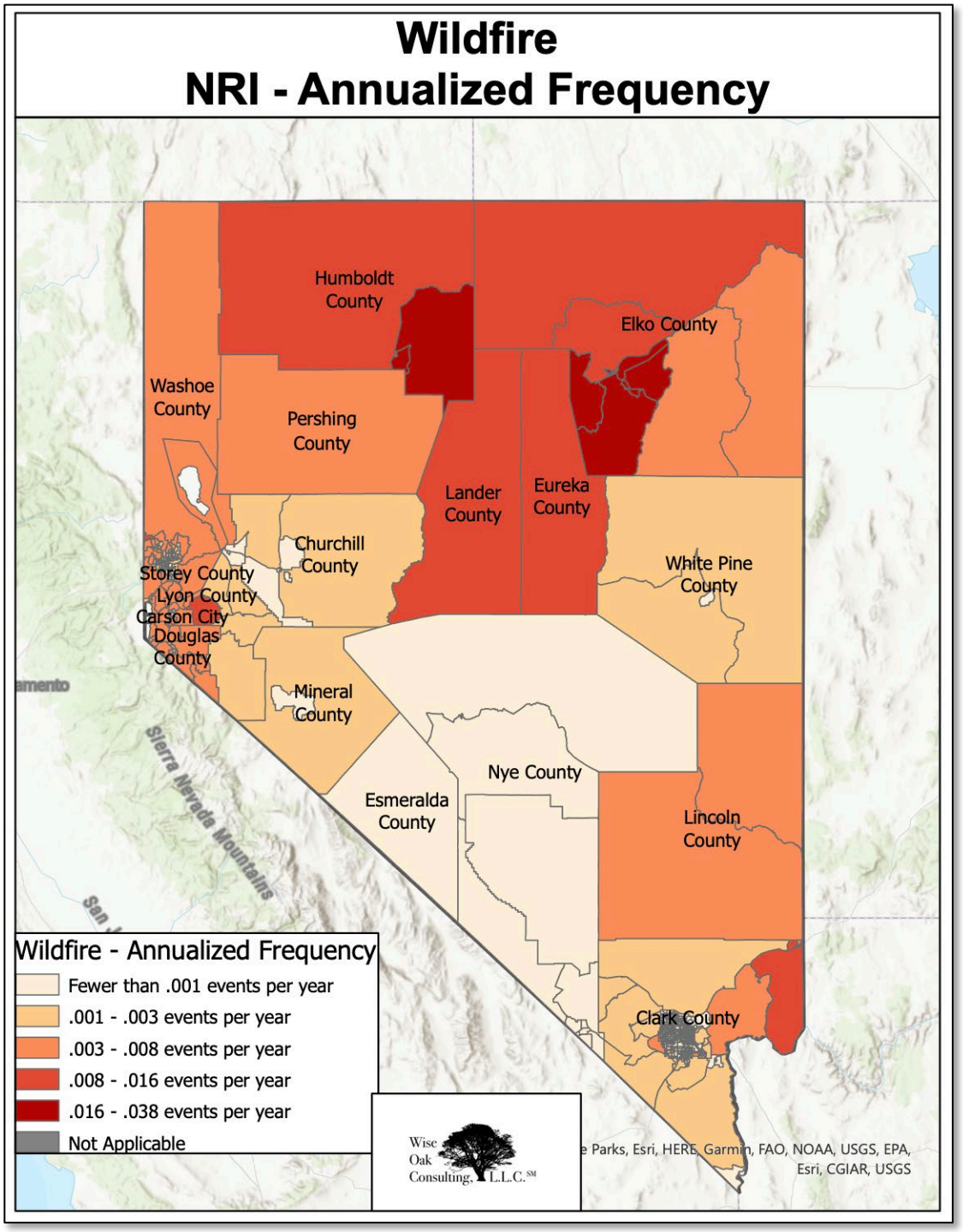


Figure 3-195. Wildfire National Risk Index Annualized Frequency – Statewide.

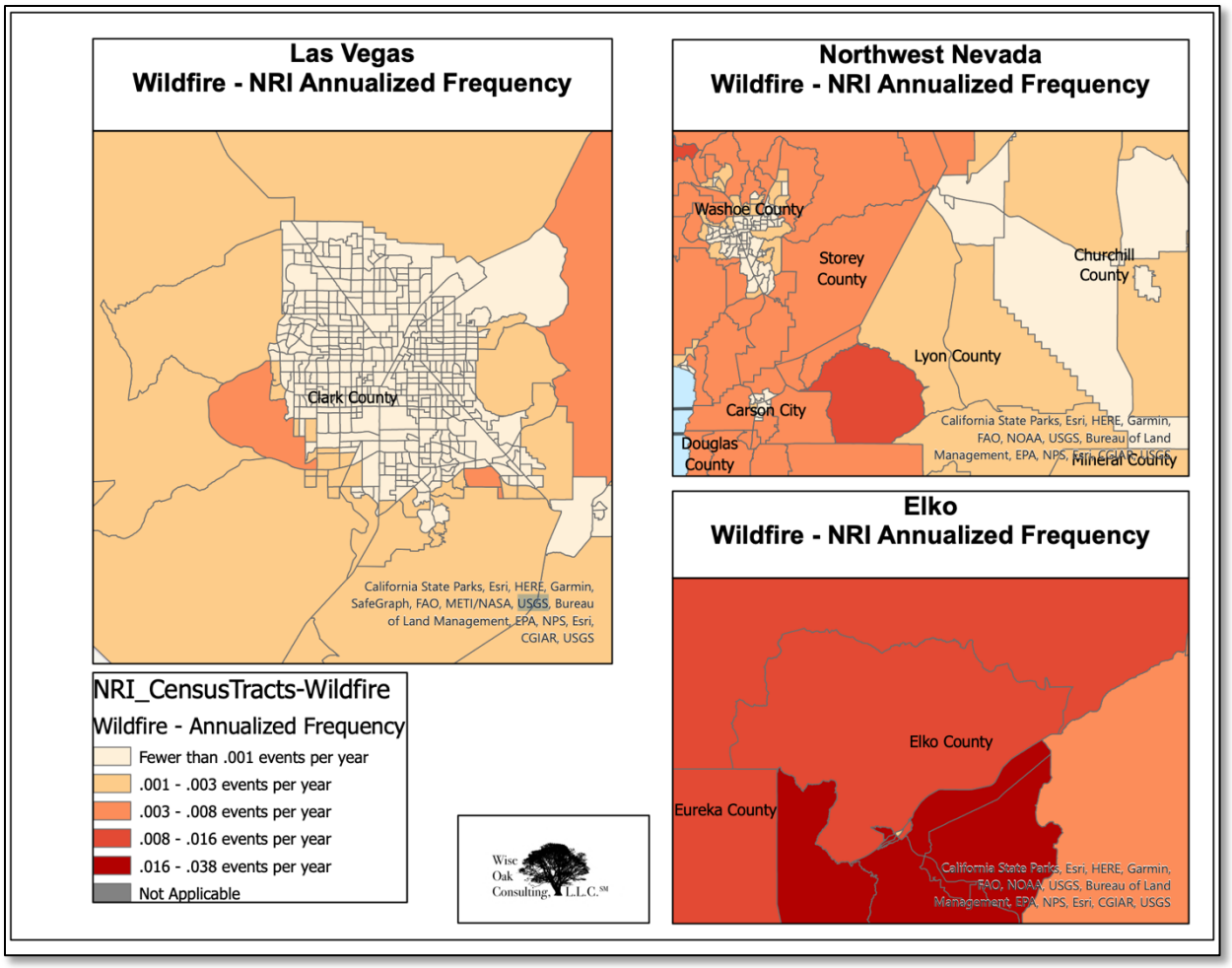


Figure 3-196. Wildfire National Risk Index Annualized Frequency – More Heavily Populated Areas.

3.3.14.4 Climate Change

Climate change is expected to have significant impacts on wildfire activity in Nevada. The state is already prone to wildfires due to its arid climate and extensive wildland-urban interface, and rising temperatures and increased drought conditions are expected to exacerbate the problem. Higher temperatures and longer, drier summers are likely to increase the frequency, intensity, and duration of wildfires in Nevada. The state's vegetation, which includes sagebrush, grasses, and other shrubs, is particularly vulnerable to these changes in climate, as well as to insect infestations that are becoming more common due to warming temperatures.

In addition to increasing the likelihood of wildfires, climate change is also expected to make it more difficult to control them once they start. Hotter temperatures and drier conditions can make it harder for firefighters to contain wildfires and may also increase the risk of fire behavior that is difficult to predict, such as spot fires or crown fires.

Overall, the expected impact of climate change on wildfires in Nevada is likely to be significant and will require a coordinated response from policymakers, land managers, and communities to mitigate the risks and build resilience to these increasingly frequent and severe events.

As depicted in Figure 3-12, Nevada's Climate Strategy highlights expected impacts due to climate change (Table 3-37).[9]

Table 3-37. Impacts of Climate Change to Wildfire

Public Health	• Wildfire smoke decreases air quality • Increase in respiratory illness • Increases in hospitalizations and emergency room visits
Water Resources	• Potential erosion leading to changes in biogeochemical cycling and water quality
Environment	• 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	• Increased fire risk and smoke may lead to loss of tourism and recreation during fire season
Agriculture & Ranching	• Direct livestock losses • Potential impact on forage production due to wildfire-induced changes in vegetation cover including noxious weeds • Crop forage loss • Federal Land permits closed or temporarily closed due to fire • Loss of infrastructure

Public Health

According to a 2022 white paper by the Office of Management and Budget (OMB), Federal healthcare costs due to climate change for wildfires could range between $128M (RCP 4.5) and $226M (RCP 8.5) by the end of the century.[146] Since wildfire risk affects Nevada, the State can assume it will also see healthcare costs increase. In 2020, state and local governments healthcare costs represented 14.3% of the $4.1T national healthcare spending.[147] If the same ratio were to hold true, state, and local government share of the cost of wildfires would be approximately $18M to $32M by the end of the century. With Nevada having 9.5% of the national population, a gross estimate of the cost due to climate change by the end of the century for wildfires for state and local jurisdictions is $1.7M to $3M. Given that the majority of wildfires occur in the West, the cost could be higher for Nevada.

Furthermore, the OMB estimates that climate change will cause an increase nationally in morbidity from wildfires by the end of the century of $128M (RCP 4.5) to $226M (RCP 8.5). Again, with Nevada having 9.5% of the national population, a gross estimate for the increase in morbidity costs would be $12.2M - $21.5M. Given that the majority of wildfires occur in the West, the cost could be higher for Nevada.

The OMB also estimates that the current economic cost of long-term mortality exposures due to wildfires is $450B. Again, with Nevada having 9.5% of the national population, a gross estimate for the increase in morbidity costs would be $42.75B. Given that the majority of wildfires occur in the West, the cost could be higher for Nevada.

Fire Suppression

[146] OMB, P. 26, accessed April 10, 2023, https://www.whitehouse.gov/wp-content/uploads/2022/04/OMB_Climate_Risk_Exposure_2022.pdf.
[147] Ibid.

The increased cost of fire suppression due to climate change is expected to increase by $1.6B to $9.6B nationally.[148] According to the National Interagency Fire Center (NIFC), the 10-year average annual cost of fire suppression in Nevada was $29.8M in 2020.[149] The OMB estimates that the Federal cost of fire suppression mid-century will increase by $.83B (RCP 4.5) to $2.32B (RCP 8.5) and will increase in late-century by $1.55B (RCP 4.5) to $3.71B (RCP 8.5).[150] If the State of Nevada's costs were to follow the same pattern (average Federal costs $2.0B between 2016 and 2018), its 10-year average annual cost for fire suppression would be $42.17M (RCP 4.5) to $64.4M (RCP 8.5) by mid-century and $52.9M (RCP 4.5) to $85.1M (RCP 8.5) by late-century.[151]

It is important to note that the estimated increase in costs due to climate change are based on a number of assumptions that may vary greatly from reality and make estimating the costs due to climate change difficult. First and foremost, studies generally focus on costs for the West and for the Federal government. Estimated cost are extrapolated based on the current comparison of Nevada's cost for fire suppression and Federal increases rather than direct studies and analysis for Nevada alone. Second, as noted in the Infestation sub-section, the risk of fire varies greatly depending on whether native or invasive species are predominant. The change in makeup of the vegetation itself is not included in the OMB assessments. Third, many fires are caused by humans. As the wildland-urban interface expands, so does the potential for fires. However, laws, policies, procedures, and plans can have a great impact on the fire risk. For these reasons, it may be more instructive to focus on the general trend of the estimated costs due to climate change as opposed to the exacts figures themselves.

Leisure and Hospitality

Overall, the impact of wildfires on tourism in Nevada and will depend on the severity and frequency of fires, as well as the effectiveness of fire management strategies and the ability of the tourism industry to adapt to changing conditions.

While the numbers were recorded during COVID-19, According to the Nevada State Parks Division's 2021 Annual Report, 7.2 million people visited Nevada state parks in 2020 and spent $83 million. This figure includes spending on a range of activities such as camping, boating, fishing, hiking, and picnicking. In 2018, Visit California reported that 11% of potential visitors cancelled trips due to wildfires, resulting in a loss of $20M in tourism in one month.[152] While similar information is not available for Nevada, the State can expect an increase in tourism losses as climate change increases wildfires.

Wildfires due to climate change will likely have a negative impact on tourism in Nevada, as well as in other western states both to direct and indirect impacts. Wildfires can lead to air quality issues, road closures, and evacuations, which can disrupt travel plans and deter tourists from visiting the area. As Nevada experienced with such fires as the Caldor Fire, smoke from fires in California can greatly impact air quality downwind for hundreds and even thousands of miles. In addition to the direct impact of wildfires on tourism, the long-term effects of climate change could also have negative implications for Nevada's tourism industry. For example, rising temperatures and changes in precipitation patterns could affect outdoor recreation activities such as skiing, hiking, and water sports, which are important drivers of tourism in the state.

Agriculture

[148] OMB, p. 35.
[149] National Interagency Fire Center, "Statistics," accessed April 11, 2023, https://www.nifc.gov/fire-information/statistics.
[150] OMB, p. 41.
[151] OMB, pp. 40-41.
[152] Jeremy Siegel, "California's Tourism Industry Hit Hard by Wildfires," The California Report, KQED, accessed April 12, 2023, https://www.kqed.org/news/11688446/californias-tourism-industry-hit-hard-by-wildfires.

Agriculture, Forestry, Fishing, and Hunting generated $433M in GDP for the State in 2022. Unlike for drought and extreme heat, during 2022, Nevada agriculture did not see losses due to fire. However producers in other states had losses due to various effects of fire. Wildfires can damage or destroy crops, livestock, and property, leading to direct losses for farmers and ranchers. In addition, smoke from wildfires can reduce the quality of crops and pasture, which can affect yields and the market value of agricultural products.

A study by the University of California Cooperative Extension estimated that the direct costs of wildfires to the agriculture industry in California from 2013 to 2018 totaled $3.7 billion, with the majority of losses coming from livestock and rangeland damage.[153] While this study focused on California, it is likely that Nevada's agriculture industry could also be affected by similar losses due to wildfires.

In addition to the direct costs of wildfire damage, there may be indirect economic impacts on the agriculture industry and the state's economy as a whole. For example, reduced agricultural production and crop yields can lead to higher food prices and decreased economic activity in related industries such as food processing and distribution.

Overall, the economic impact of wildfires on agriculture in Nevada will depend on various factors such as the severity and frequency of fires, the effectiveness of fire management strategies, and the ability of farmers and ranchers to adapt to changing conditions.

Unfortunately, there is insufficient data to predict the impact of climate change as of the writing of this Plan.

3.3.17.5 Vulnerability of State Assets

The vulnerability of state assets due to this hazard are profiled in detail in sections 3.6 and 3.7. The vulnerability of state critical buildings is provided in Appendix T.

3.3.17.6 Mitigation

This hazard is profiled in detail in sections 3.6 and 3.7. In addition, the state has numerous mitigation actions listed in Section 4. Increased public awareness, risk management, and control of new land development at the local level are necessary to mitigate this risk.

Table 3-36. Wildfire Mitigation Goals and Strategic Actions

Goal I.D.	Goal	Strategic Actions
5.A	Protect existing assets, as well as future development, from the effects of wildfire.	Completed: NDF has created the WFPP which gives member fire protection districts access to emergency suppression funds for large and expensive fire suppression. Not Completed: Local jurisdictions need to adopt defensible space standards/inspections/enforcement programs, standards of coverage, CWPPs, and WUI building codes.
5.B	Identify and recommend changes to State NRS, NAC and communities'	Not completed

[153] D.A Sumner, E.B. Thompson, J.T. Rosen-Molina, R.D. Green, "Economic impacts of California wildfires on the agricultural sector," Giannini Foundation Information Series, No. 19-2, accessed April 12, 2023, https://giannini.ucop.edu/publications/infosen/19/si-19-2.pdf.

Table 3-36. Wildfire Mitigation Goals and Strategic Actions		
Goal I.D.	**Goal**	**Strategic Actions**
	ordinances and regulations.	
5.C	Assist local communities in enacting local ordinances for mitigation and fire prevention.	Not completed
5.D	Provide public education and outreach to educate homeowners in the WUI about proper defensible space practices and landscaping for fire resistance and encourage community involvement in project completion, participation, and maintenance.	Completed: Partners in Fire Adapted Nevada continue to support it and utilize it to educate residents on fire risks/hazards. Not Completed: Long-term stable funded source needed for the organization to ensure sustainability through time.
5.E	In highly motivated communities, focus on activities by individual participation in and maintenance of projects (personal responsibility).	Partially Completed: NDF and some local fire protection districts are achieving this, but mostly through a defensible space standards and enforcement program.
5.F	Educate and train State and communities in current standards and regulations for proper practices in defensible space and firefighting.	Completed: NDF is partnering with LWF, BLM, USFS for Fire Adapted Nevada
5.G	Ensure proper personal protective equipment, apparatus, equipment and training for career staff and seasonal wildland firefighters.	Completed: All agencies adhere to NFPA PPE standards. Volunteer firefighters are the most challenging group to ensure adherence.
5.H	Assist volunteer fire departments in attaining funds for proper personal protective equipment, apparatus, equipment, and training.	Partially Completed: NDF offers the VFA grant periodically that achieves this, though the funds are decreasing over time. Local fire districts should consider applying for the FEMA-AFG annually to assist.
5.I	Participate in research and development of interoperability for emergency response communications.	Completed: All fire services in Nevada communicate regularly to each other to ensure that dispatch centers, radio frequencies, contact information and other communications issues are tested and resolved prior to every fire season.
5.J	Coordinate the development of a comprehensive, collaborative program for mutual aid/mobilization of State, local, and Federal fire resources.	Partially Complete: Many mutual aid agreements exist between local fire services. The Master Agreement between Federal and State agencies allow for these functions. As the Nevada Cohesive Strategy gets developed more, these agreements and processes will be developed further to enhance collaboration.

Table 3-36. Wildfire Mitigation Goals and Strategic Actions		
Goal I.D.	**Goal**	**Strategic Actions**
5.K	Encourage collaboration on all levels among state, federal and local cooperators, both fire- and resource-related.	Partially Completed: All cooperators were invited to attend the Nevada Cohesive Strategy Summit in Reno in 2015 where engagement at all levels lead to the adoption of the strategy and commitment of creating action plans for Nevada to address each tenet. Additionally, the annual Master Agreement allows for greater integration of fire and fuels operations.
5.L	Continue to improve fire prevention programs statewide through partnerships with Fire Prevention Association of Nevada, State Fire Marshal's Office, UNCE, and any other cooperators.	Partially Completed: A national fire prevention team was activated in northern Nevada in 2016 and they assembled some media materials as well as revived the nevadafireinfo.org website for outreach purposes. The Great Basin MEP group is meeting regularly, proving prevention trainings, as well as collaborating with prevention media materials. UNCE is not interested in traditional fire prevention roles, just mitigation. A statewide prevention team formulated of all of the prevention personnel at all levels to organize around a single set of messages and approaches may increase prevention effectiveness in the State.
5.M	Assist communities in fuels-reduction projects for areas with extreme or high ratings in updating Community Wildfire Protection Plan (CWPP) assessments.	Completed: Fire Adapted Nevada provides CWPP updating templates. State, federal and local organizations provide fuels reduction to extreme and high-risk communities as financial, and personnel resources are available. FAN adoption by NDF is aimed at increasing the volume and effectiveness of both of these tasks.
5.N	Provide funding and service forestry technical assistance through the State Fire Assistance and Hazardous Fuels Reduction programs to reduce fuels on state and private property.	Completed: This occurs annually and results in approximately 4,000 acres of treatments implemented per year, though all of the treatments are federal grant funded. Federal grants are competitive, and allocations are decreasing, so there is not enough financial support to complete all necessary projects.
5.O	Provide assistance to counties for priority setting and CWPP updating.	Partially Completed: System exists through FAN though the organization has limited manpower, so the program does not have statewide reach. NDFs adoption of FAN is aimed at increasing the volume and effectiveness of this task.

Table 3-36. Wildfire Mitigation Goals and Strategic Actions		
Goal I.D.	**Goal**	**Strategic Actions**
5.P	Provide a statewide evaluation process for monitoring community progress, prioritization, and participation in CWPP.	NDF FAN has completed a process for CWPP applications, assistance grants and monitoring through a web portal.
5.Q	Provide and maintain a statewide process for documenting fuels projects progress, completion, success, and maintenance.	Completed: NDF has contracted a web portal that will be used to track community-at-risk/CWPP boundaries and fuels reduction projects. When completed, this task will be an ongoing facet of the web portal.
5.R	Focus projects in areas to attain desired forest conditions and coordinate with forest health program activities.	Partially Completed: As the Cohesive Strategy matures in Nevada, cooperation on multijurisdictional projects will increase to greater than current levels. Integration of resource health and fire mitigation programs will also increase, although current levels are the highest they have ever been. Examples include Secretarial Order 3336, Federal Fire and Invasives Assessment Team reports, Integrated Rangeland Fire Management Strategy.
5.S	Ensure that all projects have an approved fuels/forest health/stewardship plan that includes all aspects of service forestry (State Historic Preservation Officer (SHPO) (threatened and endangered species, prescriptions, actions, etc.).	Completed: NDF has enacted this internal policy and all projects now have an associated planning documents that is entered into the federal SMART program.
5.T	Provide training for employees and project managers on SHPO and cultural resource identification, reporting methods and clearances.	Partially Complete: A course was coordinated to training and educate new employees in 2016. Agency turnover will dictate that a course is taught every 2 to 4 years.
5.U	Work closely with the Tribal communities, local landowners, and the SHPO to obtain clearances and to mark sensitive sites.	Partially Complete: This is performed for all areas that are identified for fuel reduction treatments.
5.V	Provide assistance to communities and State in planning and implementing long-term sustainable landscape projects.	Partially Complete: NDF and other agencies are actively engaged in planning and implementing long-term sustainable projects, though there is a lack of funding to do it at landscapes scales in multiple locations across the state to impact the general wildfire trends.

Table 3-36. Wildfire Mitigation Goals and Strategic Actions		
Goal I.D.	**Goal**	**Strategic Actions**
5.W	Restore native and adapted vegetation and work to prevent areas being impacted by non-native or undesirable species conversions through collaborative efforts.	Not Complete: All agencies and stakeholders are earnestly working toward achieving this task, though the gaps in science and funding have not allowed the rates of prevention of invasion and conversion from invasives back to natives and desirables to exceed the rates of invasion and impact, therefore there is a net increase in negative impacts from invasions in the sagebrush rangelands and pinyon-juniper woodlands. Invasive
5.Y	Use mechanical and hand treatments as well as prescribed fire to assist in attaining desired forest and rangeland conditions.	Partially Complete: Due to sage grouse concerns, use of prescribed fire in sagebrush rangelands has largely been curtailed. Mechanical and hand treatments are not yet prevalent enough to make a significant impact in conservation and restoration of native sagebrush communities. Pinyon-juniper woodlands and Sierra forest types are being burned and treated at small scales compared to the size of need.
5.Z	Provide native and accepted introduced seed species through the Nevada State seed bank program.	Partially Complete: This is an ongoing task that occurs through the seedbank and nursery programs. These programs need strategic plans and marketing to increase awareness and usage among stakeholders. NDOW and BLM have also cooperated to increase the functionality of the Great Basin seed warehouse in Ely. The NRCS has an established Native Plant Materials Center in Fallon. There is a group of stakeholders meeting to collaborate in providing these kinds of solutions.
5.AA	Provide training for local cooperators for treatment practices and skill acquisition.	Not Complete:
5.AB	Encourage collaboration at all levels with state, federal and local cooperators.	Partially Complete: The Nevada Cohesive Strategy adoption in 2015 and subcommittee work to complete action plans in 2016 represents the largest step forward on this task in many years. As the plans and processes to integrate resources mature, Nevada will have one of the most vertically and horizontally integrated sets of stakeholders in the country.

Table 3-36. Wildfire Mitigation Goals and Strategic Actions		
Goal I.D.	**Goal**	**Strategic Actions**
5.AC	Assist communities and State in Burned Area Emergency Rehabilitation, and complete fire damage reclamation reports and public education and outreach to provide the best land management practices available for collaborative land rehabilitation.	Complete: NDF is generally the lead for State level agencies on BAER projects and does accomplish the task. Many of those efforts are completed in conjunction with County and Federal stakeholders. Collaborative land rehabilitation practices are being made available through coordinated meetings, field assessments, and rehabilitation recommendations to affected property owners. These tasks are ongoing based on the occurrence of large wildfires.
5.AD	Assess damage to critical watershed and threats to communities' domestic water supplies and mitigate those threats through erosion control practices.	Complete: This task is usually completed as part of the BAER process where it is deemed to be necessary.
5.AE	Supply resources for rehabilitation efforts through the State Tree Nurseries in Las Vegas and Washoe Valley, and the Nevada State seed bank programs.	Complete: The nursery and seedbank programs are providing rehabilitation plant materials to the extent that they are feasible to produce, keep on hand, and purchase where stakeholders have budgets to support purchases.
5.AF	Provide training, expertise, and supplies/equipment in a collaborative manner to assist in rehabilitation.	Complete:
5.AG	Provide public education and outreach to communities affected by wildfire.	Complete:
5.AH	Focus fuels projects in communities with extreme or high ratings in CWPP assessments.	Complete: Communities with these ratings are generally considered to be the highest priority for support in the form of education, awareness, and fuel reduction projects.
5.AI	Assist with the development of and the participation in a comprehensive program by which current CWPP or equivalent assessments are updated as projects are completed, ratings change, or new at-risk communities arise.	Complete: NDF FAN tracks all CWPPs in the state. Ratings changes will likely take a partnership with local fire districts that are willing to perform defensible space inspections, enforcement and WUI construction codes.
5.AJ	Assist in the formulation and dissemination of current information such as Living with Fire documents.	Partially Complete: Stronger advocacy is needed at the local level in many local fire districts and communities to distribute the information. The adoption of FAN by NDF and growth over future years should assist with the community outreach.

Table 3-36. Wildfire Mitigation Goals and Strategic Actions		
Goal I.D.	**Goal**	**Strategic Actions**
5.AK	Encourage community involvement in project completion, participation, and maintenance.	Partially Complete: NDF and some local fire districts are performing this task on limited scope in the state. Broader scale support mechanisms are needed since the collapse of the Nevada Fire Safe Council.
5.AL	Assist, encourage and provide guidance to communities in the development of the appropriate fire service organization for their community (i.e. a legally constituted fire protection district or fire department) according to NRS 472.040.	Partially Complete; NDF provides a variety of services through membership in the WFPP (474 Districts) and in conjunction with the Community Assessments, but also supports all jurisdictions with technical support via its programs. Through budgeting procedures and NRS changes, 473 Districts are no longer supported by the state of Nevada. Rangeland Fire Protection Associations have also been created through NRS changes and NDF is actively supporting their creation.
5.AM	Assist in acquiring funding for local firefighters for training and equipment through the State Fire Assistance, and Volunteer Fire Assistance when funded by US Forest Service.	Complete:
5.AN	Assist in the planning for and removal of biomass waste on fuels reduction and forest health projects, as well as following wildland fires, flooding, and other catastrophic natural event.	Complete:
5.AO	Provide technical assistance in the formation of end users of woody biomass to produce heat and/or power (i.e. Fuels in Schools program) and provide ongoing outreach and education as to the societal benefits associated with utilization of biomass in the State of Nevada.	Completed: This task is completed as grant funding is awarded to NDF and other stakeholders to complete such tasks.
5.AP	Participate in the Nevada State Biomass Working Group, southern Nevada Woody Biomass Collaboration Group, and other state, local, and national biomass committees.	Partially Complete: There is no state level funding to support the biomass program at NDF, so the biomass coordinator position is solely dedicated to working on specific grant projects that may include utilization of biomass from specific fuel reduction projects, end user coordination, new biomass products development and demonstration

Table 3-36. Wildfire Mitigation Goals and Strategic Actions		
Goal I.D.	**Goal**	**Strategic Actions**
		project implementation.
5.AO	Comply with all federal regulations in the funding stream to ensure compliance and future competitiveness.	Complete:
5.AP	Keep apprised of all federal, state, and local regulations.	Complete:
5.AQ	Participate in interagency project planning, implementation, and monitoring.	Partially Complete: This is occurring more in some areas of the state than others based on stakeholder relationships, interagency cooperative culture, and project types. It could be better achieved by all stakeholders on a broader scale across the state.
5.AR	Protect the envelope of buildings from wildfire.	Partially Complete: Following the economic recession of 2008, many local and state fire protection resources were cut, reducing the ability of the fire services to adhere to the standards of coverage. The fire services are slowly regaining employees and returning to pre-2008 coverage levels. Additionally, only a small portion of communities are implementing and maintaining fire-adapted community practices, so most are vulnerable to damage from wildfire.

3.3.17 Winter Storms and Extreme Cold (Medium/Significant Risk)

3.3.17.1 Nature

the Winter Weather and Extreme Cold hazard aligns with FEMA's National Risk Indexe hazard of Winter Weather. Winter Weather can bring heavy rain or snow, high winds, extreme cold, and in rare cases ice storms. In Nevada, the primary weather pattern for a winter storm is the jet stream slamming into California and Nevada coupled with an atmospheric river (Figure 3-197). A significant portion of the winter snowpack is generated by these Pacific atmospheric river winter storms.

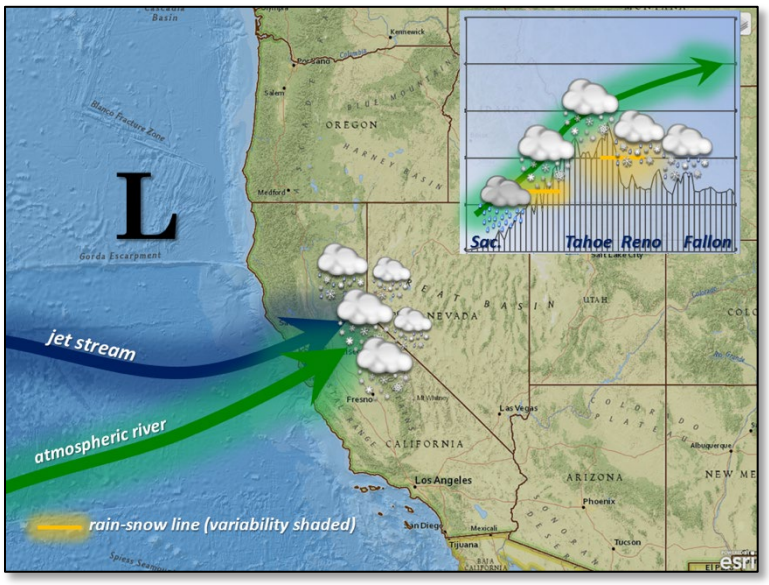


Figure 3-197. Typical Winter Weather Storm Atmospheric River Scenario.

Atmospheric river storm systems can bring heavy rain or snow to Nevada (if there's no rain shadowing by the Sierra Nevada or other California mountains), flooding (if the storm is warm enough for a rain on existing snow event), or widespread high winds (if there is rain shadowing – which is common). The high wind events are focused in areas immediately downwind of large mountain ranges, most notably along Highways 395 and 95 in Northern and Central Nevada.



Figure 3-198. Snow Covering Route 88 January 17, 2023.[154]

The current predictability of winter season heavy rain, snow, or high windstorms is generally good, with broad warning often possible 5-10 days in advance and with more specific details and potential impacts 1-4 days ahead. River forecasts of potential flooding can be seen out to 5 days into the future, but these are only for mainstream rivers such as the Truckee, Carson, and Humboldt. One specific aspect to these winter storms which is low predictability is the rain-snow

[154] Courtesy: Caltrans District 10

elevation (also known as the "snow level"). This can impact the flood versus heavy snow potential greatly and can result in big forecast changes even just 12-24 hours ahead of a storm. Other weather patterns which are favorable to heavy snow in Central and Northern Nevada are:

1) slow moving cold low pressure off the coast of California and Oregon,
2) inside slider where a strong cold front drops in from the north producing a band of heavy snow,
3) Tonopah Low where heavy snows can be produced on the east facing aspects of mountain ranges in Nevada, and
4) lake effect snow where cold air creates localized bands of heavy snow impacting communities and highways downwind of large lakes such as Tahoe, Pyramid, and Walker in northern Nevada.

The predictability of these storm types is much less than the atmospheric river events, often only 1-3 days of lead time.

Figures 3-199 and 3-200 depict the National Risk Index (NRI) Score for Winter Weather statewide and in more heavily populated areas respectively.

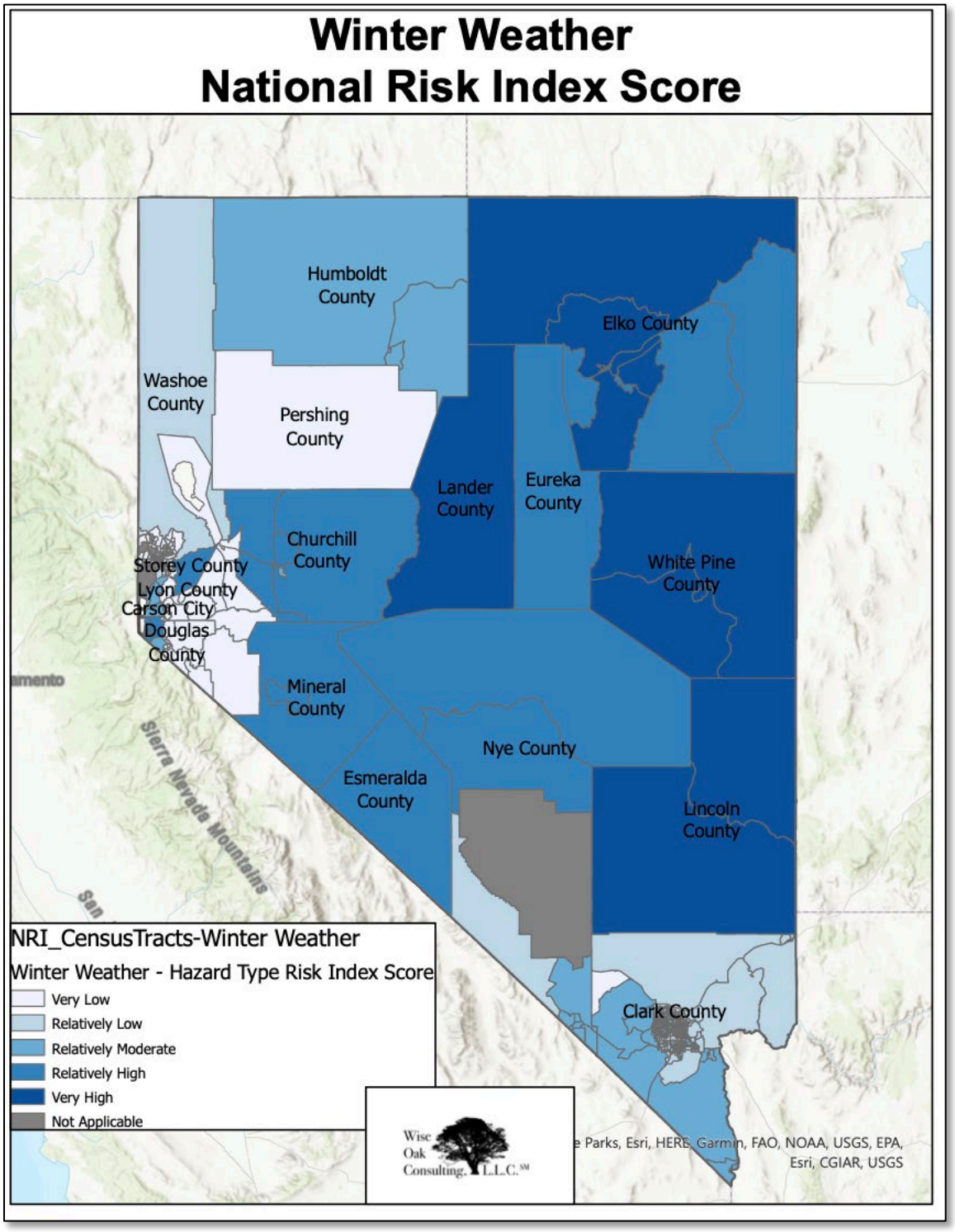


Figure 3-199. Winter Weather National Risk Index Score - Statewide.

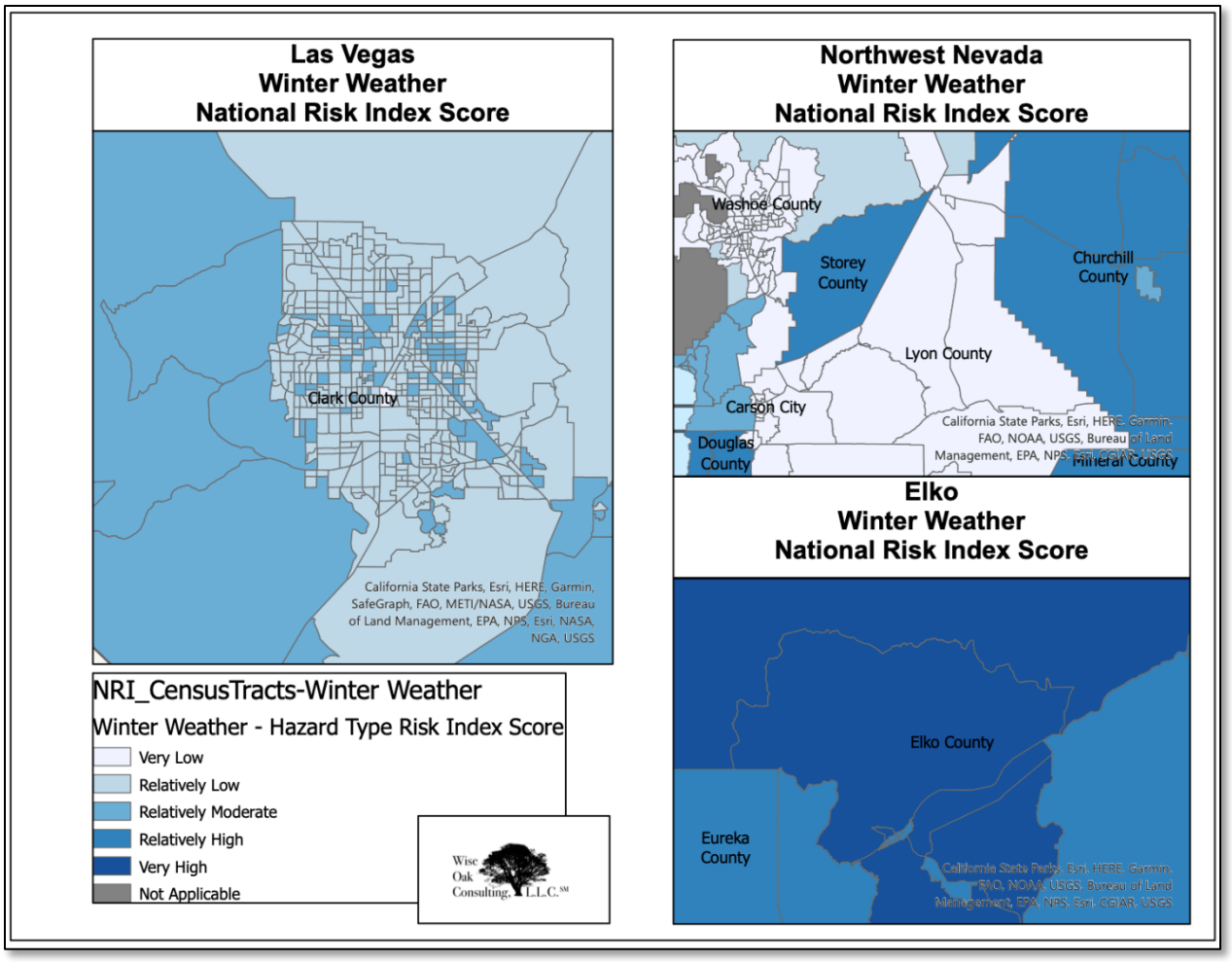


Figure 3-200. Winter Weather National Risk Index Score – More Heavily Populated Areas.

Figures 3-201 and 3-202 depict the NRI Exposure in dollar values for Winter Weather and in more heavily populated areas respectively.

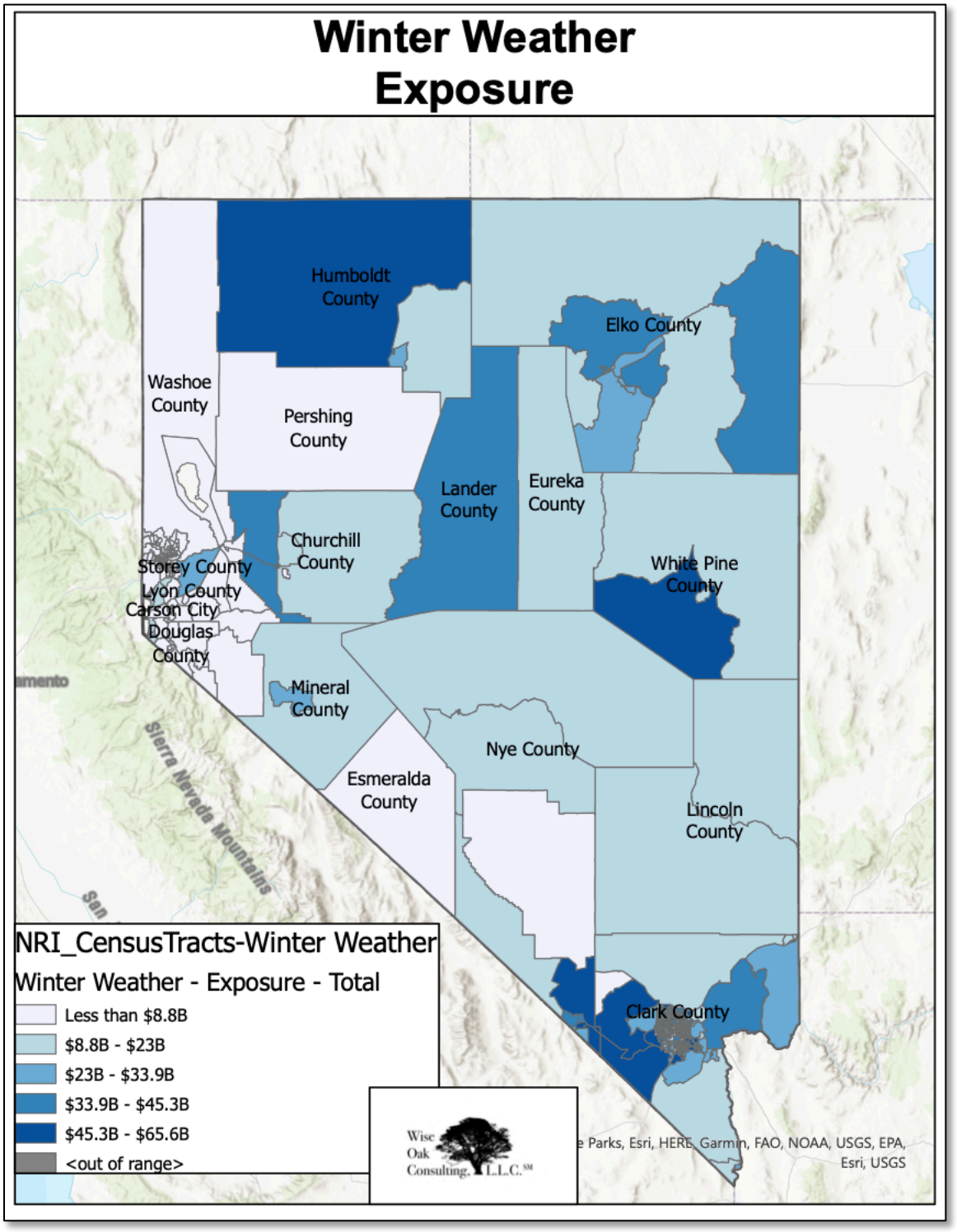


Figure 3-201. Winter Weather National Risk Index Exposure – Statewide.

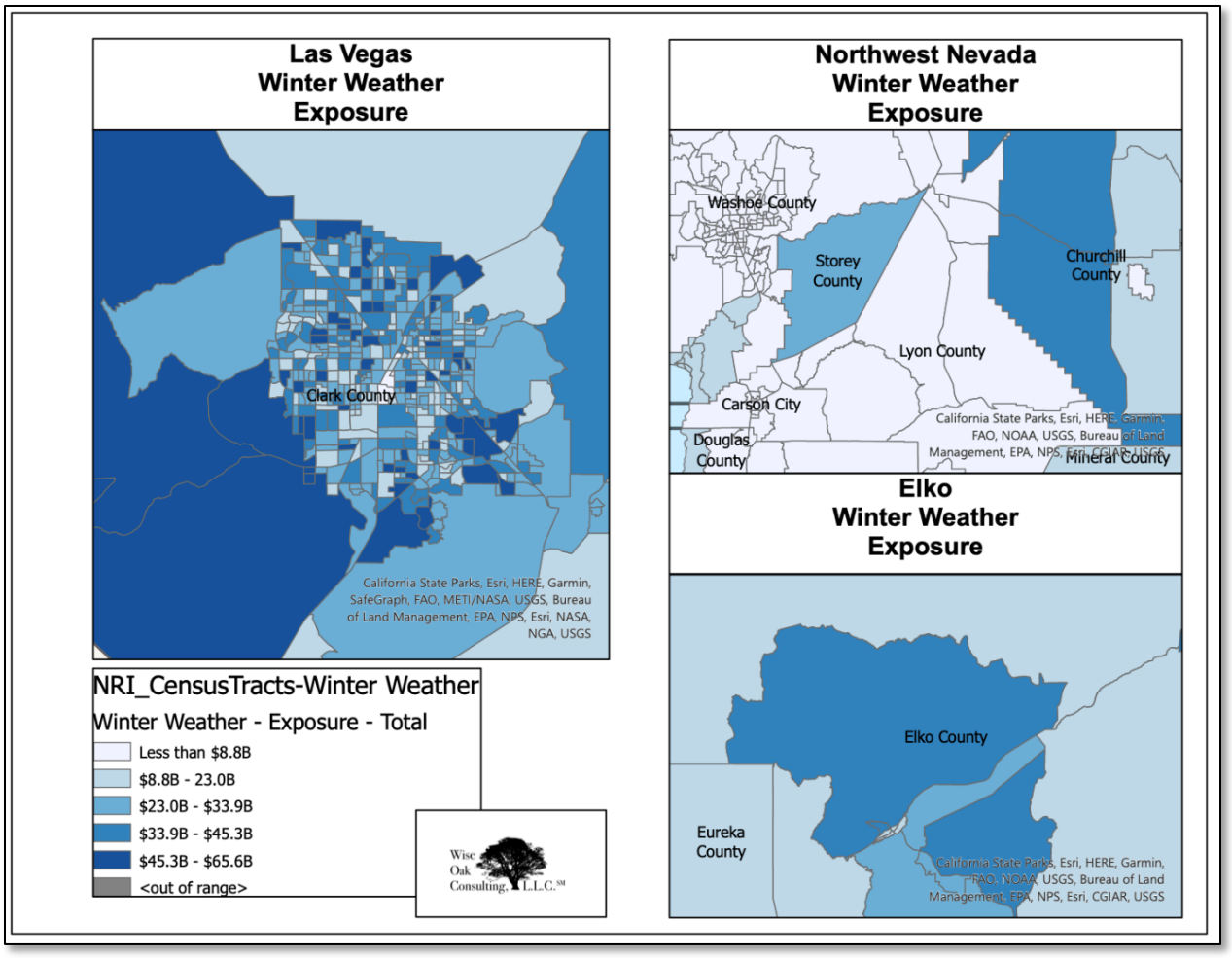


Figure 3-202. Winter Weather National Risk Index Exposure – More Heavily Populated Areas.

3.3.17.2 History

During winter months, both higher elevations and lower elevations in Northern Nevada regularly experience rain and snow, and very rarely freezing rain. Although dramatically less common, these conditions may also be experienced in lower elevations in the southern portion of the State. Table 3-38 lists a sampling of past severe storms in Nevada causing recorded deaths, injuries, economic hardship, and/or property damage. This data comes from the NOAA National Weather Service Storm Data database.

Table 3-38. Severe Winter Storms in Nevada

Date	Location	Deaths, Injuries, Damages
1889-90	Genoa area, northern NV	This winter season was known as the "White Winter" when nearly 100 inches of snow - the heaviest snowfall in northern Nevada history. An estimated 90-95% of the state's livestock died during that winter.
Winter 1937	Las Vegas area, Clark and Lincoln Counties	Although severe winter storms are generally thought to affect mainly northern Nevada, a snow storm left twelve inches of snow on Las Vegas and the Caliente Herald reported they were having the "coldest weather spell in memory for the past five days", with temperatures down to 10° above to 31° below zero, with 18 inches of snow.
February, 2004	Sierra Nevada Tahoe area	Two deaths. Severe winter storm. Gusts on the ridges were up to 110 mph. There were white-out conditions in Tahoe area. Several minor accidents were caused by the storm.
December 29, 2004, through January 10, 2005	Northern Nevada	FEMA designated 15 counties (Carson City, Churchill, Clark, Douglas, Elko, Eureka, Humboldt, Lander, Lincoln, Lyon, Mineral, Nye, Storey, Washoe, and White Pine) eligible for federal funding to pay part of the cost for emergency protective measures undertaken as a result of the snowstorm on December 29, 2004, - January 2, 2005. Shortly thereafter, FEMA designated these counties plus Pershing County eligible for federal funding as a result of another snowstorm on January 6-10.
January 3, 2011	Southern Nevada	A strong cold front brought very cold temperatures to the Mojave Desert over New Year's weekend, then a trailing Pacific storm brought locally heavy low elevation snow. A locally heavy snow burst produced five to seven inches of snow in Pahrump (2600' elevation).
Feb. 25, 2011	Reno-Carson City –Minden area, Northern Nevada	Up to 18 inches of snow with up to 50 mph winds caused 25 power poles to break and multiple auto accidents and two injuries and $250,000 damages. Nonessential State workers were sent home.
January 13-14, 2013	Northern Nevada	Governor Sandoval declared a state of emergency due to prolonged cold winter temperatures, allowing extended hours for propane truck driver deliveries. Subzero cold was responsible for several deaths in Elko, Reno, and South Lake Tahoe in January. Several days with lows in the single digits

Table 3-38. Severe Winter Storms in Nevada		
Date	**Location**	**Deaths, Injuries, Damages**
		to as low as -14F (South Lake Tahoe airport) and highs in the upper 20s to mid-30s caused pipes to burst at four casinos in Stateline on the 13th and 14th. The burst pipes caused water damage to the 18th floor at Harrah's and flooding of casino floors and stores at Harvey's Casino.
November 21-24, 2013	Southern Nevada	Heavy snow in far northern Lincoln County stranded approximately 50 cars on Highway 93, with some drivers trapped for 10-12 hours.
November 9-10, 2015	Northern Nevada	Widespread snow totals of 5 to 10 inches were noted in the Reno-Sparks area, highest on the north and west side of Reno (in lake effect band from Lake Tahoe). From the north valleys of Reno to Palomino Valley and Red Rock Rd near the California border lake effect snow from Pyramid Lake boosted snowfall totals to 8 to 15 inches, with the highest amounts in the Antelope and Hungry Valleys. Numerous broken tree branches were noted due to the heavy, wet snow and over 35,000 customers were without power in Washoe County due to downed power lines (morning of 11/10).
January 30-31, 2016	Northern Nevada	Widespread snow totals of 4 to 8 inches were reported around the Reno-Sparks area. Areas in and near the foothills west of Reno received between 8 and 10 inches of snowfall. Heavy, lake-effect snow off of Pyramid Lake caused whiteout conditions near Wadsworth, with two jackknifed big rigs causing the closure of westbound Interstate 80 in the evening. Twelve inches of snow fell at Goldfield. Near Ely - six to twelve inches of snow was reported in many valley locations and up to 18 inches in the mountains. Winds gusting over 40 mph caused drifting of snow up to 4 feet deep making travel nearly impossible. Schools and county offices were closed the next day.
January 9-12, 2017	Northern Nevada	A winter storm and atmospheric river brought exceptional snowfall and a period of blizzard conditions to mountains around Lake Tahoe, as well as a period of snowfall in the lower elevations of western Nevada. Sustained winds were as high as 63 mph at the Walker Lake NDOT sensor. Gusts reached 105 mph. Smith Valley and Yerington has automated sensors with gusts between 58 and 63 mph. The winds caused at least two semi-trucks to blow over on Highway 95 near Walker Lake. Nevada route 341 (Mount Rose Highway) was closed for blizzard conditions into the morning of the 11th. Virginia City received a total of 26 inches of snowfall. Between 6 and 9 feet of snow fell between the 9th and 12th in the higher elevation of the

Table 3-38. Severe Winter Storms in Nevada		
Date	**Location**	**Deaths, Injuries, Damages**
		northern Carson Range, including the Mount Rose and Diamond Peak ski areas. Farther south, Daggett Pass reported 45 inches of snowfall. Near lake level on the east side of Lake Tahoe, snowfall amounts ranged from 20 to 32 inches. Numerous power outages were noted and Incline Village declared a snow emergency with roads not expected to be cleared for at least a couple days. This same series of storms also lead to extensive flooding and heavy rainfall around the Reno, Sparks, Carson City, and Minden areas, which is addressed in more detail in the Flood Section.
February 6-10, 2017	Northern Nevada	Two rounds of precipitation associated with an atmospheric river brought widespread rainfall totals of 1 to 2 inches in far western Nevada, with much higher rainfall and/or liquid equivalent amounts between 3 and 6.5 inches in the foothills and Carson Range west of Interstate 580 and Highway 395. The higher elevations of the Carson Range received up to several feet of snowfall. Widespread gusts between 60 and 70 mph were recorded in the valleys on the 9th, with gusts 70 to as high as 92 mph (Browns Creek Bridge on I-580) in the foothills. Numerous downed trees and power lines were noted, with as many as 7,000 to 8,000 customers without power early in the afternoon, mostly in Douglas County. A big rig was blown over on Highway 395 near Stead. Finally, at least 7 flights into the Reno-Tahoe International airport were delayed or cancelled due to the winds. This atmospheric river also resulted in renewed flooding across much of northern Nevada, addressed in more detail in the Flood Section.
January 19, 2018	Lake Tahoe	Narrow lake effect snow bands produced heavy snowfall and travel impact east and south of Lake Tahoe. 4-12 inches of snowfall was recorded in areas such as Dagget Pass and Heavenly Ski Resort. Lake effect snow, while infrequent, can bring localized high impact snowfalls near Lake Tahoe, Pyramid Lake, and even Walker Lake in Nevada.
March 1-4, 2018	Northeastern Nevada	Heavy and strong winds occurred across southern Lander and Eureka Counties. Snow amounts ranged from 7 inches in Austin to 14-18 inches around Eureka. The mountains received 8-11 inches; higher amounts were likely in the higher peaks. Heavy snow was reported over much of the area. Spring Creek and Lamoille reported between 10 and 20 inches, and 6 to 8 inches were reported in Elko and Carlin. Wind gusts to 64 MPH were reported in Humboldt County.
March 15-	Northern	A slow moving a cold early spring storm brought widespread

Table 3-38. Severe Winter Storms in Nevada		
Date	**Location**	**Deaths, Injuries, Damages**
17, 2018	Nevada	snowfall to lower elevation cities in Northern and Central Nevada. NWS Reno Official Observation measured 14.2 inches of storm total snowfall. Snowfall of 6-12 inches was fairly common across the Sierra Front from Reno to Carson City to Minden. Significant localized snow amounts ranged from 11 inches around Winnemucca to 16 inches near Golconda Summit. This was a historic snow event for Winnemucca, breaking snowfall records. In southern Nevada, 7 inches of snow was measured in Pioche.
February 2-3, 2019	Northeastern Nevada	A winter storm brought several days of accumulations to northern Nevada with heavy accumulations seen in the mountainous regions. Eight (8) inches of snow fell at Eureka with 9 inches in Spring Creek near Elko.
January 24-27, 2021	Most of Nevada	An unusually cold atmospheric river brought plentiful snowfall to much of the state over a multi-day period. Widespread travel impacts occurred, though this storm was extremely beneficial as it ended up being the only large storm of the entire winter season, staving off even worse drought impacts. Two (2) – Twelve (12) inches of snowfall in Reno and Carson City with 1 to 2 feet in Gardnerville and Yerington. Two (2) to four (4) feet of snow for the Nevada side of Lake Tahoe. Truckee Meadows Community College, Washoe County, and Carson City school districts were closed the 27th. COVID-19 vaccine clinics were closed in Virginia City. There were also power outages reported across Reno and Carson City. Up to 16 inches of snow fell in mountainous areas of Humboldt County and in Great Basin National Park in White Pine County. In southern Nevada the storm was cold enough for one to three inches of snow around the periphery of the Las Vegas Valley, 4 inches in Pahrump, with up to 20 inches on Mt Charleston.
October 24-25, 2021	Near Reno, Carson City	An unusually powerful atmospheric river for so early in the winter storm season brought copious amounts of rainfall to Western & Northern Nevada. Reno Airport saw the largest two-day precipitation total on record – 2.92 inches. The 2.92 inches, nearly 40% of the typical annual average, was nearly the same as the 3.01 inches recorded during the entire previous water year. Rainfall amounts of 5-8" were recorded in foothill areas of Reno & Carson City. Little damaging flooding occurred as soils were extremely dry going into the storm.
December 13 - 16,	Northern Nevada	A powerful winter storm that originated the Gulf of Alaska, thrust into the Western United States from DEC 13th-16th and

Table 3-38. Severe Winter Storms in Nevada		
Date	**Location**	**Deaths, Injuries, Damages**
2021		brought heavy snow, winds, and widespread heavy rainfall to lower elevation areas across northern Nevada.
December 22 – 27, 2021	Sierra Front and western Nevada	A series of eastern Pacific winter storm pulses, occasionally aided by induction of warmer sub-tropical moisture, caused a variety of hazardous winter conditions, ib=ncluding heavy snow that disrupted holiday travel and commerce over the Sierra and western NV.
January 3, 2022	Highway 395 and I-580 corridor	A well-forecast extreme downslope wind event impacted W. Nevada and NE. California with widespread wind gusts between 60 to 95 mph along Highway 395 and I-580 corridor. Several critical highways and interstates were impacted, which disrupted ground travel across the region with strong gusty winds and blowing snow.
February 22 - 23, 2022	Sierra Front and western Nevada	Another inside slider tracked through the region w/more snow and wind. This inside slider-type system moved into the region late Sunday through Tuesday. It brought periods of snow showers, increased wind, travel difficulties, and much colder temperatures to the region through Wednesday night. Snow Monday into Tuesday morning overperformed in some areas with several inches of new snow falling in bands over parts of the eastern Sierra, and western NV.
March 4 – 6, 2022	Northern Nevada	A series of modest low pressure systems brought rain and snow showers Friday and Saturday to northeast CA and western NV. These systems also brought increased breezy winds and a subsequent cooling trend to the region.
March 11 - 15, 2022	Northern Nevada	An incoming cold front passing across northern Nevada brought moderate to heavy mountain snow and travel impacts. Gusty southwest winds with this front produced wind impacts.
April 21 - 22, 2022	Northern Nevada	Another potent spring storm brought more gusty wind and snow impacts to the region as an accompanying upper trough pushed a healthy dose of Pacific moisture and multiple waves of storms. Sierra ridge experienced 80+ mph wind gusts while wind prone areas in Mono County saw 60+ mph wind gusts. Some mountain areas above 6,000 feet saw heavy snow that added 1 to 2 feet of new accumulations to some higher Sierra locations.
May 11, 2022	South Lander and Eureka Counties	A dynamic system created unstable atmospheric conditions leading to an enhanced area of locally heavy thundersnow.
October 22 – 23, 2022	Ruby Mountains / Humboldt	A strong trough produced 8-11 inches of snow.

Table 3-38. Severe Winter Storms in Nevada		
Date	**Location**	**Deaths, Injuries, Damages**
	Range	
December 10 - 12, 2022	Northwest Nevada	Beginning on Friday, December 9, 2022, parts of northwestern Nevada have continuously experienced severe winter weather, including flooding, rain, snow, freezing temperatures, and ice.
December 30, 2022 – January 4, 2023	**Northwest Nevada**	Beginning on Friday, December 30, 2022, parts of northwestern Nevada have continuously experienced severe winter weather, including flooding, rain, snow, freezing temperatures, and ice.

Additionally, NOAA compiled the following data shown in Table 3-39 for the top 25 periods of excessive snow (15.0 inches or greater of total snowfall).

Table 3-39. Severe Winter Storms in Nevada in Decreasing Order of Snowfall	
Inclusive Dates	**Total Snowfall / Daily Maximum Amt. (Date)**
Jan. 10–14, 1911	37.9/19.7 (Jan. 12)
Dec. 1–5, 1919	33.6/11.5 (Dec. 3)
Jan. 31–Feb. 6, 1901	28.4/10.1 (Feb. 5)
Feb. 9–11, 1922	27.4/12.6 (Feb. 10)
Jan. 17–18, 1916	25.5/22.5 (Jan. 17)
Dec. 29, 2004–Jan. 1, 2005	22.2/16.4 (Dec. 30)
Feb. 16–21, 1897	22.1/10.0 (Feb. 16)
Feb. 10–12, 1959	21.9/13.2 (Feb. 10)
Feb. 16–18, 1990	21.1/18.0 (Feb. 16)
Dec. 23–29, 1941	20.0/6.5 (Dec. 27)
Jan. 15–20, 1933	19.1/10.5 (Jan. 19)
Jan. 15–16, 1913	19.0/ 10.0 (Jan. 16)
Jan. 24–27, 1956	17.8/11.0 (Jan. 25)
Feb. 23–26, 1969	17.3/8.0 (Feb. 24)
March 14–15, 1952	17.1/13.6 (March 14)
Jan. 28–30, 1937	17.0/10.1 (Jan. 30)
Jan. 22–25, 1923	16.5/9.2 (Jan. 24)
Jan. 7–8, 2005	16.4/10.5 (Jan. 8)
Nov. 8–12, 1985	16.3/15.2 (Nov. 10)
Jan. 3–Feb. 4, 1938	15.6/8.6 (Feb. 3)
March 1–3, 1902	15.5/14.4 (March 1)
Feb. 4–9, 1976	15.1/5.1 (Feb. 4)

A summary of the data is presented in a table showing the average number of days per year with extreme snowfall for representative sites in each county. Extreme snowfall is defined as that above the 15th percentile for that county. These data will assist each county in its preparedness and response planning for extreme snowfall events.

Nevada's Basin and Range topography provides the necessary conditions for down-slope winds on the leeward (east) side of the ranges and into the valleys. North-south transportation routes can become obscured by blowing dust or snow during extreme wind conditions.
The NRI Winter Weather Historic Loss Ratio is "Very Low" across the state.

3.3.17.3 Location, Severity, and Probability of Future Events

Severe storms are considered to be "Medium/Significant Risk" hazards. They occur frequently and can cause significant damage to structures that have not been built to meet current building codes. Because the transportation infrastructure within the state is rather robust, weather-related events do not generally have much long-lasting effect on the transportation network. Severe weather events may cause temporary closures, but generally do not cause damage. The exception is severe flooding, that can be caused when storms bring large amounts of rain or warm rain on top of already heavy snowpacks. These floods can cause significant damage to roads, railways and airports.
Because winter snow, rain, and windstorms occur each year in northern and central Nevada, most local and state jurisdictions are able to manage these types of events. Only when the storms are severe and repeated is there a possibility of these hazards causing damage and prolonged disruption. In southern Nevada while the region is accustomed to strong windstorms, it is less used to heavy snow events. These snows can cause widespread disruptions as a result. More research is necessary to determine and prioritize actions that will mitigate these hazards. The Subcommittee will assist in the development of strategies to mitigate this hazard as new data become available.

Figures 3-203 and 3-204 depict the NRI Expected Annual Loss statewide and in more heavily populated areas respectively.

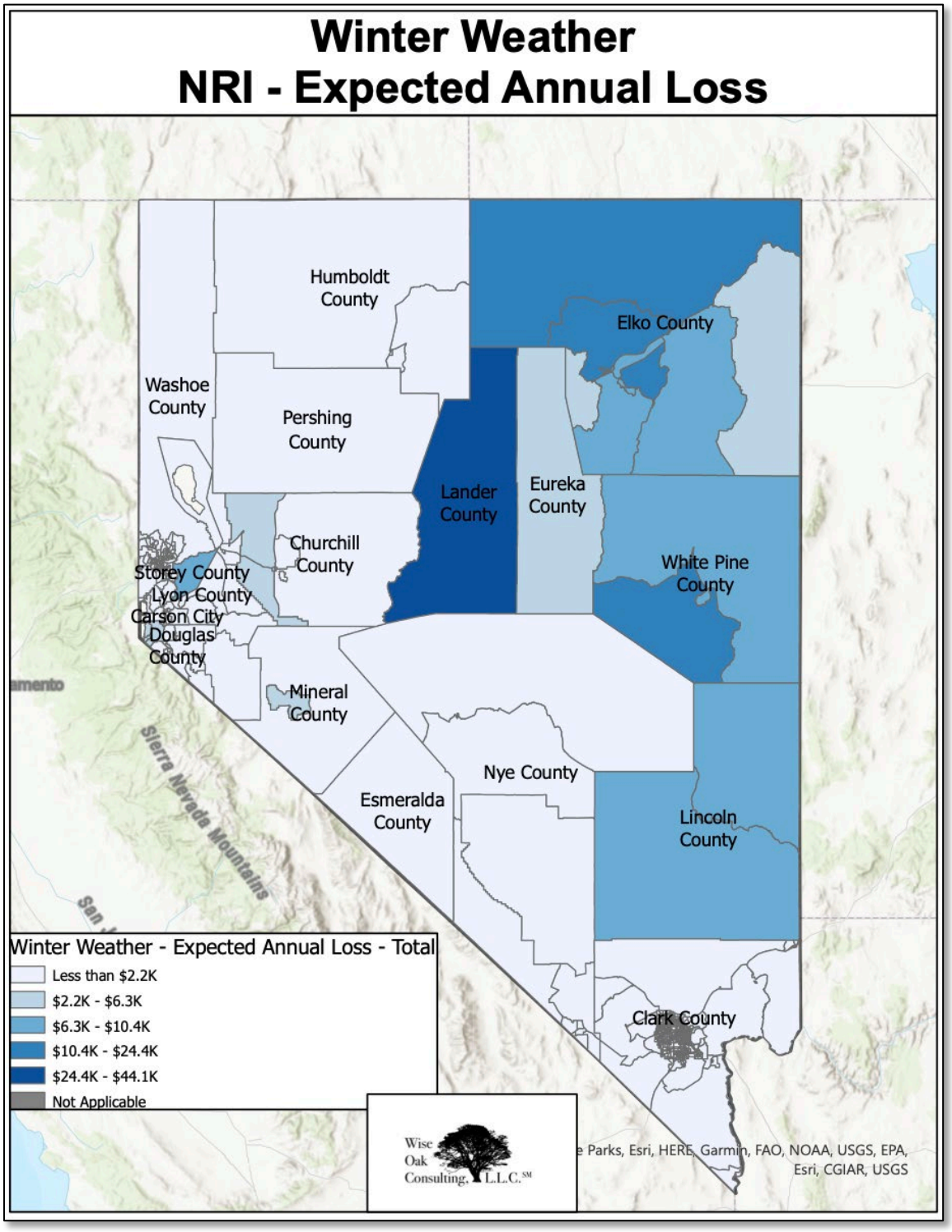


Figure 3-203. Winter Weather National Risk Index Expected Annual Loss – Statewide.

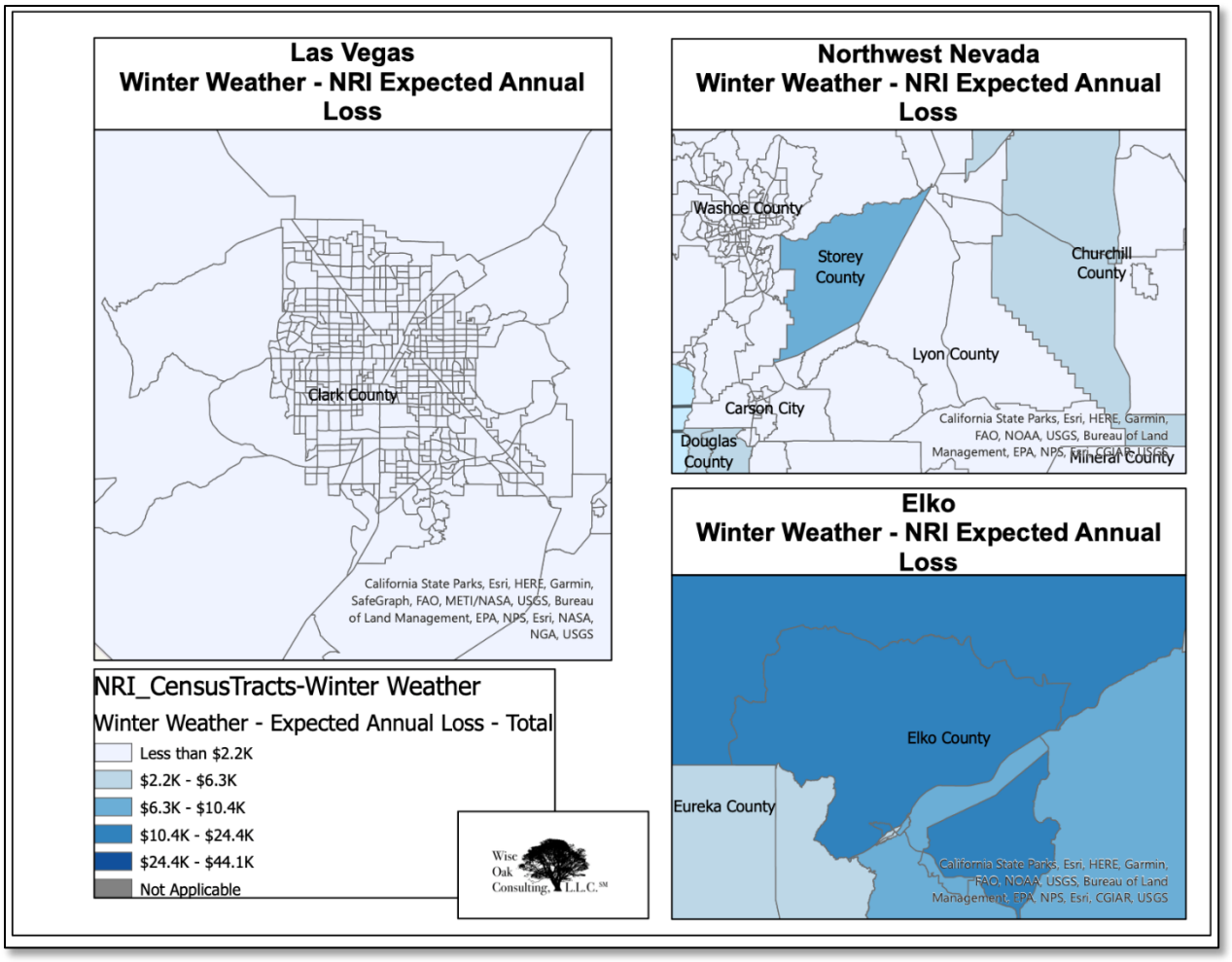


Figure 3-204. Winter Weather National Risk Index Expected Annual Loss – More Heavily Populated Areas.

Figures 3-205 and 3-206 depict the NRI Annualized Frequency for Winter Weather in terms of number of events statewide and in more heavily populated areas respectively.

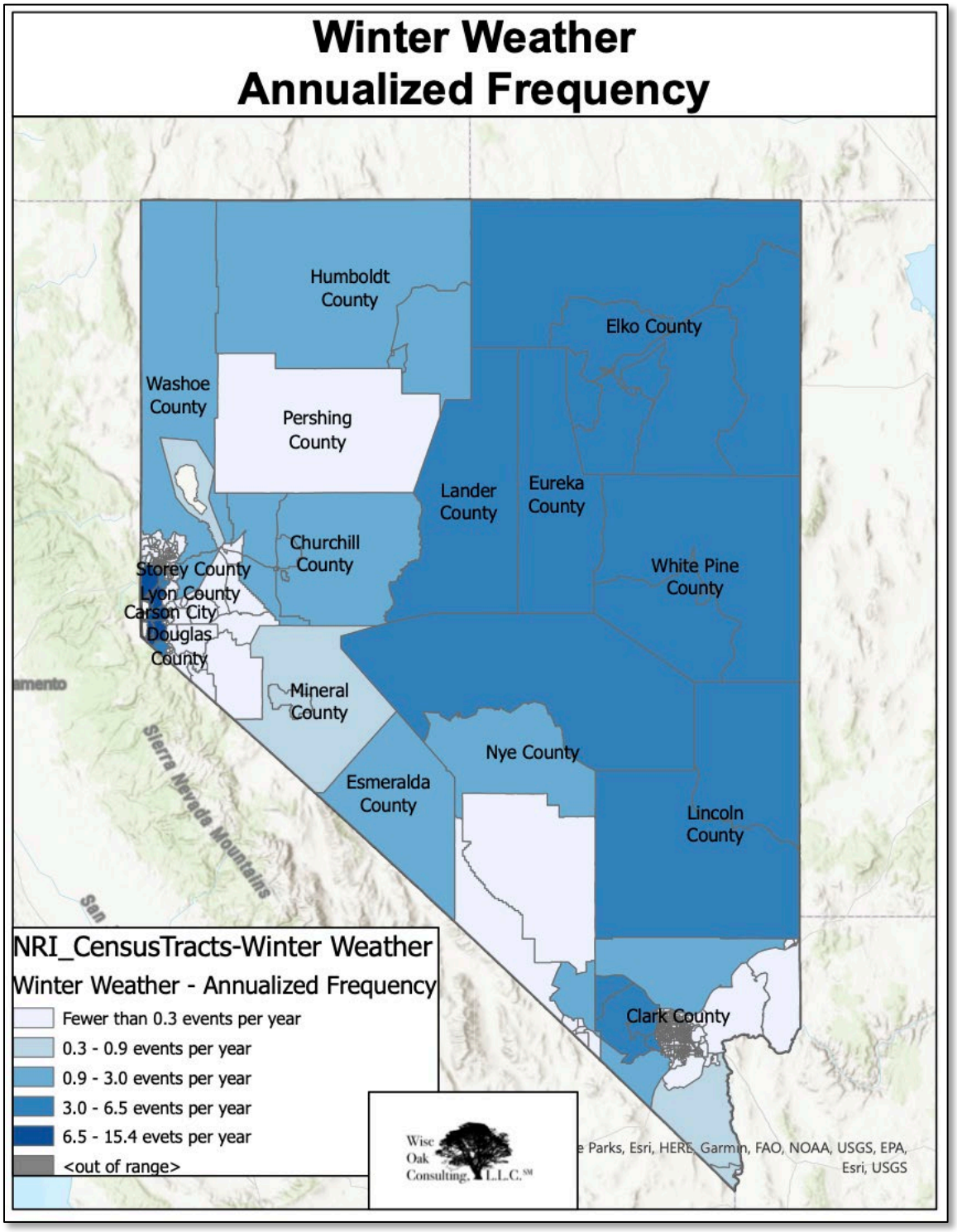


Figure 3-205. Winter Weather National Risk Index Annualized Frequency – Statewide.

