A. Adoption and Resolution

The adoption and resolution is a placeholder that will be updated once the final adoption is complete.

ORDER AMENDING THE SEPTEMBER 25, 2018, EXECUTIVE ORDER ADOPTING THE NEVADA ENHANCED HAZARD MITIGATION PLAN

WHEREAS, the Nevada Office of the Military, Division of Emergency Management, in coordination with the Nevada Hazard Mitigation Planning Committee, has updated the Enhanced Hazard Mitigation Plan for the State of Nevada; and

WHEREAS, the Plan identifies hazards that threaten Nevada's citizens and property, and identifies and prioritizes projects to reduce or eliminate those threats; and

WHEREAS, the State of Nevada must adopt the Enhanced Hazard Mitigation Plan in order to be compliant with the Section 322 of the Federal Disaster Mitigation Act of 2000, and to be eligible for increased disaster assistance; and

WHEREAS, Article 5, Section 1 of the Nevada Constitution provides that, "The supreme executive power of this State, shall be vested in a Chief Magistrate who shall be Governor of the State of Nevada."

NOW, THEREFORE, by authority vested in me as Governor by the Constitution and laws of the State of Nevada, I hereby direct and order as follows:

The Enhanced Hazard Mitigation Plan, as updated on _____, 2023, is hereby adopted by the State of Nevada.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the State of Nevada to be affixed at the State Capitol in Carson City, this ___ day of March, in the year two thousand twenty-three.

_____

Governor

_____

Secretary of State

_____

Deputy

B. Nevada Hazard Mitigation Working Group Charter

NEVADA HAZARD MITIGATION WORING GROUP CHARTER

I. Authority

The Nevada Hazard Mitigation Working Group ("Working Group") is established through the authority contained in Nevada Revised Statutes ("NRS") Chapter 414, which authorizes the Chief of the Nevada Division of Emergency Management ("DEM") to carry out the emergency management program for the State of Nevada.

II. Purpose and Mission

The purpose of the Working Group is to advise the Chief on hazard mitigation assistance ("HMA"), which includes planning, projects, and policies. All hazards, including natural and man-made, may be considered, and the Working Group should adhere to the State Hazard Mitigation Plan prepared in accordance with the federal Disaster Mitigation Act of 2000. Specific charges to the Working Group are to:

1. Provide recommendations for the implementation of the State Hazard Mitigation Plan, through the following actions:
    a. Encourage local and regional, multi-jurisdictional governmental agencies, and the private sector to prepare their own hazard mitigation plans; and
    b. Support the preparation of appropriate proposals from state agencies and encourage local and regional, multi-jurisdictional governmental agencies to submit proposals for HMA in Nevada; and
    c. Review and rank proposals submitted for HMA and make recommendations to the Chief for priorities for funding; and
    d. Assist DEM in the preparation of formed proposals to FEMA for HMA; and
    e. Promote activities that contribute toward building disaster-resistant communities throughout Nevada; and
    f. Assess risks from hazards in Nevada and use risk assessments in the development of Hazard Mitigation Plans and in the evaluation of proposals for HMA.
2. Review and recommend revisions to the State Hazard Mitigation Plan, as requested by the Chief and/or required by state or federal law, or as needed.

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III. Membership

Members will be appointed by, and serve at the pleasure of, the Chief of DEM. Working Group members will serve a three (3) year term with no limit to the number of terms, provided they are reappointed by the Chief of DEM.

The Chief may appoint membership to meet the following minimum representation:

1. An individual representing local government emergency management within Nevada.
2. An individual representing economic development.
3. An individual representing land use development.
4. An individual representing housing.
5. An individual representing health and human services with a statewide view.
6. An individual representing infrastructure within Nevada.
7. An individual representing natural and cultural resources, preferably from one of Nevada's 27 federally recognized tribes.
8. A subject matter expert for each of Nevada's key hazards:
    a. Earthquake
    b. Wildland Fire
    c. Flood
    d. Pandemic
9. An individual representing weather and meteorological expertise.
10. Any other members the Chief finds to be beneficial for the discussion to improve Nevada's resilience.

The Chief of DEM expects that members will attend every meeting of the Working Group. If a member demonstrates a pattern of non-participation, the Chief of DEM will conduct appropriate membership actions, up to, and including, removal from the Working Group.

IV. Officers and Duties

The Officers of the Working Group shall consist of the Chair and Vice Chair.

a) Chair – The Chair is appointed by, and serves at the pleasure of, the Chief of DEM. The Chair is the leader of the Working Group and will be the presiding officer at all meetings.

The Chair shall provide reports to the Chief of DEM on or before December 31 of each year detailing the activities of the Working Group.

b) Vice Chair – The Vice Chair is elected by the membership of the Working Group. The Vice Chair will serve a one-year term starting on January 1. In the absence of the Chair, the Vice Chair will assume the responsibilities of the Chair.

There is no limit to the number of terms that a member can serve as the Chair or Vice Chair. Only members of the Working Group are eligible to serve as the Chair or Vice Chair of the Committee.

V. Meetings

Working Group meetings will be called quarterly or at the request of the Chief.

All meetings are subject to the Nevada Open Meeting Law contained in Chapter 241 of the Nevada Revised Statutes.

VI. Voting

A simple majority of voting members present at a Working Group meeting constitutes a quorum for the transaction of business pursuant to the Nevada Open Meeting Law.

Proxies are not recognized by the Nevada Open Meeting Law; proxies do not count toward a quorum and are not permitted to vote.

VII. Administrative Support

The State Hazard Mitigation Officer will be responsible for administrative support to the Working Group with assistance from the Chief's Administrative Assistant or designee.

VIII. Communications

DEM will maintain a portion of their webpage to present Working Group meeting materials to the public in accordance with Open Meeting Law provisions. This webpage will also include items the State Hazard Mitigation Officer and/or this Working Group finds useful to share with our Nevada community to enhance our resilience through hazard mitigation tools, techniques, and practices.

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C. Agendas and Minutes

Per guidance from FEMA Region IX, Hazard Mitigation Working Group agendas and minutes must be maintained and available but are not required as part of the Enhanced Mitigation Plan. The 2023 Nevada Mitigation Working Group agendas and minutes may be found at:

https://dem.nv.gov/DEM/2023_Nevada_Hazard/#content.

For more information, contact the Nevada Division of Emergency Management / Homeland Security at mitigation@dem.nv.gov

D.Nevada Administrative Code Emergency Management

NAC 414.105 Application for assistance: General requirements. (NRS 414.135)

1. Except as otherwise provided in subsection 3, a state agency or political subdivision that seeks assistance from the Emergency Assistance Account for an emergency or disaster must submit, in writing, an application for assistance to the Division in accordance with the requirements for the application set forth in this section.
2. A state agency or county submitting an application for assistance from the Emergency Assistance Account must submit the application for assistance directly to the Division.
3. Before a city may submit an application to the Division for assistance from the Emergency Assistance Account, the city must apply for any available assistance from the county in which the city is located.
4. An application for assistance from the Emergency Assistance Account for an emergency or disaster must be received by the Division:
    (a) Within 30 days after the determination of an emergency or disaster, if the applicant is a state agency or county; or
    (b) Within 45 days after the determination of an emergency or disaster, if the applicant is a city.
5. Each application for assistance from the Emergency Assistance Account must include the following:
    (a) A copy of the declaration of emergency or disaster or, if such a declaration is not available, a detailed explanation of the emergency or disaster.
    (b) Any official report of a governmental entity concerning any actual or potential threat to the life, health, safety or property of persons in this state.
    (c) Any professional reports or certifications supporting the existence of an emergency or disaster.
    (d) Any preliminary damage assessment conducted:
        (1) If the applicant is a state agency, by officials of the agency and a preliminary damage assessment team deployed by the Division, if any, to arrive at a consensus pertaining to the preliminary damage assessment; or
        (2) If the applicant is a political subdivision, by a preliminary damage assessment team.

(e) A full disclosure of the financial records of the applicant for a determination of the financial need of the applicant by the Division.

(f) A certification that the existing financial or physical resources of the applicant are insufficient and no other funding sources are available to support all the estimated costs in providing a satisfactory remedy to the emergency or disaster. Such a certification from a state agency must be submitted by the Budget Division of the Office of Finance.

(g) A certification that all other available resources have been exhausted, including, without limitation, interlocal agreements, mutual aid agreements and private resources.

(h) description of all the projects to be paid, in whole or in part, by any allocation from the Emergency Assistance Account.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003; A by R046-16, 6-28-2016)

NAC 414.110 Application for assistance: Duties of Division upon receipt. (NRS 414.135**)**

Upon the receipt of an application for assistance from the Emergency Assistance Account, the Division will:

1. Verify the declaration of emergency or disaster if provided with the application.
2. Verify that the emergency or disaster poses a threat to the life, safety, health or property of persons in this state.
3. Review any professional reports or certifications supporting the existence of an emergency or disaster.
4. If the applicant is a state agency and a preliminary damage assessment team has not been deployed before application is made, determine if it is appropriate to appoint a preliminary damage assessment team and, if so, appoint a preliminary damage assessment team to work with officials from the agency to conduct a preliminary damage assessment.
5. Review the financial records of the applicant for a determination that the applicant has exhausted or will exhaust the existing financial or physical resources as a result of the emergency or disaster.
6. Review the certification of financial need submitted by the applicant.
7. Verify that the applicant has exhausted all other available resources.
8. Review the projects submitted for approval by the Division.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003; A by R046-16, 6-28-2016)

NAC 414.115 Allocation and expenditure of money for emergency or disaster. (NRS 414.135)

A. Except as otherwise provided in subsection 2, an allocation from the Emergency Assistance Account for an emergency or disaster must be expended within 60 days after the approval of the allocation by the Division, unless such time is extended by the Division based upon a showing of good cause by the requesting entity.

B. An allocation for a project that the Division reasonably determines to be a long-term project pertaining to the health or safety of human life must be expended within the fiscal year in which the allocation is approved by the Division, unless such time is extended by the Division based upon a showing of good cause by the requesting entity.

C. A request for an extension of the time in which an allocation is required to be expended must be submitted to the Division in writing and approved by the Division before the expiration of the period in which the allocation is required to be expended pursuant to this section.

D. Any money advanced but not expended within the period required pursuant to this section must be returned to the Emergency Assistance Account. Any money returned or obligated but not expended within the period required pursuant to this section will be made available for reallocation.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.120 Allocation and expenditure of money pursuant to subsection 4 of NRS 414.135. (NRS 414.135)

A. A state agency or political subdivision that seeks an allocation of money pursuant to subsection 4 of NRS 414.135 must submit, in writing, an application to the Division.

B. Any money allocated from the Emergency Assistance Account pursuant to subsection 4 of NRS 414.135 must be expended within 60 days after the approval of the allocation by the Division, unless such time is extended by the Division based upon a showing of good cause by the requesting entity.

C. A request for an extension of the time in which an allocation is required to be expended must be submitted to the Division in writing and approved by the

Division before the expiration of the period in which the allocation is required to be expended pursuant to this section.

D. Any money advanced but not expended within the period required pursuant to this section must be returned to the Emergency Assistance Account. Any money returned or obligated but not expended within the period required pursuant to this section will be made available for reallocation.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.125 Completion of project: General requirements. (NRS 414.135)

1. Each project must be completed within 90 days after the date the application was approved by the Division, unless such time is extended by the Division based upon a showing of good cause by the requesting entity.
2. A request for an extension of time to complete a project must be submitted to the Division in writing and approved by the Division before the expiration of the period required pursuant to subsection 1.
3. If the period authorized for completion of a project is more than 90 days or is extended to more than 90 days, the applicant shall submit quarterly reports of each project to the Division. Every applicant shall submit a final report of each project to the Division not later than 30 days after the end of the period authorized to complete the project.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.130 Payments from Account on basis of reimbursement or advance funding. (NRS 414.135)

1. Except as otherwise provided in this section, all payments from the Emergency Assistance Account must be made on the basis of reimbursement.
2. Assistance will be provided from the Emergency Assistance Account on a basis of advance funding only if:
   (a) The applicant is unable to begin recovery from the emergency or disaster without advance funding; and
   (b) The amounts budgeted by the applicant for an emergency or disaster are not sufficient to support the purchase of equipment or supplies.
3. Advance funding will be provided at a maximum of 25 percent of the total cost of the project. Progressive advances will be provided based on the percentage of the project that has been completed and the submission of documentation evidencing all costs incurred to date.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.135 Requests for reimbursement from Account. (NRS 414.135)

An applicant submitting a final request for reimbursement shall submit documentation evidencing all costs incurred for the project not later than 60 days after the completion of the project. An

applicant may submit periodic requests for reimbursement during a project that the Division determined to be a long-term project pursuant to NAC 414.115. Upon the receipt of a request for reimbursement, the Division will:

1. Review the eligibility of the project costs for money from the Emergency Assistance Account;
2. Require documentation evidencing all costs claimed on the request for reimbursement;
3. Verify the availability of money approved for the project; and
4. Process any claim that has been approved by the Division for payment to the applicant.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.140 Applicant to reimburse Account from certain money received. (NRS 414.135)

An applicant receiving money from the Emergency Assistance Account shall reimburse the Emergency Assistance Account from any money the applicant receives from:

1. Any federal, state or local governmental agency or private source for the emergency or disaster;
2. Legal action taken against any person or entity responsible for the emergency or disaster; or
3. Payments received as a result of coverage from a policy of insurance relating to the emergency or disaster,
4. not later than 30 days after the applicant receives such money.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

E. County Ground Motion Maps

In the previous state plan, a single scenario earthquake was portrayed for each county in Appendix F. Although this is an example of the effects of an event, there are many such events possible in each county. A single event can be misleading by underestimating the actual earthquake hazard of parts of the county that are farther away from the event than may exist. Using the National Seismic Hazard Map eliminates this potential underestimation.

Therefore, this update now has earthquake hazard maps for each county. The maps are made from the 2014 U.S. Geological Survey National Seismic Hazard Map and are peak ground accelerations with a 2% non-exceedance in 50 years. Modified Mercalli Intensities that correlate with these accelerations are also shown to aid in the interpretation of the probabilistic seismic hazard maps. Note that any part of Nevada can be subjected to damaging shaking from earthquakes.

Figure E-1.

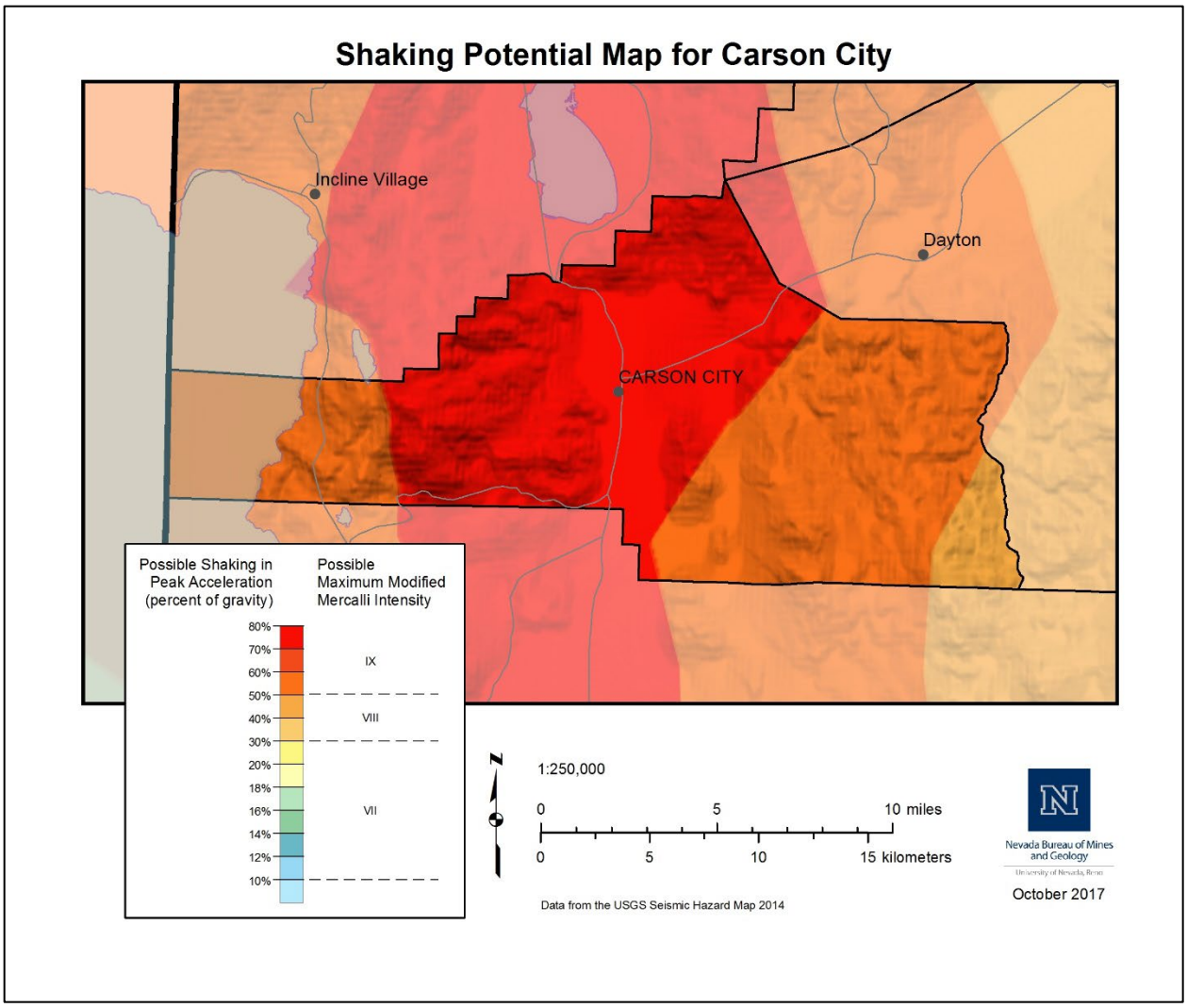


Figure E-2.

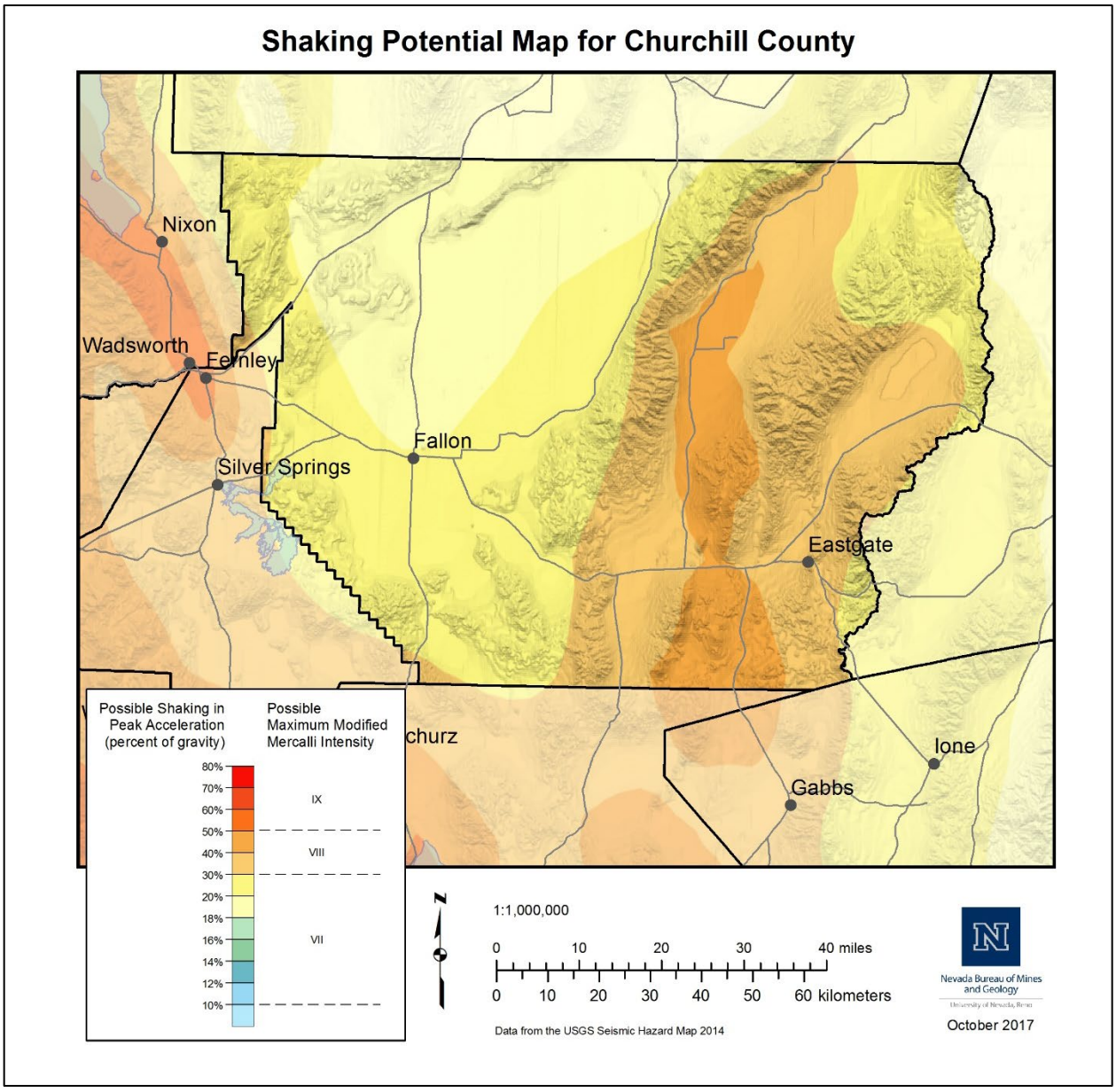

Shaking Potential Map for Churchill County
Nixon
Wadsworth
Fernley
Fallon
Silver Springs
Eastgate
churz
Ione
Gabbs
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,000,000
0 10 20 30 40 miles
0 10 20 30 40 50 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Figure E-3.