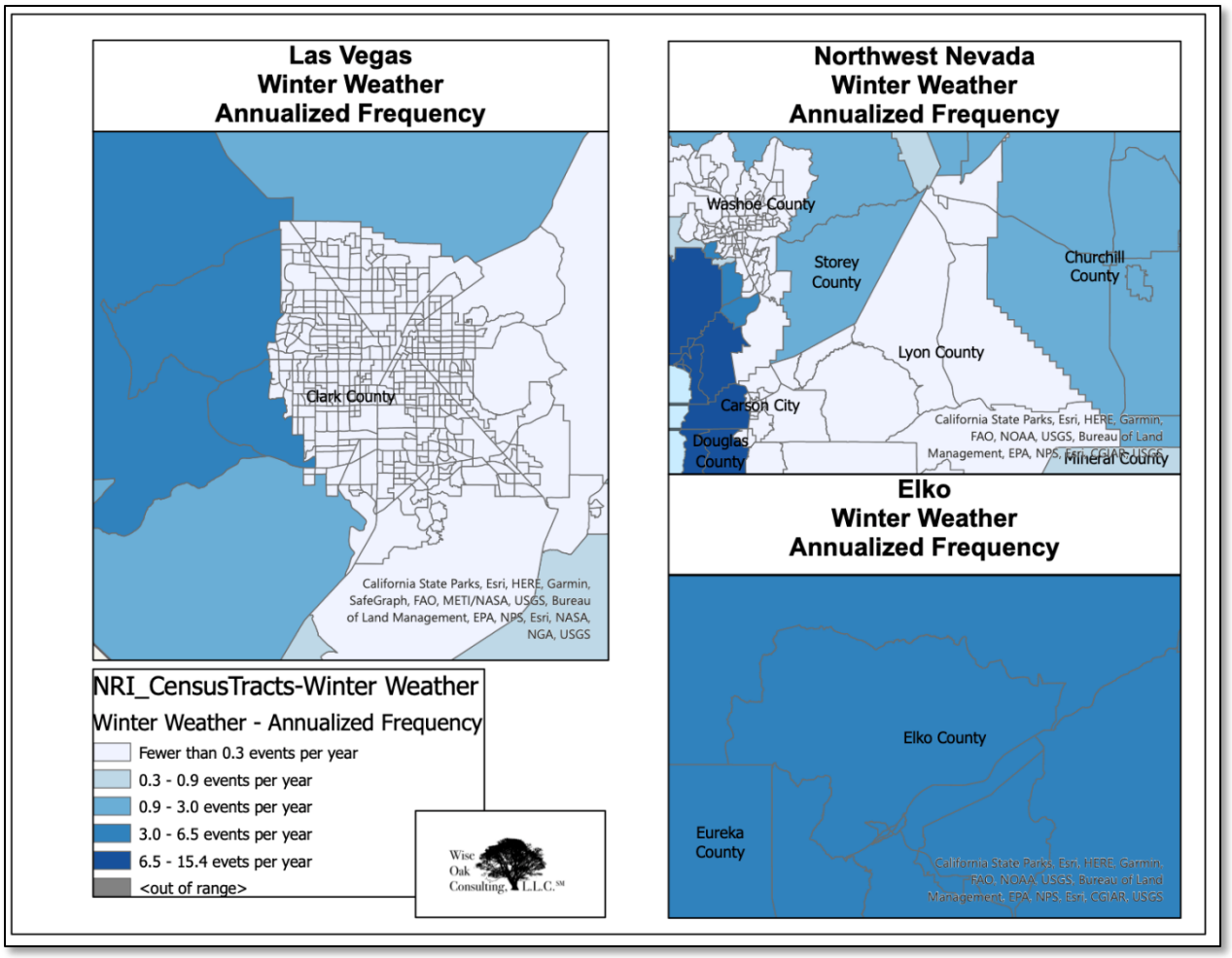


Figure 3-206. Winter Weather National Risk Index Annualized Frequency – More Heavily Populated Areas.

3.3.17.4 Impacts from Climate Change

There are some aspects to Nevada severe storms for which we have better confidence in anticipating the impacts of climate change, while for many other aspects much is unknown. Recent observations and simulations suggest a continued rise in the rain-snow elevation. This will result in a larger portion of winter precipitation falling as rain instead of snow. This scenario could lessen the frequency of lower elevation heavy snow events but increase the risk of winter floods. This scenario also means less snowpack from which to rely on for summer water supply. Simulations are mixed in terms of winter precipitation in the coming decades, with some showing a decreasing trend for the Sierra and Great Basin and others showing an increasing trend. Most projections show more of the precipitation coming in fewer, but larger atmospheric river type storms. This scenario would increase the risk of severe weather impacts – heavy snow and floods.

3.3.17.5 Vulnerability of State Assets

The vulnerability of state critical buildings to Cold Waves is provided in Appendix T. The vulnerability of crtitical satte buildsings due to ice storms did not reach a “Relatively High” or “Very High” NRI levek.

3.3.17.6 Mitigation

Subject matter experts have assessed that there is no appreciable vulnerability of state assets due to this hazard. Therefore, the hazard profile is for information purposes only and mitigation projects will not be pursued for this hazard in 2023-2028.

Technological Hazards

3.3.18 Dam Failure

3.3.18.1 Nature

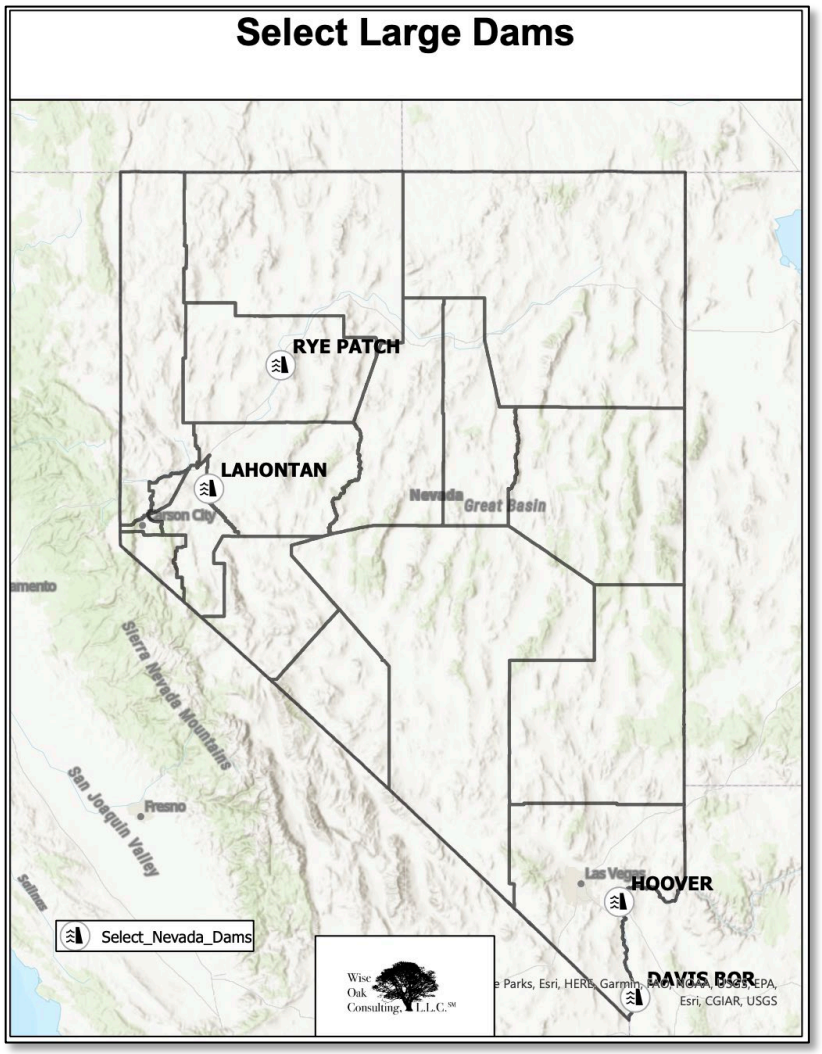


Figure 3-207. Select Large Dams.

Dam failures involve unintended releases or surges of impounded water resulting in downstream flooding. The high-velocity, debris-laden wall of water released from dam failures results in the potential for human casualties, economic loss, lifeline disruption, and environmental damage. Dam failures may involve either the total collapse of a dam, or other hazardous situations such as damaged spillways, overtopping from prolonged rainfall, or unintended consequences from normal operations. Severe storms with unusually high amounts of rainfall within a drainage basin, earthquakes, or landslides may cause or increase the severity of dam failure.

Factors causing dam failure may include natural or human-caused events, or a combination of both. Dam failures usually occur when the spillway capacity is inadequate, and water overtops the dam. Piping, when internal erosion through the dam foundation occurs, is another factor in a dam failure. Structural deficiencies from poor initial design or construction, lack of maintenance or repair, or gradual weakening from aging are factors that contribute to this hazard.

Many dams in Nevada suffer from encroachment of development onto the potential floodplains below dams. As a result, many dams fail to pass the Inflow Design Flood (IDF) inspection commensurate with their hazard potential and size (Association of State Dam Officials, 2002).

3.3.18.2 History

In Nevada history, there have been no incidents resulting in dam failure emergency or disaster declarations; however, there have been some dam failure incidents recorded, listed below in Table 3-40:

Table 3-40. Chronology of Dam Failure in Nevada

Date	Location	Description	Estimated Losses
April 25, 1876	Humboldt River Basin	Failure of an irrigation dam across the Humboldt River at Shoshone Canyon, about 22 miles east of Battle Mountain near present-day Dunphy resulted in a huge volume of water rushing through the canyon and flooding several ranches in the river bottom below.	No figures available.
January-May 1881		Sustained rains on heavy winter snowpack caused extensive localized flooding. All reservoir dams along Kelly Creek and in Squaw Valley were completely destroyed and were never rebuilt. Mines were flooded, mill dams and roads were washed out, bridges were damaged and livestock drowned.	No figures available.
June 27, 1883	Humboldt River Basin	The last remaining dam on the Humboldt River at Lovelock broke leaving a number of the largest ranchers without irrigation water.	No figures available.
May-June 1884	Humboldt River Basin	Rapid snow melt and heavy spring rains caused an extensive period of wet-mantle flooding in the Humboldt River Basin and its tributaries. Flooding along the lower Humboldt formed a vast lake extending over thirty miles from Beowawe to Battle Mountain, covering the railroad	Few records of damage are available.

Table 3-40. Chronology of Dam Failure in Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		track and damaging the road bridge across the Humboldt River in Battle Mountain. Later in June, the dam at the Humboldt dike outflow of the Humboldt River and Toulon Lakes, was blown up by local ranchers after which it was never rebuilt.	
May 1906	Humboldt River Basin	Heavy rainfall caused the failure of a reservoir dam with six deaths resulting. Various structures were damaged and horses and mules died. Southern Pacific railroad tracks were undermined.	Six lives were lost. No figures available on other losses.
March–June 1932	Humboldt River Basin	Rapid heavy snowmelt caused flooding in the Humboldt River Basin, especially in Lovelock Valley. The Big Five Diversion Dam was washed out (damaged earlier in 1910 and 1914)	No figures available.
December 1937	Carson River Basins	Heavy rain on snowpack from December 9 through December 13 caused flooding. On the East Fork Carson River, the Douglas Power (Rithenstrothf) Dam was severely damaged. In the south end of Carson Valley near Gardnerville, the flood on the East Fork Carson River crested at 10,300 cfs late in the afternoon of December 11.	No figures available.
December 1955	Truckee, Carson, and Walker River Basins	An intense late December storm dropped 10 to 13 inches of rain that melted snowpack in the Northern Sierra Nevada causing flooding along the Walker, Carson and Truckee Rivers. Derby Dam on the Truckee River east of Vista failed, and Hobart Dam, at the headwaters of Franktown Creek failed and released water that severely	The estimate of damages in the three river basins was $3,992,000 ($44,209,464 in 2022 dollars). One life was lost.

Table 3-40. Chronology of Dam Failure in Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		damaged U.S. 395.	
In 1984	Elko County	The concrete liner of the Bishop Creek Dam in Elko County failed, resulting in a 25 cubic feet per second seep. The seep eventually removed approximately 800 cubic yards of material from the toe of the dam (Association of State Dam Safety Officials, 2002).	No figures available.
1985	Olinghouse, near Wadsworth, Washoe County	A mine tailings dam owned by the Olinghouse Mining Company failed from an embankment collapse due to oversaturation in Wadsworth, Nevada. Tailings were reportedly deposited up to 1.5 km downstream.	No figures available.
2005	Near Panaca, Lincoln County	Rainfall runoff overtopped the Schroeder Dam in Beaver Dam State Park located in eastern Nevada by one foot. The top surface of the dam was not damaged, but the downstream face of the dam was severely eroded. Erosion in several of the gullies may have reached as far as the core material. The dam was an earth-fill dam with a 35-foot concrete spillway on the east side. Prior to this event the dam was considered a low-hazard dam. Mitigation at this site is ongoing under declaration FEMA-NV-DR1583.	No figures available.
September 8, 2014	Near Moapa, Overton and Mesquite, NV	On September 8, 2014, intense thunderstorms created a flash flood effect that brought rivers, small streams, and washes to overtop flood stages in Northeast Clark County. White Narrows Detention Dam (aka Dead End	No figures available.

Table 3-40. Chronology of Dam Failure in Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		Dam, a Low Hazard Dam Failed. Historically, this dam was not maintained and its failure might have been influenced by many factors. This dam is located on tribal land is not within the jurisdiction of the State, however courtesy inspections were conducted prior to the breach.	
January 22, 2016	Near Wabuska, NV	Homestretch Geothermal 2010 LLC had a dam fail that was never permitted. The dam (or aka "containment berm") was a dirt barrier, approximately 7 feet high and 18 feet wide at its base, constructed using a bulldozer. Homestretch estimates that the total volume of water released from the storage area was approximately 364 acre-feet of water. The portion of the berm that was breached is approximately 50 feet wide. When the Spill occurred, water flowed North, across the Wabuska drain, and settled in the low-lying area north of the drain From the Spill location, the Wabuska drain is approximately 1,100 feet to the Northwest. Once water entered the drain at the closest point to the spill site, (1,100 feet away) it would have to travel 2.5 miles through the Wabuska Drain, in order to enter the Walker River.	No injuries or damages were reported.
February 8, 2017	Winecup Gamble Ranch, north of Montello, NV	Twenty-one Mile Dam (aka Twenty-three mile) failed possibly from overtopping. Widespread snows had melted during a rapid warm up, which combined with rains caused flooding. The entire Elko region	No figures available.

Table 3-40. Chronology of Dam Failure in Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		experienced some type of flooding. This dam was classified as a low hazard dam. The flows from this dam were detained in another reservoir downstream (DAKE Reservoir) before making its way to the highway and railroad.	
2019	Charleston, NV	Charleston Reservoir Dam failed from overtopping after widespread snows had melted during a rapid warm up. This dam was classified as a low hazard dam. The flood flow from this dam washed out a county road downstream.	No figures available.

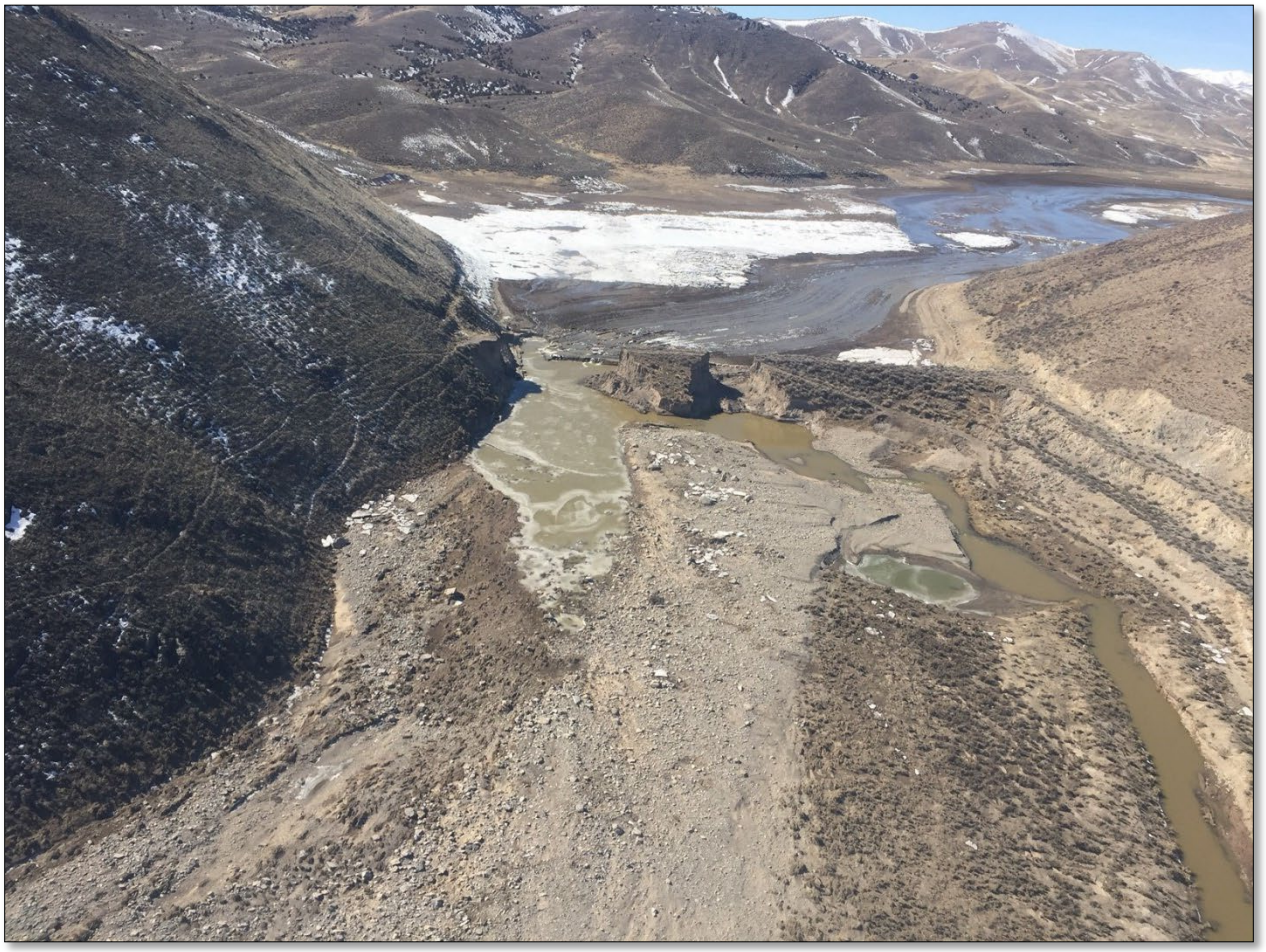


Figure 3-208. Earthen Dam Failure - Twenty One Mile Dam near Montello, NV February 2017.[155]

3.3.18.3 Location, Severity, and Probability of Future Events

The State of Nevada Division of Water Resources NDWR) currently tracks 650 active public and privately owned dams. Many of these dams are dry storm-water detention facilities. As of the writing of this Plan, 157 of these dams are rated by the NDWR as "High Hazard." See Figures 3-209 and 3-210. This hazard classification is based on life and/or property loss potential.

A listing of existing dams by county is found in Appendix F. The listing includes the national identification number, the state identification number, name, coordinates, county where it is located, owner, hazard rating, and written emergency action plan (EAP). Data for each dam may be found at http://water.nv.gov/DamsQuery.aspx. Hazard designations for dams are assigned based on downstream hazard potential in the event of a dam failure (Nevada Administrative Code [NAC] 535.140). A high hazard designation (H) is assigned to a dam if there is reasonable potential for loss of life and/or extreme economic loss. A significant hazard designation (S) is assigned to a dam if there is a low potential for loss of life but an appreciable economic loss. Lastly, a low hazard designation (L) is assigned to a dam if there is a vanishingly small potential for loss of life and the economic loss is minor or confined entirely to the dam owner's own property. These hazard designations are initially determined at the time dam design plans are reviewed, however, hazard designations can and do change as downstream conditions alter as a result of development and with the aging of the dams and levees.

The hazard designation is not dependent on type of dam and **in no way** reflects the safety or condition of the dam.

[155] *Picture courtesy of Nevada DEM.*

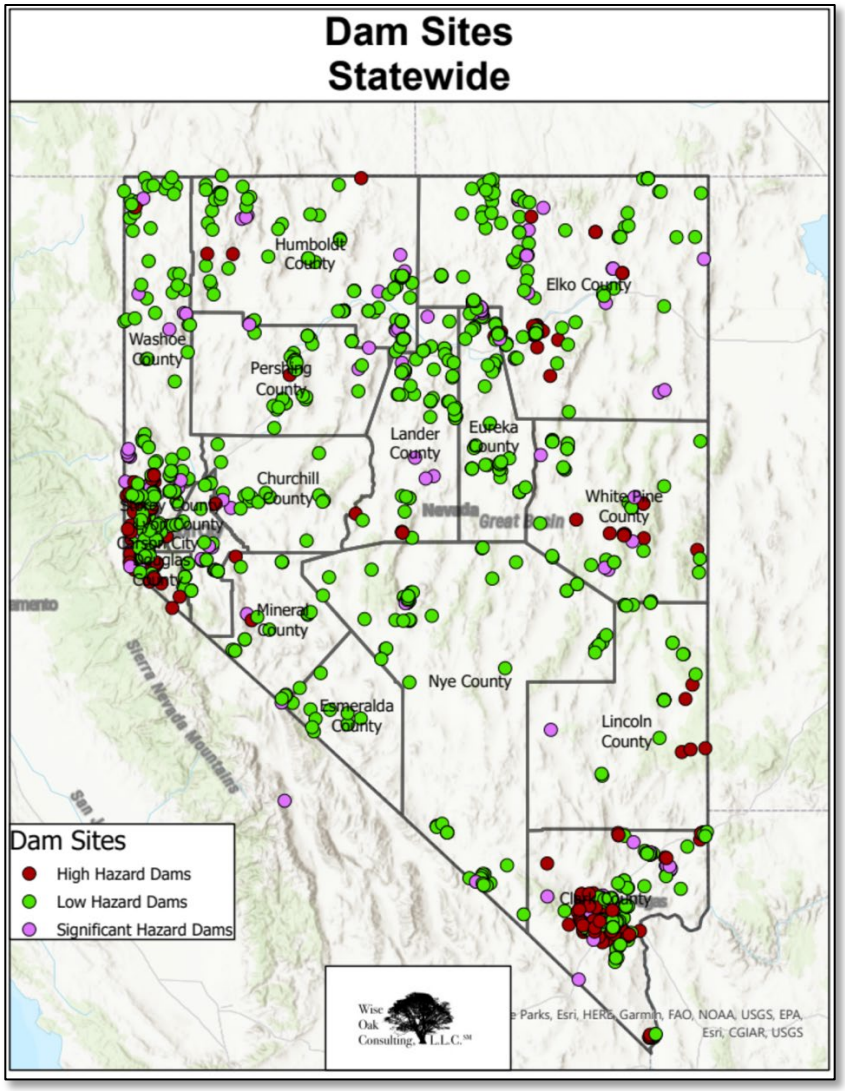


Figure 3-209. Nevada Dam Sites - Statewide.[156]

[156] https://arcgis.water.nv.gov/arcgis/rest/services/NDWR/Dam_Sites/FeatureServer

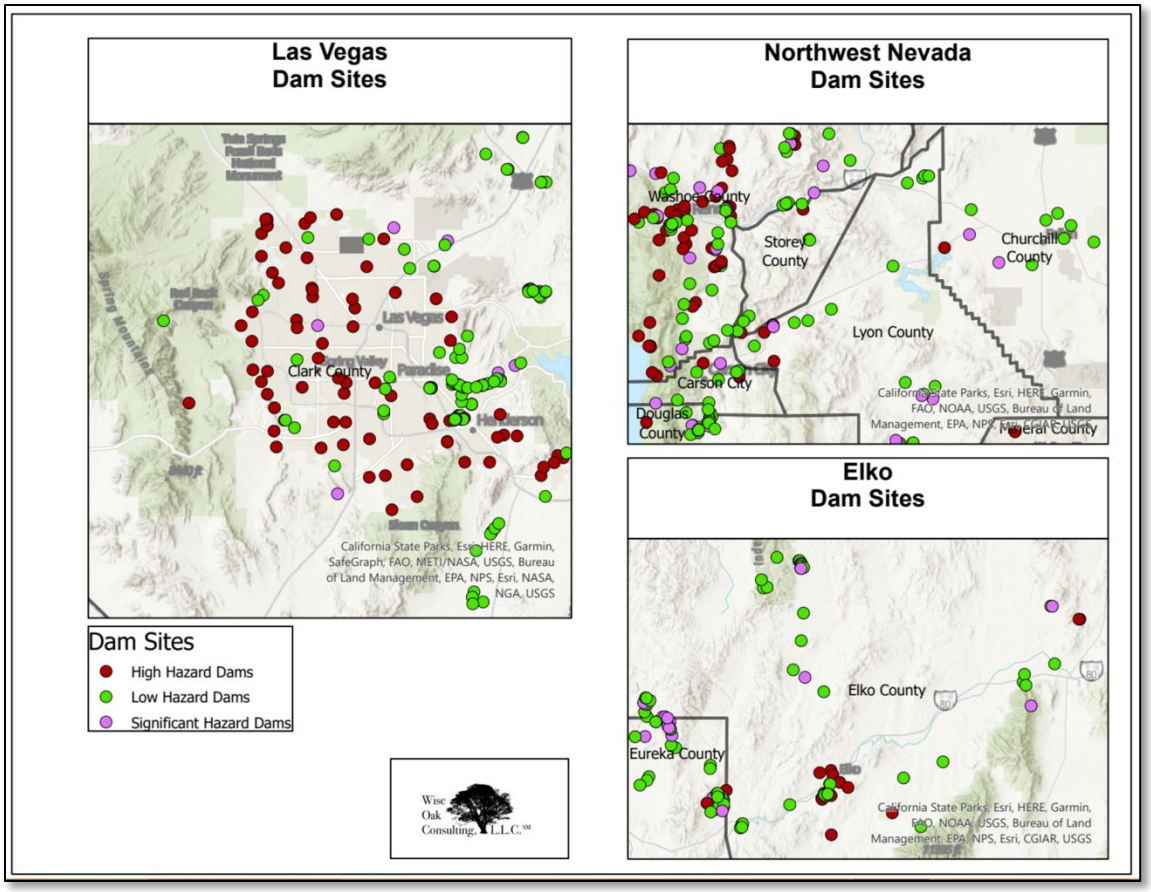


Figure 3-210. Nevada Dam Sites - Statewide.[157]

[157] https://arcgis.water.nv.gov/arcgis/rest/services/NDWR/Dam_Sites/FeatureServer

Figures 3-211 and 3-212 depict the downstream hazard potential (hazard designation and maximum storage in acre-feet) statewide and more highly populated areas.

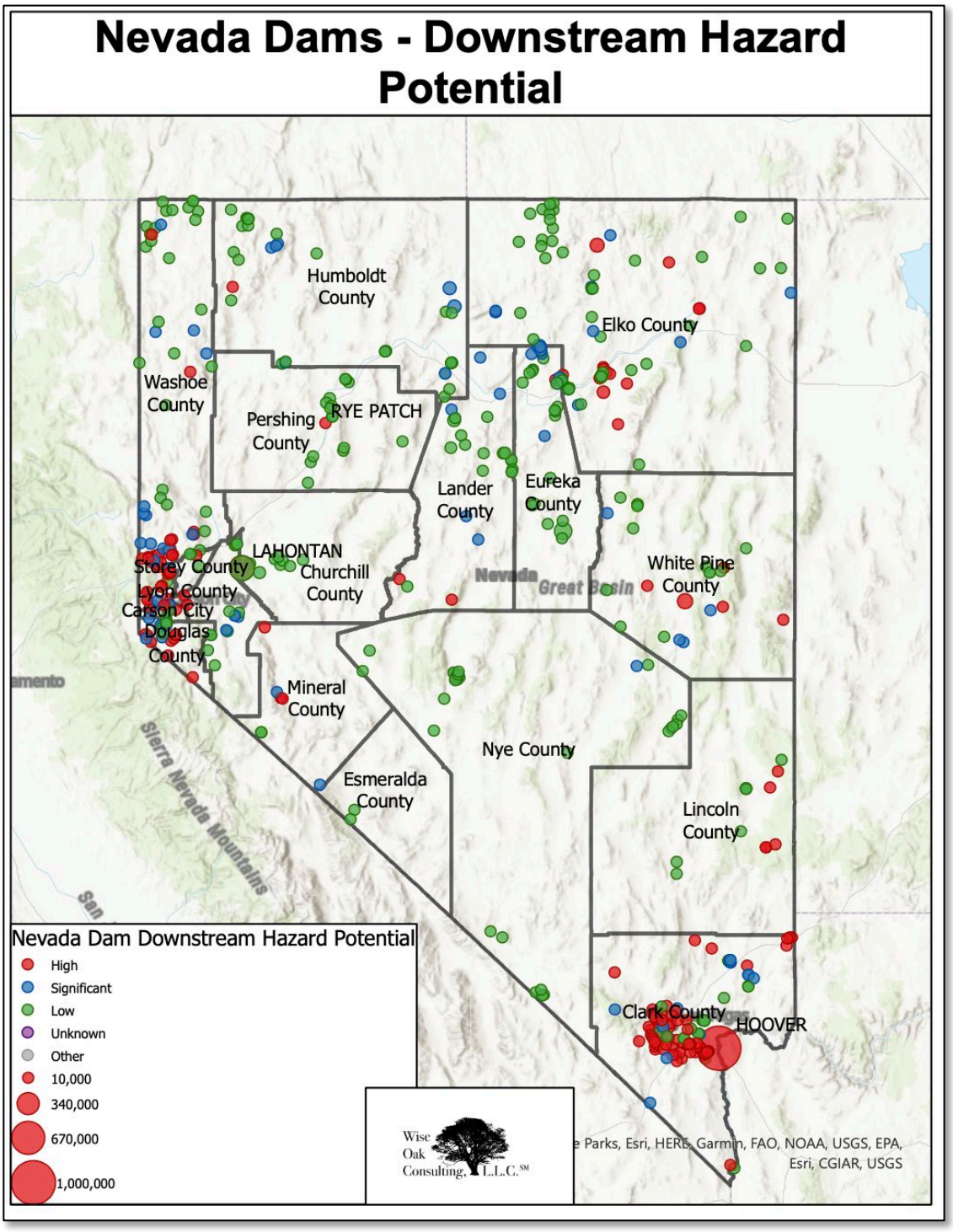


Figure 3-211. Downstream Hazard Potential by Hazard Level – Maximum Capacity in Acre Feet – Statewide.

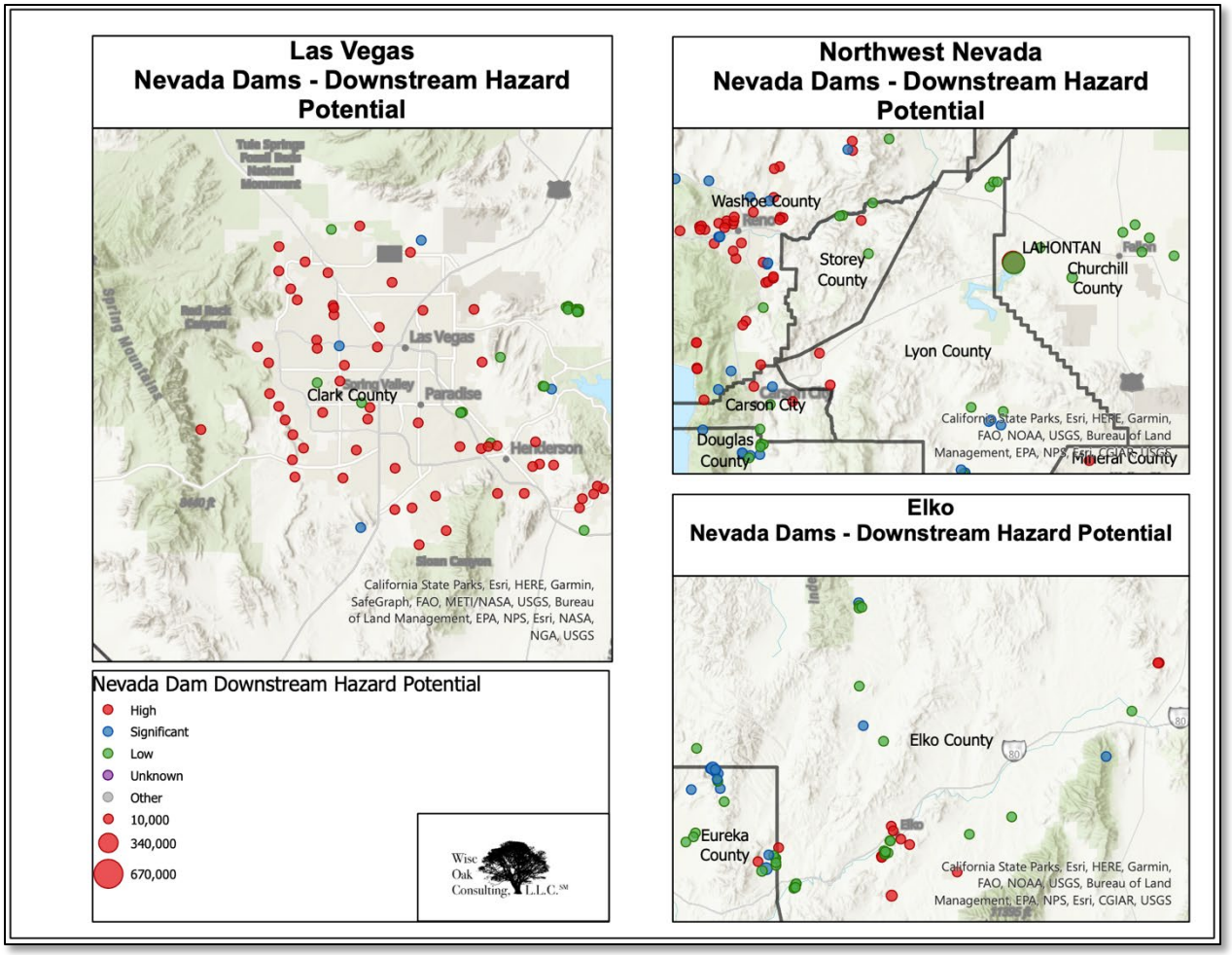


Figure 3-212. Downstream Hazard Potential by Hazard Level – Maximum Capacity in Acre Feet – More Heavily Populated Areas.

In 2007, the NHM Planning Subcommittee sent out a hazard mitigation survey to the counties and tribal entities to collect data on dam failure hazard. All counties except Esmeralda and Nye have at least one dam that is considered high hazard.

In its hazard mitigation plan, Esmeralda County does not list dam failure as a potential hazard of consideration. In their hazard mitigation surveys and/or county hazard mitigation plans, Eureka, Clark, and Douglas considered this hazard as low risk. Clark County has over 90 dry storm water detention facilities to help with flash floods. Churchill and Storey Counties consider the hazard of failing dams as medium risk. Churchill County mentioned that the Lahontan Dam is aging. This dam is watched closely by Churchill County officials. Elko lists dam failure as a moderate hazard with Bishop Creek Dam as their main concern.

In the tribal hazard mitigation surveys, Shoshone-Paiute Tribes of the Duck Valley Reservation and the South Fork Band of the Te-Moak Tribe of Western Shoshone Indians of Nevada consider the hazard of dam failure a low risk. On the Wildhorse Reservation, there is a 38-year-old dam that is in good condition. On the South Fork Band of the Te-Moak Tribe of Western Shoshone Indians of Nevada reservation, there is a diversion dam for irrigation. The Elko band of the Te-Moak Tribe of the Western Shoshone Indians of Nevada did not consider dam failure as a hazard to their community.

In the 2004 plan, the steering committee recognized the WMD/Terrorism threat rating to all dams (including Hoover and Davis Dams) as potential terrorist targets. The Bureau of Reclamation, Lower-Colorado Region considers the following factors in declaring an emergency at Hoover Dam:

- Structural or slope stability problems during a post-earthquake inspection
- Identification of new cracks or settlement, abnormal seepage
- Instrumentation readings outside of normal range limits
- Potential landslides in the vicinity of the dams or appurtenant structures
- A situation at Hoover Dam in which the average daily water releases exceed 19,000 cubic feet per second for 30 days or more
- A situation where Lake Mead is expected to reach elevation 1219.61 feet (top of joint use) and the National Weather Service forecasts heavy rain or runoff.
- A situation where an earthquake occurs with a magnitude of 3.9 (Richter-Scale) or greater occurs within a distance of 15 miles from the dam.
- A situation wherein a technological (man-caused) emergency occurs within the vicinity of the dam that would impact normal dam and/or power plant operations. Such emergencies could include a facility fire, explosion, terrorist incident, hostage situation or toxic spill on the highway or dam crest.
- A situation wherein Glen Canyon Dam has an unusual event that impacts the structural integrity of the Hoover Dam or power plant.
- Flooding due to dam failure is considered a “high hazard.” The hazard itself is difficult to quantify because dams could fail from earthquakes, excessive rainstorms, landslides, or human-induced factors. But the consequences can be severe on a local level.

At this time, NDWR is in the process of developing emergency plans for all “high” and “significant” hazard rated dams in the State. Action items from these plans will be incorporated into this Plan upon their completion. The representatives on this subcommittee expect to increase the capability to mitigate these hazards by greater coordination between NDWR, Nevada DEM, NDOT, and SPWD. Additionally, it is anticipated that there will be greater opportunity to leverage funding from existing resources. The State of Nevada supports NDWR’s efforts in mitigation action items related to this hazard.

ELEMENT	REQUIREMENTS
S10. Does the plan prioritize mitigation actions to reduce vulnerabilities identified in the risk assessment? [44 CFR §§201.4(c)(1), 201.4(c)(3)(i) and (ii); and 201.4 (c)(3)(iii)[158]; 201.4(c)(4)(ii); ; FMAG: 44 CFR §205.51(d)(2)]	a. The plan must identify actions based on the current risk assessment to reduce the vulnerability of jurisdictions within the state as well as the vulnerability of state-owned assets as described in Elements S5 and S6. b. The plan must describe the process used by the state to evaluate and prioritize actions that are cost-effective, environmentally sound, and technically feasible. c. The plan must describe how each action contributes to the hazard mitigation goals. d. The plan must describe how local government mitigation strategies link to the state mitigation strategy. e. *If the state is interested in FMAG program eligibility, the state mitigation plan's mitigation strategy must contain wildfire-related mitigation initiatives. (See FMAG2 in Section 3.9.).* f. *If the state is interested in HHPD funding eligibility, the plan must prioritize mitigation actions to reduce vulnerabilities from high hazard potential dams (see HHPD4 in Section 3.8.).*
S11. Was the plan updated to reflect progress in statewide mitigation efforts and changes in priorities? [44 CFR §201.4(d)]	a. The plan must provide a narrative of the status of each mitigation action in the previous plan. This narrative must identify which actions have been completed or not completed. For uncompleted actions, the plan must describe whether the action is either no longer relevant or included in the updated plan. b. The prioritization of mitigation actions and activities must be updated based on the updated analysis of risks, capabilities and progress.

3.3.18.4 Climate Change.

See Section 3.3.7.4 for the effects of climate change on floods.

3.3.18.5 Vulnerability of State Assets

The vulnerability of state critical buildings to floods is provided in Appendix T. Table F-1 identifies dams that have Emergency Action Plans. Emergency Action Plans (EAPs) for dams contain the expected impact on both local jurisdictions and state assets. The EAPs are not publicly shared but available on request for those with a need to know.

3.3.18.6 Mitigation

The Division of Water Resources – Dam Safety Program evaluates HHPDs via recurring visual inspections. Prioritization of deficiencies are done by immediacy of correction action needed. This is done by giving timeframes for corrective actions of Immediate (30-days), Short-term (one year), and Long-term (two-years). If corrective actions identified are not performed, DWR can

[158] 44 CFR §201.4(c)(3)(iii): "An identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified."

force dam owners to reduce the allowed impoundment levels retained by the dams or not allow any impoundments at all. Additionally, DWR can assess fines and penalties to dam owners found in violation of Nevada NRS, NAC, and Dam Permit Terms. Such deficiencies and associated remedies can include removing deep-rooted and overgrown vegetation, filling/compacting rodent holes and instituting a rodent control program, ensuring the Division has a sufficiently updated Emergency Action Plan (EAP) on file, and many others. The Division works with dam owners and operators to offer guidance in conducting these repairs and works to connect owners with resources, financial or otherwise, to address deficiencies.

Conducting thorough inspections on a regular basis and the issuance of inspection reports helps reduce risk through communication and cooperation with dam owners on notable deficiencies. In an effort to further reduce risk, and as manpower becomes available within the Dam Safety Program, the Division aims to perform more comprehensive dam inspections that would include an in-depth and thorough review of the particular dam file prior to the inspection, including prior inspection reports, plans, cross-sections, any previous design changes, and other notable items that would aid the inspector in ensuring the dam is operating as intended. A comprehensive prior review of the file can alert the inspector to known or potential issues or interesting features geotechnically or hydrologically, yielding an indication of potential risks for that structure.

Consideration for cost-effectiveness and environmental soundness of mitigation actions are not within the legal purview of the DWR. The Nevada Division of Environmental Protection (NDEP) has statutory authority over environmental concerns such as pollution while the Nevada Division of Wildlife (NDOW) has statutory authority over wildlife concerns. Cost-effectiveness of mitigation actions is a concern of the dam owners and not within the legal purview of the DWR. Technologically feasibility of mitigation actions is addressed by the DWR when the mitigation actions require a dam modification permit.

Appendix L is a list of completed mitigation activities. Currently, DWR does not keep a log of mitigation actions as activities to improve dam safety range from normal maintenance to large-scale construction projects. However, large-scale construction projects typically require applications that are processed by DWR and retained in DWR's records.





3.3.19 Flooding Along Irrigation Ditches and Canals

3.3.19.1 Nature



Figure 3-213. Flooded Intersection in a Residential Area of SW Reno - Overflow of Last Chance Ditch in 2006.

Most flooding occurs along canals and ditches in areas not mapped or designated by FEMA as floodplain because the canals and ditches are not natural waterways, but manmade waterways. Most canals and ditches in Nevada were constructed in the late 1800s and early 1900s to deliver agricultural water from Nevada's few rivers to otherwise dry farms and ranches located at some distance from those rivers. Since that time, urban expansion has extended to areas adjacent to these irrigation ditches such that in some places they are now surrounded by residential, commercial, industrial, and other development. In some cases, buildings have been built immediately adjacent to ditches and are often at elevations lower than the elevations of the ditches. The ditches are generally operated for several months of the year from spring to early fall, often coinciding with times of heavy rainfall and runoff that exacerbate flooding.

A listing of most ditches and canals in Nevada and their county and topographic quadrangle is shown in Appendix N and available online at this link:
http://nevada.hometownlocator.com/features/cultural,class,canal,startrow,1.cfm

Failure of canals and ditches can be aggravated by any of the following factors acting individually or in combination:

- Structural weakness of levee walls
- Overwhelming by excess storm water runoff
- Strong earthquake shaking
- Rodent burrowing
- Diversion of river water into ditches during storms
- Clogging with debris

Canal and ditch failures can lead to inundation of homes and businesses as well as damage to personal property, such as parked cars, stored motor homes and warehoused materials. Infrastructure damage can include roads and utilities, as well as the structural damage to the canal or ditch itself. In some cases, the flooding can be deep and fast enough to endanger the lives of people who are caught in it or who might attempt to cross flooded areas.

3.3.19.2 History

There have likely been many breaks in ditches and canals in Nevada that were unrecorded because there were few people to witness or little property that was damaged. Most damage has been caused by severe storms, but some canal failure has been documented by strong shaking from earthquakes.

Storm runoff into a canal can quickly increase hydraulic loads and potentially overwhelm its water-carrying capacity. The rapid increase in storm water can find the weaker parts of a canal embankment, potentially causing them to fail. Rodent burrowing was a contributing factor in weakening the canal embankment that failed after heavy rains on January 5, 2008, in Fernley and flooded 800 homes. This canal failure resulted in a presidential disaster declaration.

Strong ground motion or surface rupture from earthquakes can also damage and fail canal embankments. In the July 6, 1954, Rainbow Mountain earthquake near Fallon, canal embankments liquefied and flowed into the canal and several breaches also occurred to embankments in the canal system (Steinbrugge and Moran, 1956). During the April 25, 2008, Mogul earthquake, an elevated section of the Chalk Bluffs Ditch was collapsed by a rockslide. Fortunately, the water flowed into a small runoff channel and away from homes in the immediate area. There are sparse records of flooding associated with canal and ditch failure; some instances are listed in Table 3-41.

Table 3-41. Nevada Canal and Ditch Flood History

Date	Location	Description; injuries; damage cost
July 6, 1954	Fallon, NV	Canal damage caused by earthquake; embankment failures; 0 injuries; ~$1M estimated cost (~$11M in 2022 dollars).
January 1, 1997	Reno, NV	At least 5 washouts of ditch; 0 injuries; no estimates of cost
December 31, 2005	Reno, NV	Emergency declaration; Multiple canal breaks and houses flooded;0 injuries; no estimates of cost
January 5, 2008	Fernley, NV	800 homes flooded; >1500 people evacuated;0 injuries;
April 25, 2008	Mogul, NV	Canal damage caused by earthquake; 0 injuries; $1.8M cost
June 11, 2008	Fernley, NV	Disaster declaration 1738; Substantial damages; 0 injuries; Approximate cost $3.5M (~$6.2M in 2022 dollars).

3.3.19.3 Location, Severity, and Probability of Future Events

Generally, the greatest hazard from canal and ditch flooding is in developed areas, although damage to an important roadway in a rural environment can have serious consequences as well. Flooding in open fields or on agricultural lands is usually limited to economic loss of crops or livestock. Within developed areas, the most vulnerable structures are those closest to the canals or ditches, in potential flood paths, or where flooding may be concentrated. Within areas of dense building development, flooding will commonly follow the relatively unrestricted roadways. Where the flood can spread out, become shallower in water depth, and have a lower flow velocity, the hazard and severity decreases. Areas that can be the most severely affected occur where canal or ditch flow can join other water flow, such as at stream channel intersections.

The probability of flooding from canals and ditches is largely tied to large storm events, occurrence of local earthquakes, and to development adjacent to ditches and canals. The probability of recurrence is likely based on historical events unless mitigation activities such as new codes and regulations for land use planning are successful in restricting new development in flood-prone areas adjacent to ditches and canals.

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.

3.3.18.4 Climate Change

See Section 3.3.7.4 for the effects of climate change on floods.

3.3.20 Hazardous Materials (Medium/Significant Risk)

3.3.20.1 Nature

Hazardous materials are substances that pose a significant risk to life or to the environment. Environment includes surface water, groundwater, drinking water supply, land surface, subsurface strata, ambient air, dry gullies and storm sewers that discharge to surface waters. Hazardous materials are substances that may be toxic, reactive/oxidizing, corrosive, flammable/combustible, radioactive, or explosive. Incidents involving hazardous materials can result in the evacuation of a few people to entire communities. Costs associated with hazardous material releases can easily run into millions of dollars for damages and cleanup.

NAC 445A.3454 definition of a hazardous substance:

"Hazardous substance" includes, without limitation, any of the following:

1. A contaminant as defined in NRS 445A.325;
2. A hazardous material as defined in NRS 459.7024;
3. A hazardous substance as defined in 40 C.F.R. Part 302;
4. A pollutant as defined in NRS 445A.400; and
5. A regulated substance as defined in NRS 459.448.

NRS defines a Hazardous Material as any substance or combination of substances, including any hazardous material, hazardous waste, hazardous substance or marine pollutant:

1. Of a type and amount for which a vehicle transporting the substance must be placarded pursuant to 49 CFR Part 172;
2. Of a type and amount for which a uniform hazardous waste manifest is required pursuant to 40 C.F.R. Part 262; or
3. Which is transported in bulk packaging, as defined by 49 CFR § 171.8
   Source: Nevada NRS and NAC as identified above.

In Nevada, hazardous materials are regulated by numerous Federal, State, and local agencies including EPA, U.S. Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), National Fire Protection Association, FEMA, Department of Homeland Security (DHS), U.S. Army, International Maritime Organization, Nevada State Fire Marshal's Office, Nevada SERC, NDEP, Nevada Department of Public Safety (NDPS), Nevada Public Utilities Commission, and Nevada Counties and Cities.

Applicable Federal Laws governing hazardous materials include the Comprehensive Environmental Response, Compensation, and Liability Act *(CERCLA) of 1980,* Superfund and Reauthorization Act (SARA) (amendment to CERCLA) of 1986, Resource Conservation and Recovery Act (RCRA) of 1976, Hazardous Materials Transportation Act (HMTA) of 1975, OSHA of 1970, Toxic Substances Control Act (TSCA) of 1976, Clean Air Acts of 1955-1990, and the Clean Water Act of 1972.

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 SARA (42 USC 11001-11040; 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 EPCRA, CERCLA and Section 112(r) of the Clean Air Act" (https://www.epa.gov/epcra/consolidated-list-lists).*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, flooding, and forest fires on fixed facilities may be particularly serious due to

impairment or failure of the physical integrity of their containment facilities. The threat of any hazardous materials 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.

On behalf of several Federal agencies including the EPA and 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.

Nevada DEM operates the State Emergency Operations Center (SEOC). In the event of an emergency in Nevada that poses a significant threat to human health, property and/or the environment, Nevada DEM may opt to stand up the SEOC. Under the federally mandated Incident Command System, 15 Emergency Support Functions (ESF) exist to provide technical support, resources, program implementation and services that are most likely needed to save lives, protect property and the environment, restore essential services and critical infrastructure, and help affected communities return to normal. NDEP is the primary agency responsible for ESF 10 – Oil and Hazardous Materials Response in the State of Nevada. NDEP fulfills this role by providing technical support with respect to the detection, identification, cleanup and disposal of hazardous substances in the event of a State-wide incident. As detailed in the Nevada State Comprehensive Emergency Management Plan (SCEMP), January 2014, "NDEP is responsible for providing guidance regarding the response of the State and the assistance it would render in an actual or potential disaster or emergency involving the release of hazardous materials to the environment, which includes soil, air, and water quality. NDEP is the primary state agency to coordinate state, federal and/or private resources to detect, identify, contain, cleanup, dispose of, and minimize releases of hazardous substances; and prevent, mitigate or minimize the threat of potential releases."

The primary bureau within NDEP that manages and coordinates the capabilities described above is the Bureau of Corrective Actions (BCA). BCA coordinates activities of remediation contractors, as applicable, and ensures that all cleanup meets state regulatory standards. To this end, the Environmental Assistance Program (EAP) within the BCA maintains the State Hazardous Material Response Plan and Guidance Manual and operates/manages the Nevada 24-hour Spill/Complaint reporting hotline to receive hazardous substance spill reports and public drinking water system related calls and complaints 24 hours a day, seven days a week. Once the call information is documented, the information is routed to the appropriate agency for follow up. EAP staff participate in meetings, exercises and State-wide emergency management plan preparation to help plan, prevent, mitigate or minimize the threat of potential releases. Additionally, upon request by Nevada DEM during a State emergency, staff from the EAP activate to the SEOC to coordinate ESF 10 activities and become the liaison between Nevada DEM and NDEP during the emergency.

3.3.20.2 Identification of Hazardous Materials Releases

1. Hazardous materials are regulated, monitored and inspected regularly by various entities in the State of Nevada. The following list provides information regarding identification of hazardous materials releases:
2. Fixed site facilities such as, but not limited to, chemical plants, storage facilities, manufacturing facilities, warehouses, mine sites, water and wastewater treatment plants, swimming pools, dry cleaners, automotive sales/repair sites, and gas stations exist throughout the State. In Nevada, NDEP (under the DCNR), the State Fire Marshal's

Office and the SERC share responsibility for monitoring hazardous materials. The State Fire Marshal and the SERC have a combined database that stores data about fixed facilities with hazardous materials meeting: a) the most current International Fire Code, and/or b) the EPCRA requirements. The total number of permitted/reported fixed facilities in Nevada is over 5,860. The EPCRA facilities with highly hazardous/extremely hazardous substances is over 1,580. Fees are imposed on EPCRA fixed facilities for planning, training and equipment for first responders. The funding is managed by the SERC who provides grants to the local emergency planning committees (LEPCs) in the State; there is one LEPC per county in Nevada. Each LEPC develops and annually reviews a hazardous materials response plan for their county and provides updates. The plans and updates are reviewed annually by the SERC's standing Planning and Training Subcommittee. Each plan must be approved in order to receive operating funds and grants from SERC.

3. All transportation including highway, rail and air is monitored for hazardous material releases by DOT. Figure 3-214 shows highway and rail routes. For a listing of annual Nevada highway incidents, see Table 3-42. Some special transport cases specific to Nevada are listed below:
   - Proposed nuclear transportation to Yucca Mountain (currently tabled but may come up again in future administrations)
   - Waste Isolation Pilot Project transportation of transuranic waste in and through Nevada
   - Transportation storage of DOE elemental mercury stockpile at the Hawthorne Army Base in Hawthorne Nevada.
4. Pipeline transit of liquid petroleum, natural gas, or other chemicals is monitored for releases by DOT.
5. Non-terrorist related intentional or accidental acts that result in the release of a hazardous material by private persons or groups are monitored by DCNR and DPS. Examples include clandestine methamphetamine laboratories and hazardous materials released in private and public settings.
6. Terrorist-related acts resulting in the release of chemical, biological, radiological, nuclear, or explosive materials (CBRNE) are monitored and responded to by DPS and the Nevada National Guard (NNG).
7. Historic release sites are regulated or managed by NDEP. Examples include the Sparks solvent fuel site in Washoe County, the Basic Management Incorporated (BMI) Complex in Clark County, perchloroethylene (PCE) plumes in Washoe and Clark counties, the Hawthorne Army Depot in Mineral County, the Carson River Mercury Superfund Site, and the Anaconda Copper Mine Site.
8. Naturally occurring geological formations containing potentially hazardous substances exist within the state. An example is erionite, an asbestos-like substance. Erionite is discussed in detail below.

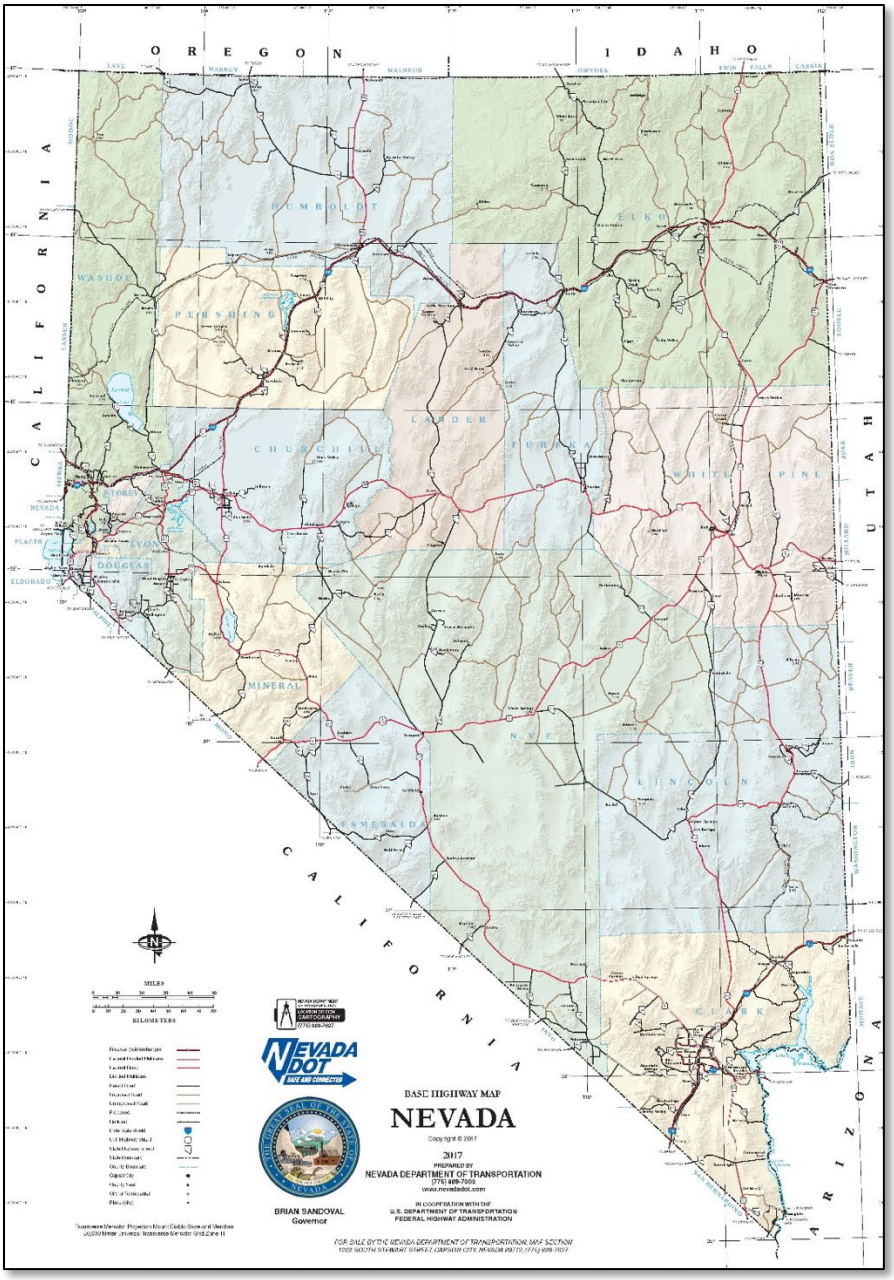


Figure 3-214. Map of Nevada Showing Major Transportation Routes Including Highway and Rail.[159]

3.3.20.3 History

Hazardous material events are no longer unusual in Nevada. Table 3-42 lists the number and location of highway accidents involving Hazardous Materials from January 2013 through October 2017 on Nevada highways as recorded by NDOT. Tables 3-43 and 3-44 provide enumerations of hazardous material event spill calls from 2000 through 2017. These types of events should be planned for due to the amount of hazardous materials located in, and shipped through the State.

[159] The online link to this map is: https://www.nevadadot.com/home/showdocument?id=122.

Table 3-42. Nevada Highway HAZMAT Incidents from January 2013 through October 2017[160]			
County/Street	**# of Events**	**County/Street**	**# of Events**
CARSON CITY		*HUMBOLDT*	
Surface streets	2	Interstate 80	1
SR529	1	*LANDER*	
CHURCHILL		Interstate 80	1
Interstate 80	2	*LINCOLN*	
US50	1	SR319	1
US95	1	US93	3
CLARK		*LYON*	
Surface streets	24	SR427	1
Interstate 15	46	US95A	1
Interstate 215	2	*MINERAL*	
SR159	1	SR362	1
SR160	1	US95	3
SR562	1	*NYE*	
SR573	3	Surface Streets	1
SR574	7	SR160	1
SR589	2	SR373	1
SR592	1	US95	2
SR594	1	*PERSHING*	
SR596	1	FRPE15	1
SR599	1	Interstate 80	6
SR604	2	*STOREY*	
SR612	4	Surface Streets	2
US 95	4	*WASHOE*	
US 93	15	Surface Streets	10
DOUGLAS		Interstate 80	12
SR28	1	Interstate 580	9
US395	4	SR445	2
ELKO		SR468	1
Surface Streets	1	SR659	3
Interstate 80	10	US 395	5
US93A	1	*WHITE PINE*	
US93	2	Surface Streets	1
ESMERALDA		US6	1
US95	1	US50	1
EUREKA		US93	5
Surface Streets	1		
Interstate 80	4		
SR306	1		

[160] Source: NDOT, crashinfo@dot.state.nv.us

Table 3-42. Nevada Highway HAZMAT Incidents from January 2013 through October 2017[160]			
County/Street	**# of Events**	**County/Street**	**# of Events**
SR766	1		

Radiation Control and the Nevada Test Site:
DPBH is designated by NRS 459 as the state radiation control agency. Consequently, the DPBH, Radiation Control Program is the state agency having primary responsibility to respond, in the state, to any radiological emergency, or non-emergency incident. For more information, refer to the State of Nevada Radiological Emergency Response Plan or call (775) 687-7550 for nonemergency inquiries. Please refer to Appendix R for the complete "State of Nevada Radiological Emergency Response Plan". The state has also recently developed a "State of Nevada Radiological and Nuclear Detection Sustainment Guidance and Concept of Operations."

Table 3-43. Nevada Spill Calls By Year, 2000-2017[161]	
Year	**Total Spill Reports**
2000	520
2001	447
2002	439
2003	465
2004	533
2005	639
2006	640
2007	650
2008	628
2009	487
2010	452
2011	548
2012	566
2013	548
2014	514
2015	609
2016	533
2017	665
Total	**9883**

Table 3-44. Nevada Spill Calls by County, 2000-2017[162]	
County	**Spill Reports 2000-2017**
Carson City	295
Churchill	308
Clark	3595
Douglas	356
Elko	620
Esmeralda	39
Eureka	356
Humboldt	413
Lander	158
Lincoln	75
Lyon	556
Mineral	117
Nye	453
Pershing	104
Storey	95
Washoe	1740
White Pine	173

The following hazardous materials events were chosen to represent the various types of incidents which have occurred in Nevada. These events help illustrate the hazards Nevada may face in the future. This list is not intended to be comprehensive. These events have been divided into two types: **Discovery event**: an historic or otherwise unobserved, release that is inferred to have occurred based on the discovery of contaminated soil or groundwater. A reporting determination is based on the magnitude and extent of discovered contamination. **Contemporaneous event**: a release that occurs in real-time that is observable or measurable such that a reporting determination can be made based on the volume or quantity of the hazardous substance released.

[161] *Source:* https://ndep.nv.gov/environmental-cleanup.
[162] Ibid.

Discovery Event Releases:

Carson River Mercury Superfund Site[163]

During the 1850s Comstock Lode mining era, mercury was imported and used for processing gold and silver. Over 250 historic mill sites are located near Carson River and Steamboat Creek. During the height of the mining era, the mills discharged an estimated 14,000,000 pounds of mercury into the two drainages, primarily in the form of mercury contaminated tailings. The rivers then conveyed and dispersed the mercury throughout their entire networks. The Carson River Mercury Site (CRMS) was added to the National Priority List (NPL) in August of 1990 under CERCLA (Superfund Act) and is jointly managed by NDEP and EPA, Region 9. The original EPA CRMS study area spans Washoe, Carson City, Storey, Lyon and Churchill Counties. In 2010, an effort was made to compress the CRMS into smaller investigative footprint areas where the contamination is most prevalent: mill sites, tailing piles, current and historic river channels and canals, Washoe Lake, Lahontan reservoir, Carson Lake, Carson sink, Stillwater Marsh and areas of sediment deposition (e.g. the 100 year flood plain). The two smaller investigative footprint areas created in 2010 are called Operable Units One and Two (OU-1 and OU-2). OU-1 in general is the land above the Carson River's banks and includes the historic mill sites, tailing piles and the Carson River floodplain from Carson City to the Six-Mile Canyon alluvial fan. OU-2 is comprised of sediments and biota found in the main channel of the Carson River below the customary and high water mark from Carson City to the terminal water bodies and wetlands east of Lahontan Reservoir, including contaminated floodplain deposits due to overbank deposits and/or flood irrigation practices downstream (east) of the Six-Mile Canyon alluvial fan. Many areas in the CRMS have yet to be characterized so the investigation into the extent of mercury contamination in these two areas is ongoing.

Anaconda Copper Mine Site[164]

The approximately 3,400-acre former Anaconda Copper Mine Site (Site) is located west of the City of Yerington, in Lyon County, Nevada. The Site includes both private land owned by Singatse Peak Services (SPS) and public lands managed by BLM. Since the Site was abandoned in 2000, EPA and NDEP have addressed environmental concerns working towards long-term closure. The bulk of the Anaconda operations occurred before modern environmental regulations were in place, so many of the operational practices did not meet current regulatory standards. The Anaconda Site has many areas of potential concern and risk with the highest priorities being the heap leach pads and fluid management system, groundwater impacts, and potential source areas associated with the evaporation ponds. Use of unlined evaporation ponds has resulted in contamination of groundwater. Concentrations of metals above drinking water standards, including arsenic and uranium, occur at the north end of the mine in the area of the former evaporation ponds. These contaminants have also migrated off-site in the area immediately north of the mine site. The extent and magnitude of this contamination has been extensively studied with over 350 monitoring wells installed. The City of Yerington water supply is safe and has never been impacted by the Anaconda Site. There are no City water supply wells located in the vicinity of the mine and the water is regularly tested and complies with state and federal drinking water requirements. Atlantic Richfield Company (ARC) remains responsible for addressing issues related to the former Anaconda operations, including groundwater contamination. When Arimetco abandoned its operations in 2000, the immediate concern was management of the process fluids since the heap leach pads were fully charged with sulfuric acid process solution.

[163] *Source:* https://ndep.nv.gov/environmental-cleanup.
[164] *Source:* https://ndep.nv.gov/environmental-cleanup.

The heap leach pads are all constructed on synthetic liners; therefore, the fluids are collected in lined ditches, pipes and lined pond systems. As the heap leach pads have drained down naturally over time, the fluid flow rates have declined from over 3,000 gallons per minute in 2000 to about 10 gallons per minute currently, but the fluids, which are acidic and high in total dissolved solids, require continued management. With voluntary financial support from ARC and SPS, NDEP constructed two new evaporation ponds in 2013 to contain the drain down fluids as a stop-gap measure, but the ponds will continue to fill with evaporative salts over time, which will ultimately exceed capacity. A long-term remedy is to cap and close the heaps to reduce infiltration of rainwater.

Basic Management Incorporated Complex[165]

In 1941, the U.S. Government deeded approximately 5,000 acres of vacant desert in the southeastern part of the Las Vegas Valley that would become the site of the world's largest magnesium plant – a plant that played a critical role in the World War II effort. Following the war, portions of the plant and adjacent land were leased to various industrial, government and business entities primarily involved in the production of chemicals and products containing chemicals. During the ensuing years, operations at these plants produced a variety of industrial and municipal effluents that were historically disposed of on-site in unlined evaporation ponds, transported off-site via ditches, or disposed of on the land surface. These disposal practices were industry-standard and legal at the time. Some of the wastes migrated into the Las Vegas Wash, a waterway that flows into Lake Mead (a primary source of drinking water for southern Nevada and millions of downstream users). Current waste disposal practices are consistent with all local, state and federal guidelines and regulations. The area is now referred to as the BMI Complex.

Central Truckee Meadows Remediation District and Clark County[166]

In the 1980s, the EPA identified PCE as a possible human carcinogen and required municipal water systems nationwide to initiate systematic monitoring for PCE. Locally, the first sampling of drinking water wells in 1987 showed that five of the municipal water supply wells located in the central Truckee Meadows had PCE concentrations exceeding the drinking water quality standard. PCE was used extensively from the 1940s through the 1980s as a product in chemical manufacturing, as a cleaner/degreaser by automotive repair shops, paint shops, machine shops, and dry cleaning businesses. It was later determined that approximately 16 square miles of the Truckee Meadows ground water system is affected and other drinking water wells are threatened. In addition, in Clark County, PCE contamination has also been identified at multiple sites. Assessment and remediation of many of these sites are still in progress with oversight provided by NDEP.

Sparks Solvent Fuel Site

The Sparks Solvent/Fuel Site (SSFS) is a rail yard and fuel terminal tank farm located in Sparks, Nevada. Industrial activities at the site over the past century led to contamination of groundwater and soils by gasoline, solvents, diesel fuels, and other petroleum products. The rail yard was constructed in the late 1800s and has served as a major east-west thoroughfare for railroad traffic since its construction. The site has been used as a refueling and service area for Southern Pacific Railroad since about 1907 and has been a fuel storage and distribution facility since 1957. Current and past operations at the terminal include the storage, distribution, and loading of gasoline, heating oil, diesel fuels, military fuels, and fuel additives.

[165] *Source:* https://ndep.nv.gov/environmental-cleanup.
[166] Ibid.

In mid-1987 the NDEP was informed of the presence of soil and ground water contamination at the fuel terminal tank farm located just south of Interstate 80 in Sparks, Nevada. In November 1988, petroleum hydrocarbon contamination was noted in the Helms Gravel Pit located approximately 4200 feet east of the fuel terminal. It was determined that the contamination in the gravel pit was from the terminal. In 1989, the NDEP issued an order to Santa Fe Pacific Pipeline Partners (now known as Kinder Morgan Energy Partners) to investigate contamination.
In 1991, the terminal and rail yard landowners and tenants began coordinated environmental investigations at the site through the Vista Canyon Group (VCG).
Investigation of soil and groundwater at the SSFS has been ongoing since 1991. Active site-wide remediation began in 1995. Free-phase petroleum product is no longer present at the site. Currently, the primary chemicals of concern are benzene, methyl tert-butyl ether (MTBE), trichloroethylene (TCE), and PCE. From 1995 to 2009, approximately 4.8 billion gallons of groundwater have been extracted and treated on site.

Contemporaneous Releases

Table 3-45 below provides data on some significant contemporaneous HAZMAT releases recorded in Nevada from 1988 through 2018.