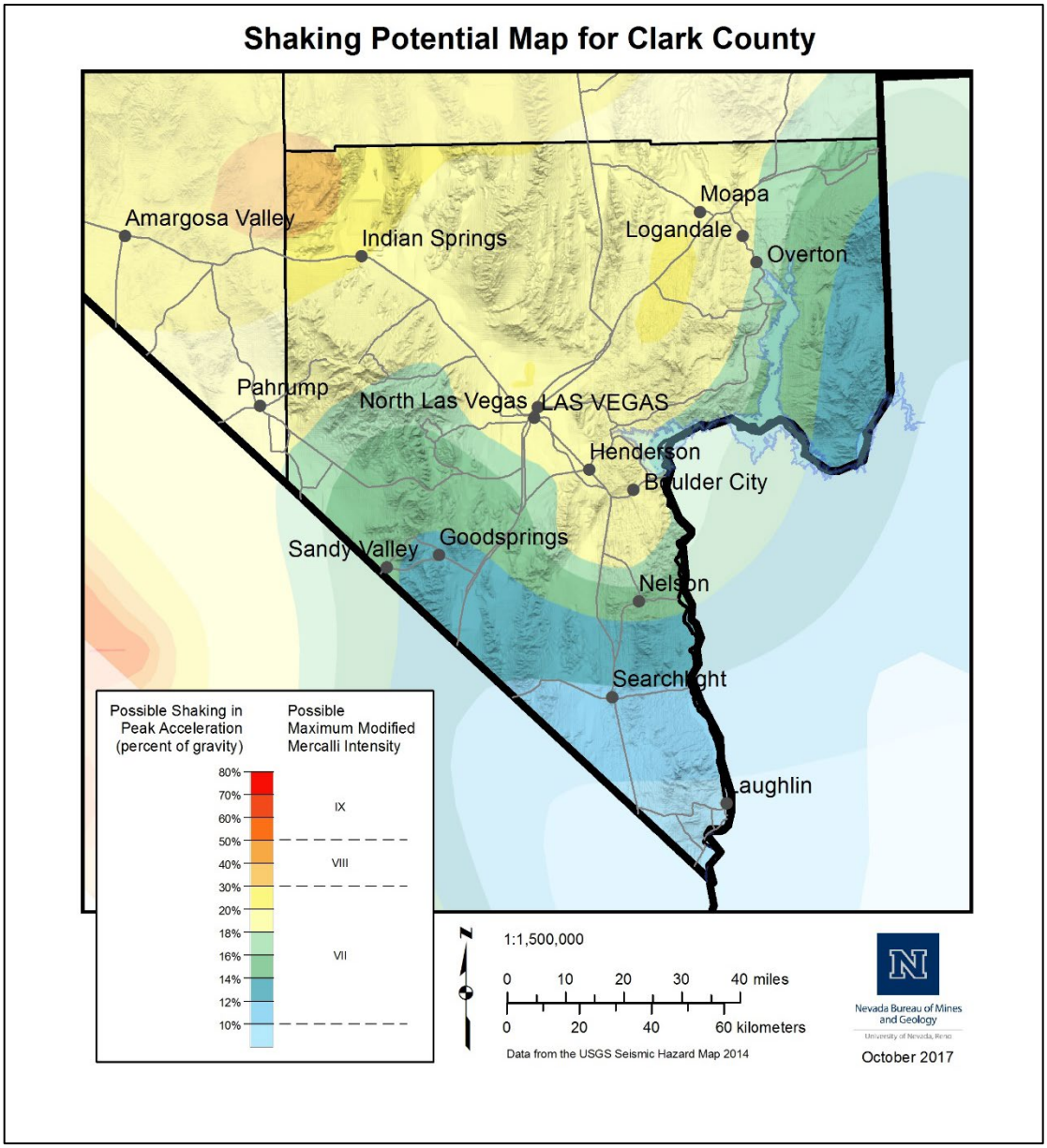
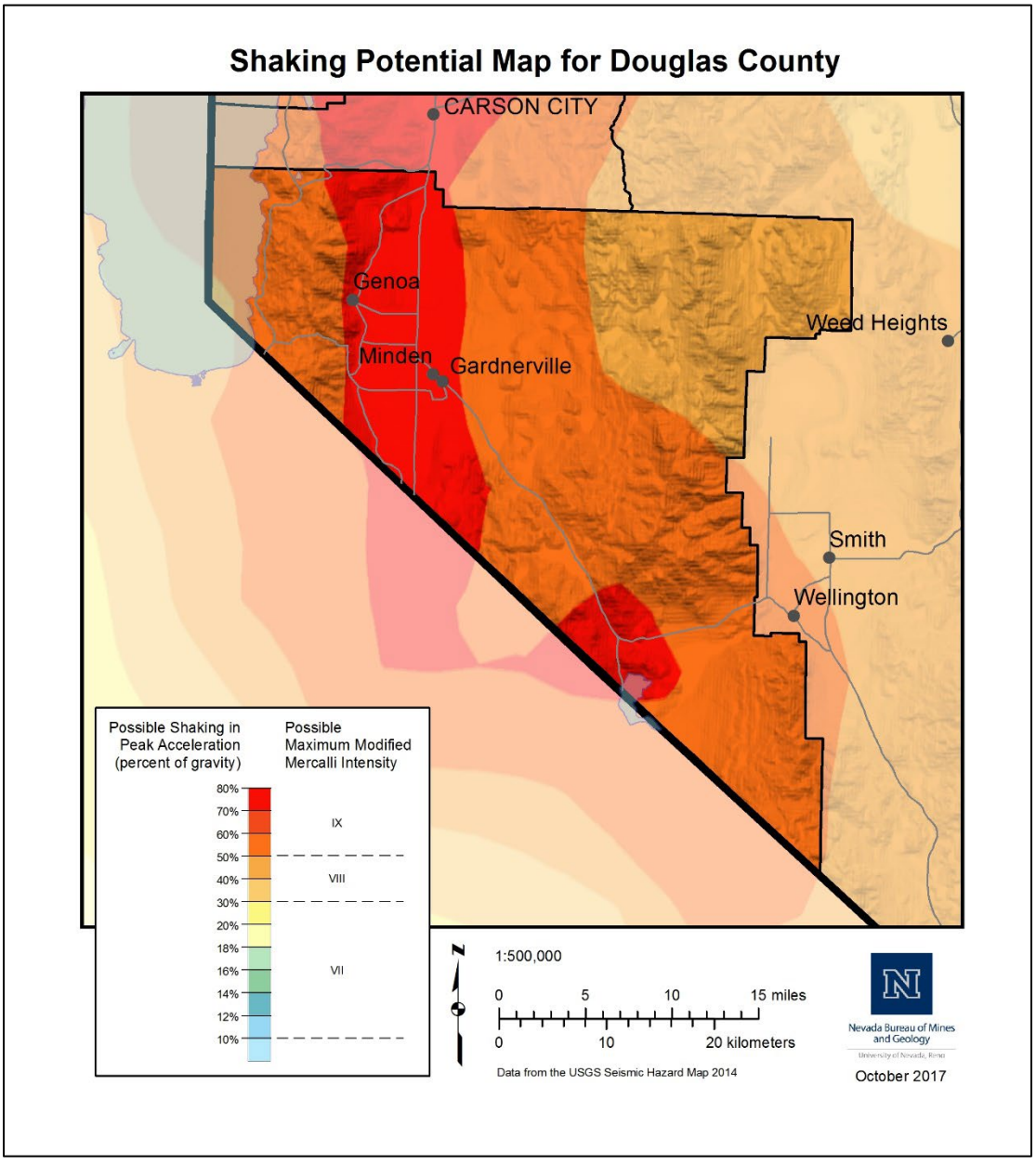

Shaking Potential Map for Clark County
Amargosa Valley
Indian Springs
Moapa
Logandale
Overton
Pahrump
North Las Vegas
LAS VEGAS
Henderson
Boulder City
Sandy Valley
Goodsprings
Nelson
Searchlight
Laughlin
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,500,000
0 10 20 30 40 miles
0 20 40 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure E-4.


Shaking Potential Map for Douglas County
CARSON CITY
Genoa
Minden
Gardnerville
Weed Heights
Smith
Wellington
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
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20%
18%
16%
14%
12%
10%
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VIII
VII
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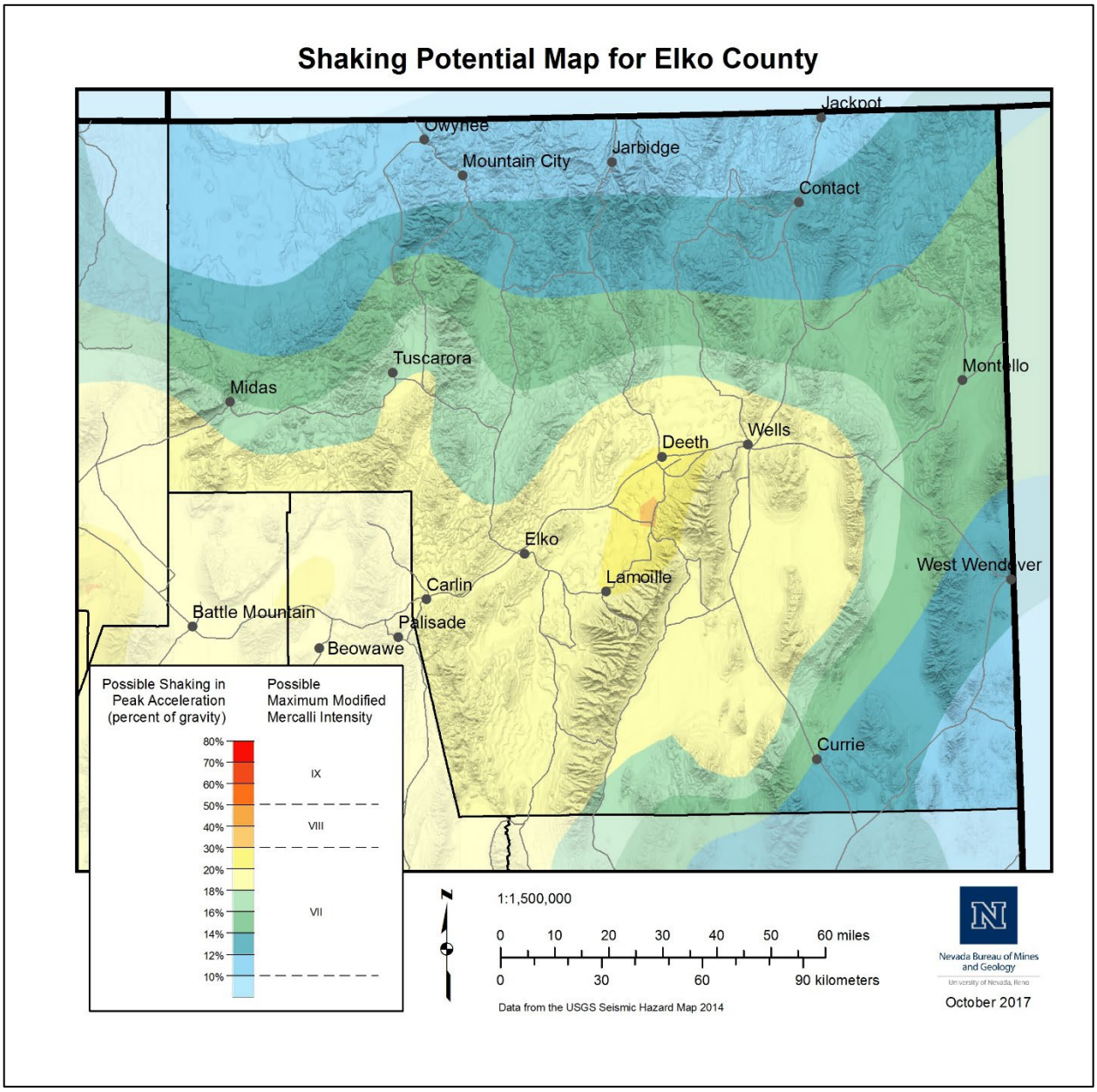
0 5 10 15 miles
0 10 20 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure E-5.


Shaking Potential Map for Elko County
Jackpot
Owyhee
Mountain City
Jarbidge
Contact
Tuscarora
Midas
Montello
Deeth
Wells
Elko
West Wendover
Carlin
Lamoille
Battle Mountain
Palisade
Beowawe
Currie
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
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14%
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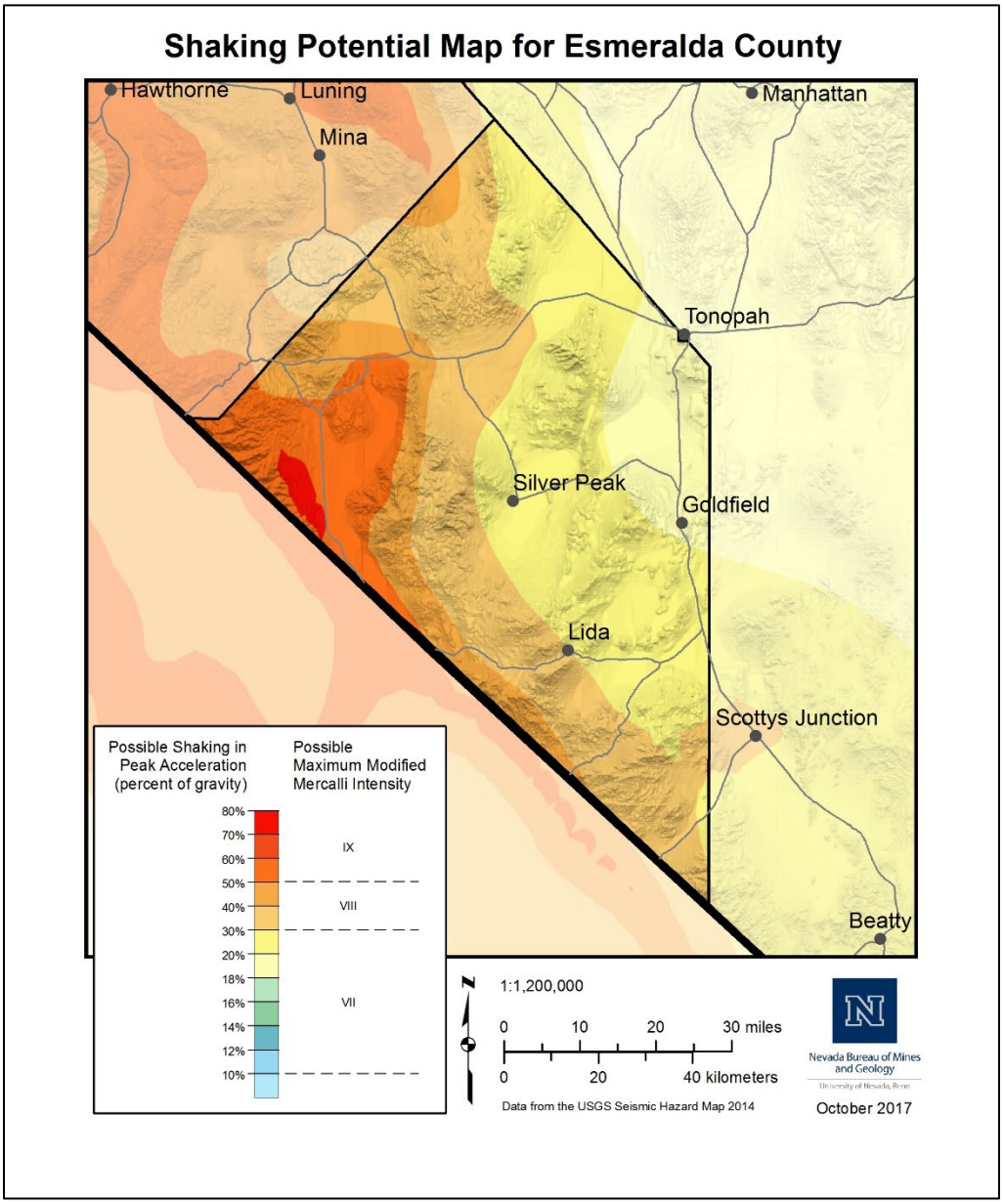
10%
IX
VIII
VII
1:1,500,000
0 10 20 30 40 50 60 miles
0 30 60 90 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure E-6.


Shaking Potential Map for Esmeralda County
Hawthorne
Luning
Mina
Manhattan
Tonopah
Silver Peak
Goldfield
Lida
Scottys Junction
Beatty
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
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14%
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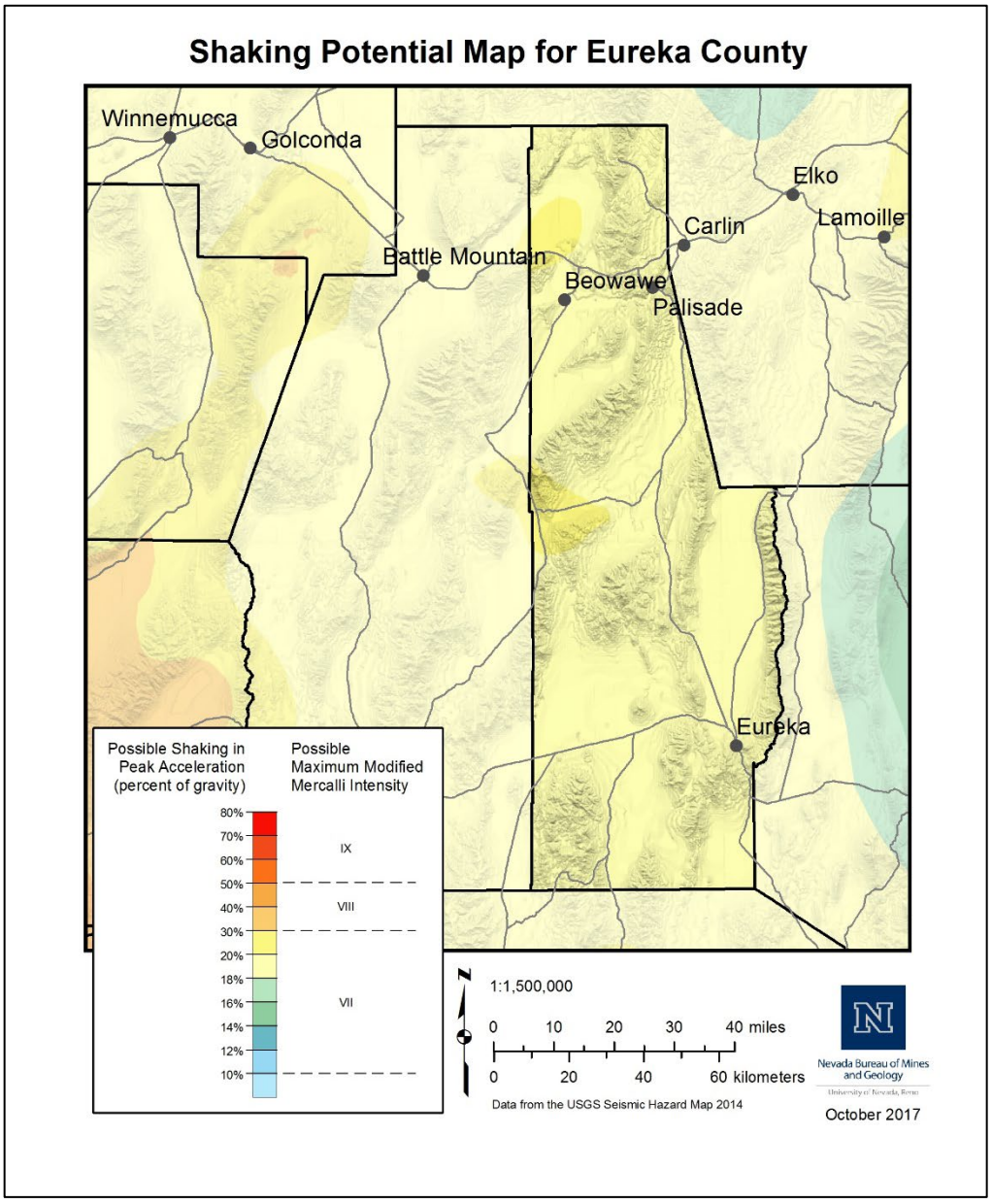
1:1,200,000
0 10 20 30 miles
0 20 40 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure E-7.


Shaking Potential Map for Eureka County
Winnemucca
Golconda
Elko
Lamoille
Carlin
Battle Mountain
Beowawe
Palisade
Eureka
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
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20%
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14%
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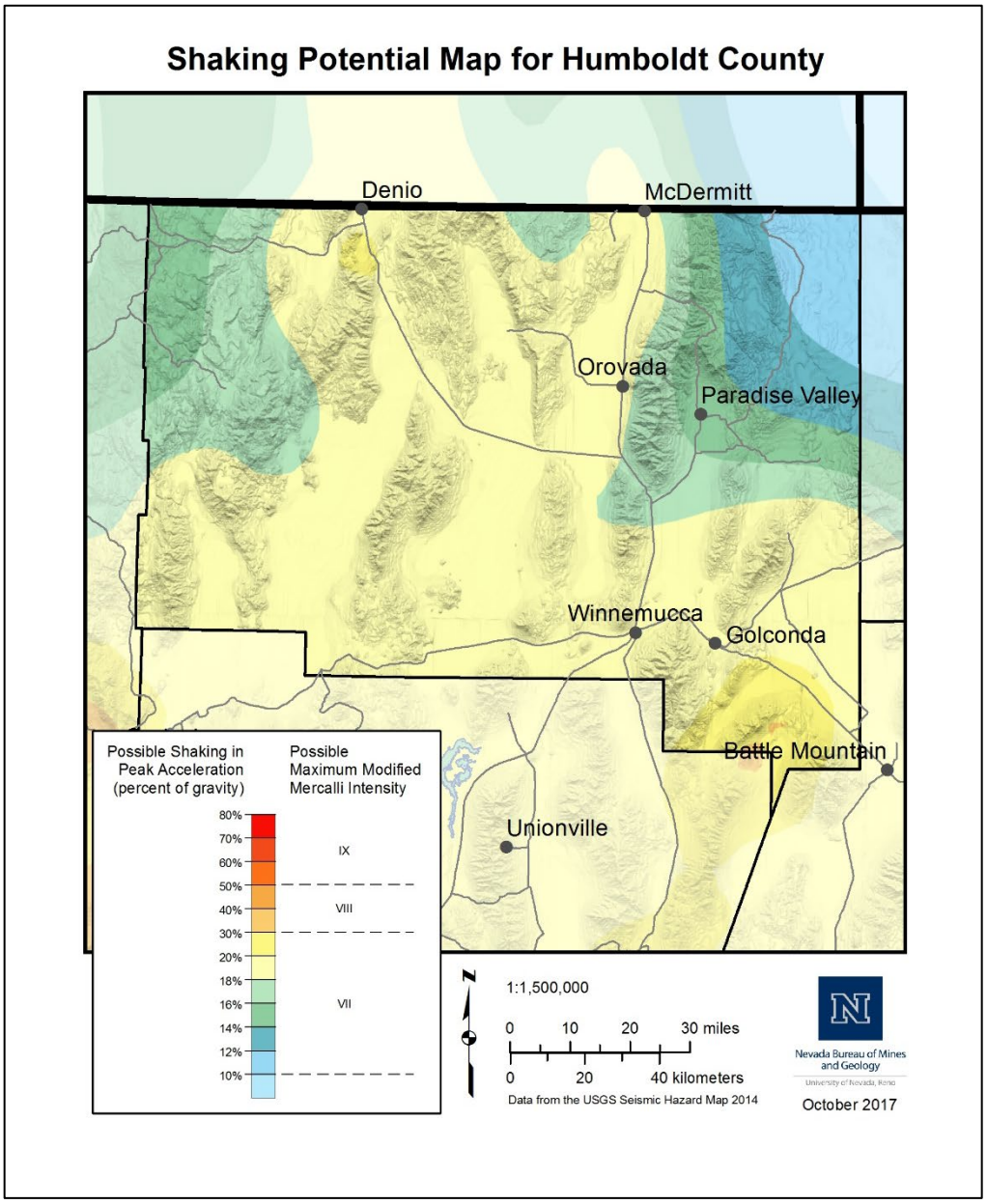
IX
VIII
VII
1:1,500,000
0 10 20 30 40 miles
0 20 40 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Figure E-8.


Shaking Potential Map for Humboldt County
Denio
McDermitt
Orovada
Paradise Valley
Winnemucca
Golconda
Battle Mountain
Unionville
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
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0 10 20 30 miles
0 20 40 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
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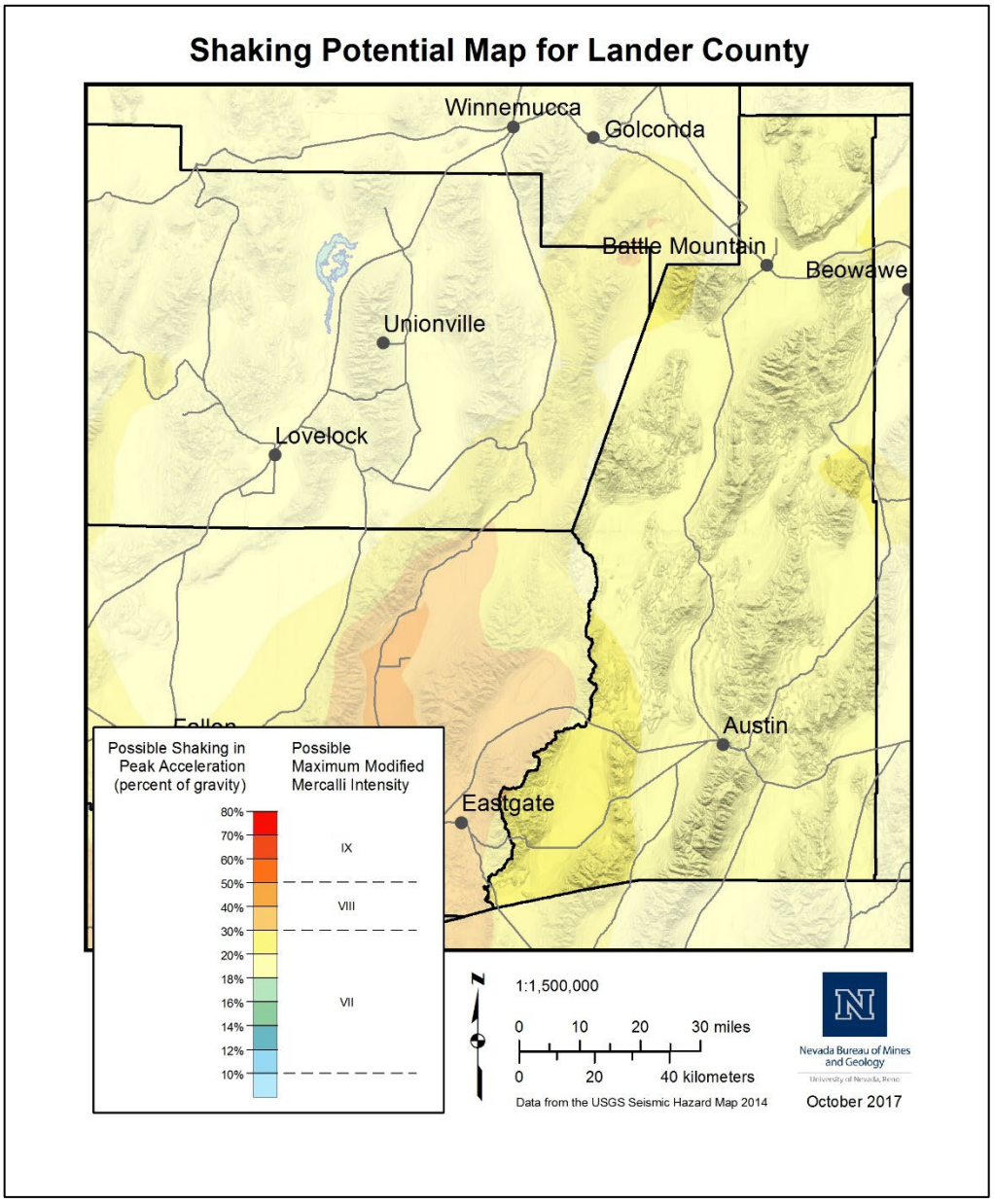
Figure E-9.


Shaking Potential Map for Lander County
Winnemucca
Golconda
Battle Mountain
Beowawe
Unionville
Lovelock
Austin
Eastgate
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
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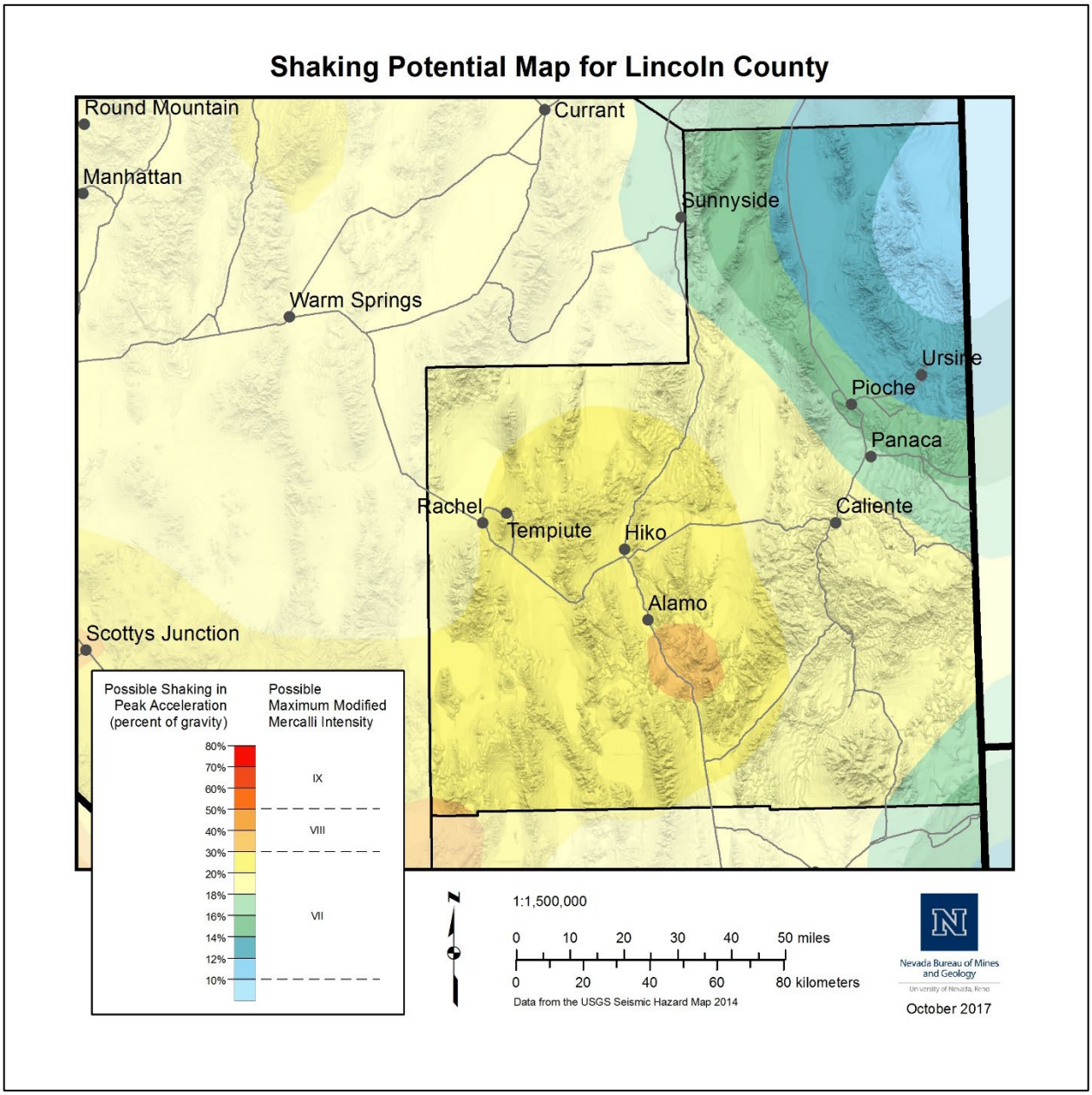
1:1,500,000
0 10 20 30 miles
0 20 40 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Figure E-10.


Shaking Potential Map for Lincoln County
Round Mountain
Currant
Manhattan
Sunnyside
Warm Springs
Ursine
Pioche
Panaca
Rachel
Tempiute
Hiko
Caliente
Alamo
Scottys Junction
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
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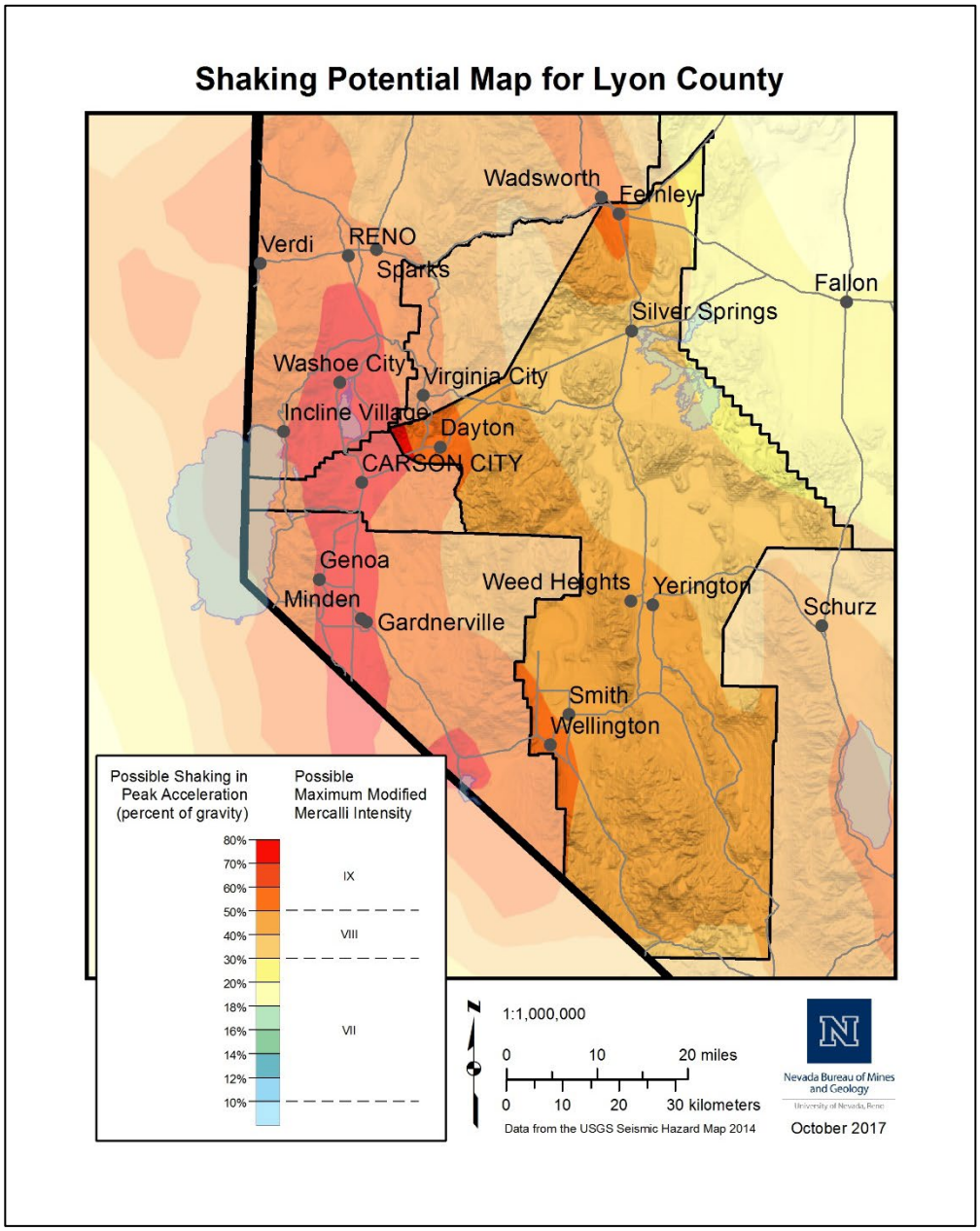
IX
VIII
VII
1:1,500,000
0 10 20 30 40 50 miles
0 20 40 60 80 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure E-11.


Shaking Potential Map for Lyon County
Wadsworth
Fernley
Verdi
RENO
Sparks
Fallon
Silver Springs
Washoe City
Virginia City
Incline Village
Dayton
CARSON CITY
Genoa
Minden
Gardnerville
Weed Heights
Yerington
Schurz
Smith
Wellington
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
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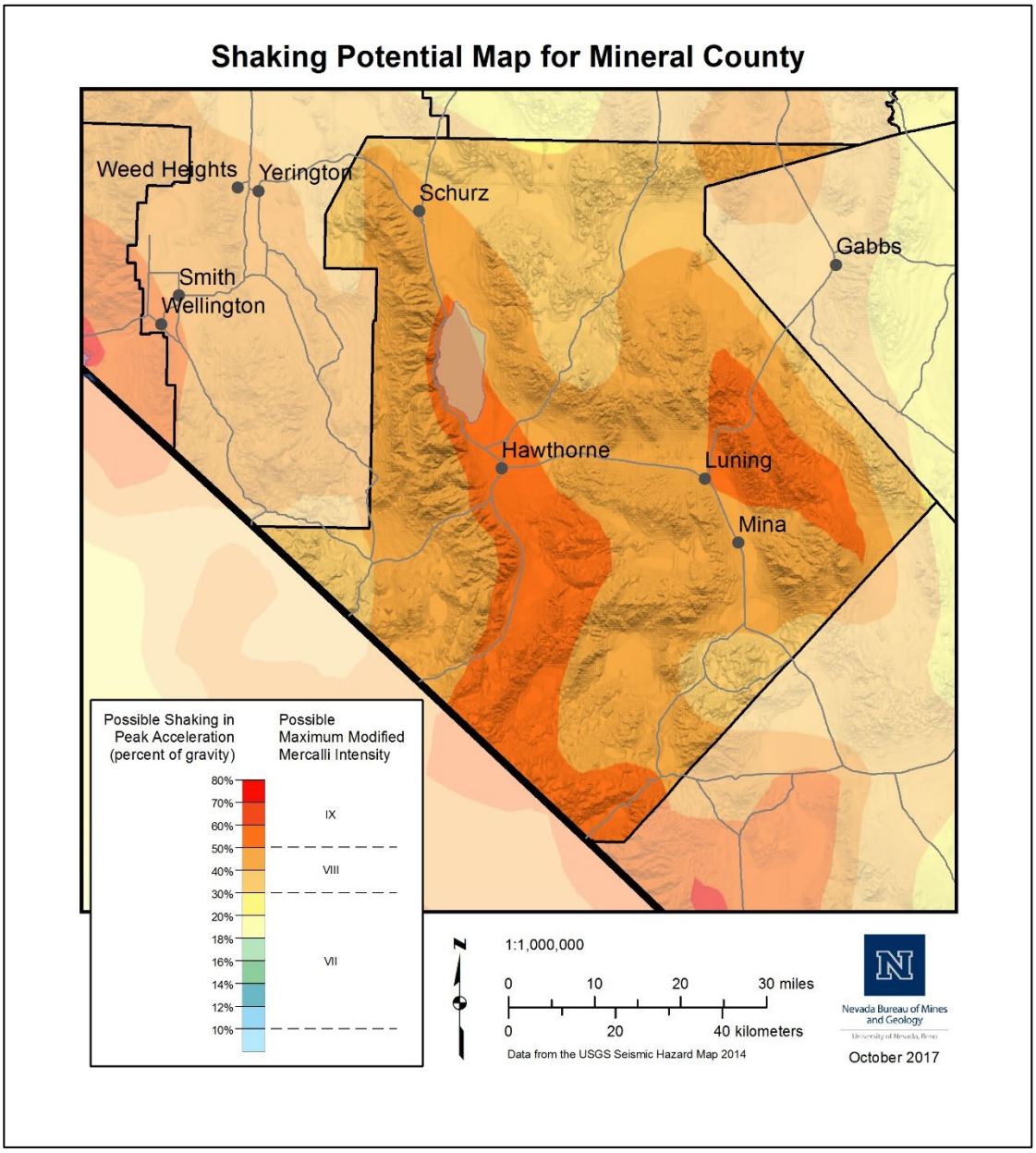
0 10 20 miles
0 10 20 30 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure E-12.