Table 3-45. Historical HAZMAT Events in Nevada

Date	Location	Details and Damages
May 1988	Henderson – Clark County	The PEPCON facility exploded when a welding operation started a fire. The fire spread to AP storage an oxidizer for solid rocket propellant. The explosion resulted, in two deaths, 372 injuries and damage to 7,000 homes and businesses. Damages estimated at 100 million dollars.
May 1991	Henderson – Clark County	A massive leak of liquefied chlorine at Pioneer Chlor-Alkali Company created a cloud of poisonous gas over the city of Henderson, Nevada. Over 200 persons were examined at a local hospital for respiratory distress caused by inhalation of the chlorine and approximately 30 were admitted for treatment. Approximately 700 individuals were taken to shelters. It is estimated that from 2,000 to 7,000 individuals were taken elsewhere.
January 1998	Kean Canyon 10 miles east of Reno – Washoe County	January 7, 1998, two massive explosions just seconds apart destroyed the Sierra Chemical Company's Kean Canyon explosives manufacturing plant ten miles east of Reno, Washoe County, Nevada, killing four workers and injuring six others.
July 2000	Dayton – Lyon County	An explosion of hydrogen trifluoride gas seriously damaged an industrial plant in Dayton, Lyon County, Nevada.
April 2002	Interstate 80 at the California and Nevada Border	A twenty-one car pileup occurred on I-80 at Union Mills Grade just east of the California Highway Patrol scales. Six big rigs were involved, spreading metal debris, gasoline, and furniture across both lanes of eastbound I-80 traffic.
January 2004	Fernley – Lyon County	There was an evacuation of Fernley's Nevada Pacific Industrial Park in Lyon County, due to a strange vapor emanating from a disposal bin at the Philip Services Corporation (PSC) facility. PSC recycles chemicals

Table 3-45. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
		including acids, alkaline substances, cyanide, and battery waste. The smoke-like vapor was found to be nontoxic.
January 2004	Gardnerville – Douglas County	Pau Wa Lu Middle School. A student brought approximately one pound of elemental mercury to the school and shared it with his classmates. 60 students were decontaminated and the school was closed for 14 days while a cleanup was conducted.
February 2006	Southern Nevada Transportation Corridors	A tanker transporting 4,500 gallons of radioactive wastewater from the San Onofre Nuclear Power Plant leaked while *en route* to the disposal site in Utah. This particular tanker's route was through Las Vegas, Nevada. According to the driver, he was unaware of the leak until he stopped at Parowan, Utah.
April 2007	Carson City/County	The Carson City Fire, Sheriff Office and the Quad-County Hazmat Team responded to All Metals Plating facility for the report of an orange gas cloud coming from the facility. A chemical mixing mistake caused a chemical reaction occurred that produced an orange plume of acid vapors that migrated out of the facility. The Plating Shop and adjacent businesses were evacuated. One employee from the Plating Shop was taken to the Hospital for possible exposure to the vapors. NDEP and EPA Region 9 mobilized to the incident to provide assistance to the Incident Commander. The Quad-County Hazmat Team set up a decontamination corridor and performed an entry into the Plating Shop to collect a sample of the waste mixture to be able to identify the substances involved. An environmental contractor worked with the responders to stabilize the hazardous waste for disposal.
August: 2007	Las Vegas – Clark County	A rail tanker containing chlorine gas escaped from the Arden train yard outside of Las Vegas. Reaching a speed of approximately 50 mph the tanker traveled through populated areas of Las Vegas and North Las Vegas. No release occurred.
October, 2007	Reno/Sparks – Washoe County	A breach in the high pressure Kinder-Morgan fuel pipeline caused a 35'X100' petroleum impact area with puddles of Jet-A fuel reported. The site is 1,000 feet from the Truckee River. Estimated release amount was 500 gallons.
January 2008	Fernley – Lyon County	Following intense rain and snowmelt, a canal bank gave way flooding a residential portion of the City of Fernley. Local, State and Federal Disasters were declared. Potentially damaged household hazardous material was identified as a potential threat to the community. NDEP, EPA Region 9, the United States Coast Guard, and FEMA cooperated to hold a household hazardous waste collection event for the flood-impacted residents.
August 25, 2009	Carson City/County	Bella Lago Apartment Complex, 1600 Airport Road, Carson City. Initially the Fire Dept. was called on report of a mercury discovery beneath carpeting in one apartment of a 20-unit apt. building. 220 tenants were evacuated from the building and Hazmat with oversight from NDEP

Table 3-45. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
		took over to proceed with cleanup which involved removing both the concrete floor and 20 inches of dirt below it. Ultimately more than 35 pounds of elemental mercury were recovered from the floor and underlying dirt. Cleanup took several months, and high blood mercury levels were measured in many residents of the complex; seven of those individuals received on-going medical treatment for mercury exposure, including several children. Mercury was traced to a previous tenant who was probably using it to recover placer gold.
June 2010	Elko County	Tanker truck accident. A tanker truck driver turned too tight around a locomotive, the tanker was breached in the middle and 3,500-4,000 gallons of diesel was released to the ground.
July 2010	Elko County	A two-trailer tanker truck's rear tank overturned, caught fire and exploded on Highway 93 causing the closure of the Highway. Approximately 4,500 gallons of gasoline was released to the soil.
August 2010	Churchill County	Approximately 10,000 gallons of hydrochloric acid was released to a chemical room in the City of Fallon New River Water Treatment Plant due to failure of a plumbing fitting during filling of the acid storage tank. The chemical room and an adjacent business were evacuated. An Incident Management Team was activated by the Nevada DEM at the request of the City of Fallon. Both the Washoe County and the Quad-County Hazmat Teams responded to the incident. The hazmat teams, a private hazmat contractor and the City of Fallon worked to pump the acid out of the building. The response lasted five days. The chemical building suffered significant damage. During the response, a temporary water treatment system was set up to provide water to the city.
July 2011	Lincoln County	Tanker Truck Accident. A tanker transporting naphtha (a petroleum hydrocarbon mixture) rolled over, exploded and caught fire near Hiko, Nevada. It was estimated that 8,000 to 9,000 gallons was released. The driver was reported to be injured in the accident.
February 2012	Clark County	Environmental company reported that a valve on a tanker truck holding sodium hydroxide failed, releasing 700 gallons to the warehouse floor. The fire department contained the spill and diluted the product, causing sodium hydroxide solution to enter the storm drain. NDEP worked with the facility to ensure cleanup of the storm drain.
March 2012	Clark County	More than 10 pounds of gas chlorine was vented to the atmosphere at the Titanium Metals Corporation when pH control of the SOX scrubber in the chlorination process was lost.
April 2012	Clark County	City of Las Vegas sewer main broken by a contractor causing over 1,000 gallons of raw sewage to enter storm drain. NDEP worked with the City of Las Vegas to isolate the break for repairs and to clean up the affected storm drain.
June 2012	Lyon County	A trucking facility in Fernley reported that a tote containing 10-15% nitric acid and 30% sulfuric acid fell from a forklift spilling 150 gallons which

Table 3-45. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
		flowed across pavement to a storm water sump. NDEP worked with the facility and its contractor to clean the pavement and excavate the sand filter in the storm water sump.
August 2012	Clark County	Sanitary sewer (raw sewage) overflow from a manhole in Las Vegas. 25,000 gallons of raw sewage entered a storm drain. NDEP worked with the City of Las Vegas and their contractor to isolate and clean the affected storm drain.
September 2012	Douglas County	A resort in the county and Douglas County Utilities ran sewer pumps at the same time, overwhelming the system. 500 to 1,000 gallons of raw sewage was released into a wetlands area. NDEP worked with Douglas County Utilities to clean up standing water and to sanitize the spill area.
March 2013	Clark County	A plastic container containing 10 pounds of mercury was spilled in a homeowner's garage; 2 pounds of the mercury spilled onto the garage floor and some of it also was transported outside to landscaping. EPA worked with the Henderson Fire Department and H2O Environmental to clean up the contaminated areas.
March 2013	Clark County	Sewer main blockage in Las Vegas caused over 83,000 gallons of raw sewage to be released and flow to a storm drain. NDEP worked with the water reclamation district to ensure the sewer main blockage was cleared and the affected ground surface and storm drain were cleaned up and disinfected.
August 2013	Lyon County	Sewer force main break in Fernley caused 200 gallons of raw sewage to flow into a storm drain ditch. NDEP worked with the City of Fernley to ensure that the standing water was removed and the affected storm drain ditch was disinfected.
September 2013	Washoe County	City-owned sewer line blockage in Reno caused release of 200 gallons of raw sewage into a storm drain. NDEP worked with City of Reno Environmental Control to ensure the blockage was cleared and that the storm drain was cleaned and disinfected.
November 2013	Clark County	An apartment complex private sewer manhole overflowed releasing 6,450 gallons of raw sewage which flowed to a storm drain. NDEP worked with Clark County Water Reclamation, Clark County RFCD and Southern Nevada Health District to ensure sewer blockage was cleared and affected ground surface and storm drain were cleaned up and disinfected.
March 2014	Washoe County	Private sewer blockage in Reno discovered by City of Reno staff. Approximately 300 gallons of raw sewage flowed to the storm drain system and a storm ditch. NDEP worked with City of Reno to ensure blockage was cleared and the storm drain system and storm ditch were cleaned up and disinfected.
May 2014	Clark County	Onsite remediation system in Las Vegas became clogged resulting in numerous failures and eventually a release of 1,500 gallons of untreated groundwater to a parking lot and nearby storm drain. The groundwater

Table 3-45. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
		contained TCE. NDEP worked with Clark County RFCD and the responsible party to ensure the remediation system was repaired and the affected ground and storm drain were cleaned up.
July 2014	Washoe County	Sewer line blockage in City of Reno caused release of 1,470 gallons of raw sewage to flow across the pavement to a storm drain. NDEP worked with City of Reno Environmental Control to ensure the blockage was cleared and the pavement and storm drain were cleaned up and disinfected.
December 2014	Lyon County	City of Fernley lift station failure caused 30,000 gallon spill of raw sewage onto soil. NDEP worked with the City of Fernley to ensure lift station repairs were completed and to ensure affected area was disinfected.
February 2015	Humboldt County	A student brought a salt shaker filled with mercury to a school exposing at least 4 others directly by playing with it. Mercury was spilled into a hallway where an unknown number of other school children walked through it. 498 students and 40 school district staff were decontaminated by first responders. EPA had their START contractor use lumexes to evaluate areas of concern. School district hired an environmental firm to conduct cleanup of contaminated areas.
May 2015	Churchill County	A tractor overturned into an irrigation canal in Churchill County, releasing 40 gallons of diesel and hydraulic fluid. The irrigation canal is part of the Truckee-Carson Irrigation District and flows to Stillwater Wildlife Refuge. NDEP worked with the Fallon Fire Department to ensure that booms were placed to capture the release in the irrigation canal.
May 2015	Clark County	Sewer line blockage caused release of 7,200 gallons of raw sewage onto pavement and into a storm drain. NDEP worked with Clark County RFCD to ensure blockage was cleared and that affected pavement and the storm drain were cleaned up and disinfected.
August 2015	Animas River, CO and Colorado River, NV	EPA was conducting an investigation of the Gold King Mine near Silverton, CO. While excavating above the old adit, pressurized water began leaking above the mine tunnel, spilling about three million gallons of water stored behind the collapsed material into Cement Creek, a tributary of the Animas River. The Animas River flows into the Colorado River and eventually Lake Mead, NV. Lake Mead supplies Las Vegas with drinking water. NDEP participated in the regional damage and danger assessments advising the Southern Nevada Water Authority on the spill tracers. To date, no impact has been detected in Lake Mead.
October 2015	Elko County	Mining company drilling activity incident caused 60,000 gallons of drilling fluid containing barite, native soil and water into Stormy Creek. NDEP worked with the mining company to ensure that erosion controls were deployed around the impacted area and that creek cleanup was conducted.

Table 3-45. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
October 2015	Nye County	A fire was reported by US Ecology Nevada. US Ecology manages a hazardous waste treatment, disposal, and metals recycling facility near Beatty, NV. Initially, the exact extent and cause of the fire was unknown. Due to the proximity to Nevada's low-level radioactive waste site, the Nevada Emergency Operation Center activated. The Civil Support Team was activated to coordinate with Nye County officials, DOE, NDEP, and the EPA to determine damage and danger assessment. The fire was out within one day and no injuries were reported. Follow-up assessment included updating remedial design for the facility.
January 2016	Humboldt County	A mine in Humboldt County reported that 6,000 gallons of process solution spilled onto soil due to a valve failure; the solution contained 3.12 pounds of cyanide. NDEP worked with the mine to ensure affected soil was cleaned up and disposed of properly.
March 2016	Clark County	A dairy reported that equipment failure caused nearly 100 pounds of anhydrous ammonia to be released to the air at their facility. Evacuation was ordered. NDEP worked with Clark County Air and Southern Nevada Health District to determine the cause. Evaporating water on a diffusion tank wall (inside the tank) left residual ammonia, which tripped an in-tank alarm. The reported amount of released anhydrous ammonia was significantly downgraded and it was determined that there was negligible release to the atmosphere. No injuries reported, and evacuation and return were successful.
June 2016	Lyon County	A viral video surfaced showing employees dumping 55-gallon drums with unknown liquid contents through the chain-link fence of a facility. NDEP contacted EPA regarding the incident. The day the video surfaced, NDEP Bureaus of Corrective Actions, Water Pollution Control and Waste Management visited the facility to conduct inspections and inquire about the dumping. Subsequently, NDEP worked with EPA to conduct soil sampling outside the fence where the liquids were poured. Analytical results showed that the soil was not impacted with harmful chemicals. The facility was ordered to discontinue dumping drums through the fence and to provide documentation of all future disposal activities.
June 2016	Douglas County	A vehicle accident caused 45 gallons of diesel to spill on the Lutheran Bridge over the Carson River. Two to three gallons of the diesel impacted the Carson River. NDEP routed the spill report to Bureaus of Water Pollution Control, Safe Drinking Water and Corrective Actions, NDWR and Douglas County. EPA worked with NDOT and H2O Environmental to ensure that the spill was cleaned up with no additional impact to the Carson River.
August 2016	Storey County	A building products facility reported equipment failure and overflow (within and outside of the building) of their water ionizing treatment plant. The overflow fluid contained up to 54% sulfuric acid and did reach a storm drain. NDEP worked with the facility to determine that although

Table 3-45. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
		the storm drain pipe was impacted, no fluid reached the outfall of the pipe. The storm drain pipe, pavement and affected building interior were cleaned up by Clean Harbors.
August 2016	Douglas County	Tahoe Queen fire reported in Zephyr Cove. EPA, Douglas County, Tahoe Regional Planning Agency and Tahoe Water Suppliers Association notified. Personnel from the Bureaus of Water Pollution Control and Corrective Actions traveled to Zephyr Cove to inspect the firefighting activities. U.S. Coast Guard had boomed around the vessel and there was no evidence of spilled oil on the surface of the lake. Within the boom there was fire debris and ash as well as biodegradable firefighting foam on the water surface. Firefighters put out the fire and absorbent pads were used to absorb the foam within the boom area. Nets were then used to remove fire debris and ash.
September 2016	Clark County	Clark County reported a mercury release at Walter Johnson Middle School and requested EPA Emergency Response Team (ERT) activation to the school. The mercury release apparently occurred at least a week prior to the report and mercury contamination had been spread through various portions of the school. The school was locked down and the EPA ERT screened over 1,200 students for many hours, releasing them in small groups as they were cleared. This was one of the largest health-related school lock down's in the country. EPA oversaw cleanup of the mercury in the school and even at the homes of some students who had the most contact with the mercury.
November 2016	Elko County	An airplane crash was reported in a parking lot in downtown Elko. The crash caused a large fire. Firefighting water and foam entered a storm drain. NDEP worked with City of Elko Environmental and H2O Environmental to determine that flow of the material did not reach the river and environmental impacts from hydrocarbons were negligible because the fire burned off the hydrocarbons.
December 2016	Clark County	A Henderson grocery store reported that an employee broke an industrial thermometer spilling 6 to 8 ounces of mercury near the commercial fryer. The employee tried to clean up the mercury and was contaminated. The store was closed until Henderson Fire could assess the situation and contamination could be cleaned up. NDEP informed Southern Nevada Health District who took lead on cleanup as the facility is a food establishment.
April 2017	Storey County	A facility in the Tahoe Reno Industrial Park reported that a 55-gallon drum of ethyl methyl carbonate fell off a trailer and contents flowed into a storm drain. NDEP worked with Quad County HazMat and Clean Harbors to ensure that the spill was cleaned up. Although the material reached the storm drain, flow did not make it to the Truckee River.
May 2017	Washoe County	A casino in Reno reported that an equipment malfunction caused release of 30,000 gallons of untreated PCE-contaminated water to the storm

Table 3-45. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
		drain. Bureau of Water Pollution Control (BWPC) worked with the permitted facility to determine the cause and ensure that repairs were completed in a timely manner to minimize release of the untreated groundwater. BWPC also informed the City of Reno, Truckee Meadows Water Authority, the Water Master and the Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation of the release.
June 2017	Lovelock – Pershing County	A triple trailer overturned on an off ramp into Lovelock, spilling an unknown chemical into the nearby flowing irrigation ditch. Due to the pungent smell the nearby residents were evacuated. NDEP worked with the UPS Hazmat team, H2O Environmental, and Reno Hazmat team to identify the hazardous substance (ethyl mercaptan – the chemical odorant added to propane) and coordinate clean up.
July 2017	Clark County	A metal processing facility in Henderson reported that equipment failure caused a release of 11.7 pounds of chlorine gas from a pollution control unit. NDEP worked with the company and Clark County Air Quality to ensure the release was secured and the equipment was repaired.
July 2017	Washoe County	A stainless steel plant reported a fire and a breach of a tank which caused a release of Potassium Hydroxide. Fire suppressant water mixed with the Potassium Hydroxide spilled under a doorway and into a private property storm drain. NDEP worked with the Washoe County Health District overseeing Clean Harbors' cleanup of the spill.
July 2017	Esmeralda County	A lithium mine reported a metal fire caused by spontaneous combustion. The fire occurred in slag drums and burned for 12 to 14 hours. The drums were then buried in sand to cool and NDEP worked with the mine personnel and Patriot Environmental to ensure cleanup and proper disposal of the burned metal was completed.
September 2017	Carson City/County	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.
October 2017	Clark County	A dairy reported the accidental release of 882 pounds of anhydrous ammonia to NDEP during the annual site inspection. The facility stated that the leak took place over a 2 week period from a condenser on the roof of one of their buildings. NDEP worked with the facility to isolate the condenser, determine the cause and repair it.
October 2017	Elko County	A tanker truck crash on I-80 near Elko caused a spill of 4,000 gallons of Ammonium Bisulfate. Both directions of I-80 were closed for a day and NDEP worked with EPA and NDOT to ensure prevention of the spill reaching the Humboldt River and cleanup of the spill by Clean Harbors.

Table 3-45. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
February 2018	Clark County	A big box store sewer line blockage caused 750 gallons of raw sewage to be released to pavement and a storm drain. NDEP worked with Clark County Water Reclamation District and Southern Nevada Health District to ensure the blockage was cleared and the affected pavement and storm drain were cleaned up and disinfected.

Naturally-occurring potentially hazardous substances:
Naturally occurring potentially hazardous substances may include but are not limited to: erionite, asbestos, radionuclides, radon, lead, mercury, arsenic, crude oil, selenium, nitrates, and sulfur. Erionite and naturally occurring asbestos are addressed below. The other substances listed above will be addressed in subsequent updates of the Nevada Hazard Mitigation Plan.

3.3.20.4 Erionite and Naturally Occurring Asbestos

Not all hazardous materials are manmade and not all hazardous events are human-caused. Erionite is a naturally occurring, microscopic, fibrous zeolite-group mineral, with the chemical formula $(Na_2,K_2,Ca)_2Al_4Si_{14}O_{36}•15H_2O$, commonly found in volcanic ash that has been altered by weathering and ground water. It forms brittle, wool-like fibrous masses in the hollows of volcanic rocks. Although erionite is not currently regulated by the EPA as one of the six asbestos fibers, some properties of erionite are similar to the properties of asbestos and it is known to be a human carcinogen listed by the International Agency for Research on Cancer as a Group 1 Carcinogen. Erionite has been identified as the cause of deaths from mesothelioma in some villages in Turkey (Pratt, 2012). It occurs in Nevada and other western states in altered sedimentary deposits derived from volcanic ash (Papke, 1972; Sheppard, 1996). North Dakota's Department of Transportation has banned the use of erionite gravels on state roads, recognizing that erionite-bearing crushed stone had already been used as aggregate on some dirt roads in the western part of the state.
Naturally occurring asbestos (NOA) is found in rocks and soils. Asbestos refers to a group of silicate minerals that share similar fibrous characteristics. There are six types of NOA recognized by the EPA (asbestos.com), five of which are found in Nevada. These five types are known as Amphibole asbestos and include crocidolite, also known as riebeckite $(Na_2Fe_3^{2+}Fe_2^{3+}Si_8O_{22}(OH)_2)$, amosite, a variety of cummingtonite, anthophyllite $(Mg_7(Si_8O_{22})(OH)_2)$, tremolite, and actinolite $(Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2)$. They are also known as fibrous amphiboles. NOA can release mineral fibers in the air during weathering processes or human disturbance. These fibers pose a potential risk for exposure by inhalation. It is important to note that NOA does not refer to commercially processed asbestos materials (asbestos siding or insulation, among other materials).
Asbestos fibers can become trapped in the body after exposure as they do not dissolve and the body has difficulty expelling them (asbestos.com). Sickness related to asbestos often take years to develop, but can lead to genetic damage to cells, mesothelioma, and lung cancer in the affected person's body.

3.3.20.4.1 History

Inhalation of fibrous dust particles such as NOA and erionite has been linked with diseases including mesothelioma According to Pratt (2012), "high rates of mesothelioma observed among

residents of the Turkish villages of Karain, Tuzkoy, Old Sarihidir, Karlik, and Boyali have been related to erionite, not exposure to asbestos." Residents in these villages built homes with volcanic tuff containing erionite. In North Dakota, the EPA has been working with state and county officials to minimize the risks to children in areas where erionite-bearing gravel was used at baseball fields, playgrounds, and schools. Fibrous minerals inhalation has been associated with causing disease in Libby, MT (Meeker et al., 2003; Shannahan et al., 2012).

3.3.20.4.2 Location, Severity and Probability of Future Events

At this time, we are not aware of any use of erionite-bearing crushed stone or gravel in Nevada highways or roads. NDOT (Robert Piekarz, personal communication, 15 December 2011) is concerned that individuals testing potential sources of crushed stone or gravel for use in highway construction and repairs may be exposed to erionite. The rocks containing erionite (tuffs and volcaniclastic sediments with high contents of ash) typically are of too low a quality to be quarried or mined for road construction. The NHMWG therefore believes the risk of this hazard in Nevada is low.

Sheppard (1996) summarized the following observations about erionite in Nevada:

> *"Except for two localities (Figure 3-215, localities 19 and 20) near Beatty, the occurrences of erionite are in the northern and central parts of Nevada. Deffeyes (1959) was first to report that erionite was not as rare as had been previously believed. He documented the common and abundant occurrence of erionite in silicic, vitric tuffs that had been deposited in Cenozoic lakes of central Nevada. Papke (1972) mapped and studied in detail four of the erionite deposits (localities 23, 27, 29, and 30) that had been prospected by several companies, including Union Carbide Corporation, Shell Development Company, and Mobil Oil Corporation. Of all the high-grade erionite deposits in Nevada, only several hundred tons of erionite-rich tuff were mined from Jersey Valley (locality 27) by Mobil Oil Corporation."*

Most erionite occurrences in Nevada are in upper Cenozoic tuffaceous, lacustrine rocks. The thickness of the erionite-bearing tuff is less than 1 cm to more than 1 m, and the erionite content ranges from a trace to nearly 100 percent. At Jersey Valley (locality 27), two erionite-rich beds can be traced along strike for about 5.5 km. Most erionite-rich tuff is yellow or light orange. Erionite coexists with analcime, chabazite, clinoptilolite, mordenite, and phillipsite, but the association with clinoptilolite is most common. At the Reese River occurrence (locality 29), some erionite has a woolly appearance (Gude and Sheppard, 1981) and resembles the type erionite from Durkee, Oregon (locality 44). Most erionite from the lacustrine deposits occurs as acicular or prismatic crystals or as bundles or aggregates of radiating acicular crystals.

Ash-flow tuffs at Yucca Mountain (locality 20) and near Fish Creek (locality 28) rarely contain trace amounts of erionite. Erionite has been recognized only in the subsurface at Yucca Mountain. At both localities, the erionite coexists with clinoptilolite."

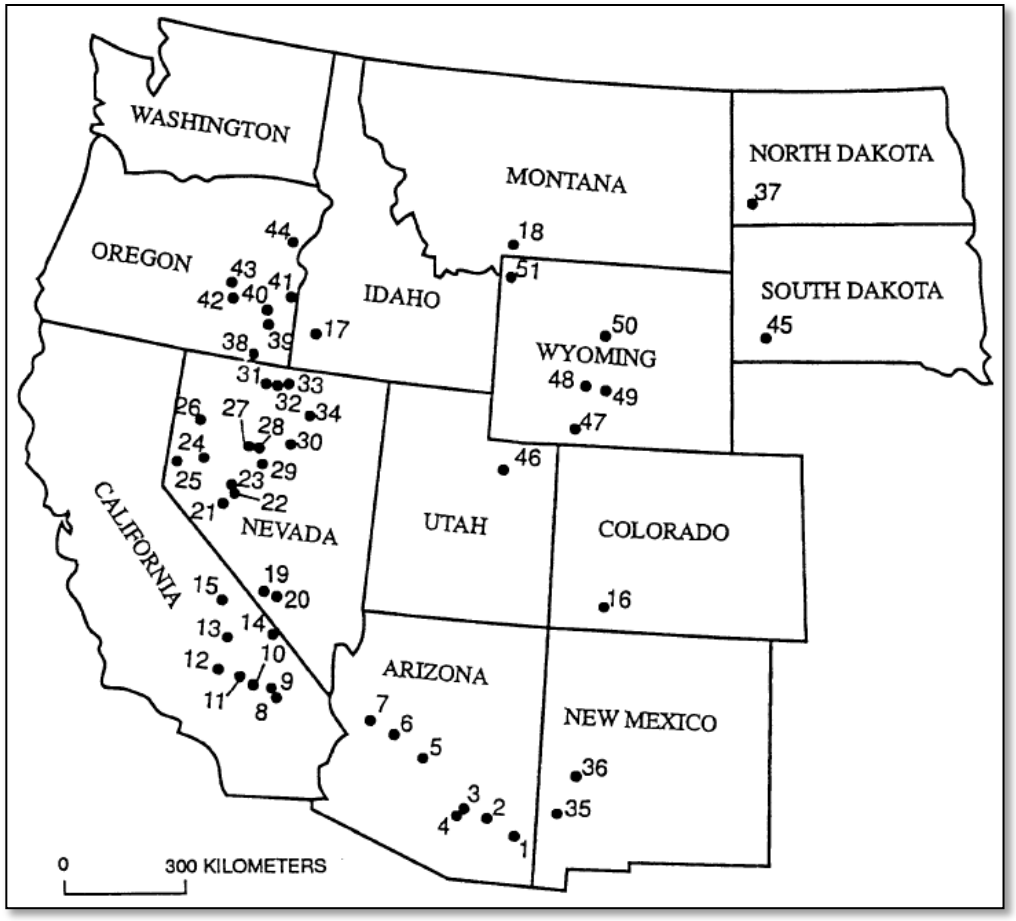


Figure 3-215. Some known Occurrences of Erionite in the Western United States.[167]

[167] Sheppard, R., 1996, Occurrences of erionite in sedimentary rocks of the western United States: U.S. Geological Survey Open-File Report 96-018.

Table 3-46 Identifies the Erionite sites in Figure 3-215.

Table 3-46. Erionite Sites Depicted in Figure 3-215	
I.D.	**Site**
19	Near Beatty, Nye County
20	Drill holes (UE-25a#l, about 395.1 m depth; J-12, about 189.0-192.0m depth; USW G-4, about 400.5 m depth; USW GU-3, about 362.5 m depth) at Yucca Mountain, Nye County
21	Gabbs Valley, northwest of Gabbs, Nye County
22	Southern Desatoya Mountains, Churchill County
23	Near Eastgate, Churchill County
24	Trinity Range, Churchill County
25	Near Hungary Valley, Washoe County
26	Near Windy Basin, east of Gerlach, Pershing County
27	Jersey Valley, Pershing County
28	Near Fish Creek, Lander County
29	Near Reese River, Lander County
30	Pine Valley, Eureka County
31	Along Spring Creek, Humboldt County
32	Eastern fork of Chimney Reservoir, Humboldt County
33	Along South Fork Little Humboldt River, Elko County
34	Near Susie Creek, Elko County

Amphibole NOA minerals are rare, and the growth of asbestiform mineral fibers requires specific geologic processes such as the deformation of amphibole during or after mineral growth (Ahn and Buseck, 1991; Virta, 2002). NOA has been documented at four localities in Nevada. Three of which were compiled by Van Gossen (2008) and include sites at the Segerstrom-Heizer mine, the Windous magnesite deposit, and in the Tonopah district (Table 3-47). A fourth NOA site was documented in a 2013 study done by researchers from UNLV in southern Nevada, around Boulder City, southeast Henderson, and surrounding regions (Buck et al., 2013). Two subsequent studies by NDOT were conducted in 2014 and 2016 that confirmed the presence of NOA in the phase one and two projects of the Boulder City Bypass – a highway built to alleviate traffic though Boulder City, NV (Tetra Tech, 2014; Kleinfelder, 2014; NDOT Presentation on NOA and Erionite, 2016). While scientists are aware that there is a hazard, more research and air sampling are needed to determine how NOA in this area of Clark County is affecting the population. Researchers are continuing to locate additional deposits of NOA in the region.

Table 3-47. NOA Occurrences in Nevada from Van Gosen, 2008 – Reported Historic Asbestos Mines					
State	**Historic Site Name**	**Asbestiform Mineral(s)**	**Associated Mineral(s)**	**Host Rock(s)**	**References**
NV	Segerstrom-Heizer mine (Pershing County)	crocidolite	magnetite, hematite, apatite, pyrite, marcasite, chlorite, calcite, actinolite-	iron ore body replacing diorite	Reeves and Kral (1955, p. 25-28); Castor and Ferdock (2004, p. 389)

Table 3-47. NOA Occurrences in Nevada from Van Gosen, 2008 – Reported Historic Asbestos Mines					
			tremolite		
NV	Windous magnesite deposit (White Pine County)	clinochrysotile	magnesite, serpentine (deweylite), dolomite, calcite, quartz	calcareous tuff	Faust and Callaghan (1948); Vitaliano (1951, p. 13-16); Faust and Fahey (1962, p. 10); Hose and others (1976, p. 50-51)
NV	Tonopah district	tremolite asbestos	not reported	not reported	Castor and Ferdock (2004, p. 440)

Buck et al. (2013) summarized the impact of NOA in southern Nevada:

> *"Evidence of fibrous amphiboles on car tires and on clothing after recreational activities shows that they can be brought back to family members and thus increase the risk of exposure for other populations besides those directly exposed through outdoor dust emissions. Because health effects may occur even at low levels of exposure to fibrous amphiboles (Alexander et al., 2011; Hillerdal, 1999), our data indicate a potential public health threat in southern Nevada. Any potential future land-use projects should carefully determine the risks to both workers and the regional populations because disturbances to these natural desert surfaces cause increased dust emissions (Goossens et al., 2012). Social behaviors and land management practices that limit dust production in areas where fibers are present could be implemented to reduce human exposure. There is a compelling need for epidemiology studies, additional geologic and mineral studies, and significantly more research on their location, emission, airborne concentration, and pathways of human exposure."*

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3.3.20.5 Location, Severity, and Probability of Future Events

The probability of future events for this category is considered high for a number of reasons which are listed below:

1. As previously mentioned, the EPA placed the Carson River on the Superfund National Priorities List (NPL). As of February 2018, the CRMS is the only site in Nevada under this listing which is under direct control of the EPA. Mitigation of this site and other historic mining release sites are often complex and may take many years to complete. In addition, due to historic hazardous materials practices prior to Federal, State and Local regulations and ordinances, future discovery events in Nevada are probable. In response to this possibility, the Abandoned Mine Lands Program (AML) was established within BCA to evaluate the potential human health and ecological concerns associated with contamination from legacy heavy metal mining operations by assessing AML throughout Nevada. The sites are evaluated and prioritized for future site restoration activities.
2. The use of State highway and rail routes to transport hazardous materials cannot be avoided. The Waste Isolation Pilot Program (WIPP) transports transuranic waste through Nevada highway corridors *en route* to the Nevada Test Site (located in Nye County) and other locations in the country. Transuranic waste is radioactive waste consisting of material containing elements having an atomic number greater than 92, the atomic number of uranium. As of January 2018, the Nevada Test Site has received a total of 48 shipments of transuranic waste according to the DOE website, www.wipp.energy.gov/shipments.htm.
3. Air transportation of hazardous materials across Nevada cannot be avoided.
4. Approximately 84% of the territory in Nevada is federally managed. Federal land stewardship can present a challenge to the enforcement of state and local laws.
5. Natural hazards such as earthquakes, flooding, and forest fires are unpredictable and may not only cause releases of hazardous substances but can also severely complicate response activities.
6. Terrorist acts present an unpredictable threat and could be especially catastrophic due to the locations of facilities that store, transport or manufacture hazardous substances.
7. There are specific hazards posed to the water supplies for the two major population centers (Reno-Sparks [Truckee River] and Las Vegas [Colorado River-Lake Mead]) by possible hazardous materials contamination originating out-of-state. California contaminants can impact the Truckee River (as well as the Carson and Walker Rivers), and Arizona contaminants can impact the Colorado River.
8. Hazardous materials releases can occur at natural resource sites. The minerals industry is important in hazardous materials transportation, production, and use in Nevada. In 2017, UNR- NBMG reported about 34 active mines, 12 oil fields and 25 geothermal plants statewide.[168]
9. The volume of hazardous substances stored and manufactured in Nevada communities along with the transport of these substances in and through the State are factors that help determine the potential release and community exposure to these substances. These factors are variable and make the probability of future releases difficult to predict. However, the number of facilities that store, manufacture and transport hazardous substances is likely to increase in coming years as the population of the State increases

[168] *Source: http://pubs.nbmg.unr.edu (revised 2017).*

and more businesses locate to Nevada. Therefore, the potential of hazardous material releases is likely to increase.

3.4 RANKING OF HAZARDS BY COUNTIES AND TRIBES

The Nevada Hazard Mitigation Planning Committee reviewed local, county, and tribal hazard mitigation plans, and their hazard ratings are compiled together as Table 3-48 and 3-49 below (L=low hazard, M=moderate hazard, H=high hazard, N=none).

Table 3-48. Rankings of Hazards by County

Local hazards identified by counties	Carson City	Churchill	Clark	Douglas	Elko	Esmerald	Eureka	Humboldt	Lander	Lincoln	Lyon	Mineral	Nye	Pershing	Storey	Washoe	White Pine
Avalanche	L	N	L	N	L	N	L	L	L	N	N	L	N	L	L	M	L
Civil disorder			M							M			L			M	
Drought	M	L	H	H	M	H	M	M	M	M	M	L	H	M	L	M	M
Earthquake	H	H	H	H	H	M	H	H	M	H	M	M	M	M	M	H	M
Epidemic	H	L	H	L	L	L	M	M	M	H	L	M	L	L	L	M	M
Expansive soil	N	N		N	N	N	L	L	L		N	N		L	N	N	L
Flood (includes flash flood, dam, & canal wall failure, mudslide)	H	H	H	H	M	M	M	M	M	H	M	H	M	M	H	H	M
Hail and thunderstorm	M	M	H	H	M	L	M	M	M	N	L	M	L	L	M	M	H
Hazardous materials	M	M	H		H	M	H	H	M	H	M	M	M	L	L	M	H
Heat, extreme		M	M	H	N	N	M	H	M	N	L	N	N	L	N	M	H
Infestation		L	L	N			L	M	L	N	L	L	L	L	N	N	M
Land subsidence/ground failure		N	M	N	N	L	M	L	L	N	L	N	L	L	M	N	L
Landslide	L		L		L	N	M	L	L	N	L	L	L	L		N	L
Large venue fires			H														
Mining hazards						N	L						M		M		M
Nuclear waste/radiological			N							H	M					M	
Terrorism/WMD	H	H	N		N	M	M	H	M	M	L	M	M	L	L	L	M
Tornado		M	L	N		L	M	M	M	N	L	M	N	L	N	M	L
Tsunami/Seiche	M	N		L	N	N		L	L		N	N		L	N		
Utility loss/energy emergency	M		L				M						M			L	M
Volcano	M	L	L	L	N	N	L	L	L	N	H	L	N	N	N	L	L
Wildfire	H	M	H	H	H	L	H	H	H	H	M	M	H	H	H	H	H
Windstorm	M	M	H	H	L	L	M	M	M	M	M	M	M	L	M	M	H
Winter storm/Severe (includes extreme snowfall)	M	M	H	H	M	L	M	M	M	N	M	M	M	L	M	M	H

Table 3-49. Rankings of Hazards by Tribes																						
Local hazards Identified by Tribes	Confederated Tribes of the Goshute Reservation (NV and UT)	Duckwater Shoshone Tribe of the Duckwater Reservation	Ely Shoshone Tribe of Nevada	Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation (NV and OR)	Fort Mojave Indian Tribe (AZ, CA, NV)	Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony	Lovelock Paiute Tribe of the Lovelock Indian Colony	Moapa Band of Paiute Indians of the Moapa River Indian Reservation	Paiute-Shoshone Tribe of the Fallon Reservation and Colony	Pyramid Lake Paiute of the Pyramid Lake Reservation	Reno-Sparks Indian Colony	Shoshone- Paiute Tribes of the Duck Valley Reservation	Summit Lake Paiute Tribe of Nevada	Te-Moak Tribe of Western Shoshone Indians of Nevada: Battle Mountain Band	Te-Moak Tribe of Western Shoshone Indians of Nevada: Elko Band	Te-Moak Tribe of Western Shoshone Indians of Nevada: South Fork Band	Te-Moak Tribe of the Western Shoshone Indians of Nevada: Wells Band	Walker River Paiute Tribe of the Walker River Reservation	Washoe Tribe (NV and CA)	Winnemucca Indian Colony of Nevada	Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch	Yomba Shoshone Tribe of the Yomba Reservation
Avalanche		N							N	L	L	N			N			L	N			
Civil Disorder		L								L	L	N							L			
Drought		M			H			M	L	L	L	N			H			M	H			
Earthquake		L						H	H	H	H	L			H			M	M			
Epidemic		L			M			L	L			L			H			L	L			
Expansive Soil									N	N	N	N			N			N	N			
Flood		L			H			H	L	H	H	H			L			H	M			
Hail and thunder-storm		M							M	L	L	N			M			H	M			
Hazardous materials		L			H			M	M	M	M	L			H			L	M			
Heat, extreme		N			H				N			L			N			N	N			
Infestation		L						L	L	N	N	N			N			L	N			
Land subsidence/ ground failure		L						L	N	N	N	N			N			N	N			
Landslide		L								L	L	L			L			L	M			
Large venue fires												N							N			
Mining hazards		L										N							N			

Table 3-49. Rankings of Hazards by Tribes																					
Local hazards Identified by Tribes	Confederated Tribes of the Goshute Reservation (NV and UT)	Duckwater Shoshone Tribe of the Duckwater Reservation	Ely Shoshone Tribe of Nevada	Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation (NV and OR)	Fort Mojave Indian Tribe (AZ, CA, NV)	Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony	Lovelock Paiute Tribe of the Lovelock Indian Colony	Moapa Band of Paiute Indians of the Moapa River Indian Reservation	Paiute-Shoshone Tribe of the Fallon Reservation and Colony	Pyramid Lake Paiute of the Pyramid Lake Reservation	Reno-Sparks Indian Colony	Shoshone- Paiute Tribes of the Duck Valley Reservation	Summit Lake Paiute Tribe of Nevada	Te-Moak Tribe of Western Shoshone Indians of Nevada: Battle Mountain Band	Te-Moak Tribe of Western Shoshone Indians of Nevada: Elko Band	Te-Moak Tribe of Western Shoshone Indians of Nevada: South Fork Band	Te-Moak Tribe of the Western Shoshone Indians of Nevada: Wells Band	Walker River Paiute Tribe of the Walker River Reservation	Washoe Tribe (NV and CA)	Winnemucca Indian Colony of Nevada	Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch	Yomba Shoshone Tribe of the Yomba Reservation
Nuclear waste/ radiological										H	L	N							N			
Terrorism/ WMD		L						L	H	H	L	L			M			L	N			
Tornado		N							M	L	L	L			M			H	N			
Tsunami/ Seiche									N	N	N	N			N			N	N			
Utility loss/ energy emergency		H			M			H		H	L	L			N				N			
Volcano		N							L	L	H	N			N			L	N			
Wildfire		H			H			M	M	H	H	H			H			M	H			
Windstorm		M			H				M	M	L	M			H			H	L			
Winter storm/ severe		M							M	M	L	H			H			H	M			

3.5 VULNERABILITY ASSESSMENT

The next step of risk assessment is the vulnerability assessment. This section includes assessing vulnerability by jurisdiction and assessing vulnerability of State facilities.

3.5.1 Overview

This vulnerability assessment includes only the hazards rated by the Subcommittee as "High": Earthquake, Flood (including Dam Failure), and Wildfire. The vulnerability assessment data compiled are derived from local hazard mitigation plans (LHMPs) (both approved and in development), HAZUS runs and assessments as well as other sources listed under the individual hazards below.

ELEMENT	REQUIREMENTS
S6. Does the risk assessment include an overview and analysis of jurisdictions' vulnerability to the identified hazards and the potential losses? [44 CFR §§201.4(c)(2)(ii) and 201.4(c)(2)(iii)][169]	a. The risk assessment must provide a current summary of the most vulnerable jurisdictions based on the state, local, and tribal, as applicable, risk assessments. Vulnerability must be analyzed in terms of: 1. Jurisdictions most threatened by the identified hazards based on type, location, range of anticipated intensities, and probability. Probability must include the potential impacts of climate change. 2. Jurisdictions most vulnerable to damage and loss from hazard events with respect to potential impacts to: i. Populations, including socially vulnerable and underserved communities. ii. Structures, including critical facilities. iii. Infrastructure and community lifelines servicing jurisdictions that could affect state resilience, including Safety and Security; Food, Water, Shelter; Health and Medical; Energy; Communications; Transportation; and Hazardous Material lifelines. b. The risk assessment must include an overview and analysis of the potential losses to the identified vulnerable structures based on estimates in the local risk assessments as well as the state risk assessment. c. *If the state is interested in HHPD funding eligibility, the risk assessment must address risks from high hazard potential dams in the risk assessment (see HHPD2 in Section 3.8.).* ***Community lifelines*** are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. An ***overview*** provides the results of the analysis and does not need to include the details from each local plan. Detailed analyses do not need to be placed in the body of the plan. They can be included as appendices. An example of an overview is a list of key issues or problem statements that clearly describes the greatest vulnerabilities and compares losses across the state, allowing the state to determine mitigation priorities.

3.5.2 Analysis of State and Local Risk Assessment

The risk analysis was completed exclusively for the natural hazards rated as "High" by the NHM Working Group: earthquake, flood, and wildfire.

[169] 44 CFR §201.4(c)(2)(iii): "An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas."

Earthquake (High Risk)

Earthquake-related information was derived from the Seismo Lab, NBMG, and USGS. NBMG used the most current version available of FEMA's loss-estimation computer model, HAZUS-MH, to estimate such factors as total economic loss, numbers of buildings receiving extensive to complete damage, number of people needing public shelter and hospital care, and number of fatalities from earthquakes of magnitude 5.0, 5.5, 6.0, 6.5, and 7.0. Thirty-eight communities that include all the major population centers in each of Nevada's 17 counties were modeled. The epicenters of the earthquakes were chosen at the fault position that is closest to each community. A depth of 10 kilometers (6 miles) was used for each scenario. Magnitudes ranging from 5.0 to 7.0 were chosen to illustrate the variation that magnitude has on losses. The resulting estimates were compiled into tables summarizing losses for each community and the state, including over 400 separate HAZUS summary reports. The individual HAZUS summary reports include the following data for each community and the state:

- General description of the region
- Building and lifeline inventory
- Building inventory
- Critical facility inventory
- Transportation and utility lifeline inventory
- Earthquake scenario parameters
- Direct earthquake damage
- Buildings damage
- Critical facilities damage
- Transportation and utility lifeline damage
- Induced earthquake damage
- Fire following earthquake
- Debris generation

The complete report is available as NBMG Open-File Report 14-5, Updated Estimated Losses from Earthquakes near Nevada Communities, in Appendix J and online at: http://pubs.nbmg.unr.edu/Updated-estimated-losses-p/of2014-05.htm

Summary HAZUS earthquake loss values for selected Nevada communities are contained in Tables 3-58 and 3-59 found in Section 3.7.1.

In 2011, NBMG completed a study entitled "Comparison of Loss-Estimation Modeling Using HAZUS with Ground-Motion Input from ShakeMap versus Default Values" (NBMG OFR 11-1) that corroborated the validity of HAZUS values within an order of magnitude except at the lowest earthquake magnitudes studied. Results are available online at: http://pubs.nbmg.unr.edu/Loss-estimation-modeling-HAZUS-p/of2011-01.htm

The study concludes that loss estimates from HAZUS using ShakeMap ground motions are higher than those calculated by HAZUS, probably due mainly to the use of different fragility functions. However, the two calculations still yield results that are mostly well within an order of magnitude of one another. ShakeMap provides more accurate information about ground shaking than that derived from HAZUS, because in a real earthquake, ShakeMap incorporates actual measurements of ground motion.

Earthquake loss estimates from magnitude 6 event, such as the 2008 Wells, Nevada earthquake, generally range from tens of millions of dollars to a few billion dollars, making earthquakes one of the highest consequence events that can occur in the state. Earthquakes near communities can have much larger magnitudes than this, as high as 6.8 to 7.4, which would have much higher, more widespread multi-community impacts. A steady reduction in earthquake risk through mitigation is needed to reduce these potential losses.

Flood (High Risk)

To assess risks and vulnerability due to flooding, the State of Nevada used the most current version available of FEMA's loss-estimation model, HAZUS-MH for reaches of the Carson, Colorado, Humboldt, Muddy, Truckee, Virgin, and Walker Rivers. In all cases, the HAZUS runs used floods with average 100-year return periods.

The HAZUS modeling program integrates many factors contributing to the frequency and severity of flooding that include:

- Rainfall intensity and duration
- Antecedent moisture conditions
- Watershed conditions, including steepness of terrain, soil types, amount and type of vegetation, and density of development
- Changes in landscape resulting from wildfires (loss of moisture-trapping vegetation and increased sediment available for runoff)
- The existence of attenuating features in the watershed, including natural features such as swamps and lakes, and human-built features such as dams
- The existence of flood control features, such as levees and flood control channels
- Velocity of flow
- Availability of sediment for transport, and the erodibility of the bed and banks of the watercourse

These factors were evaluated using:

- Hydrologic analysis to determine the probability that a discharge of a certain size will occur, and
- Hydraulic analysis to determine the characteristics and depth of the flood that results from that discharge.

Tables 3-60 and 3-61 found in Section 3.7.2 below summarize the HAZUS flood assessment and losses.

The NHMWG recognizes the need to assess non-riverine flood risks in Nevada, including failure of irrigation canals & ditches, flash flooding on developed alluvial fans, and flooding in closed basins. Recently, alluvial fan flooding has not been a major issue in the southern Nevada Las Vegas area. Alluvial fan flooding in the Las Vegas area is handled by large detention basins and outfall channels managed by the Clark County RFCD. Due to flooding events in northern Nevada in 2017, NHMWG recognizes that flooding in closed basins and sub-basins is another non-riverine flood risk that needs to be assessed. Committee members are currently working on other funded hazard mitigation activities and promoting local activities that implement strategies to mitigate these hazards.

Wildfire (High Risk)

To assess wildfire vulnerability, the Subcommittee used approved LHMPs, the most current version of the CWPPs and assessed valuations of real property for each county. NDF provided the Nevada Natural Resources and Fire Information Portal, accessible online at: https://nevadaresourcesandwildfireinfo.com/ which is available to all public, partners and cooperators. Under this assessment, GIS wildfire hazard mitigation maps were produced for seventeen counties that show the assessed valuation of property and land value affected by wildfire risk. Appendix I contains these maps. The map data will be made available to planning groups via MyPlan, on request from the SHMO, and at local technical assistance meetings. A summary of County Assessors' property values and number of state-owned buildings by county are provided in Appendix I as Tables J-1 and J-2, respectively. Parcel data was not available for Esmeralda County. Once available, similar analyses will be conducted.

Since the last plan update, NDF continued to collaborate with the Western States Foresters and Western Forestry Leadership Coalition (including federal agencies such as the BLM and USFS) to update a statewide risk assessment for areas of the state that had not been previously assessed. NDF also collaborates within individual communities who are updating their individual CWPPs to reflect current conditions.

NDF utilized GIS databases from the BLM and a GIS analysis to report and document the increasing scale of wildfire across the state. An additional analysis using a database from the USFS's Electronic Geospatial Portal was performed to report and document the continued fire starts from both human and natural ignition sources across the state. These databases were also used to document the increase of wildfires occurring outside of the traditional fire season (May-Oct.) in Nevada.

An analysis performed by UNR dispelled the notion that large fire years are only related to drought and displayed a high correlation between wetter years and the greatest amount of acreage annually burned in the state. NDF also continued to collect and analyze safety messages that contained fire behavior warnings to detect well-documented experiences of extreme fire behavior.

3.5.3 State's Vulnerability Based on Local, County, and Tribal Assessments as well as State Assessments

The updated plan includes a description of vulnerability to each of the high-rated hazards based on estimates provided in local risk assessments as well as the State risk assessments (see each Hazard description section above). The State will continue to work with the local, county, and tribal entities to convey the most up-to-date information from risk or vulnerability assessments, such as the HAZUS results presented in sections 3.7.1 for earthquakes, 3.7.2 for floods, and the NDF analysis presented in section 3.7.3 for wildfire. Results of all vulnerability assessment studies will be shared with local communities throughout the state, and communities and counties will share their results and data with the state as they become available through the MyPlan web application, providing a two-way exchange that benefits all in hazard mitigation strategy development.

3.5.4 State's Vulnerability in Terms of Jurisdictions Most Threatened and Vulnerable.

Local jurisdictions' vulnerabilities to the three highest-ranked hazards are found in the sections listed below:

- Earthquake — Section 3.7.1, Tables 3-58 and 3-59
- Flood — Section 3.7.2, Tables 3-60 and 3-61
- Wildfire — Section 3.7.3, Tables 3-62 and 3-63

Table 3-50 was developed using a combination of National Risk Index (NRI) data and approved LHMPs. It shows the relative NRI Score for each county for earthquake, riverine flooding, and fire - 1 being the highest risk and 17 being the lowest. Table 3-50 also highlights the Expected Annual Loss (EAL), and total NRI Total Exposure for earthquake, flood, and fire. This ranking is considered during the NHMWG grant application prioritization process.

Table 3-50. Projected Losses and Threat Rankings by County for Each Major Hazard[170]									
County	EQ NRI Score	EQ EAL	EQ Exposure	FL NRI Score	Flood EAL	FL Exposure	WF NRI Score	Wildfire EAL	WF Exposure
Carson City	3	$33.38M	$690.3B	11	$175.6K	$22.34B	10	$1.08M	$41.11B
Churchill	6	$3.88M	$301.2B	13	$120.1K	$17.15B	15	$110K	$33.98B
Clark	1	$156.99M	$26,675B	1	$7.16M	$84.77B	2	$25.51M	$1,163B
Douglas	4	$24.74M	$586.2B	7	$723K	$44.43B	5	$4.71M	$116.98B
Elko	9	$3.12M	$634.1B	6	$633K	$24.08B	1	$48.04M	$217.4B
Esmeralda	15	$289K	$8.89B	17	$0	$0	17	$4.5K	$2.73B
Eureka	16	$341K	$22.6B	10	$214.3K	$1.86B	9	$2.13M	$9.90B
Humboldt	11	$1.02M	$204.7B	15	$47.2K	$1.79B	3	$8.04M	$63.70B
Lander	14	$372K	$67.9B	12	$117.3K	$21.74B	8	$1.78M	$22.60B
Lincoln	12	$457K		4	$1.98M	$8.90B	11	$889K	$16.50B
Lyon	5	$13.32M	$697.8B	5	$1.5M	$32.11B	6	$3.41M	$127.1B
Mineral	10	$1.37M		9	$184.5K	$22.0B	16	$26.9K	$3.08B
Nye	7	$3.25M	$608.2B	3	$3.44M	$204.50B	14	$262.3K	$93.72B
Pershing	17	$230K	$78.1B	16	$6.5K	$233M	12	303.8K	$14.95B
Storey	8	$3.55M	$50.4B	8	$452.6K	$8.29B	7	$2.79M	$20.51B
Washoe	2	$165.82M	$5,731B	2	$64.9M	$103.13B	4	$10.46M	$418.2B
White Pine	13	$501K	$108.9B	14	$63.5K	$10.37B	13	$410.7K	$24.64B

[170] FEMA, National Riks Index, accessed April 24, 2023, https://hazards.fema.gov/nri/.

Corresponding to the relative risk for each County, Figures 3-216 – 3-218 depict the relative National Risk Index Score for each county ranked in risk from 1-17 for earthquake, riverine flood, and wildfire respectively.

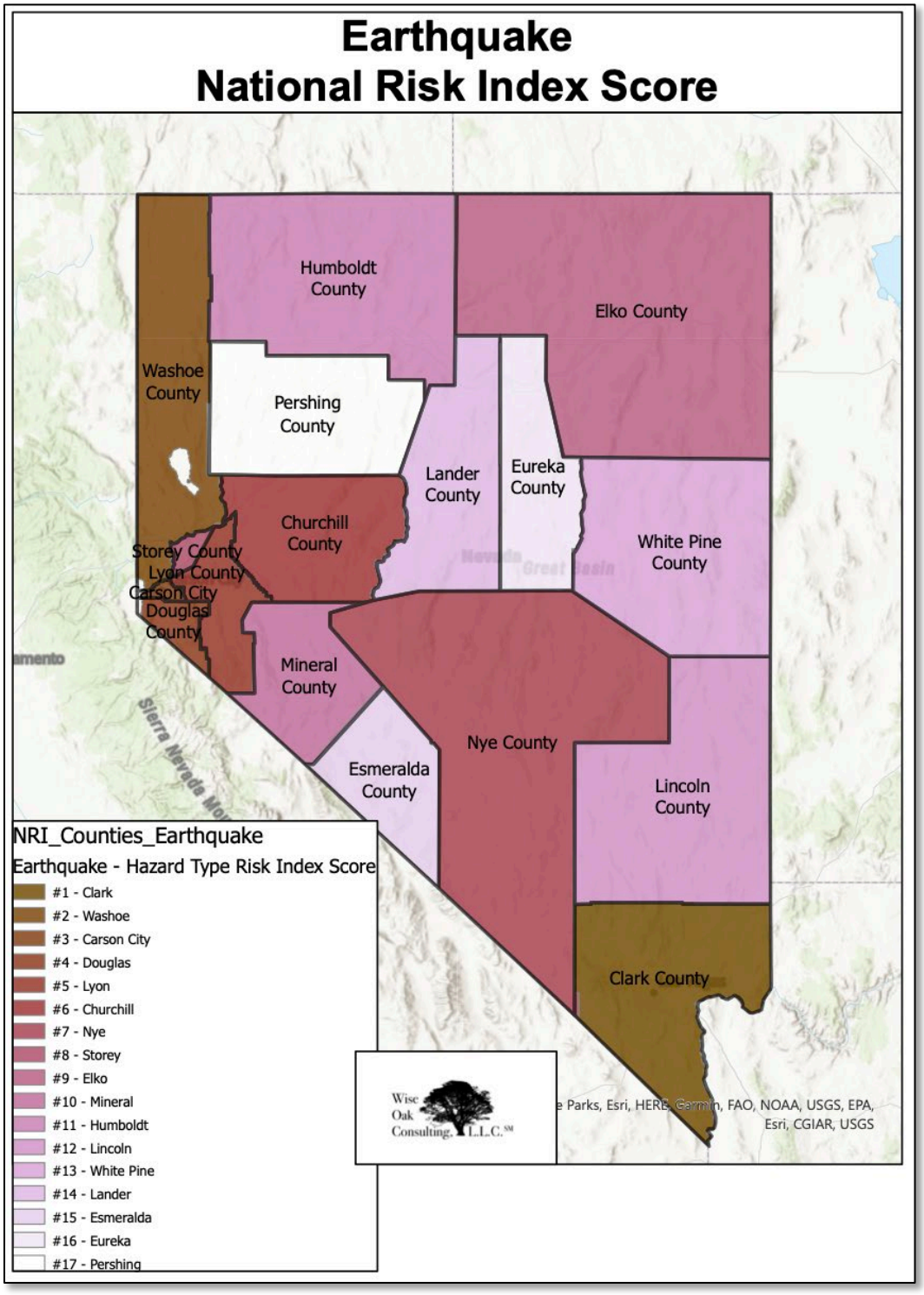


Figure 3-216. Earthquake National Risk Index Score by County.

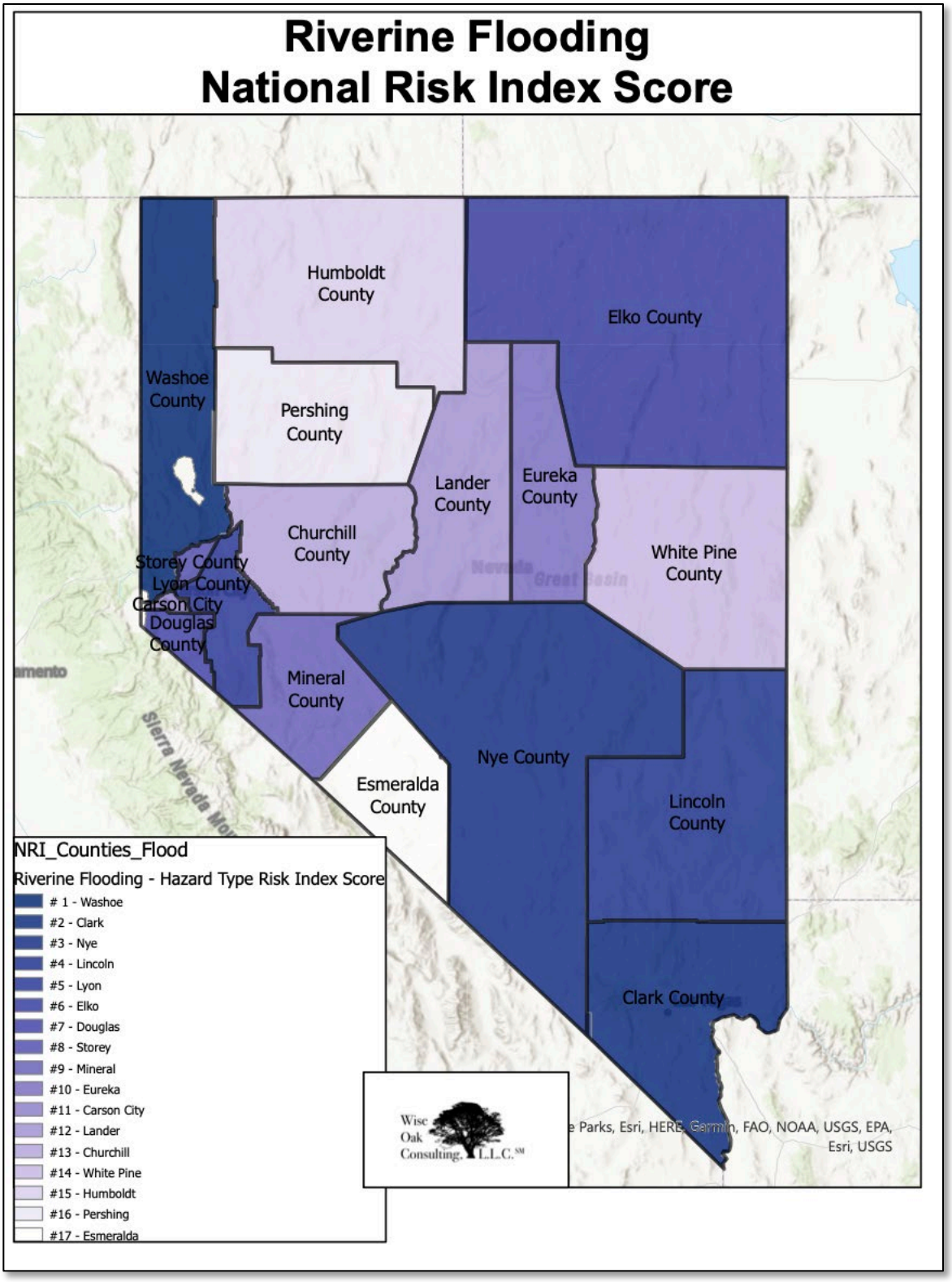


Figure 3-217. Riverine Flooding National Risk Index Score by County.

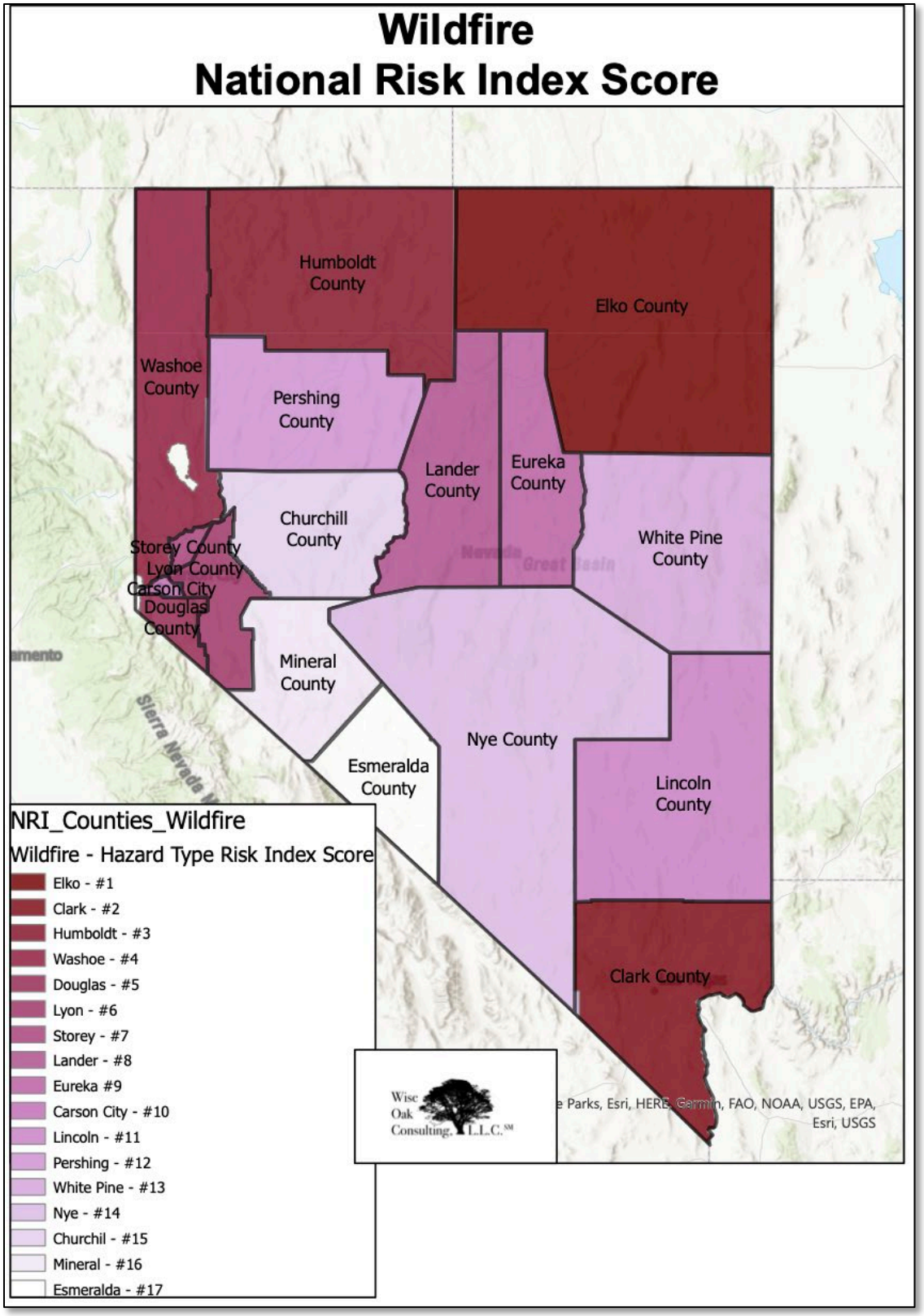


Figure 3-218. Wildfire National Risk Index Score by County.

Again, corresponding to Table 3-50, Figures 3-219 – 3-221 depict the relative NRI Expected Annual Loss for each county for earthquake, riverine flood, and wildfire respectively.

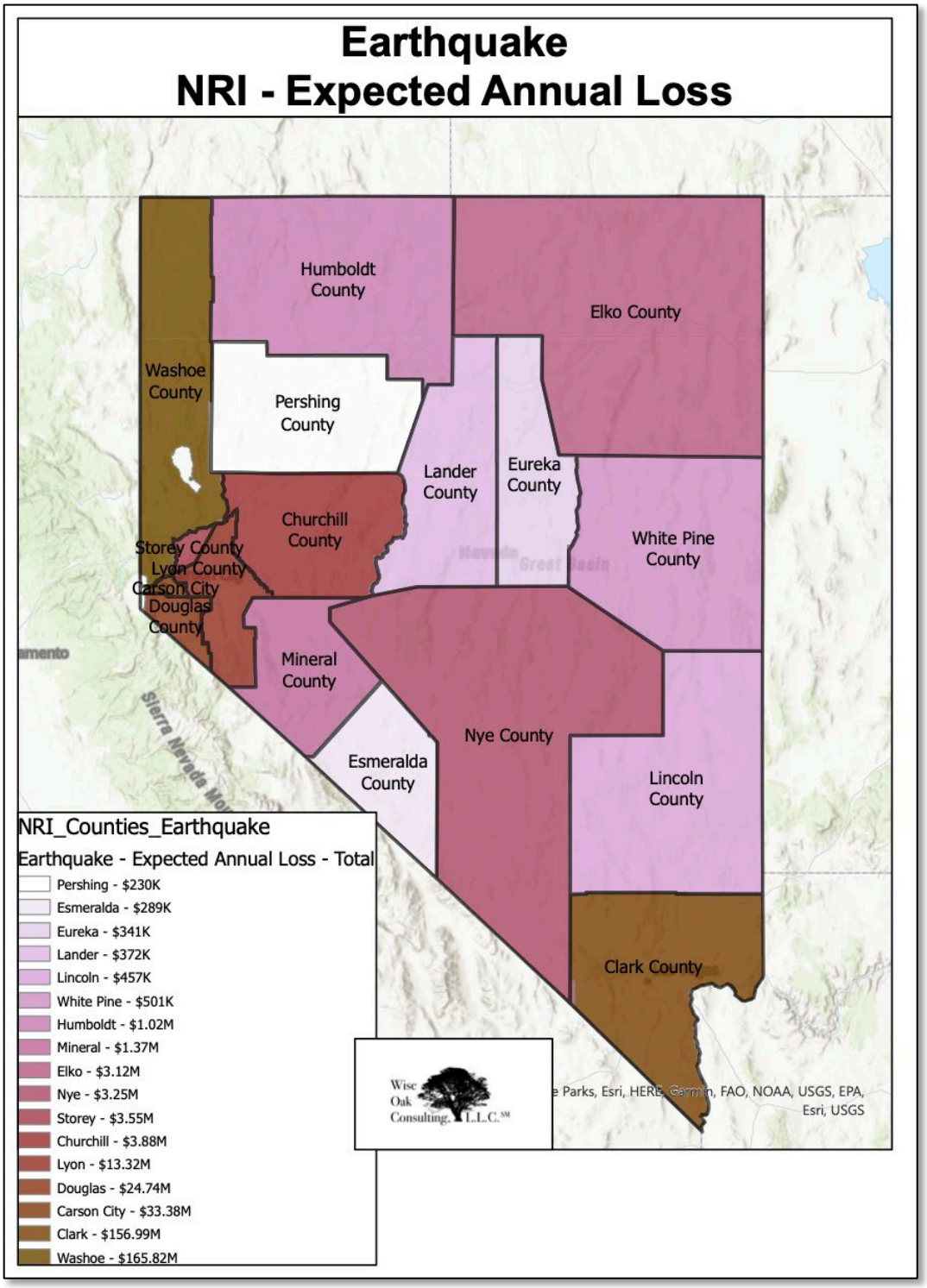


Figure 3-219. Earthquake NRI Expected Loss by County.

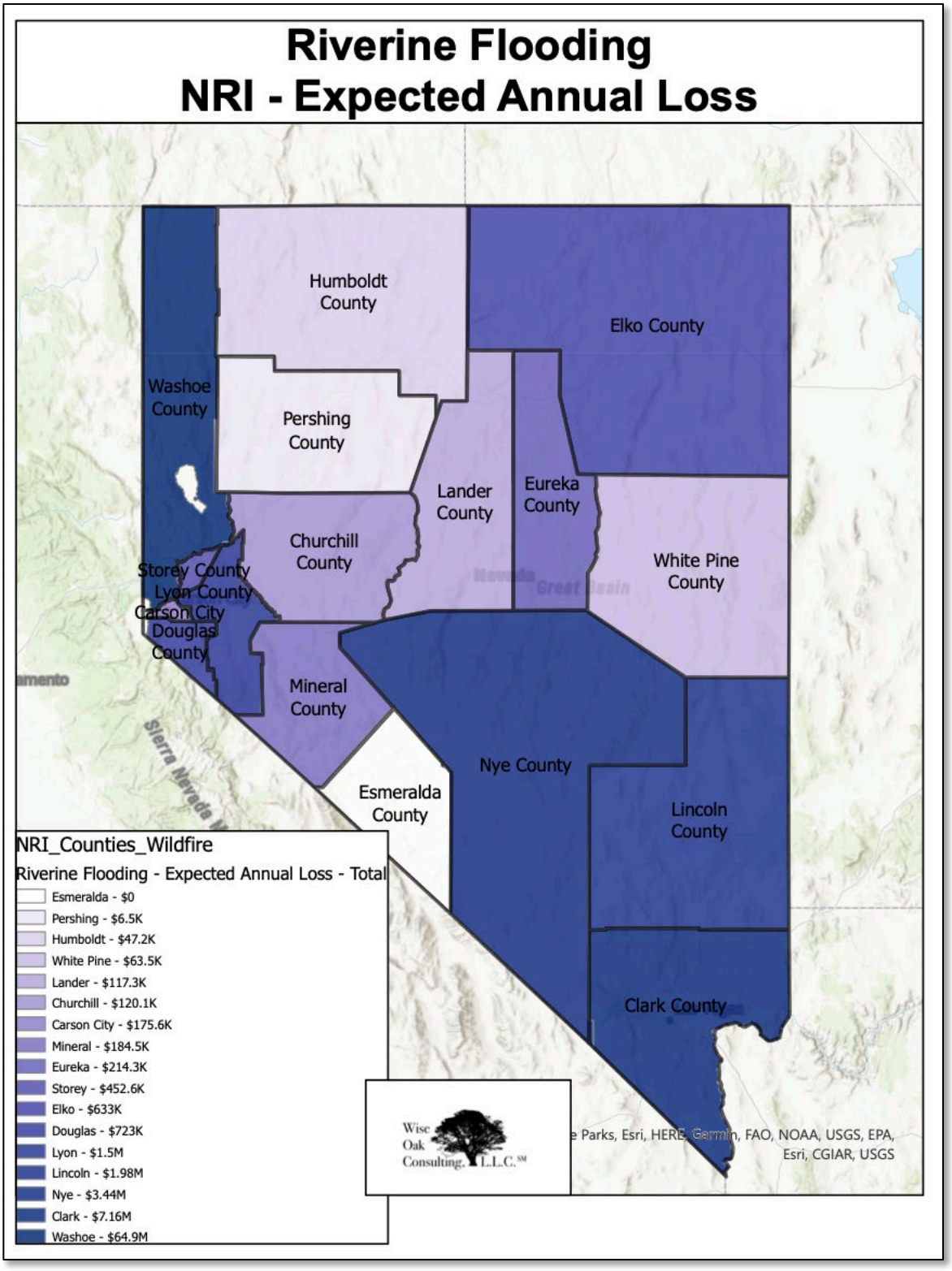


Figure 3-220. Riverine Flooding NRI Expected Annual Loss by County.

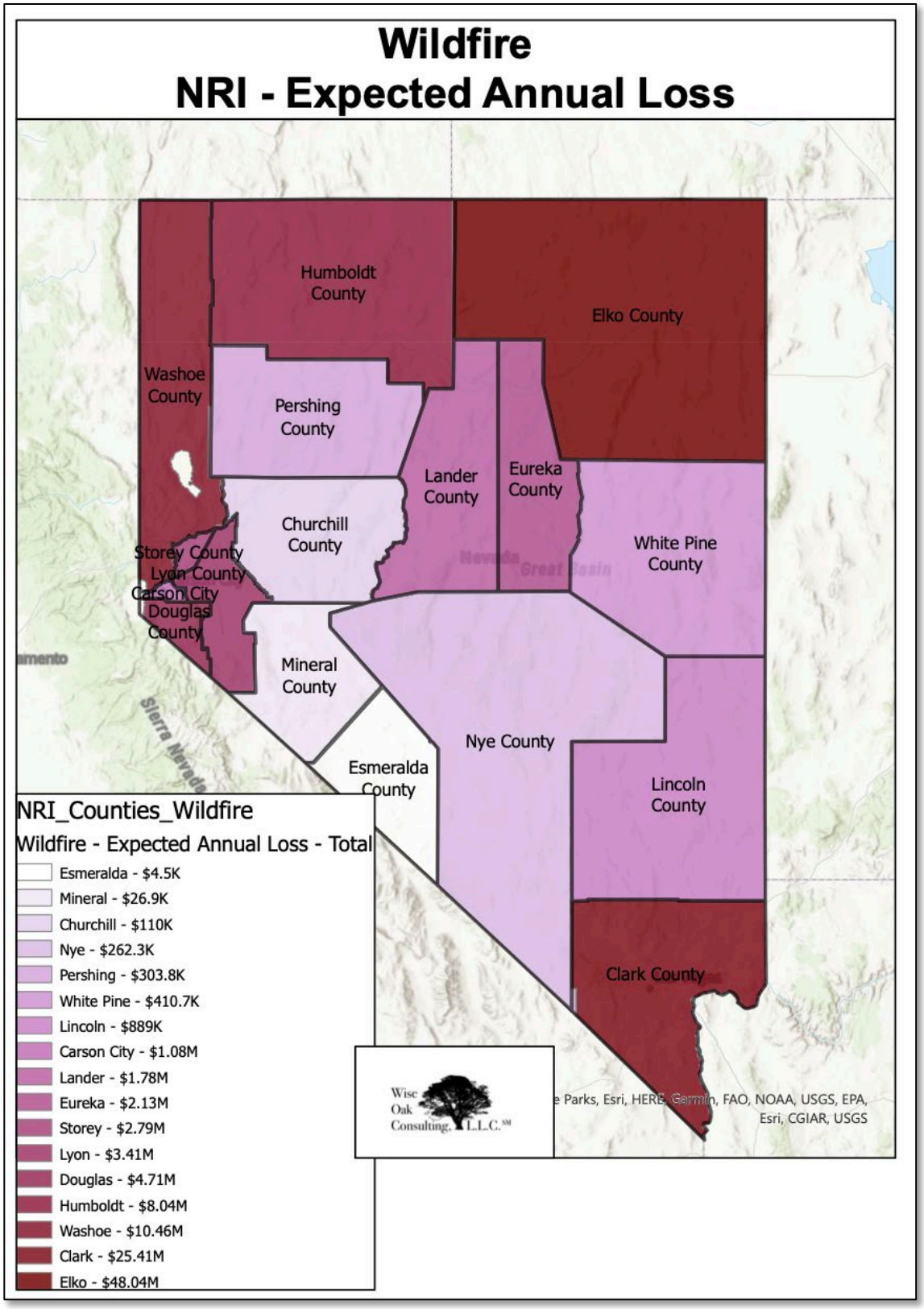


Figure 3-221. Wildfire NRI Expected Annual Loss by County.

Finally, corresponding to Table 3-50, Figures 3-222 – 3-224 depict the relative NRI Total Exposure for each county for earthquake, riverine flood, and wildfire respectively.

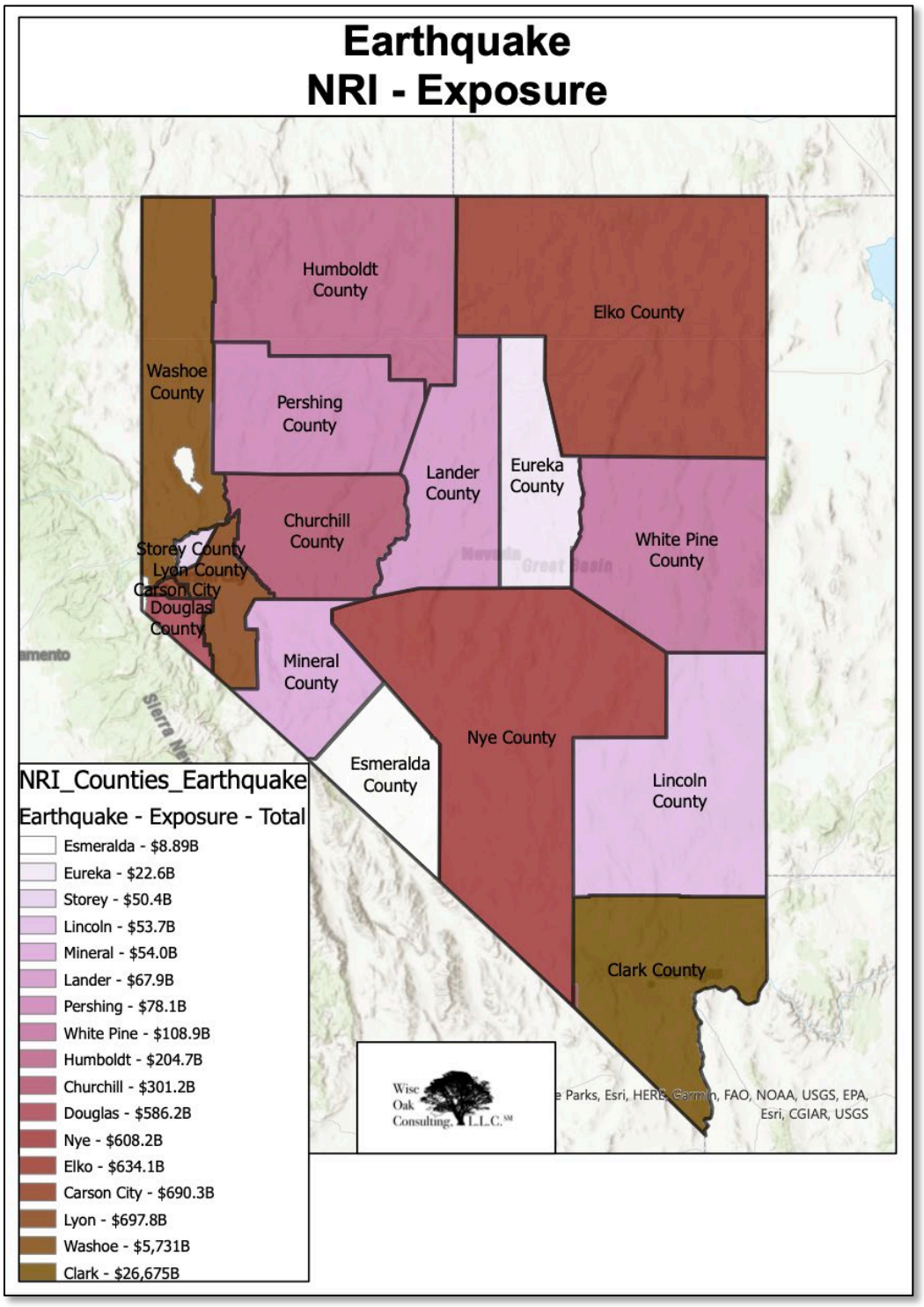


Figure 3-222. Earthquake NRI Total Exposure by County.

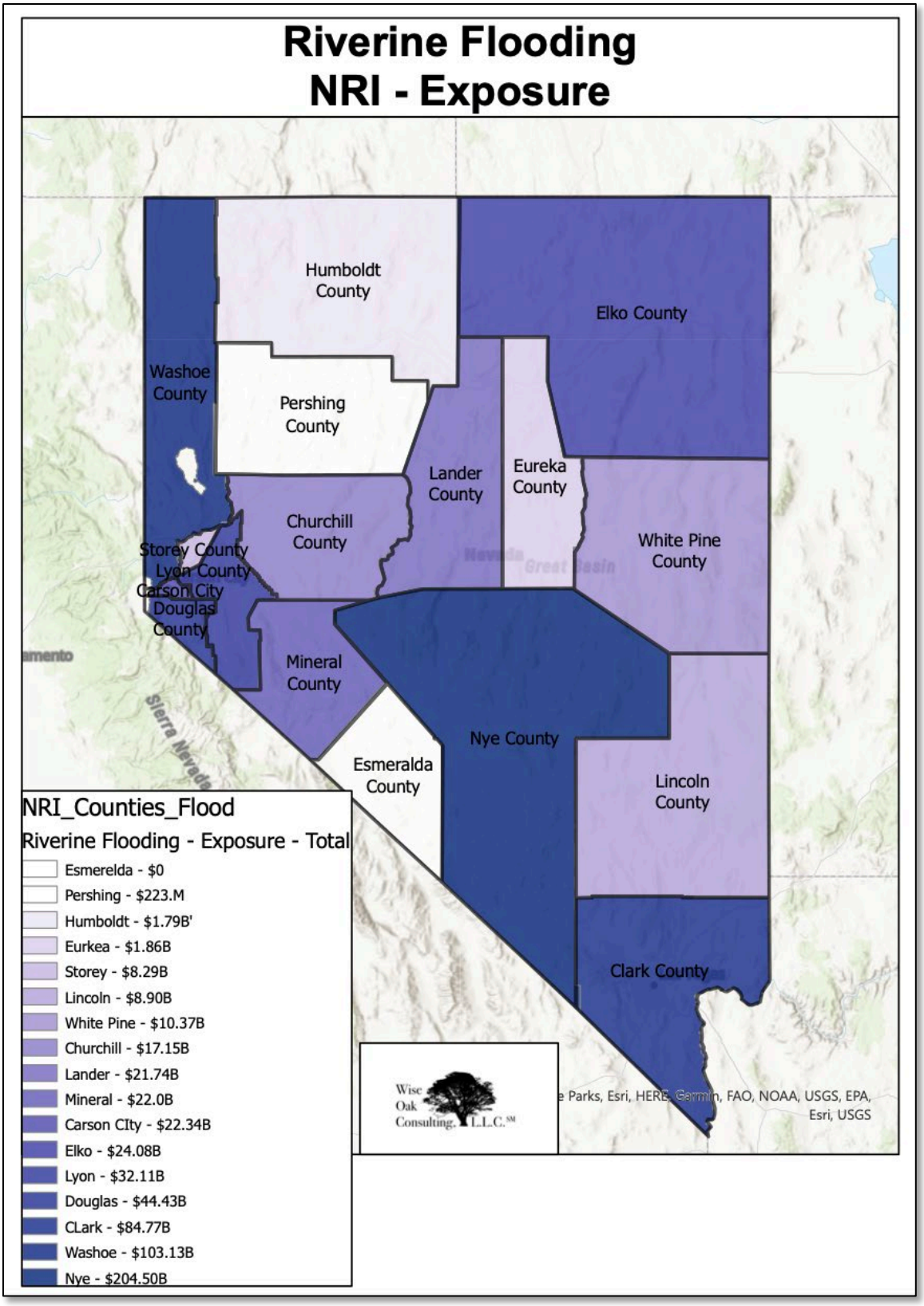


Figure 3-223. Riverine Flooding NRI Total Exposure by County.

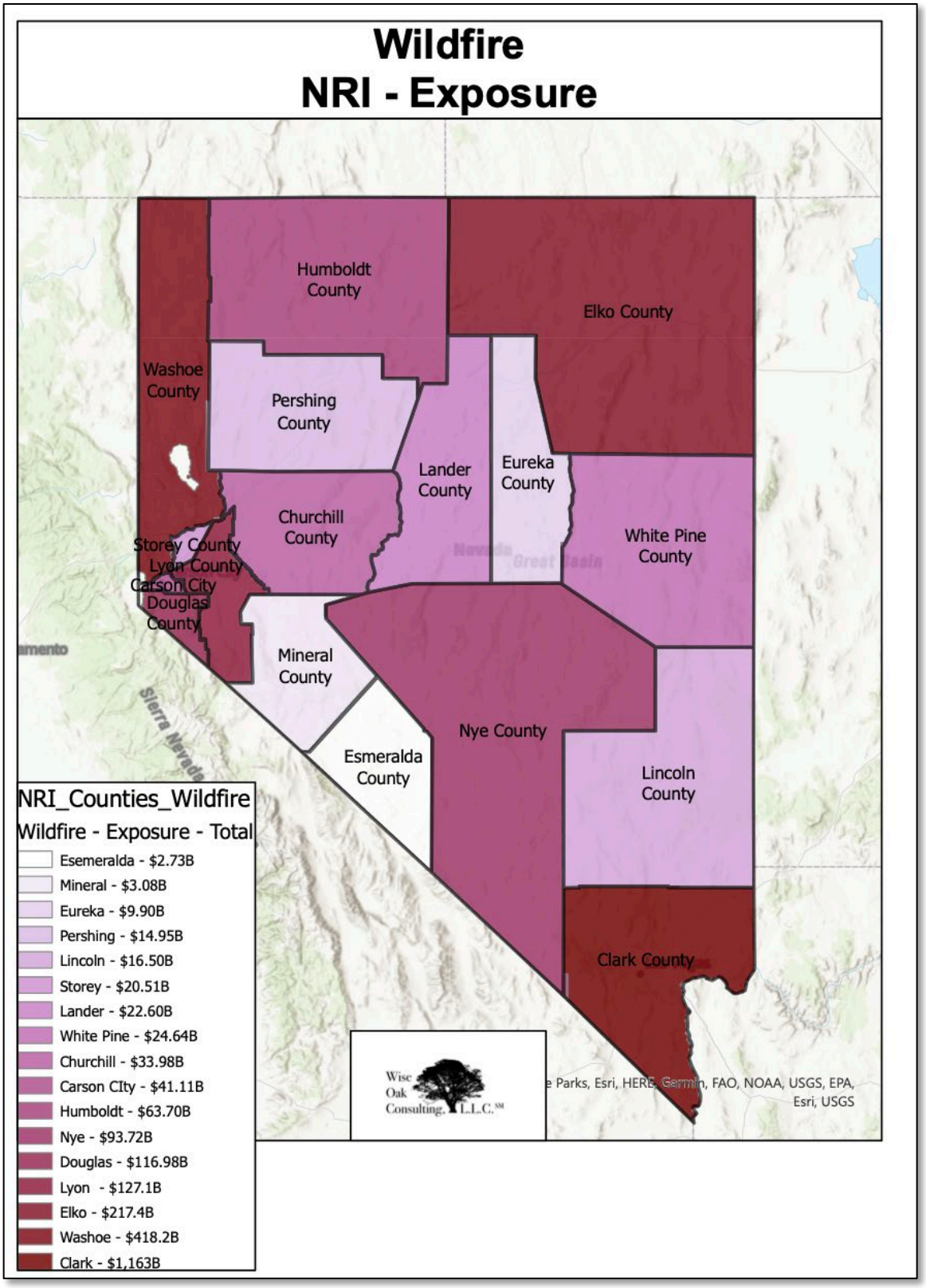


Figure 3-224. Wildfire NRI Total Exposure by County.

3.5.5 Results of Changes in Development

Table 3-51 shows the cumulative change in population in Nevada counties from 2017 to 2022. The greatest total increase by population is found in Clark and Washoe counties; however, Esmeralda and Lander counties have the greatest growth by percentage. As demonstrated in Table 8-5, Section 8.6.4, more Nevada communities have adopted the latest versions of international building and fire codes, however, enforcement of codes and regulations becomes cumbersome with reductions in staffing.

Table 3-51. Population Change in Nevada by County 2010-2017[171]

	Population Estimates		Change, 2017 to 2022	
	July 1, 2017 Estimates Base	July 1, 2022 Estimates Base	Difference	Percent
Nevada Total	*2,930,654*	*3,177,772*	*247,118*	*8.4%*
Counties				
Churchill	26,048	25,843	1,171	*4.5%*
Clark	2,126,099	2,322,985	174,830	*8.2%*
Douglas	48,171	49,628	1,174	*2.4%*
Elko	55,294	54,046	6,476	*11.7%*
Esmeralda	1,044	744	261	*25.0%*
Eureka	1,930	1,863	-57	*-3.0%*
Humboldt	18,159	17,272	1,630	*9.0%*
Lander	6,778	5,766	1,003	*14.8%*
Lincoln	5,099	4,482	-246	*-4.8%*
Lyon	55,404	61,585	3,424	*6.2%*
Mineral	4,404	4,525	-368	*-8.4%*
Nye	46,004	54,738	2,058	*4.5%*
Pershing	6,830	6,462	77	*1.1%*
Storey	4,009	4,170	-1	*0.0%*
Washoe	459,142	496,745	37,735	*8.2%*
White Pine	10,295	8,788	265	*2.6%*
Carson City	55,945	58,130	671	*1.2%*

Increases in population place more people at risk from the high-risk hazards of earthquake, wildfire, and flood, including dam failure. These risks are particularly dangerous to communities when:

- Building along faults and locations prone to extreme shaking during an earthquake.
- Developing residential locations within areas prone to wildfire without the required defensible space, water storage, or building materials.
- Developing residential neighborhoods on alluvial fans that are vulnerable to flash-flooding in arid environments.
- Potential flood and dam failure concerns are ignored as dams are built along the creeks, rivers and waterways.

Other challenges to land use planning are as follows:

- Enforcement – lack of staffing in rural counties due to the county's economic, administrative and technical capabilities.

[171] United States Census Bureau, Quick Facts, accessed April 24, 2023, https://www.census.gov/quickfacts/fact/table/NV,US/PST045222.

- State laws are not effective unless counties and cities adopt and enforce them at the local level.
- Federal ownership of land - over 85% of the land in Nevada is managed by the federal government. New development on privately owned property is often flanked on several sides by federally owned land making the mitigation of hazards problematic, especially for wildfire and flood hazards.

Possible solutions to avoid risks posed by hazards are:

1. Provide incentives to communities for added enforcement of existing codes.
2. Create stricter requirements for development.
3. Enhance land-use-planning capabilities.
4. Initiate water reclamation projects.
5. Restrict water-saving features to new homes;
6. Provide incentives for new and existing homeowners to mitigate the risk to their homes from possible hazards.
7. Increase hazard mapping and study programs for all hazards but especially on alluvial fans and areas adjacent to canals and ditches.
8. Increase public awareness for all hazards.

3.6 ASSESSING VULNERABILITY OF STATE FACILITIES

The requirements for assessing vulnerability of State facilities, as stipulated in the DMA 2000 and the regulations implementing the act are described below.

ELEMENT	REQUIREMENTS
S4. Does the risk assessment provide an overview of the probabilities of future hazard events? [44 CFR §201.4(c)(2)(i)][172] .	a. The risk assessment must provide an overview of the probability of future hazard events that includes projected changes in the location, range of anticipated intensities, frequency, and/or duration of each natural hazard. b. Probability must include considerations of changing future conditions, including climate change (e.g., long-term weather patterns, average temperature, and sea levels) on the type, location, and range of anticipated intensities of identified hazards. ***Probability od future hazard events*** means the likelihood of the hazard occurring or reoccurring. It may be defined in historical frequencies, statistical probabilities, hazard probability maps and/or general descriptors (e.g., unlikely, likely, highly likely). If general descriptins are used, they must be quantified or defined in the plan. For example, "highly likely" could be defined as "100% chance of occurrence next year" or "one event every year."

3.6.1 Types of State-Owned or -Operated Critical Facilities in Hazard Areas

Definition of a Critical Facility

Critical facilities in the state are defined as those that will impact the delivery of vital services to Nevadans; or whose damage would put special populations at risk; or which could cause greater damage to other sectors of the community. Critical facilities is defined in *Emergency Management: Principles and Practice for Local Government* (1991) Drabek and Hoetmer (Editors) as "sites, structures and institutions that, if affected by an emergency, may enlarge the scope of impact by exacerbating the problem; reducing a department's ability to respond; or presenting a secondary problem greater than the primary one".

The State recognizes that some privately owned critical facilities are essential to Nevada's economy and livelihood such as casinos. A major disaster would have a strong negative impact on these private assets as well as on state facilities.

At the completion of this update in 2023, there were a total of 3,195 facilities on the 2017 listing of buildings owned by the state. SPWD has determined that 801 of these state-owned buildings should be considered critical and are listed in Table 3-52. To view the complete list, please see SPWD's website: http://publicworks.nv.gov/Buildings/List_of_State_Owned_Buildings.

Table 3-52 summarizes the state's critical facilities and infrastructure, and their replacement value updated for 2023. Please note that there is only one bridge listed – the recent bridge constructed by SPWD in Caliente, Nevada. This list does not include NDOT bridges or roads that may be considered critical however it does include NDOT buildings.

Table 3-52. State Critical Facilities and Infrastructure

State Departments	Number of Buildings	Facility Replacement Value
Administrative	30	$63,898,250

[172] 44 CFR §201.4(c)(2)(i), "An overview of the type and location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate;"

Conservation and Natural Resources	90	$12,726,500
Military	62	$209,453,500
Nevada System of Higher Education	117	$1,045,487,250
Veteran Services	9	$51,442,500
Department of Wildlife	22	$1,669,250
Department of Agriculture	3	$2,429,250
Attorney General	3	$8,679,750
Department of Corrections	220	$808,282,000
Department of Education	3	$7,523,000
Health and Human Services	81	$178,129,000
Legislative	3	$60,019,000
Department of Motor Vehicles	2	$6,618,250
Department of Public Safety	5	$25,082,000
Supreme Court	1	$29,725,000
Department of Transportation	143	$171,210,500
Nevada Adult	1	$5,047,500
Tourism and Convention Administration	5	$378,000
Bridge[173]	1	$3,000,000
Total	**801**	**$2,679,382,750**

[173] Caliente Bridge maintained by HHS. NDOT maintains its own inventory of bridges.

3.6.2 Estimating Potential Losses by Jurisdiction

The requirements for estimating potential losses by jurisdiction, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S6. Does the risk assessment include an overview and analysis of jurisdictions' vulnerability to the identified hazards and the potential losses? [44 CFR §§201.4(c)(2)(ii) and 201.4(c)(2)(iii)][174]	a. The risk assessment must provide a current summary of the most vulnerable jurisdictions based on the state, local, and tribal, as applicable, risk assessments. Vulnerability must be analyzed in terms of: 1. Jurisdictions most threatened by the identified hazards based on type, location, range of anticipated intensities, and probability. Probability must include the potential impacts of climate change. 2. Jurisdictions most vulnerable to damage and loss from hazard events with respect to potential impacts to: i. Populations, including socially vulnerable and underserved communities. ii. Structures, including critical facilities. iii. Infrastructure and community lifelines servicing jurisdictions that could affect state resilience, including Safety and Security; Food, Water, Shelter; Health and Medical; Energy; Communications; Transportation; and Hazardous Material lifelines. b. The risk assessment must include an overview and analysis of the potential losses to the identified vulnerable structures based on estimates in the local risk assessments as well as the state risk assessment. c. *If the state is interested in HHPD funding eligibility, the risk assessment must address risks from high hazard potential dams in the risk assessment (see HHPD2 in Section 3.8.).* ***Community lifelines*** are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. An ***overview*** provides the results of the analysis and does not need to include the details from each local plan. Detailed analyses do not need to be placed in the body of the plan. They can be included as appendices. An example of an overview is a list of key issues or problem statements that clearly describes the greatest vulnerabilities and compares losses across the state, allowing the state to determine mitigation priorities.

As part of the current update to this plan, the most recent version of HAZUS was run for a series of earthquake and flood scenarios. An earthquake that has happened in the geological past was chosen on a fault near each county seat. Results and vulnerability analyses for earthquake are discussed and tabulated in Section 3.7.1 below.

For floods, HAZUS was run for 100-year floods on the major rivers within the state (Carson, Colorado, Humboldt, Muddy, Truckee, Virgin, and Walker). Results and vulnerability analyses for flood are discussed and tabulated in Section 3.7.2 below. For potential failures of major dams on the Truckee (and its tributaries in California), Carson, and Humboldt Rivers, the 100-year flood values serve as a proxy for potential losses. HAZUS scenarios for failures of the two

[174] 44 CFR §201.4(c)(2)(iii): "An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas."

dams on the Colorado River in Nevada (Hoover and Davis) have not been analyzed; Hoover Dam is discussed in Section 3.3.17.3.

For wildfire vulnerability, NDF provided an analysis of potential wildfire losses in areas of mapped as moderate to high-risk for wildfire compared to the assessed value of improved and unimproved land provided by the county assessors' offices. These data are displayed in Table 3-62 and 3-63 in the wildfire vulnerability subsection 3.7.3.

3.6.3 Estimating Potential Losses of State Facilities

The requirements for estimating potential losses of State facilities, as stipulated in the DMA 2000 and its implementing regulations, are described below. NDWR estimates that the dam failure losses will be similar to flood losses. Therefore, we do not present separate data for dam failure, but include it as a type of flooding. Potential losses to State building facilities were estimated for the three highest-ranking natural hazards: earthquake, wildfire, and flood. These loss estimations are presented in the following subsections.

ELEMENT	REQUIREMENTS
S4. Does the risk assessment provide an overview of the probabilities of future hazard events? [44 CFR §201.4(c)(2)(i)][175] .	a. The risk assessment must provide an overview of the probability of future hazard events that includes projected changes in the location, range of anticipated intensities, frequency, and/or duration of each natural hazard. b. Probability must include considerations of changing future conditions, including climate change (e.g., long-term weather patterns, average temperature, and sea levels) on the type, location, and range of anticipated intensities of identified hazards. ***Probability of future hazard events*** means the likelihood of the hazard occurring or reoccurring. It may be defined in historical frequencies, statistical probabilities, hazard probability maps and/or general descriptors (e.g., unlikely, likely, highly likely). If general descriptions are used, they must be quantified or defined in the plan. For example, "highly likely" could be defined as "100% chance of occurrence next year" or "one event every year."

3.6.3.1 Earthquake Loss Estimation for State Facilities

Losses were calculated using the updated *"Nevada State Owned Building List"* received from SPWD, which provided an updated average replacement value of $1,150 for all state buildings.[176]

1. The sum of the square footage for all state buildings equals 29,355,021 sq. ft.
2. The sum of the square footage for critical state buildings equals approximately 10,701,931 sq. ft.
3. The replacement value for all State Buildings totals $733,760,574,150.[177]
4. The replacement value for Critical State Buildings is approximately **$12,311,120,650**.

Dividing the National Risk Index (NRI) building expected annual loss by the NRI building exposure provides an average annualized loss rate of 0.06%. Using this loss rate and the replacement values at $1,150 per square foot for all state buildings and critical state facilities listed in Table 3-52, the annualized loss would be approximately $20,760,574,150 for all State Buildings and $7,386,672 for critical state buildings.

[175] 44 CFR §201.4(c)(2)(i), "An overview of the type and location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate;"

[176] Branden Pearson, Nevada Publics Works Division, "Please use $1,150 per square foot for the replacement cost. This includes construction costs (materials and labor) and project costs (Architect/ Engineering design, permit fees, surveys, geotechnical reports, contingency, etc.), email, May 2, 2023.

[177] The value of the Caliente Bridge is $3,000,000 vice its value at $250 per sq. ft.

The State of Nevada Conduct three, regional THIRAs/SPRs that it aggregates into its statewide THIRA/SPR – Northwest Nevada, Northeast Nevada, and Southern Nevada. In its THIRAs, the state carries earthquake scenarios for each region – Mt. Rose, Mt. Ruby, and Frenchman Mountain respectively. Accordingly, the State conducted hazard analysis to estimate the expected losses from each of these scenarios to estimate the losses from each of these "worst most likely" cases. A description of scenario results follows and Table 3-53 provides a summary of the results.

HAZUS modeling of the USGS M6.9 Mt. Rose Earthquake scenario resulted in a total replacement cost of state facilities within the affected counties of $16,440258,550 and $5,855,123,000 for critical facilities. The HAZUS run resulted in a loss ratio of 6.2% (Building Loss/Building Inventory) of the inventory. Using 6.2% as a loss ratio for buildings in the affected counties results in a loss of $1,019,296,628,000 for all state facilities and a loss of $363,017,626 for critical facilities.

HAZUS modeling of the USGS M6.6 Frenchman Mountain Fault Earthquake scenario resulted in a total replacement cost of state facilities within the affected counties of $15,422,768,450 and $5,518,494,650 for critical facilities. The HAZUS run resulted in a loss ratio of .24% of the inventory. Using .24% (Building Loss/Building Inventory) as a loss ratio for buildings in the affected counties results in a loss of $37,014,644 for all state facilities and a loss of $13,244,387 for critical facilities.

HAZUS modeling of the USGS M6.9 Ruby Mountain Earthquake scenario resulted in a total replacement cost of state facilities within the affected counties of $1,771,254,150 and $899,283,900 for critical facilities. The HAZUS run resulted in a loss ratio of 1.2% (Building Loss/Building Inventory) of the inventory. Using 1.2% as a loss ratio for buildings in the affected counties results in a loss of $21,255,049 for all state facilities and a loss of $10,791,407 for critical facilities.

Table 3-53. Estimate Losses - USGS Scenarios for Mt. Rose, Frenchman Mountain, Ruby Mountain					
USGS HAZUS Scenario	**HAZUS Loss Ratio**	**Total Government Building Exposure**	**Total Government Building Loss**	**Critical Government Building Exposure**	**Critical Government Building Loss**
M 6.9 Mt. Rose	6.2%	$16,440,258,550	$1,019,296,030	$5,855,123,000	$363,017,626
M 6.6 Frenchman Mountain	.24%	$15,422,768,450	$37,014,644	$5,518,494,650	$13,244,387
M 6.9 Ruby Mountain	1.2%	$1,771,254,150	$21,255,050	$899,283,900	$10,791,407
Total	N/A	$33,634,281,150	$1,077,565,724	$12,272,901,550	$387,053,420

3.6.3.2 Loss Estimation for Flood for State Facilities

The State Division of Risk Management provided a listing of critical state facilities found in SFHAs along with the insured value for the buildings.

The State Flood Insurance Program Manager, based on historical data, concluded that there would be a building loss of approximately 30% for buildings located within the 100-year flood zone. The losses calculated include contents of each facility as provided by the Division of Risk Management. Using this loss percentage, the estimated losses for State-owned critical facilities during a 100-year flood are summarized in Table 3-54 below.

Table 3-54. Flood Vulnerability of Critical State-Owned Buildings, Statewide

Hazard Rating	Building Inventory Affected	
	Number of Buildings	*Value in ($ Million)*
Extreme		
High[1]	49	$68.5
Medium[2]	531	$2,160
Total Losses in ($) Millions	**$2,228.5**	

Source: NV Risk Management (provided flood zone data) and SPWD (provided a list critical facilities). Data does not include Nevada System of Higher Education (NSHE) buildings. Due to staff and time constraints, only a fraction of state-owned buildings has been mapped.

[1] Includes critical buildings listed in the following flood zones: A, AE, AH, AO

[2] Includes critical buildings listed in the following flood zones: C, X, X500, X500L

3.6.3.3 Loss Estimation for Wildland/Urban Interface Fires for State Facilities

For buildings in the listing provided by SPWD without a replacement value, the members of the NHM Working Group agreed to use the previous cost of $1,150 sq. ft. for replacement cost of a structure. For all facilities, the State Fire Program Manager confirmed the loss of the entire structure when faced with wildland fire whether in extreme, high, or medium risk location, the value of contents was calculated by adding 50 percent to its total cost. This is considered an average cost to include cleaning of smoke damage, loss of function, equipment, and supplies. The formula is:

$$\text{Loss} = (\text{Area X } \$1{,}150) + ((\text{Area X } \$1{,}150) \text{ X } .50)$$

for facilities with no current replacement value. Otherwise, the value provided by the SPWD was used with a 50 percent value for contents added. NDF used the Westwide Wildfire Risk Assessment GIS data to overlay the known wildland fire risk categories associated with current locations of state facilities. The loss estimation due to wildfire for critical state facilities is shown in Table 3-55. The maps created for this vulnerability assessment are found in Appendix I.

Table 3-55. Wildfire (WUI) Vulnerability of Critical State-Owned Buildings, Statewide

Hazard Rating	Building Inventory Affected	
	Number of Buildings	*Value in ($ Million)*
Extreme	465	$1,456.8
High	200	$1,509.2
Medium	195	$1,78.5
Total Losses in ($) Millions	**$466.2**	

Source: NDF provided data & SPWD provided a list of critical facilities

3.6.3.4 Vulnerability of State Communication Facilities due to Earthquake, Flood, and Wildfire

In Nevada, communication facilities are managed by NDOT and the Enterprise IT Services (EITS). Because the management lies outside of SPWD, and was received at a later time, this information was not included in the HAZUS or wildfire vulnerability assessments. Table 3-56 below shows the vulnerability for state-owned communications facilities based on the information provided by EITS Manager for the State Microwave Group. The location of these facilities will be integrated into the HAZUS data base and the wildfire GIS module for inclusion in the overall analysis next iteration of this plan. The analysis consists of applying the number of facilities at risk of each hazard by the replacement value, estimated at $500,000 each, with an increase of 50 percent of the value for contents. For example, all 110 facilities are at risk of earthquake, presuming complete damage, 110 X $500,000 = $5,500,000. With a 50 percent increase for contents: $5,500,000+2,750,000 =$8.250 million. EITS estimates that 20 percent and 60 percent of the communication facilities are at risk of flood and wildland fire, respectively.

Table 3-56. Vulnerability for State-owned Communication Facilities, Statewide						
	Communications Facilities Inventory Affected					
Hazard Rating	**Earthquake**		**Flood**		**Wildfire**	
	Number	$ Mill	Number	$ Mill	Number	$ Mill
Extreme	110	$82.5				
High					66	$49.5
Medium			22	$16.5		
Total Losses in ($) Millions	**$148.5**					

Source: Enterprise IT Services. This table will be updated in the next iteration of the plan.

3.7 VULNERABILITY ASSESSMENT AND ANALYSIS OF POTENTIAL LOSSES

This section provides detailed vulnerability analysis for 801 State of Nevada Critical buildings based on earthquake, flood, and wildfire. Appendix T provides a more general analysis of the same vulnerability to the same buildings for all hazards that are both in this plan and included in FEMA's National Risk Index.

3.7.1 Earthquake

The following information is taken from NBMG Open-File Report 14-5, *Updated Estimated Losses from Earthquakes near Nevada Communities,* 2014, by Irene M. Seelye, Gary L. Johnson, Craig M. dePolo, James E. Faulds, and Jonathan G. Price, which is available in Appendix J and online at this link: *http://pubs.nbmg.unr.edu/Updated-estimated-losses-p/of2014-05.htm*
Figure 3-225 shows the location of the thirty-eight Nevada communities chosen for the scenarios for this report. It estimates losses from earthquakes that could occur near the communities, which include all county seats and major population centers. The online report includes links to detailed loss estimation scenarios for each community for each of the given earthquake values. The report uses the FEMA's loss-estimation computer model, HAZUS-MH, to estimate factors from earthquakes of magnitude 5.0, 5.5, 6.0, 6.5, and 7.0:

- Total economic loss
- Numbers of buildings receiving extensive to complete damage
- Number of people needing public shelter and hospital care
- Number of fatalities

.

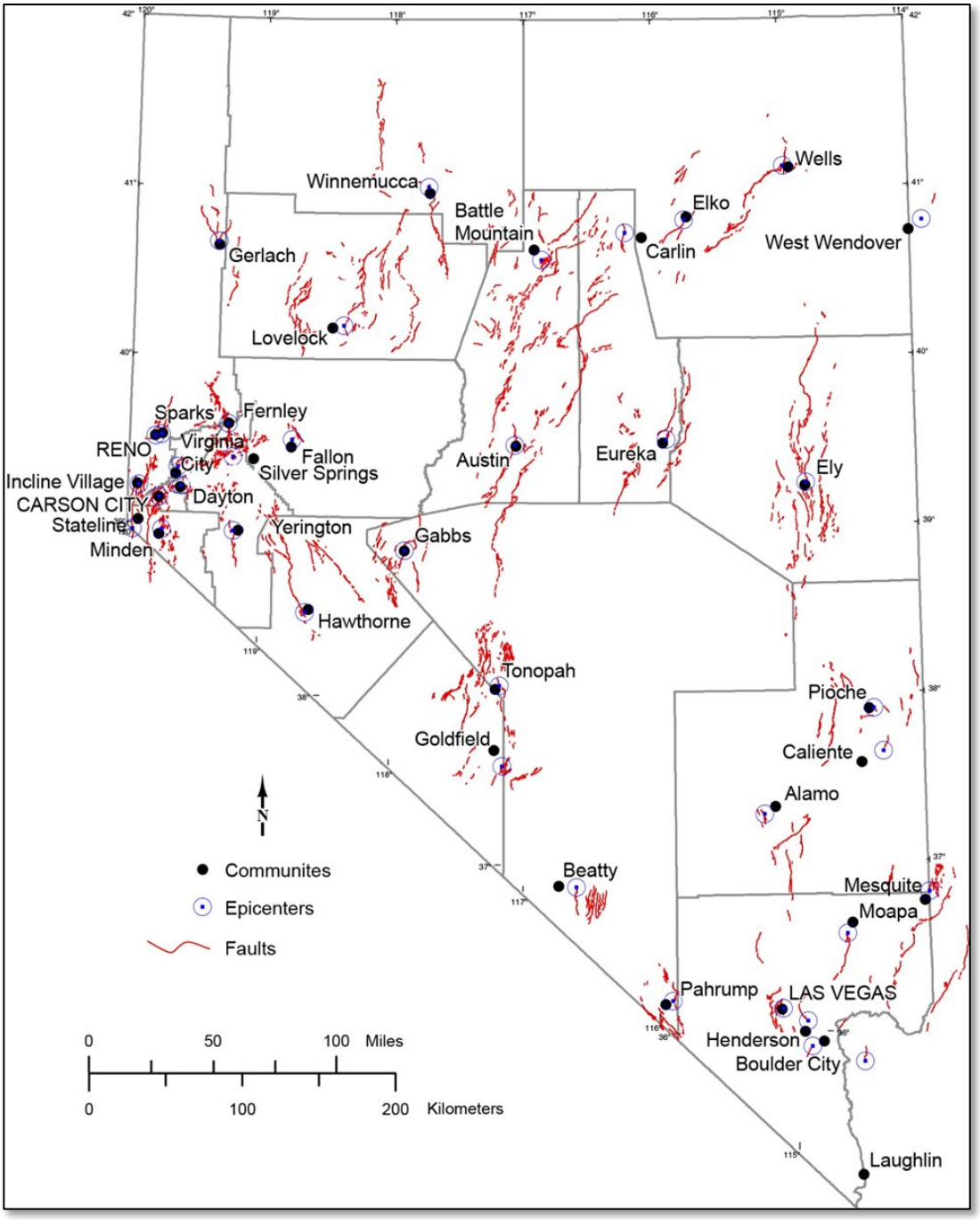


Figure 3-225. Locations of the 38 Communities in Nevada HAZUS Earthquake Scenarios.[178]

The probability of occurrence of each of these earthquake magnitudes for the listed communities is also tabulated using USGS's probabilistic seismic hazard analysis and is shown in Table 3-57.

[178] Note: The faults chosen for the earthquake scenarios are also shown with red lines. The epicenters of the earthquakes shown with thin blue circles were chosen at the fault position that is closest to the community.

Table 3-57. Probabilities of Earthquakes of Various Magnitudes Occurring within 50 years within 50 kilometers (31 miles) of 38 Major Communities in Nevada[179]							
County	**County seat *or other community***	**% Probability of occurrence of magnitude greater than or equal to:**					**Rank by Probability**
		5.0	5.5	6.0	6.5	7.0	
Carson City	Carson City	>90	~80	70	50-55	12-15	2
Churchill	Fallon	80-90	~60	35	20-25	6-8	14
Clark	Las Vegas	40-50	~30	12	4-5	<0.5	28
	Boulder City	50-60	~30	12	4-5	<0.5	23
	Henderson	50-60	~30	12	4-5	<0.5	23
	Laughlin	10-20	~5	2-3	0.5-1	<0.5	38
	Mesquite	20-30	~15	4-6	2	<0.5	35
	Moapa	40-50	~25	10	4-5	<0.5	30
Douglas	Minden	>90	~80	67	50-60	10-12	6
	Stateline	>90	~80	60-70	40-50	10	9
Elko	Elko	30-40	~25	10-15	6-8	0.5-1	31
	Carlin	40-50	~30	10-15	6-8	0.5-1	27
	Wells	30-40	~20	9	6	0.5-1	32
	West Wendover	20	~10	4	1-2	<0.5	37
Esmeralda	Goldfield	80-90	~55	20-30	5-10	<1	15
Eureka	Eureka	40-50	~30	10-15	4-6	<0.5	28
Humboldt	Winnemucca	50-60	~35	15-20	5-10	1-1.5	22
Lander	Battle Mountain	60-70	~40	18	10	1.5	20
	Austin	60-70	~40	20	10-15	2-3	19
Lincoln	Pioche	30-40	~20	6-10	2-3	<0.5	33
	Alamo	70-80	~50	20-25	6-8	<0.5	17
	Caliente	50-60	~35	10-15	4	<0.5	23
Lyon	Yerington	>90	~75	60	40-45	12	8
	Dayton	>90	~80	70-75	50-55	15-18	1
	Fernley	90	~70	48	35	8	12
	Silver Springs	>90	~70	50-60	30-40	10-12	11
Mineral	Hawthorne	>90	~75	61	30-40	10-12	10
Nye	Tonopah	70-80	~50	20-30	5-10	<1	17
	Beatty	70-80	~55	30-40	20-30	10-12	16
	Gabbs	90	~65	40-50	20-25	6-8	13
	Pahrump	30-40	~25	5-10	3	<1	33
Pershing	Lovelock	50-60	~35	10-20	10	1-2	21
Storey	Virginia City	>90	~80	70	50	12-15	3
Washoe	Reno	>90	~80	67	50	12-15	4
	Gerlach	40	~25	10-15	6-10	2-3	26
	Incline Village	>90	~80	60-70	40-50	10-12	7
	Sparks	>90	~80	67	50	12-15	4
White Pine	Ely	20-30	~15	4-6	1.5-2	<0.5	35

[179] Source: Data taken from maps produced by USGS.

What these Magnitudes Mean

Although it is nearly impossible to specifically predict what an earthquake of a given size might do to a community, the earthquake sizes presented relate to different general levels of damage. Generally, the greater the magnitude, the stronger the shaking will be and the longer the shaking will last.

Magnitude 5 earthquakes are distinctly felt by almost everybody and can cause rockslides and nonstructural damage, such as heavy, unsecured objects falling off shelves. If a magnitude 5 earthquake is shallow and directly under a community, significant damage can occur.

Magnitude 6 earthquakes can significant nonstructural damage, damage to weak buildings, and content damage, especially in basins and along ridge tops.

Magnitude 6.5 earthquakes can create surface offsets and can cause significant damage.

Magnitude 7 earthquakes cause widespread structural, nonstructural, and content damage to multiple communities and require a significant "recovery period" for communities to restore themselves and can have surface ruptures tens of miles long.

It is noteworthy that the earthquake that struck Wells, Nevada on 21 February 2008 was a magnitude 6.0 event. The probability of such an earthquake striking the Las Vegas urban area is comparable to the probability for Wells, and the probability of such an earthquake striking the Reno-Sparks-Carson City urban corridor is considerably higher.

A shaking potential map for the entire state of Nevada is shown in Figure 3-226. Individual county shaking potential maps are presented in Appendix E.

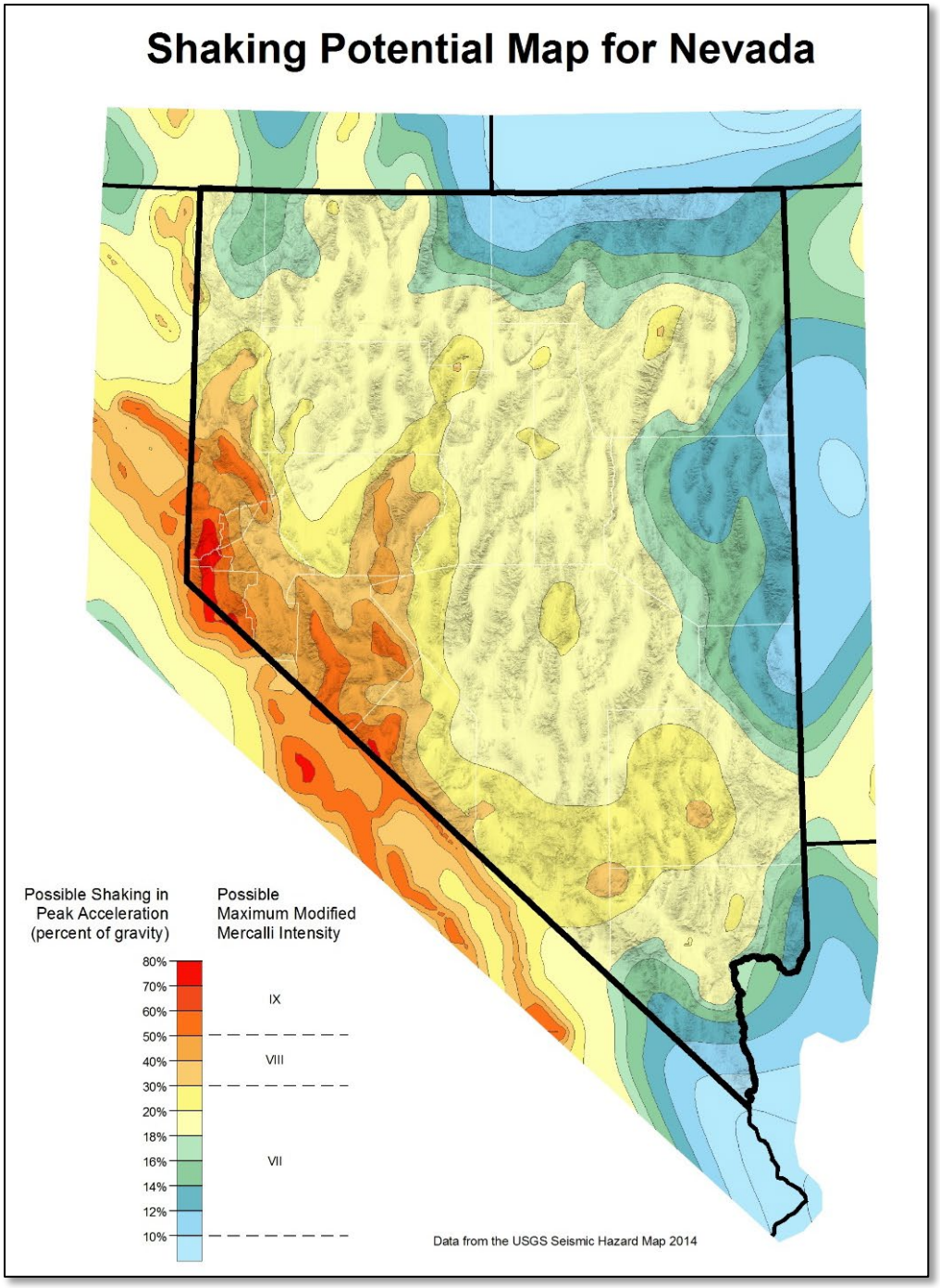


Figure 3-226. Shaking Potential Map for Nevada.[180]

HAZUS damage estimates for individual communities for each scenario magnitude earthquake are presented in Table 3-58 below or may be accessed online at this link: *http://pubs.nbmg.unr.edu/Updated-estimated-losses-p/of2014-05.htm*

[180] *Source: Nevada Bureau of Mines and Geology.*

Table 3-58. HAZUS Summary Estimates for Total Economic Losses[181]				
County	**County seat (bolded)** *or other community (italicized)*	**Total Economic Loss**	**% Probability of occurrence** *(from Table 3-58)*	**Rank by Loss**
Carson City	**Carson City**	$250,000,000	70	6
Churchill	**Fallon**	$53,000,000	35	14
Clark	**Las Vegas**	$3,100,000,000	12	1
	Boulder City	$590,000,000	12	5
	Henderson	$1,000,000,000	12	2
	Laughlin	$44,000,000	2–3	16
	Mesquite	$62,000,000	4–6	13
	Moapa	$33,000,000	10	17
Douglas	Minden	$140,000,000	67	10
	Stateline	$160,000,000	60–70	7
Elko	**Elko**	$92,000,000	10–15	12
	Carlin	$7,500,000	10–15	31
	Wells	$17,000,000	9	22
	West Wendover	$6,000,000	4	34
Esmeralda	**Goldfield**	$5,000,000	20–30	36
Eureka	**Eureka**	$16,000,000	10–15	24
Humboldt	**Winnemucca**	$18,000,000	15–20	20
Lander	**Battle Mountain**	$8,600,000	18	30
	Austin	$15,000,000	20	25
Lincoln	**Pioche**	$7,000,000	6–10	32
	Alamo	$5,100,000	20–25	35
	Caliente	$6,000,000	10–15	33
Lyon	**Yerington**	$13,000,000	60	28
	Dayton	$110,000,000	70–75	11
	Fernley	$44,000,000	48	15
	Silver Springs	$29,000,000	50–60	19
Mineral	**Hawthorne**	$14,000,000	61	26
Nye	**Tonopah**	$9,000,000	20–30	29
	Beatty	$4,600,000	30–40	37
	Gabbs	$4,300,000	40–50	38
	Pahrump	$30,000,000	5–10	18
Pershing	**Lovelock**	$13,000,000	10–20	27
Storey	**Virginia City**	$140,000,000	70	9
Washoe	**Reno**	$970,000,000	67	3
	Gerlach	$16,000,000	10–15	23

[181] *Note:* Figures are derived from a magnitude 6.0 earthquake on a fault close to each of the scenario communities and probability of a magnitude 6 or greater earthquake occurring within 50 years within 50 kilometers (31 miles) of each community. Source: NBMG OFR 14-5; 2014, Updated Estimated Losses from Earthquakes near Nevada Communities, 2014, by Irene M. Seelye, Gary L. Johnson, Craig M. dePolo, James E. Faulds, and Jonathan G. Price.

Table 3-58. HAZUS Summary Estimates for Total Economic Losses[181]				
County	**County seat (bolded)** *or other community (italicized)*	**Total Economic Loss**	**% Probability of occurrence** *(from Table 3-58)*	**Rank by Loss**
	Incline Village	$140,000,000	60–70	8
	Sparks	$920,000,000	67	4
White Pine	**Ely**	$17,000,000	4–6	21

Table 3-58 indicates that damage from major earthquakes could range from millions of dollars in sparsely populated rural counties to billions of dollars in urban areas. Tens of thousands of buildings could suffer extensive or complete damage. Fatalities could reach into the hundreds. Thousands of people may need public shelter. Importantly, many earthquakes are likely to cause significant, simultaneous damage in multiple counties. In particular, a major earthquake anywhere in the Reno-Carson City urban corridor is likely to cause significant damage in not only Carson City but also in adjacent Douglas, Storey, and southern Washoe Counties.
Table 3-59 ranks the top ten Nevada communities by potential economic losses due to the scenario earthquake. Not surprisingly, the counties with the largest populations are generally the ones with the most at risk.

Table 3-59. HAZUS Top Ten Nevada Communities for Highest Potential Economic Loss from Earthquake				
County	**County seat (bolded)** ***or other community***	**Total economic loss**	**% Probability** ***(see Table 3-58)***	**Rank by Loss**
Clark	Las Vegas	$3,100,000,000	12	1
Clark	*Henderson*	$1,000,000,000	12	2
Washoe	Reno	$970,000,000	67	3
Washoe	*Sparks*	$920,000,000	67	4
Clark	*Boulder City*	$590,000,000	12	5
Carson City	Carson City	$250,000,000	70	6
Douglas	*Stateline*	$160,000,000	60-70	7
Washoe	*Incline Village*	$140,000,000	60-70	8
Storey	Virginia City	$140,000,000	70	9
Douglas	Minden	$140,000,000	67	10

Source: HAZUS, NBMG, UNR

HAZUS program runs also demonstrate that essential facilities will be severely stressed following major earthquakes. The HAZUS program predicts that hospitals in the epicenter areas will have insufficient beds to accommodate the number of injured people, which means that plans should be improved for transporting injured people to hospitals in other unaffected jurisdictions. Fire stations, police stations, and schools will most likely be operating at reduced capacity due to earthquake damage, and there may be significant damage to utilities and transportation systems.

HAZUS is a modeling tool only. Given the uncertainties in actual ground-shaking and potential damage during earthquakes, HAZUS damage estimates are likely to differ from actual losses by

a factor of between two and ten. Nonetheless, HAZUS provides a reasonable, widely accepted methodology for estimating vulnerabilities and ranking areas by relative risk.

From a geological perspective, it is obvious that all areas of Nevada will experience major earthquakes at some time in the future. Thus, all communities are justified in preparing for a serious earthquake scenario regardless of the probability of occurrence of an earthquake of that magnitude, particularly in the consideration of using earthquake-resistant building standards in the design and planning of critical facilities.

3.7.2 Flood

Flooding is considered to be a "High Risk" hazard in much of Nevada. Floods can potentially affect many areas developed for businesses and homes. Floods can affect multiple jurisdictions, as was the case in January of 1997, when Carson City, Douglas, Lyon, Storey, and Washoe Counties were impacted by floods on the Carson, Walker, and Truckee Rivers. Based on the frequency of flooding in the past, the probability of future, damaging floods in Nevada is high. Emerging tools and techniques will help in the process of identifying the structures with the highest flooding vulnerability. GIS data of Nevada's Critical Facility structures have been compiled and can be used with the new digital flood hazard data to query detailed information. Current and future flood hazard mapping as part of FEMA's Risk MAP program will include a non-regulatory flood risk product data set called "Areas of Mitigation Interest." Features of this data set identifies conditions in a watershed that may contribute to the severity and associated losses of a flood hazard: stream flow pinch points, the conditions included in this spatial data set are areas experiencing development or land use change, locations of past claims areas with a history of flood claims, key emergency routes overtopped during frequent flooding events, areas of significant erosion or mitigation success, and areas that have structures that are contributing to flooding (undersized culverts, bridges and dams). With a general idea of potential mitigation projects, the task of ranking the proposed projects can be facilitated with the use of a refined HAZUS analysis (updated terrain data, hydrologic and hydraulic analyses, and updated building stock/population data).

To assess risks and vulnerability associated with riverine flooding, the State has run the most recent version of FEMA's loss-estimation model, HAZUS-MH for reaches of the Carson, Colorado, Humboldt, Muddy, Truckee, Virgin, and Walker Rivers. The results are summarized in Tables 3-60 and 3-61. In most cases, the HAZUS runs used floods with average 100-year return periods.

Although failures of dams can cause floods, no specific HAZUS runs were made to simulate dam failures. Nonetheless, the inundation caused by a flood with a 100-year return period can be used to approximate the damage that could occur from some dam failures, particularly along the Truckee River (with the Stampede, Boca, and Prosser Reservoirs along tributaries in California, upstream from Reno), Carson River (with Lahontan Reservoir upstream from Fallon), and Humboldt River (with Rye Patch Reservoir upstream from Lovelock).

Tables 3-60 and 3-61 indicate that damage from floods could range from hundreds of thousands of dollars in sparsely populated rural areas to hundreds of millions of dollars in large urban areas. Hundreds of buildings could suffer complete destruction. Thousands of people may need public shelter. Hundreds of thousands of tons of debris may need to be cleared.

One way of assessing vulnerability is in terms of total building-related economic losses, summed for the counties affected by a 100-year flood. Using this measure, flood vulnerabilities are ranked as follows:

- Highest loss: Truckee River: $2.83 billion
- 2nd highest: Carson River: $2.76 billion
- 3rd highest: Colorado River: $1.36 billion
- 4th highest: Muddy River: $570 million
- 5th highest: Walker River: $362 million
- 6th highest: Humboldt River: $355 million
- 7th highest: Virgin River: $94 million

Clearly, Nevada's northern counties, Washoe County in particular, are more at risk than its southern ones for floods along major rivers. Clark County is, however, very vulnerable to damage from flash flooding on alluvial fans along ephemeral streams, particularly in Las Vegas Valley. This vulnerability is difficult to quantify without further extensive geologic mapping in areas where residential, industrial, and commercial development is extending over alluvial fan surfaces.

Table 3-60. Summary of HAZUS Loss-Estimation Output for 100-year Floods on Major Rivers in Nevada					
River	**County**	**Cities**	**Building-Related Economic Loss[182] ($ million)**	**Number of People Needing Short Term Shelter**	**Buildings with at least moderate damage[183]**
Carson					
	Carson City	Carson City	$100.31	187	250
	Churchill	Fallon	$1,809.68	656	6,283
	Douglas	Gardnerville, Minden	$154.59	243	301
	Lyon	Dayton, Silver Springs	$699.56	549	1,445
Carson Total			**$2,764.15**	**1,635**	**8,279**
Colorado					
	Clark[184]	Laughlin, Bullhead City, Riviera	$1,356.01	371	4,573
Colorado Total			$1,356.01	371	4,573
Humboldt					
	Elko	Elko, Carlin	$256.65	298	525
	Eureka	Palisade, Beowawe	$10.62	0	19
	Humboldt	Winnemucca	$79.61	59	229
	Lander	Battle Mountain	$7.72	75	31
	Pershing	Lovelock (protected by Rye Patch Reservoir)	$26.89	26	125
Humboldt Total			**$354.60**	**458**	**804**
Muddy					
	Clark	Moapa, Glendale, Logandale, Overton	$561.79	147	2,110
	Lincoln	Ursine, Panaca, Caliente	$7.74	7	16
Muddy Total			**$569.53**	**154**	**2,126**
Truckee					
	Lyon		0	n/a	n/a
	Storey	Lockwood	$149.81	43	843
	Washoe	Verdi, Reno, Sparks, Wadsworth, Nixon	$2,679.03	4,557	5,029
Truckee Total			**$2,828.84**	**4,600**	**5,872**
Virgin					
	Clark	Mesquite, Bunkerville	$4,760.1	117	136
Virgin Total			**$4,760.1**	**117**	**136**
Walker					

[182] Total (Pre-and Post-Firm) HAZUS results for building loss, contents loss, and inventory loss.
[183] HAZUS results that include average damage more than 30%.
[184] HAZUS runs were completed for 100-year floods on the major rivers within the state (Carson, Colorado, Humboldt, Muddy, Truckee, Virgin, and Walker), which is why Las Vegas was not included.

Table 3-60. Summary of HAZUS Loss-Estimation Output for 100-year Floods on Major Rivers in Nevada					
River	**County**	**Cities**	**Building-Related Economic Loss[182] ($ million)**	**Number of People Needing Short Term Shelter**	**Buildings with at least moderate damage[183]**
	Douglas		0	0	0
	Lyon	Wellington-Smith, Yerington	$354.89	208	543
	Mineral	Schurz, Hawthorne (protected by Walker L.)	$7.28	25	18
Walker Total			**$362.17**	**233**	**561**

Table 3-61. Vulnerability of Buildings in Each County to HAZUS 100-floods on Selected Rivers in Nevada, Ranked Both by Economic Loss and Loss by a Percentage of Exposure					
River & County	**Building Exposure ($ million)**	**Building-Related Economic Loss ($ million)**	**Loss as % of exposure (%)**	**Rank by Economic Loss**	**Rank by Loss as % Exposure**
Carson River				2	4
Carson City	$10,106.83	$100.31	0.99%		
Churchill County	$5,168.07	$1,809.68	35.02%		
Douglas County	$12,094.01	$154.59	1.28%		
Lyon County	$10,652.73	$699.56	6.57%		
Total	*$38,021.64*	*$2,764.15*	*7.27%*		
Colorado River				3	1
Clark County	$6,269.15	$1,356.01	21.63%		
Humboldt River				6	6
Elko County	$6,294.41	$256.65	4.08%		
Eureka County	$1,082.47	$10.62	0.98%		
Humboldt County	$4,197.53	$79.61	1.90%		
Lander County	$1,420.32	$7.72	0.54%		
Pershing County	$936.88	$26.89	2.87%		
Total	*$13,931.61*	*$354.60*	*2.55%*		
Muddy River				4	2
Clark County	$3,466.22	$561.79	16.21%		
Lincoln County	$1,549.69	$7.74	0.50%		
Total	*$5,015.91*	*$569.53*	*11.35%*		
Truckee River				1	5
Lyon County	n/a	n/a	0%		
Storey County	$2,771.72	$149.81	5.40%		
Washoe County	$88,101.73	$2,679.03	3.04%		
Total	*$90,873.45*	*$2,828.84*	*3.11%*		
Virgin River				7	7
Clark County only	$4,760.1	$94.32	1.98%		
Total	$4,760.1	$94.32	1.98%		
Walker River				5	3
Douglas County	$283.81	0	0%		
Lyon County	$1,980.38	$354.89	17.92%		
Mineral County	$1,202.37	$7.28	.61%		
Total	*$3,466.56*	*$362.17*	*10.45%*		

Table 3-61 summarizes vulnerability (or risk) from floods using two methods of ranking flood vulnerability:

(1) by building-related economic loss and
(2) by economic loss as a percentage of building exposure.

The county's building exposure, one of the factors within the HAZUS program, is a measure of the economic wealth of the county and a proxy for the ability of the county to recover from a disaster. Ranked by loss as a percentage of exposure, the most vulnerable rivers are:

- Highest vulnerability: Colorado River
- 2nd highest: Muddy River
- 3rd highest: Walker River
- 4th highest: Carson River
- 5th highest: Truckee River
- 6th highest: Humboldt River
- 7th highest: Virgin River

The complete HAZUS flood report with all data generated by these HAZUS runs will be contained in Nevada Bureau of Mines and Geology Open-File Report 18-1 entitled "Updated Assessment of Risks and Vulnerability to Flood Hazards in Nevada." This report is available as an online document at
http://data.nbmg.unr.edu/public/freedownloads/of/of2018-01.zip
Appendix G contains maps showing the extent of flooding for the 100-year flood event along each of the following river systems: the Carson, Colorado, East Humboldt, West Humboldt, Truckee, Walker, Virgin, and Muddy as well as a location map showing the location of these rivers within the state of Nevada. Colored contour areas represent the peak floodwater depth, an indicator of flooding intensity, scaled depending on the river and the area flooded.
The HAZUS runs have been done along major rivers within the State. However, as population in Nevada grows and development continues to expand outward from the currently populated areas, additional buildings will likely become prone to flooding in and along what are normally dry alluvial fans, washes, or ephemeral streams, particularly around the periphery of Las Vegas Valley. Flooding in these areas is typically caused by intense rainfall over relatively short periods of time. The Clark County RFCD has an aggressive program to reduce these hazards within their jurisdiction in an attempt to mitigate flood hazards along dry washes, in canyons, and on alluvial fans.

3.7.3 Wildfire

For wildfire vulnerability, NDF provided a GIS analysis of maximum potential wildfire losses in areas mapped as medium to extreme risk for wildfire overlain by the assessed values of improved and unimproved property obtained from the county assessors' offices to generate a total potential maximum exposure of property loss for each county. These data are displayed in Table 3-62. Wildfire Risk Maps and a summary of county assessors' property value lists from which the GIS data analysis was generated are located in Appendix I. For a few counties, no assessor's data were available to complete the analysis at this time (Esmeralda).

Table 3-62. Wildfire Vulnerability in Moderate to High-Risk Areas[185]

County	Land Value	Value of Improvements	Total Assessed Parcel Value
Carson City	$352,307,825	$496,563,110	$848,870,935
Churchill	$94,640,965	$240,412,110	$335,053,075
Clark	$7,612,696,132	$6,609,037,887	$14,221,734,019
Douglas	$634,986,237	$600,744,669	$1,235,730,906

[185] *Summary of County Assessors' Property Values used in GIS Wildfire Index Category Analysis.*

Table 3-62. Wildfire Vulnerability in Moderate to High-Risk Areas[185]			
County	**Land Value**	**Value of Improvements**	**Total Assessed Parcel Value**
Elko	$206,971,674	$656,123,644	$863,095,318
Esmeralda	No Parcel Data Available		$0
Eureka	$22,123,567	$75,583,195	$97,706,762
Humboldt	$90,049,690	$392,280,429	$482,330,119
Lander	$69,419,831	$50,088,060	$119,507,891
Lincoln	$509,160,677	$83,064,143	$592,224,820
Lyon	$276,298,041	$881,114,952	$1,157,412,993
Mineral	$93,951,988	$17,298,489	$111,250,477
Nye	$1,848,901,684	$738,729,977	$2,587,631,661
Pershing	$119,014,035	$62,031,267	$181,045,302
Storey	$99,804,495	$185,393,811	$285,198,306
Washoe	$2,535,594,078	$4,458,283,022	$6,993,877,100
White Pine	$565,302,005	$112,735,982	$678,037,987
TOTAL			**$30,790,707,671**

Table 3-63 below presents an assessment of wildfire vulnerability and potential losses of due to wildfire on tribal lands and two Nevada counties not covered in Table 3-62 above. Data source was the 2013 NEHMP Table 3-48, which derived the data from the LHMPs. To assist the communities still lacking any wildfire vulnerability assessment for the current iteration of this plan (Esmeralda), the state will request funding to work with NDF and the local county assessors to gather building stock value and number data resulting in a GIS-based vulnerability analysis that will be available to those communities via the MyPlan website.

Table 3-63. Wildfire Vulnerability Assessment of Nevada Counties and Tribal Lands not included in Table 3-62

County/Tribal Hazard Mitigation Plan	Hazard Rating	Population affected	Building Inventory Affected				No. of Critical Facilities affected		Total by Rating	Total Losses $ x1000
			Residential		Non-Residential					
			Number	($x1000)	Number	($ x1000)	Number	($x1000)		
Esmeralda County[186]	Extreme								0	
	High								0	
	Moderate	971	629	32,554	10	1,391	35	6,500	40,445	40,445
Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	Extreme								0	
	High	1,268	449	39,695	8	1,287	131		40,982	
	Moderate								0	40,982
Te-Moak Tribe of Western Shoshone Indians of Nevada - Elko Band	Extreme								0	
	High								0	
	Moderate	729	267	30,884	15	44,797	6	4,565	80,246	80,246
Reno-Sparks Indian Colony	Extreme									
	High									*
	Moderate	919			2	183				
Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation	Extreme									
	High	Not available	6	128	2	324				*
	Moderate	Not available	6	128	2	324				
Washoe Tribe (Nevada and California)	Extreme								0	
	High	3,833			Not available	15,007	57	20,332	35,339	35,339
	Moderate								0	

[186] All people, critical facilities and structures are equally vulnerable to this hazard. * Included in Washoe County figures.

Section 4

This Section describes the State's mitigation goals that guide the selection of mitigation activities. It also describes how the previous goals were assessed and whether they were revised. It includes a discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities. It includes an evaluation of State laws, regulations, policies, and programs related to hazard mitigation. It evaluates the State's policies related to development in hazard-prone areas and discusses State funding capabilities for hazard mitigation projects. This section includes a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.

The NHMWG strategy is to support and encourage the lead agencies and their efforts to achieve their mitigation goals and objectives to the maximum extent possible. This Plan stresses its support of all mitigation efforts as resources become available.

For the 2023 iteration of this plan, the NHMWG and Planning Team made the following revisions (no significant changes were made to Tables 4-1, 4-2, 4-11, and 4-12):

- *In 2022, an amendment was made to Table 4-1 and 4-2 identifying drought as a High-Risk hazard for the state.*
- *Table 4-3 of hazard management policies, programs, and capabilities was updated with new web links.*
- *Tables 4-4, 4-5, 4-6 and Figures 4-1, 4-2, 4-3 relating to hazard mitigation grant funding were revised to reflect additional program management capability and funding received since the last plan iteration.*
- *Table 4-7 of State Model Codes was updated to reflect changes in revised statutes since the last plan iteration.*
- *Table 4-8 Local Capabilities General Analysis was updated to reflect changes in local and plan status and changes to capabilities since the last plan iteration, and approved tribal plans were added.*
- *New Social, Technical, Administrative, Political, Legal, Economic, Environmental (STAPLEE) prioritization of Strategic Actions was done by the NHM Planning Subcommittee and used to update Table 4-10, Strategic Action Plan Matrix.*

4.1 HAZARD MITIGATION GOALS

The requirements for hazard mitigation goals, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S9. Does the mitigation strategy include goals to reduce long-term vulnerabilities from the identified hazards? [44 CFR §201.4(c)(3)(i)[187]]	a. The plan must identify hazard mitigation goals representing what the state seeks to accomplish through mitigation plan implementation using a wide range of funding, including non-FEMA funding. a. The goals must be consistent with the hazards and identified in the risk assessment. b. *If the state is interested in HHPD funding eligibility, the plan must include mitigation goals to reduce long-term vulnerabilities from high hazard potential dams. The plan does*

[187] 44 CFR §201.4(c)(3)(i): "A description of State goals to guide the selection of activities to mitigate and reduce potential losses."

ELEMENT	REQUIREMENTS
	not need to include a goal specific to high hazard potential dams alone (see HHPD3 in Section 3.8.). ***Goals*** are broad, long-term policy and vision statements that explain what will be achieved by implementing the mitigation strategy.

4.1.1 Hazard Mitigation Goal Assessment Overview

The NHMWG members were asked to review and assess the 2018 goals for the 2018 Enhanced Plan based on the revised hazard rankings that resulted from the Subcommittee's hazard categorization and assessment work presented earlier in Section 3 that identified earthquake, flood, and wildfire as the High-Risk hazards in the state. Specific feedback was requested from those NHMWG members and subject matter experts from the lead agencies for each of the major profiled high-risk hazards – earthquake, flood, and wildfire. The five previous 2018 goals were found to still be valid for 2018 without modifications. In 2022, Drought was identified as a fourth High Risk hazard for the state by the Nevada Hazard Mitigation Working Group. These goals and the lead agencies that assessed them are shown in Table 4-1. The lead agency for each goal is the state agency with regulatory responsibility to address a particular proposed action, or which is capable and willing to organize resources, find appropriate funding, oversee implementation, monitor, and evaluate the goal's activities. Agencies that may be able to assist in the implementation of a particular proposed action item by providing added resources to the lead agency are also listed. The intent of these goals is to guide NHMWG in the selection of mitigation activities at the state level as well as the local jurisdiction level in accomplishing these goals. Three additional new goals and mitigation actions were added to the 2023 updated plan.

Table 4-1. 2023 Goals and Lead Agencies

2023 Goals	2023 Lead Agencies
Goal 1: *Reduce the loss of life and injuries.*	*Nevada Division of Emergency Management and Nevada Hazard Mitigation Working Group*
Goal 2: *Improve local hazard mitigation plans -technical assistance.*	*Nevada Division of Emergency Management and Nevada Hazard Mitigation Working Group*
Goal 3: *Reduce the possibility of damage and losses due to earthquakes.*	*Nevada Bureau of Mines and Geology), Nevada Seismology Laboratory, Nevada Division of Emergency Management, Nevada Hazard Mitigation Working Group*
Goal 4: *Reduce the possibility of damage and losses due to flooding.*	*Nevada Division of Water Resources), Nevada Hazard Mitigation Working Group*
Goal 5: *Reduce the possibility of damage and losses due to wildfire.*	*Nevada Division of Forestry, NV DEM, NHMWG*

Table 4-1. 2023 Goals and Lead Agencies	
Goal 6: *Reduce the possibility of damage and losses due to drought.*	*Nevada Division of Emergency Management, Nevada Division of Water Resources, Nevada Division of Environmental Protection, Nevada Hazard Mitigation Working Group*
Goal 7: *Reduce the possibility of health impact, damage, losses, and fatalities due to excessive heat.*	*Nevada Division of Emergency Management, Nevada Division of Environmental Protection, Nevada Department of Health and Human Services, Nevada Hazard Mitigation Working Group*
Goal 8: *Reduce the possibility of damage and losses due to winter storm.*	*Nevada Division of Emergency Management, Nevada Hazard Mitigation Working Group*
Goal 9: *Reduce the possibility of health impact and fatalities due to infectious disease.*	*Nevada Division of Emergency Management, Nevada Department of Health and Human Services, Nevada Hazard Mitigation Working Group*

4.1.2 Mitigation Goals and Strategic Actions

The NHMWG members and specifically the lead agencies for each of the 2023 profiled High-Risk hazards were asked to review and assess all 2018 strategic actions for the 2023 Enhanced Plan. No significant changes were made to Table 4-2 in this iteration of the plan. The intent of the Strategic Actions is to guide NHMWG in the selection of mitigation activities at the state level as well as the local jurisdiction level to accomplish the goals. Since these goals and actions were developed through the contribution of state and local agencies, they are a guide to the mitigation activities that are needed in Nevada. Each action provides a framework for the NHMWG members to advise, review, and direct resources of the state to projects that will address hazard mitigation. NDWR staff, including the State Floodplain Manager and the Dam Safety Officer, developed the flood action items. NDF provided the Wildland Fire actions. NBMG working with the Seismological Lab developed the Earthquake actions. NDWR provided the drought actions.