Shaking Potential Map for Mineral County
Weed Heights
Yerington
Schurz
Gabbs
Smith
Wellington
Hawthorne
Luning
Mina
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
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IX
VIII
VII
1:1,000,000
0 10 20 30 miles
0 20 40 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Figure E-13.

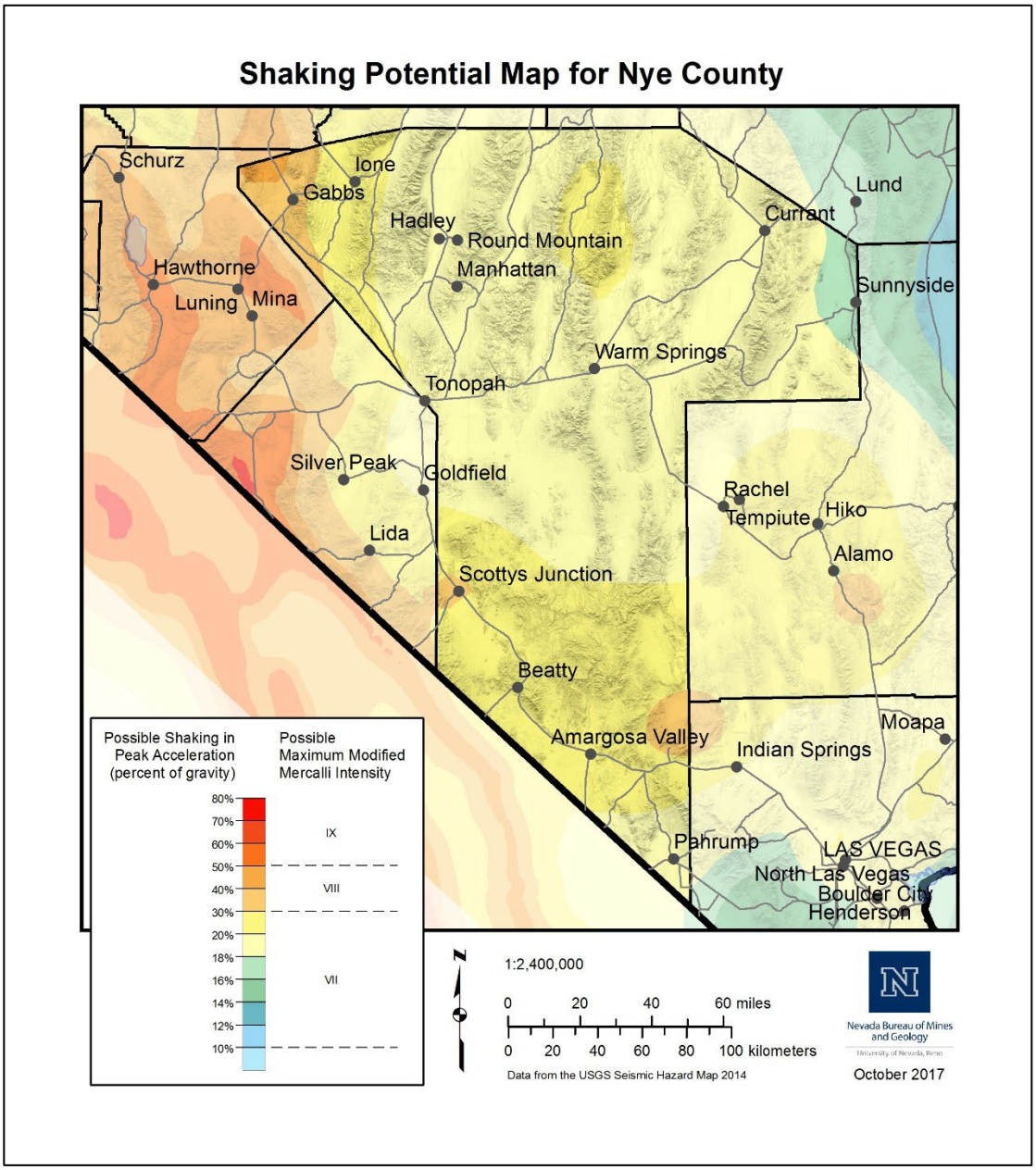

Shaking Potential Map for Nye County
Schurz
Ione
Gabbs
Hadley
Round Mountain
Manhattan
Lund
Currant
Sunnyside
Hawthorne
Luning
Mina
Warm Springs
Tonopah
Silver Peak
Goldfield
Rachel
Tempiute
Hiko
Alamo
Lida
Scottys Junction
Beatty
Moapa
Amargosa Valley
Indian Springs
Pahrump
LAS VEGAS
North Las Vegas
Boulder City
Henderson
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
N
1:2,400,000
0 20 40 60 miles
0 20 40 60 80 100 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure E-14.

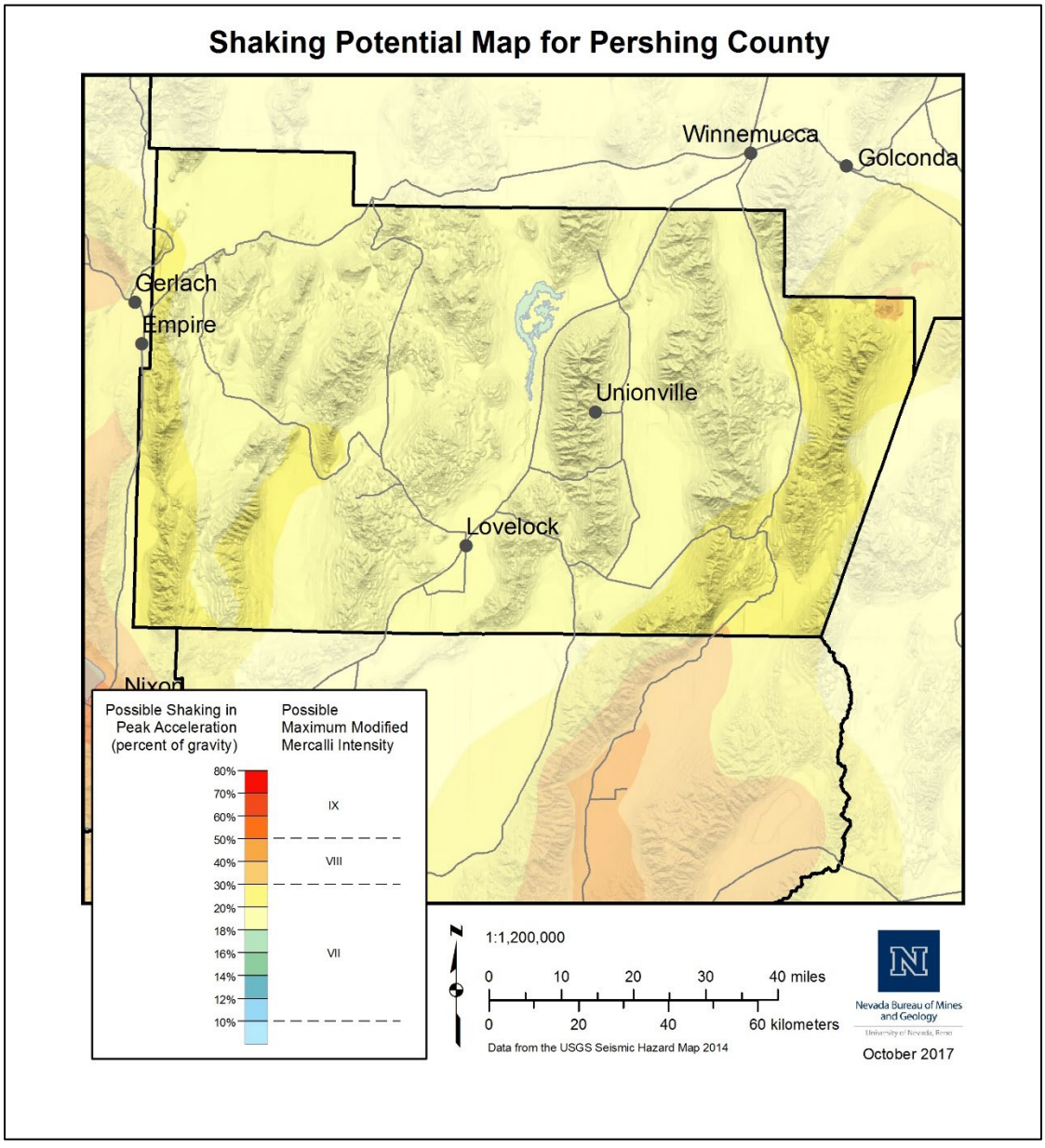

Shaking Potential Map for Pershing County
Winnemucca
Golconda
Gerlach
Empire
Unionville
Lovelock
Nixon
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,200,000
0 10 20 30 40 miles
0 20 40 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure E-15.

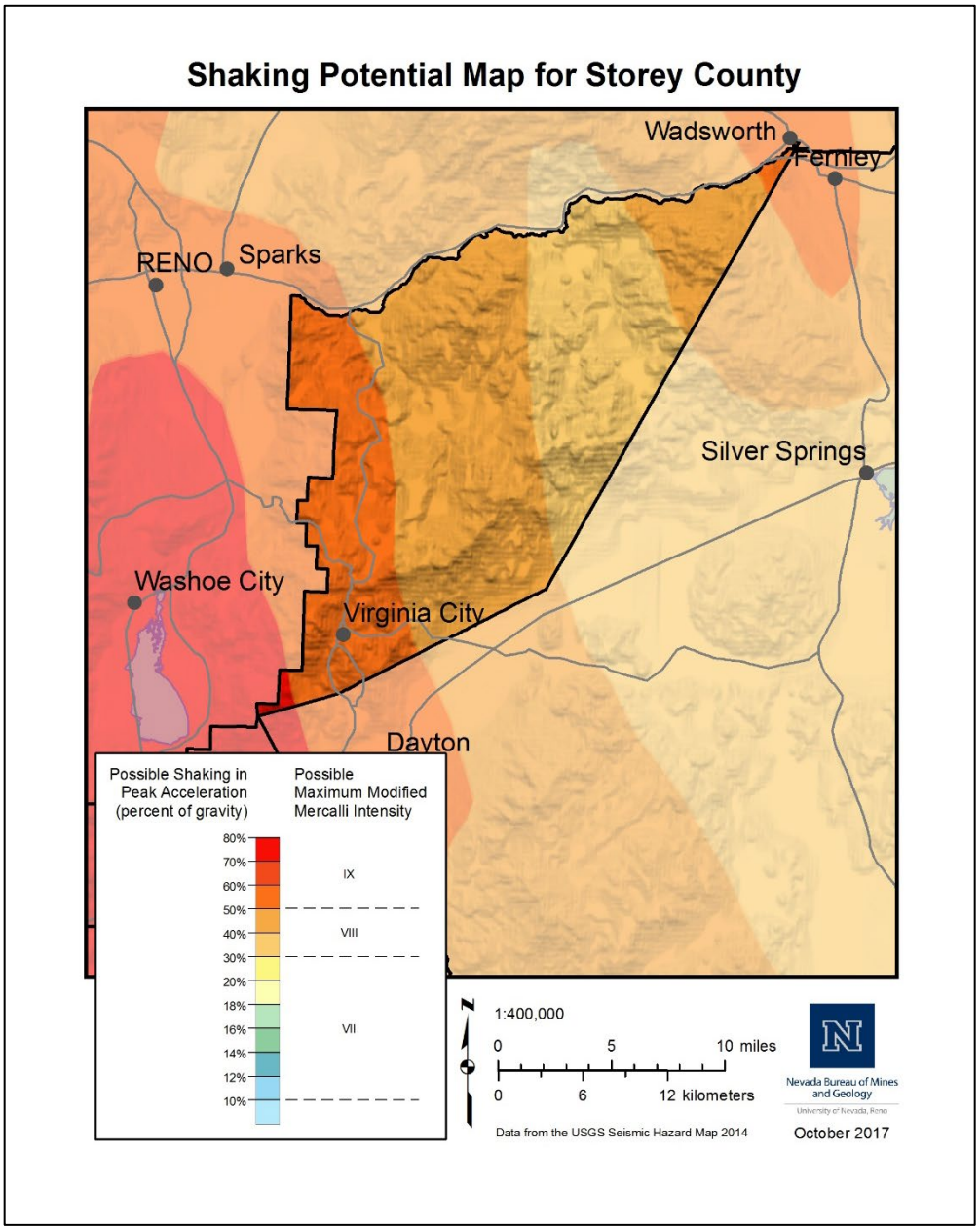

Shaking Potential Map for Storey County
Wadsworth
Fernley
RENO
Sparks
Silver Springs
Washoe City
Virginia City
Dayton
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:400,000
0 5 10 miles
0 6 12 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure E-16.

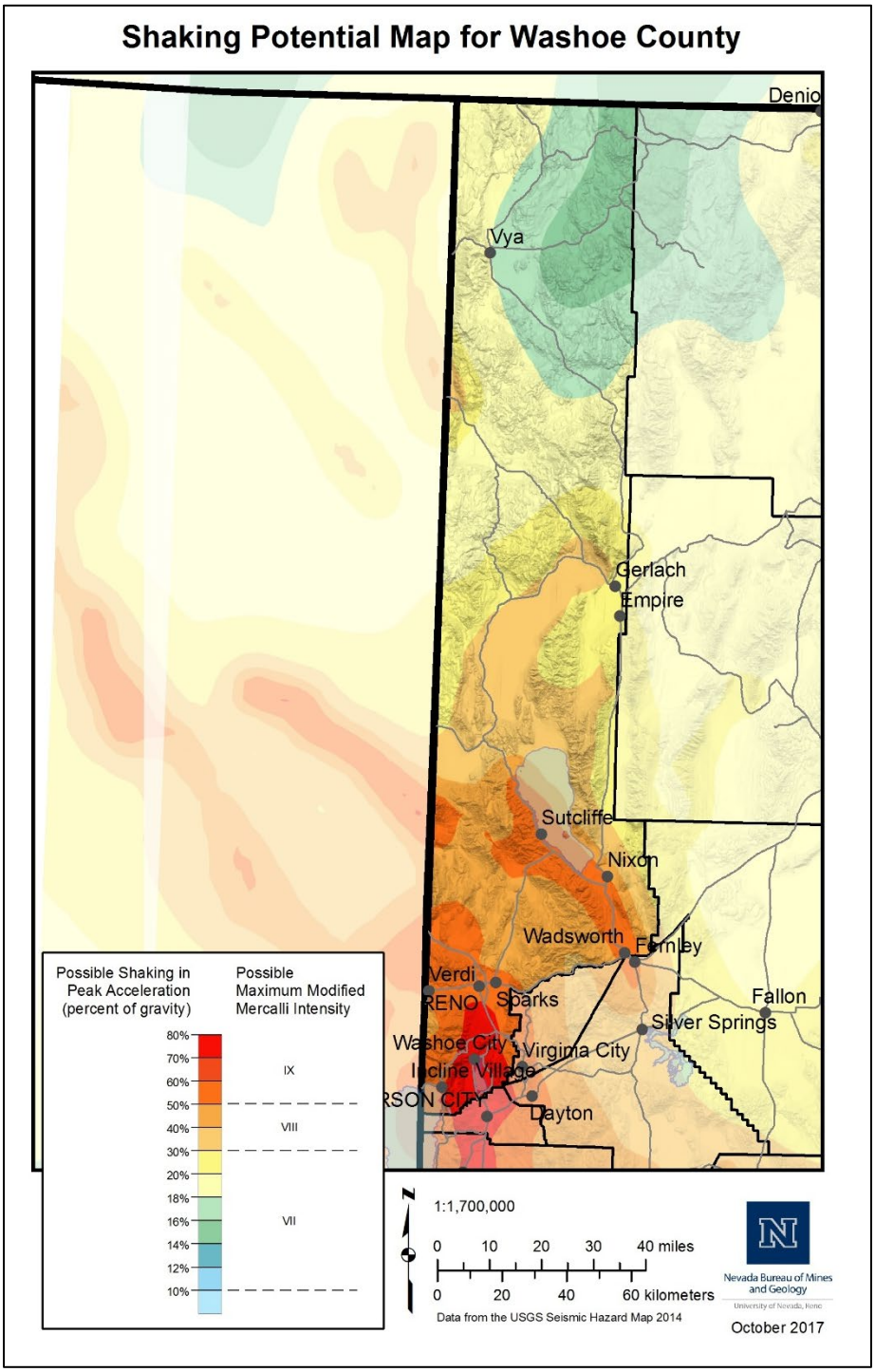
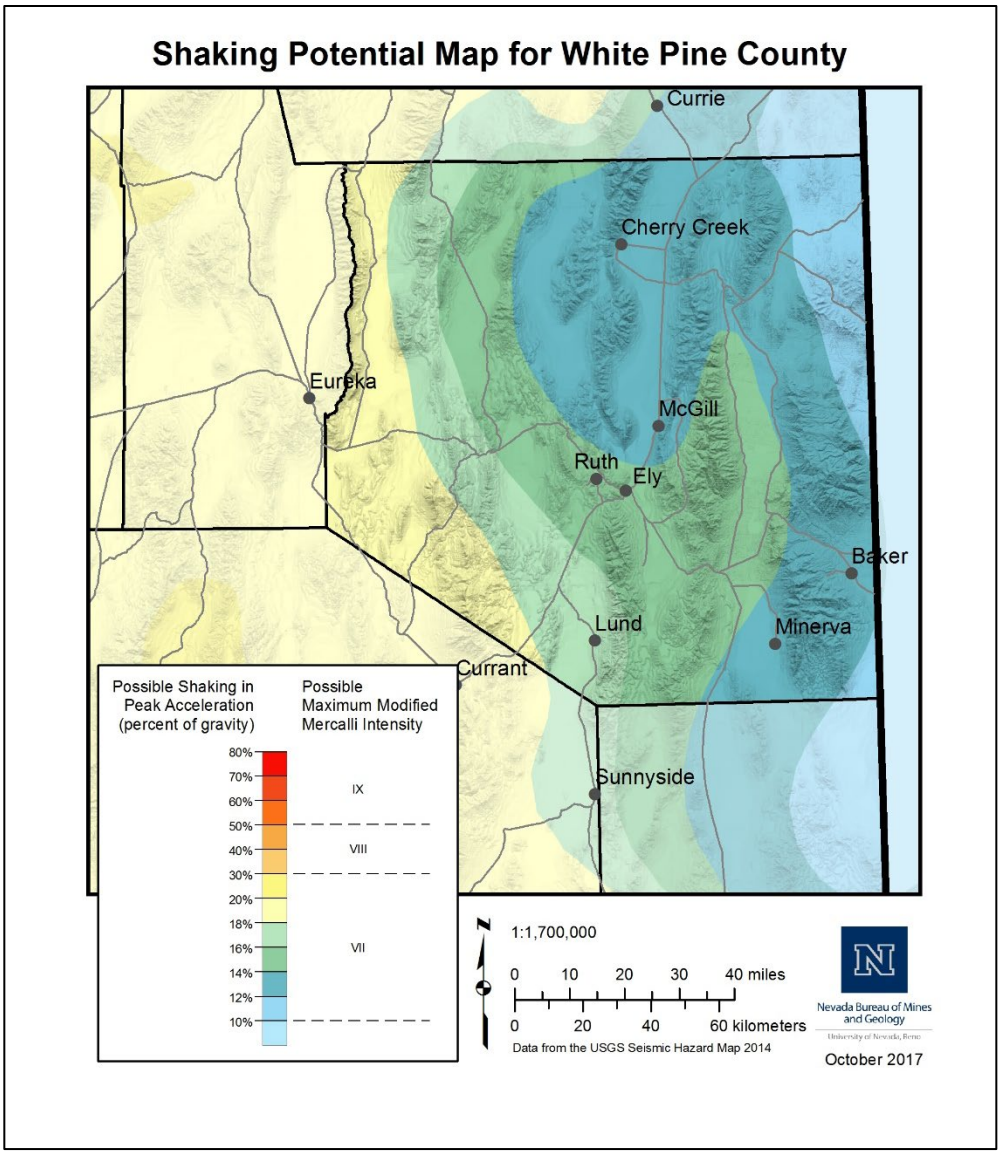

Shaking Potential Map for Washoe County
Denio
Vya
Gerlach
Empire
Sutcliffe
Nixon
Wadsworth
Fernley
Verdi
RENO
Sparks
Fallon
Silver Springs
Washoe City
Virginia City
Incline Village
RSON CITY
Dayton
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
N
1:1,700,000
0 10 20 30 40 miles
0 20 40 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure E-17.