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 1 Reduce the loss of life and injuries. *NV DEM and NHMWG*	1.A	Improve awareness of the locations, potential impacts and links among hazards, vulnerability, and measures to protect life safety and health.	
Goal 1	1.B	Provide current information and workshops about hazards, vulnerabilities, mitigation processes and technical assistance for planning and grant availability and application procedures to State and local agencies.	
Goal 1	1.C	Encourage the incorporation of mitigation measures into repairs, major alterations, new development, and redevelopment practices.	
Goal 1	1.D	Promote the modification of structures to meet life safety standards.	
Goal 1	1.E	Improve communication, collaboration and integration among stakeholders and promote hazard mitigation as an integrated public policy.	
Goal 1	1.F	Encourage local governments, special districts, and tribal organizations to develop, adopt, implement maintain and update hazard mitigation plans.	
Goal 1	1.G	Develop a hazard communication system that can be used to rapidly detect and provide early warning for multiple hazards, including earthquakes and wildfires.	
Goal 2 Improve Local Hazard Mitigation Plans Technical Assistance *NV DEM and NHMWG*	2.A	Provide technical assistance, guidance, resources and tools to local governments and tribal entities to promote hazard evaluation and to develop and update hazard mitigation plans.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 2	2.B	Provide specialized training and exercises to state agency staff and local governments concerning local hazard mitigation planning and the local hazard mitigation plan program.	
Goal 2	2.C	Maintain a tracking system for local and state government mitigation plans and projects.	
Goal 2	2.D	Provide training to local governments and state agency staff to clarify mitigation measures from response and recovery and preparedness measures.	
Goal 2	2.E	Maintain a system to allow state agencies with hazard mitigation programs and plans to make recommendations about how local governments can incorporate these in support of the state's mitigation program efforts.	
Goal 2	2.F	Continue to build operational links between hazard mitigation, disaster preparedness and recovery programs with public and private sectors	
Goal 2	2.G	Promote understanding by the general public of the benefits of hazard mitigation in reducing casualty and property losses and ensuring continuity of businesses, institutional and government functions	
Goal 2	2.H	Promote coordination among state agencies, local governments, and tribal organizations of regional hazard mitigation activities	
Goal 2	2.I	Identify, enhance, and integrate public education efforts by state and local agencies that have programs directed to hazard mitigation	
Goal 3	3.A	Protect existing assets, as well as future development, from the effects of earthquakes by providing setback criteria for building and development.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Reduce damage and losses from earthquakes. *NBMG, Nevada Seismology Laboratory, NV DEM, NHMWG*			
Goal 3	3.B	Hold workshops on strategies, benefits, risk-reduction opportunities, and challenges associated with the inventory of seismically susceptible buildings.	
Goal 3	3.C	Assist communities and State to retrofit, change occupancy to decrease risk, or demolish susceptible buildings and structures.	
Goal 3	3.D	Create planning for "special consideration zones" for Nevada communities.	
Goal 3	3.E	Create microzonation of earthquake hazards in Nevada.	
Goal 3	3.F	Encourage seismic retrofit of deficient essential structures and infrastructure of community and State critical facilities (economic and lifeline-utilities) to withstand the effects of earthquakes structurally and seismically.	
Goal 3	3.G	Encourage seismic retrofit of public safety and critical facilities (both community and State) (such as 911 communications, hospitals, fire, law enforcement and ambulance facilities, etc.)	
Goal 3	3.H	Develop lesson plans or activities for teachers to increase awareness about Nevada's earthquake hazard that tie into the existing science curriculum and align with the science standards for the state.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 3	3.I	Increase media involvement by networking with partners from all media types such as print, radio, TV, and social media.	
Goal 3	3.J	Provide Applied Technology Council (ATC) training and develop formalization of the process.	
Goal 3	3.K	Expand earthquake awareness in educational sites such as regional science fairs, and speakers.	
Goal 3	3.L	Develop earthquake hazard information programs targeting public safety, emergency managers, local government executives, and business and industry.	
Goal 3	3.M	Promote the Great Nevada Shakeout and earthquake drills throughout the state.	
Goal 3	3.N	Promote training of volunteer community emergency response teams (CERT) about earthquake risks and possible mitigation activities.	
Goal 3	3.O	Promote training of hospital staff about earthquake risks and possible mitigation activities.	
Goal 3	3.P	Improve integration of the emergency management system at all levels of the community bringing forth the "whole community" approach.	
Goal 3	3.Q	Provide publications and workshops to promote the exchange of technical information relating to earthquakes among professionals, managers and the citizens of Nevada.	
Goal 3	3.R	Promote a post-earthquake technical clearinghouse through planning and established practices.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 3	3.S	Give planning and special consideration to developing a "Fault Map of Nevada" and identifying all active faults and seismic sources near major urban areas in Nevada.	
Goal 3	3.T	Establish a "lifelines and transportation" workgroup.	
Goal 3	3.U	Enhance implementation of nonstructural remediation.	
Goal 3	3.V	Create earthquake planning scenarios (Las Vegas and rural areas).	
Goal 3	3.W	Determine potential fault rupture characteristics and maximum earthquakes.	
Goal 3	3.X	Continue to inventory and field-verify unreinforced masonry buildings in Nevada and make this data publicly available to planners and emergency response staff in communities statewide.	
Goal 3	3.Y	Promote coordination among private and public entities to improve statewide earthquake monitoring capabilities.	
Goal 3	3.Z	Identify potential funding sources for earthquake mitigation strategic actions not only at the Federal and State levels but also from private funding and community partnerships.	
Goal 3	3.AA	Develop a set of model codes and regulations that would be presented after a major earthquake occurs in Nevada.	
Goal 3	3.AB.	Develop an Earthquake Early Warning System for Nevada.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 4 Reduce damage and losses from floods. *NDWR, NHMWG*	4.A	Protect existing assets, as well as future development, from the effects of flooding.	
Goal 4	4.B	Identify and prioritize areas in the State where existing flood hazard mapping is inadequate due to planned and existing significant development and conduct flood hazard mapping in those areas.	
Goal 4	4.C	Conduct flood hazard mapping in piedmont and alluvial fan environments.	
Goal 4	4.D	Retrofit State buildings to meet NFIP standards.	
Goal 4	4.E	Assist communities and State with programs to elevate, dry-flood proof or wet-flood proof identified structures to obtain NFIP compliance and/or mitigate repetitive loss structures and severe repetitive loss structures.	
Goal 4	4.F	Assist communities and State with programs dealing with repetitive loss structures and severe repetitive loss structures; these programs may involve acquisition and demolition; relocation; elevation or other mitigation strategies.	
Goal 4	4.G	Upgrade State-owned or operated infrastructure (e.g. servicing roads, culverts, bridges, channels, and structures) related to State-owned or operated critical facilities to protect critical facilities from flood damages or disruption of essential services.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 4	4.H	Protect existing assets as well as future development from the effects of dam failure	
Goal 4	4.I	Inventory existing dams and add to the inventory as dams are discovered or constructed.	
Goal 4	4.J	Inventory and inspect existing dams for structural and hydraulic adequacy and implement operational constraints, if warranted.	
Goal 4	4.K	Install early warning weather stations in watersheds with dams above populated areas.	
Goal 4	4.L	Assist communities and State in structural mitigation measures, updates, repairs and maintenance to dams, ditches, and canals.	
Goal 4	4.M	Encourage local ordinances and regulations to reduce encroachment into flood-prone zones resulting from dam impoundment or high (non-failure) releases.	
Goal 4	4.N	Identify hazards of flooding from man-made structures, such as irrigation ditches and canals, and integrate these into local zoning ordinances.	
Goal 4	4.O	Develop laws and regulations that ensure reasonable standards of design and construction to reduce flood hazards.	
Goal 4	4.P	Develop Emergency Action Plans to ensure swift coordinated response in the event of an emergency.	
Goal 5 Reduce the possibility of damage and losses due to wildfire.	5.A	Protect existing assets, as well as future development, from the effects of wildfire.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
NDF, NV DEM, NHMWG			
Goal 5	5.B	Identify and recommend changes to State NRS, NAC and communities' ordinances and regulations.	
Goal 5	5.C	Assist local communities in enacting local ordinances for mitigation and fire prevention.	
Goal 5	5.D	Provide public education and outreach to educate homeowners in the WUI about proper defensible space practices and landscaping for fire resistance and encourage community involvement in project completion, participation, and maintenance.	
Goal 5	5.E	In highly motivated communities, focus on activities by individual participation in and maintenance of projects (personal responsibility).	
Goal 5	5.F	Educate and train State and communities in current standards and regulations for proper practices in defensible space and firefighting.	
Goal 5	5.G	Ensure proper personal protective equipment, apparatus, equipment and training for career staff and seasonal wildland firefighters.	
Goal 5	5.H	Assist volunteer fire departments in attaining funds for proper personal protective equipment, apparatus, equipment, and training.	
Goal 5	5.I	Participate in research and development of interoperability for emergency response communications.	
Goal 5	5.J	Coordinate the development of a comprehensive, collaborative program for mutual aid/mobilization of state and local government fire resources.	
Goal 5	5.K	Encourage collaboration on all levels among state, federal and local cooperators, both fire- and resource-related.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 5	5.L	Continue to improve fire prevention programs statewide through partnerships with Fire Prevention Association of Nevada, State Fire Marshal's Office, University of Nevada Cooperative Extension, and any other cooperators.	
Goal 5	5.M	Assist communities in fuels-reduction projects for areas with extreme or high ratings in updating CWPP assessments.	
Goal 5	5.N	Provide funding and service forestry technical assistance through the State Fire Assistance and Hazardous Fuels Reduction programs to reduce fuels on state and private property.	
Goal 5	5.O	Provide assistance to counties for priority setting and CWPP updating.	
Goal 5	5.P	Provide a statewide evaluation process for monitoring community progress, prioritization, and participation in CWPP.	
Goal 5	5.Q	Provide and maintain a statewide process for documenting fuels projects progress, completion, success and maintenance.	
Goal 5	5.R	Focus projects in areas to attain desired forest conditions and coordinate with forest health program activities.	
Goal 5	5.S	Ensure that all projects have an approved fuels/forest health/stewardship plan that includes all aspects of service forestry (State Historic Preservation Officer (SHPO) (threatened and endangered species, prescriptions, actions, etc.).	
Goal 5	5.T	Provide training for employees and project managers on SHPO and cultural resource identification, reporting methods and clearances.	
Goal 5	5.U	Work closely with the Tribal communities, local landowners, and the SHPO to obtain clearances and to mark sensitive sites.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 5	5.V	Provide assistance to communities and State in planning and implementing long-term sustainable landscape projects.	
Goal 5	5.W	Restore native and adapted vegetation and work to prevent areas being impacted by non-native or undesirable species conversions through collaborative efforts.	
Goal 5	5.Y	Use mechanical and hand treatments as well as prescribed fire to assist in attaining desired forest and rangeland conditions.	
Goal 5	5.Z	Provide native and accepted introduced seed species through the Nevada State seed bank program.	
Goal 5	5.AA	Provide training for local cooperators for treatment practices and skill acquisition.	
Goal 5	5.AB	Encourage collaboration at all levels with state, federal and local cooperators.	
Goal 5	5.AC	Assist communities and State in Burned Area Emergency Rehabilitation, and complete fire damage reclamation reports and public education and outreach to provide the best land management practices available for collaborative land rehabilitation.	
Goal 5	5.AD	Assess damage to critical watershed and threats to communities' domestic water supplies and mitigate those threats through erosion control practices.	
Goal 5	5.AE	Supply resources for rehabilitation efforts through the State Tree Nurseries in Las Vegas and Washoe Valley, and the Nevada State seed bank programs.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 5	5.AF	Provide training, expertise, and supplies/equipment in a collaborative manner to assist in rehabilitation.	
Goal 5	5.AG	Provide public education and outreach to communities affected by wildfire.	
Goal 5	5.AH	Focus fuels projects in communities with extreme or high ratings in CWPP assessments.	
Goal 5	5.AI	Assist with the development of and the participation in a comprehensive program by which current CWPP or equivalent assessments are updated as projects are completed, ratings change, or new at-risk communities arise.	
Goal 5	5.AJ	Assist in the formulation and dissemination of current information such as Living with Fire documents.	
Goal 5	5.AK	Encourage community involvement in project completion, participation, and maintenance.	
Goal 5	5.AL	Assist, encourage and provide guidance to communities in the development of the appropriate fire service organization for their community (i.e. a legally constituted fire protection district or fire department) according to NRS 472.040.	
Goal 5	5.AM	Assist in acquiring funding for local firefighters for training and equipment through the State Fire Assistance, and Volunteer Fire Assistance when funded by USFS.	
Goal 5	5.AN	Assist in the planning for and removal of biomass waste on fuels reduction and forest health projects, as well as following wildland fires, flooding and other catastrophic natural event.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 5	5.AO	Comply with all federal regulations in the funding stream to ensure compliance and future competitiveness.	
Goal 5	5.AP	Keep apprised of all federal, state, and local regulations.	
Goal 5	5.AQ	Participate in interagency project planning, implementation and monitoring.	
Goal 5	5.AR	Protect the envelope of buildings from wildfire.	
Goal 6 Reduce the possibility of damage and losses due to drought. *NV DEM, NDWR, NDEP, NHMWG*	6.A	Maintain and expand intergovernmental and interagency stakeholder collaboration and networking opportunities to leverage scarce resources, reduce duplication of efforts, and enhance progress towards statewide drought resiliency.	
Goal 6	6.B	Provide support to strengthen collaboration between stakeholder agencies for drought education and outreach efforts at the state, regional, and local levels to increase public awareness for drought.	
Goal 6	6.C	Assist in reducing drought impacts to the States's economy, people, state assets, cultural resources, and environment by encouraging vulnerability and risk assessments, planning, and mitigation activities.	
Goal 6	6.D	Encourage water system improvements that increase drought resiliency.	
Goal 6	6.E	Assist in identifying funding opportunities for projects associated with increasing water system drought resiliency.	
Goal 6	6.F	Assist in identifying funding opportunities for projects associated with wastewater and stormwater treatment	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 6, 4	6.G	Assist communities and the State in structural mitigation measures, updates, repairs, and maintenance to dams, ditches, and canals	
Goal 6, 4	6.H	Encourage water conservation to reduce water demand by promoting indoor and outdoor conservation of water. Provide educational materials and information to the public about beneficial conservation measures and effective irrigation management techniques.	
Goal 6	6.I	Improve water availability monitoring	
Goal 6	6.J	Encourage and provide technical assistance for local level drought planning	
Goal 6	6.K	Increase monitoring, data collection, and assessment of drought impacts	
Goal 6	6.L	Evaluate changes in drought frequency and severity related to climate change as a planning issue and incorporate into relevant plans	
Goal 6	6.M	Increase or maintain surveillance and monitoring activities for drought-specific public health issues	
Goal 6	6.N	Integrate State drought planning with other statewide planning efforts	
Goal 6	6.O	Encourage more efficient municipal irrigation systems, including State-owned properties	
Goal 6	6.P	Promote Green Infrastructure and Best Management Practices in drought planning and mitigation projects	
Goal 6	6.Q	Develop approaches and encourage agricultural modifications to help farmers adapt to and lessen the impacts of drought	
Goal 6	6.R	Provide support to maintain momentum for drought awareness, preparedness, and mitigation regardless of drought conditions.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
		Continued support is important to achieving long-term drought resiliency goals	
Goal 7 Reduce the possibility of damage and losses and fatalities due to excessive heat. *NV DEM, NDEP, NV DHHS, NVHMWG*	7.A	Expand the urban tree canopy and the amount of urban green space.	
Goal 7	7.B	Use green, cool and/or reflective building and paving materials.	
Goal 7	7.C	Reduce waste heat – for example with community design that reduces reliance on cars.	
Goal 7	7.D	Provide community cooling centers, particularly in areas with low-income, elderly, and young populations	
Goal 7	7.E	Ensure proper functioning of energy and water systems	
Goal 7	7.F	Encourage citizens to check on their family, friends, and neighbors to ensure they have access to air conditioning	
Goal 7	7.G	Educate and encourage communities to drink plenty of fluids to stay hydrated	
Goal 7	7.H	Map urban heat islands	
Goal 8 Reduce the possibility of damage and losses due to winter storm.	8.A	Education and community outreach for weatherproofing homes and safe heating during winter storms. Educate on winterizing vehicles.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
NV DEM, NHMWG			
Goal 8	8.B	Provide community warming centers, particularly in low income, elderly, and young children areas.	
Goal 8	8.C	Educate and community outreach in creating an emergency kit	
Goal 8	8.D	Encourage monitoring of severe winter weather reports and road closures	
Goal 8	8.E	Encourage citizens to check on their families, friends, and neighbors during winter storms	
Goal 9 Reduce the possibility of detrimental health impacts and death due to infectious disease. *NV DEM, NHMWG*	9.A	Encourage the strengthening of core public health infrastructure, including water and sanitation systems.	
Goal 9	9.B	Ensure community situational awareness and rapidly extinguish sparks that could lead to pandemic	
Goal 9	9.C	Encourage coordinated response focusing on maintenance of situational awareness, public health messaging, reduction of transmission, and care for and treatment of the ill	
Goal 9	9.D	Encourage community contingency planning and response requiring surge capacity as necessary	
Goal 9	9.E	Encourage community risk transfer mechanism planning	
Goal 9	9.F	Encourage community education and outreach providing methods of reducing risk factors.	

The implementation strategy for the Strategic Actions shown in Table 4-2 above is found in Section 4.4, Table 4-10, Strategic Action Plan Matrix. This table includes the lead department/division, potential funding sources, implementation timelines, and economic justification.

4.2 STATE CAPABILITY ASSESSMENT

The requirements for State capability assessment, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S18. Does the plan discuss the evaluation of the state's hazard management policies, programs, capabilities, and funding sources to mitigate the hazards identified in the risk assessment? [44 CFR §201.4(c)(3)(ii)[188]]	The plan must describe and evaluate the state's existing pre- and post-disaster hazard management policies, programs and capabilities to mitigate the hazards identified in the risk assessment, including but not limited to: a. An evaluation of state laws, regulations, policies and programs related to hazard mitigation that improve or impede resilience to future natural hazard events and other future conditions, including the potential effects of climate change, that contains: 1. A summary description of state land use laws, enabling legislation, and plans, including authorities that may be delegated to local governments by state law. 2. A summary description of state laws governing adoption and enforcement of building codes in the state, including authorities that may be delegated to local governments by state law. i. For states that have adopted a statewide building code, a description of the code including the year of adoption, model code year (as applicable), and whether the code includes hazard-resistant provisions.[189] 3. A summary description of how state agencies work together to administer the NFIP pre- and post-disaster, Including: i. Changes in participation, insurance coverage and trends. ii. Substantial damage administration. iii. Support for communities participating in or interested in the Community Rating System (CRS). iv. A summary of structures at high risk of flooding, including repetitive and severe repetitive loss structures and any action taken to reduce the number of these structures. v. Any other NFIP challenges that may be identified during regular coordination between the state and FEMA. 4. A summary discussion of the state's participation in and capabilities related to FEMA's flood hazard mapping program (i.e., Risk MAP) including how the state shares flood risk data

[188] 44 CFR §201.4(c)(3)(ii): "A discussion of the State's pre and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: an evaluation of State laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas; a discussion of State funding capabilities for hazard mitigation projects; a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities."

[189] FEMA provides resources and tools for building code adoption tracking on its Nationwide Building Code Adoption Tracking webpage.

ELEMENT	REQUIREMENTS
	for use in mitigation and community planning and mitigation action development, identifies areas that need to be studied or restudied, and build partnerships. b. A general discussion of state funding capabilities for hazard mitigation actions and projects, including how the state has used: 1. Its own funds and other state resources. 2. FEMA mitigation programs and funding sources, including, but not limited to: HMGP, HMGP Post Fire, BRIC, FMA,HHPD, and PA Mitigation. 3. Other federal programs and funding sources for mitigation, if applicable. c. A summary of: 1. Obstacles, challenges and proposed solutions related to any state capabilities, including a brief discussion of potential strategies for overcoming any challenges related to implementing and enforcing hazard-resistant building codes statewide, as applicable. These items may be included in the mitigation strategy. 2. Changes since the previous plan approval.

4.2.1 Pre- and Post- Disaster Hazard Management Capability

Table 4-3 below presents the state's capability to mitigate the hazards described in Section 3 and demonstrates pre-and post-disaster hazard management policies, programs, and capabilities. It also presents the state's funding capabilities for hazard mitigation projects - whether it can support, facilitate, or fund such projects. Support implies that the state manages federally funded programs. The state may also facilitate mitigation programs by providing technical assistance to local, tribal, and other entities. The last column provides details of each listed program or agency and its policies and capabilities to mitigate hazards in the state. In the 2023 iteration of the plan, there were no new programs added to Table 4-3.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
U. S. Housing and Urban Development (HUD)	All Hazards	Community Development Block Grants (CDBG)	√	√	√	√		Grants to develop viable communities, principally for low- and moderate-income persons. CDBG funds available through Disaster Recovery Initiative. Contingent upon Presidential Disaster declaration https://www.hud.gov/sites/dfiles/CPD/documents/CDBG-Disaster-Recovery-Overview.pdf
HUD	All Hazards	Disaster Recovery Assistance		√	√	√		Disaster relief and recovery assistance in the form of special mortgage financing for rehabilitation of impacted homes. https://www.hud.gov/disaster_resources/disaster_recovery_for_individuals_and_families/disaster_recovery_funds
HUD	All Hazards	HUD Sustainable Communities Planning Grant Program	√		√	√		This program supports multi-jurisdictional regional efforts that integrate housing, economic development, transportation, water infrastructure and environmental planning, and assists regional entities and consortia of local governments with integrated decision-making.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								https://www.hud.gov/program_offices/economic_development/sustainable_communities_regional_planning_grants
HUD	All Hazards	HOME Investment Partnerships Program	√	√	√	√		HOME provides formula grants to States and localities that communities use, often in partnership with local nonprofit groups, to fund a wide range of activities that build, buy, and/or rehabilitate affordable housing for rent or home ownership or provide direct rental assistance to low-income people. The construction is up to standard hazard-resistant building codes. https://www.hud.gov/program_offices/comm_planning/home
USDA	All Hazards	Smith-Lever Special Needs Funding	√		√	√		Grants to State Extension Services at 1862 Land-Grant Institutions to support education-based approaches to addressing emergency preparedness and disasters. https://nifa.usda.gov/funding-opportunity/smith-lever-special-needs-competitive-grants-program
USDA	All Hazards	Community Facilities Guaranteed	√		√	√		This program provides an incentive for commercial lending tool develop essential

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
		Loan Program						community facilities, such as fire stations, police stations, and other public buildings. https://www.rd.usda.gov/programs-services/community-facilities-guaranteed-loan-program
USDA	All Hazards	Community Facilities Direct Loans Community Facilities Direct Grants	√		√	√		This program provides direct loans for essential community facilities. https://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program
USDA	All Hazards	Community Facilities Direct Grants	√		√	√		This program provides grants to develop essential community facilities. https://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
USDA Farm Service Agency	All Hazards	Farm Service Agency (FSA) Disaster Assistance Programs		√	√	√		This program provides emergency funding and technical assistance for farmers and ranchers to rehabilitate farmland and livestock damaged by natural disasters. https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/index?utm_source=landing&utm_medium=spotlight&utm_content=spot3&utm_campaign=fsadisasters
U.S. Department of Health & Human Services	All Hazards	Disaster Assistance for State Units on Aging (SUAs)		√	√	√		This program provides disaster relief funds to those SUAs and tribal organizations who are currently receiving a grant under Title VI of the Older Americans Act. https://www.acl.gov/grants/disaster-assistance-state-units-aging-suas-and-tribal-organizations-national-disasters
U.S. Economic Development Administration (EDA)	All Hazards	Economic Development Administration Investment Programs	√	√	√	√		These programs provide grants that support public works, economic adjustment assistance, and planning. Certain funds are allocated for locations recently hit by major disasters. https://www.eda.gov/strategic-initiatives/disaster-recovery

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
U.S. Small Business Administration	All Hazards	Small Business Administration Loan Program		√	√	√		This program provides low-interest, fixed rate loans to small businesses for the purpose of implementing mitigation measures. Also available for disaster- damaged property. https://www.sba.gov/funding-programs/disaster-assistance
USDA/APHIS/ Veterinary Services	All Hazards	Animal Disaster Program	√	√		√		This program plans and facilitates sheltering of animals during emergency or disaster incidents.
FEMA	All Hazard	Hazard Mitigation Grant Program (HMGP & HMGP-PF)		√	√	√		This program provides grants to implement long-term hazard mitigation measures after a major disaster declaration. https://www.fema.gov/hazard-mitigation-grant-program
FEMA	All Hazard	Pre-Disaster Mitigation Grant Program (PDM)	√		√	√		This program provides funds for hazard mitigation planning and implementation of mitigation projects prior to a disaster event. https://www.fema.gov/pre-disaster-mitigation-grant-program

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
FEMA	All Hazard	Building Resilient Infrastructure and Communities (BRIC)						Building Resilient Infrastructure and Communities (BRIC) will support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities
FEMA	All Hazard	Hazard Mitigation Funding Under Section 406 (Stafford Act)		√	√	√	√	This FEMA program provides funds for the repair of disaster-damaged facilities that directly reduce the potential of future, similar damages to the repaired facility by subsequent disaster events. https://www.fema.gov/press-release/20230426/fema-hazard-mitigation-grants-404-and-406
FEMA	All Hazard	Emergency Management Performance Grant	√		√	√	√	This program assists in the development, maintenance and improvement of state, tribal and local emergency management capabilities. https://www.fema.gov/grants/preparedness/emergency-management-performance

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
Nevada DEM	All Hazard	Disaster Relief Fund		√	√	√	√	This fund provides required matching funds for federal grants for local governments.
Nevada DEM	All Hazard	Emergency Assistance Account		√	√	√	√	This account provides required matching funds for federal grants local governments.
US Department of Commerce, Economic Development Administration	All Hazard	Disaster Mitigation Planning and Technical Assistance	√		√	√		This provides technical and planning assistance grants for capacity building and mitigation project activities focusing on creating disaster resistant jobs and workplaces.
USDA NRCS	All Hazard	Watershed Program	√		√	√		Through the Watershed Programs NRCS provides technical and financial assistance to States, local governments and Tribes (project sponsors) to plan and implement authorized watershed project plans for the purpose of: watershed protection, flood mitigation, water quality improvements, soil erosion reduction, rural, municipal and industrial water supply, irrigation, water management, sediment control, fish and wildlife enhancement, wetlands and wetland function creation and restoration, groundwater recharge, easements,

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								wetland and, floodplain conservation, hydropower, watershed dam rehabilitation. http://www.nrcs.usda.gov/programs/watershed/index.html
USDA NRCS	All Hazards	Emergency Watershed Protection Program		√	√	√		The EWP Program assists sponsors, landowners, and operators in implementing emergency recovery measures for runoff retardation and erosion prevention to relieve imminent hazards to life and property created by a natural disaster that causes a sudden impairment of a watershed. https://www.nrcs.usda.gov/programs-initiatives/ewp-emergency-watershed-protection
National Science Foundation (NSF)	All Hazards	Decision, Risk, and Management Sciences Program (DRMS)	√		√	√		This program provides grants for small-scale, exploratory, high-risk research having a severe urgency with regard to natural or anthropogenic disasters and similar unanticipated events. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423&org=SES

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
DHS, FEMA, NDCNR BCA, Nevada DEM	All Hazards	Homeland Security Grant Programs	√		√	√	√	These programs provide funding to assist state, tribal, and local governments to maintain and improve plans, facilities and equipment. They also fund disaster preparedness exercises and training for emergency services.
NBMG	All Hazards	GIS and HAZUS support	√	√	√	√		NBMG provides expertise in HAZUS loss estimation modeling to support mitigation planning efforts and disaster training.
NSF	All Hazards	Hazard Reduction Program			√	√	√	NSF provides funding for research and related educational activities on hazards.
US Department of Health and Human Services (USDHHS) (partners with Nevada Department of Health and Human Services (NDHHS) and State Health	All Hazards	Emergency Management / Mitigation Training	√		√	√		This program provides training in disaster mitigation, preparedness, and planning for Public Healthcare https://aspr.hhs.gov/Pages/Home.aspx

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
Division (SHD))								
USACE, USDA-FSA	Drought	Drought Assistance	√	√	√	√		NDA coordinates requests for disaster declarations related to drought. The state's Disaster Assistance Account funding may become available for drought declaration assistance.
DCNR, Division of Water Planning	Drought	Nevada Drought Plan	√		√	√		This document establishes a system for determining drought severity and establishes an administrative coordinating system among agencies to help mitigate drought impacts. It also establishes a process for obtaining federal assistance if required.
NDWR, Colorado River Water Commission	Drought		√		√	√		Coordination of water distribution for the Colorado River basin among all interested parties.
USDA FSA	Drought	Emergency Conservation Program (ECP)		√	√	√		This program provides emergency funding and technical assistance for farmers and ranchers to rehabilitate farmland damaged by natural disasters and for carrying out emergency water conservation measures in periods of severe drought.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								https://www.fsa.usda.gov/programs-and-services/conservation-programs/emergency-conservation/index#:~:text=What%20Is%20The%20Emergency%20Conservation,through%20funding%20and%20technical%20assistance.
USDA FSA	Drought	Emergency haying and grazing		√	?	?		Emergency haying and grazing of CRP acreage may be authorized to provide relief to livestock producers in areas affected by a severe drought. Emergency authorization is provided by either a national FSA office authorization or by a state FSA committee determination utilizing the U.S. Drought Monitor. http://www.fsa.usda.gov/Internet/FSA_File/haying_and_grazing_july2012.pdf
Southern Nevada Water Authority, Truckee Meadows Water Authority	Drought	Several water conservation and drought mitigation programs	√		√	√	√	Local government and state agencies and consortia have authority to place restrictions on water use and to implement programs for drought mitigation. TMWA offers information on water conservation at https://tmwa.com/our-environment/water-conservation/

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								SNWA offers incentive programs and information to encourage water conservation. https://www.snwa.com/
EPA	Drought and Flood	Clean Water Act Section 319 Grants	√		√	√	√	This program provides grants to state agencies to implement non-point source programs, including support for nonstructural watershed resource restoration activities. https://www.epa.gov/nps/319-grant-program-states-and-territories
EPA Bureau of Water Quality Planning (BWQP) may have a grant from EPA to fund this type of program/project in NV)	Drought and Flood	Clean Water Act Section 319 Grants	√		√	√	√	This program provides grants to state agencies to implement non-point source programs, including support for nonstructural watershed resource restoration activities.
National Institute of	Earthquake	National Earthquake	√		√	√		NEHRP Provides grants for seismic mapping for U.S. HAZUS loss-estimation

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
Science and Technology (NIST); FEMA; USDHHS; Department of Interior, USGS; NSF (Partnering with UNR-NBMG, Seismo Lab, UNLV)		Hazard Reduction program (NEHRP) in Earth Sciences						modeling, fault-hazard identification, liquefaction-hazard identification, landslide-hazard identification, probabilistic seismic hazard analysis, ground-shaking microzonation, basin-effect analysis, earthquake process research. http://www.nehrp.gov/contracts/solicitations.htm
CDC, USD	Epidemic	Programs for prevention of epidemic disease	√	√	√	√		CDC Provides funding for preparation for and prevention and control of diseases. https://www.cdc.gov/earlycare/infectious-diseases/index.html
USDA/Animal and Plant Health Inspection Service/ Veterinary Services (Partners with NDA)	Epidemic	Animal diseases	√		√	√		USDA conducts tests for State/Federal program of animal diseases, livestock issues related to food safety, and those animal diseases transmissible to man. https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/!ut/p/z1/04_iUlDg4tKPAFJABpSA0fpReYllmemJJZn5eYk5-hH6kVFm8T7-Js6GTsEGQNrVycDRNcjc19XV08ggyEjfS

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
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			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								z8Kv4KC7EBFANjvecc!/
EPA (NDEP has a grant from EPA to manage a Safe Drinking Water Revolving Loan Fund)	Epidemic	Safe Drinking Water Revolving Loan.	√		√	√		This program provides funds to communities, tribes, individuals and others to finance infrastructure improvements to drinking water systems with an emphasis on providing funds to small and disadvantaged communities and to programs that encourage pollution prevention as a tool for ensuring safe drinking water. https://www.epa.gov/drinkingwatersrf
USDHHS	Epidemic	The Hospital Preparedness Program (HPP)	√	√	√	√		This program enhances the ability of hospitals and health care systems to prepare for and respond to bioterrorism and other public health emergencies. https://www.phe.gov/Preparedness/planning/hpp/Pages/default.aspx
FEMA (Partners with NDWR, Tribes, local and individuals)	Flood	NFIP	√	√	√	√		This program enables property owners to purchase insurance as a protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
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			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								damages. https://www.fema.gov/national-flood-insurance-program
FEMA (Partners with NDWR, Tribes, local and individuals)	Flood	Flood Mitigation Assistance	√		√	√		This program provides funding to implement measures to reduce or eliminate the long term risk of flood damage. https://www.fema.gov/flood-mitigation-assistance-grant-program
FEMA (Partners with NDWR, Tribes, local and individuals)	Flood	Repetitive Flood Claims	√		√	√		This program provides funds to assist States and communities reduce flood damages to insured properties that have had one or more claims to the National Flood Insurance Program (NFIP). https://www.fema.gov/repetitive-flood-claims-grant-program-fact-sheet
EPA (Partners with NDWR, Tribes, local and individuals)	Flood	Wetlands Program Development Grants	√		√	√		This program provides funds for projects that promote research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction and elimination of water pollution. https://www.epa.gov/wetlands/wetland-program-development-grants

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
USACE (Partners with Tribes, NDWR, CWSD, Truckee River Flood Project (TRFP), Tribes	Flood	Planning Assistance to States	√		√	√		This program provides funding for the development of plans to conserve water resources, dam safety, flood damage reduction, and flood plain management. https://trfma.org
USACE (Partners with Tribes, TRFP, NDWR, Clark County Flood Control Project)	Flood	Flood Plain Management Services	√		√	√		This program provides technical support for effective flood plain management. http://www.nae.usace.army.mil/Missions/Public-Services/Flood-Plain-Management-Services/
USACE (Partners with Tribes, locals, NDWR)	Flood	USACE Environmental Laboratory						This program provides guidance for implementing environmental programs as ecosystem restoration and reuse of dredged materials. http://www.erdc.usace.army.mil/Locations/EL.aspx
USDA	Flood	Emergency Watershed Protection Support		√	√	√		This program provides funds for implementing emergency measures in watersheds in order to relieve imminent hazards to life and property created by a natural disaster.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
		Services						https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/
USDA	Flood	Watershed and Flood Prevention Operations	√		√	√		This program provides funding for soil conservation, development, utilization and disposal of water, and conservation as well as the proper use and conservation of land. https://www.nrcs.usda.gov/programs-initiatives/watershed-and-flood-prevention-operations-wfpo-program
USACE, EPA	Flood	Aquatic Ecosystem Restoration	√		√	√		The purpose of the program is the development of aquatic ecosystem restoration and protection projects that improve the quality of the environment, are in the public interest, and are cost effective. http://www.nae.usace.army.mil/Missions/Public-Services/Continuing-Authorities-Program/Section-206/
EPA (Partners with DCNR, BWQP)	Flood	Wetlands Protection and Development	√		√		√	This Federal grant program supports State, Tribal, and local efforts to protect wetlands by providing funds to enhance existing programs or develop new programs. https://www.epa.gov/wetlands

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
EPA (Partners with DCNR, BSDW, Dept. of State Lands)	Flood	Source Water Protection	√		√	√		This program provides funding to states, local and tribes for activities to protect drinking water. https://www.epa.gov/sourcewaterprotection
FEMA	Flood	National Dam Safety Program	√		√	√		This program provides financial assistance to the states for strengthening their dam safety programs. https://www.fema.gov/national-dam-safety-program
FEMA (Partners with NDWR, Tribes, local communities)	Flood	Community Assistance Program - State Support Services Element	√		√	√		This program provides funding to States to provide technical assistance to communities in the NFIP and to evaluate community performance in implementing NFIP floodplain management activities https://www.fema.gov/community-assistance-program-state-support-services-element
U.S. Department of Energy Partners with Nevada DEM, Desert Research	Hazardous Materials	DOE's Radiological Assistance Program (RAP)	√		√	√		RAP provides resources (trained personnel and equipment) to evaluate, assess, advise, isotopically identify, search for, and assist in the mitigation of actual or perceived nuclear or radiological hazards. The RAP

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
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			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
Institute, and NDHHS								is implemented on a regional basis, with coordination between the emergency response elements of state, local, and federal agencies. https://nnsa.energy.gov/aboutus/ourprograms/emergencyoperationscounterterrorism/respondingtoemergencies/firstresponders-0
U.S. DOT's Pipeline and Hazardous Materials Administration (Partners with SERC, tribes and local emergency planning committees)	Hazardous Materials	Hazardous Materials Emergency Preparedness (HMEP) Grant Program	√		√	√		The HMEP program provides financial and technical assistance as well as national direction and guidance to enhance State, Territorial, Tribal, and local hazardous materials emergency planning and training. https://www.phmsa.dot.gov/grants/hazmat/hazardous-materials-grants-program
SERC Partners with local emergency planning committees and state agencies	Hazardous Materials	Superfund Amendment and Reauthorization Act (SARA) Title III	√		√	√	√	Filing fees for reports submitted pursuant to SARA, Title III provide funding for planning, training and equipment activities in emergency preparedness, prevention, mitigation and response capabilities associated with hazardous chemicals. Eligible applicants include

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
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			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								LEPCs and state agencies. Funding is available to public officials, fire and police personnel, medical personnel, first responders and tribal personnel through the LEPCs. http://serc.nv.gov/
EPA Partners with Tribes	Hazardous Materials	Hazardous Waste Management grant program	√		√	√		This program supports projects designed to develop and implement hazardous waste management programs that improve the applicant's ability to properly identify, manage, or dispose of hazardous waste. All hazardous waste management activities that address the RCRA Subtitle C "cradle to grave" approach are eligible. https://www.epa.gov/tribal-lands/hazardous-waste-management-grant-program-tribes
NDEP	Hazardous Materials	Nevada Brownfields Program		√	√	√	√	The Nevada Brownfields Program currently operates a $2 million dollar revolving loan fund intended to help property owners or developers cover the costs associated with the cleanup of sites with environmental contamination. https://ndep.nv.gov/environmental-

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
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			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								cleanup/brownfields
NDEP	Hazardous Materials	Nevada Brownfields Revolving Loan Fund Program		√	√	√	√	The Nevada Brownfields Program currently operates a $900,000 dollar revolving loan fund to help property owners or developers cover the costs associated with the cleanup of sites that are hindered for redevelopment due to environmental contamination and have no viable responsible party. https://ndep.nv.gov/environmental-cleanup/brownfields/funding/revolving-loan-fund
NDEP	Hazardous Materials	Nevada 128(a) Brownfields Program		√	√	√	√	The Nevada 128(a) Brownfields Program provides funding to municipalities and non-profit organizations when there are no viable responsible parties for the assessment and characterization of sites that are abandoned or under developed due to the perception of contamination. https://ndep.nv.gov/environmental-

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								cleanup/brownfields
EPA	Hazardous Materials	104(k) Brownfields Program		√	√			EPA provides a wide-range of funding opportunities to municipalities and non-profit organizations that may be used to mitigate potential hazards on eligible Brownfields sites. EPA Region IX also may provide Targeted Site Assessment services with their federal monies for Brownfields projects in the State of Nevada http://www.epa.gov/brownfields/
NDEP	Hazardous Materials	Nevada Petroleum Fund		√				This fund provides reimbursement to the qualified storage tank owner/operators for corrective action costs associated with cleaning up petroleum product releases. https://ndep.nv.gov/environmental-cleanup/petroleum-fund

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			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
NDEP	Hazardous Materials	Nevada Voluntary Cleanup Program		√				This program provides relief from liability to owners who undertake cleanups of contaminated properties under the oversight of the NDEP. https://ndep.nv.gov/environmental-cleanup/brownfields/voluntary-clean-up-program-vcp/voluntary-cleanup-brownfields
USDA FSA	Multiple: drought, infestation, flood	**Noninsured Crop Disaster Assistance Program (NAP)**		√	√	√	?	**Provides financial assistance to producers of non-insurable crops when low yields, loss of inventory or prevented planting occur due to a natural disaster.** http://www.fsa.usda.gov/Internet/FSA_File/nap_august_2011.pdf

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
USDA FSA	Multiple: drought, infestation, flood	Supplemental Revenue Assistance Payments (SURE) Program		√	√	√	?	is authorized by the 2008 Farm Bill to provide assistance to producers suffering crop losses due to natural disasters. SURE is available for crop losses due to natural disasters occurring through Sept. 30, 2011. http://www.fsa.usda.gov/Internet/FSA_File/sure_2011.pdf
FEMA – Safeguarding Tomorrow Revolving Loan Fund	Multiple	Low interest loan program for mitigation projects	√	√	√	√		New low interest loan program for FEMA mitigation assistance. Can be utilized for match combined with other grant programs. Policy and regulation needed to be added to state legislation prior to participation in this new program. https://www.fema.gov/grants/mitigation/storm-rlf

4.2.2 Policies Related to Development in Hazard-Prone Areas

The State of Nevada has not established a statewide land use plan, although the state provides guidance to the counties and local communities in legislating policies related to development in hazard-prone areas. However, it is the responsibility of the counties to adopt and enforce building code policies within their jurisdictions. Nevada Revised Statutes require each county to have and maintain a Master Plan that regulates development in hazard-prone areas. In addition, organizations, such as the UNCE, and regulating state agencies, such as NDWR, provide a wide array of technical assistance, funding, and support to Nevada communities in the mitigation of hazards.

NDWR also coordinates the National Flood Insurance Program (NFIP) and leverages many state, federal, local, and private partnerships to administer the program and its goals of reducing and mitigating flood risk. This is done pre- and post-disaster with stakeholder meetings throughout the year as well as through participation in community outreach events, training, newsletters, multimedia campaigns, and website management for NevadaFloods.org. Through these vessels information is provided regarding changes to the NFIP, substantial damage/substantial improvement (SD/SI) requirements, and to support communities participating in or who are interested in the Community Rating System (CRS).

Outreach and education efforts are aimed at informing communities and their residents about flood risk awareness, preparedness, and mitigation including the purchase of flood insurance as a flood risk mitigation option. One challenge is the recent overall decline in the number of NFIP policies in Nevada. This could be the result of many factors including recent changes to the NFIP due to Risk Rating 2.0 or policy holders buying private flood insurance.

NDWR provides training opportunities to Nevada communities on SD/SI and the (Community Rating System) CRS program. Training provided to communities for SD/SI provides support for the administration of SD/SI by increasing NFIP participating community knowledge of SD/SI requirements and the need to preform substantial damage assessments post-disaster. Workshops, training, and the coordination of a CRS user group supports CRS participating communities by allowing them to share best practices, stay current on updates to CRS requirements, and by providing an opportunity to explore improving their CRS rating. The CRS user group and training are open to participation by communities that currently do not participate in CRS but are interested in participating in the future. This allows interested communities the opportunity to learn more about the CRS program before they participate.

NDWR works with Nevada communities to identify flood risk mapping needs and updates needed to exiting flood risk maps to ensure Nevada communities have the most current flood risk data available for planning and mitigation. Structures at a high risk of flooding in Nevada are found in areas along rivers, alluvial fans, burn scars, and in hydrologically closed basins. Nevada communities have zero Severe Repetitive Loss properties, and the Repetitive Loss properties are located in Clark County and Washoe County. NDWR and NDEM work with these communities to identify mitigation opportunities, potential projects, and funding opportunities that can assist with reducing and mitigating the risk of flooding for these Repetitive Loss properties.

Nonetheless, one challenge is the current social and political climates, which are not conducive to providing the necessary foundation for the State to promote a uniform statewide “smart growth” policy. NHMWG attempts to promote “smart growth” in its grant-awarding procedures by considering the subapplicant’s existing building codes and regulations when prioritizing proposals for mitigation funding. The State’s Notice of Intent requires information about the

proposed activity's concurrence with the subapplicant's adopted building codes which is provided to NHMWG members with the proposal. Please see a copy of the Notice of Intent in Section 8.2, Figure 8-2, for the prioritization criteria.

4.2.3 State Funding Capabilities

Nevada has two sources of funding created by the Legislature to assist with hazard management and mitigation.

1. The Emergency Assistance Account (EAA) provides support to state agencies and local jurisdictions during declared emergencies on the state or local level. To receive funds from the EAA, the applicant must declare an emergency or disaster, have a preliminary damage assessment, and disclose financial records within thirty days or forty-five days depending on jurisdiction type. See Appendix D for a copy of the Nevada Administrative Code 414.105 through 414.140 with detailed information on procedures to obtain funding from this State source.
2. The Disaster Relief Account is a special account intended to stabilize the operation of the state government after a disaster. The Interim Finance Committee administers the account. This account is used to match Federal funding for declared disasters. See NRS 353.2735 for details.

4.2.4 Hazard Management Capabilities Changes

With the loss of long-time temporary staff since the 2018 plan, Nevada DEM has been challenged by the inability to hire permanent staff. The Mitigation Section has hired two contract staff for now. The collaborative approach to mitigation has enabled Nevada's mitigation capability to multiply, since the process involves coordination among government entities at all levels, including tribal nations. The following paragraphs provide a summary of mitigation activities accomplished since the approval of the last plan.

FEMA's unification of the hazard mitigation programs provided an excellent platform for Nevada DEM and NDWR to join forces in the management of the five programs in Nevada. During the update of this plan, the State Flood Plain Manager and the SHMO have worked together to promote all five programs and provide additional technical assistance to local and tribal government resulting in added number of and improved quality of applications. This resulted in increased funding for the state. In 2012, NDWR ceded the management of the three flood programs to Nevada DEM while maintaining a close working relationship for Unified Hazard Mitigation Assistance Programs (HMA) programs. This remains in effect with this plan update.

Since the approval of the previous 2018 plan, more counties and State agencies have become involved in the planning process. This has promoted networking which has led to a greater awareness of existing mitigation programs. This has resulted in better mitigation planning and related activities in the State. In 2004, five counties and three cities had approved plans. Since the previous state plan was approved in 2018, 12 counties have maintained a FEMA-approved plan with five counties working on their plan updates. The following counties are in the process of updating plans: Eureka-White Pine (regional plan), Mineral and Esmeralda (creating new regional plan) and waiting on their BRIC awards. Clark and Nye will be submitting their plans to FEMA very soon, and Washoe and Churchill are in the process of updating their HMPs. The

State has promoted the cost effectiveness as well as other benefits of a regional planning approach. Washoe and Clark Counties updated their plans with multi-jurisdictional regional-type plans to include incorporated cities, school districts, and tribal nations. Nye County updated their 2013 plan to include the Duckwater Shoshone Tribe of the Duckwater Reservation as an additional jurisdiction. Churchill County included the City of Fallon and the Paiute Shoshone Tribe of the Fallon Reservation and Colony in its multi-jurisdictional plan. Mineral County included Walker River Paiute Tribe of the Walker River Reservation in their 2016 update and plan to have Esmeralda County join their plan as a regional plan. Elko County included the following cities in their 2019 update: Wells, West Wendover, Carlin, and Elko. Lincoln County included the City of Caliente in their 2016 update. Additionally, White Pine and Eureka as well as Pershing, Humboldt and Lander counties are regional areas with low populations but similar topography and hazards, that have joined together to develop regional multi-jurisdictional plans. This has allowed the state to better manage the planning process including training and support with limited state resources. The state continues to encourage counties to join together to create regional plans with counties near and similar to them.

The SHMO and the NHMWG are increasing public awareness by convening the NHMWG quarterly committee meetings at locations around the state where the local community stakeholders are invited to participate. This process has been challenging due to the two 2017 presidentially declared disasters in northwest Nevada, which have placed more demands on a limited mitigation staff. Additional challenges include the COVID pandemic which required meetings to be held by virtual format. At these meetings, local community leaders are invited to give presentations on the area's demographics, government, geography, economic, and social profile. Local emergency managers provide specifics on the area's hazards and capabilities or needs and the area Flood Plain Manager presents local flood hazard information and capabilities if known. The State Geologist or representative presents information regarding the HAZUS-MH runs on earthquakes and the SHMO provides information on the Building Resilient Infrastructure and Communities (BRIC) and Hazard Mitigation Grant Program (HMGP) grants. NBMG provides MyPlan information and data access details. This provides to the community increased awareness of the programs and funding opportunities and provides the NHMWG information to help with their evaluation of applications. The SHMO continues working closely with fiscal staff to increase efficiency in distributing funds to subgrantees and to improve capability for obtaining the cost share requirements. The SHMO continues to take advantage of the administrative funds allocated by HMA programs.

The table below provides information on the number of PDM applications submitted each year. The SHMO and mitigation staff continue to provide technical assistance during the application drafting process. The SHMO and mitigation staff provide regional Grant Application Workshops the goal is to provide BCA training in both northern and southern Nevada in the near future.

Table 4-4. HMA Grant Applications

PDM 2007	Planning	3	3
	Project	1	1

Table 4-4. HMA Grant Applications			
PDM 2008	Planning	1	1
	Project	4	1
PDM 2009	Planning	1	0
	Project	4	2
PDM 2010	Planning	4	4
	Project	7	4
PDM 2011	Planning	4	1
	Project	3	1
FMA 2011	Planning	0	0
	Project	1	1
PDM 2012	Planning	2	2
	Project	3	1
PDM 2013 – Accepted by NHMPC but not submitted to FEMA because PDM 2013 remains unfunded.	Planning	1	0
	Project	2	0
PDM 2014	Planning	4	4
	Project	1	1
PDM 2015	Planning	1	1
	Project	1	1
PDM 2016	Planning	1	1
	Project	2	2
PDM 2017	Planning	4	4
	Project		
PDM 2018	Planning	1	1
	Project	2	2
PDM 2019	Planning	4	4
	Project	1	1
BRIC 2020	C&CB	5	5
	Project	2	0
BRIC 2021	C&CB	3	3
	Project	1	0
BRIC 2022	C&CB	3	3
	Project	5	4

The table and figures below provide HMA funding by year in Nevada, excluding management costs where applicable. The increased local awareness combined with the technical assistance are demonstrated by the increased funding each year. Also evident is the state's reliance on pre-disaster funding sources for the implementation of mitigation plans.

Table 4-5. HMA Grant Funding

Year	Funding by Program			
	PDM ($)*	HMGP ($)	FMA ($)	BRIC ($)
2001				
2002	297,271	0		
2003	198,125	0		
2004		523,113		
2005	60,064	392,541		
2006	29,115	413,679		
2007	561,347			
2008	573,173	489,792		
2009	1,067,996			
2010	3,515,777			
2011	905,822		1,930,138	
2012	2,598,569			
2013	355,650.00			
2014	2,255,125	583,609		
2015	400,000			
2016	1,379,989			
2017	407,635.61	4,866,012.26		
2018	16,594,569.20	3,400,062		
2019	4,552,587.40	1,817.727		
2020**		3,148,405		600,000
2021		15,584,381		500,000
2022				1,990,704.07
Sub-Total	38,843,519.28	31,219,321.26	1,930,138	3,090,704.07
Total	**$71,992,978.54**			

*Funding amounts reflect selected projects. Funding is conditioned on NEPA review. Flood Mitigation Assistance (FMA)

**PDM program changed to BRIC program

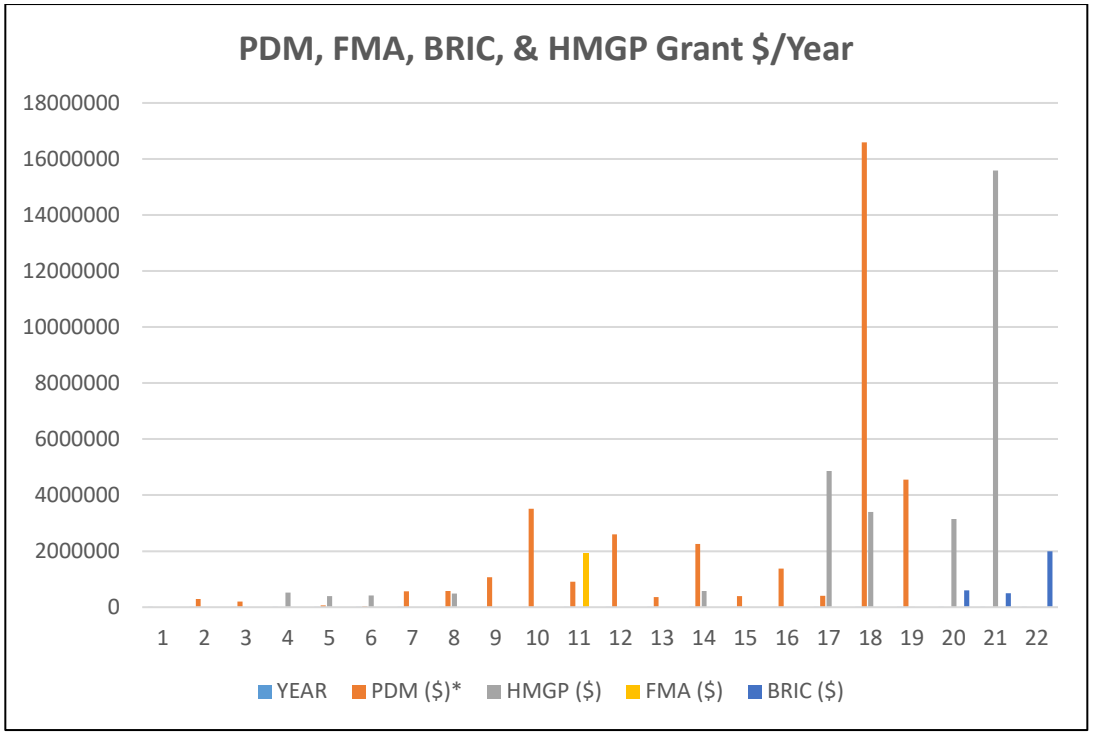


Figure 4-1. PDM, FMA, BRIC, and HMGP Grant Dollars of Funding per Year.

The table and figure below provide the PDM, FMA, and HMGP funding by type of mitigation activity and project. Earthquake, flood, and wildfire are Nevada's most destructive hazards.

Table 4-6. PDM & HMGP Funding by Hazard Type

Hazard or Grant Type	Amount
Earthquake	$ 14,888,262.00
Flood	$ 31,150,695.79
Wildfire	$ 3,078,845.50
Public Awareness	$ 36,310.00
Local Planning	$ 1,580,152.71
State Plan	$ 1,558,602.95
Management	$ 4,371,528.22
Total	$ 56,664,397.17

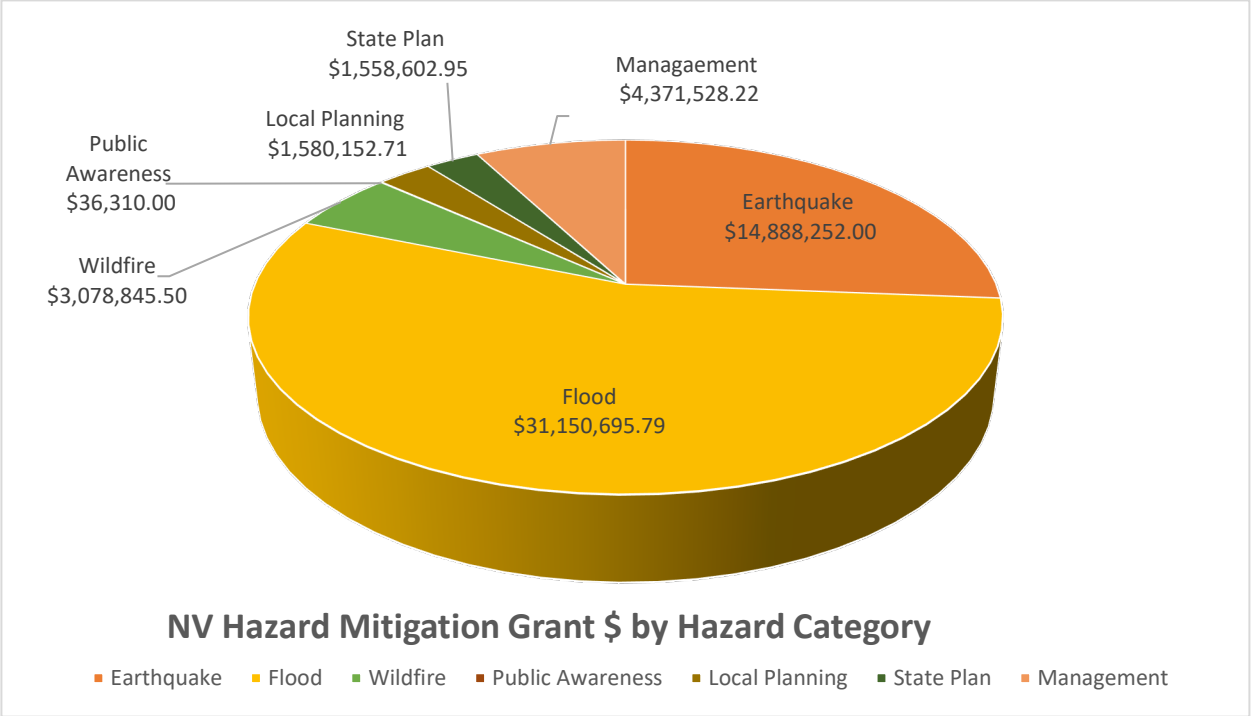


Figure 4-2. PDM, FMA & HMGP Funding by Activity Type.

Figure 4-3 below depicts HMA funding by county. Tracking county funding allows the State to provide training and public awareness to counties that are not applying.

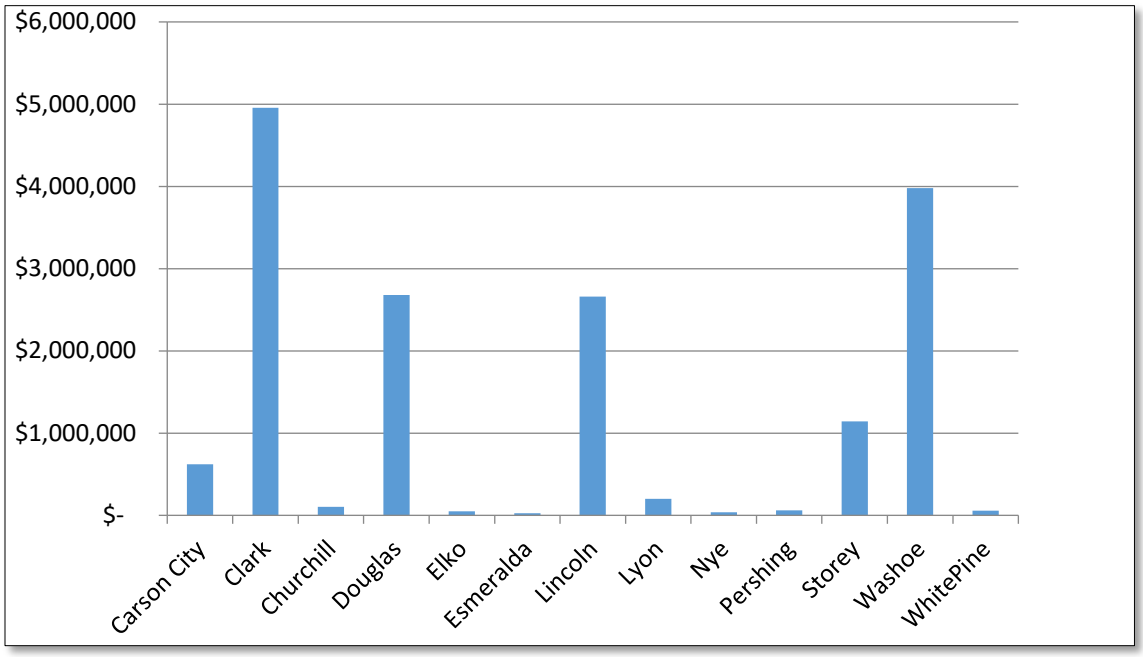


Figure 4-3. Bar Graph of HMA Funding by County.

Currently, the Division of Risk Management and SPWD works closely with Nevada DEM, Public Works, and Buildings and Grounds to complete mitigation activities and projects

affecting State buildings. This change has an added capability to the State's hazard management programs.

NBMG first ran HAZUS "Loss-Estimation Modeling" earthquake scenarios for each county in Nevada in 2007 and created an updated report with similar data for 38 communities across the state in 2014.That series of models also incorporates ShakeMap data provided by the Seismo Lab. The results are summarized in this report, available in detail in the NBMG publication Open-file 14-5, and is linked up online within the MyHazards and MyPlan websites.

There is continued commitment of the Nevada DEM, NDWR, and NHMWG to a comprehensive mitigation program as evidenced by the development of this Plan, the commitment to local mitigation planning, statewide promotion of mitigation, interdepartmental coordination, and the continuation of training workshops, technical assistance and outreach efforts. Examples of these ongoing efforts are listed below.

1. Nevada DEM and NDWR coordinate regular training sessions on the five HMA programs to assist local governments with grant administration, hazard mitigation planning and related duties.
2. Nevada DEM administers pass-through of HMA grant funds to counties and municipalities to develop DMA 2000-compliant hazard mitigation plans.
3. Nevada DEM coordinates the NHM Planning Subcommittee, which is directly responsible for assisting in the development and updating of this plan.
4. NHMWG and NDWR evaluate and prioritize hazard mitigation grant proposals.
5. NHMWG and NDWR provide advice to Nevada DEM in mitigation planning activities statewide.
6. NHMWG and NDWR improve the level of coordination across state agency programs that share objectives that complement the goals of this plan.
7. Nevada DEM continues to develop the mitigation program's GIS capability with support from UNR, NBMG's existing system.
8. NBMG partnering with Nevada DEM provides and enhances risk and vulnerability assessment data for local and tribal governments.
9. Nevada DEM coordinates local annual Tabletop Exercises (TTX) for Hazard Mitigation plan maintenance statewide.
10. Nevada DEM supports THIRA activities at the state and local level.
11. NDWR manages and coordinates the Silver Jackets team program.

4.3 LOCAL CAPABILITY ASSESSMENT

The requirements for local capability assessment, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S13. Does the plan include a general description and analysis of the effectiveness of local government mitigation policies, programs, and capabilities? [44 CFR §201.4(c)(3)(ii)][190]	a. The plan must provide a summary of current local government policies, programs and capabilities of jurisdictions to accomplish hazard mitigation. b. The plan must describe the effectiveness of local government mitigation policies, programs and capabilities, including: 1. Challenges to implementing these mitigation policies, programs and capabilities. These should include gaps and disparities in serving underserved communities and challenges resulting from the impacts of climate change. 2. Opportunities for implementing mitigation actions through local government capabilities. c. *If the state is interested in HHPD funding eligibility, the plan must generally describe and analyze the effectiveness of local mitigation policies, programs, and capabilities that address high hazard potential dams (see HHPD6 in Section 3.8.).*

4.3.1 Local Capability Description

The NHMWG has been actively working with local governments to identify the most effective strategic actions for hazard mitigation planning. Nevada has a history of being strong on property rights, but support is growing for policies that will help with hazard mitigation. NHMWG identifies those local governments with policies currently in place that include strong hazard mitigation programs and offers them as positive examples to other Nevada communities and local governments in developing their own effective hazard mitigation plans and ordinances. The State provides guidance to these communities and supports pass-through funds available to communities interested in adopting hazard mitigation actions. While Nevada, by law, cannot currently mandate statewide building codes, counties and local jurisdictions do comply with the latest international building codes in their respective jurisdictions.

The existing State model codes are shown in Table 4-7 below and Table 8-4 in Section 8. Adoption of these codes by local jurisdictions is encouraged and will make local mitigation more effective. As stated above, the NHMWG takes into consideration the adoption of building codes by the community applying for hazard mitigation funding when prioritizing proposals. Building code adoption in Nevada by law occurs at the local county level. Nevada has three small rural counties that do not have building codes officially adopted. However, they all refer to the state-

[190] 44 CFR §201.4(c)(3)(ii), "A discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: An evaluation of State laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas; a discussion of State funding capabilities for hazard mitigation projects; and a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities."

adopted building codes when providing building permits which are the latest building codes. As noted previously, the current political climate does not lend itself to changing the laws. However, the most recent review of local building codes and population showed that 97% of Nevada population are covered by the most recent building codes.

Table 4-7. Existing State Model Codes Promoted for Adoption by Local Governments

Policy	Description of Model Codes	Applicability
Building and Fire Codes	The State has adopted a building code and local governments are required to adopt and enforce this code with the exception of Clark County. (see NRS 477.030 (12)). **NRS 278.580 – Building codes: Adoption; fees for permits; applicability to State and Nevada System of Higher Education; authorization of use of materials and technologies that conserve resources in construction and use of solar or wind energy; adoption of seismic provisions and standards** **NRS 461.170 –** Division required to adopt by regulation nationally recognized codes and standards for construction, reconstruction and alteration. **NRS 477.030 (1)–**Requires the State Fire Marshal to adopt minimum fire and building codes to ensure fire safety, except as otherwise provided. **NRS 477.030 (12)-** Except as otherwise provided in this subsection, any regulations of the State Fire Marshal concerning matters relating to building codes, including, without limitation, matters relating to the construction, maintenance or safety of buildings, structures and property in this State. Exemptions are provided to a county whose population is 700,000 or more (Clark County, only) and have adopted a code at least as stringent as the *International Fire Code* and the *International Building Code*, published by the International Code Council. **NRS 514.040(3) –** Apply geologic engineering principles to problems of conservation, environment, construction, mineral industry and other scientific matters that may be of importance to the welfare of the State.	The adoption and enforcement of building and fire codes relates the design and construction of structures to standards established for withstanding wildfires, earthquakes, flooding, dam failure, and high winds.

Table 4-7. Existing State Model Codes Promoted for Adoption by Local Governments		
Policy	**Description of Model Codes**	**Applicability**
	NRS 623 – Architects, Interior Designers and Residential Designers.	
Zoning	Laws and ordinances regulate development by dividing the community into zones and by setting development criteria for each zone. **NRS 278.147 –** Facilities for use, manufacture, processing, transfer or storage of explosives or certain other substances: Conditional use permit required; application for and issuance of conditional use permit**.** **NRS 278.160 –** Elements of the master plan (planning and zoning). **NRS 278.580—** Standards for the investigation of hazards relating to seismic activity, including, without limitation, potential surface ruptures and liquefaction **NRS 410.095 through 410.210 –** Regulation and restriction of outdoor junkyards.	Zoning can keep inappropriate development out of hazard-prone areas and can designate certain areas for such things as conservation, public use, or agriculture. Zoning can also be used to control construction by dedicating areas for cluster development or planned unit development. The State currently works with local governments on implementing these last two policies.
Land Use Planning	Comprehensive land use planning provides a mechanism to prevent development in hazardous areas or allows development in a manner that minimizes damage from hazards. Land use planning gives local governments "the big picture" of what is happening in their jurisdiction. **NRS 278.02521 –** Legislative intent (protecting environmentally sensitive areas and maintaining the economic viability of rural lands). **NRS 278.160 –** Elements of master plan (planning and zoning). **NRS 278.580—**Standards for the investigation of hazards relating to seismic activity, including, without limitation, potential surface ruptures and liquefaction. **NRS 321.640 through 321,770 –** State planning of use of land. **NRS 324 –** Lands under Carey Act (regulates use of water and reclamation of water	Local governments can use land use planning to identify those areas subject to damage from hazards and work to keep inappropriate development out of those areas. Land use planning can also be used for more regional approach when local governments work together.

Table 4-7. Existing State Model Codes Promoted for Adoption by Local Governments		
Policy	**Description of Model Codes**	**Applicability**
	projects). **NRS 376A –** Taxes for development of open space land. **NRS 472 –** State Forester Fire Warden (management of vegetation, cooperative agreements, rangeland fire protection associations, elimination of fire hazards, etc.). **NRS 528 –** Forest practice and reforestation. **NRS 534 –** Underground water and wells	
Subdivision Regulations	Sets construction and location standards for subdivision layout and infrastructure. **NRS 445D –** Environmental covenants (Uniform Act).	Contains standards for such things as storm water management and erosion control
Capital Improvements Planning	Identifies where major public expenditures will be made over the next 5 to 10 years.	Capital Improvement Plans can secure hazard-prone areas for low risk uses, identify roads or utilities that need strengthening, replacement, or realignment, and can prescribe standards for the design and construction of new facilities.

4.3.2 Local Capabilities General Analysis

Currently, 12 Nevada counties have FEMA-approved mitigation plans. Five Nevada counties are in the process of updating their plans which have expired with the COVID-19 disaster with limited staff and turnover of staff. All five of these counties are in the process of updating their HMPs with two counties waiting for BRIC 2022 grant awards. The Working Group will integrate the capabilities from local jurisdictions as soon as their completed plans are approved by FEMA. The NHMWG Task Force derived this information from the local jurisdiction hazard mitigation plans. The following table provides a general summary analysis of the effectiveness of the local capabilities of the completed plans.

Table 4-8. Local and Tribal Capabilities General Analysis

County	Effectiveness			Comments
	Legal Regulatory	Administrative Technical	Fiscal	
Carson City	Excellent	Excellent	Excellent	Plan was approved. Carson City continues to adopt and enforce the most current building codes. They remain strong in their desire to incorporate mitigation projects as well as training and public awareness campaigns.
Churchill	Excellent	Very Good	Very Good	Plan in update status with PDM 2019. Actively working to implement flood mitigation activities and accomplished quite a bit of flood mitigation during the 2017 January and February flood events. They did several flood projects for the current disaster,
Clark	Excellent	Excellent	Excellent	Plan going through update process. They have excellent mitigation actions in flood awareness and prevention. Currently, they are researching earthquake mitigation actions, but already have regulations dealing with faults and fissures. One community is rated extreme for wildfire risk. The County, State, and Federal agencies implement mitigation activities for wildfire. The most current building codes are in place

Table 4-8. Local and Tribal Capabilities General Analysis				
Douglas	Very Good	Very Good	Very Good	Plan is approved. Douglas continues with legal, regulatory, and fiscal and administrative capability. Coordination and partnerships have improved in the hazard management field.
Duckwater Shoshone Tribe of the Duckwater Reservation	Very Good	Good	Good	Plan is expired but they are very interested in doing their own standard tribal plan.
Elko	Very Good	Very Good	Very Good	Plan is approved. Elko County has the foundation in place to enhance current hazard mitigation strategy. Implementing local mitigation activities.
Esmeralda	Good	Good	Good	Plan is expired but they are joining Mineral County to create a regional plan with both counties. Coordination among its agencies improved through the planning process.
Eureka	Good	Good	Good	Plan approved. Currently working on an update in conjunction with White Pine County.
Humboldt	Good	Good	Good	Plan approved as a tri-county regional plan with Pershing and Lander Counties.
Lander	Good	Good	Good	Plan approved as a tri-county regional plan with Humboldt and Pershing Counties.
Lincoln	Very Good	Very Good	Very Good	Plan is expired but in the update process with a current BRIC 2020 grant. Coordination among its agencies improved through the planning process and implementing a strategy.
Lyon	Good	Good	Good	Plan approved. Currently working on their plan update. The county remains part of a superfund site and this limits some of the flood mitigation available for the county.
Mineral	Very Good	Good	Very Good	Plan is expired but in the process of a grant to update and joining with

Table 4-8. Local and Tribal Capabilities General Analysis				
				Esmeralda County for a regional HMP.
Nye	Good	Good	Good	Plan is expired but just about complete to submit to FEMA for approval. Nye Co. has the ability to adopt regulations. Additional staff and funding for mitigation purposes would help the growing population.
Pershing	Good	Good	Good	Plan approved as a regional tri-county plan with Humboldt and Lander counties. As a rural county, Pershing is limited in staff to increase mitigation efforts.
Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation	Good	Very Good	Good	Developed an approved plan in conjunction with Washoe County.
Reno-Sparks Indian Colony	Good	Good	Very Good	Developed an approved plan in conjunction with Washoe County.
Shoshone-Paiute Tribes of the Duck Valley Reservation	Good	Good	Good	Plan is approved.
Storey	Very Good	Very Good	Very Good	Plan approved. Storey County has successfully applied for HMA funding and has a current HMGP flood project.
Te-Moak Tribe of Western Shoshone Indians of Nevada – Elko Band	Very Good	Very Good	Very Good	Plan remains in update process. They have been challenged by staff turnover.
Washoe	Excellent	Excellent	Excellent	Washoe Co. completed a regional hazard mitigation plan to include tribes, and communities have applied for funding to implement strategy. The currently have a BRIC 2021 grant for updating their plan.
Washoe Tribe (Nevada and California)	Excellent	Excellent	Excellent	Plan is currently in the update process. The tribe has been challenged by turnover in staff working on the plan update. They will work to accomplish their update along with state technical assistance.

Table 4-8. Local and Tribal Capabilities General Analysis				
White Pine	Good	Good	Good	Plan approved as a regional plan with Eureka County.

The NHMWG will continue to track and analyze the local jurisdictions' capabilities as approved plans enter the update process (all county plans are approved or are in the process of updating their approved plans).

4.4 MITIGATION ACTIONS

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

ELEMENT	REQUIREMENTS
S10. Does the plan prioritize mitigation actions to reduce vulnerabilities identified in the risk assessment? [44 CFR §§201.4(c)(1), 201.4(c)(3)(i) and (ii); and 201.4 (c)(3)(iii)[191]; 201.4(c)(4)(ii); ; FMAG: 44 CFR §205.51(d)(2)]	g. The plan must identify actions based on the current risk assessment to reduce the vulnerability of jurisdictions within the state as well as the vulnerability of state-owned assets as described in Elements S5 and S6. h. The plan must describe the process used by the state to evaluate and prioritize actions that are cost-effective, environmentally sound, and technically feasible. i. The plan must describe how each action contributes to the hazard mitigation goals. j. The plan must describe how local government mitigation strategies link to the state mitigation strategy. k. *If the state is interested in FMAG program eligibility, the state mitigation plan's mitigation strategy must contain wildfire-related mitigation initiatives. (See FMAG2 in Section 3.9.).* l. *If the state is interested in HHPD funding eligibility, the plan must prioritize mitigation actions to reduce vulnerabilities from high hazard potential dams (see HHPD4 in Section 3.8.).*
S11. Was the plan updated to reflect progress in statewide mitigation efforts and changes in priorities? [44 CFR §201.4(d)]	c. The plan must provide a narrative of the status of each mitigation action in the previous plan. This narrative must identify which actions have been completed or not completed. For uncompleted actions, the plan must describe whether the action is either no longer relevant or included in the updated plan. d. The prioritization of mitigation actions and activities must be updated based on the updated analysis of risks, capabilities and progress.

This is the process by which the Subcommittee identified, evaluated and prioritized cost-effective, environmentally sound, and technically feasible mitigation strategy actions.

[191] 44 CFR §201.4(c)(3)(iii): "An identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified."

4.4.1 Identification of Cost-Effective, Environmentally Sound, and Technically Feasible Mitigation Actions

To identify strategic actions, we first reviewed the 2018 mitigation strategic actions and projects and requested input from NHMWG members on any needed additions deletions or changes to the list or any that had been accomplished. Completed mitigation activities are listed in Appendix L.

4.4.2 Evaluation and Prioritization of Strategic Actions and Activities

The standard FEMA-approved STAPLEE process was used as a starting point for the Subcommittee to focus prioritization of action items in the strategic plan. Table 4-9 presents the evaluation criteria of the STAPLEE process as used in development of mitigation strategy.

Table 4-9. STAPLEE Evaluation Criteria for Ranking Mitigation Strategic Action Items

Evaluation Category	Discussion topics	Considerations
Social	Is there public support for the overall mitigation strategy and specific mitigation actions?	Community acceptance; any adverse effects on population
Technical	Is the mitigation action technically feasible and is it a whole or partial solution?	Technical feasibility; long-term solutions; secondary impacts
Administrative	Does the community have the personnel and administrative capabilities necessary to implement the action or will outside help be necessary?	Staffing; funding allocation; maintenance/operations
Political	What do the community and its members feel about issues related to the environment, economic development, safety, and emergency management aspects of the action?	Political support; local champion; public support
Legal	Does the community have the legal authority to implement the action, or must the community pass new regulations?	Local, state, and federal authority; potential legal challenges
Economic	Can the action be funded with current or future internal and external sources? Do the costs seem reasonable for the size of the project, and is enough information available to complete a FEMA Benefit-Cost Analysis?	Benefit/cost of action; contributes to other economic goals; outside funding required; FEMA Benefit-Cost Analysis
Environmental	What is the impact on the environment? Does the action promote a desirable, sustainable and environmentally healthy community for the public?	Effect on local flora and fauna; consistent with community environmental goals; consistent with local, state, and federal laws.

To achieve this, the NHMWG members were given a spreadsheet containing the action items as rows and the items defining STAPLEE as columns. The members ranked the actions using numbers 1 to 5 with 1 being the lowest rating and 5 the highest rating for each specific action

and item. The numbers were added and ranked based on a summation of all points received from members providing input. These results for all the participating members are shown as a column under the NHMWG Respondents heading.

A review of the results of the STAPLEE prioritization shows that the 112 strategic action items received scores of between 106 and 282 points each from Subcommittee members; The top 25% scoring 248 and above were ranked as "High" priority strategic action items. The second quartile (scoring 218 to 247) were ranked as "Medium" priority strategic action items and the lower half receiving less than 218 points in the STAPLEE rating process were ranked as "Low" priority strategic action items.

The resulting prioritization of strategic actions effectively constitutes the Mitigation Strategy for the State and is listed below in Table 4-10, Strategic Action Plan Matrix. This listing details not only the ranking of strategic action items, but also the lead agencies for each item, possible funding sources for their highest priority actions, implementation timeline and economic justification. The Subcommittee strongly supports any mitigation action for earthquake, flood, and wildfire — those hazards that are rated "High" and that affect all Nevada communities. Although this prioritization presents a general framework for mitigation strategy at the state level, it should not be regarded as a rigid set of guidelines dictating all mitigation activity. Actual mitigation efforts across the state are more often directed by the efforts of the local communities and groups who submit innovative, feasible, fundable grant projects with local matching funds for activities of importance to them at the community level. These projects are deserving of state support whenever possible.

Note that in 2023, the NHMWG has added goals and actions for drought and extreme heat. The addition reflects the effects of climates change, the State of Nevada's Climate Strategy that specifically addresses heat and heat waves; and new analysis on extreme heat in Section 3.

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
5.H	Assist volunteer fire departments in attaining funds for proper personal protective equipment, apparatus, equipment and training.	NDF	FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AJ	Assist in the formulation and dissemination of current information such as Living with Fire documents.	NDF	USDA, BLM, USFS, NRCS, UNCE, Living With Fire Program, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.A	Protect existing assets, as well as future development, from the effects of wildfire.	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AR	Protect the envelope of buildings from wildfire.	NDF	USDA, BLM, USFS, NRCS, UNCE, locals, private, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.G	Ensure proper personal protective equipment, apparatus, equipment and training for career staff and seasonal wildland firefighters.	NDF	FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AB	Encourage collaboration at all levels with state, federal and local cooperators.	NDF	USDA, BLM, USFS, Living With Fire Program	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
5.AN	Assist in the planning for and removal of biomass waste on fuels reduction and forest health projects, as well as following wildland fires, flooding and other catastrophic natural event.	NDF	USDA, BLM, USFS, NRCS, UNCE, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.E	In highly motivated communities, focus on activities by individual participation in and maintenance of projects (personal responsibility).	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS,UNCE	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AO	Comply with all federal regulations in the funding stream to ensure compliance and future competitiveness.	NDF	NDF	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.K	Encourage collaboration on all levels among state, federal and local cooperators, both fire- and resource-related.	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AM	Assist in acquiring funding for local firefighters for training and equipment through the State Fire Assistance, and Volunteer Fire Assistance when funded by USFS.	NDF	USDA, BLM, USFS, NRCS, UNCE, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
5.M	Assist communities in fuels-reduction projects for areas with extreme or high ratings in updating CWPP assessments.	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS, locals	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AQ	Participate in interagency project planning, implementation and monitoring.	NDF	USDA, BLM, USFS, NRCS, UNCE, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.L	Continue to improve fire prevention programs statewide through partnerships with Fire Prevention Association of Nevada, State Fire Marshal's Office, University of Nevada Cooperative Extension, and any other cooperators.	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AC	Assist communities and State in Burned Area Emergency Rehabilitation, and complete fire damage reclamation reports and public education and outreach to provide the best land management practices available for collaborative land rehabilitation.	NDF	USDA, BLM, USFS, NRCS, USACE, UNCE	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.J	Coordinate the development of a comprehensive, collaborative program for mutual	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and	HIGH

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
	aid/mobilization of state and local government fire resources.				reduce loss of life and injury	
5.AG	Provide public education and outreach to communities affected by wildfire.	NDF	USDA, BLM, USFS, NRCS, UNCE, Living With Fire Program, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.F	Educate and train State and communities in current standards and regulations for proper practices in defensible space and firefighting.	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS,UNCE	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.Q	Provide and maintain a statewide process for documenting fuels projects progress, completion, success and maintenance.	NDF	locals?	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AD	Assess damage to critical watershed and threats to communities' domestic water supplies and mitigate those threats through erosion control practices.	NDF	USDA, BLM, USFS, NRCS, USACE	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AF	Provide training, expertise, and supplies/equipment in a collaborative manner to assist in rehabilitation.	NDF	USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
5.AH	Focus fuels projects in communities with extreme or high ratings in CWPP assessments.	NDF	USDA, BLM, USFS, NRCS, UNCE, Living With Fire Program, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.D	Provide public education and outreach to educate homeowners in the WUI about proper defensible space practices and landscaping for fire resistance and encourage community involvement in project completion, participation, and maintenance.	NDF	HMA, Emergency Management Performance Grant (EMPG), Fire Management Assistance Grant (FMAG), USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.N	Provide funding and service forestry technical assistance through the State Fire Assistance and Hazardous Fuels Reduction programs to reduce fuels on state and private property.	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS, locals	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.R	Focus projects in areas to attain desired forest conditions and coordinate with forest health program activities.	NDF	USDA, BLM, USFS, locals	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.Z	Provide native and accepted introduced seed species through the Nevada State seed bank program.	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and	HIGH

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
					reduce loss of life and injury	
5.W	Restore native and adapted vegetation and work to prevent areas being impacted by non-native or undesirable species conversions through collaborative efforts.	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AP	Keep apprised of all federal, state, and local regulations.	NDF	NDF	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	HIGH
5.AK	Encourage community involvement in project completion, participation, and maintenance.	NDF	USDA, BLM, USFS, NRCS, UNCE, Living With Fire Program, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
5.U	Work closely with the Tribal communities, local landowners, and the SHPO to obtain clearances and to mark sensitive sites.	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
5.AL	Assist, encourage and provide guidance to communities in the development of the appropriate fire service organization for their community (i.e. a legally constituted fire protection	NDF	USDA, BLM, USFS, NRCS, UNCE, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
	district or fire department) according to NRS 472.040.					
5.I	Participate in research and development of interoperability for emergency response communications.	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
5.T	Provide training for employees and project managers on SHPO and cultural resource identification, reporting methods and clearances.	NDF	BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
4.G	Upgrade State-owned or operated infrastructure (e.g. servicing roads, culverts, bridges, channels, and structures) related to State-owned or operated critical facilities to protect critical facilities from flood damages or disruption of essential services.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
5.AA	Provide training for local cooperators for treatment practices and skill acquisition.	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
5.O	Provide assistance to counties for priority setting and CWPP updating.	NDF	HMA, EMPG, FMAG, USDA,	Ongoing	Reduce economic impact of hazards on infrastructure and	MEDIUM

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
			BLM, USFS, locals		reduce loss of life and injury	
5.P	Provide a statewide evaluation process for monitoring community progress, prioritization and participation in CWPP.	NDF	locals?	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
5.Y	Use mechanical and hand treatments as well as prescribed fire to assist in attaining desired forest and rangeland conditions.	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
5.S	Ensure that all projects have an approved fuels/forest health/stewardship plan that includes all aspects of service forestry (State Historic Preservation Officer (SHPO) (threatened and endangered species, prescriptions, actions, etc.).	NDF	USDA, BLM, USFS, locals	ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
4.C	Conduct flood hazard mapping in piedmont and alluvial fan environments.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE,NRCS, USDA, USGS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
4.H	Protect existing assets as well as future development from the effects of dam failure	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Preparation of inundation maps by DWR and review of inundation maps	MEDIUM

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
					submitted by dam owners identifies downstream risk for property owners and local communities to help inform them of hazards and guide them for risk reduction actions.	
4.I	Inventory existing dams and add to the inventory as dams are discovered or constructed.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	A current inventory of dams within the state is necessary to ensure that the necessary dams are being inspected, have owners identified, are in the state database for local and state DEMs, and are complying with local and state laws and regulations.	MEDIUM
4.K	Install early warning weather stations in watersheds with dams above populated areas.	NDWR, NHMPC	NWS, NOAA, USGS	Ongoing	Early warning weather stations in watersheds with dams above populated areas allow notification	MEDIUM

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
					for evacuation in dam emergencies.	
4.P	Develop Emergency Action Plans to ensure swift coordinated response in the event of an emergency.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, NRCS, USDA	Ongoing	Current EAPs help with emergency response in dam emergencies.	MEDIUM
5.AE	Supply resources for rehabilitation efforts through the State Tree Nurseries in Las Vegas and Washoe Valley, and the Nevada State seed bank programs.	NDF	NDF	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
4.A	Protect existing assets, as well as future development, from the effects of flooding.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE,NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
5.V	Provide assistance to communities and State in planning and implementing long-term sustainable landscape projects.	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
2.D	Provide training to local governments and state agency staff to clarify mitigation measures from response and recovery and preparedness measures.	Nevada DEM and NHMPC	HMGP, EMPG, Interoperable Communications, USGS, USFS, BLM, FEMA, BOR	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
5.AI	Assist with the development of and the participation in a	NDF	USDA, BLM, USFS, NRCS,	Ongoing	Reduce economic impact of hazards on	MEDIUM

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
	comprehensive program by which current CWPP or equivalent assessments are updated as projects are completed, ratings change or new at-risk communities arise.		UNCE, Living With Fire Program, FEMA		infrastructure and reduce loss of life and injury	
6.F	Improve access to information about drought mitigation and response programs.	Nevada DEM and NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE,NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and the main state economic engines.	MEDIUM
2.H	Promote coordination among state agencies, local governments and tribal organizations of regional hazard mitigation activities	Nevada DEM and NHMPC	HMA, EMPG, FEMA,	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
4.B	Identify and prioritize areas in the State where existing flood hazard mapping is inadequate due to planned and existing significant development and conduct flood hazard mapping in those areas.	NDWR, NHMPC	Repetitive Flood Claims (RFC), SRL, BRIC, HMGP, FMA, EMPG, USACE,NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
7.A	Expand the urban tree canopy and the amount of urban green space.	Nevada DEM, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
6.B	Direct providers to develop water conservation plans that	Nevada DEM and NHMPC	RFC, SRL, BRIC, HMGP, FMA,	Ongoing	Reduce economic impact of hazards on	MEDIUM

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
	include strategies like water metering, tiered-rating, and outdoor watering guidelines that limit irrigation to cooler times of day.		EMPG, USACE,NRCS, USDA		infrastructure and the main state economic engines.	
2.F	Continue to build operational links between hazard mitigation, disaster preparedness and recovery programs with public and private sectors	Nevada DEM and NHMPC	HMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	MEDIUM
6.C	Increase the efficient use of agricultural water.	Nevada DEM and NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE,NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and the main state economic engines.	MEDIUM
4.J	Inventory and inspect existing dams for structural and hydraulic adequacy and implement operational constraints, if warranted.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Inspection of dams is vital to identifying deficiencies that may lead to dam failures. Major deficiencies can lead to restrictions to impoundment capacities, loss of impoundment, fines and/or other penalties. Lowering of reservoir levels or emptying of	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
					reservoirs increases safety for the downstream population by lowering the risk or removing it altogether.	
4.L	Assist communities and State in structural mitigation measures, updates, repairs and maintenance to dams, ditches, and canals.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Mitigation, updates, repairs and maintenance of dams, ditches, and canals increase the safety of the structures and the downstream population.	LOW
4.M	Encourage local ordinances and regulations to reduce encroachment into flood-prone zones resulting from dam impoundment or high (non-failure) releases.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, NRCS, USDA	Ongoing	Communication and education outreach for local communities to identifying dams and education of dam hazards for the communities.	LOW
6.E	Identify new water sources, including water reuse.	Nevada DEM and NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG,	Ongoing	Reduce economic impact of hazards on infrastructure and	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
			USACE,NRCS, USDA		the main state economic engines.	
3.M	Promote the Great Nevada Shakeout and earthquake drills throughout the state.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP	ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
7.B	Use green, cool and/or reflective building and paving materials.	Nevada DEM, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
2.I	Identify, enhance and integrate public education efforts by state and local agencies that have programs directed to hazard mitigation	Nevada DEM and NHMPC	HMA, EMPG, FMA, RFC, local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
2.E	Maintain a system to allow state agencies with hazard mitigation programs and plans to make recommendations about how local governments can incorporate these in support of the state's mitigation program efforts.	Nevada DEM and NHMPC	HMA, EMPG, Local fees, SERC	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
6.A	Increase drought condition monitoring	Nevada DEM,	RFC, SRL, BRIC, HMGP, FMA,	Ongoing	Reduce economic impact of hazards on	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
		NDWR, NHMPC	EMPG, USACE,NRCS, USDA		infrastructure and the main state economic engines.	
3.N	Promote training of volunteer community emergency response teams (CERT) about earthquake risks and possible mitigation activities.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.L	Develop earthquake hazard information programs targeting public safety, emergency managers, local government executives, and business and industry.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, USFS, BLM, NDF, Local FD	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
4.F	Assist communities and State with programs dealing with repetitive loss structures and severe repetitive loss structures; these programs may involve acquisition and demolition; relocation; elevation or other mitigation strategies.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE,NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.K	Expand earthquake awareness in educational sites such as	NBMG, Nevada Seismology	HMA, EMPG, USFS, BLM,	Ongoing	Reduce economic impact of hazards on infrastructure and	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
	regional science fairs, and speakers.	Laboratory, NESC, Nevada DEM, NHMPC	NDF, UNR Coop Extension		reduce loss of life and injury	
3.O	Promote training of hospital staff about earthquake risks and possible mitigation activities.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.Q	Provide publications and workshops to promote the exchange of technical information relating to earthquakes among professionals, managers and the citizens of Nevada.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
5.C	Assist local communities in enacting local ordinances for mitigation and fire prevention.	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
4.E	Assist communities and State with programs to elevate, dry-flood proof or wet-flood proof identified structures to obtain	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG,	Ongoing	Reduce economic impact of hazards on infrastructure and	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
	NFIP compliance and/or mitigate repetitive loss structures and severe repetitive loss structures.		USACE,NRCS, USDA		reduce loss of life and injury	
2.G	Promote understanding by the general public of the benefits of hazard mitigation in reducing casualty and property losses and ensuring continuity of businesses, institutional and government functions	Nevada DEM and NHMPC	HMA, EMPG, NHERP, NSF	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
7.C	Reduce waste heat – for example with community design that reduces reliance on cars.	Nevada DEM, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG	Initiating	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
4.D	Retrofit State buildings to meet NFIP standards.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.B	Hold workshops on strategies, benefits, risk-reduction opportunities, and challenges associated with the inventory of seismically susceptible buildings.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, FMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
3.V	Create earthquake planning scenarios (Las Vegas and rural areas).	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.G	Encourage seismic retrofit of public safety and critical facilities (both community and State) (such as 911 communications, hospitals, fire, law enforcement and ambulance facilities, etc.)	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, USFS, BLM, NDF, Local Fire Department	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
5.B	Identify and recommend changes to State NRS, NAC and communities' ordinances and regulations.	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.S	Give planning and special consideration to developing a "Fault Map of Nevada" and identifying all active faults and seismic sources near major urban areas in Nevada.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
3.X	Continue to inventory and field-verify unreinforced masonry buildings in Nevada and make this data publicly available to planners and emergency response staff in communities statewide.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP, EMPG, locals	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
1.A	Improve awareness of the locations, potential impacts and links among hazards, vulnerability and measures to protect life safety and health.	Nevada DEM and NHMPC	HMA, EMPG, DHS grant, USFS, FMAG, BLM, Emergency Response Commission, Local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.Y	Promote coordination among private and public entities to improve statewide earthquake monitoring capabilities.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
1.F	Encourage local governments, special districts and tribal organizations to develop, adopt, implement maintain and update hazard mitigation plans.	Nevada DEM and NHMPC	HMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
2.A	Provide technical assistance, guidance, resources and tools to	Nevada DEM and NHMPC	HMA, EMPG	Ongoing	Reduce economic impact of hazards on	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
	local governments and tribal entities to promote hazard evaluation and to develop and update hazard mitigation plans.				infrastructure and reduce loss of life and injury	
3.R	Promote a post-earthquake technical clearinghouse through planning and established practices.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.T	Establish a "lifelines and transportation" workgroup.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
4.N	Identify hazards of flooding from man-made structures, such as irrigation ditches and canals, and integrate these into local zoning ordinances.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.W	Determine potential fault rupture characteristics and maximum earthquakes.	NBMG, Nevada Seismology Laboratory, NESC,	HMA, NEHRP, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
		Nevada DEM, NHMPC				
6.D	Modify and amend the state water law.	Nevada DEM and NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, USACE,NRCS, USDA	Initiating	Reduce economic impact of hazards on infrastructure and the main state economic engines.	LOW
3.I	Increase media involvement by networking with partners from all media types such as print, radio, TV, and social media.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, USFS, BLM,	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
4.O	Develop laws and regulations that ensure reasonable standards of design and construction to reduce flood hazards.	NDWR, NHMPC	RFC, SRL, BRIC, HMGP, FMA, EMPG, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.Z	Identify potential funding sources for earthquake mitigation strategic actions not only at the Federal and State levels but also from private funding and community partnerships.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
2.B	Provide specialized training and exercises to state agency staff and local governments concerning local hazard mitigation planning and the local hazard mitigation plan program.	Nevada DEM and NHMPC	HMA, EMPG, CDBG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.J	Provide Applied Technology Council (ATC) training and develop formalization of the process.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, USFS, BLM, UNCE	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.P	Improve integration of the emergency management system at all levels of the community bringing forth the "whole community" approach.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.AB	Develop an Earthquake Early Warning System for Nevada.	NBMG, Nevada Seismology Laboratory, NESC, Nevada	USGS, FEMA, Earthquake Hazard Program (EHP)	Near future	Reduce injuries and losses from earthquakes by forewarning people, agencies, and industry that imminent shaking is	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
		DEM, NHMPC			about to occur allowing safety, economic, and operational measures to be taken	
1.B	Provide current information and workshops about hazards, vulnerabilities, mitigation processes and technical assistance for planning and grant availability and application procedures to State and local agencies.	Nevada DEM and NHMPC	HMA, EMPG, DHS grant, USFS, FMAG, BLM, Emergency Response Commission, Local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
1.E	Improve communication, collaboration and integration among stakeholders and promote hazard mitigation as an integrated public policy.	Nevada DEM and NHMPC	HMGP, EMPG, USGS, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.H	Develop lesson plans or activities for teachers to increase awareness about Nevada's earthquake hazard that tie into the existing science curriculum and align with the science standards for the state.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, USFS, BLM, SHPO,	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.U	Enhance implementation of nonstructural remediation.	NBMG, Nevada Seismology Laboratory,	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
		NESC, Nevada DEM, NHMPC			reduce loss of life and injury	
3.AA	Develop a set of model codes and regulations that would be presented after a major earthquake occurs in Nevada.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, NEHRP, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
1.D	Promote the modification of structures to meet life safety standards.	Nevada DEM and NHMPC	HMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.F	Encourage seismic retrofit of deficient essential structures and infrastructure of community and State critical facilities (economic and lifeline-utilities) to structurally and seismically withstand the effects of earthquakes.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, USFS, BLM, UNCE	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
2.C	Maintain a tracking system for local and state government mitigation plans and projects.	Nevada DEM and NHMPC	HMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
1.C	Encourage the incorporation of mitigation measures into repairs, major alterations, new development and redevelopment practices.	Nevada DEM and NHMPC	HMA, EMPG, DHS grant, USFS, FMAG, BLM, Emergency Response Commission, Local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.A	Protect existing assets, as well as future development, from the effects of earthquakes by providing setback criteria for building and development.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, FMA, RFC	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
1.G	Develop a hazard communication system that can be used to rapidly detect and provide early warning for multiple hazards, including earthquakes and wildfires.	Nevada DEM and NHMPC	HMA, EMPG, BLM, NDF, USFS, SERC, Local Fees	12-18 Months	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.C	Assist communities and State to retrofit, change occupancy to decrease risk, or demolish susceptible buildings and structures.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, USGS, Interoperable communications, local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW

Table 4-10. Strategic Action Plan Matrix; 2023 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
3.D	Create planning for "special consideration zones" for Nevada communities.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, USGS, FMA, FEMA, local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW
3.E	Create microzonation of earthquake hazards in Nevada.	NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC	HMA, EMPG, USFS, BLM	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	LOW

The NHMWG will continue to evaluate all the listed strategic action items during its quarterly meetings for validity and revise the related plan sections accordingly. Any significant revisions will be submitted to FEMA as they occur.

The action items provided by each of the lead agencies participating in the NHMWG meetings fall into one of the following broad mitigation strategy categories.

Prevention: These strategic activities are especially effective in areas where development has not occurred or capital improvements have not been substantial. For example:

- Planning and zoning
- Hazard mapping
- Building codes
- Studies, data collection and analysis
- Open space preservation
- Floodplain regulations
- Storm water management

Property Protection: Examples of activities for property protection are listed below. These actions enable structures to better withstand hazard events or remove structures from hazardous locations.

- Acquisition
- Relocation
- Building elevation
- Critical facilities protection and/or hardening
- Retrofitting
- Insurance

Natural Resource Protection: These activities reduce the impact of hazards by preserving or restoring the natural function of environmental systems. These measures serve the dual purpose of protecting lives and property while enhancing environmental goals. These activities are usually carried out by parks, recreation or conservation organizations.

- Floodplain protection
- Fire resistant landscaping
- Fuel breaks
- Watershed protection

Structural Projects: These projects modify the physical environment of the structures to lessen the impacts of a hazard.

- Levees/dikes/floodwalls

- Reservoirs
- Diversion, detention, retention dams

Emergency Services: These activities are generally not considered as mitigation techniques, but they minimize the impact of a hazard on people and property.

- Warning system
- Evacuation planning and management

Public Information and Awareness: These activities are used to advise residents, business owners, visitors and government officials about hazards, hazardous areas, and mitigation techniques used to protect life and property.

- Outreach and education
- Training
- Public service announcement

4.4.3. Actions in Local Plans & State Mitigation Strategy

The NHMWG's quarterly meetings are now being conducted at a different county each quarter. A list of the local planning area goals and actions, when available, is provided to the NHMWG members prior to the meeting, providing them with background on mitigation strategy identified by the locals. It also provides input for NHMWG to reflect these local mitigation strategies in the state goals and objectives.

Although local agencies are independent in their development of mitigation goals and actions, the state provides a plan format as a recommended guide. The plan format provides a sample list of mitigation goals and objectives that mirror the state strategy. The final local actions are reviewed by NHMWG as each local plan is submitted. This dual process of similar goals and actions provide familiarity and supports the development of concurrent action items for both state and local plans.

Some tribal entities have chosen to develop mitigation plans as governmental entities at the State level and their planning process did not include a review by the State of Nevada. They received their funding directly from FEMA. Nevada provides technical assistance to tribal entities only when requested. When the information on goals and actions is available Nevada DEM will distribute it to the NHMWG members.

4.5 FUNDING SOURCES

The requirements for funding sources, as stipulated in the DMA 2000 and its implementing regulations, are described below.[192]

ELEMENT	REQUIREMENTS
S11. Does the plan identify current and potential sources of funding to implement mitigation actions and activities? [44 CFR §201.4(c)(3)(iv)][193]	a. Mitigation activities must include the identification of current and/or potential sources of federal, state, local or private funding for implementation. b. At a minimum, the plan must identify FEMA mitigation funding sources (if applicable) including, but not limited to: HMGP, HMGP Post Fire, BRIC, FMA, HHPD and PA Mitigation.20 c. If the state is interested in HHPD funding eligibility, the plan must identify current and potential sources of funding to implement mitigation actions and activities for high hazard potential dams (see HHPD5 in Section 3.8.).

4.5.1 Current Funding Sources

Since 2010, the State of Nevada has used the funding sources shown in the table below for mitigation activities. Local jurisdictions supply matching funds and at times fully support mitigation activities without assistance from Federal or State resources. The rural counties have less economic, administrative, and technical capability to manage and support mitigation activities. The more populous counties, Clark, Carson City, Douglas, Washoe and to a limited extent, Elko have programs that support mitigation activities, such as paid fire departments, flood control districts and the ability to enforce land-use regulations. For additional sources of funding currently available for mitigation activities, see Table 4-3 in Section 4.2.1. This table will be updated as the Subcommittee finds new funding sources to implement mitigation activities.

[192] Stafford Act, §406(e) Repair, Restoration, and Replacement of Damaged Facilities and 44 CFR §206.226 Restoration of damaged facilities. FEMA Recovery Policy 9526.1 "Hazard Mitigation Funding Under Section 406 (Stafford Act)", dated March 30, 2010.

[193] 44 CFR §201.4(c)(3)(iv)][193] "Identification of current and potential sources of Federal, State, local, or private funding to implement mitigation activities."

Table 4-11. Current Funding Sources for Strategic Mitigation Actions	
Description	**Comments**
Clark County Flood Control District	Develops flood control projects countywide
FEMA	For pre-disaster and post-disaster mitigation and emergency funding, HMGP, PDM, FMA, RFC, FMAG
National Weather Service	Early warning public announcements
Nevada Division of Forestry	Administers funding from FEMA, BLM, and U.S. Forest Service for wildfire emergency and mitigation funding, except for HMGP and PDM
Nevada Earthquake Safety Council	Allocates FEMA money for earthquake mitigation efforts
Nevada State Emergency Response Commission (SERC)	Administers state and federal money for pre-disaster funding in mitigation efforts for Hazardous Materials
Nevada Mining Association, Newmont Gold, Barrick Mines, and other individual mining companies.	Donations, public awareness, and/or mitigating their structures for hazard safety
Private individuals	Provide labor and matching costs for mitigation activities.
Southern Nevada Water Authority	Provides incentives to preserve water
Truckee Meadows Water Authority	Regulates the use of water in the Truckee Meadows
Truckee River Flood Management Authority	Responsible for implementing the "Living River" project that eliminates flood risk throughout the Truckee River.
U. S. Army Corps of Engineers (ACE)	Mitigation and emergency funding for any navigable river, stream, or waterway
U. S. Bureau of Land Management	Funding for plans and projects for wildfire and urban-wildfire interface
U. S. Forest Service	Provides emergency and mitigation funding for wildfire
U. S. Geological Survey	UNR and UNLV have participated in the external grants program of the USGS portion of the National Earthquake Hazard Reduction program.
U. S. HUD Community Development Block Grants (CDBG)	State-administered Small Cities CDBG grants program to smaller units of local government for community development activities. Annually, each State develops funding priorities and criteria for selecting projects to address a wide range of community development needs including hazard mitigation
United We Stand	Special License Plate that funds first responder training and equipment.
Volunteer Fire Departments (local and paid)	Local fundraisers and local jurisdictions; general fund

4.5.2 Potential Funding Sources

In addition to federal agencies already providing hazard mitigation funding (see Table 4-3, Section 4.2.1), Table 4-12 lists several potential funding sources in the private sector for mitigation activities. This table will be updated as the NHMWG discovers new potential funding sources for implementing strategic mitigation activities.

Table 4-12. Potential Funding Sources for Strategic Mitigation Activities

Private Sources	Comments
Casinos	Donations, public awareness, and/or mitigating their structures for hazard safety
Construction (New Development) Companies, Contractors	Donations, public awareness, and/or mitigating their structures for hazard safety
Federal Emergency Management Agency	Through the PDM and the HMGP funded local jurisdiction hazard mitigation plans, FMA, Community Assistance Program, National Dam Safety Program, NFIP and flood modernization programs, etc.
Housing and Urban Development	CDBG
Intermountain Farmers Association, Nevada Cattlemen's Association, etc.	Public awareness and/or mitigating their structures for hazard safety
Local communities/districts	Fire districts, school districts, general improvement districts, county and city governing authorities have all provided in-kind or cash matching sources for all the activities accomplished through federal sources.
Local media	Offering free public safety announcements
National Science Foundation	Earthquake risk reduction
Private Insurance Companies Farmers Insurance, AIG, Allstate, etc.	Public awareness, incentives for mitigation activities, and mitigation training.
U. S. Army Corps of Engineers	Design and construction of local flood control projects, riverbank protection, floodplain management, etc.
U. S. Department of Agriculture	Waterway protection from erosion: Environmental Quality Incentives Program (EQIP), Agricultural Management Assistance (AMA), Conservation Stewardship Program (CSP), Conservation Reserve Program (CRP)
U. S. Department of Agriculture	Invasive species protection programs: EQIP, Grassland Reserve Program (GRP), Wetlands Reserve Program (WRP), CSP, CRP
U. S. Department of Agriculture	Wildfire protection programs: EQIP, GRP, WRP, CSP, AMA
U. S. Department of Agriculture	Animal disease, rural development, flood control projects, etc.
U. S. Department of Agriculture	Severe wind damage protection: EQIP, CSP
U. S. Department of Energy	Stream gauging, flood monitoring, disaster mitigation planning and technical assistance, disaster resistance jobs and workplaces, etc.

Table 4-12. Potential Funding Sources for Strategic Mitigation Activities	
Private Sources	**Comments**
U. S. Department of Health and Human Services	Medical emergency management and mitigation, training and preparedness, etc.
U. S. Environmental Protection Agency	Wetlands protection, emergency watershed protection, Clean Water Act, etc.
U. S. Bureau of Land Management	Funded CWPPs and WUIs
U. S. Geological Survey	Earthquake hazard reduction, mapping, etc.

4.6 REPETITIVE LOSS AND SEVERE REPETITIVE LOSS

This Section addresses the State's strategy for mitigation of repetitive loss properties including Severe Repetitive Loss properties.

Legislative changes made in the Biggert-Waters Flood Insurance Reform Act of 2012 define a **Severe Repetitive Loss** (SRL) property as a **structure** that:

a. Is covered under a contract for flood insurance made available under the NFIP and
b. Has incurred flood-related damage
    i. For which four or more separate claims made available under flood insurance coverage with the amount of each such claim exceeding $5,000, and the cumulative amount of such claims payments exceeding $20,000; or

    ii. For which at least 2 separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

A **Repetitive Loss** (RL) property is a structure covered by a contract for flood insurance made available under the NFIP that:

a. Has incurred flood-related damage on 2 occasions, in which the cost of the repair, on the average, equaled or exceeded 25% of the market value of the structure at the time of each such flood event; and
b. At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance.

Existing NFIP data for the State of Nevada indicate that there is currently one SRL and two RL properties in the State that fulfills the criteria defined above.

The NHM Planning Subcommittee will continue to monitor data from the NFIP to identify any SRL properties in the State. The goal is to address any repetitive flood structure to avoid it becoming an SRL. Should the State develop any additional SRL properties in the future, the following strategy will be followed to mitigate such SRL occurrences.

4.6.1 Goals that Support Mitigation Activities for Repetitive Loss Properties

State mitigation goals that support the selection of mitigation activities for RL properties are Goal 1 – Reduce the loss of life and injuries, and Goal 4 – Reduce the possibility of damage and losses due to flooding. See Section 4.1.2 for more detail on goals and actions.

4.6.2 Repetitive Loss and State & Local HM Policies, Programs & Capabilities

Section 4.2.1, Table 4-3 provides Nevada's policies, programs and capabilities for flood hazards. Additionally, NDWR manages floodplain managers. NDWR works with local communities to

address NFIP issues and flood mapping. This provides communities with guidance and assistance in hazard mitigation projects.

4.6.3 Repetitive Loss Properties in Risk Assessment

Table 3-17 in Section 3.3.7.3.2 provides a summary of RL and SRL properties due to flood for each community in Nevada. Section 3.3.7.3.3 provides a description of partnerships and stakeholders with whom Nevada cooperates to reduce repetitive losses from floods.

4.6.4 Mitigation Actions for Repetitive Loss and Severe Repetitive Loss Properties

Section 4.1.2., Table 4-2, Goal 4, Action item 4.E and 4.F provide actions effective in mitigating and reducing the flood hazard in repetitive loss and severe repetitive loss properties in Nevada. Specifically:
Action item 4.E: "Assist communities and State with programs to elevate, dry-flood proof or wet-flood proof identified structures to obtain NFIP compliance and/or mitigate repetitive loss structures and Severe Repetitive Loss structures, "and
4.F "Action 4.F: " Assist communities and State with programs dealing with Repetitive Loss and Severe Repetitive Loss structures; these programs may involve acquisition and demolition; relocation; elevation or other mitigation strategies." The STAPLEE process was used to prioritize actions.

4.6.5 Specific Actions Implemented to Mitigate Repetitive Loss Properties

See Section 3.3.7.3.3 and Appendix L for examples of actions implemented in Nevada to mitigate repetitive loss properties. In addition, TRFMA is using 2017 HMGP funds on a home elevation project of two repetitive loss structures. Through Nevada DEM, TRFMA utilized PDM 2015 and PDM 2016 grants to demolish structures along the Truckee River, which is still in progress as of February 2018.
The TRFMA is utilizing PDM 2016 and HMGP funds to elevate flood-prone residences in the Hidden Valley area of Washoe County, making the properties more resistant to flood damage. In a separate area within the Carson River SFHA, residences located in flood-prone areas were elevated.
Nevada has applied for FMA funding but has not yet been selected for further review.

4.6.6 Funding for Repetitive Loss Properties

Sections 4.5.1 and 4.5.2 identify current and potential sources of Federal, State, local, and private funding to implement mitigation activities for repetitive loss properties.

Section 5

This section provides a description of the State of Nevada's support in the development and maintenance of local mitigation plans. *Major accomplishments in this section since the last iteration of the NEHMP include the following:*

- *16 counties have FEMA-approved HM plans (at the time of writing, the Clark County plan is awaiting FEMA approval).*
- *Six tribal entities have updated plans, and three are in the process of updating.*
- *The State has developed and successfully implemented a "Tabletop Exercise" for updating of local plans*
- *Successfully developed and used the MyPlan website for the exchange of hazard mitigation data with local and tribal entities*
- *Integrated LHMP data into the current Enhanced State Plan*

5.1 LOCAL FUNDING AND TECHNICAL ASSISTANCE

The requirements for local funding and technical assistance for the development of local mitigation plans, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENTS	REQUIREMENTS
S13. Does the plan include a general description and analysis of the effectiveness of local government mitigation policies, programs, and capabilities? [44 CFR §201.4(c)(3)(ii)] [194]	a. The plan must provide a summary of current local government policies, programs and capabilities of jurisdictions to accomplish hazard mitigation. b. The plan must describe the effectiveness of local government mitigation policies, programs and capabilities, including: 1. Challenges to implementing these mitigation policies, programs and capabilities. These should include gaps and disparities in serving underserved communities and challenges resulting from the impacts of climate change. 2. Opportunities for implementing mitigation actions through local government capabilities. *c. If the state is interested in HHPD funding eligibility, the plan must generally describe and analyze the effectiveness of local mitigation policies, programs, and capabilities that address high hazard potential dams (see HHPD6 in Section 3.8.).*

[194] 44 CFR §201.4(c)(3)(ii) "A discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: An evaluation of State laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas; a discussion of State funding capabilities for hazard mitigation projects; and a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities."

ELEMENTS	REQUIREMENTS
S14. Does the plan describe the process to support the development of approvable local government mitigation plans? [44 CFR §§201.3(c)(5)[195] and 201.4(c)(4)(i)[196]]	a. The plan must describe how the state supports developing or updating FEMA-approvable mitigation plans, including the process used to provide: 1. Training. 2. Technical assistance. 3. Funding *[NOTE: criteria for prioritizing funding for planning and project awards are addressed in S15].* b. The plan must provide a brief summary of the following: 1. Barriers to developing or updating, adopting and implementing FEMA-approved local government mitigation plans based on an analysis of plan and jurisdiction coverage data and trends across the state. 2. Steps to remove barriers to help local governments advance mitigation planning, including how plan and jurisdiction coverage data and trends inform those steps. Maps or tables may be used if appropriate.

5.1.1 Analysis of Policies

The State of Nevada has developed a dynamic method for analyzing mitigation plans and polices – using a tabletop exercise (TTX). Nevada DEM staff developed a TTX to facilitate annual evaluation of approved local hazard mitigation plans. Nevada DEM staff demonstrates this exercise at established LEPC meetings where there is already a broad cross-section of community leaders in attendance without requiring an additional meeting. SERC requires that the LEPC meetings include representatives from local law enforcement, fire departments, hospitals, elected officials, and the private sector.

The primary benefit of the TTX has been to educate individuals not involved in the original planning process about hazard mitigation actions for the community. It is through these TTX that the effectiveness of local mitigation policies, programs and especially capabilities are reviewed and determined. Review of challenges regarding climate change and Recent TTX have made counties aware of the importance of the plan update and many counties will address the update process at quarterly meetings. Where it has been implemented, this exercise has also proved its usefulness in generating requests from the participating local individuals about hazard mitigation activities. As one example, Lincoln County requested information on seismic retrofits of mobile homes as a result of the TTX. As another example, as a result of the TTX, Storey County decided to ground-truth URM data presented at the exercise. Tabletop Exercises have been completed in Douglas County, Storey County, Esmeralda County, and Carson City. Tabletop exercises are planned with each county as they update their HMPs. This process has been

[195] 44 CFR §201.3(c)(5): "Provide technical assistance and training to local governments to assist them in applying for HMGP planning grants, and in developing local mitigation plans."

[196] 44 CFR §201.4(c)(4)(i): "A description of the State process to support, through funding and technical assistance, the development of local mitigation plans."

challenging for NV DEM Mitigation staff with a small staff and change of staff. However, NV DEM Mitigation staff continue to be involved with each county plan update along the process. The TTX is compliant with the Homeland Security Exercise and Evaluation Program (HSEEP) and FEMA Region IX considered it as a Best Management Practices example for other states to follow.

Fdams

Due to the myriad requirements, developing and adopting approved hazard mitigation plans is daunting. The greatest overall challenge is a lack of staff with the expertise and understanding of FEMA's hazard mitigation plan requirements. Not only is the State of Nevada DEM staff lean, but the many rural counties cannot afford to maintain staff with the unique skill sets required. Challenges observed during this plan update process and solutions are in Table 5-1.

Table 5-1. Challenges and Solutions to Local Hazard Mitigation Planning

Challenge	Solution
High staff turnover at DEM	Hire contract employees / contractors to fill gaps. During the last two years, two contractors have been hired including dedicated grants as well as planning staff members.
Disaster declarations during planning	Prioritize and adjust planning schedules to ensure the most critical milestones are met Hire contract employees / contractors to maintain momentum while government employees respond
Lack of continuity	Hire contract employees / contractors to help manage the planning process
Lack of expertise	State provides technical assistance State facilitated workshops Develop multi-jurisdictional plans. Additional regional plans are being developed with our counties to lessen the burden of HMP updates. State data sources such as MyPlan
Lack of funds	BRIC/HMGP Local jurisdictions share funds and/or develop multi-jurisdictional plans

5.1.3 Development of Local Mitigation Plans

The primary goal of the NHMWG is to ensure that every community in Nevada develops a hazard mitigation plan and maintains it in a current, updated status. The NHMWG believes that the planning process is the first step in awareness of the risk and vulnerability posed by the hazards and provides the communities with a method to "do something about the risk." This goal includes the updating of existing plans and enhancing the data available for locals to use in the update process. The State provides technical assistance in the development of local mitigation plans in all communities including those with SRL properties. Through 2018, every plan needing an update has acquired funding through the application process, and, where needed, communities have joined to develop regional plans. Since the previous state plan was approved in 2018, several counties have had their plans expire secondary to the long COVID-19 disaster. Those county plans that have expired all either have current grants to update their HMPs or are in the process of waiting for award of grants to update their HMPs. Several counties are in the process of submitting their plans to FEMA for approval including Nye County and Clark County. Funding received for planning during PDM 2017 allowed Douglas County, Washoe County, and the Humboldt/Pershing/Lander tri-county all updated their plan. Carson City received FEMA approval of their HMP and utilized BRIC 2020 funding. Churchill and Lincoln County plan updates are in process with BRIC 2020 grants. Clark County (BRIC 2020) is ready to submit their plan to FEMA R9 for review and approval. Nye County also is ready to submit their HMP update. Lyon County plan is in process and they are updating themselves with the help of NV DEM. Applicants for BRIC 2022 include a new regional plan for Mineral and Esmeralda Counties including the Walker River Tribe, and the combined Eureka and White Pine County Regional plan which will add the Ely Tribe. Nevada has also developed separate plans to cover tribal entities. Five of the 27 tribal entities have approved plans, while an additional three tribes are in the process of updating their plans.

Planning funds have been "shared" by more than one community in several instances. For example, Humboldt, Lander and Pershing counties have developed a regional plan under the approved PDM 2017 funding, and Mineral and Esmeralda and White Pine and Eureka have applied for BRIC 2022 grant funding. This leveraging of grant funds to develop regional plans is a very cost-effective way for rural communities to work together to become covered by a mitigation plan. NV DEM is working to have additional counties work together on regional plans.

The status of hazard mitigation plans and updates for all 17 counties and tribes is shown pictorially in Figure 5-1:

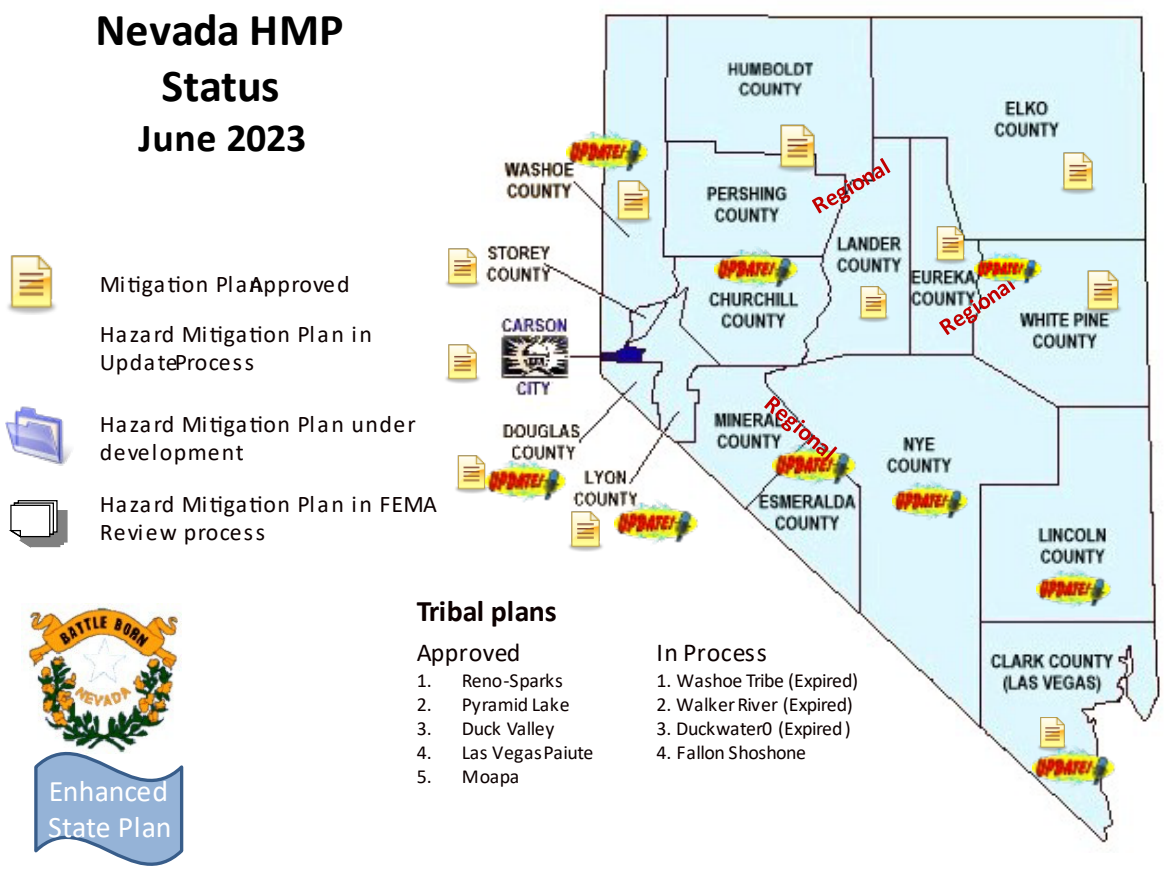


Figure 5-1. Map of Counties and LHMP Status.

Since the last NEHMP was approved:

- Clark County is updating their plan under a BRIC 2020 planning grant and are ready to submit to FEMA for approval.
- Churchill and Lincoln County plans have grants approved under the BRIC 2020. These planning efforts were helped by NHMWG traveling to rural counties to conduct the quarterly meeting.
- The White Pine County and Eureka County multi-jurisdictional plan is due to be updated and they submitted for a BRIC 2022 planning grant. They will add the Ely tribe to the regional plan.
- The Pershing, Humboldt, and Lander Tri-County HMP was approved in 20.21 This was accomplished through a PDM 2017 planning grant. This occurred during the COVID pandemic and was accomplished via virtual meetings.
- All counties either have a FEMA-approved HM plan or are in the process of updating or awaiting a grant to update.

The following counties are in the process of updating plans: Churchill, Clark, Lyon, Nye, and

Washoe.

The following Counties are awaiting grant awards: White Pine-Eureka (regional plan), Mineral-Esmeralda (new regional plan), and Douglas.

Nevada's SHMO, mitigation planner, and NHMWG are currently working to assist the tribal nations in developing hazard mitigation programs. Since the last iteration of the NEHMP, hazard plans have been approved for the Reno-Sparks Indian Colony, the Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation, the Moapa Band of Paiutes, the Las Vegas Paiute Tribe, and the Duck Valley Shoshone-Paiute Tribe. The Walker River Paiute Tribe of the Walker River Reservation, the Paiute-Shoshone Tribe of the Fallon Reservation and Colony, and the Ely Tribe are either in process or awaiting grant funding. These were completed singly or in conjunction with other community plans. Plans for Duckwater Shoshone Tribe of the Duckwater Reservation and Washoe tribe of Nevada and California, and Elko Band are in progress. With the assistance of the State Tribal Liaison, mitigation staff continues to meet with tribal emergency managers to discuss development and/or update of mitigation plans. As with any community, awareness and the readiness of the community is the first step in beginning the planning process.

During the last five-year period, Carson City, Douglas, Elko, Eureka and White Pine, Storey, and Washoe counties either received grants or utilized State assistance to update their plans, and all were approved. Churchill and Lincoln counties are currently updating their plans with assistance from PDM 2019 and BRIC 2020 grants respectively. Clark County is completing their update with a PDM 2019 grant. Lyon county is updating their plan on their own with help from State mitigation planning. Nye County is also almost ready to submit their plan update with a PDM 2017 grant. Douglas applied for a disaster grant planning grant, and Eureka-White Pine and Mineral-Esmeralda applied for BRIC 2022 planning grants and are awaiting funding of those grants.

Washoe, Clark, Douglas, Carson City, Lincoln, Churchill, Lyon counties and the cities of North Las Vegas and Reno continue to take advantage of available funding sources. All have projects eligible for future HMA funding that include embankment protection, demolition of flood-prone buildings, culvert enhancement and infrastructure protection. NHMWG members discuss and evaluate the criteria for the prioritization process every time applications are submitted to the state. To date, the primary challenge has been to submit applications that are competitive nationally. An additional challenge for competitive BRIC funding is Nevada's lack of statewide building code adoption. Nevada state law adopts building codes at the local county level. As stated previously, the last study indicated that 97% of the Nevada population is covered under the latest building codes.

As for successes in coordination of Local Mitigation Plans, data in Table 5-2 reveal that Nevada now has all 17 counties have either FEMA approved plans or are in the process of updating their plans or awaiting a grant to update their plans. A definite success for planning is the addition of another regional plan for Mineral and Esmeralda as well as the addition of the Ely Tribe to the Eureka-White Pine regional HMP and Walker River Tribe to remain included in the new Mineral-Esmeralda HMP. Clark and Nye counties are both ready to submit their plans to FEMA for approval.

Development of Local Mitigation Plans among Nevada's 26 independent tribal entities has presented a challenge to coordination. In 2013, there were five approved tribal hazard mitigation plans. As of 2023, there are five tribal entities that have approved plans, and three tribes are in the process of updating their HM plans with their counties. The State, through its tribal liaison

member on the NHMWG and the Nevada Tribal Emergency Coordinating Council (NTECC) provides an avenue for tribal participation in mitigation planning. The SHMO and/or mitigation planner makes regular visits throughout the year to various tribal communities with mitigation outreach flyers, funding information, planning tools, and technical expertise. Additionally, all tribal entities are included in all mitigation outreach.

5.1.3.1 Nevada's Local Hazard Mitigation Planning Process

Multiple funding opportunities are available through FEMA for planning efforts including pre-disaster with the BRIC program as well as post-disaster HMGP and HMGP-PF funding. These efforts are supported by Management Cost funds. The SHMO, Mitigation Grants Analyst, and Mitigation Planner do outreach through visits to the targeted communities and personal meetings with emergency managers, planners, public works directors and county commissioners of all Nevada communities to build awareness about the hazard mitigation plan requirements and process. Once the local jurisdiction has established resources and committed to the planning process, the SHMO, Mitigation Grants Analyst, Mitigation Planner assist in obtaining funds for the development and/or updating of the plan. Technical support from the state continues throughout the application process and plan development and/or update. Under the HMA program, Nevada DEM works together with the help and guidance of NDWR staff in administering and processing all six hazard mitigation grant programs to ensure that Nevada's subgrantees follow the same process when applying for funding under the HMA and both agencies provide outreach together.

Nevada's established methodology for technical support for the development and maintenance of local plans is as follows:

SHMO and staff attend local planning meetings in rural venues to ascertain their needs and capabilities, and to develop local points of contact.

SHMO and staff act as liaison with consultants and local entities to ensure information is provided promptly and accurately.

Nevada DEM provides risk assessment data and access to experts in the all-hazard fields specific to the local jurisdictions. It also provides risk assessment data on flood, wildfire and earthquake hazards through the MyPlan website. (MyPlan is a FEMA-funded GIS-based website developed by NBMG to assist local planning professionals with hazard data necessary to address the risk and vulnerability assessment information required for hazard mitigation planning in their communities. For additional details see Section 8.6.2).

Tables 5-2 and 5-3 below show details of the current status of hazard plan development and updates in the local jurisdictions, tribal communities, and the state, as well as the dates FEMA approved their plans.

Table 5-2. Current Status of Local Hazard Plan Development and Updates

State of Nevada - Division of Emergency Management County Hazard Mitigation Plan Status as of May 4, 2023					
County/City		**Type of Plan**	**Date Approved**	**Update Due**	**Comments**
1	Carson City	Single	Oct 13, 2021	Oct 13, 2026	

Table 5-2. Current Status of Local Hazard Plan Development and Updates

State of Nevada - Division of Emergency Management
County Hazard Mitigation Plan Status as of May 4, 2023

	County/City	Type of Plan	Date Approved	Update Due	Comments
2	Churchill	Multi	Apr 27, 2017	Apr 26, 2022	Update in process with PDM 19 grant but challenged by turnover in emergency management staff
3	Clark County	Multi	Aug 15, 2018	Aug 15, 2023	PDM 19 grant, about ready to submit
4	Douglas County	Single	Jan 27, 2020	Jan 27, 2025	Applied for HMGP-PF 2022
5	Elko County	Multi	Oct 13, 2021	Oct 13, 2026	
6	Esmeralda County	Single	Sep 14, 2016	Sep 14, 2021	Creating regional plan with Mineral Co and applied for BRIC 2022 grant
7	Eureka County[1]	Multi	Aug 27, 2019	Aug 21, 2024	Expanding regional plan to include Ely Tribe – Applied for BRIC 2022
8	Humboldt County[2]	Multi	Oct 13, 2021	Oct 13, 2026	
9	Lander County[2]	Multi	Oct 13, 2021	Oct 13, 2026	
10	Lincoln County	Multi	Aug 11, 2016	Aug 11, 2021	Update in process, BRIC 2020 grant (delay in award as error in FEMA GO)
11	Lyon County	Multi	Dec 11, 2018	Dec 10, 2023	Update in process
12	Mineral County	Multi	May 6, 2017	May 15, 2022	Developing regional plan with Esmeralda and Walker River Tribe – Applied for BRIC 2022
13	Nye County	Multi	Dec 3, 2013	Dec 3, 2018	Update in process, close to submitting. Significant challenges throughout COVID pandemic as well as difficulty procuring a contractor
14	Pershing County[2]	Multi	Oct 13, 2021	Oct 13, 2026	
15	Storey County	Single	Jul 20, 2020	Jul 20, 2025	
16	Washoe County	Multi	Jun 23, 2020	Jun 23, 2025	BRIC 2021 grant – update in process
17	White Pine County[1]	Multi	Aug 27, 2019	Aug 21, 2024	Expanding regional plan to include Ely Tribe – Applied for BRIC 2022

[1] Eureka and White Pine Counties have a regional HMP
[2] Humboldt, Lander and Pershing Counties have a Tri-County regional HMP

Table 5-3. Current Status of Nevada Tribal Hazard Plan Development and Updates					
	Tribal	**Type of Plan**	**Date Approved**	**Update Due**	**Comments**
1	Duckwater Shoshone Tribe of the Duckwater Reservation	Standard	3-Dec-2013	3-Dec-2018	Regional with Nye County
2	Ely Shoshone Tribe of Nevada	Standard	-	-	Joining Regional with Eureka-White Pine Regional Plan
3	Paiute-Shoshone Tribe of the Fallon Reservation and Colony	Standard	Apr 27, 2017	Apr 26, 2022	Regional with Churchill Co.- in process
4	Fort Mojave Indian Tribe (AZ, CA, NV)	Standard	12-Aug-2016	12-Aug-2021	Regional with Mohave Co. AZ
5	Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation (NV and OR)	Standard	-	-	
6	Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony	Standard	Oct 17, 2019	Oct 16, 2024	Annex to Clark County Plan.
7	Lovelock Paiute Tribe of the Lovelock Indian Colony	-	-	-	
8	Moapa Band of Paiute Indians of the Moapa River Indian Reservation	Standard	29-Nov-2012	29-Nov-2017	Annex to Clark County Plan.
9	Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation	Standard	Jun 23, 2020	Jun 22, 2025	Regional annex with Washoe Co.
10	Reno-Sparks Indian Colony	Standard	Jun 23, 2020	Jun 22, 2025	Regional annex with Washoe Co.
11	Shoshone-Paiute Tribes of the Duck Valley Reservation	Standard	Nov 14, 2018	Nov 13, 2023	
12	Summit Lake Paiute Tribe of Nevada	-	-	-	-
13	Te-Moak Tribe of the Western Shoshone Indians of Nevada (Four constituent bands:)	-	-	-	-
	Battle Mountain Band	Standard	-	-	
	Elko Band	Standard	-	-	-
	South Fork Band	Standard	-	-	-
	Wells Band	-	-	-	-

Table 5-3. Current Status of Nevada Tribal Hazard Plan Development and Updates					
	Tribal	**Type of Plan**	**Date Approved**	**Update Due**	**Comments**
14	Walker River Paiute Tribe of the Walker River Reservation	Standard	16-May-2017	15-May-2022	Joining new regional plan with Mineral and Esmeralda counties
15	Washoe Tribe (Nevada and California)	Standard	3-Jun-2009	3-Jun-2014	Working on update and awaiting revisions
	Carson Colony	-	-	-	-
	Dresslerville Colony	-	-	-	-
	Stewart Community	-	-	-	-
16	Winnemucca Indian Colony of Nevada	-	-	-	-
17	Yerington Paiute Tribe of the Yerington Colony and Campbell Ranch	-	-	-	-
18	Yomba Shoshone Tribe of the Yomba Reservation	Standard	Dec 3, 2018	Dec 2, 2023	

5.1.3.2 Identification and Notification of Potential Subgrantees

Potential subgrantees for pre-disaster BRIC/FMA as well as post-disaster mitigation funding are identified and notified via the TTX sessions, workshops, social media, Flood Mitigation (FM) technical assistance sessions, NHMWG member networking, as well as widely distributed e-mail notices.

First, there is a well-established email communication tree network that connects the main "trunk" SHMO with all subsidiary branches of the emergency management network throughout Nevada that reaches all levels of emergency management personnel in state, county, local, and tribal governments. This e-mail network is used to communicate with, identify, and notify potential subgrantees of pre-disaster mitigation funding opportunities. Through this network the initial notification is sent to the following main branches of the emergency management system and all subsidiary networks throughout the state:

- State Floodplain Manager
- Emergency Managers
- NHMWG
- Tribal Liaison
- Nevada Association of Counties
- Public Works Directors for local communities
- Homeland Security Distribution list
- Governor's office email list of State agencies
- Current and past subgrantee list
- Community Emergency Response Teams (CERT)
- Local Emergency Planning Committees
- Nevada Grants Office

In addition, the Floodplain Management Website and the Nevada DEM website are updated with current application procedures and notices of intent and relevant forms.
Below is the State Administrative Plan's section pertaining to identification and notification of potential subgrantees for the post-disaster funding, HMGP. It includes the application process for BRIC/FMA and HMGP as well as the application prioritization criteria used by NHMWG for all hazard mitigation requests under HMA. This process is also used to prioritize FMA proposals
.
The State's Multi-Hazard Enhanced Plan will be used as the basis for initiating the HMGP. Among projects to be funded, those that do not require extensive environmental and historical reviews may be expedited.

The State may use up to seven percent of the total amount allocated to the HMGP for planning activities. Five percent of the total amount of the HMGP may be used to fund activities difficult to evaluate for cost effectiveness and eligibility. The activities to be submitted under the five percent set aside initiative shall be identified and selected at the discretion of the Governor's Authorized Representative (GAR). Guidelines for the Five Percent Initiative activities are in the Fiscal Year 2023 Hazard Mitigation Assistance Program and Policy Guide (FY 23 HMA Guidance).

A. IDENTIFICATION OF POTENTIAL SUBAPPLICANTS
   Upon receipt of a presidential disaster declaration, the SHMO will coordinate with the HMBC to determine a preliminary list of Sub-applicants. Using the most current disaster assessment information available, the SHMO will develop a list of potential Subrecipients. The SHMO will consider the use of pre-identified mitigation strategies (un-funded BRIC and potential HMGP projects found in the State and/or Local Multi-Hazard Mitigation Plan.) Potential projects may also be identified during the preliminary damage assessment or post-disaster hazard mitigation team process. The SHMO will forward all applications to NHMWG for review of eligibility and prioritization recommendations. The list of potential subrecipients will continue to expand as recovery efforts get underway.
B. NOTIFICATION OF POTENTIAL SUBAPPLICANTS
   1. Potential sub-applicants may be notified through a standard briefing process.
   2. Identified potential sub-applicants will be notified of the HMGP by letter. Outreach and communication may also be conducted through telephone, publication of notices, media/social media, and the NV DEM website.
   3. NV DEM will work to identify and notify appropriate private non-profit organizations (PNPs) and any other potential applicant that may be eligible for participation. Generally, NV DEM will rely on local governments to identify appropriate PNPs.
C. SUBAPPLICANT ELIGIBILITY
   The following entities are eligible to apply for the HMGP:
   1. State agencies
   2. Local governments
   3. Private non-profit organizations (PNPs) which meet the criteria of 44 CFR
   4. Indian tribes or authorized tribal organizations (may apply directly to FEMA)

D. SUBAPPLICATION WORKSHOPS
   1. NV DEM and FEMA will announce, advertise, and conduct HMGP Workshops, as needed, in areas convenient to potential sub-applicants. At these Workshops information will be provided describing the HMGP, the mitigation priorities for the current disaster and the sub-application process.
   2. NV DEM will provide HMGP program guidance.
   3. The materials provided to qualified sub-applicants at the Applicant Workshops will include information concerning the following:
      a. General program overview
      b. Eligibility
      c. Application process
      d. Selection process
      e. Types of activities
      f. Project management
      g. Environmental requirements
      h. Local planning requirements
      i. Cost effectiveness (Benefit Cost Analysis)
      j. Cost share requirements
      k. Management cost funding and deadlines
      l. Financial control and grant management
      m. Technical assistance
      n. Contact for additional information

E. SUBAPPLICATION PROCESS

The State recognizes its responsibility to submit complete subgrant applications in a timely manner.

   1. State Responsibilities
      a. The State will provide technical assistance to sub-applicants.
      b The State will provide a list of state funding priorities and program guidelines to sub-applicants, including details of eligibility determination and key deadlines.
      c. The State will assist sub-applicants in developing and completing sub-applications.
      d. The SHMO and NV DEM mitigation staff will have primary responsibility for ensuring that all sub-applications are properly completed prior to submission to FEMA.
      e. The SHMO and NV DEM mitigation staff will provide all subrecipients and sub-applicants a management costs guidance document which will outline the sub-application process including deadlines, eligibility, and availability of management costs funding.
   2. Subapplicants Responsibilities
      a. The sub-application must be properly completed and submitted by the announced deadlines.
      b. The sub-applicant must complete the Subrecipient Management Cost Application selecting “yes” if the sub-applicant chooses to apply for management costs for the project.
   3. FEMA Responsibilities

a. FEMA will perform programmatic and environmental review of proposed activities.

F. TYPES OF ACTIVITIES

The activities funded under HMGP are derived from the full range of measures identified in the State of Nevada Enhanced Multi-Hazard Mitigation Plan, consistent with the state legislation or mandates, and reflecting state-of-the-art knowledge and practices. Virtually all types of hazard mitigation projects are eligible provided they meet basic project eligibility requirements (see section H below). See FEMA FY 23 HMA Guidance for eligibility.
https://www.fema.gov/grants/mitigation/hazard-mitigation-assistance-guidance

HMGP funds may be used in combination with other funding sources when appropriate to develop a comprehensive mitigation solution. This includes assistance for any part of an activity for which benefits have not been provided by another local, state, or federal funding source.

The 44CFR section 206.434 (g) states, "Section 404 funds may be packaged or used in combination with other Federal, State, local, or private funding sources when appropriate to develop a comprehensive mitigation solution, though section 404 funds cannot be used as a match for other Federal funds."

G. ACTIVITY PRIORITIZATION

The Nevada Hazard Mitigation Working Group (NHMWG) consists of the seven required state agencies per the enhanced guidance as well as additional hazard subject matter experts. Applications will be reviewed for eligibility by mitigation staff and the FEMA Application Review Tool will be completed and provided to the SHMO for review. It is the function of the NHMWG to review, prioritize and select projects for submission to FEMA for approval and funding utilizing the review tool provided for this review and rank. The SHMO will submit prioritized projects to the GAR for his/her review and final approval.

H. ACTIVITY ELIGIBILITY

The State is responsible as recipient for ensuring that the subgrant applicants and proposed activities meet basic eligibility requirements. Specifically, NV DEM will:

1. Ensure applicant and activity eligibility as defined in 44 CFR Section 206.434.
2. Ensure that all proposed activities are consistent with current codes, standards, state and local hazard mitigation plans, and permit requirements, if applicable.
3. Ensure that all costs included in the individual activity budgets (including those to be funded by non-federal funds) are eligible costs for funding under the HMGP.
4. Verify availability and eligibility of non-federal share of funding.
5. Provide FEMA a list of names and addresses of potential acquisition and elevation projects for Duplication of Benefits (DOB) searches to ensure that HMGP funds are not used to duplicate amounts available from any other source including insurance, legal settlements, or other financial sources.
6. Verify eligibility of pre-award costs in conformance with 2 CFR Chapters I and II. Application development costs incurred after the disaster declaration date will be eligible for reimbursement upon award of the subgrant.

I. ENVIRONMENTAL REQUIREMENTS

NV DEM will help expedite FEMA's Environmental Planning and Historic

Preservation (EHP) and floodplain review by assisting subrecipients with their application attachments. NV DEM's assistance to subrecipients and FEMA includes:

1. Providing subrecipients with a FEMA-approved environmental checklist and application instructions that list the required attachments for an expedited EHP review.
2. Coordinate the EHP kick off meeting where all parties will discuss the project and view the site.
3. Making the applicant aware of Executive Order 11988 and the eight step process for projects in the flood plain.

The HMGP application is designed to expedite this review by requiring the applicant to identify potential environmental and historic impacts. The application also requires subapplicants to identify project alternatives. The alternatives may be developed for further FEMA review if unresolved conflicts arise from the proposed alternative.

J. ACTIVITY SELECTION PROCESS

1. The projects must be in conformance with the State Enhanced Multi-Hazard Mitigation Plan and the applicable local hazard mitigation plan.
2. Where it is necessary to select from a wide range of activities due to funding or other constraints, the SHMO will determine ranking factors. This ranking will be in accordance with the priorities established by the GAR in Section VII(G) and the criteria in 44 CFR 206.435(b).
3. The GAR will utilize the SHMO and NHMWG in the prioritization process. The GAR retains the option to re-evaluate the priorities and to re-rank activities based upon lessons learned about initial priorities and activities funded under that disaster.
4. Upon completion of the activity selection process, the GAR will determine which HMGP subapplications shall be submitted by the State to the Regional Administrator (RA), FEMA Region IX, for funding approval. The State will forward subapplications for Activities and Waiting List Activities (as defined by this plan).

K. TECHNICAL ASSISTANCE

The State Hazard Mitigation staff, under the direction of the SHMO, may assist subapplicants in completing their HMGP subapplications. Workshops may be provided as described in Section VII (D) above.

L. ADVANCE ASSISTANCE

Advance Assistance is authorized by the Sandy Recovery Improvement Act of 2013, which allows advancing up to 25 percent of the HMGP ceiling or $10 million to Applicants, whichever is less. The purpose is to provide States resources to develop mitigation strategies and obtain data to prioritize, select and develop complete HMGP applications in a timely manner. States may request Advance Assistance by submitting an HMGP application to the Regional Mitigation Division Director. The application must identify the proposed use of the funds, including costs in sufficient detail for each proposed activity and milestones for submitting completed HMGP applications to FEMA. Advance Assistance is subject to the HMGP cost-sharing requirements and Strategic Funds Management. Advance Assistance is a part of the HMGP ceiling amount.

5.1.3.3 Application Procedures

1. The SHMO will coordinate with the State Public Assistance and Individual Assistance Officers as well as the Federal Hazard Mitigation Officer (FHMO) to determine deadlines

for the HMGP.

2. The SHMO will have responsibility to ensure the proper completion of all applications prior to submission to the FEMA Regional Director. The State requires submission of an electronic copy and a hard copy of all applications.
3. An interested potential subgrantee must submit a Notice of Interest (NOI) to the SHMO within 60 days of the disaster declaration. The SHMO and/or the Public Assistance (PA) officer will announce the 60-day deadline at the Public Assistance and/or Mitigation Applicants' Briefings.
4. The SHMO will forward all applications to the NHMWG for review of eligibility in accordance with Section H, Part 1. The SHMO will obtain additional information necessary to assist NHMWG in making their determination and notifying Subgrantees of ineligible projects.
5. In the event that several eligible projects are competing for limited funding, the NHMWG will prioritize the applications. Applications will be submitted to FEMA according to NHMWG's prioritization.
6. The SHMO will prepare the Hazard Mitigation Grant Program application package for submission to FEMA. The GAR for the HMGP or the Chief of Nevada DEM for PDM will forward state application to FEMA based on the NHMWG's recommendation.
7. The SHMO will notify Subgrantees of the NHMWG's decision regarding application approval or disapproval. Requests and project information will be coordinated with the FHMO.

5.1.4 Funding and Technical Assistance for the Past Five Years

Nevada's SHMO continues to work with local entities to provide funding and technical assistance for local hazard mitigation plans. Technical assistance for local mitigation planning projects has consisted of the following:

a) Providing guidance for organization of resources
b) Mitigation planning presentations for elected officials
c) Putting local entities in contact with appropriate sources of expertise such as NBMG for earthquake information, and NDWR for flood issues
d) Regularly attending local mitigation planning meetings.

Funding for mitigation plans and projects is provided under FEMA mitigation programs through Nevada DEM in close coordination with NDWR. All plans developed at the local and State levels are presented to the SHMO for a preliminary review. Jurisdictions are strongly encouraged to present partial sections to the SHMO allowing for "course corrections" before their final draft submissions. As mentioned before, the SHMO also participates as a State Liaison in key plan development meetings with the jurisdiction whose plan is under development. State funding for development and/or updating of hazard mitigation plans is not available. Local, tribal, and state plans are developed only with funding received through the HMA process. Table 5-4 presents a summary of HMA funding received by counties, regional communities, and the State for plan development and updates during the period since the last state update, 2019-2023.

Table 5-4. HMA Funding for Plans 2013-2018

Year	County/City	Description	Source	Amount ($)
2019	Carson City	Update of HM plan	PDM	86,250.00
2019	Churchill County	Update of HM plan	PDM	61,500.00

Table 5-4. HMA Funding for Plans 2013-2018				
2019	Clark County	Update of HM plan	PDM	225,000.00
2020	Lincoln County	Update of HM plan	BRIC	37,317.40
2021	Washoe County	Update of HM plan	BRIC	90,000.00
2022	Eureka and White Pine Regional	Update of HM plan	BRIC	126,000.00
2022	Esmeralda and Mineral Regional	Update and new regional HM Plan	BRIC	120,000.00
Total received during five-year state planning cycle				**746,067.40**

5.2 LOCAL PLAN INTEGRATION

The requirements for local plan integration, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S16. Does the plan describe the process and time frame to review, coordinate, and link local mitigation plans with the state mitigation plan? [44 CFR §§201.3(c)(6),[197] 201.4(c)(2)(ii)[198], 201.4(c)(3)(iii)[199], and 201.4(c)(4)(ii)[200]]	a. The plan must describe the state's process and time frame to review and submit approvable local and tribal (if applicable) mitigation plans to FEMA. If the state is unable to consistently submit approvable plans to FEMA or submit adoption resolutions from participating jurisdictions, including special districts, the plan must describe actions planned to improve state and local mitigation planning capabilities. b. The plan must describe the state's process and time frame to share risk assessment data and mitigation priorities with local governments for their plan updates, as well as integrate local risk assessment and mitigation actions into the state mitigation plan updates.

5.2.1 Process and Timeframe to Review Local Plans

The SHMO or his/her designee requests review of drafts from the communities as the planning process progresses in an effort to provide feedback and guide the plan to meet the federal requirements. While attending local HM planning meetings, State HM staff recommends appropriate action to ensure compliance with federal planning requirements. Once a completed draft of the plan is received, mitigation staff reviews the State Mitigation Plan Review Guide and

[197] *44 CFR §201.3(c)(6): "For Managing States that have been approved under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c), review and approve local mitigation plans in accordance with §201.6(d)."*
[198] *44 CFR §201.4(c)(2)(ii):* "An overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State must describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned or operated critical facilities located in the identified hazard areas must also be addressed."
[199] *44 CFR §201.4(c)(3)(iii):* "An identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified."
[200] *44 CFR §201.4(c)(4)(ii): "A description of the State process and timeframe by which the local plans will be reviewed, coordinated, and linked to the State Mitigation Plan."*

content of the plan document and together with the lead local planner make revisions. In addition to attending local planning meetings when possible, mitigation staff is available to provide planning technical assistance when requested by the community.

Rapid review of local mitigation plans is hindered by understaffing within the Nevada DEM mitigation section. A mitigation planning contract staff was hired in 2022 to assist the SHMO with planning. A mitigation grant analyst was also hired in 2022 to assist with SHMO with grant, application and technical assistance tasks greatly which has greatly increased efficiency and timeliness of the SHMO's ability to fully review all local hazard mitigation plans within 45 days of receipt. Typically, the review by the SHMO and/or mitigation planner is completed within three weeks from receipt. Management costs have 0funded these contractors. This assistance is essential to provide the technical support for local hazard mitigation updates and maintenance in the future. There is a plan to seek changing these positions regular state staff in the next legislative biennium.

5.2.2. Coordinate and Link Local Plans to the State Hazard Mitigation Plan

The NHMWG is charged with coordinating and linking the local plans to the Nevada HMP. Once a local plan is completed and approved by FEMA Region IX, the plan must wait for review until the next quarterly Subcommittee meeting. The integration process is expected to take 6 months to a year. The following process will be used for linking the local plan to the Nevada HMP.

1. NHMWG Meeting (6 months to a year)
2. Local plans are presented to the NHMWG as new business by SHMO as follows:
    a. Written detailed items found in new local plan, including required analyses, proposed for incorporation into the State Plan (examples of information presented for incorporation are listed below)
        i. Recommended additions to State plan under each identified hazard, noting hazards not identified in the State plan.
        ii. Add capability assessment information
        iii. Add goals, objectives and action (GOAS) items, noting current mitigation activities, funding sources, and link to the State's GOAS.
        iv. Record the completed plan in appropriate State plan locations.
3. The additions are approved, disapproved, or modified by the NHMWG.
4. Incorporation of new plan data made to the Nevada HMP by the SHMO or designee.

Local plans use the state plan to compile information about the communities' hazards, their nature, location, and estimated potential losses. The information for earthquake and flood hazards currently found in the state plan has been used by communities such as Washoe County and Carson City to update their plans. The state in turn uses the local plans to update the data about the communities' capabilities, hazard ratings, and the mitigation strategy.

Since 2007, the integration of local plans with the state plan is bi-directional, with the planning communities using the state plan's information to assist in their risk assessment. This is the primary reason for the NHMWG to work on enhancing the data found in the state plan and making it available in electronic format to Nevada's communities. Much work remains to be done and although priorities exist, these are not always the same for the state as for the communities. As the state is not a source for mitigation funding, support for communities who go above and beyond the norm in mitigation planning and strategy consists basically of written letters of recognition from NHMWG, and the state tracks the activity when notified.

In an effort to better support the integration of local plans with the state plan, the NHMWG has initiated a special project called "MyPlan", implemented by NBMG's GIS staff as time and funding is available for updating and maintenance. This project uses the same format as that created by California's "MyPlan" project, which consists of a website directed to community planners to access hazard risks for each and all communities but populates it with Nevada-specific data. The use of the website as a resource for developing and/or updating hazard mitigation plans with better, more accessible data will make the planning process much easier for locals and for state integration purposes. During the 2019-2023 plan update period, Craig dePolo with NBMG has attended numerous NHMWG meetings, LHMP meetings, and other meetings in Nevada counties to give presentations to those groups in order to familiarize planners with MyPlan and its capabilities in the planning process and to solicit input of additional local hazard data sets into the system.

5.3 PRIORITIZING LOCAL ASSISTANCE

The requirements for prioritizing local assistance, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S15. Does the plan describe the criteria for prioritizing funding? [44 CFR §201.4(c)(4)(iii)[201]]	a. The plan must describe criteria for prioritizing jurisdictions to receive planning and project grants under available federal and non-federal programs. A principal criterion for prioritizing grants will be the degree to which benefits are maximized. Areas of consideration should include, but not be limited to: 1. Communities at the highest risk with the highest vulnerability, including underserved communities and socially vulnerable populations. The plan should consider non-monetary benefits. 2. High-risk properties, including repetitive loss and severe repetitive loss structures. 3. Areas under intense development pressures and areas that may experience increasingly severe impacts from climate change. a. *If the state is interested in HHPD funding eligibility, the plan must describe the criteria for prioritizing funding for high hazard potential dams (see HHPD in Section 3.8.).*
S7. Was the risk assessment revised to reflect changes in development? [44 CFR §201.4(d)[202]]	a. The plan must provide a summary of recent development and potential or projected development in hazard-prone areas based on state and local government risk assessments including, but not limited to the following: 1. Changes in land use and the built environment and projected future growth or re-development areas. 2. Changes in population demographics that may affect vulnerability to hazard events, including socially vulnerable and underserved communities. 3. Changes to the vulnerability of state assets. 4. Changes in development that could impact jurisdictions most threatened by the identified hazards based on local risk assessments, including the potential impacts of climate change. ***Changes in development*** include conditions that may affect jurisdictions' risks from and vulnerabilities to hazards, such as changes in land use and development, including infrastructure development, declining populations, projected increases in

[201] 44 CFR §201.4(c)(4)(iii): "Criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risks, repetitive loss properties, and most intense development pressures. Further, that for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs."

[202] 44 CFR §201.4(d): "Review and updates. Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Administrator every 5 years."

ELEMENT	REQUIREMENTS
	population, or shifts in the needs of underserved communities or gaps in social equity.

5.3.1 Local Funding and Technical Assistance

5.3.1.1 Planning, Review, Ranking, and Selection

The guidelines used by the NHMWG to review, rank, and select projects for HMA are set forth in Section 8. Please refer to Section 8.2.3 and Figure 8-20 for these guidelines on the review, ranking and selection of projects for HMA.

5.3.1.2 Prioritization Evaluation

Application Prioritization criteria used by the NHMWG prioritize projects for HMA funding are set forth in Section 8. Please refer to Section 8.2.3 and Figure 8-02 for these Prioritization criteria

5.3.1.3 Prioritization Form

The Mitigation Grant Prioritization Form used by the NHMWG is shown in Section 8, Figure 8-02 and Figure 5-2. This form is in process of being updated to include the new and expanded funding sources and application types but is not quite ready to be replaced in the plan.

NHMWG Prioritization Form

Subgrantee: _____ **Activity Name:** _____

Ranking and Selection of Applications:

Application Prioritization Criteria (I-3)	**Assigned Value (0 - 10)**
a. Population Affected	
b. Public Perception of Need	
c. Emergency Access and Public Inconvenience ***For planning applications:*** *Performance of current plan maintenance activities & Implementation of mitigation activities.*	
d. Cost Effectiveness of the Project (BCA=1) (10 pts) ***For planning applications****: (15 pts)* *Understanding of the planning process and a methodology for completing the proposed mitigation plan.*	
e. Availability of Other Funding Sources	
f. Timing and Implementation	
g. Environmental Enhancement (10 pts) ***For planning applications****: (0 pts)*	
h. Resilience, Maintenance & Sustainability of Project (10 pts) ***For planning applications****: (15 pts)* *The description of unique or innovative outreach activities*	
Subtotal Prioritization Criteria (I-3, a thru h)	
Subtotal Criteria - (80-Point Maximum)/2 =	(Max. 40 points)
Additional Prioritization Considerations (I-4)	
a. Consistent with State & Local Mitigation Plan	
b. Detrimental Impact if Not Taken	
c. Greatest Impact to Reduce Future Disaster Losses	
d. Mitigate Multiple Hazards and/or Accomplish Multiple Objectives	
e. Optimize Total Funds Available	
f. Local Level of Interest & Degree of Commitment to Project	
Additional Considerations Combined (I-4, a thru f)	(Max. 60 points)

Total Criteria + Considerations _____ (Max. 100 points)

Figure 5-2. NHMWG Prioritization Form.

5.3.1.4 Cost Benefit Review of Proposed Projects

Section 8.2.1, Figure 8-02 subsection 3.d, Application Prioritization, letter d. states the consideration of the cost benefit review criteria.

5.3.1.5 Highest Risk Communities

Section 8, Figure 8-02 subsection 4 lists a series of considerations taken by the committee regarding highest risk communities.

5.3.1.6 Repetitive Loss Properties

Section 8, Figure 8-01 subsection 4 lists a series of considerations taken by the committee regarding repetitive loss properties.

5.3.2 Intense Development Communities

5.3.2.1 Changes In Land Use

Figures 5-3 and 5-4 show land use statewide and in more highly populated areas respectively. Federal agencies control more than 86% of the land. These groups include the U. S. Bureau of Land Management (BLM), U.S. Department of Defense (DOD), U.S. Forest Service (USFS), U.S. Bureau of Indian Affairs (BIA), U.S. Bureau of Reclamation (BOR), U.S. Fish and Wildlife Service (USFWS), National Parks Service (NPS), and others. Some of the areas controlled by these agencies are shown in Figures 5-3 and 5-4. For a number of reasons such as legacy control by the Federal government, the immense desert expanse, mining and natural resources, military installations, and conservation. Due to the extensive Federal land use, the State of Nevada does not expect major changes in land use that will materially affect hazard mitigation in this NEHMP update. Land use changes are expected to largely exist around current population centers as they expand.

As described in Section 8.1.1, the State of Nevada and local jurisdictions integrate with such efforts as the 2023 “National Cohesive Wildland Fire Management Strategy Addendum Update,” and the Truckee River Flood Management Project to guide and manage changes in land us.