Shaking Potential Map for White Pine County
Currie
Cherry Creek
Eureka
McGill
Ruth
Ely
Baker
Lund
Minerva
Currant
Sunnyside
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,700,000
0 10 20 30 40 miles
0 20 40 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

F. Dams and High Hazard Dam Supplement

Overview

As of May 2023, the State of Nevada Division of Water Resources is tracking 1,176 dams – 650 of those are active. Table F-1 is a summary of the dams by county, its hazard classification, and the status of its emergency action plan (EAP). Table F-2 contains select information for the High Hazard Potential Dams. For details about each dam, see the State of Nevada Division of Water Resources website at: http://water.nv.gov/DamsQuery.aspx. NAC 535.140—Hazard classifications are as follows (NRS 532.120, 535.030, 535.040):

1. The State Engineer will assign a hazard classification to each dam.
2. The State Engineer will determine the immediate consequences to persons and property located downstream from the dam in the event of a failure of the dam. The State Engineer will classify a dam as:
    a. High hazard if failure of the dam carries a high probability of causing a loss of human life.
    b. Significant hazard if failure of the dam carries a:
        i. Reasonable probability of causing a loss of human life; or
        ii. High probability of causing extensive economic loss or disruption in a lifeline.
    c. Low hazard if failure of the dam carries a:
        i. Very low probability of causing a loss of human life; and
        ii. Reasonable probability of causing little, if any, economic loss or disruption in a lifeline.
3. If changes in the persons or property located downstream from a dam change the immediate consequences in the event of a failure of the dam, the State Engineer will change the hazard classification of the dam accordingly.
4. The hazard classification of a dam does not constitute a warranty in favor of anyone concerning the actual safety of the dam.

Polices

Local policies, programs and capabilities that exist for HHPD are mostly county and city programs for flood control projects, water storage or wastewater treatment facilities. These programs typically have programs that include either staff engineers, operators and maintenance crews or contracted engineers, operators, and maintenance crews. These programs are able maintain and make improvements to HHPD facilities within a timely manner. Currently, there are no current local policies, programs, and capabilities within the state for non-government owned HHPDs though some private companies within the state maintain their own dam policies, programs, and capabilities.

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.

Mitigation

Opportunities for implementing mitigation actions that will reduce risk to and from HHPD through local capacities will include coordinated outreach with local communities and state DEM. This will include outreach for education on dam safety, education on dam hazards, education on dams within the local communities, assistance in HMP preparation, notification of grant opportunities, etc.

Challenges

Challenges Nevada has identified to implement HHPD risk reduction actions and reduce vulnerabilities are the state program's staffing levels and lack of funding. Low staffing levels affects availability for outreach and education efforts as inspections and processing applications are prioritized.

Additionally, funding sources for dam owners to perform risk reduction projects are limited. Current programs such as FEMA's HHPD program requirements either do not work for many areas of Nevada (areas without Floodplain Management Programs) and requires extra staffing to process and maintain. The current USACE program's minimum project size of $20 million is too large for most dam owners within the state. DWR's dam storage fees, that were initially proposed to help fund the Dam Safety Program, are paid into the general fund for the state and not available for mitigation projects.

Statuts of Dams by County

Table F-1. Status of Dams by County.

County	Total	Hazard Classification			EAP Status			
		High	Significant	Low	Yes	No	NR	Unknown
Carson City	5	2	1	2	3	0	7	
Churchill	12	1	2	9	2	1	15	
Clark	134	76	17	41	97	3	146	
Douglas	28	10	7	11	16	1	30	
Elko	93	13	10	70	25	0	113	
Esmeralda	8	0	0	8	0	1	11	
Eureka	47	1	12	34	16	1	62	1
Humboldt	50	1	8	41	8	3	2	
Lander	33	2	5	26	8	1	9	

Table F-1. Status of Dams by County.								
County	**Total**	**Hazard Classification**			**EAP Status**			
		High	**Significant**	**Low**	**Yes**	**No**	**NR**	**Unknown**
Lincoln	15	4	0	11	5	0	34	
Lyon	17	2	4	11	6	1	11	
Mineral	12	3	2	7	4	1	68	
Nye	49		2	47	2	1	7	
Pershing	19	1	0	18	1	1	29	
Storey	8	1	1	6	2	0	39	
Washoe	90	35	16	39	50	3	24	
White Pine	30	5	4	21	10	1	10	
Total	**650**	**157**	**91**	**402**	**255**	**19**	**10**	**1**

Figure F-1 depicts the dam locations statewide and Figure F-2 depicts dam locations in more heavily populated areas based on their hazard classification.

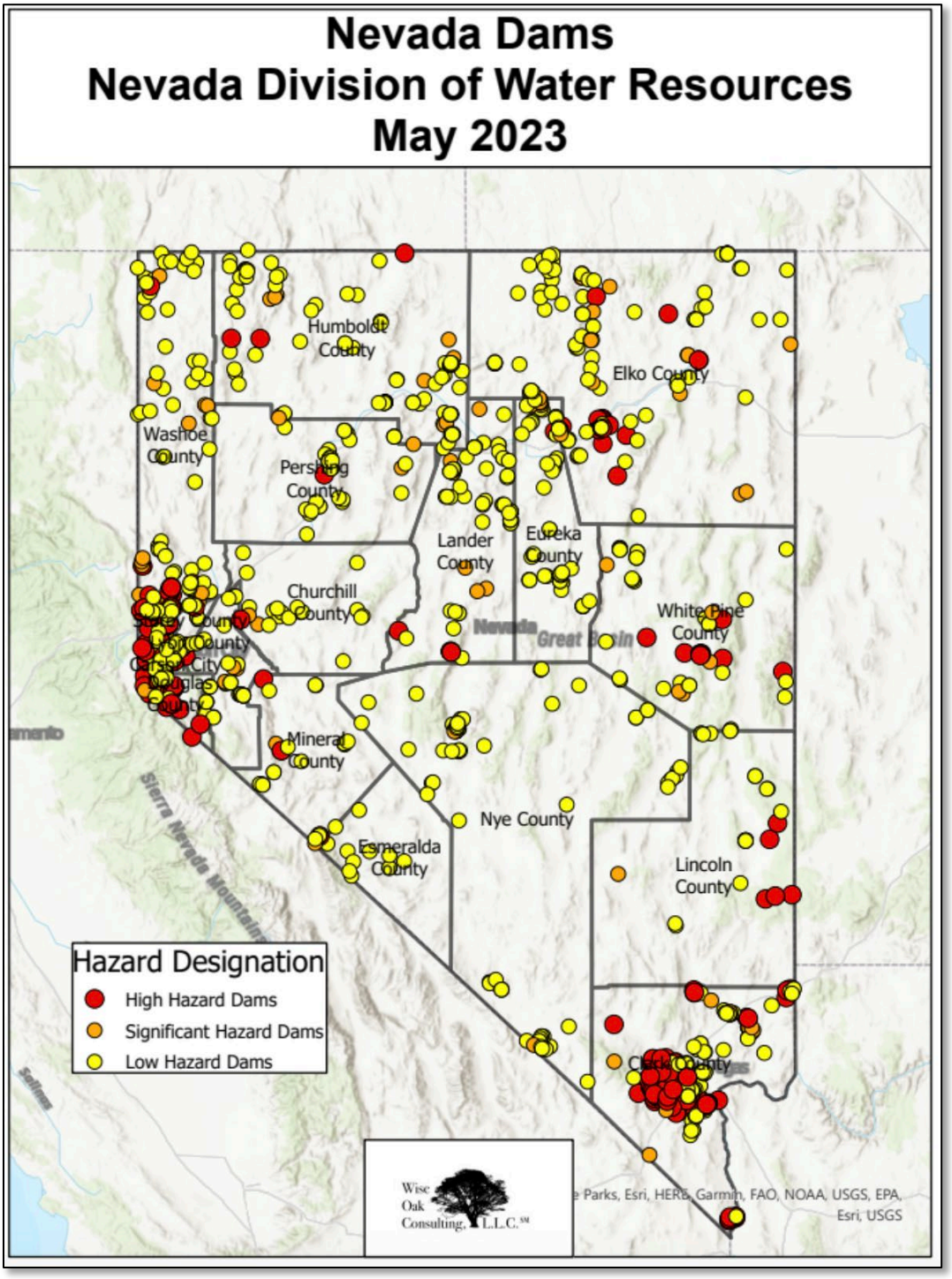


Figure F-1. Nevada Dams by Hazard Classification – Statewide.

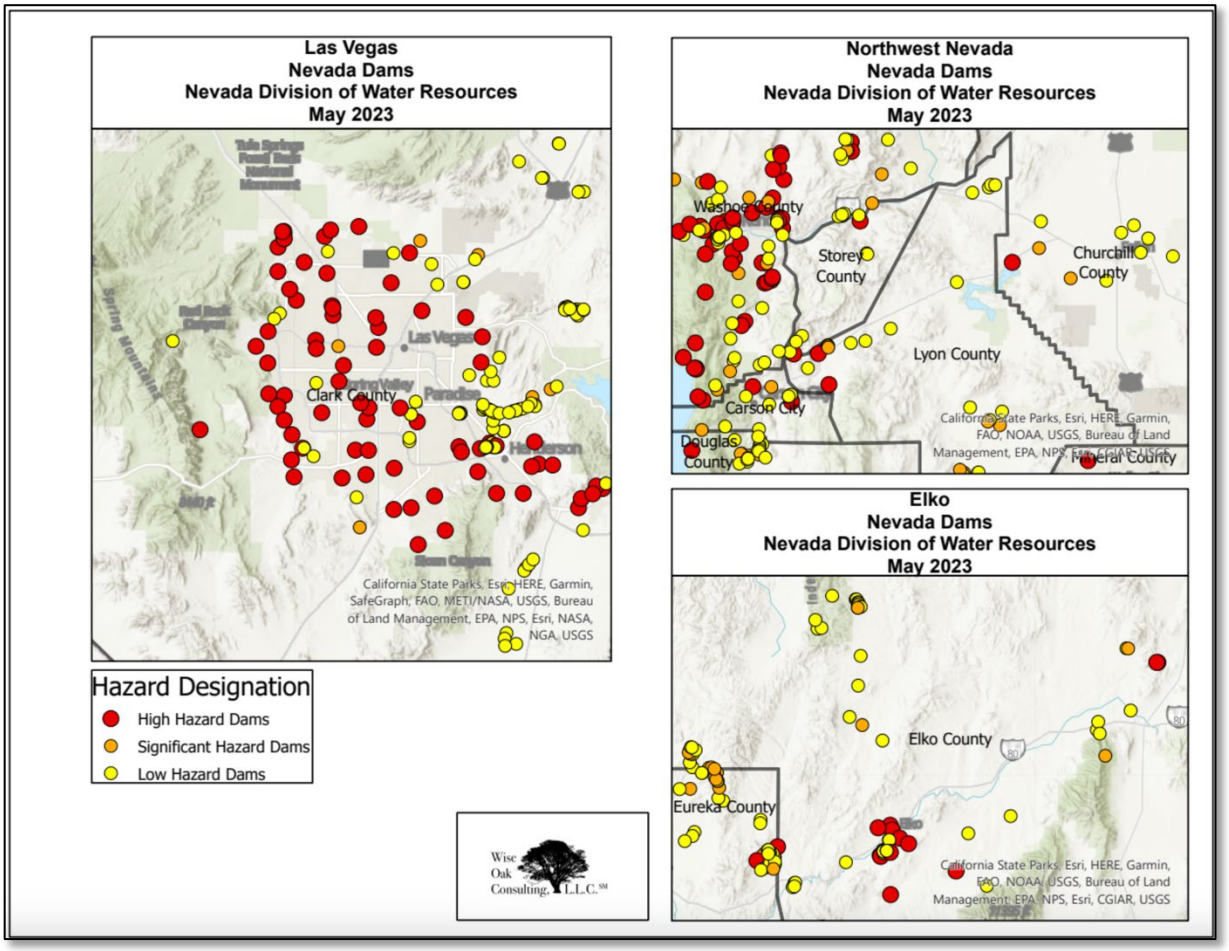


Figure F-2. Nevada Dams by Hazard Classification – More Heavily Populated Areas.

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
Spring Creek Dam #1	J-125	NV00009	Spring Creek Association	-115.571	40.7417	Elko	Y
Bishop Creek Dam		NV00050	Pacific Reclamation Company	-114.913	41.2556	Elko	Y
Zunino Reservoir Dam	J-691	NV00055	Cumming Ranch	-115.652	40.4619	Elko	Y
Highland Reservoir Dam	J-464	NV00067	Truckee Meadows Water Authority	-119.827	39.54166	Washoe	Y