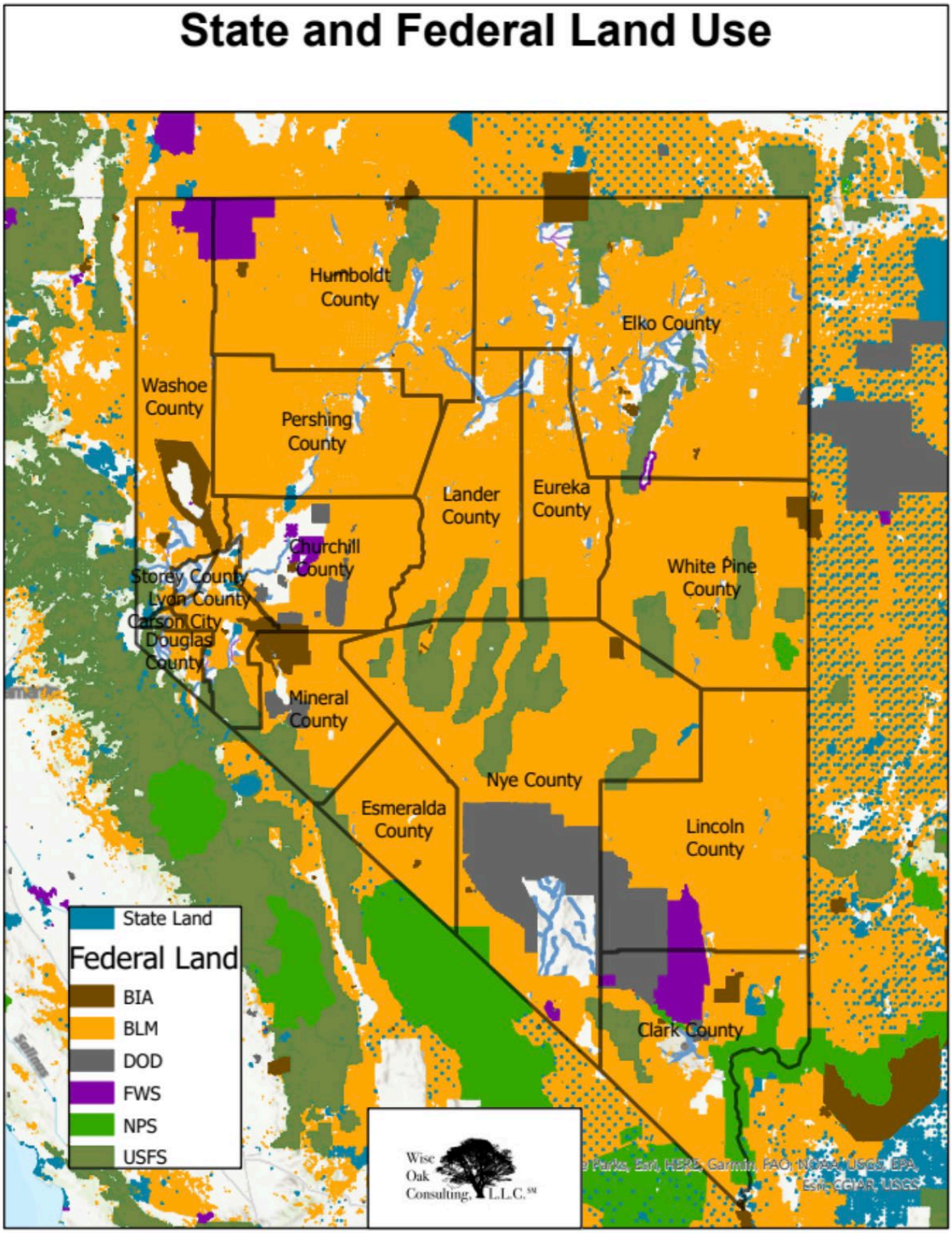


Figure 5-3. State and Federal Land Use Statewide.

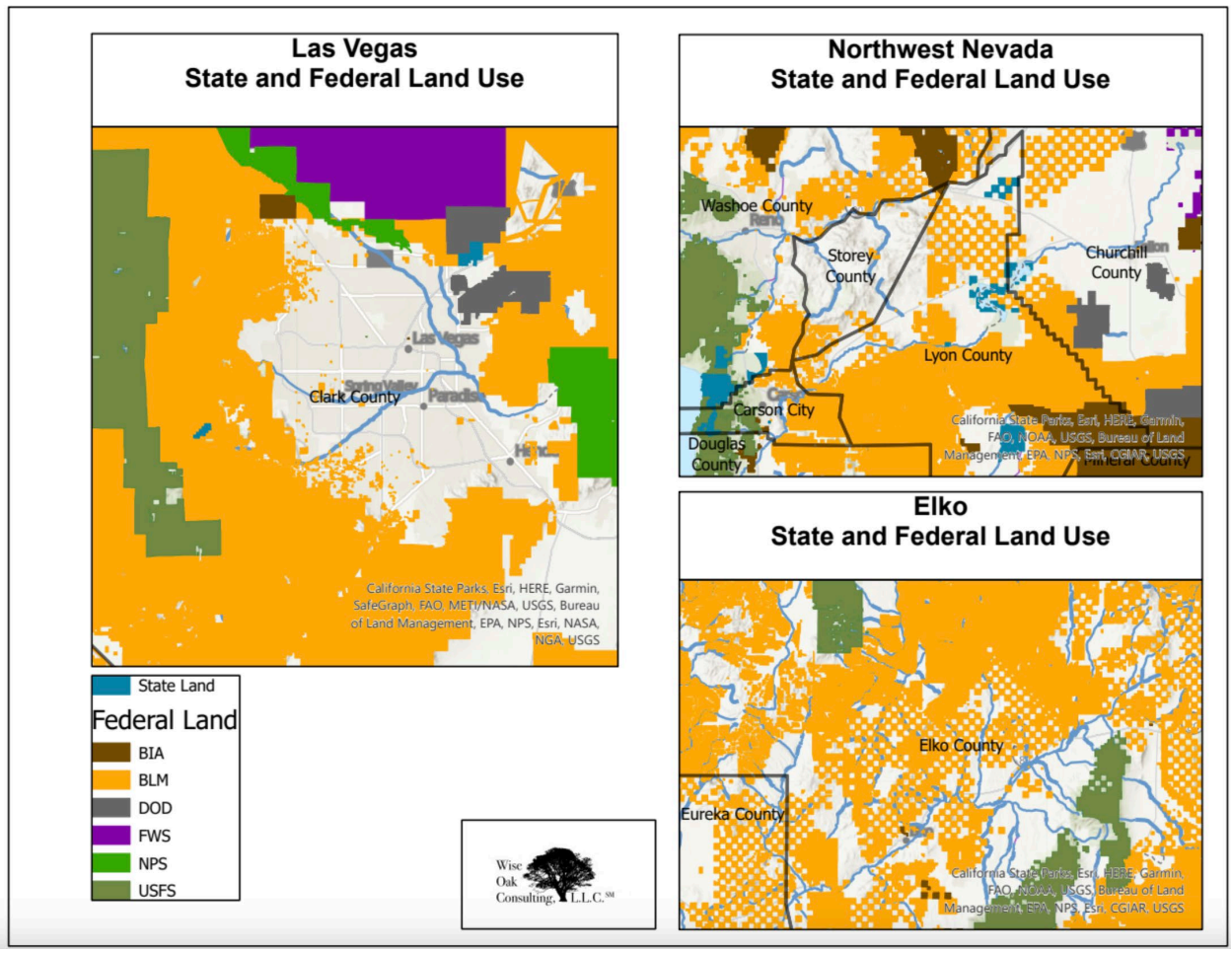


Figure 5-4. State and Federal Land Use in More Heavily Populated Areas.

5.3.2.2 Changes In Demographics

Population affected is the first criterion used for prioritization of mitigation funding proposals. Figure 5-5 compares population and demographics between the State of Nevada's 2019 and 2022 Threat and Hazard Identification and Risk Assessment (THIRA) assessment. The colors are based are relative ad represent at least one (1) standard deviation away from the mean demographic change across the 17 counties:

- Green/Red – county changed more than one standard deviation from statewide mean
- Yellow/Orange – county changed within one standard deviation above statewide mean

Jurisidiction	2019-2022 Population Change	2019-2022 Over 65 Change	2019-2022 Disability Change	2019-2022 ESL Change	2019-2022 Poverty Change
Carson City	6.5%	13.6%	-40.7%	16.9%	-10.8%
Churchill County	5.2%	6.9%	-0.9%	22.8%	-5.3%
Clark County	2.7%	9.0%	-0.7%	2.0%	-1.9%
Douglas County	2.9%	12.5%	-24.2%	10.4%	-0.1%
Elko County	2.8%	3.0%	3.0%	3.0%	3.0%
Esmerelda	-10.0%	-20.2%	14.8%	4.2%	-11.2%
Eureka County	-5.0%	3.3%	-0.8%	4922.6%	6.4%
Humboldt County	5.1%	12.7%	-10.0%	-6.4%	-4.0%
Lander County	4.0%	7.4%	58.4%	-15.3%	-12.4%
Lincoln	-13.0%	-16.3%	-6.3%	-6.3%	-70.1%
Lyon County	9.1%	11.4%	-14.0%	12.9%	3.2%
Mineral	1.6%	2.3%	-21.5%	21.6%	-11.8%
Nye	17.9%	22.7%	8.0%	36.3%	8.5%
Pershing County	1.1%	3.0%	-1.9%	-9.9%	-3.6%
Storey County	2.8%	8.8%	-38.5%	21.2%	15.3%
Washoe County	5.9%	11.9%	4.2%	6.2%	-2.0%
White Pine	0.0%	-7.3%	-7.3%	-7.3%	-7.3%

Figure 5-5. Key Demographic Changes Between 2019 and 2022 THIRA Analysis.

For overall population, a red change means a loss. For all other demographics, red means an increase in that demographic – more challenge to serving at risk communities. The demographic shifts show the following trends:

- Population increase/decrease is mixed with an increase in eight of 17 counties
  - Largest gains in Nye and Lyon Counties
  - Largest losses in Lincoln County and Esmeralda Counties
- The number of people over 65 increased in 10 of 17 counties
- The number of people identifying with disabilities decreased in 9 of 17 counties
- The number of people speaking a language other than English at home increased in 11 of 17 counties
- The number of people in poverty decreased in 12 of 17 counties

In summary, Nevada counties saw mixed growth between 2019 and 2022, has more people over 65, fewer people with disabilities, fewer people in poverty, and more non-English speakers.

5.3.2.3 Changes in Social Vulnerability

In this update, the State of Nevada's analysis includes National Risk Index information for each applicable hazard in Section 3.1. Two of the social vulnerability maps are included here for representation.

In order to maximize standardization across the nation and consistency across Nevada's planning updates, the State is incorporating FEMA's National Risk Index and the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) and associated Social Vulnerability Themes. Figures 5-6 and 5-7 show the 2018 and 2020 overall census tract-level Social Vulnerability Index changes statewide and in more heavily populated areas. The State uses the SVI maps to help determine how it might prioritize mitigation and preparedness projects.

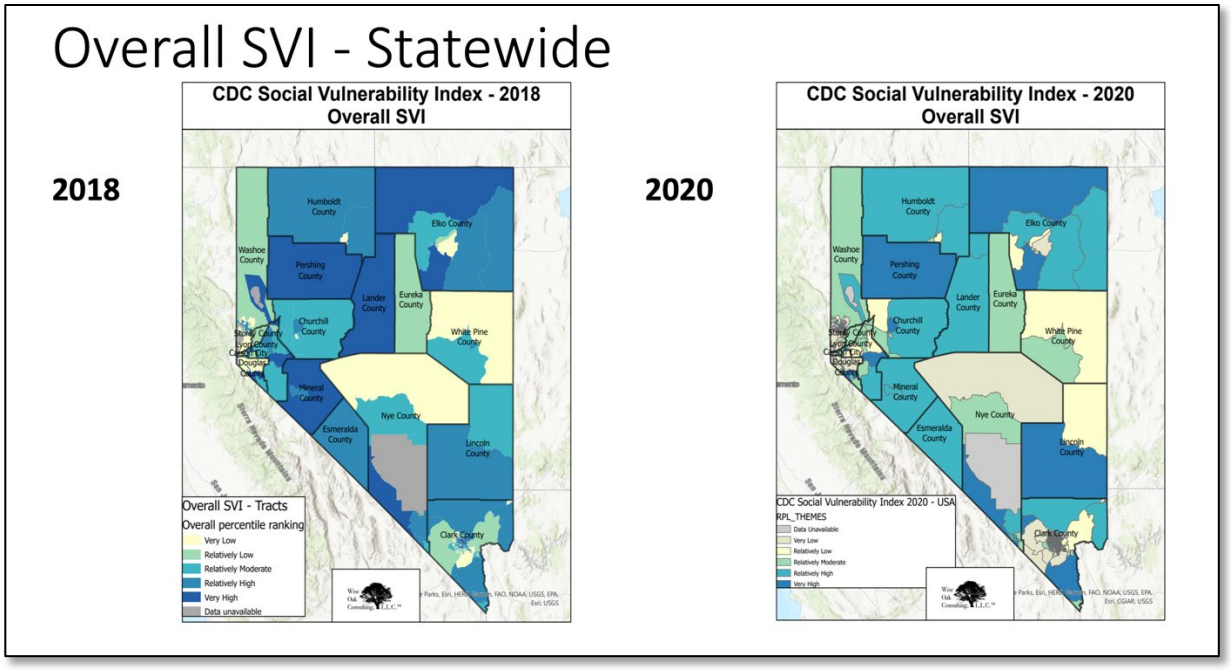


Figure 5-6. 2018 and 2020 Social Vulnerability Indices - Overall, Statewide.

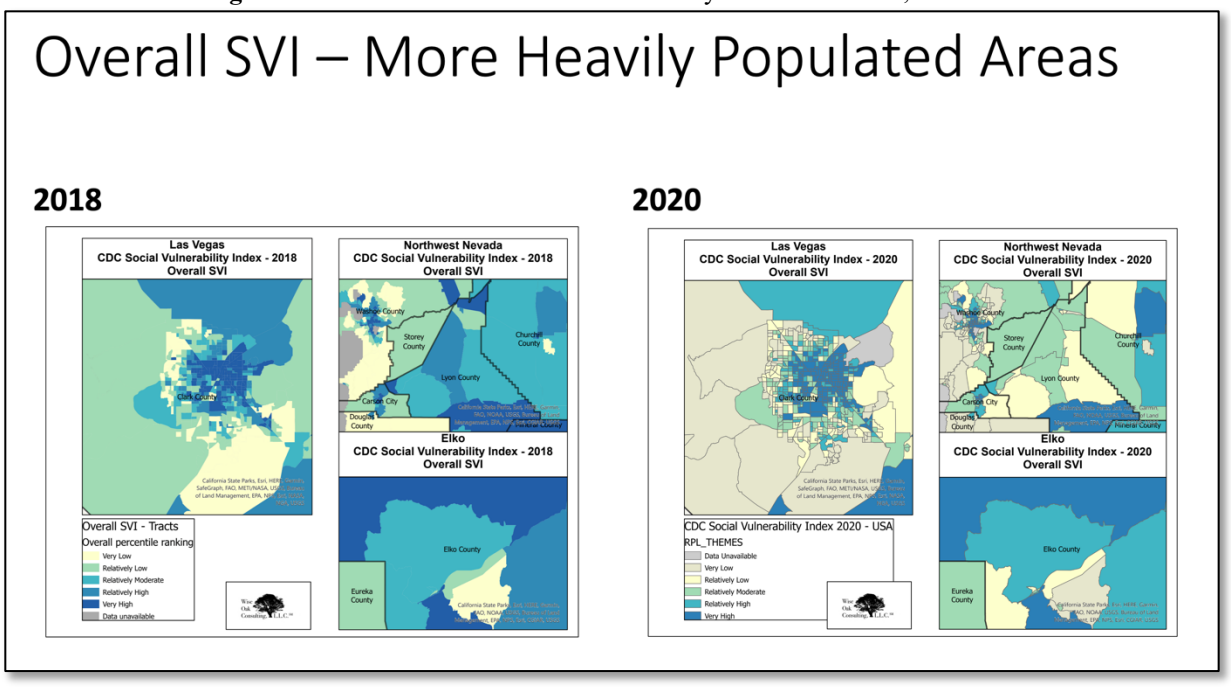


Figure 5-7. 2018 and 2020 Social Vulnerability Indices – More Heavily Populated Areas.

5.3.2.4 Changes In Vulnerability of State Facilities

Sections 3.6 has an extensive discussions about the vulnerability in state facilities. The most significant being in the change in replacement value from $250 to $1,150 per square foot. The three most significant hazards across Nevada are Earthquake, Flood and Wildfire – the focus of Section 3.6. Due to the adherence to building codes and zoning restrictions, the increased risk to state facilities lies in the increased replacement cost.

5.3.2.5 Changes In Development

Each hazard in Section 3 with a corresponding National Risk Index (NRI) hazard has an expected annual loss map. Each hazard also has suggested mitigation measures recommended by subject matter experts where applicable. As with state facilities, the adherence to building code and zoning largely prevents increased risk with respect to development. In addition, there is detailed analysis of the impact of climate change for the major hazards of concern in the "Nevada's Climate Strategy" – heat and heat waves; drought; loss of snow; floods, and wildfire risk. Sections 3.6-3.7 have extensive analysis regarding the vulnerability and consequences due to the State's big three hazards – earthquake, flood, and wildfire. As with state facilities, adherence to building code and zoning largely prevents increased exposure due to new development for flood and wildfire. However, the THIRA highlights major areas of concern for increased risk due to development with respect to wildfire. The State of Nevada faces similar high-risk challenges as the State of California with such disasters as in Paradise due to the Camp Fire. That is, there is increased risk due to the expanding urban-wildland interface. The THIRA focuses on a major risk that increases with development in each major region of the state – North, South, and Northeast. The major areas of concern are "Paradise-like" areas in which there is a single access road to a populated area:

- Northern Nevada – Wildfire in the Tahoe Basin with 12,000 with households and growing
- Southern Nevada – Wildfire in the Spring Mountains with 3,700 homes and growing
- Northeast Nevada – Wildfire in Spring Creek / Lamoille with 4,700 homes and growing

Section 6

This section provides the State of Nevada's schedule for monitoring, evaluating, and updating the Nevada HMP; including reviewing progress on goals and actions in the mitigation strategy. *No significant changes were made to this Section other than updates to the data referenced and pertinent Section number changes.*

6.1 MONITORING, EVALUATING, AND UPDATING THE PLAN

The requirements for monitoring, evaluating, and updating the plan, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S17. Is there a description of the method and schedule for keeping the plan current? [44 CFR §§201.4(c)(5)(i)[203] and 201.4(d)[204]]	The plan must describe the process to monitor, evaluate and update the plan. The description must include: a. The agency/office responsible for monitoring, evaluating, and updating. b. The schedule for monitoring, evaluating, and updating. ***Monitoring*** means tracking the plan's implementation over time. ***Evaluating*** means assessing the effectiveness of the plan at achieving its stated purpose and goals. ***Updating*** means reviewing and revising the plan at least once every five years.

6.1.1 Schedule for Monitoring, Evaluating and Updating the Plan

To ensure that the goals and objectives for Nevada are current and that local mitigation efforts are accomplished, the Subcommittee periodically monitors the Nevada HMP.

The Working Group monitors the Nevada HMP quarterly or as situations dictate, such as after a disaster declaration or when new information is obtained. The Working Group, along with the SHMO, and his/her designee is responsible for updating the Nevada HMP throughout the entire update process. A record of updates is maintained in the minutes of the Working Group meetings. When an evaluation of the plan determines it is necessary, the update process will begin immediately.

6.1.2 Method for Monitoring the Plan

The process to initiate and complete the modification of the Nevada HMP has five basic steps listed below.

1. The Chair of the NHMWG receives a quarterly report on the status of the Nevada HMP's goals, objectives, action items, and the status of identified hazards.
2. The report evaluates whether the Nevada HMP's current mitigation hazards, goals, objectives, and action items are appropriate and/or effective.

[203] 44 CFR §201.4(c)(5)(i): "An established method and schedule for monitoring, evaluating, and updating the plan."

[204] 44 CFR §201.4(d): "Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Administrator every five years."

3. The report recommends any needed changes and/or amendments to the Nevada HMP. Any proposed changes are discussed in open forum at the quarterly meetings by Working Group members.
4. If the NHMWG determines to modify the Nevada HMP, the NHMWG can initiate a modification by a majority vote at a quarterly meeting followed by an agenda item at the next quarterly meeting following the administrative requirements of the state's open meeting law.
5. The SHMO or his/her designee records any reviews and updates in formal meeting minutes.

6.1.3 Method for Evaluating the Plan

The methodology did not change during the 2023 update process. The evaluation was accomplished by reviewing each and every section of the 2018 plan and each question listed below was asked as the appropriate section was reviewed by the Working Group.
The Working Group Chair incorporates the following process into the quarterly meetings:

1. Risk Assessment Evaluation
    a. Incorporate new and/or updated local mitigation plan risk assessment information.
    b. Have the risks changed at a state level?
    c. Are there new hazards at the local or state level?
    d. Has the current ranking of the hazards changed?
2. Goals Evaluation
    a. Are the goals appropriate for what the State wants to accomplish?
    b. Do the goals reflect what the local jurisdictions want to accomplish?
    c. Do the State's and local jurisdictions' goals and actions complement each other?
    d. Do the goals satisfy the Federal criteria (i.e., the plan review tool)?
    e. Do the goals reflect the local jurisdictions' plans and concerns?
    f. Are the goals feasible given the funding sources available to state, and local jurisdictions?
3. Modify goals in accordance with the results of the evaluation.
4. Action/Project Evaluation
    a. What action items have been accomplished?
    b. Are the action items appropriate to accomplish the plan's goals and objectives?
    c. Do any of the action items need to be changed?
    d. Do new action items need to be added?
5. Does the Nevada HMP meet federal criteria?
    a. Using current FEMA State Mitigation Plan Review Guide to review the plan for appropriate (https://www.fema.gov/sites/default/files/documents/fema_state-mitigation-planning-policy-guide_042022.pdf).

6.1.4 Method for Updating the Plan

Once the Nevada HMP is monitored and evaluated, it must be updated to stay current with hazards, mitigation goals, objectives, and activities. The process for updating the plan is in the following list of actions:

1. The Working Group Chair, SHMO, or his/her designee submits changes to the Working Group. (A NHMWG member can also submit changes to the Nevada HMP).

2. The Working Group reviews and recommends (or rejects) the changes and the changes are reviewed by the NHMWG.
3. The NHMWG approves/rejects the Nevada HMP's changes.
4. The SHMO or his/her designee updates the Nevada HMP with approved changes.
5. The changes are recorded in the meeting minutes, which become part of the plan in the form of Appendix C.
6. The process is completed within 90 days.
7. Update the record of adoption if necessary.

As mentioned before, the update of the NHMP is continuous in Nevada. After FEMA approval in October, the next Working Group meeting in January marks the beginning of the update process through the monitoring, evaluating, data compilation, and updating of the plan document.

6.1.5 Previous Process and Recommended Changes

No major changes to the previous process for monitoring and updating of the plan were made in this iteration. The Working Group used the Annual Questionnaire form at its quarterly meeting as a guide to gather data and solicit input from the members. The Completed Mitigation Activity Report Form (Figure 6-3) was distributed to all members via e-mail and in hard copy at the quarterly meetings. The information collected in these reports is found in Appendix L. Additionally, the planning team developed a form that assisted in gathering the information about public awareness and outreach efforts by members of the NHMWG. These efforts include, but are not limited to, civil and professional organizations with content about hazard mitigation planning or project activities. These data are summarized in Section 2.2.2, Participation of Interested Groups in the Planning Process.

As events occur in the State, the Working Group will continue to learn from them and adjust both the process and the plan to address any deficiencies highlighted by these occurrences.

The periodic monitoring of the plan and process takes place through quarterly meetings of the Working Group. Below is a possible list of general agenda items for discussion and/or action at the established quarterly meetings of the Working Group.

1. Risk assessment review involving both the state and local level:
    a. Local level
        i. New plans
        ii. Updated plans
2. Ongoing studies
3. Addition of action items to address risk
4. Modification of action items
5. Deletion of action items completed or no longer applicable
6. Grant application, funding sources
7. Training and workshops

This information will be reported to the NHMWG by the SHMO or his/her designee at its quarterly meetings.

PLAN SECTION	QUESTIONS	YES	NO	COMMENTS

PLANNING PROCESS	Are there internal or external organizations and agencies that have been invaluable to the planning process or to mitigation action?			
	Are there procedures (e.g., meeting announcement, plan updates) that can be done more efficiently?			
	Has the Steering committee undertaken any public outreach activities regarding the HMP or implementation of mitigation actions?			
HAZARD PROFILES	Has a natural and/or human-caused disaster occurred in this reporting period?			
	Are there natural and/or human-caused hazards that have not been addressed in this HMP and should be?			
	Are additional maps or new hazards studies available? If so, what have they revealed?			
VULNERABILITY ANALYSIS	Do any new critical facilities or infrastructure need to be added to the asset lists?			
	Have there been changes in development patterns that could influence the effects of hazards or create additional risks?			
MITIGATION STRATEGY	Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning?			
	Are the goals still applicable?			
	Should new mitigation actions be added to a community's Mitigation Action Plan?			
	Do existing mitigation actions listed in a community's Mitigation Action Plan need to be reprioritized?			
	Are the mitigation actions listed in a community's Mitigation Action Plan appropriate for available resources?			

Figure 6-1. Annual Review Questionnaire.

6.2 MONITORING PROGRESS OF MITIGATION ACTIVITIES

The requirements for monitoring the progress of mitigation activities, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S18. Does the plan describe the systems for monitoring implementation and reviewing progress? [44 CFR §§201.4(c)(5)(ii)[205] and 201.4(c)(5)(iii)[206]]	a. The plan must describe the system for tracking the implementation of the mitigation activities and projects identified in the mitigation strategy. This includes all mitigation activities, not just those funded by FEMA. b. The system must include the following: 1. A schedule; 2. The agency/office responsible for coordination; and 3. The role of the agencies/offices identified in the mitigation strategy as responsible for implementation of actions. c. The plan must describe a system for reviewing progress on achieving the mitigation strategy's goals that includes the criteria and process for evaluating progress.

6.2.1 Monitoring Progress of Mitigation Activities

The SHMO or his/her designee will track, monitor, and provide oversight for approved projects under FEMA's HMA programs. The tracking of projects includes a comparison against the mitigation goals, objectives, and actions from Nevada HMP Section 4. The comparison allows the SHMO to verify that Nevada is meeting the goals and objectives set in the updated Nevada HMP as well as the effectiveness of the mitigation program.

For HMA funding, the tracking of projects begins when the SHMO reviews initial project applications for completeness and eligibility. At this time, the SHMO also compares the project with the Nevada HMP Section 4, to determine whether the project is in agreement with the goals, objectives, and actions established in the mitigation strategy. The SHMO maintains records of the applicable action, goal and objective by funding source, year, and hazard. The resulting information is shown in figures and tables found in Section 4.2.4 as Hazard Management Capability changes. This report is presented to the NHMWG at its quarterly meetings. The form shown n Figure 6-3 is used by Nevada DEM to assist in tracking mitigation actions in Nevada. Data collected from these forms is incorporated into this plan in Appendix L, Completed Mitigation Activities.

After the project closeout, the SHMO works with the NHMWG to re-evaluate two items: one, the mitigation strategy to determine the progress made and, two, if modifications are necessary. The SHMO maintains a record of any modifications to the mitigation strategy in the minutes of the NHMWG meetings. This record is used to create the report for the NHMWG's review at their subsequent meeting.

It is our intent to compile data about the State's accomplishments in the mitigation field. These data are provided by the representatives of the lead agencies participating in the Subcommittee, the NHMWG and/or the annual survey described in section 6.2 as well as through the annual TTX at local meetings attended by the Hazard Mitigation staff and the incorporation of after-action reports from the TTX.

[205] 44 CFR §201.4(c)(5)(ii): "A system for monitoring implementation of mitigation measures and project closeouts."

[206] 44 CFR §201.4(c)(5)(iii): "A system for reviewing progress on achieving goals as well as activities and projects identified in the Mitigation Strategy."

6.2.2 Project Closeouts

The process described in 2018 remains essentially the same; the only change was the form presented.

1. Subgrantees mark final report accordingly
2. Nevada DEM confirms payment of all reimbursements
3. Nevada DEM requests closure of award to FEMA; closing request includes package with
    a. Expenditures
    b. Deobligations
    c. Final site visit with photos if applicable
    d. Confirmation that project is complete

When the SHMO determines that all project management procedures have been satisfied, the original signed Final Quarterly Report Form will be filed with the project file. A copy of the form will be forwarded to FEMA with a formal letter officially requesting closure of the project. Nevada successfully closed PDM projects during the update of this plan following the procedure above.

6.2.3 Review Progress on Mitigation Strategy

The SHMO or his/her designee tracks mitigation objectives, goals, or action items implemented with the HMA programs. To obtain data about activities implemented by local, tribal, other state and private entities with different sources of funding, the form shown in Figure 6-3: Completed Mitigation Activity/Project Report is distributed quarterly to the current tree network of contacts described in Section 5.1.1.1. The information serves as a means for the SHMO to measure progress and capability of the group performing the mitigation activity in the implementation of the mitigation strategy at the community level.

6.2.4 Modifications in Tracking Mitigation Actions

No modification was made to this process during the 2023 plan update. Figure 6-3 is a valid and useful form that provides the SHMO a standardized format to track state agencies and local jurisdictions' objectives, goals, and actions as well as track their progress and accomplishments. The SHMO compiles data and compares the activities to the goals and objectives. This data is presented to the NHMWG at their regularly scheduled meetings.

6.2.5 Reviewing Progress on Implementing Activities and Projects

The document shown in Figure 6-2 is an example of a quarterly financial and progress report used in the system for reviewing the progress of activities and projects of the Nevada HMP programs managed by Nevada DEM. This form is updated on a quarterly basis by the subgrantees and sent to the SHMO for review. The SHMO reports this information to the NHMWG at its quarterly meeting. The NHMWG discusses the information and formulates recommendations to modify the Nevada HMP accordingly.

All activities requesting funds from HMA programs require NHMWG's input in the prioritization process before submission to FEMA. Beginning in 2012, NDWR and Nevada DEM agreed to have all HMA applications managed by Nevada DEM.

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Nevada Office of the Military, Division of Emergency Management

Programs › FFY 2019 Mitigation › PDM FFY 2019 Churchill County Multi-jurisdictional HMP Update

FFY 2019 Mitigation

USD$ 0.00 Available
Deadline: 12/31/2023

Churchill County

PDM FFY 2019 Churchill County Multi-jurisdictional HMP Update

Next

USD$ 0.00 **USD$ 0.00 Requested**

USD$ 0.00 Cost Share Amount

Quarterly Progress Report 1

Due date (mm/dd/yyyy) 10/30/2020

Quarterly Progress Report 1 not required ☐

✓ Quarterly Progress Report 1 submitted: 9/22/2022

Un-Submit

1. Please list the project you are working on.
Hazard Mitigation Plan Update

2. Please list the Project Manager, Fiscal Manager, and personal responsible for gathering and submitting documentation along with their email and phone number. Update this information quarterly. This may be cut and pasted from quarter to quarter to save on data entry.

3. List major milestones/tasks to be accomplished during this grant. Please list your tasks as Milestone #1 through however many milestones you have. Below you will be asked to assign a % complete to each milestone each quarter. The milestones must remain in the same order as listed in the first quarterly report.
You may copy and paste quarterly to save on data entry. Example: Milestone #1: Project Management Milestone #2: Obtain Permits Milestone #3: Construction of flood wall:

no tasks accomplished to date

4. Update the % of completion of each task/milestone.

0 **Milestone #1** 0 total to date

Milestone #2

	Milestone #3	
	Milestone #4	
	Milestone #5	
	Milestone #6	
	Milestone #7	
	Milestone #8	
0.00	TOTAL	0.00 TOTAL

5. What is the overall completion of this project. Please answer with a 0-100% complete. Please estimate the percentage of how much of your project is complete at this time based on the period of performance
0%

6. Will the Project be completed by the grant award deadline (period of performance)? If you will need an extension, please submit a letter requesting this extension explaining the reason for the extension, how much funding has been spent to date, and your plan to complete your project by the requested extension.

- ☐ Yes
- ☑ No — 1 total to date

7. Do you expect to de-obligate any funds?

- ☐ Yes
- ☑ No — 1 total to date

8. Describe any problems that may be delaying or halting the progress of this grant. Please include items which threaten completion of the project. You must include how the problems are being addressed. The information provided will give the SAA situational awareness to determine if spending is on time or if an extension or de-obligation is necessary.
Covid-19 has put a hold on the ability to assemble for public meetings

9. Do you need a project change request for budget or time? Have you submitted this project change request? All changes must be requested ahead of time.
N/A

Churchill County

PDM FFY 2019 Churchill County Multi-jurisdictional HMP Update

Nevada Office of the Military, Division of Emergency Management
FFY 2019 Mitigation

Subrecipient Duns:	094376993
Subrecipient Required Match:	$ 0.00
Federal Award Amount:	$ 0.00
FEMA Application Number:	PDMC-PL-09-NV-2019-005
Function Code:	
GL#:	
Category:	
DEM Job Number:	97047.20
Budget Account:	
Vendor Number	
Official Project Name	
Subrecipient UEI	
Subrecipient Award Period	
Federal Award Period to DEM	

Churchill County
155 N. Taylor St.
Fallon
Nevada, NV 89419

Tel:
Fax:
EIN:

Project Contact

Total Requested
USD$
Funding Amount Approved
USD$

Date Submitted

Quarterly Financial Report Contact

Quarterly Financial Report Number
9

HideQuarterly Financial Report Status

Quarterly Financial Report Status

Pending

Approved by

Approval Date
(mm/dd/yyyy)

Instructions/Comments
Zero report

	Awarded	(-)Pending (From Other Invoices on this App)	(-)Approved (From Other Invoices on this App)	(-)Paid (From Other Invoices on this App)	(-)Funding Amount (This Quarterly Financial Report)	(=)Remaining
PDM 2019 Nevada Department of Public Safety, Division of Emergency	USD$ 0.00	USD$0.00	USD$0.00	USD$0.00	USD$ 0.00	USD$ 0.00

Management & Homeland Security							
PDM 2019 Cost share Nevada Department of Public Safety, Division of Emergency Management & Homeland Security	USD$0.00	USD$0.00		USD$0.00	USD$0.00	USD$ 0.00	USD$ 0.00
Approved Amount	**USD$ 0.00**	**USD$0.00**		**USD$0.00**	**USD$0.00**	**USD$ 0.00**	USD$ 0.00

Quarterly Financial Reimbursement

Quarterly Financial Reimbursement

(for this Quarterly Financial Report only)

Quarterly Financial Reimbursement Instructions

-none-

Add Quarterly Financial Reimbursement **Total USD$0.00**

Line Item Details

Grant Category Budget Line Item *(from application)*	Description	Requested	Quantity	Rate	Funding Amount Approved
Flood Mitigation Feasability Study					USD$
Churchill County Personnel & Planning Committee					USD$
GIS Mapping and Vulnerability Assesment					USD$
Plan Development & Project Management					USD$
			Quantity Total Row	**Rate Total Row**	

Did you read the instructions for submitting a quarterly financial report?

☑ Yes

Remember, the programmatic report MUST be submitted at the same time as the quarterly financial report in order to receive reimbursement. Are you submitting a quarterly programmatic report?

☑ Yes
☐ No

Are you reporting personnel costs? If yes, do you have a line item for personnel in your budget? Do you have enough funding left in this budget line item for the costs you are requesting? Please ensure all required backup is included.

no

Are you reporting travel? Ensure all receipts are included: Hotel, parking, shuttle, taxi, rental car, conference fee invoice, flight invoice, internet search map for mileage, formal or informal agenda, GSA rate printout.

no

Are you requesting an equipment reimbursement? All equipment is required to be maintained according to 2 CFR 200 Subpart E (200.439). You may not dispense without written pre-approval from the SAA.

no

Did you procure services or commodities? You must follow 2 CFR part 200.403(g), NRS 333 or NRS 332, whichever is more restrictive. Locals may not use NRS 332.315.

no

Did all procurements go out to bid? Yes or No? If no, please explain here.

N/A

Did you issue or agree to any contracts this quarter? Yes or No? Did you use the minimum required FEMA DHS language? Please see examples at https://dem.nv.gov/uploadedFiles/demnvgov/content/COVID-19/FEMA_ContractsProvisionsTemplate.pdf

no

Have you included your cost share/match and backup documentation? (25% for most) (10% for small and impoverished)

N/A

Documents Requested *	Required?	Uploaded Documents *
	☐	-none-
Personnel and Fringe supporting documentation (payroll download, paystubs, documentation of hours spent working on grant)	☐	-none-
Consultants and Contracts supporting documentation	☐	-none-
Copy of contracts with contractors	☐	-none-
Supplies and Operating supporting documentation	☐	-none-
Travel supporting documentation	☐	-none-
Equipment supporting documentation	☐	-none-
Summary Overview of QFR submission in Excel	☑	QFR9

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Quarterly Financial Report Certification

Attached are copies of all expenses to substantiate the expenses requested on this claim. I certify that submitted invoices have been paid prior to the request for reimbursement from the SAA and to the best of my knowledge and belief, this report is correct and complete and that all outlays and unpaid obligations are for the purposes set forth under the terms of federal and state assurances, program regulations and the approved grant budget. I further certify that a copy of this Financial Report has been provided to the above named Project Manager.

Documentation Certifications

In accordance with 2 C.F.R. §200.333 as well as state and local record retention requirements, the Applicant will maintain all documentation that supports this project application in its own files. This documentation will be required if the Applicant submits an appeal for additional funding, as well as in the case of any audits.

Signed by:

38.70.238.18

ZGID 227738

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Figure 6-2. Sample Quarterly Financial & Progress Report.

As mentioned previously in Section 6.1.4, other programs will be monitored by Working Group members. The SHMO will place an action item in the Working Group's agenda requesting information about accomplished mitigation projects supported, facilitated and/or funded through/by other state agencies.

Each member reports on the current status of and progress made on any mitigation-related activities or projects within the agency he or she represents and is provided a "Completed Mitigation Activity/Project Report" (shown in Figure 6-3), by the planning team upon completion of any of these mitigation-related activities or projects. These forms are distributed at the same time as the Annual Review Questionnaire to NHMWG members and any completed forms are requested to be turned in at each quarterly meeting for reporting purposes. This form was presented to the NHMWG during the current plan update. The planning team compiles all completed mitigation-related activities and projects submitted by committee members into one document presented as Appendix L.

QUARTER: Jan, Feb, Mar 2023 **Date Submitted:** _____ **Activity/Project**	**Agency and Amount ($)**		**Effect on Loss Reduction**	**Goal, Action # achieved from State Plan (See Table 4-2 for Mitigation Goals and Strategic Actions)**
	State – Manage, support, Fund ($)	**Federal ($)**		
Complete applicable areas. If unknown, write N/A. Any questions call SHMO Janell Woodward at 775-687-0467				

Figure 6-3. Completed Mitigation Activity/Project Report.

The staff reviews each updated section of the plan before the next quarterly Working Group meeting and helps to develop future strategic mitigation actions based on those developed in the State or local plans or in supporting agency goals and objectives or discussed at meetings to include for consideration in the new iteration.

Mitigation actions were implemented as planned during the 5-year update cycle; see Section 4.1.1, Goal Assessment and 4.2.4 Hazard Management Capabilities Changes for details. Nevada closed PDM 2016 and HMGP 4202.

Section 7
7.1 REFERENCES

All county and tribal hazard mitigation plans used to update the 2018 iteration of Nevada's HMP are referenced in section 7.1.28.1.

7.1.1 Section 0 References

- Great Basin National Heritage Area: https://greatbasinheritage.org (accessed May 2023).
- Nevada Department of Transportation, 2017, Indian reservations and colonies in Nevada: https://www.nevadadot.com/home/showdocument?id=142 (accessed May 2023).
- Nevada Regional Economic Analysis Project, Industry structure and performance- earnings across counties and regions of a selected industry: https://nevada.reaproject.org/analysis/industry-structure/industries_by_region/average_earnings_per_job/ (accessed May 2023).
- Nevada State Demographer's Office, 2015, Population projections 2021 to 2040: https://tax.nv.gov/uploadedFiles/taxnvgov/Content/TaxLibrary/Nevada%20County%20Population%20Projections%202021%20to%202040.pdf (accessed May 2023).
- Reno-Sparks Indian Colony, 2016, Reno-Sparks Indian Colony -Three tribes one nation: http://www.rsic.org/ (accessed May 2023).
- U.S. Census, Intergovernmental Affairs: Tribal Affairs – American Indian and Alaskan Native (AIAN): https://www.census.gov/about/cong-gov-affairs/intergovernmental-affairs/tribal-aian.html (accessed May 2023).
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7.1.2 Section 1 References

- Nevada Legislature, 2015, Nevada Revised Statutes: https://www.leg.state.nv.us/NRS/Index.cfm (accessed May 2023).

7.1.3 Section 2 References

- Elliott, B., 2014, Nevada Drought Strategic Plan – a map for a more drought resilient Nevada: Nevada Division of Water Resources, Nevada Division of Emergency Management, Nevada State Climate Office, 14 p.: http://water.nv.gov/programs/planning/NV_Long_Term_Drought_Strategic_Plan.pdf (accessed May 2023).
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Section 8

This section demonstrates the extent to which this plan is integrated with other State and regional programs, as well as with FEMA programs and initiatives. It describes current mitigation program management capabilities and discusses how mitigation efforts can be better integrated with those programs via legislative, policy, institutional, substantive, functional, and financial perspectives. Included is an analysis of mitigation actions and effective use of funds and a system and strategy for monitoring the effectiveness of mitigation efforts and updating the SHMP in the future. It also addresses FEMA criteria for qualifying the 2023 plan as an enhanced plan. *Updates to this section include the revision to reflect the management of all HMA grants by Nevada DEM, updates in the HMA review, ranking and review process due to NHMWG streamlining, and information on disaster recovery framework. Nevada DEM modified terminology for the damage assessment teams. Examples of mitigation activities were also updated.*

8.1 INTEGRATION WITH OTHER PLANNING INITIATIVES

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

ELEMENTS	REQUIREMENTS
E6. Does the plan demonstrate integration (to the extent practicable) with other state and/or regional planning initiatives and FEMA mitigation programs and initiatives? [44 CFR §201.5(b)(1)][207]	a. The Enhanced plan must demonstrate integration with other state and/or regional planning initiatives, including, at a minimum, the following sectors: 1. Emergency management (including Safety and Security; Hazardous Materials; and Food, Water, Shelter community lifelines). 2. Economic development. 3. Land use development, including the agency or department that regulates building codes and administers land use authorities. 4. Housing (including Food, Water, Shelter community lifelines). 5. Health and social services (including Health and Medical community lifelines). 6. Infrastructure (including Energy; Communications; Transportation; and Food, Water, Shelter community lifelines). 7. Natural and cultural resources. Integration must be coordinated and demonstrated with agencies, departments, programs and organizations within the state and/or geographic region, as well as beyond the state agency leading the development of the mitigation plan. Integration should include state agencies and organizations with expertise in climate change and climate adaptation and agencies with programs, policies and assistance that support underserved communities, as well as other leaders and key stakeholders from non-governmental organizations serving these communities in the mitigation planning process. Integration must be demonstrated in terms of current activities and outcomes. Where integration with other state and/or regional planning initiatives representing these sectors is not practicable, the plan must describe the limitations as well as how the state will overcome barriers. These items must be included in the mitigation strategy. b. The enhanced plan must demonstrate integration of FEMA mitigation programs and initiatives. This may include, but is not limited to: PA, FMAG, HMGP, HMGP Post Fire, BRIC, FMA, NFIP, CRS, the Cooperating Technical Partners (CTP) program, Risk MAP, NEHRP, HHPD and the National Dam Safety Program, as well as FEMA programs that advance mitigation, such as Threat Hazard Identification and Risk Assessment and Emergency Management Performance Grant Program. Where integration with FEMA mitigation programs and initiatives is not practicable, the plan must describe the limitations as well as how the state will overcome barriers. These items must be included in the mitigation strategy.

[207] 44 CFR §201.5(b)(1): "Demonstration that the plan is integrated to the extent practicable with other State and/or regional planning initiatives (comprehensive, growth management, economic development, capital improvement, land development, and/or emergency management plans) and FEMA mitigation programs and initiatives that provide guidance to State and regional agencies."

8.1.1 Integration with Other Planning Initiatives

Section 2 of the 2023 SHMP provides a legal, institutional, and policy framework that allows the State to readily integrate advances in hazard mitigation practice in Nevada and provide a framework for the local and tribal communities to do the same. Tables 2-1 and 2-2 of Section 2 identify emergency management and hazard mitigation responsibilities of over thirteen different state agencies, one tribal agency and two local agencies who are involved in the NHMWG and update process. Table 2-7 in Section 2.3.3 provides a detailed listing of the integration of the State plan with more than 15 other major state hazard planning efforts, most of which bear on the highest ranked natural hazards in the State – earthquake, flood, and wildfire. Through the efforts of the NHMWG members, other stakeholders are, at minimum, made aware of the state hazard mitigation planning process and vice versa; members bring to the table the policies and plans developed by other entities outside of state government. While there is a vacant spot within the NHMWG (weather SME) the Working Group continues to reach out and contact individuals specializing in all aspects needed to update the state plan.

An example is the participation of NDF on the NHMWG. NDF staff provide assistance in the development of local and tribal hazard mitigation and contribute to the State plan in the areas of risk assessment, history, and development of goals and objectives for wildfire hazard. NDF also works closely with federal agencies who manage much of Nevada's land when planning wildfire mitigation strategies. The wildfire strategies found in the state plan are based on the National Cohesive Strategy (2014) and 2023 addendum update, which has largely replaced the 10 Year Comprehensive Strategy. Federal, state, and local agencies are engaged in the Nevada Cohesive Strategy working group. The group has created multi-agency action plans that are facilitating inter-agency task accomplishments in the areas of safe and effective wildland fire suppression, fire adapted communities implementation, and resilient landscape maintenance. The Nevada Forest Action Plan can be found at http://stateforesters.org/forest-action-plans/nevada.

The base "National Cohesive Strategy" can be found at the following website: https://www.forestsandrangelands.gov/strategy/documents/strategy/CSPhaseIIINationalStrategyApr2014.pdf.

The 2023 "National Cohesive Wildland Fire Management Strategy Addendum Update," is at: https://www.forestsandrangelands.gov/documents/strategy/natl-cohesive-wildland-fire-mgmt-strategy-addendum-update-2023.pdf.

A second example is the partnership with NDWR in Risk MAP resilience activities in coordinating meetings with communities to discuss the risks of flood with customized portfolios showing potential flash flooding locations. Both NV DEM and NDWR participate in any community meetings that are scheduled with Risk MAP.

Local planning efforts, such as the Truckee River Flood Management Project (Flood Project), which can be found at http://trfma.org/the-project/planning/, are integrated into the Washoe County's Regional HMP (referenced in the plan as the Living River Plan). Project elements from the Flood Project are listed in Appendix L. Both plans address activities to mitigate flooding in all communities situated along the Truckee River. The County's plan is integrated into the state plan. Additionally, the CWSD works closely with local, state, and tribal agencies to preserve the Carson River watershed and reduce flooding using a regional approach. The CWSD developed a plan for the watershed drafted in conjunction with mutual members of the NHMWG and CWSD.

A third example is the integration with the State's Threat and Hazard Identification and Risk Assessment (THIRA) / Stakeholder Preparedness (SPR). Section 3.32 of the 2023 NHMP update includes an overview of the 2022 State of Nevada THIRA/SPR to include a crosswalk of THIRA and NHMP threats and hazards. Although not required for the THIRA/SPR, the State of Nevada has included Mitigation core capabilities since 2019.

A fourth example is the 2023 update of the NHMP includes the State of Nevada Climate Strategy in its analysis in Section 3, focusing on the most significant hazards affected by climate change:

- Heat and heat waves
- Drought
- Loss off snow
- Floods
- Wildfires

The integration of climate change led to the addition of two (2) goals and nine (9) strategic actions in Section 4.1.1 for drought and extreme heat.

8.1.2 Integration with FEMA Programs

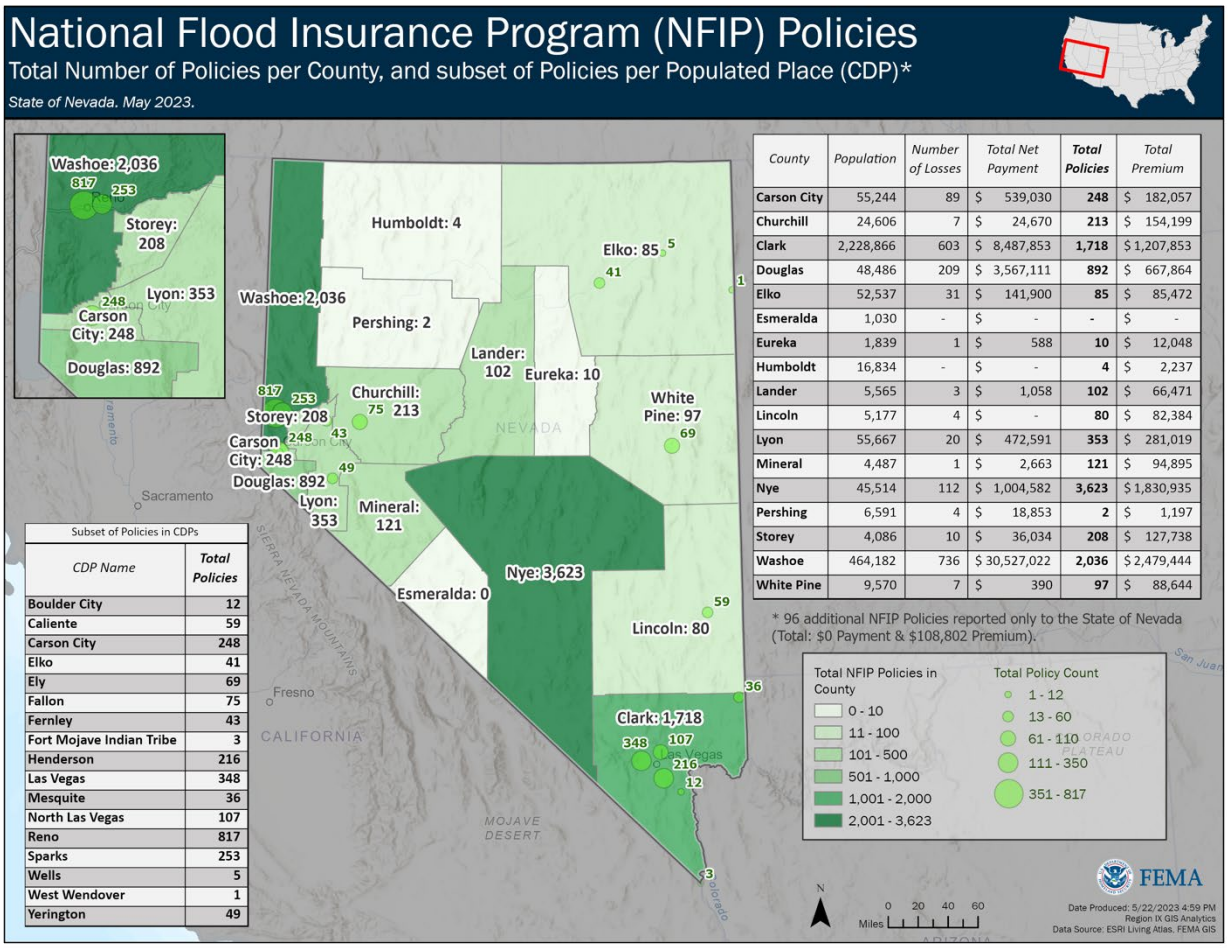
Table 2-7 lists FEMA mitigation programs and initiatives, the pertinent hazards, a brief statement of the mechanism for integration of the Nevada State plan and local plans with the FEMA program. The pertinent goals and strategic actions are fully outlined in Table 4-2. Additional efforts to integrate hazard mitigation planning with different planning mechanisms at the local level are demonstrated by NHMWG, holding its meetings with a virtual option bringing awareness of risks and activities that enhance the resiliency of each individual community throughout the state. It is also notable that the NHMWG membership includes a representative whose responsibility is implementing one or more of the FEMA mitigation programs. As the Working Group expands to include more stakeholders in the process of updating the state plan, so grows its integration with other planning mechanisms and the FEMA mitigation programs. These stakeholders in turn bring to the planning process their vast network of working relationships with other local, tribal, state, and federal agencies that promote integration of mitigation plans and FEMA's programs. During this update process, the Working Group acquired new subject matter experts from NDEP, NDWR, NWS, and Reno-Sparks Indian Colony. The resulting plan is used as a guide by other agencies and communities in Nevada in the development of their mitigation strategies and plans. NBMG has updated its open GIS site for exploring hazards, resources, and other maps at https://data-nbmg.opendata.arcgis.com.

In coordination with the FEMA Risk MAP program, mitigation staff developed program integration activities by collaborating with the Floodplain Manager (FM) and NDWR to implement mitigation workshops throughout the state.

Table 4-3 in Section 4.2.1 presents the state's capability to mitigate the hazards described in Section 3 and demonstrates pre-and post-disaster hazard management policies, programs, and capabilities. It also presents the state's funding capabilities for hazard mitigation projects - whether it can support, facilitate, or fund such projects. Support implies that the state manages federally funded programs. The state facilitates mitigation programs by providing technical assistance to local, tribal, and other entities. The last column provides details of each listed program or agency and its policies and capabilities to mitigate hazards in the state. Even a brief perusal of this chart reveals that there are dozens of available programs, mostly at the federal

level, which the State of Nevada and locals are eligible to apply for to support and facilitate hazard mitigation projects for all types of hazards in the state.

Figure 8-1 depicts the National Flood Insurance Program (NFIP) Policies in Nevada counties and populated places.



County	Population	Number of Losses	Total Net Payment	Total Policies	Total Premium
Carson City	55,244	89	$ 539,030	248	$ 182,057
Churchill	24,606	7	$ 24,670	213	$ 154,199
Clark	2,228,866	603	$ 8,487,853	1,718	$ 1,207,853
Douglas	48,486	209	$ 3,567,111	892	$ 667,864
Elko	52,537	31	$ 141,900	85	$ 85,472
Esmeralda	1,030	-	$ -	-	$ -
Eureka	1,839	1	$ 588	10	$ 12,048
Humboldt	16,834	-	$ -	4	$ 2,237
Lander	5,565	3	$ 1,058	102	$ 66,471
Lincoln	5,177	4	$ -	80	$ 82,384
Lyon	55,667	20	$ 472,591	353	$ 281,019
Mineral	4,487	1	$ 2,663	121	$ 94,895
Nye	45,514	112	$ 1,004,582	3,623	$ 1,830,935
Pershing	6,591	4	$ 18,853	2	$ 1,197
Storey	4,086	10	$ 36,034	208	$ 127,738
Washoe	464,182	736	$ 30,527,022	2,036	$ 2,479,444
White Pine	9,570	7	$ 390	97	$ 88,644

Subset of Policies in CDPs

CDP Name	Total Policies
Boulder City	12
Caliente	59
Carson City	248
Elko	41
Ely	69
Fallon	75
Fernley	43
Fort Mojave Indian Tribe	3
Henderson	216
Las Vegas	348
Mesquite	36
North Las Vegas	107
Reno	817
Sparks	253
Wells	5
West Wendover	1
Yerington	49

Figure 8-1. National Flood Insurance Program (NFIP) Policies in Nevada.

8.2 PROJECT IMPLEMENTATION CAPABILITY

ELEMENT	REQUIREMENTS
E9. Does the enhanced plan document capability to implement mitigation actions? [44 CFR §§201.5(b)(2)(i)[208], 201.5(b)(2)(ii)[209], and 201.5(b)(2)(iv)[210]]	a. The enhanced plan must describe the system to rank the mitigation measures according to established eligibility criteria, including a process to prioritize between funding programs, jurisdictions, and proposals that address different or multiple hazards. b. The enhanced plan must describe how the state will assess the effectiveness of mitigation actions, including the agencies that are involved as well as the timeline, and use the results to inform the mitigation strategy. Effectiveness may be based on cost factors but may also include other beneficial functions, including non-monetary benefits for underserved communities.

Nevada DEM administers the federal hazard mitigation grant programs in the HMA program, each of which is addressed in this section:

- Hazard Mitigation Grant Program (HMGP)
- HMGP – Post Fire
- Pre-Disaster Mitigation Grants (PDM)
- Flood Mitigation Assistance Grants (FMA)
- Building Resilient Infrastructure and Communities (BRIC)
- Safeguarding Tomorrow Revolving Loan Fund Program (STORM Act)

Each of these programs requires applications for proposed activities (usually planning and project activities) and is reviewed for the following:

1. Consistency with federal and state eligibility criteria (Section 5.3)
2. Consistency with state mitigation priorities (Table 4-10)
3. Rank based on state ranking criteria (Section 5.3.1.1 and Figure 8-2 below)

The Safeguarding Tomorrow Revolving Loan Fund Program is a new program to FEMA Mitigation. This program requires additional legislation through the Nevada State Legislature which only meets every two years. When this program began, it was too late to bring new legislation before the 2023 State Legislature and for this reason, Nevada is unable to utilize this program until new legislation can be brought before the legislature in two years. Nevada plans to move forward with this program once the proper legislation allowing for this program is in place.

8.2.1 Establishing Eligibility Criteria for Multi-Hazard Mitigation Measures

[208] 44 CFR §201.5(b)(2)(i): "Documentation of the State's project implementation capability, identifying and demonstrating the ability to implement the plan, including: Established eligibility criteria for multi-hazard mitigation measures."

[209] 44 CFR §201.5(b)(2)(ii): A system "to rank the measures according to the State's eligibility criteria. A system to determine the cost effectiveness of mitigation measures, consistent with OMB Circular–94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs."

[210] 44 CFR §201.5(b)(2)(iv): "A system and strategy by which the State will conduct an assessment of the completed mitigation actions and include a record of the effectiveness (actual cost avoidance) of each mitigation action." [45] 44 CFR §201.5(b)(3): "Demonstration that the State effectively uses existing mitigation programs to achieve its mitigation goals."

Before forwarding applications to FEMA, Nevada DEM, NDWR, and NHMWG review proposed activities to ensure consistency with federal and state criteria. Nevada DEM documents the review and keeps a record of it. Figure 8-2 is an excerpt from the currently approved HMA Administrative Plan showing the eligibility criteria used by both Nevada DEM and NDWR in reviewing applications for funding of mitigation activities under the HMA programs.

The first step in the eligibility review is done when the Notice of Interest (NOI) is submitted by the possible subapplicant. The SHMO and the FM jointly review these notices against the current guidelines and the eligibility criteria found in Figure 8-2 to ensure that both the subapplicant and the proposed project are eligible. A formal notification about the eligibility of each NOI is forwarded to each submitting entity stating the eligibility of the proposed activity. This is done prior to the NHMWG review to ensure that eligibility criteria are met prior to the subapplicant's investment of time in the benefit cost analysis and completion of the remaining required documentation such as commitment letters.

Next, the applications are reviewed by the NHMWG to provide feedback to eligible subapplicant and to ensure the application is feasible, cost effective, and is a long-term solution to the risk. Any recommended revisions are formally presented to the subapplicant to revise. The subapplicants have several weeks to make the recommended revisions and enhance the application prior to a final review by the SHMO, FM, and Mitigation Specialist who work with the subapplicant in making revisions to comply with the recommendations made by the NHMWG members.

Next, applications are prioritized by NHMWG using a numerical scoring process for clarity, consistency, and accuracy. This is done at open meetings where the scores from each NHMWG member are tabulated, added, and averaged with the highest scoring proposals rating higher in priority. Immediately after prioritization, the SHMO and/or FM notify all participating subapplicants of the prioritization results and submit all applications to FEMA. Many participating subapplicants attend these open meetings and are aware of their application status immediately at the meeting.

For HMGP funding, applications are submitted to FEMA in order of the priority assigned with consideration to the amount allocated to the state. Applications may be submitted out of order to ensure the use of all funding allocated.

Ranking and Selection of Applications

1. The NHMWG will be the review, ranking and selection panel for the Hazard Mitigation Assistance program funding sources listed below.
   a. Hazard Mitigation Grant Program
   b. Hazard Mitigation Grant Program – Post Fire
   c. Building Resilient Infrastructure and Communities,
   d. Flood Mitigation Assistance,
2. Each application will be reviewed for eligibility. It is the function of the NHMWG to review, prioritize and select projects for submission to FEMA for approval and funding.
3. Prioritization Criteria for HMA Applications
   Any application for mitigation funding must include all necessary data to allow the NDEM, NDWR and the NHMWG to evaluate the project in terms of the criteria listed below.
   The NHMWG will use the "NHMWG Prioritization Form" as a tool to help prioritize applications. The form uses the Prioritization Criteria for HMA Applications, Section I-3 "a"

through "h" as applicable (weighted 40 percent) and the Additional Selection Criteria in Section I-4 "a" through "h" (weighted 60 percent) to prioritize applications submitted for funding under the HMA programs. Life safety issues shall be the primary consideration during evaluation of an application.

a. Community Population Affected. The percentage of the population benefiting which equals the number of individuals directly benefiting divided by the community population.
b. Disadvantaged and Underserved Communities. The percentage of population that is considered disadvantaged and/or underserved benefitted divided by the community population.
c. Public Perception of Need. The application will be evaluated in terms of satisfying the public's desire to see their money spent on "worthwhile" activities and the public's perception of the need.
d. Emergency Access and Public Inconvenience. **Project** applications will be evaluated to determine its impact on the access of emergency vehicles including police, ambulance, and fire vehicles to their respective substation, hospital or station. The evaluation will include an assessment of the project's contribution to the accessibility to isolated residences, businesses, and public facilities created by the hazard. **For planning and/or planning-related applications,** the application demonstrates the performance of plan maintenance and implementation of mitigation activities.
e. Benefit Cost Analysis (BCA). The cost effectiveness of the **project** resulting in a BCA ratio equal to 1. **For planning and/or planning-related applications**, the thoroughness of the scope of work demonstrating an understanding of the planning process and a methodology for completing the proposed mitigation plan.
f. Availability of Other Funding Sources. This includes an evaluation of the potential for funds from other grants, and other public and private interests. Low score if other funding is available.
g. Timing and Implementation. All aspects of timing and implementation will be considered under this item including, but not limited to, the ability to administer, begin, and complete a project or plan within the performance period.
h. Environmental Enhancement. Evaluation of this criterion, for **project** applications, includes benefits derived from improving or mitigating the threat to public health. It also includes, if applicable, information on the project's enhancement of habitat, recreational opportunities, and water quality.
i. A **project's** resilience, sustainability and maintenance plan. Resilience is the ability to recover after an event. Sustainability is the environmental, social and economic concerns. The designation of a responsible party, schedule and funding for continued maintenance during the life expectancy of the project. **For planning and/or planning-related applications,** the description of unique or innovative outreach activities appropriate to the planning process that advance mitigation and/or serve as a model for other communities.

4. Additional Prioritization Considerations

The NHMWG will evaluate and prioritize all eligible applications using the criteria in 3 above and the considerations (a-h) below. See NHMWG Prioritization Form following this section. This ranking will be in accordance with the criteria in 44 CFR Section 206.

a. Requests for funding must be consistent with the State and Local Hazard Mitigation Plans.
b. Measures that, if not taken will have a detrimental impact on the subrecipient, such as potential loss of life, loss of essential services, damage to critical facilities, or economic hardship on the community.
c. Measures that have the greatest potential impact on reducing future disaster losses

(Repetitive Loss Properties).

d. Measures designed to mitigate multiple hazards and/or accomplish multiple objectives including damage reduction, environmental enhancement, and economic recovery.
e. Measures that optimize the total amount of funding available, including overmatching of Federal funds with non-Federal funds when developing this ranking.
f. NHMWG will also consider the level of interest and demonstrated degree of commitment of each subrecipient.

5. The Chief of Emergency Management makes the final decision on applications the State submits to FEMA. The NHMWG makes a final recommendation to the Chief prior to his decision making.
6. When submitting more than one application to the State, the subrecipient must provide an internal ranking to the NHMWG.

PRIORITIZATION EVALUATION

Application Prioritization Criteria Section I-4 "a" through "h" (weighted 40 percent) and the Additional Selection Criteria in Section I-5 "a" through "g" (weighted 60 percent) will be rated by the NHMWG on a scale of zero (0) through ten (10). The NHMWG will use the total point values in the **PRIORITIZATION FORM** below as a guide to the overall evaluation.

Figure 8-2. Review, Ranking, and Selection Process**.**

NHMPC Prioritization Form

Subgrantee: _____ **Activity Name:** _____

Ranking and Selection of Applications:

Application Prioritization Criteria (I-3) **Assigned Value (0 - 10)**

a. Population Affected _____
b. Public Perception of Need _____
_____
c. Underserved/disadvantaged population _____
d. Emergency Access and Public Inconvenience
For planning applications:
Performance of current plan maintenance activities & Implementation of mitigation activities. _____
e. Cost Effectiveness of the Project (BCA=1) (10 pts)
For planning applications: (15 pts)
Understanding of the planning process and a methodology for completing the proposed mitigation plan. _____
f. Availability of Other Funding Sources _____
g. Timing and Implementation _____
h. Environmental Enhancement (10 pts)
For planning and planning-related activity applications: (0 pts) _____
_____
i. Resilience, Maintenance & Sustainability of Project (10 pts)
For planning and planning-related avtivity applications: (15 pts)
The description of unique or innovative outreach activities _____
Subtotal Prioritization Criteria (I-3, a thru h) _____
Subtotal Criteria - (80-Point Maximum)/2 = _____

	(Max. 40 points)
Additional Prioritization Considerations (I-4)	
a. Consistent with State & Local Mitigation Plan	_____
b. Detrimental Impact if Not Taken	_____
c. Greatest Impact to Reduce Future Disaster Losses	_____
d. Mitigate Multiple Hazards and/or Accomplish Multiple Objectives	_____
e. Optimize Total Funds Available	_____
f. Local Level of Interest & Degree of Commitment to Project	_____
Additional Considerations Combined (I-4, a thru f)	_____
	(Max. 60 points)
Total Criteria + Considerations	_____ **(Max. 100 points)**

Figure 8-3. NHMWG Application Prioritization Form.

8.2.2 System to Determine the Cost Effectiveness of Mitigation Measures

FEMA-funded proposed activities must meet the criteria described in Office of Management and Budget (OMB) Circular A-94 Guidelines. Nevada DEM uses the most current version of FEMA's Mitigation BCA Toolkit, presently found in the portal at https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis/full-bca#download, which incorporates the discount rate and present day value in the B/C ratio calculations. Grant subapplicants perform the BCA for each project application. Currently, Nevada DEM provides basic benefit-cost training to potential applicants as part of the application workshops, allowing the applicants to perform their own analysis and request assistance from the helpline for complex questions. Advanced BCA courses are offered by FEMA, although not regularly in Nevada. Nevada DEM makes an effort to notify possible Nevada subrecipients about neighboring states venues where FEMA conducts such training. Nevada is currently in the process of procuring a contract with a national company to provide application development as well as BCA development assistance to our stakeholders.

8.2.3 System to Rank the Measures According to the State's Eligibility Criteria

A task force of the now retired Nevada Hazard Mitigation Planning Committee (NHMPC) developed the criteria described in Figure 8-2 when the PDM competitive grant program was initiated in 2003. These criteria are now used to prioritize mitigation activities for all HMA programs that are managed by Nevada DEM. NHMWG members are very knowledgeable about Nevada's communities, their risks, vulnerabilities, capabilities, and mitigation strategies. Together, the group has combined expertise in the identified and profiled highest-risk hazards for Nevada giving them the necessary professional background to address the proposals for all hazards and to allow competitiveness among a set of very diverse rural and urban communities.

PRIORITIZATION EVALUATION

Application Prioritization Criteria Section I-3 "a" through "h" (weighted 40 percent) and the Additional Selection Criteria in Section I-4 "a" through "f" (weighted 60 percent) will be rated by the NHMWG on a scale of zero (0) through ten (10). The Committee will use the total point values in the **PRIORITIZATION FORM** in Figure 8-3 as a guide.

SUBMISSION OF SELECTED PROJECTS TO FEMA

1. The SHMO will prepare a project package for submission to FEMA containing:
   a. A narrative describing the anticipated project benefits, justification for recommendation and rationale for project selection;
   b. A certification that the project meets all eligibility requirements;
   c. The grantee and subrecipient must review the information submitted for content and make sure all documentation (such as maps, etc.) are included so FEMA can complete a National Environmental Protection Act (NEPA) review; Compliance with the NEPA is a FEMA responsibility.
   d. A completed SF 424, Application for Federal Assistance, signed by the GAR;
   e. All projects and supplements must be submitted to FEMA no later than one year from the declaration date or upon approval for extension.
2. The NHMWG will review, approve, and prioritize selected projects for submission to FEMA.
3. Upon FEMA project approval, the SHMO will notify the NHMWG and subrecipients of which projects have been approved. A packet containing the following information will be provided to the approved subrecipients:
   a. Reporting requirements;
   b. Requesting funds;
   c. Eligible administrative costs;
   d. State-Local Disaster Agreement;
   e. State and Federal Assurances;
   f. Eligible administrative costs;
   g. State-Local Disaster Assistance Agreement;
   h. State and Federal Assurances
4. Upon FEMA disapproval of a project, the SHMO will advise subrecipients of the appeal process as outlined in 44 CFR part 206.440.

Nevada is a large state with small population and presidentially declared disasters tend to be sporadic and small in comparison to other states in Region IX. Thus, applications for the HMGP program are not submitted in great numbers mostly due to the very limited funding this program brings. Historically, all HMGP applications have been submitted to FEMA with a clear prioritization. The hazard mitigation program currently has a library of proposed activities not funded under PDM or FMA for consideration when HMGP or any funding source is available. Nevada continues to build out this list for future funding.

Applications not funded by FEMA are subsequently enhanced by the subrecipients using the NHMWG recommendations and are resubmitted for funding under any funding source when available.

Below is a list of major disaster declarations in Nevada for the last decade and the amount allocated for mitigation for each declared disaster.

Table 8-01. Mitigation Funding Under Presidential Disaster Declarations

Year	Hazard Type	Mitigation Allocation
2023	Flood	TBD
2020	Pandemic	$13,584,381
2017	Flood	$2,157,558.25

2017	Flood	$2,689,362.26
2014	Flood	$583,609
2012-2013	Drought	**

**FEDERAL FUNDING FOR DROUGHT RELIEF IS PROVIDED DIRECTLY TO THE AFFECTED ENTITY AND THUS IS NOT TRACKED BY NEVADA DEM

8.3 PROGRAM MANAGEMENT CAPABILITY

ELEMENT	REQUIREMENTS
E2. With regard to HMA, is the state maintaining the capability to meet application timeframes and submitting complete project applications? [44 CFR §201.5(b)(2)(iii)(A)[211]]	a. All applications are complete and submitted by the end of each program's respective application period. b. All applicants are entered into FEMA's electronic data systems (i.e., the National Emergency Management Information System [NEMIS], eGrants, and/or FEMA Grants Outcomes [FEMA GO]). c. A complete Minimum Criteria Checklist for Project Subapplicants or equivalent documentation is prepared for all subapplications. States may develop and use their own checklists if approved by FEMA and the state. d. All applications are determined to be complete by FEMA within 90 days of submittal or selection for further review, or after the first request for information response. Required environmental and historic preservation (EHP) reviews and consultations will not be included in the 90-day review timeframe calculations.
E3. With regard to HMA, is the state maintaining the capability to prepare and submit accurate environmental reviews and benefit-cost analyses? [44 CFR §201.5(b)(2)(iii)(B)]	a. All applications and amendments are determined to be complete by FEMA within 90 days of submittal or selection for further review, or after the first request for information response, including all data requested by FEMA to support cost-effectiveness determinations and EHP compliance reviews. Required EHP reviews and consultations will not be included in the 90-day review time frame calculation. Technical assistance contracts for EHP considerations and cost-effective determinations will not be charged against the state. However, the state staff must document general understanding of the program. This should be done by completing relevant Emergency Management Institute courses (Benefit-Cost Analysis and EHP) or their equivalent.
E4. With regard to HMA, is the state maintaining the capability to submit complete and accurate quarterly progress and financial reports on time? [44 CFR §201.5(b)(2)(iii)(C)[212]	a. All progress reports must be complete and submitted on time. Information in reports must accurately describe grant activities, including data related to the completion of individual property acquisitions. Incomplete progress reports that do not provide information on all open grants and subgrants or do not include all information required by the HMA Guidance are not considered on time. b. All Federal Financial Reports (FFR) Standard Form (SF) SF-425 are submitted on time. Information in reports must accurately describe grant activities as described in the HMA Guidance. State consistently complies with the Financial and Program Management Standard requirements described in 2 CFR §§ 200.300 to 200.309.

ELEMENT	REQUIREMENTS

[211] 44 CFR §201.5(b)(2)(iii)(A): "Demonstration that the State has the capability to effectively manage the HMGP as well as other mitigation grant programs, including a record of the following: (A) Meeting HMGP and other mitigation grant application timeframes and submitting complete, technically feasible, and eligible project applications with appropriate supporting documentation;"

[212] 44 CFR §201.5(b)(2)(iii)(C): "Demonstration that the State has the capability to effectively manage the HMGP as well as other mitigation grant programs, including a record of the following: (C) Submitting complete and accurate quarterly progress and financial reports on time;"

E5. With regard to HMA, is the state maintaining the capability to complete HMA projects within established performance periods, including financial reconciliation? [44 CFR §201.5(b)(2)(iii)(D) [213]]	a. All work as part of HMA subawards must be completed by the end of the period of performance as described in the HMA Guidance. All extension requests must be complete, on time, and with adequate justification as described in the HMA Guidance (2015) and subsequent update. Complete subaward closeout packages are submitted to FEMA no later than 180 days from project completion. All subaward closeout packages are determined to be complete by FEMA after the first request for information response. b. There should be no major findings on the last single audit obtained by the state related to HMA programs. For states without HMA grants, FEMA will review other federal grants prepared by the responsible agency (such as the state emergency management agency). c. All grant closeout activities and documentation, including financial reconciliation, are completed within 120 days from the end of the award performance period as outlined in 2CFR 200.344, including: 1. Final FFR SF-425 and Performance Reports complete and submitted within 120 days from the end of the performance period, unless an extension is granted by FEMA. 2. Statement that approved scope of work and all EHP requirements have been satisfied. 3. Completed SF-270 Request for Advance or Reimbursement or request to de-obligate funds, if applicable, due to cost underruns. 4. Other documentation is complete, as required in the HMA Guidance. 5. No late drawdowns are requested or performed after the liquidation period has ended. d. Actual expenditures have been documented and are consistent with SF-424A or SF-424C.

[213] 44 CFR §201.5(b)(2)(iii)(D): "Demonstration that the State has the capability to effectively manage the HMGP as well as other mitigation grant programs, including a record of the following: (D) Completing HMGP and other mitigation grant projects within established performance periods, including financial reconciliation."

8.3.1 Effective Management of HMA Programs

Nevada DEM now administers three federal hazard mitigation grant programs in the Unified HMA program. Both the SHMO and the Floodplain Manager continue to work very closely to implement all applicable mitigation programs. Nevada DEM uses the established application review process shown in Figure 8-4 to ensure timely and adequate implementation of the HMA programs.

In the last 2 years, Nevada had two Presidential disaster declarations. This resulted in Nevada being able to reach out and help local jurisdictions develop successful HMGP applications with 11 projects for DR-4523 with several subgrants already awarded and DR-4708 still in process. FM-5382 resulted in three subapplications. FM-5448 is still in application process. BRIC 2022 resulted in two planning and one project scoping subapplication, as well as six project subapplications and one large competitive subapplication for the State of Nevada.