Table F-2. Select Information for High Hazard Potential Dams.							
Dam Name	**State ID**	**National ID**	**Owner Name**	**Longitude**	**Latitude**	**County**	**EAP Status**
Marlette Lake Dam	J-048	NV00069	Nevada Da Buildings And Grounds	-119.906	39.1728	Washoe	Y
Wheeler Reservoir Dam		NV00072	Lakeridge Shores Homeowners Association	-119.821	39.4708	Washoe	Y
Mill Creek Dam No 2	J-378	NV00076	Incline Village Gid	-119.926	39.24006	Washoe	Y
West Wash Dam	J-047	NV00078	City Of Reno	-119.846	39.5423	Washoe	Y
East Wash Diversion Dam	J-056	NV00079	City Of Reno	-119.845	39.5486	Washoe	Y
Peavine Creek Upper Dam	J-046	NV00080	City Of Reno	-119.866	39.54351	Washoe	Y
Peavine Creek Lower Dam	J-068	NV00081	City Of Reno	-119.851	39.5341	Washoe	Y
Roundhill Effluent Dam	J-100	NV00084	Douglas County Sewer Improvement District #1	-119.924	38.985	Douglas	Y
Allerman #1 Dam		NV00092	Allerman Upper Virginia Irrigation Co Inc	-119.71	38.9516	Douglas	Y
Smith Creek Dam		NV00100	Smith Creek Ranch Company	-117.636	39.384	Lander	Y
Cave Creek Dam	J-786	NV00102	Nevada Department Of Wildlife	-114.697	39.1901	White Pine	Y
Illipah Pond Dam	J-190	NV00105	Nevada Department Of Wildlife	-115.386	39.33694	White Pine	Y
Silver Creek Dam	J-021	NV00112	Baker Ranches, Inc.	-114.152	39.09802	White Pine	Y
Bowman Dam	J-079	NV00113	Muddy River Irrigation District	-114.48	36.62106	Clark	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
Eagle Valley Reservoir Dam	J-078	NV00116	Nevada Department Of Wildlife	-114.201	38.02223	Lincoln	Y
Echo Canyon Dam	J-116	NV00117	Nevada Dcnr Parks	-114.272	37.90719	Lincoln	Y
Kingston Canyon Dam	J-114	NV00127	Nevada Department Of Wildlife	-117.164	39.2393	Lander	Y
Eight Mile Creek Dam	J-102	NV00146	City Of Elko	-115.786	40.85481	Elko	Y
Fifth Street Wash Dam	J-107	NV00147	City Of Elko	-115.78	40.84333	Elko	Y
South Side Wash Dam	J-122	NV00148	City Of Elko	-115.755	40.82284	Elko	Y
Eldorado Canyon Dam	J-086	NV00150	Wade Development Company Inc	-119.564	39.2055	Lyon	Y
Duck Creek East Dam		NV00194	Kennecott Corporation	-114.7	39.4636	White Pine	Y
Soldier Meadow Dam	J-152	NV00197	Kudrna, Jim	-119.15	41.4033	Humboldt	Y
Hunter Creek Reservoir Dam	J-444	NV00201	Truckee Meadows Water Authority	-119.879	39.5011	Washoe	Y
Carson City Treated Effluent Dam	J-228	NV00223	City Of Carson City	-119.666	39.16912	Carson City	Y
Angel Park North Detention Basin Dam	J-677	NV00224	City Of Las Vegas	-115.279	36.18202	Clark	Y
South Fork Dam	J-785	NV00226	Nevada Dcnr	-115.785	40.68332	Elko	Y
Northgate Golf Course Dam	J-246	NV00232	City Of Reno	-119.905	39.5297	Washoe	Y
Meadows Detention Basin Dam	J-793	NV00233	City Of Las Vegas	-115.184	36.17306	Clark	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
East Peak Lake Dam	J-257	NV00234	Heavenly Valley Limited Partnership	-119.893	38.94125	Douglas	Y
Sun Valley Detention Dam	J-272	NV00238	City Of Sparks	-119.773	39.5669	Washoe	Y
Spanish Springs Stormwater Detention Facility Dam	J-522	NV00245	City Of Sparks	-119.717	39.5975	Washoe	Y
Pine Canyon Dam	J-028	NV10001	Us Army Corps Of Engineers - Los Angeles District	-114.309	37.47925	Lincoln	Y
Mathews Canyon Dam	J-033	NV10002	Us Army Corps Of Engineers - Los Angeles District	-114.22	37.49967	Lincoln	Y
Cat Creek Dam		NV10101	Us Army Corps Of Engineers - Sacramento District	-118.697	38.5406	Mineral	Y
Black Beauty Reservoir Dam		NV10103	Us Army Corps Of Engineers - Sacramento District	-118.696	38.5392	Mineral	Y
Wild Horse Dam	J-103	NV10119	Usdi Bureau Of Indian Affairs	-115.845	41.6871	Elko	Y
Hoover Dam		NV10122	Usdi Bureau Of Reclamation-Los Angeles District	-114.737	36.0167	Clark	Y
Lahontan Dam		NV10123	Usdi Bureau Of Reclamation	-119.066	39.4625	Churchill	Y
Rye Patch Dam	J-706	NV10124	Pershing County Water Conservation District	-118.308	40.4695	Pershing	Y
Weber Dam		NV10132	Usdi Bureau Of Indian Affairs	-118.86	39.04492	Mineral	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
Mccarran Airfield Detention Dam	J-406	NV10145	Clark County Department Of Aviation	-115.12	36.0783	Clark	Y
Carey/Lake Mead Detention Basin Dam	J-356	NV10150	City Of North Las Vegas	-115.181	36.19833	Clark	Y
Gowan Detention North Dam	J-375	NV10151	City Of Las Vegas	-115.253	36.22583	Clark	Y
Oakey Detention Dam	J-388	NV10156	City Of Las Vegas	-115.235	36.15002	Clark	Y
Spring Mountain Ranch Dam	J-144	NV10159	Nevada Dcnr Parks	-115.461	36.06833	Clark	Y
Town Wash Dam	J-367	NV10160	City Of Mesquite	-114.073	36.82583	Clark	Y
Hemenway Valley Flood Control Dam	J-360	NV10161	City Of Boulder	-114.828	35.99333	Clark	Y
Flamingo Wash Upper Detention Basin Dam	J-319	NV10162	Clark County Public Works	-115.27	36.09	Clark	Y
Las Vegas Wash Upper Detention Basin Dam	J-364	NV10163	City Of North Las Vegas	-115.211	36.32639	Clark	Y
Buckeye Creek Lower Effluent Storage Pond Dam	J-380	NV10166	Douglas County Sewer Improvement District #1	-119.665	38.98603	Douglas	Y
Maggie Creek Dam	J-410	NV10195	Nevada Gold Mines, Llc	-116.153	40.80167	Elko	Y
James Creek Diversion Dam	J-218	NV10239	Nevada Gold Mines, Llc	-116.221	40.7675	Eureka	Y
Dant Blvd Detention Dam	J-304	NV10367	City Of Reno	-119.827	39.4856	Washoe	Y
Herman Dam	J-014	NV10371	Washoe County Parks And Recreation	-119.825	39.5481	Washoe	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
Mill Creek No 1 Dam	J-071	NV10376	Incline Village Gid	-119.925	39.23773	Washoe	Y
North Virginia Detention Dam	J-361	NV10377	City Of Reno	-119.826	39.5564	Washoe	Y
Huffaker Effluent Storage Reservoir Dam	J-763	NV10384	Washoe County	-119.746	39.4617	Washoe	Y
Red Rock Detention Dam	J-256	NV10406	Clark County Public Works	-115.355	36.15305	Clark	Y
Gibbs Ranch Dam	J-390	NV10410	Gibbs, Wh	-115.19	41.57	Elko	Y
Kyle Canyon Detention Dam	J-396	NV10416	City Of Las Vegas	-115.338	36.30028	Clark	Y
Angel Park South Detention Basin Dam	J-677	NV10419	City Of Las Vegas	-115.278	36.17139	Clark	Y
North Las Vegas Detention Basin Dam	J-208	NV10420	City Of North Las Vegas	-115.132	36.29306	Clark	Y
Mission Hills Detention Basin Dam	J-402	NV10426	City Of Henderson	-114.953	35.98725	Clark	Y
Giroux Wash Tsf Dam	J-762	NV10437	Kghm, Robinson Nevada Mining Company	-115.044	39.2286	White Pine	Y
Mud Lake Dam	J-515	NV10439	West Fork Water Company	-119.737	38.8461	Douglas	Y
Lamoille Road Detention Dam		NV10440	Elko County Public Works	-115.726	40.8093	Elko	Y
Pagni Dam		NV10442	World Properties Inc	-119.793	39.3385	Washoe	Y
Hiko Springs Detention Basin Dam	J-426	NV10447	Clark County Public Works	-114.632	35.1553	Clark	Y
Confluence Detention Basin Dam	J-422	NV10456	Clark County Public Works	-115.043	36.2111	Clark	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
Lone Mountain Detention Basin Dam	J-433	NV10461	City Of Las Vegas	-115.31	36.23278	Clark	Y
Topaz Lake Dam		NV10470	Walker River Irrigation District	-119.507	38.6366	Douglas	N
Washoe Lake Dam		NV10472	Washoe Lk Res & Galena Ck Ditch Co	-119.802	39.3297	Washoe	Y
Bourne Reservoir Dam	J-474	NV10474	Horowitz & Bourne	-119.939	38.9969	Douglas	Y
Home Ranch Canyon Dam		NV10480	Mitch Gerlinger	-119.504	39.715	Washoe	Y
Wilcox Canyon #1 Dam		NV10481	Stambaugh, Kevin	-119.503	39.6953	Washoe	Y
Summerlin Detention Basin #5 Dam	J-770	NV10499	Howard Hughes Corporation	-115.373	36.1744	Clark	Y
Las Vegas Wash Lower Detention Basin Dam	J-473	NV10511	City Of North Las Vegas	-115.161	36.255	Clark	Y
River Mountains Impoundment Dam	J-491	NV10516	Southern Nevada Water Authority	-114.929	36.02456	Clark	Y
Equestrian Detention Basin Dam	J-681	NV10518	City Of Henderson	-114.94	36.0215	Clark	Y
Windmill Wash Detention Basin Dam	J-488	NV10526	Clark County Public Works	-114.122	36.76644	Clark	Y
East C-1 Detention Basin Dam	J-498	NV10528	City Of Henderson	-114.907	36.0233	Clark	Y
Pittman Park Detention Basin Dam	J-497	NV10530	City Of Henderson	-115.054	36.04667	Clark	Y
Elko Effluent North Storage Pond Dam	J-496	NV10531	City Of Elko	-115.818	40.78046	Elko	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
D'andrea Ranch Hole #6 Pond Dam	J-502	NV10541	D'andrea Nevada Llc	-119.699	39.556	Washoe	Y
Pittman Anthem Detention Basin Dam	J-504	NV10543	City Of Henderson	-115.075	35.94	Clark	Y
Black Mountain Detention Basin Dam	J-516	NV10550	City Of Henderson	-114.995	35.98724	Clark	Y
Sierra Sage Ponds		NV10551	Washoe County Parks And Recreation	-119.894	39.6321	Washoe	Y
Duck Creek Lower Detention Dam	J-514	NV10558	Clark County Public Works	-115.156	36.0193	Clark	Y
Desert Inn Detention Basin Dam	J-517	NV10559	Clark County Public Works	-115.243	36.12983	Clark	Y
Tropicana Detention Basin Dam	J-520	NV10562	Clark County Public Works	-115.199	36.0817	Clark	Y
Pittman East Detention Basin Dam	J-528	NV10572	City Of Henderson	-115.129	35.9689	Clark	Y
Pioneer Detention Basin Dam	J-531	NV10575	City Of Henderson	-115.02	36.0442	Clark	Y
Asamera Effluent Storage Dam	J-756	NV10576	Tahoe Reno Industrial Center Llc	-119.479	39.5493	Storey	Y
Mccullough Hills Park Detention Basin Dam	J-533	NV10577	City Of Henderson	-115.092	35.98389	Clark	Y
Aaron Way Detention Basin Dam	J-536	NV10583	City Of Boulder	-114.838	35.9965	Clark	Y
Cheyenne Peaking Detention Basin Dam	J-538	NV10584	City Of North Las Vegas	-115.112	36.2196	Clark	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
West Logan Ridge Trail Dam	J-541	NV10586	City Of Reno	-119.92	39.5364	Washoe	Y
East Logan Ridge Trail Dam	J-548	NV10587	City Of Reno	-119.914	39.5381	Washoe	Y
Damonte Ranch Flood Control Diversion Dam	J-545	NV10592	Nevada Tri-Partners	-119.739	39.4192	Washoe	Y
Damonte Ranch Flood Detention Basin Dam	J-545	NV10593	Nevada Tri-Partners	-119.732	39.4211	Washoe	Y
Damonte Ranch Wetlands Detention Basin Dam	J-545	NV10594	Nevada Tri-Partners	-119.718	39.4282	Washoe	Y
Damonte Ranch Dam Detention Pond #4	J-545	NV10595	Nevada Tri-Partners	-119.718	39.4316	Washoe	Y
Virginia Lake Dam	J-720	NV10596	City Of Reno	-119.805	39.50206	Washoe	Y
Fort Apache Detention Basin Dam	J-550	NV10604	City Of Las Vegas	-115.297	36.28104	Clark	Y
Bently Reservoir Dam	J-551	NV10605	Bently Family Limited Partnership	-119.684	38.96646	Douglas	Y
Upper Duck Creek Interim Detention Basin Dam	J-552	NV10606	Clark County Public Works	-115.313	36.00815	Clark	Y
Indian Springs Detention Basin Dam	J-561	NV10617	Clark County Public Works	-115.683	36.57125	Clark	Y
North Railroad Detention Basin Dam	J-564	NV10619	City Of Boulder	-114.866	35.96892	Clark	Y
R-4 Detention Dam	J-646	NV10621	Clark County Public Works	-115.353	36.11394	Clark	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
Blue Diamond Upper Detention Dam	J-645	NV10622	Clark County Public Works	-115.317	36.02993	Clark	Y
F-4 Detention Basin Dam	J-567	NV10625	Clark County Public Works	-115.3	36.04478	Clark	Y
Verdi Meadows Wastewater Disposal Dam	J-133	NV10632	Verdi Meadows Utility Company, Inc	-119.972	39.5276	Washoe	Y
Gowan Detention South Dam	J-375	NV10634	City Of Las Vegas	-115.252	36.21382	Clark	Y
Shenandoah Detention Basin Dam		NV10635	City Of Carson City	-119.771	39.20101	Carson City	Y
Sheep Camp Detention Dam		NV10638	Lyon County	-119.593	39.27082	Lyon	Y
Rancho Detention Basin Dam	J-584	NV10639	City Of Las Vegas	-115.261	36.2672	Clark	Y
Bootleg Detention Basin Dam	J-575	NV10647	City Of Boulder	-114.861	35.9806	Clark	Y
South Edge East 1 Headworks Detention Basin Dam	J-576	NV10648	City Of Henderson	-115.118	35.922	Clark	Y
Ann Road Detention Basin Dam	J-577	NV10652	City Of Las Vegas	-115.339	36.2694	Clark	Y
North Spanish Springs Flood Sediment Basin Dam	J-579	NV10653	Washoe County	-119.701	39.6619	Washoe	Y
North Spanish Springs Flood Detention Facility Dam	J-580	NV10654	Washoe County	-119.715	39.65741	Washoe	Y
Abbott Wash Detention Basin Dam	J-582	NV10656	City Of Mesquite	-114.094	36.82568	Clark	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
Pulsipher Wash Detention Basin Dam	J-583	NV10657	City Of Mesquite	-114.115	36.81758	Clark	Y
Duck Creek Railroad Detention Basin Dam	J-587	NV10658	Clark County Public Works	-115.238	36.00682	Clark	Y
Northeast C-1 Detention Basin Dam	J-599	NV10670	City Of Henderson	-114.935	36.05278	Clark	Y
Buckeye Creek Middle Effluent Storage Pond Dam	J-380	NV10686	Douglas County Sewer Improvement District #1	-119.666	38.99069	Douglas	Y
Buckeye Creek Upper Effluent Storage Pond Dam	J-380	NV10687	Douglas County Sewer Improvement District #1	-119.667	38.99744	Douglas	Y
Elko Effluent South Storage Pond Dam	J-496	NV10705	City Of Elko	-115.817	40.77775	Elko	Y
Tropicana North Branch Detention Basin Dam	J-612	NV10731	Clark County Public Works	-115.195	36.09632	Clark	Y
Lower Blue Diamond Detention Dam	J-641	NV10768	Clark County Public Works	-115.217	36.04231	Clark	Y
F-1 Dam Detention Basin	J-643	NV10770	Clark County Public Works	-115.339	36.09772	Clark	Y
F-2 Dam Detention Basin	J-644	NV10771	Clark County Public Works	-115.329	36.08049	Clark	Y
Floyd Lamb Park South Enhancement Embankment Dam	J-632	NV10784	City Of Las Vegas	-115.265	36.314	Clark	Y
Flamingo Wash Lower Detention Basin Dam	J-631	NV10789	Clark County Public Works	-115.209	36.1024	Clark	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
Pond Gw-11 Dam	J-665	NV10797	Nv Environmental Response Trust	-115.005	36.0514	Clark	Y
Orchard Detention Basin Dam	J-673	NV10809	Clark County Public Works	-115.019	36.154	Clark	Y
D'andrea Detention Basin #1 Dam	J-502	NV10818	D'andrea Nevada Llc	-119.692	39.555	Washoe	Y
D'andrea Detention Basin #3 Dam	J-502	NV10819	D'andrea Nevada Llc	-119.701	39.551	Washoe	Y
Gw-1 Pond Dam	J-705	NV10859	Titanium Metals Corporations	-114.995	36.0478	Clark	Y
F-3 Detention Basin Dam (Summerlin V16a Blm Detention Basin)	J-708	NV10862	Clark County Public Works	-115.317	36.06185	Clark	Y
Lone Mountain-Beltway Detention Basin Dam	J-711	NV10887	City Of Las Vegas	-115.32	36.24684	Clark	Y
Skye Canyon Detention Basin 1 Dam	J-728	NV10895	City Of Las Vegas	-115.329	36.31089	Clark	Y
Pittman Horizon Ridge Detention Basin Dam	J-719	NV10902	City Of Henderson	-115.024	36.01483	Clark	Y
Gowan Detention Middle Dam	J-375	NV10908	City Of Las Vegas	-115.252	36.2228	Clark	Y
Pittman North Detention Basin Dam	J-730	NV10911	City Of Henderson	-115.156	35.96668	Clark	Y
Coyote Springs Detention Basin 1-2 Dam	J-734	NV10672	Coyote Springs Nevada, Llc	-114.954	36.8043	Clark	Y
Trail Head Detention Basin Dam	J-360	NV10930	City Of Boulder	-114.844	35.9866	Clark	Y

Table F-2. Select Information for High Hazard Potential Dams.

Dam Name	State ID	National ID	Owner Name	Longitude	Latitude	County	EAP Status
Skye Canyon Detention Basin 2 Dam	J-744	NV10928	City Of Las Vegas	-115.331	36.3199	Clark	Y
Silverado Ranch Detention Basin Dam	J-747	NV10934	Clark County Public Works	-115.2	36.0111	Clark	N
Floyd Lamb Park North Enhancement Embankment Dam	J-632	NV10935	City Of Las Vegas	-115.256	36.322	Clark	Y
Blue Diamond Business Center Detention Basin Dam #1	J-729	NV10910	Blue Diamond Business Center	-115.196	36.0421	Clark	Y
Grand Park Detention Basin Dam	J-766	NV10952	Howard Hughes Corporation	-115.354	36.1932	Clark	Y

The remainder of this appendix is the "Nevada High Hazard Potential Dams Supplement," to the State of Nevada 2018 Enhanced Hazard Mitigation Plan.

Nevada High Hazard Potential Dams Supplement

A supplemental report to The State of Nevada Enhanced Hazard Mitigation Plan, 2018 that includes more information to address elements from the Federal Emergency Management Agency's Rehabilitation of High Hazard Potential Dam Grants Program for Fiscal Year 2019.

Authored by the Nevada Division of Water Resources (DWR) with assistance from State of Nevada Department of Public Safety, Division of Emergency Management (DEM) and the Federal Emergency Management Agency (FEMA) Region IX (RIX) and California Department of Water Resources Division of Dam Safety.

INTRODUCTION TO FEMA'S HIGH HAZARD POTENTIAL DAM PROGRAM

The Rehabilitation of High Hazard Potential Dam (HHPD) Grant Program is a FEMA program that began in 2019 and is administered by the National Dam Safety Program (NDSP). The HHPD Grant Program provides grants to states for non-Federal governmental organizations or nonprofit organizations for the rehabilitation of eligible high hazard potential dams. Eligible high hazard potential dams are non-federal dams that: are located in a state with a state dam safety program; are classified as "high hazard potential" by the state dam safety agency in the state in which the dam is located; have an emergency action plan approved by the relevant state dam safety agency; and the state in which the dam is located determines that the dam fails to meet minimum dam safety standards of the state and poses an unacceptable risk to the public. Applicants must also meet the following requirements: the state, territory, or county where the dam is located must participate in, and comply with, all federal flood insurance program; have in place a hazard mitigation plan that includes all dam risks; have a floodplain management plan in place, or demonstrate that it will be in place no later than one year after the date of completion of construction of the project; and a couple of other requirements that are listed in the HHPD Applicant Requirements.

The downstream hazard potential classification is based solely on potential downstream impacts to life and property should the dam fail when operating with a full reservoir. This hazard is not related to the condition of the dam or its appurtenant structures. In the Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures (FEMA P-946, July 2013), FEMA categorizes the downstream hazard potential into three categories in increasing severity: Low, Significant, and High. The Rehabilitation of High Hazard Potential Dam Grant Program defines High Hazard Potential as "a classification standard for any dam whose failure or mis-operation will cause loss of human life and significant property destruction."
For purposes of the HHPD Grant Program, the determination of dams that pose an unacceptable risk to the public is to be made by the state dam safety program.

PARTNERSHIPS/RESPONSIBLITIES FOR NEVADA'S DAM PROGRAM

The State of Nevada (NV) Department of Public Safety, Division of Emergency Management (DEM) is responsible for leading the preparation, coordination, and implementation of the to The State of Nevada Enhanced Hazard Mitigation Plan (SHMP) on behalf of the state. The primary responsibilities of DEM in preparing, maintaining, and implementing the SHMP are to:

- Ensure that the SHMP meets FEMA requirements and is approved by FEMA.
- Coordinate the continued development of the SHMP with the DEM and strategic working groups, and conduct outreach to other local, tribal, public/private, state, and federal agencies.
- Provide ample opportunities for stakeholder involvement in the update of the SHMP.
- Administer FEMA's Hazard Mitigation Assistance (HMA) programs, including the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA).
- Support integration of local, regional, and tribal hazard mitigation efforts with the SHMP.

DEM leads the SHMP planning efforts. The Division coordinates with all the partner agencies to update, socialize, and implement the plan. Additionally, the Division has the responsibility of updating the SHMP to incorporate the HHPD Grant Program review elements.

DWR implements dam safety regulatory power afforded to them under Nevada's Revised Statutes and Administrative Code and provides oversight to the design, construction, and maintenance of approximately 625 jurisdictional dams in the state. DWR helps to ensure dam safety in NV by:

- Reviewing and approving new dam construction and the enlargement, repair, alteration, and removal of existing dams to ensure that dams and their appurtenant structures are designed to meet minimum requirements.
- Performing independent analyses to understand dam and appurtenant structures performance. These analyses can include structural, hydrologic, hydraulic, and geotechnical evaluations.
- Overseeing construction to ensure work is being done in accordance with the approved plans and specifications.
- Inspecting all "Low" hazard dams at least once every five calendar years, "Significant" hazard dams at least once every three calendar years, and "High" hazard dams every calendar year to ensure that the dams are safe, performing as intended, and are not developing issues.

- Periodically reviewing the stability of dams and their major appurtenances in light of improved design approaches and requirements, as well as new findings regarding earthquake hazards and hydrologic estimates in Nevada.

The DEM and DWR, along with FEMA's NDSP and RIX, will work together as needed to address the updates necessary to make the 2018 NV SHMP compliant with FEMA's Fiscal Year 2019 (FY2019) HHPD requirements, and continue addressing all dam risk in all future iterations of the SHMP. Additional coordination will occur with the DEM Local Mitigation Planning and DEM Hazard Mitigation Assistance (HMA) programs and with any other relevant DWR programs.

BACKGROUND OF NEVADA'S FY2019 HHPD GRANT SUBMITTAL

In 2019, DWR submitted an application on behalf of the State of Nevada for the FY2019 Rehabilitation of HHPDs Grant Program through FEMA.

HHPD grant requirements state that applicants must have in place (by the application deadline and at the time of obligation of grant funds) a FEMA-approved state hazard mitigation plan that includes all dam risks and complies with the Disaster Mitigation Act of 2000 (Public Law 106–390; 114 Stat. 1552). If an HHPD applicant does not have a state hazard mitigation plan that includes all dam risks, the applicant may request an extension to meet this requirement under the HHPD Notice of Funding Opportunity (NOFO) grant guidelines for "Mitigation Plan Extraordinary Circumstances".

After submitting the grant application, DWR received a Request for Information (RFI) from FEMA as part of the application process. One of the elements of the RFI was a workplan on how the state would address any HHPD elements not met in NV's SHMP. A workplan was developed and included the estimated resources, timeline, and effort necessary to address the identified revisions for purposes of the state's eligibility for the new HHPD grant program. DWR worked with DEM and FEMA RIX to submit the workplan and other components to help meet the RFI requirements. As a result of these efforts, DWR and the State of Nevada received FY2019 FEMA HHPD grant funding approval in 2019.

PURPOSE OF SUPPLEMENTAL

This Supplemental document is intended to document the deliverables that were produced as outlined in the Nevada's 2019 HHPD grant application process. The supplemental document supports the 2018 NV SHMP, and any additional progress on addressing all dam risk, including HHPD elements, will be tracked for the 2023 NV SHMP update.

The updated HHPD elements in this supplemental need to be completed, reviewed, and approved by FEMA RIX in accordance with the document titled "The Department of Homeland Security (DHS) Notice of Funding Opportunity (NOFO) FY 2019 Rehabilitation of High Hazard Potential Dams (HHPD)".

HHPD ELEMENTS FOR THE 2018 AND FUTURE SHMPs

PLANNING PROCESS

The DEM worked with DWR to update the 2018 SHMP with the elements necessary to meet the FY2019 HHPD program requirements, while ensuring that Nevada is considering all dams risk, and not just the risk from those dams that qualify for the HHPD program.

PRIORITIES

Upon FEMA RIX's initial review and analysis of the 2018 NV SHMP to evaluate if the plan met the FY2019 FEMA HHPD Elements, FEMA RIX determined that NV met six of seven HHPD elements, concluding that HHPD 6 were "not met". FEMA RIX also provided additional suggested areas of improvement to make the HHPD elements stronger. DWR divided FEMA's findings into three sets of priorities as listed below.