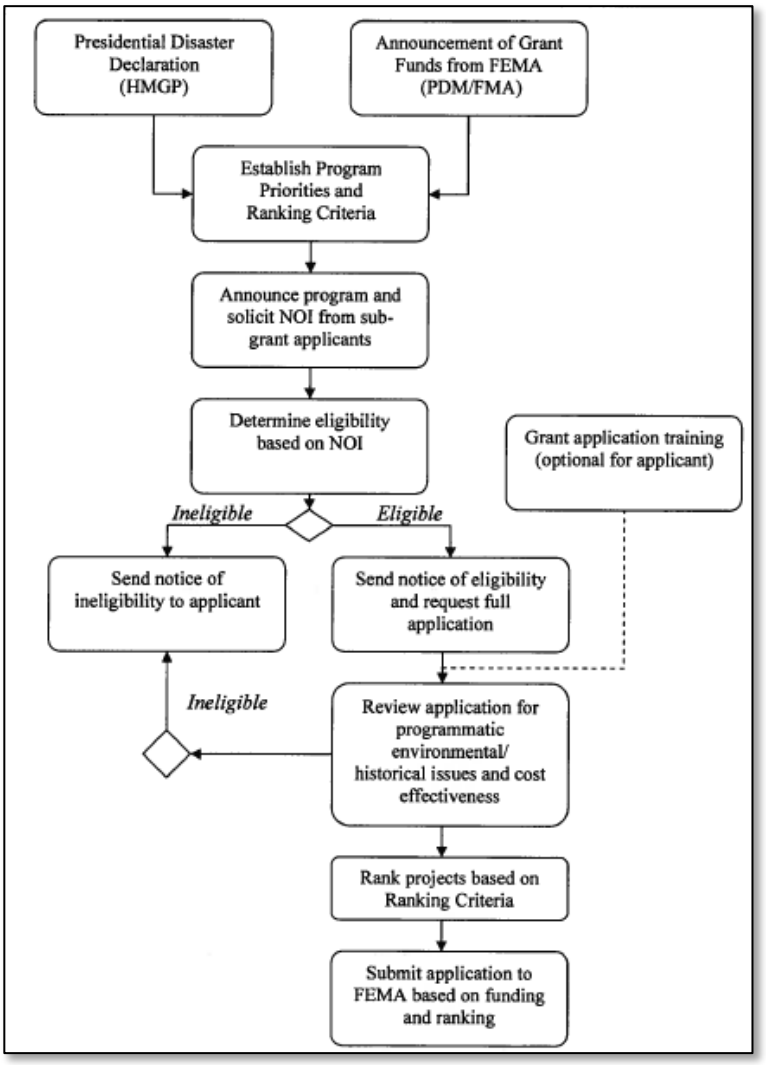


Figure 8-4. Mitigation Activities Review Process.

The functions of the SHMO include the following:

1. Working with communities to develop appropriate grant applications for the HMA programs.
2. Technical Assistance.
3. Fiscal management of grants when received.
4. Grant close-outs.

Based on the number of awards in the 2019 - 2023 period, Nevada DEM has a successful record of meeting mitigation grant application timeframes and submitting complete, technically feasible, and eligible proposed activity applications with appropriate supporting documentation with request for information (RFIs) completed within the required 90-day period from the time of the first RFI. NV DEM completes all requests for additional information in the required timeframe.

When new federal guidelines for HMA funding are available, the SHMO and the FM hold intensive application training workshops to increase the quality of applications. The last training workshops were held in April 2023. These training workshops cover specific grant programs, preparing an application, contacting a BCA, using the FEMA GO system, and meeting all basic requirements of each grant category. Before each new grant cycle or award, the SHMO reviews scoring criteria and considers FEMA changes to grant requirements and criteria. The SHMO notifies the NHMWG and potential subapplicants quickly if any modifications affect the criteria or process. This ensures that Nevada DEM procedures are up-to-date and consistent with federal direction in hazard mitigation.

During the 2019-2023 period, Nevada DEM has successfully processed hazard mitigation awards under HMA programs, not including PDM 17. All applications submitted were reviewed and the sub-applicants were provided feedback about proper documentation and the environmental questionnaire. Feedback and cooperation with the subrecipient occupy the available time of the SHMO. Nevada exceeded its funding minimum allocation of $500,000 in the PDM program in 2013 through 2018. A listing of open, closed and pending awards is maintained by the SHMO in a spreadsheet format that tracks expiration date, quarterly reporting, closure and balances. This information is provided to the NHMWG and the public on a quarterly basis.

Program and financial reports for each award are reviewed by mitigation staff for completeness, content, and appropriate programmatic responses. Mitigation staff, SHMO or Mitigation Specialist, will record any discrepancy or concern found in this initial review in the appropriate file, request a technical assistance meeting with the subrecipient to discuss the issue and note any corrective actions in the report for reference. Follow-up calls, emails and, if necessary, visits, are made to ensure the corrective actions are completed. Fiscal staff will accompany mitigation staff occasionally or depending on the corrective action.

Upon completion of the review by mitigation staff, the reports are forwarded to fiscal staff who audits them for consistency, accuracy, and eligibility of expenditures. Fiscal staff process reimbursement of funding based on quarterly report audits. Fiscal staff also maintain grant reconciliation reports showing balances and expenditures per grant by calendar year. A declining balance report for each HMA award is maintained allowing for consistent tracking of balances. Mitigation staff members use these reports to manage the awards and to update NHMWG at quarterly meetings. A sample of the Monthly Reconciliation report is shown below in Figure 8-5. This format remains consistent in 2023 so was unchanged.

PRE DISASTER MITIGATION GRANT
2016
MONTHLY RECONCILIAITON

EMF-2017-PC-0009
PDM15 9704717-3700

SUBRECIPIENT (AGENCY)	GRANT AWARD				CLAIMS										Award Less Claims BALANCE	GRANT CLOSED
	ORIGINAL	Deobligated	Additional	TOTAL	QFR 1		QFR 2		QFR 3		QFR 4		QFR 5	TOTAL CLAIMS		
JURISDICTION	$ 154,999.50			$ 154,999.50	-		-		-					$ -	$ 154,999.50	
TOTALS	$ 154,999.50	$ -	$ -	$ 154,999.50	$ -		$ -				$ -		$ -		$ -	$ 154,999.50	

CAT 23 - RGL 3591	9704717-3700
Fed Performance Period:	
AWARD AMOUNT =	$ 154,999.50
Less Claims:	$ -
GRANT BALANCE:	$ 154,999.50

PROOF	
Fed AWARD	$ 154,999.50
Less Subgrants	$ (154,999.50)
Unallocated	$ -
Locals Balance	$ 154,999.50
Balance	$ 154,999.50

=

O/S Pmts
-
-

9704717-3700

RECONCILIATION OF EXPENDITURES VS CLAIMS		
02/09/18	3674 DAWN 74.0 EXP SFY18:	-
	3674 DAWN 74.0 EXP SFY19:	
	Outstanding:	-
	TOTAL EXPENDITURES:	-
	Less Total Claims:	-
	DIFFERENCE:	-

Reconciled 2.13.18 mad

Figure 8-5. Sample Award Tracking Report.

8.3.2 Environmental Review and Benefit-Cost Analysis

The SHMO and/or mitigation staff ensures that all subapplicants have provided all required environmental information and benefit-cost analysis information in the application, including required documentation for all data sources and thorough description of calculations and assumptions. The SHMO and FM rely on the staff of FEMA Region IX to conduct environmental reviews for construction projects seeking hazard mitigation grant funding from the HMA Programs. Before FEMA approval of a hazard mitigation grant, the project activities must comply with all applicable federal, state, and local codes and standards including the National Environmental Policy Act (PL 91-190, as amended) and all federal laws covered within the act, and for securing the necessary permits and approvals. Nevada does not provide funds to cover environmental reviews. Mitigation staff provide FEMA RIX's EHP most current checklist to all subapplicants applying for projects to be completed and submitted with their application. Additionally, webinars are being provided to ensure additional EHP training to stakeholders.

8.3.3 Quarterly Progress Report and Monitoring

The SHMO submits complete and accurate quarterly progress and financial reports on time. Quarterly reports based on measurable outcomes are generated by the sub-grantee and reported to Nevada DEM. Nevada DEM compiles the reports, assesses the programmatic and financial components, and sends the reports to FEMA. The reports include the following:

- Percent completion of the project
- Progress on milestones identified in the original schedule
- Overall assessment of the schedule
- Adherence to budget (including overruns and underruns)

If subrecipients do not submit timely and accurate quarterly reports or the reports indicate problems associated with the above components, Nevada DEM will provide technical assistance and suggest corrective action. The SHMO requires the subrecipient to submit a plan for corrective action in writing. If the plan of action is not carried through, then payment processing is suspended.

The SHMO monitors the progress by reviewing the Quarterly Progress Report (see Figure 6-2 in Section 6) and may, at any time, contact the subrecipient to review the project. Subrecipient quarterly reports are received electronically; packaged by program; filed; and sent to the applicable FEMA Region IX staff. HMGP reporting is provided to FEMA via email. All other grant reporting is done through the E-Grant system, FEMA GO, and/or ND Grants.

The success of the reporting and monitoring process is documented by two mileposts:

1. We have successfully tracked the progress and money trail of each subrecipient's project through completion and closure.
2. Subrecipients have generally adhered to budget.

The great diversity in the type of projects presents a wide variety of issues to deal with; sometimes a new one with each project. It is a constant learning process. Despite these challenges, the monitoring and reporting process continues to work well.

8.3.4 Mitigation Activities Completion and Closeout

The State of Nevada completes all mitigation grant activities within established performance periods, including financial reconciliation. The SHMO is responsible for HMA closeout procedures. Since the approval of the last plan in 2018, Nevada DEM has successfully disbursed

and closed out (or is in the close-out process) approximately 11 HMA individual grants, five overall HMA grants, one HMGP grants, and two complete HMGP programs.

Nevada successfully closed one overall PDM grant as well as their associated subgrants in the last 12 months. Nevada is dedicated to its process of grant management, including outreach and education to our local jurisdictions, and helping local jurisdictions work toward their mitigation goals reflected in their county hazard mitigation plans.

The HMGP closeout procedures are initiated when the subrecipient informs the SHMO that the project has been completed and all expenditures are reimbursed. As part of the closeout procedure, the subrecipient is required to submit a final Quarterly Financial Report and cost documentation. The PDM/BRIC grant closeout procedure is initiated when:

1. The subrecipient informs Nevada DEM that the project is completed, or
2. The performance period for the grant will expire.

As part of the closeout procedure, the subrecipient is required to submit a final Quarterly Financial Report and closeout documentation. For projects, the SHMO performs a site visit prior to closeout to confirm that the project has been completed as stated in the approved scope of work. This is documented as part of the closeout package. The SF-425s are submitted on time by the fiscal staff upon closure of the grants.

For each grant program, the SHMO ensures that quarterly reports and closeout documents are submitted on time. Nevada DEM currently has a dedicated auditor position who performs fiscal site audits of subrecipient grant files.

If a project is not close to completion and its performance period is about to expire, first the SHMO evaluates specific details of the project with the subrecipient. The subrecipient is required to submit a plan of action for completion of the work on the project. Usually, a request for time extension is sufficient to complete the project goals and objectives. In some cases, the subrecipient's agency may provide additional matching funds necessary to complete work on a project. Other innovative approaches may be implemented depending upon the circumstances and the details of the specific project.

8.4 ASSESSMENT OF MITIGATION ACTIONS

ELEMENT	REQUIREMENTS
E9. Does the Enhanced plan document capability to implement mitigation actions? [44 CFR §§201.5(b)(2)(i)[214], 201.5(b)(2)(ii)[215], and 201.5(b)(2)(iv)[216]]	a. The Enhanced plan must describe the system to rank the mitigation measures according to established eligibility criteria, including a process to prioritize between funding programs, jurisdictions, and proposals that address different or multiple hazards. b. The Enhanced plan must describe how the state will assess the effectiveness of mitigation actions, including the agencies that are involved as well as the timeline, and use the results to inform the mitigation strategy. Effectiveness may be based on cost factors but may also include other beneficial functions, including non-monetary benefits for underserved communities.

8.4.1 System and Strategy for the Assessment of Completed Mitigation Actions

Since 2003, Nevada DEM has maintained a database that contains all HMA project files, from initial funding through project completion. This is made up of over 112 projects, 31 of which have been added since 2018. The database provides information on the scope of the projects, local contacts, and it also provides examples to other communities of mitigation activities that could be done in their areas.

The database is structured such that in the event of a disaster occurring in the State, the SHMO may check the database to determine if a mitigation project has been funded in the immediate vicinity of that disaster area. Existing project files include locations, project particulars, and local contact people. Local contact is made by the SHMO to request a field report on the effectiveness of the mitigation project, with local participants deciding cost-avoidance. This process should provide quality assessment information of the effectiveness of local mitigation projects from the local level. In addition, when an event occurs, field-gathered information is used in developing a state emergency proclamation and in requesting a federal disaster declaration. Since the implementation of the database, there has been one disaster occurrence that correlates to completed mitigation projects. The 2017 flood in Reno-Sparks required hundreds of residents to evacuate. A storm that brought several inches of rain to the area and the nearby snow-covered mountains, which led to the biggest flood in Northern Nevada in more than a decade. The Lockwood property, owned by Washoe County, was restored following flooding issues in 1997. Structures on the property were demolished, and the area is now a park. The project was completed by The Nature Conservancy (TNC), TRFMA, and other partners. The restoration included: one new river meander, eight riffles, two wetlands, and 28 acres of revegetation. Approximately 0.6 miles of river channel was restored, creating approximately 37 acres of native habitat. This restoration rehabilitates the land and reduces flooding risks. TRFMA and TNC are

[214] 44 CFR §201.5(b)(2)(i): "Documentation of the State's project implementation capability, identifying and demonstrating the ability to implement the plan, including: Established eligibility criteria for multi-hazard mitigation measures."

[215] 44 CFR §201.5(b)(2)(ii): A system "to rank the measures according to the State's eligibility criteria. A system to determine the cost effectiveness of mitigation measures, consistent with OMB Circular–94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs."

[216] 44 CFR §201.5(b)(2)(iv): "A system and strategy by which the State will conduct an assessment of the completed mitigation actions and include a record of the effectiveness (actual cost avoidance) of each mitigation action."

continually trying to acquire critical areas along the Truckee River before it is developed and becomes at risk for future flooding. Another example is the City of Reno's Oxbow Park project, which involved restoring the north riverbank of the Truckee River, and reestablishing riparian habitat. The riverbank was severely eroded due to flooding in 1997 and 2005. The project helps to protect the Truckee River and reduce erosion and sediment loading. FEMA provided a cash match to assist in the Oxbow project.

For information on the Lockwood property and the Oxbow project, see:

- https://www.nature.org/en-us/get-involved/how-to-help/places-we-protect/mccarran-ranch-preserve/
- http://truckeeriverfund.org/projects/truckee-river-bank-stabilization-at-oxbow-park/

March 2023 brought Nevada Atmospheric River #2 affecting eight counties and several tribes resulting in a presidentially declared disaster. The funding amount for this disaster is still being calculated but will result in HMGP funding for Nevada. Nevada is currently monitoring damages from the Spring Thaw 2023 after the heaviest winter snowfall resulting in damages to several counties and tribes. This is under an emergency declaration and is being submitted for a disaster declaration. Whether this will result in a presidentially declared disaster is still to be determined.

8.4.2 Effectiveness of Mitigation Actions (Loss Reduction)

Nevada DEM currently coordinates volunteers who participate in State Preliminary Damage Assessment (PDA) Teams, which assess damage after an incident. The State PDA volunteers include representatives from the following agencies and professional groups:

- Nevada Attorney General's Office
- Nevada Department of Administration
- Nevada Department of Business & Industry/Insurance Division
- Nevada Department of Transportation
- Nevada Department of Wildlife
- Nevada Division of Emergency Management
- Nevada Division of Forestry
- Nevada Division of Records & Technology
- Nevada Division of Water Resources

State PDA volunteers also include voluntary agencies, local governments and other members of the private sector. This wide range of professional expertise and backgrounds allows the State PDA Teams to work efficiently to assess damage. State PDA Team volunteers are coordinated by the State Recovery Officer. Training and meetings of volunteers take place quarterly and in a just-in-time trainings when disasters strike.

Training sessions have included:

- *ATC-20* Post Earthquake Safety Evaluation of Buildings,
- *Earthquake hazard mitigation for hospitals* Disaster Declaration Process & Data Collection needs
- Damage Assessment for FEMA Public Assistance Program
- Damage Assessment for FEMA Individual Assistance Programs
- Damage Assessment for SBA Disaster Assistance Programs
- NV Disaster Recovery Framework Training

- FEMA IS-2900 National Disaster Recovery Framework
- FEMA P-154 Rapid Visual Screening of Buildings for Potential Seismic Hazards
- ArcGIS Camp Collector app
- Orion Mobile PDA app
- Proper safety procedures
- Media management.
- Incident Command System
- National Incident Management System
- Benefit cost analysis
- Reducing Earthquake Risk in the Classroom and Beyond
- FEMA P-1000 Safer, Stronger, Smarter: A Guide to Improving School Natural Hazard Safety
- Application Development
- Procurement for Mitigation Grants
- FEMA P0767 Earthquake Mitigation for Hospitals

The SHMO coordinates with the State Recovery Officer and FEMA to provide this group with formal training, which in turn allows these volunteers to assess damage, capture data, and prepare reports necessary to complete the studies for losses avoided on completed hazard mitigation projects.

The State PDA Teams participate in drills and training provided by emergency management personnel in the state.

Table 8-02. State PDA Training Sessions in the 2019-2023 Update Period

June 29, 2017	***ATC-20 and FEMA 154 refresher class***
Feb 9, 2018	***Disaster Declaration Process & Data Collection Needs***
2019	***ATC-20, FEMA P-154, FEMA P-1000, and FEMA E-74***
2020	
2021	***ATC-20, FEMA P-154, FEMA 395, FEMA P-1000, FEMA P-767, FEMA P-50-1***
June 12, 2022	***ATC-20 and FEMA 154, FEMA P-749, Building Code Overview, FEMA 232***
Mar 6, 2023	***Disaster Declaration Process & Data Collection Needs/Process***
July 2023	***ATC-20, FEMA 154, FEMA 232, FEMA P-1000, FEMA P-767***

The COVID pandemic presidential disaster declaration did not result in additional PDA training secondary to the type of disaster.

State PDA Teams are activated when any disaster event occurs and the affected local jurisdiction requests the assistance of the state in assessing damages, whether there is a Presidential declaration or not. The assessment process consists of three phases: information gathering; site visit and damage assessment; and reporting of data to Nevada DEM.

1. **Information gathering**: Nevada DEM mitigation staff members retrieve files on funded mitigation projects in the immediate area based on location coordinates required for all such projects. This information along with the appropriate State PDA Team assessment forms for the type of event (earthquake, flood, wildfire) and a summary of the project background are provided to the State PDA team.
2. **Site visit and damage assessment**: The assembled information and forms are provided to the State PDA Team, which is then sent to the disaster location(s) to contact appropriate local agencies and conduct assessments of previously funded mitigation projects with a primary focus on estimating loss avoidance. This process was used during

the 2023 Winter Storms disaster and 2017 flooding events in Northern Nevada by NBMG geoscientists. It was also implemented during the 2008 Wells earthquake by NBMG staff and worked well in gathering information from local affected stakeholders (government, utilities, residents, businesses, etc.)

3. **Reporting of data to Nevada DEM**: Once the State PDA Team completes the physical site examination, they compile the State PDA report and send it back to Nevada DEM where the SHMO analyzes it in terms of the project's BCA and other factors such as avoidance of injury, loss of life, or environmental degradation.

For example, if the funded project was a structural retrofit to a URM building and an earthquake occurs, then the loss avoidance would be calculated as the construction cost to rebuild the building along with any loss of life or injury of those working in the building at the time of the event.

State PDA Team reports and studies from preliminary damage assessment of recent events in Nevada include:

- Minden Flooding – 2018
- Mineral County Flooding – 2018
- SBA Disaster Declarations – 2018
- Area 51 – 2019
- UNR Argenta Explosion - 2019
- COVID-19 – 2020
- Law Enforcement Support – 2020
- Mina Earthquake – 2020
- Mudslide – 2020
- Pinehaven Fire – 2020
- Caldor Fire – 2021
- Nye Flash Flooding – 2021
- Tamarack Fire – 2021
- Atmospheric River 2 - 2023
- Spring Thaw - 2023

Reports by State PDA Teams to Nevada DEM following disaster incidents are provided to the NHMWG for their use in prioritizing proposed projects. These reports will also form part of the vulnerability assessment for the community and the state plan updates.

In 2017, a Loss Avoidance Study (LAS) was completed by FEMA, which assessed the efficacy of past mitigation projects where public funding is involved. The study focused on two analysis sites within the declared disaster area of Northwest Nevada (due to flooding in January and February 2017). The LAS addressed two mitigation projects: the Truckee River Flood Project (east Reno) and the Vicee Canyon Basin Expansion Project (northwest Carson City). The Loss Avoidance Study is in Appendix Q. Nevada did not have a disaster in the five-year time to do a new loss avoidance study. However, a mitigation successes report was completed and added to the annex S.

Nevada's long-term strategy is to create a risk reduction portfolio of all HMA type projects as well as to promote activities (such as building code adoption and resilient land use planning) to reduce risks over time. These findings can be used in determining the most effective or the highest priority mitigation projects for Nevada.

8.5 EFFECTIVE USE OF AVAILABLE MITIGATION FUNDING

ELEMENT	REQUIREMENTS
E8. Is the state effectively using existing mitigation programs to achieve mitigation goals? [44 CFR §§201.5(a) and 45 201.5(b)(3)[217]]	The state must demonstrate and document the full and effective use of existing mitigation programs to achieve its mitigation goals, as outlined below. a. The state must demonstrate and document the full and effective use of existing FEMA programs (if funding is available), including, but not limited to: 1. FEMA HMA Programs: HMGP, HMGP Post Fire, BRIC, and FMA (including management costs). 2. Public Assistance: PA C-G (permanent work) and PA Mitigation. 3. Flood Hazard Mapping, including the CTP Program, Floodplain Management, and the Community Assistance Program – _State Support Services Element. 4. Dam Safety: Rehabilitation of HHPDs; State Assistance for Dam Safety. 5. NEHRP – _Earthquake State Assistance Grants (high and very high risk states only[24]). Note: If the state has not made full and effective use of available funding, the enhanced plan must document the reasons why and include a strategy for improving this capability. b. The state must demonstrate and document the full and effective use of non-FEMA programs including, but not limited to: 1. **State-supported hazard mitigation and resilience programs,** including those led by agencies and departments outside the state

[217] 44 CFR §201.5(b)(3): "Demonstration that the State effectively uses existing mitigation programs to achieve its mitigation goals."

	agency that leads the development of the mitigation plan (e.g., the state emergency management agency/department). 2. **Other federal programs** that support mitigation and resilience, where available. Examples include, but are not limited to, programs administered by the following: Economic Development Administration, Environmental Protection Agency, HUD, Department of Transportation, National Oceanic and Atmospheric Administration, U.S. Army Corps of Engineers, and the U.S. Department of Agriculture. 3. **Non-governmental organizations,** including public-private partnerships. This may include nonprofit organizations, academia, business, and industry.

8.5.1 Effective Use of Available Mitigation Funding

Nevada uses many funds and programs to mitigate against injury, loss of life, and damage to property. Some of the major mitigation programs of the state are the federally funded HMA programs, which are administered by Nevada DEM.

Over the 2019-2023 period, 48 FEMA grants are either approved and funded or under environmental review under the HMA programs in Nevada. The primary goal of the NHMWG is to ensure that every community in Nevada develops a hazard mitigation plan. The NHMWG believes that the planning process is the first step in awareness of the risk and vulnerability posed by the hazards and provides the communities with a method to "do something about the risk." This goal includes the updating of existing plans and enhancing the data available for locals to use in the update process. To date, every plan needing an update has acquired funding through the application process or through the State, and, where needed, communities have joined together to develop regional plans. Since the previous plan was approved in 2018, funding received for planning has allowed and five counties (not including four potential updates for BRIC 2022) to update their current plans and four counties are updating or creating two separate regional plans.

As a result, Nevada continues to maintain its goal of all counties updating hazard mitigation plans by 2023 (at the time of writing, Clark County has submitted their LHMP for review and approval, and Nye County is about ready to submit to FEMA for approval).

Planning funds have been "shared" by more than one community in the past. Humboldt, Lander, and Pershing counties have developed a regional plan under the approved PDM funding as well as Eureka and White Pine Counties with another regional plan. These regional plans have been approved by FEMA. This leveraging of grant funds to develop regional plans is a very cost-effective way for rural communities to work together to become covered by a mitigation plan.

This is something that Nevada is encouraging our counties to consider, especially counties that work together closely.

Nevada will use the plan maintenance process found in Section 6 to enhance its collection of data about locally funded mitigation projects to demonstrate the commitment of communities to the reduction of risk. Other funding sources such as the National Earthquake Hazard Reduction Program (NEHRP) have been used by NBMG to enhance risk assessment tools and awareness of earthquakes statewide, also need to be documented and presented in this plan. Private mitigation activities include the total repair and seismic retrofit of the Church of Jesus Christ of Latter-day Saints Wells Ward Chapel in 2009. The retrofit was completed close to the one-year anniversary of the 2008 Wells earthquake. The City of Wells planned a special event for the anniversary, and the church participated in the activities. UNR recently completed a seismic retrofit of Lincoln Hall, an 1800's vintage building that was damaged in the 1914 earthquake. UNR has plans to complete a seismic retrofit of Manzanita Hall. The City of Reno has a current PDM 2019 grant to seismically retrofit the Reno City Hall building which also houses critical infrastructure.

Local chapters of the Fire Safe Council, a coalition that is spearheaded by homeowners, UNCE, BLM, USFS, along with many state agencies, all work closely to coordinate a WUI Summit. The Summit's sole purpose is to provide homeowners and local government entities information about the wildfire mitigation activities and possible sources for funding that can be done to protect life and property. Summit workshops and sessions cover three main topics: fire adapted communities, operations and suppression, and wildland fire policy and tools. Until 2012, the Summit occurred in September with up to 200 attendees from rural, urban, and "frontier" communities. The 2018 Summit is scheduled for February, and now has a mobile app for attendees. The app allows for easy navigation during the event, and allows users to stay organized, take notes and rate presentations, and stay connected with attendees. Beginning in 2013, UNCE created a customized workshop for rural communities and will assess changes in risk, since the writing of their CWPPs. UNCE also developed a web-based application to update CWPPs. The computer application is an interactive tool involving stakeholders such as community members and local fire prevention professionals with a vested interest in wildfire mitigation activities.

Many agencies have spearheaded a variety of hazard mitigation projects that have been completed or are under way since the last iteration of the plan. These include the following:

- Clark County RFCD completed 39 flood-control projects from 2019-2023. As of July 2023, 14 projects are under construction or about to start. Since 1985, 64 square miles have been removed from FEMA special flood hazard areas. For more information on Clark County RFCD's accomplishments and future projects, see Appendix L.
- TRFMA has a long list of accomplishments in flood mitigation, restoration, prevention, public awareness education and outreach since 2009. Completed flood risk management projects include: the Virginia Street bridge replacement, the Reno-Sparks Indian Colony levee and floodwall construction, and the North Truckee drain relocation project. Additionally, TRFMA has a home elevation program, in which homeowners are eligible to receive grants from Washoe County and TRFMA. Elevating homes in the approved area (Hidden Valley, Rosewood Lakes, and Eastside Subdivision neighborhoods) makes the properties more resistant to flood damage, and thereby making it more cost-effective to elevate flood-prone homes. This program has continued and there are numerous grants

through various HMGP and PDM programs for home elevations still in process. Additional information about TRFMA's projects can be found in Appendix L.

- CWSD has many mitigation accomplishments. Projects include floodplain management and restoration, weed management, updates to local flood regulations, and many more. CWSD has a current HMGP grant for a Carson River Watershed Regional Drought and Water Sustainability Plan. They have an additional BRIC 2022 Dayton Valley project scoping application awaiting award for Lyon County. CWSD accomplishments are listed in Appendix L.
- NDF has completed numerous hazardous fuels reduction projects and have more planned. The Tahoe Fire and Fuels Team (TFFT) has also completed numerous hazardous fuels reduction projects. Projects completed by NDF and TFFT are highlighted in Appendix L.
- Truckee Meadows Fire Protection District (TMFPD) has been active with the HMGP-Post Fire grant program after each Fire Management Assistance Grant (FMAG) declaration for Washoe County. With the increase in number of disasters, especially fire, in FEMA Region IX, a challenge has been the delay of projects caught up in the environmental review process. For this reason, Nevada has had our fire project applications take on the culture reviews and sometimes other environmental type reviews to help this process move faster.

Many county-funded projects were completed during this plan update period. These investments in mitigation are located in the major disaster risk areas of Nevada, according to the GIS modeling maps of local plans. FEMA mitigation funds allocated are closely linked to the state and applying community's plan goals. Prevention or significant reduction of loss of life and injuries is the state's primary goal.

The criteria used by Nevada DEM and NHMWG to solicit, select, and rank projects are clear and linked to maximizing project impacts that support the state plan goals. The Nevada DEM objective is to expend all funds in each grant program. Nevada DEM attempts to maximize local opportunities for receiving federal mitigation funding by establishing a project waiting list of HMA applicants from previous grant cycles from which to identify, prioritize and submit potential mitigation projects. NV DEM Mitigation has made a concerted effort with outreach providing weekly technical assistance during the BRIC/FMA grant cycle as well as offering regional application development workshops in a hybrid format. Nevada has made a concerted effort to utilize the Flood Mitigation Assistance (FMA) program. However, it has been challenging and Nevada has not yet received a successful grant award under FMA. Nonetheless, each cycle we strive to at least submit one FMA application. The BRIC/FMA FY 2022 had two applications started but in the end were unable to complete the application process secondary to difficulties with the BCA process and Nevada was unable to submit those applications.

The Public Assistance program (PA) is used extensively for every presidential disaster declaration. Examples include the COVID pandemic where more than $90 million in PA funds were incurred and reimbursed. Additionally, a new presidential declaration for an atmospheric river event in March 2023 was received. Current results of the Spring Thaw 2023 after a record-setting snow year may also result in a presidential declaration. These two events will also provide additional HMGP funding for Nevada.

The High Hazard Potential Dam program (HHPD) has been utilized with our first project still in the environmental review process. This has been a challenging process with delays in FEMA HQ managing this program and the delays incurred. It is our understanding that this program will eventually move to the regions.

The Cooperative Technical Partners (CTP) is utilized each year by NDWR. NV DEM has utilized this funding in the past for numerous projects including the TTX with local counties for their HMP yearly updates as well as the MyPLAN project development. Additionally, NDWR utilizing the Flood Hazard Mapping, Floodplain Management, and Community Assistance Program – State Support Services Element funding through their agency each year.

The Safeguarding Tomorrow Revolving Loan Fund (STORM Act) program is FEMA's newest funding program aimed toward underserved areas allowing for low-cost loans for mitigation projects including cost share. This program requires legislative additions to state law. Nevada's legislature meets every two years and by the time this program was finalized by FEMA HQ, it was too late to include this in the current legislative session that is just ending in Nevada. The plan is to put this legislation forward with the next legislative session so that this program will be able to be utilized.

8.5.2 Nevada's Effective Use of Existing Programs to Achieve Mitigation Goals

A number of HMA programs fund multi-hazard mitigation planning activities at the local or multi-jurisdictional level. In addition to the FEMA support funding shown in Table 8-03, Nevada communities augment mitigation funds with those provided through many other sources. Some of the local and private sources that collaborate with the state are listed in Tables 4-11 and 4-12. Collaborating with local and private groups in mitigation planning and projects promotes increased awareness and participation in mitigation activities on a local level. For example, TNC's Lower Truckee Restoration Project proved to be successful after the major flooding events of 2017. TNC has restored about 10 miles of the Truckee River and its floodplain over the past 14 years. The Lower Truckee Restoration Project has implemented many strategies to restore the Truckee River, including reshaping the river, reconnecting the river to its floodplain, creating in-stream riffles to provide habitat for native fish, excavating banks to provide habitat, and invasive species management. During the flooding events of 2017, water slowed down and thinly flowed as the floodwaters met the floodplain, protecting life and property. TNC has partnered with numerous agencies on the project, including City of Reno, NDOW, NDEP, Pyramid Lake Paiute Tribe, Truckee Meadows Flood Management Project, Washoe County, NDWR, and many more. Additionally, NV DEM is partnering with the NDEP State Revolving Fund to assist with matching funds for flood and drought projects.

To see a complete list of partners and more information on the Truckee River Project, visit: https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placesweprotect/truckee-river-project.xml.

SNWA has a Water Smart Landscapes rebate program. SNWA will rebate customers $2.00 per square foot of grass removed and replaced with native, desert landscaping up to the first 5,000 square feet converted, per property and per year. After the first 5,000 square feet, SNWA will rebate customers $1.00 per square foot (maximum of $300,000 in a fiscal year). The program has saved billions of gallons of water and has upgraded more than 183 million square feet. SNWA is governed by a seven-member board of directors, and has representatives from: Big Bend Water District, City of Boulder City, Clark County Water Reclamation, City of Henderson, City of Las

Vegas and North Las Vegas, and the Las Vegas Valley Water District. For more information, please visit:
https://www.snwa.com/rebates/wsl/index.html.

As noted on Carson City's Open Space Division webpage, "The Open Space Program was created by the Quality-of-Life Initiative, or Question 18, passed by Carson City voters in 1996. The Quality-of-Life Initiative included the acquisition, development and maintenance of parks, opens space, trails and recreation facilities through an increase in the sales tax rate of ¼ of 1 percent. Forty percent of the funds are designated for the Open Space Program, which currently results in approximately $1 million in annual revenue. The Open Space Program does not operate on any revenue from the General Fund." Currently, the Open Space Program manages approximately 6,940 acres, and has acquired over 21 properties, including one 40-year open space protection agreement and one conservation easement. Furthermore, two properties have been donated to the program since its inception. Lands have also been acquired through a lands exchange with the USFS and BLM. Carson City owns land not acquired through the Open Space program but through Public Works Utility funds. These lands also include floodplain. Since October 2017, Carson City has 3,890 acres of SFHA, of that amount 60 percent is in open space (City, State, & private). The City's portion is 30% of the 60% or half.

The City of Yerington and Lyon County filed a joint resolution proclaiming the existence of an emergency and/or disaster within their respective jurisdictions with respect to the immediate necessity to clean the Walker River and remove debris and sediment that had built up since the 1997 flood. This was referred to as the Walker River Clean-up project. The Mason Valley Conservation District was the lead for the project, with assistance from the Walker River Irrigation District, Federal Water master, City of Yerington, and Lyon County. Approximately 300,000 cubic yards of sediment and debris were removed from the Walker River main channel, including all three primary bridge crossings, increasing channel capacity by nearly twice what it was before the project was completed. The Walker River Clean-up project was completed in December 2015.

The "Big Dig" project was the culmination of a series projects providing local flood mitigation measures on the Carson River near Fallon. The projects were the result of forecasts predicting runoff from the Sierra Nevada into the Carson River that would exceed the capacity of Lahontan Reservoir. To mitigate potential flooding from snowpack runoff, a series of projects were completed with coordination between local, state, and federal partners. A weir was installed to divert flows below Lahontan Reservoir out into the desert and into Carson Lake. The completed "Big Dig" project is a 60-foot wide 17-mile long channel that diverts excess water from Carson Lake to the Stillwater Point Reservoir. It is anticipated that these flood mitigation measures will mitigate flooding in the area for many decades. The "Big Dig" project was completed in May 2017. During the recent Atmospheric River flood events in March 2023, Churchill County added several weirs to address flood risk which were funded by the county. These weirs were paid for by the County themselves.

NDEP's BWQP 319(h) Nonpoint Source Protection Grant Program is funded through the Clean Water Act. The Grant Program provides funding to qualifying counties, conservation districts, higher education institutions, regional agencies, and nonprofit organizations to improve conditions of Nevada's watersheds and protect against nonpoint source water

pollution. Mitigation is inherently a part of protecting the quality of Nevada's surface waters. Additional examples of NDEP's mitigation programs and activities are listed in Appendix L.
Nevada Flood Awareness Week (FAW) is an annual event that builds awareness about the danger of flooding, and how to protect life and property from a flood. Nevada FAW is a Nevada Flood Awareness Committee initiative and involving many agencies. To see a list of partners and more information about NFAW, please see: http://nevadafloods.org. Another example is Nevada Wildfire Awareness Month (NWAM), an annual event that builds awareness and encourages action to reduce the wildfire threat to Nevada homes and communities. It is a partnership among federal and state agencies, community members and private entities. A listing of all sponsors may be found at this link: https://www.livingwithfire.com/get-involved/nevada-wildfire-awareness-campaign/.
The Great Nevada ShakeOut is another example of a partnership between State and federal agencies, universities, casinos, and other community members, in earthquake hazard mitigation. The ShakeOut is an earthquake drill that is broadcasted simultaneously throughout the state. The 2021 Great Nevada Shakeout had over 540,000 participants. More information is available online about the upcoming 2023 Great Nevada ShakeOut on 10/19/2023 at 10:19 AM: http://www.shakeout.org/nevada/.
Nevada has also partnered with FEMA RIX mitigation as well as NDEP State Revolving Loan Fund (SRF) program, and Federal level EPA to address drought. This partnership helped to update our State HMP as well providing outreach and webinars and working toward drought projects for the state.

Table 8-03. 2005 to 2023 FEMA-Supported Grant Activities in Nevada					
HMGP					
Disaster Number	**Selected**	**Obligated**	**Expended**	**Deobligated**	**Status**
4708	TBD				Pending
4523	$13,584,381.00	$800,391.49	$ -	$ -	In process
FM-5448	$1,048,736.00	$ -	$ -	$ -	In process
FM-5382	$2,336,334.00	$ -	$ -	$ -	In process
FM-5316	$3,148,405.00	$614,445.75	$ -	$ -	In process
FM-5283	1,817,727.00	$450,000	$ -	$ -	In process
FM-5154	3,400,062.00	$1,522,196.65	$98,331.92	$ 1,340.42	In process
4307	$2,531.731.36	$1,913,276.50	1,258,758.40	$298,336.34	In process
4303	$2,128,628.62	$2,081,584.55	641,861.30	$ -	In process
4202	$583,609.00	$583,609.00	$583,609.00	$ -	Closed
1540	$726,541.00	$726,541.00	$519,877.54	$206,663.46	Closed
1583	$533,519.00	$533,519.00	$392,541.00	$140,978.00	Closed
1629	$625,497.00	$625,497.00	$624,552.07	$944.93	Closed
1738	$475,537.56	$71,092.56	$44,906.23		Closed
Total	**$30,408,977.18**	**$2,058,944.56**	**$1,604,712.99**	**$348,586.39**	
PDM					
Funding Year	**Selected**	**Obligated**	**Expended**	**Deobligated**	**Status**
2004-2005	$60,063.50	$60,063.50	$60,063.50	$ -	Closed
2006	$29,115.00	$29,115.00	$29,115.00	$ -	Closed
2007	$467,586.75	$467,586.75	$420,112.49	$47,474.26	Closed
2008	$573,173.43	$573,173.43	$565,090.32	$8083.11	Closed
2009	$1,067,995.50	$1,067,995.50	$229,740.91	$838,254.59	Closed
2010	$3,182,907.31	$1,806,991.31	$326,015.97		Closed
2011	$905,824.25	$905,824.25	$904,242.05	$143.84	Closed
2012	$2,532,568.77	$2,532,568.77	$2,427,763.62	$104,805.15	Closed
2013	$364,650.00	$364,650.00	$363,320.93	$1329.07	Closed
2014	$2,470,057.87	$2,470,057.87	$621,763.66		Closed
2015	$440,000	$440,000	$8,304.94		Closed
2016	$1,482,988.45	$154,999.50	$0		Closed
2017	$407,635.61	$407,635.61	$320,686.02	$ -	In process

Table 8-03. 2005 to 2023 FEMA-Supported Grant Activities in Nevada					
2018	$10,773,149.34	$773,149.00	$198,149.35	$ -	In process
2019	$4,552,587.40	$4,372,750.00	$403,204.40	$ -	In process
Total	**$29,310,303.18**	**$10,873,025.88**	**$5,955,533.39**	**$895,284.87**	

Table 8-03 is a summary of the status of all FEMA grant funds for hazard mitigation activities received between 2005 and 2023. All mitigation activities associated with the grant awards have been completely implemented according to the grant's scope of work. The information found on Table 8-03, regarding HMA awards, includes five disaster declarations beginning in 2004 and ending in 2014. There were nine declarations for HMGP including HMGP-PF from 2017-2023. Note the following items on Table 8-03:

- The HMGP difference between the obligated and expended funds is due to cost savings on two projects awarded in the 2004 and 2005 disasters. During these two disasters, subapplicant awareness of the hazard mitigation program was limited, and the state received only enough applications to cover the amount awarded by FEMA. Since 2005, increased subapplicant awareness of the program has built up an inventory of mitigation on-the-shelf projects that are available for submission when events occur or funding sources become available, allowing the state to utilize all awarded funds when cost-savings occur.
- For Disaster #1629, the $944.93 in the "Deobligated" column is cost savings from subrecipient in travel costs and the expiration of the performance period. For PDM 2007, the $47,474.26 in the Deobligated column results from the project coming in under budget due to changes in the economy. Grant restrictions do not allow the transfer of these funds to another project.
- For PDM 2009, the $838,254.59 in the "Deobligated" column results from a portion of the project being unable to be completed secondary to limitations in FEMA rules regarding pile burning for the fuels reduction project. Grant restrictions do not allow transfer of these funds to another project.
- For PDM 2012, the $104,805.15 in the "Deobligated" column is cost savings from the subapplicant in personnel costs.
- The discrepancy between "Selected" and "Obligated" amounts arise because there are projects pending obligation.
- The dollar difference in the "Selected" and "Obligated" columns is a result of the sluggishness of FEMA's National Environmental Policy Act compliance review process for all HMA selected projects as well as FEMA grants obligating funding for awards.
- For PDM awards, the difference between the obligated and expended funds is due to pending submission of expenditures by the subrecipient for activities that fall within the performance period.
- Homes listed in the RFC loss listing are included in the home elevation program applications with TRFMA for PDM 2016 and HMGP 4303. TRFMA's home elevation program is discussed in Section 8.5.1.

Nevada has been proactive in addressing repetitive flood property such as the following program targeted at the flood-prone areas of the Truckee Meadows. TRFMA continues to actively support the Flood Project (previously referred to as the Living River Plan) - a flood management plan for the Truckee River under which repetitive flood properties have been acquired, including the following:

- UNR's Mill and McCarran Property (60 acres)
- 85 N. Edison Way (1 acre)
- 105 N. Edison Way (1 acre)
- 195 N. Edison Way (1 acre)
- Monday Property (17 Lockwood - 1 acre)
- Excel Property (8 acres)
- Catholic Diocese Property (14 acres)
- Ferrari Property (22 acres)
- 102 Ranch (128 acres)
- A portion of UNR Farms (60 acres), a portion of Butler Ranch (800 acres), and five other properties.

Nevada's mitigation program has successfully accomplished its planning goal of developing hazard mitigation plans for all Nevada counties (many are in the update process). The State has successfully developed relationships among agencies and brought awareness to communities about their risk, and the State will continue to assist rural communities with mitigation plans to apply for funding to reduce risks. This has been addressed by continuing to hold NHMWG meetings in local communities, which has both heightened awareness of hazard risks and successfully encouraged application for grant funding available to develop local plans to combat these risks. The mitigation staff also continue the TTX, which are performed at each community's LEPC meeting where an approved hazard mitigation plan exists to help with continued plan maintenance. As mentioned earlier, the COVID pandemic disaster declaration was a very big challenge for our rural communities and caused some of our rural communities to allow their plans to lapse. However, all expired communities are either working on updating their local HMPs or awaiting grant award to update their plans.

8.6 COMMITMENT TO A COMPREHENSIVE MITIGATION PROGRAM

ELEMENT	REQUIREMENTS
E7. Does the state demonstrate commitment to a comprehensive mitigation program? [44 CFR §§ 201.3(c)[218],	a. The state must demonstrate commitment to statewide programs, initiatives, and plans that advance mitigation and resilience. The state must demonstrate commitment through a combination of activities that may include, but are not limited to, the following: 1. Statewide planning laws, legislative initiatives, or frameworks (where permitted by state and local law) that require or promote land use planning or other integrated strategies aimed at advancing mitigation. 2. Establishing councils or teams (beyond the state mitigation planning team) or forming innovative mitigation public/private partnerships focused on mitigation investment at the state, regional and local levels. 3. Integrating mitigation and community resilience principles into the state's post-disaster recovery operations. 4. Developing a comprehensive, multi-year plan to mitigate the risks posed to existing buildings identified as necessary for post-disaster response and recovery operations. 5. Use of a model floodplain ordinance that includes and goes beyond the NFIP minimum requirements and is coordinated with the state building code(s). 6. Other executive actions and activities that promote mitigation statewide. b. The state must demonstrate a commitment to mitigation training and capability building. The state can demonstrate this commitment through a combination of activities that include, but are not limited to, the following: 1. Advancing local mitigation planning by providing or supporting workshops, training and capability building beyond the basic

[218] 44 CFR 201.3(c), "The key responsibilities of the State are to coordinate all State and local activities relating to hazard evaluation and mitigation and to:
(1) Prepare and submit to FEMA a Standard State Mitigation Plan following the criteria established in § 201.4 as a condition of receiving non-emergency Stafford Act assistance and FEMA mitigation grants. In accordance with § 77.6(b) of this chapter, applicants and subapplicants for FMA project grants must have a FEMA-approved mitigation plan that addresses identified flood hazards and provides for reduction of flood losses to structures for which NFIP coverage is available.
(2) In order to be considered for the 20 percent HMGP funding, prepare and submit an Enhanced State Mitigation Plan in accordance with § 201.5, which must be reviewed and updated, if necessary, every 5 years from the date of the approval of the previous plan.
(3) At a minimum, review and update the Standard State Mitigation Plan every 5 years from the date of the approval of the previous plan in order to continue program eligibility.
(4) Make available the use of up to the 7 percent of HMGP funding for planning in accordance with § 206.434.
(5) Provide technical assistance and training to local governments to assist them in applying for HMGP planning grants, and in developing local mitigation plans.
(6) For Managing States that have been approved under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c), review and approve local mitigation plans in accordance with § 201.6(d).

201.5(b)(4)[219], and 201.6(d)[220]]	requirements under 44 CFR §201.3(c)(5). For example, the state could develop a program for supporting floodplain management or other certification programs related to hazard reduction or provide workshops on more advanced mitigation topics to develop mitigation capabilities at the local level. 2. Partnering with other state and federal agencies, or the private sector, to provide resources and incentives for more inclusive and integrated mitigation planning and plan implementation using a wide range of public and private resources. 3. Supporting implementation of local government mitigation actions, including providing state planning grants or a portion of the non-federal match for HMGP, BRIC and/or other mitigation projects and programs. c. The state must demonstrate a commitment to its mitigation planning responsibilities by helping local governments update and adopt their plans before they expire. To this end, the state must be able to show that at least 75% of all its local jurisdictions that have previously submitted a mitigation plan are currently approved or updating their plans. Special districts are excluded from this calculation. If the state cannot show this at the time of plan submittal, the plan must document when this was met in the previous

[219] 44 CFR §201.5(b)(4): "Demonstration that the State is committed to a comprehensive state mitigation program, which might include any of the following:
(i) A commitment to support local mitigation planning by providing workshops and training, State planning grants, or coordinated capability development of local officials, including Emergency Management and Floodplain Management certifications.
(ii) A statewide program of hazard mitigation through the development of legislative initiatives, mitigation councils, formation of public/private partnerships, and/or other executive actions that promote hazard mitigation.
(iii) The State provides a portion of the non-Federal match for HMGP and/or other mitigation projects.
(iv) To the extent allowed by State law, the State requires or encourages local governments to use a current version of a nationally applicable model building code or Standard that addresses natural hazards as a basis for design and construction of State sponsored mitigation projects.
(v) A comprehensive, multi-year plan to mitigate the risks posed to existing buildings that have been identified as necessary for post-disaster response and recovery operations.
(vi) A comprehensive description of how the State integrates mitigation into its post-disaster recovery operations."

[220] 44 CFR 201.6(d): Plan Review

(1) Plans must be submitted to the State Hazard Mitigation Officer (SHMO) for initial review and coordination. The State will then send the plan to the appropriate FEMA Regional Office for formal review and approval. Where the State point of contact for the FMA program is different from the SHMO, the SHMO will be responsible for coordinating the local plan reviews between the FMA point of contact and FEMA.

(2) The Regional review will be completed within 45 days after receipt from the State, whenever possible.

	five years and the process to improve this status with a focus on adoption by all participating jurisdictions. d. The state is strongly encouraged to demonstrate its commitment to mitigation by adopting and enforcing building codes that enhance mitigation and resilience. 1. For states that have a mandatory, statewide building code, the state is strongly encouraged to demonstrate the following: i. The state has adopted the current or next most published editions of hazard-resistant building from nationally recognized authorities such as International Code Council that have not been or changed in a way that weakens code related to natural hazards. ii. The state does not allow local governments to weaken the hazard-resistant provisions of the state building code. iii. The state encourages local governments to adopt higher standards for hazard resistance in their locally adopted building codes. iv. The state ensures that state-owned and operated facilities are constructed in compliance with the current or next most recent hazard-resistant building codes as described in E7(d)(1)(i) above and the state avoids constructing facilities in areas vulnerable to current and future hazards (e.g., the facility's lifespan)_to the greatest extent possible. 2. If the state **has not** adopted the current or next most recently published editions of hazard-resistant building codes, as described above in E7 (a)(1)(i), the state is strongly encouraged to include in the plan a strategy with action steps toward state adoption and implementation of the current or next most recent hazard-resistant building codes as part of its commitment to mitigation. The strategy and action steps should be based on national programs and standards, such as the state Building Code Effectiveness Grading Schedule (BCEGS) scores and state averages (where available). 3. **For states that do not have a mandatory statewide building code,** based on the evaluation of building code adoption and enforcement in the state required under Element S8,the state is strongly encouraged to: i. Describe and document a strategy with action steps to support and encourage all local jurisdictions in the state to adopt and enforce the current or next most recent hazard-resistant building code as described in E7 (a)(1)(i) above.

(3) A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

(4) Managing States that have been approved under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c)will be delegated approval authority for local mitigation plans, and the review will be based on the criteria in this part. Managing States will review the plans within 45 days of receipt of the plans, whenever possible, and provide a copy of the approved plans to the Regional Office.

	ii. Describe and document a strategy and action steps that the state could take toward the adoption of a hazard-resistant mandatory statewide building code. iii. Ensure that state-owned and operated facilities are constructed in compliance with the current or next most recent hazard-resistant building code as described in E7(a)(1)(i) above and that the state avoids constructing facilities in areas vulnerable to hazards to the greatest extent possible. For Element E7-d., reviewers should document strengths and opportunities for improvement related to building codes in the Plan Assessment section of the Plan Review Tool (see Appendix C).

8.6.1 Commitment to Support Local Mitigation Planning

The SHMO works closely with the State Floodplain Manager (FM) to provide workshops, training, and technical assistance to the local emergency, tribal, and floodplain managers, government officials, firefighters, grant managers, and private sector consultants. The ultimate goal of these workshops is to assist each community in reaching its goal of having an approved local hazard mitigation plan (LHMP). The current status of LHMP is shown in Section 5, Figure 5-1. Details of local and tribal plan status are located in Tables 5-01 and 5-02 of Section 5 of the plan.

The FM sponsors workshops for floodplain managers providing information on the NFIP. These workshops include education about the Community Rating System (CRS), which is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements by reducing their flood insurance premiums. Another workshop presentation is the Risk MAP program, which increases public awareness and leads to action that reduces flood risk to life and property.

- The FM and the SHMO jointly coordinate and present grant application workshops for potential subapplicants to the HMA funding programs.
- During the LHMP, update process mitigation staff attends planning meetings and provides technical assistance as needed.
- SHMO staff schedules an annual visit to each community with an approved LHMP, where it performs a TTX that it has developed to help them with continued plan maintenance.
- In addition, the FM provided a comprehensive weeklong L273 workshop to Floodplain Managers statewide that covered building codes, elevations, insurance, FEMA policies,

etc. The last course sponsored by the FM was in 2015. This may be repeated on an as-needed basis. NDWR offers courses as needed for county and city floodplain managers for continuing education.

- SMAC provides critical technical assistance to local, state, and tribal entities. SMAC was established to advise the USGS on state priorities for map products and to inform map users about the status of mapping programs and the availability of map products. Membership in SMAC and its subcommittees is open to anyone interested in mapping in Nevada. Two subcommittees are currently active: one for GIS and one for geologic mapping. Participants include representatives of numerous local, state, and federal agencies, community colleges and universities, and the private sector. Additional data about SMAC is available at this website: http://www.nbmg.unr.edu/smac/smac.htm.
- NV DEM mitigation and public information officer (PIO) educates the public about earthquake hazards and promotes earthquake awareness activities, such as the Great Nevada Shake Out, that help save lives, reduce property loss, and speed recovery from earthquakes. The Nevada earthquake program sponsors yearly earthquake training for the public through the National Earthquake Technical Assistance Program (NETAP), which provides various courses with typically one or more courses provided throughout the State on a rotating basis. ATC-20 and FEMA-154 (pre and post-earthquake evaluation) is offered on a yearly basis and will be offered August 2023 again via virtual training to allow Arizona, Utah and Wyoming to join with Nevada in this training.

Nevada DEM and NDWR staff continue to maintain positive working relationships with local governments through phone, e-mail, conference calls, and meetings providing technical assistance, support, and information as needed. NV DEM Mitigation staff provide additional training workshops for application development and local HM planning training. All training opportunities are also provided to all tribal partners.

8.6.2 Statewide Programs Promoting Hazard Mitigation

Sections 2, 3, 5 and Section 8.1.1 have already detailed many of Nevada's statewide hazard mitigation programs, including legislative initiatives and executive actions that promote hazard mitigation. Some of the higher profile statewide programs dealing with Nevada's highest ranked hazards are summarized below:

- **Living With Fire Program** is managed by UNCE and is a collaborative effort involving many organizations to help make communities more likely to survive a wildfire. Together with Nevada's firefighting organizations, they developed a set of consistent wildfire threat reduction recommendations that are shared with schools, homeowners, community groups, and firefighting professionals to help educate and inform those living in fire-prone areas about mitigating Nevada's wildfire threat. Partners include the UNCE, BLM, USFS, and NDF who promote the development of Fire-Adapted Communities. Please see additional details found on the website at http://www.livingwithfire.info/
- **Silver Jackets Program** is a partnership among federal (USACE, NOAA, FEMA, USGS, NRCS), state (Nevada DEM, NDWR, NDOW,) and local agencies and non-profits formed to reduce the risks associated with flooding and other natural hazards in Nevada. It provides a formal and consistent strategy for an interagency approach to planning and implementing measures. Involvement from other regional, local, and tribal

groups within this program will improve and increase flood risk communication with a unified interagency message and help collaboration on flood mitigation, response, and recovery. For more information please visit: https://silverjackets.nfrmp.us/State-Teams/Nevada

Listed below are some statewide programs that involve collaboration among State, local and/or private sector groups to achieve specific local mitigation planning efforts.

- Nevada DEM partners with the Nevada Insurance Pool and NBMG, through PDM grants, to develop information such as HAZUS run data for earthquake and flood for each county. This data is distributed to local jurisdictions for their use in loss estimation and mitigation planning. Additionally, Nevada DEM has worked with UNR through an HMGP grant to develop a statewide report of geocoded potential URM building locations (by county) published as *Preliminary Assessment of Potentially Unreinforced Masonry Buildings: Nevada Bureau of Mines and Geology Report 54,* available free online. A GIS inventory of ditches in the northwest portion of the state was completed by NBMG with grant support from Nevada DEM in 2015.

- FEMA has provided funds for NBMG to develop and maintain the "MyPlan" and "MyHazards" interactive web maps to assist local planning professionals in the data collection necessary to address the risk and vulnerability assessment information required for hazard mitigation planning in their communities. Craig dePolo, with NBMG, has been conducting informational presentations both to the NHMWG, NHM Planning subcommittee, and to the local LHPCs. The presentations help to familiarize LHPCs with this resource available to help them in development of their mitigation plans, and to inspire them to provide more raw data to enter into it to make it a more valuable tool. In late 2017, the Arizona Geological Survey (AZGS) contacted the Cartography and GIS office at NBMG for information regarding the set-up and implementation of the MyHazards web application in order for the AZGS to develop a similar product. The MyPlan and MyHazards websites have many participating partners across state lines, including; California Emergency Management Agency, Nevada DEM, NDOT, and NBMG, with NBMG acting as the lead in this project. These web applications provide local counties and tribes with information and mapping of local hazards and for counties to upload hazard/risk data. This provides local counties and Nevada with a database that can be improved upon over time when additional data becomes available. It is designed to allow local and tribal communities to observe multiple hazards layers in their regions for a full risk and vulnerability assessment. Providing a more detailed risk assessment to local communities will improve their hazard mitigation planning efforts and allow for a better project identification and prioritization process. NBMG maintains the MyPlan website.
- NBMG continues to update the HAZUS database with current building inventory and posting Open File Reports online with HAZUS flood data on major rivers, as well as earthquake data for more than 38 rural communities in Nevada. The current HAZUS runs were accomplished by the NV DEM contractor for the SHMP update secondary to staffing at NBMG.
- The NHMWG continues to meet in locations statewide with wide and great acceptance by local communities. The meetings provide awareness of mitigation and resiliency

successfully as shown by the completion of LHMPs statewide and the increase in applications for projects for all identified natural hazards.

8.6.3 State Provision of a Portion of the Non-Federal Match for Mitigation Projects

Although there is no provision for any portion of the State to provide a match for mitigation projects, there are other potential sources of State funding that may be used to match federal grants for specific projects. Some examples follow:

- State NRS 414, Emergency Management, provides the Disaster Relief Fund and the Emergency Assistance Account that can be used by the state to match projects in qualifying communities for post-disaster costs including hazard mitigation.
- UNR continues to provide the match on planning activities such as HAZUS earthquake and flood runs.
- State grants provides limited opportunity for matching funds each year.
- State Revolving Fund under NDEP partners with NDEM for matching funds on related projects.

8.6.4 Promotion of Nationally Applicable Model Building Codes

Since 1981, the State of Nevada has adopted a series of nationally applicable, model building-related codes that local governments (with the exception of Clark County in some instances) are required to enforce. The existing State codes are shown in Table 8-04. Local governments may also adopt these codes with amendments that are more restrictive than the state adoption but may not be less restrictive. Adoption of these codes by local jurisdictions will make local mitigation more effective. NHMWG takes into consideration the adoption of the State building codes when prioritizing proposals by the communities applying for hazard mitigation funding. NHMWG identifies those local governments with policies currently in place that include strong hazard mitigation programs and offers them as positive examples to other Nevada communities and local governments in developing their own effective hazard mitigation plans and ordinances. The State provides guidance to these communities and supports pass-through funds available to communities interested in adopting hazard mitigation actions. While FEMA has encouraged states to adopt building codes at the statewide level, Nevada is one of nearly half of the country who adopt building codes at the local county level. Three rural/frontier counties in Nevada do not have adopted building codes but have notified the State that they follow whatever the State has adopted for building codes when building permits are requested. As stated prior in this plan, via the last study that was accomplished regarding building codes in Nevada, 97% of the population in Nevada are covered by 2018 or later building codes at the local level. The political climate in Nevada surrounding building code adoption at the statewide level is such that NV DEM mitigation staff are unable to work to change this situation. Nevada DEM's recommendation to FEMA is to go about this is a different way and provide points in the BRIC competitive funding area based on County level adoption of building codes rather than statewide adoption. This would make building code adoption equitable to all state regardless of their state law. By last update, the State and 12 counties have adopted the 2018 IBC and IRC codes, one county has adopted 2021 IBC and IRC codes, to rural frontier counties have adopted 2012 IBC and IRC codes, and two frontier counties have not adopted any codes but refer to following whatever the State has adopted.

As stated above, the current political climate does not allow NV DEM mitigation staff to address change to a statewide building code adoption. However, with only two counties with older 2012 adopted codes, mitigation staff is engaged in outreach in encouraging adoption of newer building codes. The two counties who have not adopted any building codes are too small to force adoption of building codes. NV DEM mitigation staff are working to have a statement added to their ordinances that officially states they follow the State code adoption. Nevada DEM mitigation staff regularly encourage adoption of newest building codes at most training and workshop events. All state-owned and operated facilities are at least at the 2018 code adoption level. The plan is to continue outreach to our rural counties encouraging adoption of latest codes. Per the 2021 population count with a population of 3,143,515 and 3,131,758 living under the 2018 IBC/IRC code adoption, 99% of the population in Nevada is covered under 2018 building codes. Therefore, Nevada would argue that FEMA should consider changing their requirement from statewide adoption to county level adoption considering that extremely small frontier communities are unlikely to apply for a competitive BRIC grant and thus the current technical review points for this grant are not equitable to a state like Nevada.

Table 8-04. Existing State Model Codes Promoted for Adoption by Local Governments.

Policy	Description of Model Codes	Applicability
Building and Fire Codes	The State has adopted a building code and local governments are required to adopt and enforce this code with the exception of Clark County. (see NRS 477.030 (12)). NRS 278.580 – **Building codes: Adoption; fees for permits; applicability to State and Nevada System of Higher Education; authorization of use of materials and technologies that conserve resources in construction and use of solar or wind energy; adoption of seismic provisions and standards** NRS 461.170 – Division required to adopt by regulation nationally recognized codes and standards for construction, reconstruction and alteration. NRS 477.030 (1)–Requires the State Fire Marshal to adopt minimum fire and building codes to ensure fire safety, except as otherwise provided. NRS 477.030 (12) - Except as otherwise provided in this subsection, any regulations of the State Fire Marshal concerning matters relating to building codes, including, without limitation, matters relating to the construction, maintenance or safety of buildings, structures and property in this State. Exemptions are provided to a county whose population is 700,000 or more (Clark County, only) and have adopted a code at least as stringent as the *International Fire Code* and the *International Building Code*, published by the International Code Council.	The adoption and enforcement of building and fire codes relates the design and construction of structures to standards established for withstanding wildfires, earthquakes, flooding, dam failure, and high winds.

Table 8-04. Existing State Model Codes Promoted for Adoption by Local Governments.		
Policy	**Description of Model Codes**	**Applicability**
	NRS 514.040(3) – Apply geologic engineering principles to problems of conservation, environment, construction, mineral industry and other scientific matters that may be of importance to the welfare of the State. NRS 623 – Architects, Interior Designers and Residential Designers.	
Zoning	Laws and ordinances regulate development by dividing the community into zones and by setting development criteria for each zone. NRS 278.147 – Facilities for use, manufacture, processing, transfer or storage of explosives or certain other substances: Conditional use permit required; application for and issuance of conditional use permit. NRS 278.160 – Elements of the master plan (planning and zoning). NRS 278.580— Standards for the investigation of hazards relating to seismic activity, including, without limitation, potential surface ruptures and liquefaction NRS 410.095 through 410.210 – Regulation and restriction of outdoor junkyards.	Zoning can keep inappropriate development out of hazard-prone areas and can designate certain areas for such things as conservation, public use, or agriculture. Zoning can also be used to control construction by dedicating areas for cluster development or planned unit development. The State currently works with local governments on implementing these last two policies.
Land Use Planning	Comprehensive land use planning provides a mechanism to prevent development in hazardous areas or allows development in a manner that minimizes damage from hazards. Land use planning gives local governments "the big picture" of what is happening in their jurisdiction. NRS 278.02521 – Legislative intent (protecting environmentally sensitive areas and maintaining the economic viability of rural lands). NRS 278.160 – Elements of master plan (planning and zoning). NRS 278.580—Standards for the investigation of hazards relating to seismic activity, including, without limitation, potential surface ruptures and liquefaction. NRS 321.640 through 321,770 – State planning of use of land. NRS 324 – Lands under Carey Act (regulates use of water and reclamation of water projects). NRS 376A – Taxes for development of open space land.	Local governments can use land use planning to identify those areas subject to damage from hazards and work to keep inappropriate development out of those areas. Land use planning can also be used for more regional approach when local governments work together.

Table 8-04. Existing State Model Codes Promoted for Adoption by Local Governments.		
Policy	**Description of Model Codes**	**Applicability**
	NRS 472 – State Forester Fire Warden (management of vegetation, cooperative agreements, rangeland fire protection associations, elimination of fire hazards, etc.). NRS 528 – Forest practice and reforestation. NRS 534 – Underground water and wells	
Subdivision Regulations	Sets construction and location standards for subdivision layout and infrastructure. NRS 445D – Environmental covenants (Uniform Act).	Contains standards for such things as storm water management and erosion control
Capital Improvements Planning	Identifies where major public expenditures will be made over the next 5 to 10 years.	Capital Improvement Plans can secure hazard-prone areas for low risk uses, identify roads or utilities that need strengthening, replacement, or realignment, and can prescribe standards for the design and construction of new facilities.

Table 8-05 below provides the status of adoption of different building codes by local governments in Nevada. Acronyms are defined below Table 8-05.

Table 8-05. Code Adoption by Jurisdiction, as of July 2023									
JURISDICTION	**IBC**	**IRC**	**UPC**	**UMC**	**NEC**	**IECC**	**IFC**	**OTHER**	**AMENDMENTS**
CARSON CITY	2018	2018	2018	2018	2018	2018	2018	2018 IMC 2018 IFGC 2018 IPMC 2018 IEBC 2018 USPSHT 2018 ISPSC 2018 IWUIC 2008 ICC/ANSI A117.1	2015 Northern NV Amendments 2012 Northern NV Fire Amendments 2012 Northern NV Amendments 2011 Northern NV Energy Code Amendments
CLARK COUNTY SCHOOL DIST	2018		2018	2018	2018	2018	2018	2018 ICC A117.1 Accessibility 2018 NFPA 13 & 72	YES
CLARK COUNTY BLDG DEPT	2018	2018	2018	2018	2018	2018	2018	2018 Clark County Building Administrative Code 2018 ISPSC	YES
CITY OF LAS VEGAS	2018	2018	2018	2018	2018			2018 ISPSC Amendments 2018 Administrative Code ordinance 2018 IBC ordinance 2018 IEBC ordinance 2018 IRC ordinance 2018 UMC ordinance 2018 UPC ordinance NEC Requirement Applicable to Special Events Special Events Permit Guidelines 5152014	YES: Existing Building Code CLV Amendments to the SNV 2012 IBC
BOULDER CITY	2018	2018	2018	2018	2018	2018	2018	2018 BSDAC 2018 ISPSC	YES
CITY OF NORTH LAS VEGAS	2018	2018	2018	2018	2018	2018		2018 ISPSC Building Policies and Procedures Building Administrative Code	YES: Southern Nevada Amendments

Table 8-05. Code Adoption by Jurisdiction, as of July 2023									
JURISDICTION	**IBC**	**IRC**	**UPC**	**UMC**	**NEC**	**IECC**	**IFC**	**OTHER**	**AMENDMENTS**
								ASHRAE ANSI A117. 1-2009 The Blue Book	
DOUGLAS COUNTY	2021	2021	2021	2021	2021	2021	2021	2021 International Urban Wildfire Interface Fire Code for Lake Tahoe area	YES
ESMERALDA COUNTY	-	-	-	-	-	-	-		Population 743
EUREKA COUNTY	-	-	-	-	-	-	-		Frontier status
STATE OF NV (NAC 341.045)	2018	2018	2018	2018	2018	2018	2018	2018 IEBC 2018 SAD	YES(NAC 341.045)
CITY OF SPARKS	2018	2018	2018	2018	2018	2018		2018 IEBC 2018 IMC 2018 IFGC 2018 ISPSC 2018 IGCC NFPA 58 & 54	YES
WASHOE COUNTY	2018	2018	2018	2018	2018	2018	2018	2018 IEBC 2018 IFGC 2018 IMC 2018 ISPSC 2018 IWUIC 2018 IGCC NFPA 58 & 54	YES: Northern Nevada amendments (2012 & 2015)
CITY OF RENO	2018	2018	2018	2018	2018	2018		2018 IFGC 2018 IMC	YES
LINCOLN COUNTY	2012	2012	2012	2012	2012	2012			YES
LYON COUNTY	2018	2018	2018	2018	2018	2008		20128IFGC	YES
ELKO COUNTY*	2018	2018	2018	2018	2018	2018	2018 (including the NFPA's)	2018 UAC 2018 IEBC	YES
MINERAL COUNTY	2012	2012	2012	2012	2012	2012			

Table 8-05. Code Adoption by Jurisdiction, as of July 2023									
JURISDICTION	**IBC**	**IRC**	**UPC**	**UMC**	**NEC**	**IECC**	**IFC**	**OTHER**	**AMENDMENTS**
NYE COUNTY	2018	2018	2018	2018	2018	2018	2018	2018 IPMC, 2018 USPSHT	
PERSHING COUNTY	2018	2018	2018	2018	2018	2018	2018		
STOREY COUNTY	2018	2018	2018	2018	2018	2018	2018		
WHITE PINE COUNTY	2018	2018	2018	2018	2018	2018	2018		

Table 8-05 Notes:
ANSI- American National Standards Institute
ASHRAE- American Society of Heating, Refrigerating, and Air-Conditioning Engineers
BSDAC- Building and Safety Division Administrative Code
IBC- International Building Code
ICC - International Code Council
IEBC- International Existing Building Code
IECC- International Energy Conservation Code
IFC- International Fire Code
IFGC - International Fuel Gas Code
IGCC- International Green Construction Code
IMC- International Mechanical Code
IPMC- International Property Maintenance Code
IRC- International Residential Code
ISPSC - International Swimming Pool and Spa Code
IUWIFC- International Urban Wildfire Interface Fire Code
IWUIC- International Wildland-Urban Interface Code
NEC- National Electrical Code
NFPA- National Fire Protection Association
SAD- Standards for Accessible Design
UAC- Uniform Administrative Code
UMC- Uniform Mechanical Code
UPC- Uniform Plumbing Code
USPSHT- Uniform Swimming Pool, Spa & Hot Tub Code
Nevada L_P Gas Board – National Fire Protection Act - NFPA 54 (2009 edition)– applies statewide.
Nevada Division of Industrial Relations –Safety Codes for Elevators and Escalators A17.1 (2013 edition), A17.3 (2011 edition) and others.
**Elko County's 2003 IBC with Appendix Chapters B, C, E, G, H, J, & I and 2003 IRC (Building and Electrical Chapters) with Appendix's G, H, & L. The State Fire Marshal's Office adopted the 2012 IBC and Fire Code and the 2012 UMC.*
Clark County School District will be adopting the Southern Nevada Building Official amendments for the 2018 ICC series along with the UMC and UPC in early 2019

8.6.5 Post-Disaster Mitigation of Building Risks

Through partnerships with the Nevada Fire Safe Council, the FM, and other groups, the state has begun a comprehensive, multi-year effort to mitigate risks posed to existing buildings identified as necessary for post-disaster response and recovery operations.
Buildings identified as necessary for post-disaster response and recovery operation include:

- Facilities used by first responders
- Buildings used as evacuation centers, such as schools
- Water facilities needed by communities
- Critical communication infrastructure
- Hospitals and clinics
- Major utility sources

NBMG has completed a project in which all potential URM buildings in the state were identified and geotagged with GPS coordinates in a user-friendly database. This database provides a starting place for field-checking to verify which ones are definitely URMs. The next step in completion of this project will be developing a grant that includes a funding request for field verification of the potential URMs statewide, with particular reference to identifying which are critical facilities and schools. Field verification has been completed in the Clark County unincorporated areas, Reno, and Carson City. A subset of critical state and local buildings has been compiled and mapped providing vulnerability assessment information for mitigation activities as well as information for the response effort. This database will be expanded to include additional critical facilities and structures as they are identified and located. This will help mitigate the risks posed to these structures essential to post-disaster response and recovery operations. Also, as part of the Risk MAP program, NDWR and Nevada DEM work together in the development and update of local plans to provide risk data for communities to bring awareness of the location of the hazard in reference to the current building inventory with the development of flood depth grids as data (mostly locally funded LiDAR) becomes available.

8.6.6 Integration of Mitigation with Post-Disaster Recovery

Hazard mitigation is an integral part of Nevada's post-disaster recovery operations. When a presidentially declared disaster occurs, a joint field office is opened and operated by FEMA. The SHMO is co-located with the recovery PA Officer who manages the public assistance program. Staff members from several other state agencies such as NDOT, NDF, NBMG as well as local stakeholders may also be situated here, allowing for the identification of a wide spectrum of mitigation elements in recovery, repair, and restoration projects. Mitigation and public assistance program staff jointly conduct applicant briefings to discuss mitigation opportunities through both public assistance and HMGP. The SHMO quickly disseminates letters of intent and information on the HMGP and provides technical assistance to potential applicants. The SHMO coordinates with NHMWG members and with FEMA staff to develop a strong hazard mitigation strategy that includes the following elements:

- Technical services
- Support to 406 mitigation
- Hazard Mitigation Planning
- HMGP Technical Assistance

- Community Education and Outreach

The intent of Nevada's HM program is to increase the resiliency of communities in Nevada. As always, more work in outreach can be done to bring additional programs to partner in hazard mitigation efforts. In Nevada, the THIRA program is a good example of a new program integrating hazard mitigation data for response and recovery purposes.
Nevada had two presidential disaster declarations in 2017. Nevada DEM set a goal of 50% of project worksheets to include 406 Hazard Mitigation funding. Actual 406 mitigation was 47% for the combined disasters.

Nevada received the presidential disaster declaration with the COVID pandemic in 2021, as well as received a presidential declaration for atmospheric river storms in March 2023. The plan is for mitigation to be added to each project worksheet as makes sense in building back better. Mitigation is a state priority in post disaster recovery.

8.6.7 Disaster Recovery Framework

Recovery and mitigation work closely together with ongoing mitigation planning efforts. Implementation of mitigation projects play a key role in ensuring the state's preparedness to recover. The State Enhanced HMP identifies projects that have direct impacts on long-term recovery activities. This framework recognizes that recovery-planning efforts must work in concert with mitigation planning activities and that there may be an overlap between the two aspects of emergency planning.

Mitigation and Recovery work together with eight Recovery Support Functions (RSF). These RSFs include Community Planning and Capacity Building, Economic Recovery, Health and Social Services, Disaster Housing, Infrastructure Systems, and Natural and Culture Resources. The Recovery Framework brings together many supporting agencies including the Governor's Office of Economic Development, Department of Employment, Training and Rehabilitation, DCNR, NDA, Department of Public Safety, Department of Corrections, NDOT, Nevada Housing Division, Department of Education, NDHHS, SPWD, Department of Business and Industry, NDOW, Department of Taxation, Nevada Contractors Association, and the Rural Community and Economic Development Division. Mitigation is woven throughout the Recovery Framework including working together for planning, technical support in identifying recovery and mitigation projects, and monitoring post disaster recovery and mitigation projects to ensure proper oversight. Our goal is to help build accessibility, resiliency, sustainability, and mitigation measures into identified recovery strategies, preparedness, and operational plans.
Executive order 2018-4, Implementation of Nevada's Statewide Resilience Strategy, discusses the fact that Nevada experienced an unprecedented number of emergencies and disasters during calendar year 2017, which resulted in disruption and tragedy throughout Nevada. It states, "Nevada's lessons learned from its unprecedented year, its commitment to recovering fully, and its established policy development and implementation framework through the Nevada Homeland Security Working Group can be combined to build and implement a plan for building statewide resilience". This executive order outlines the plans and measures that will be taken to recover from these events as well as plan for increased resilience regarding future disasters.

Recovery efforts work together with effective mitigation efforts to make Nevada a more resilient state.