First - Meet HHPD Element 6 FEMA rated as "not met (NM)" in the 2018 NV SHMP. This is the reason for the SHMP supplemental.

Second – Work on meeting the HHPD Elements that FEMA RIX rated as "Met (M*)" in the 2018 NV SHMP. These will be included in the 2023 NV SHMP update.

Third – Enhance analysis of all dam risk in Nevada and update the plan and supplemental to include actions Nevada is taking to mitigate the dam risk.

ELEMENT HHPD 6

HHPD Element 6:

> "Did Element S13 (local) generally describe and analyze the effectiveness of local mitigation policies, programs, and capabilities that address HHPDs that pose an unacceptable risk to the public?"

Required Revisions comments are:

> "HHPD6- Section 3.3.8.3 describes the NHMPC effort to survey local jurisdiction to collect mitigation data on dam risk. Sections 4.3.1 and 4.3.2 analyze the effectiveness of local mitigation policies, programs, and capabilities in general. However, nothing speaks directly to the local jurisdictions' capabilities to address dam risk. For revisions, we suggest using content from these two sections and going one step further to highlight existing opportunities and gaps in each jurisdiction's policy framework and capabilities to address dam risk."

Analysis Process

DWR reviewed 14 Local Hazard Mitigation Plans (LHMPs) representing cities, counties, and special districts in NV with high and significant hazard dams physically located in their

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STRATEGY MOVING FORWARD

DEM and DWR will continue to move forward on educating about dam hazard, associated risk, and mitigation strategies including the implementation of HHPD elements and activities that occur in the state. These items will be used to improve the 2023 SHMP update with regards to dams. DWR and DEM will continue to develop and share resources and enhanced technical assistance and training for local jurisdictions where it relates to the dam hazard and HHPD elements in LHMPs.

ATTACHMENT

Maps of dams in Nevada by County

G.HAZUS Flood Maps

Figure G-1. HAZUS Flood Scenarios Overview.

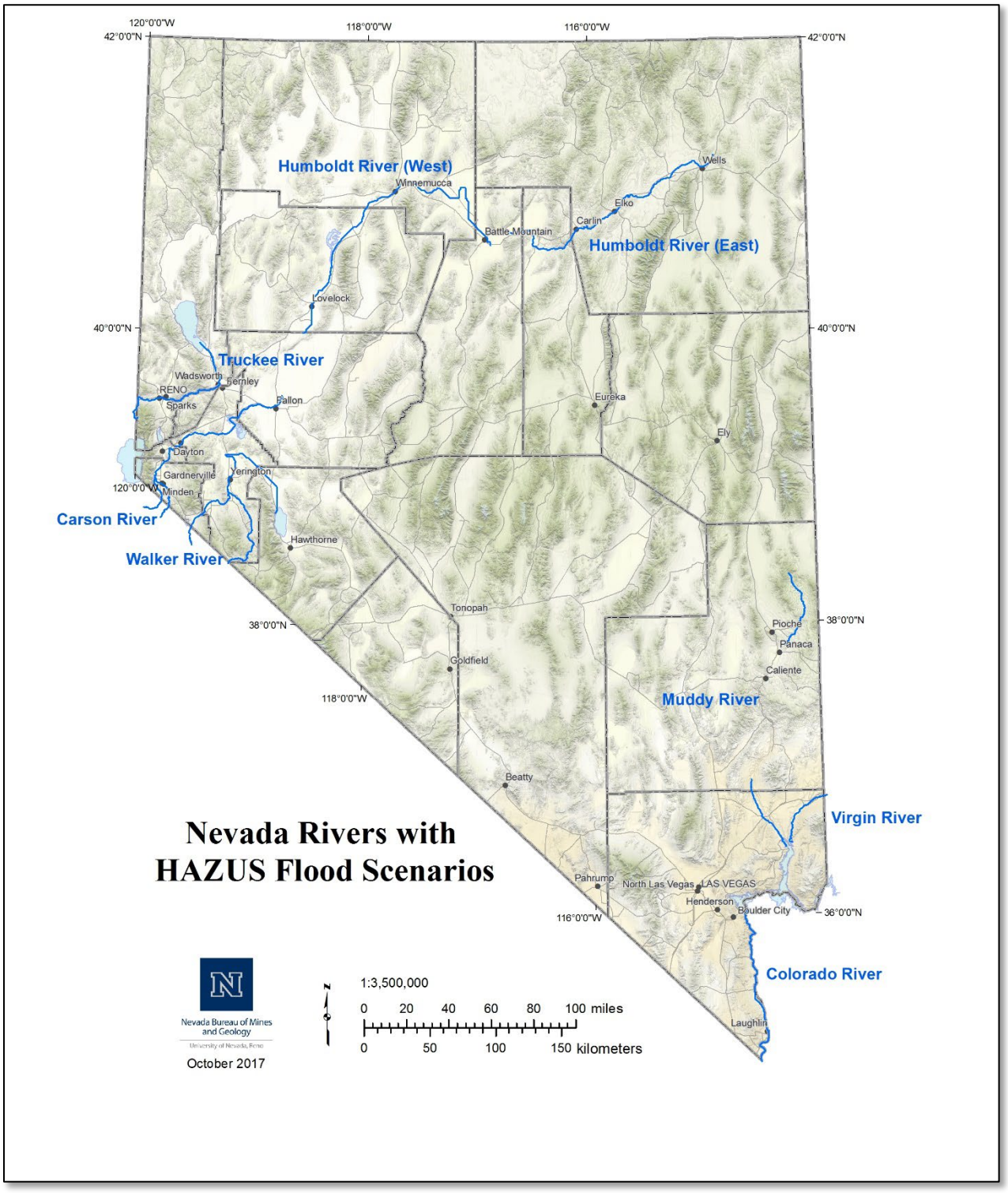


Figure G-2. Carson River Basin 100 Year HAZUS Flood Scenario.

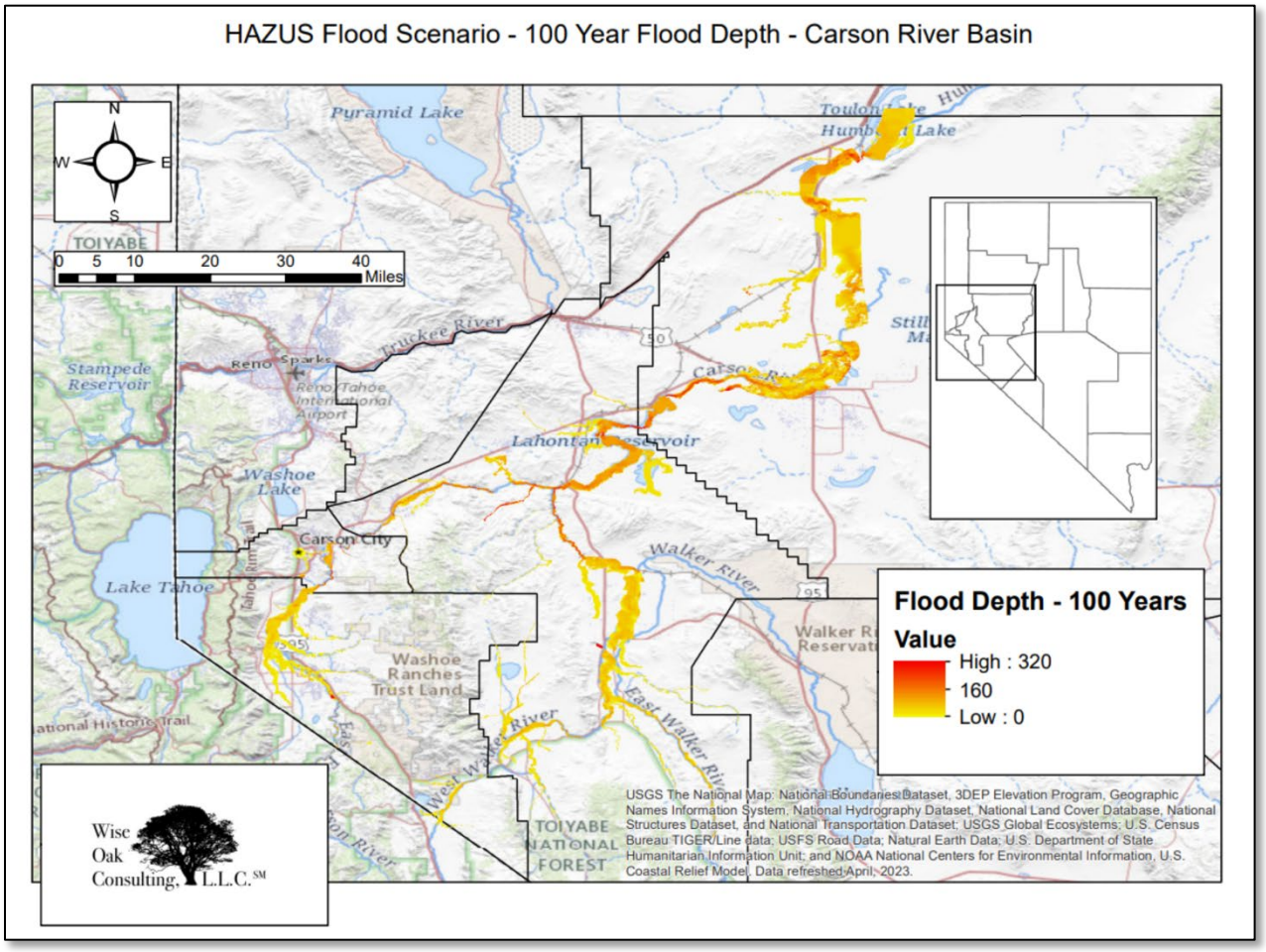


Figure G-3. Colorado River 100 Year HAZUS Flood Scenario.

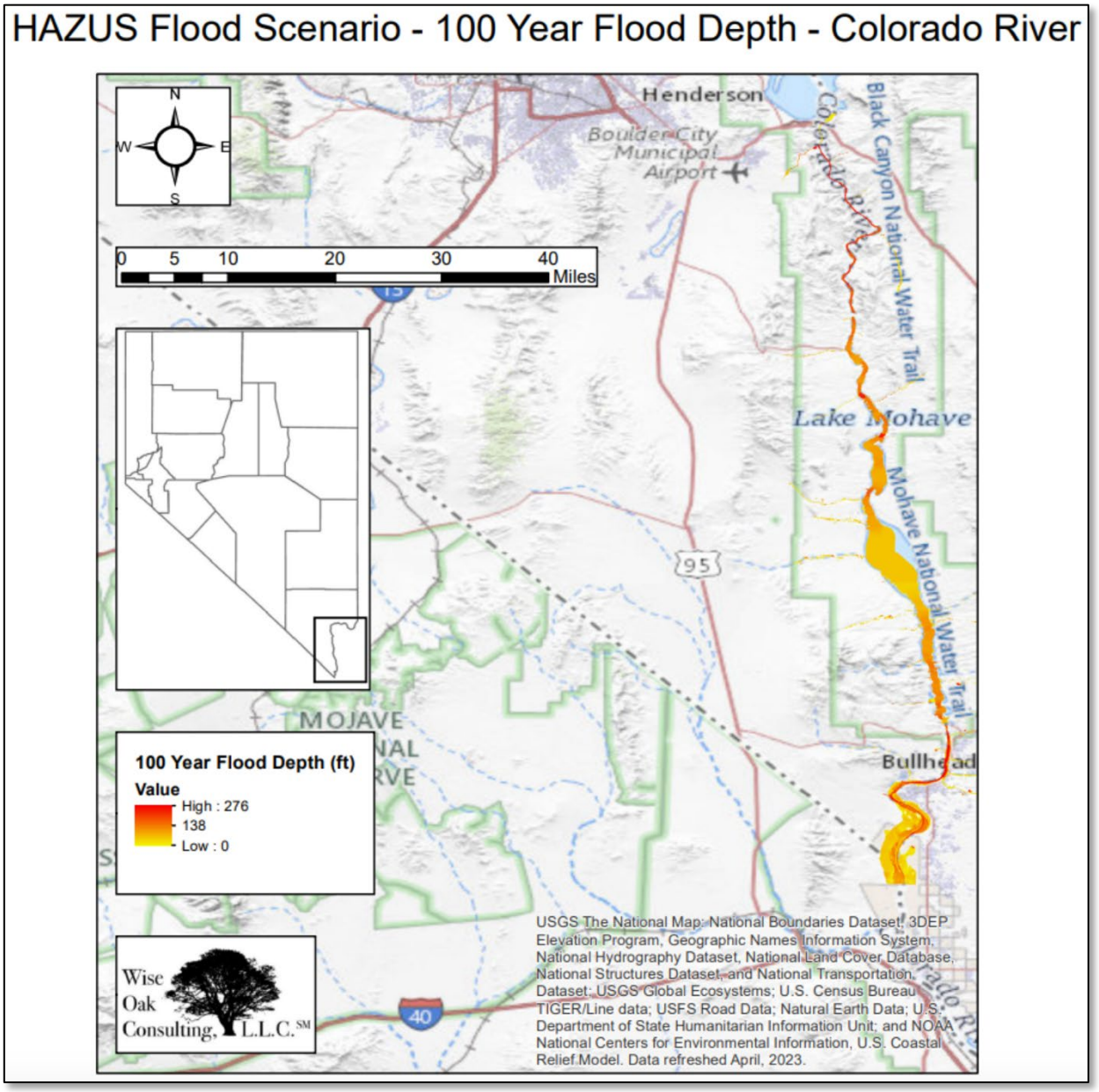


Figure G-4. Eastern Humboldt River 100 Year HAZUS Flood Scenario.

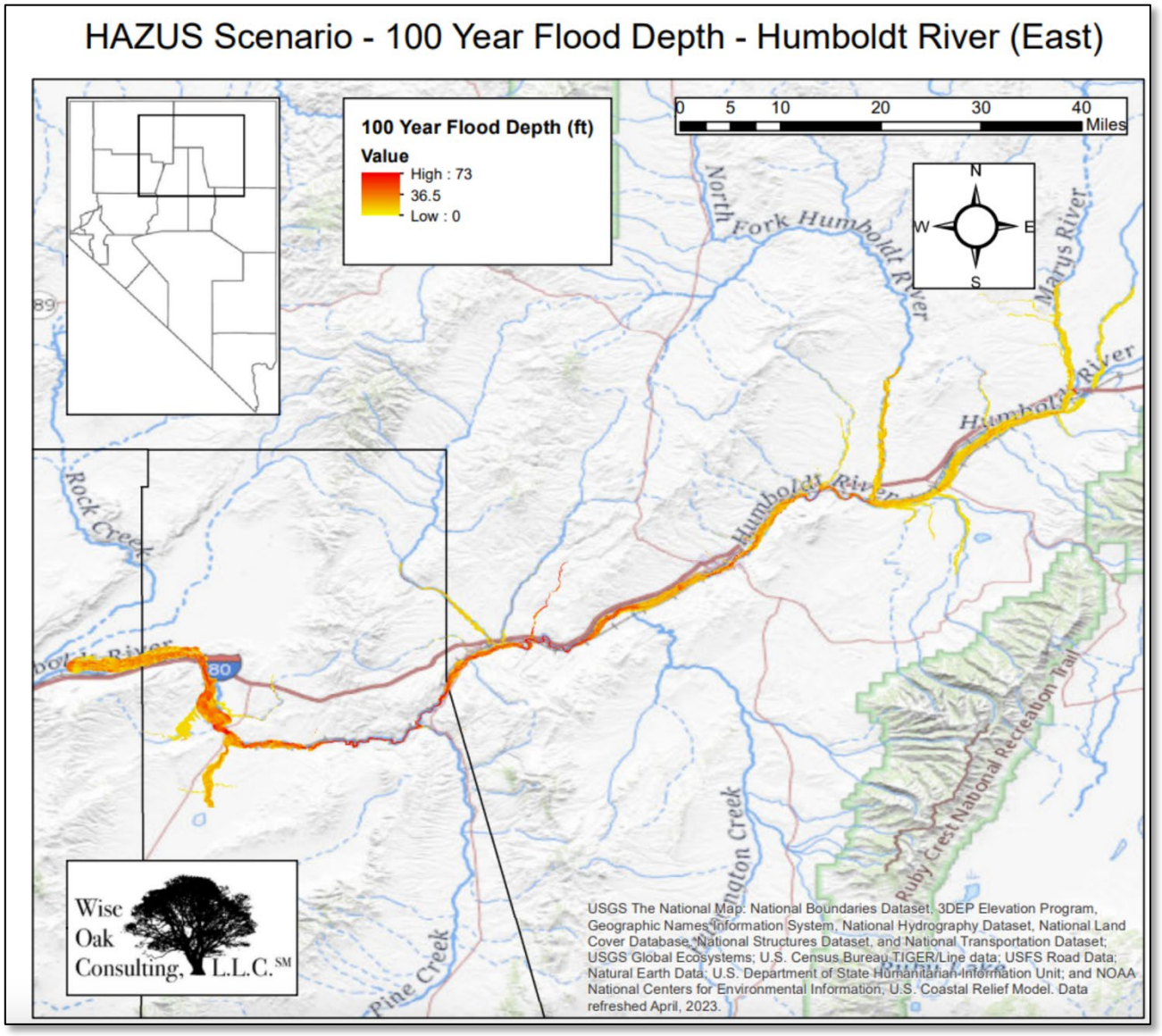


Figure G-5. Western Humboldt River 100 Year HAZUS Flood Scenario.

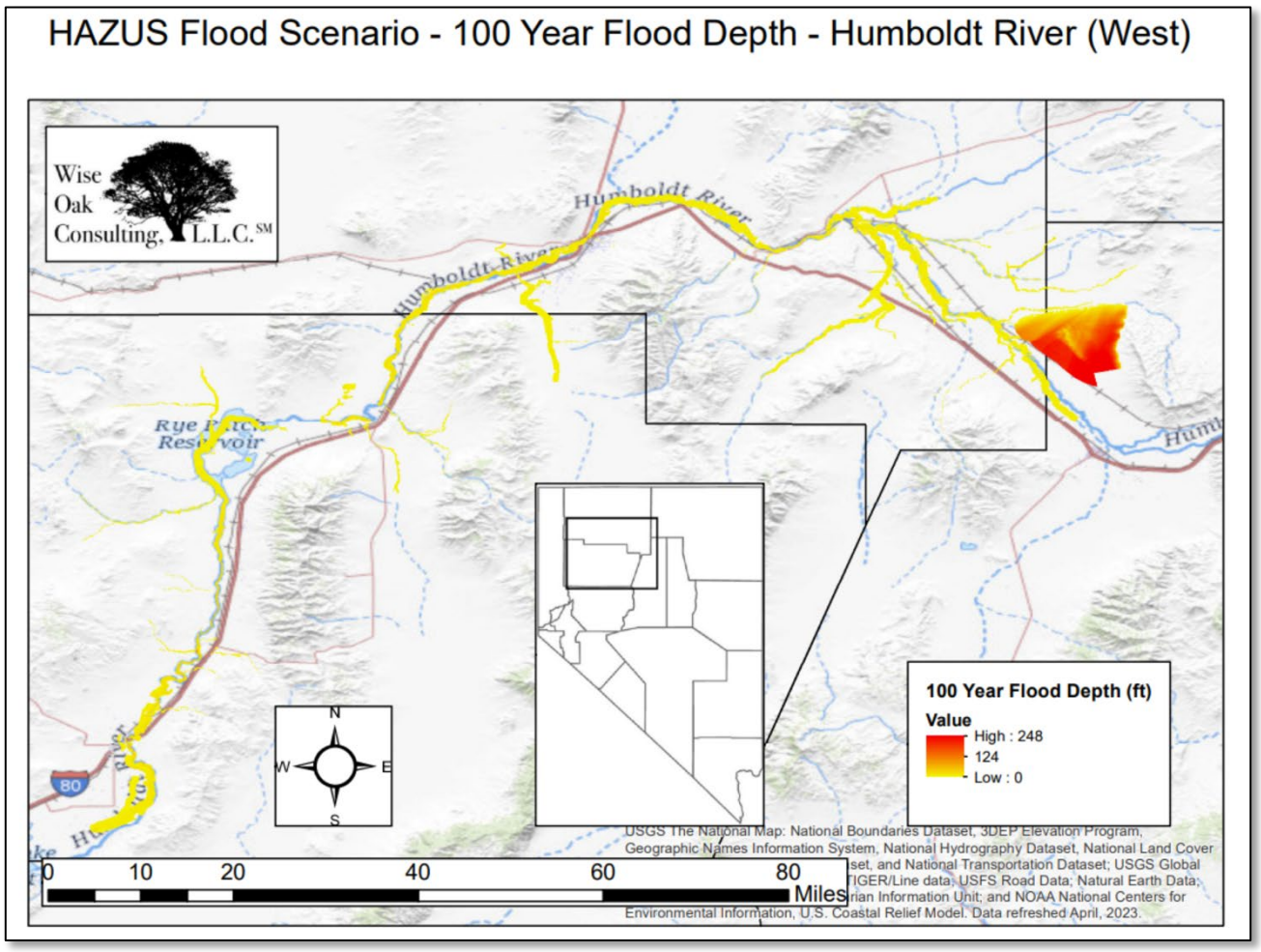


Figure G-6. Muddy River 100 Year HAZUS Flood Scenario.

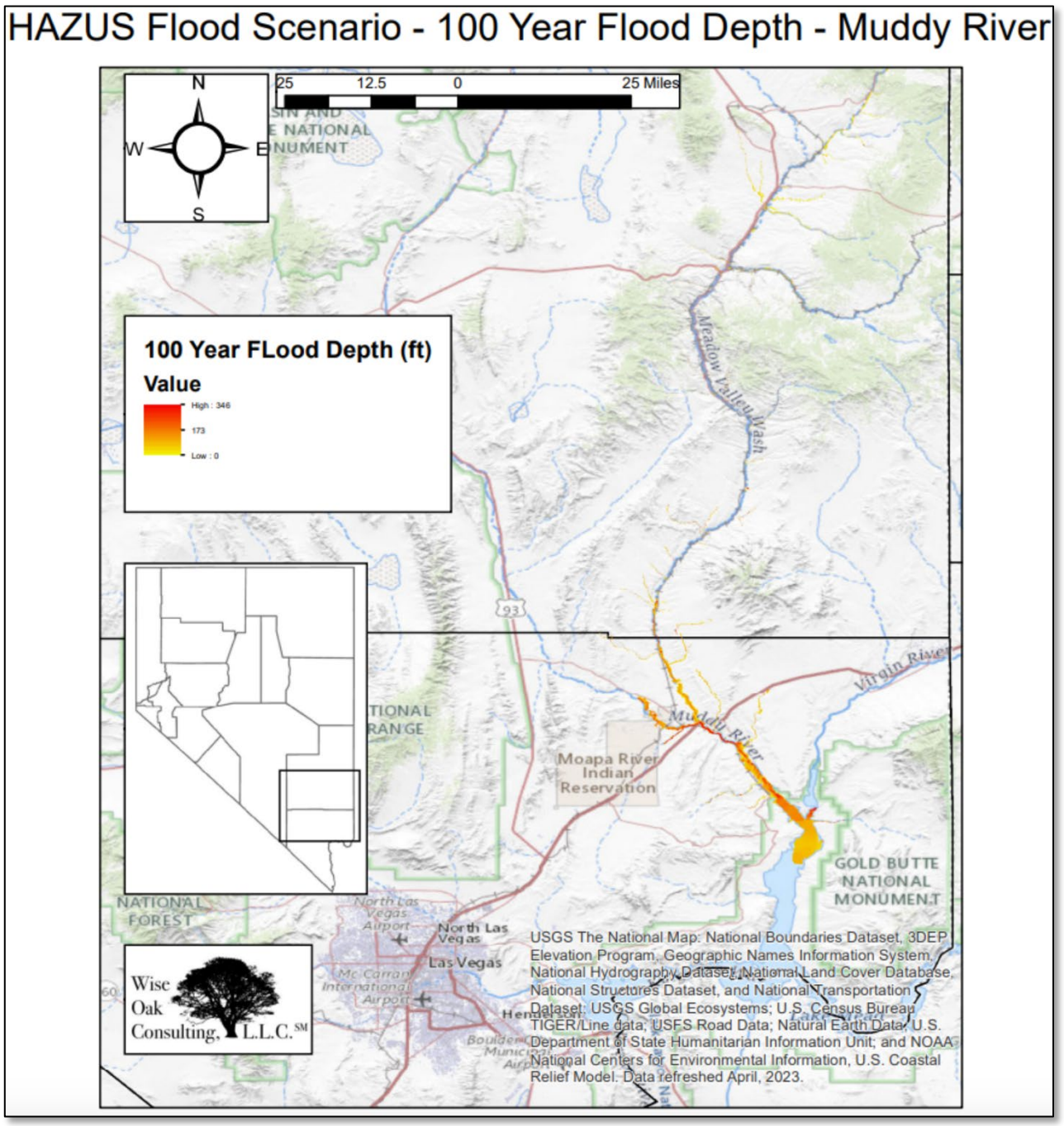


Figure G-7. Truckee River 100 Year HAZUS Flood Scenario.

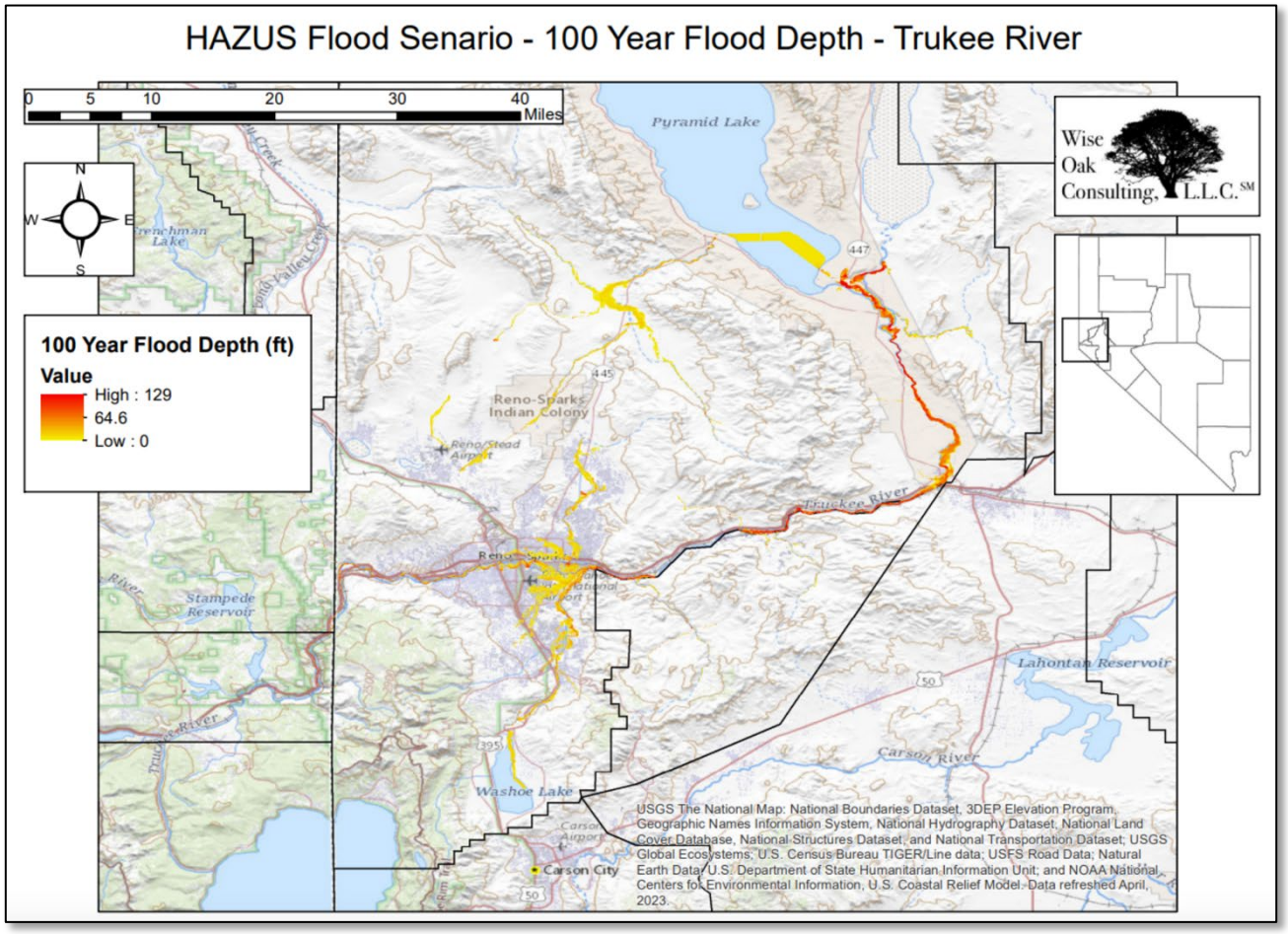


Figure G-8. Virgin River 100 Year HAZUS Flood Scenario.

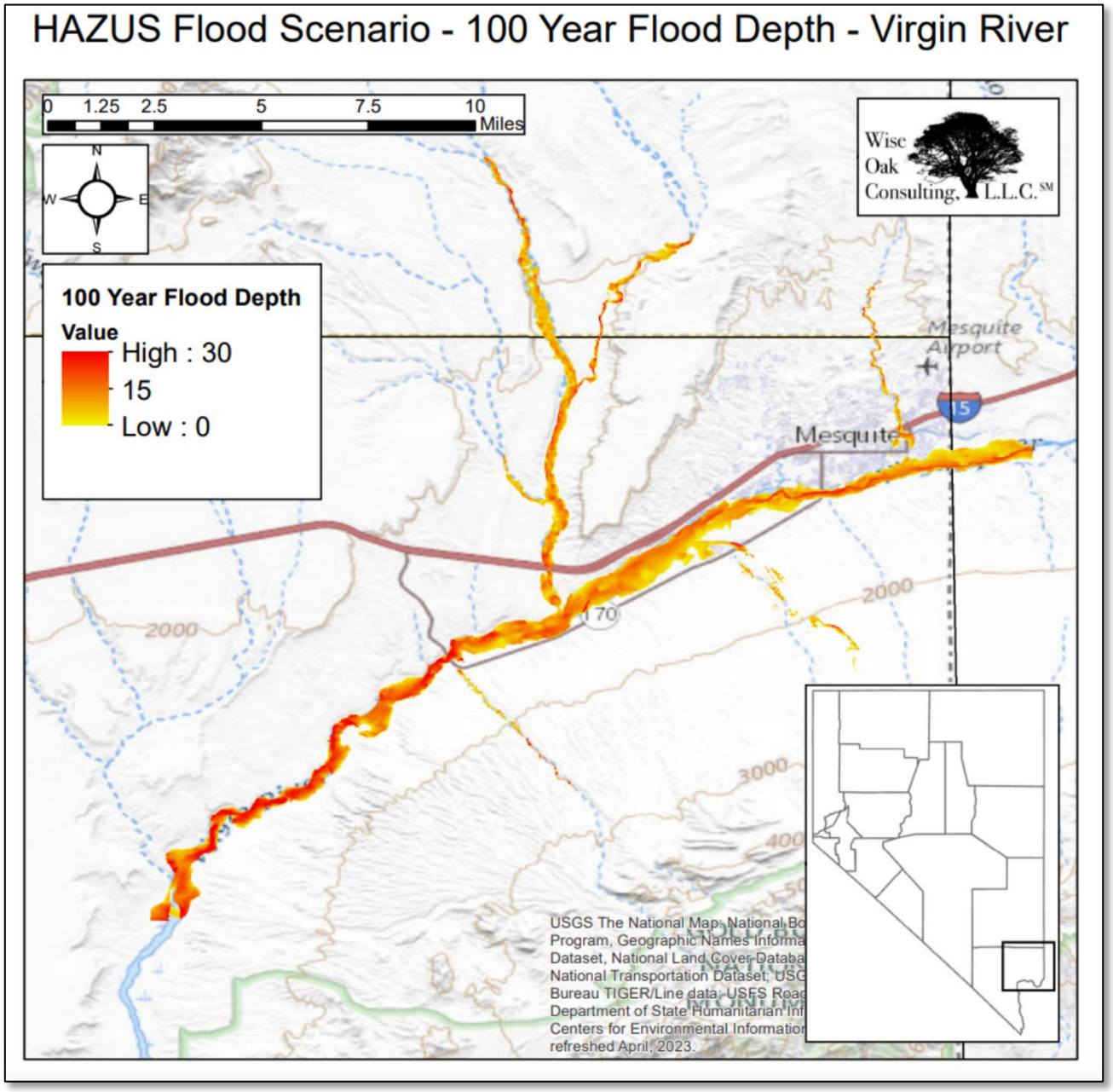
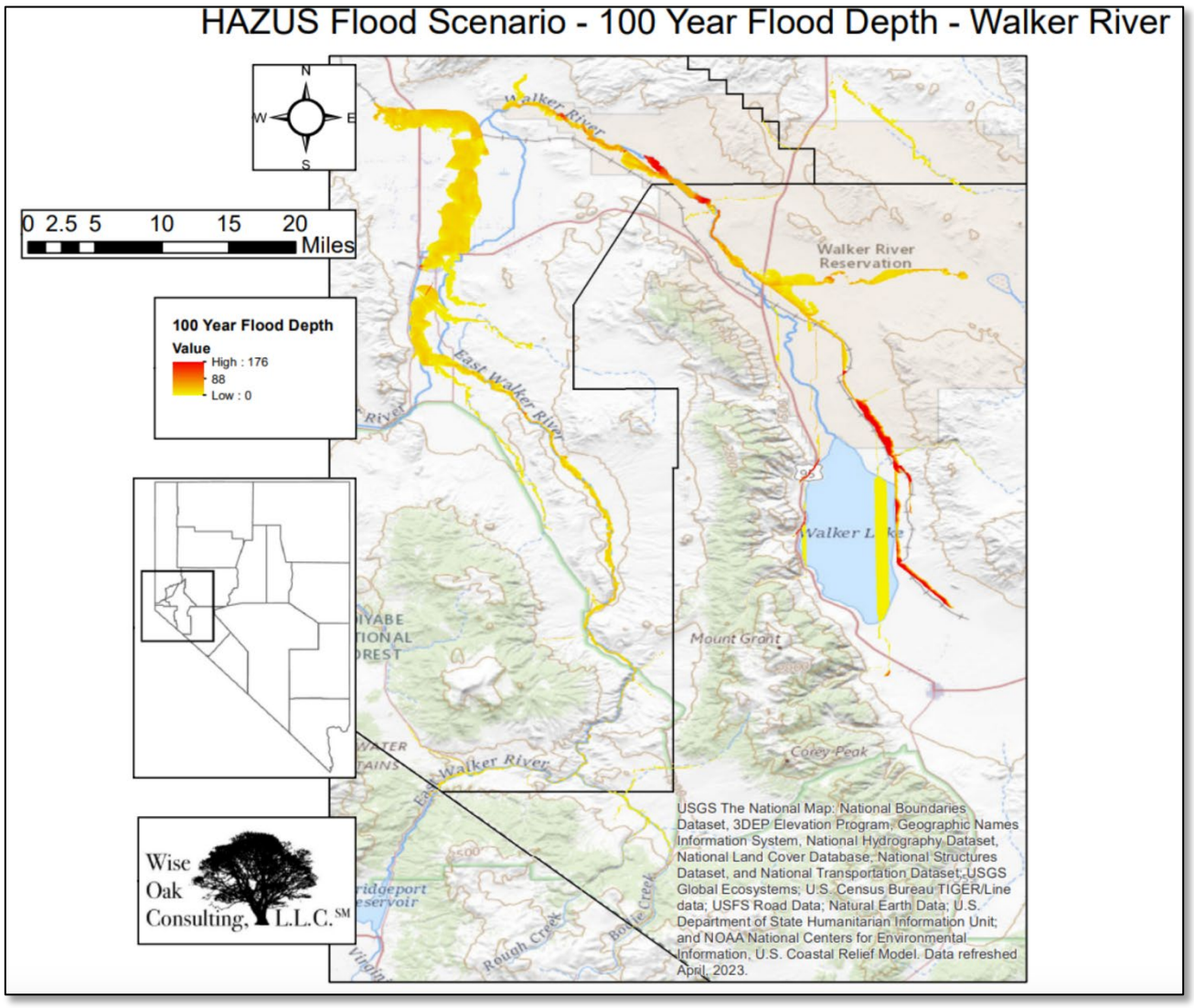


Figure G-9. Walker River 100 Year HAZUS Flood Scenario.



H.Federal & State Assurances

Incorporated (1) Federal & State Assurances (2) Financial and Program Assurances (3) Federal Certifications (4) Scope and Timeline of Work (5) Line Item Detail Budget, Zoom Grants Listed Resource Documents attached to this application.

As the duly authorized representative of the (name of agency), hereby certify that the Subrecipient has the legal authority to apply for federal grant assistance and the institutional, managerial, and financial capability (including funds sufficient to pay the non-Federal share of the project cost) to ensure proper planning, management, and completion of the described project ("Project") within the period of performance. I further acknowledge that the Subrecipient is responsible for reviewing and adhering to all of the following requirements:

Applicable Federal Laws, Regulations, and Guidelines (government cost principles, uniform administrative requirements, and audit requirements for federal grant programs are set forth in Title 2, Part 200 of the Code of Federal Regulations (C.F.R.). Updates are issued by the Office of Management and Budget (OMB) and can be found at http://www.whitehouse.gov/omb/);

- Notice of Funding Opportunity (NOFO);
- FEMA Preparedness Manual & FEMA Environmental Planning and Historical Preservation Policy Guide
- Applicable Nevada Statutes, Regulations, and Policies;
- Nevada Office of the Military, Division of Emergency Management Grant Assurances;
- Nevada Office of the Military, Division of Emergency Management, Grant Management Guide.

In addition to the above-listed requirements, the (name of agency) hereby agrees to comply with the following Federal and State Articles of this Agreement:

Federal Articles

Article 1 Assurances, Administrative Requirements, Cost Principles, Representations and Certifications

DHS financial assistance recipients must complete either the Office of Management and Budget (OMB) Standard Form 424B Assurances – Non-Construction Programs, or OMB Standard Form 424D Assurances – Construction Programs, as applicable. Certain assurances in these documents may not be applicable to your program, and the DHS financial assistance office (DHS FAO) may require applicants to certify additional assurances. Applicants are required to fill out the assurances applicable to their program as instructed by the awarding agency. Please contact the DHS FAO if you have any questions. DHS financial assistance recipients are required to follow the applicable provisions of the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards located at Title 2, Code of Federal Regulations (C.F.R.) Part 200, and adopted by DHS at 2 C.F.R. Part 3002. By accepting this agreement, the recipient, and its executives, as defined in 2 C.F.R. § 170.315, certify that the recipient policies are in accordance with OMB guidance located at 2 C.F.R. Part 200, all applicable federal laws, and relevant Executive guidance.

Article 2 DHS Specific Acknowledgements and Assurances

All recipients, subrecipients, successors, transferees, and assignees must acknowledge and agree to comply with applicable provisions governing DHS access to records, accounts, documents, information, facilities, and staff. 1. Recipients must cooperate with any compliance reviews or compliance investigations conducted by DHS. 2. Recipients must give DHS access to, and the right to examine and copy, records, accounts, and other documents and sources of information related to the federal financial assistance award and permit access to facilities, personnel, and other individuals and information as may be necessary, as required by DHS regulations and other applicable laws or program guidance. 3. Recipients must submit timely, complete, and accurate reports to the appropriate DHS officials and maintain appropriate backup documentation to support the reports. 4. Recipients must comply with all other special reporting, data collection, and

evaluation requirements, as prescribed by law, or detailed in program guidance. 5. Recipients of federal financial assistance from DHS must complete the DHS Civil Rights Evaluation Tool within thirty (30) days of receipt of the Notice of Award or, for State Administrative Agencies, thirty (30) days from receipt of the DHS Civil Rights Evaluation Tool from DHS or its awarding component agency. After the initial submission for the first award under which this term applies, recipients are required to provide this information once every two (2) years if they have an active award, not every time an award is made. Recipients should submit the completed tool, including supporting materials, to CivilRightsEvaluation@hq.dhs.gov. This tool clarifies the civil rights obligations and related reporting requirements contained in the DHS Standard Terms and Conditions. Subrecipients are not required to complete and submit this tool to DHS. The evaluation tool can be found at https://www.dhs.gov/publication/dhscivil-rights-evaluation-tool.

The DHS Office for Civil Rights and Civil Liberties will consider, in its discretion, granting an extension if the recipient identifies steps and a timeline for completing the tool. Recipients should request extensions by emailing the request to CivilRightsEvaluation@hq.dhs.gov prior to expiration of the 30-day deadline.

Article 3 Acknowledgement of Federal Funding from DHS

Recipients must acknowledge their use of federal funding when issuing statements, press releases, requests for proposal, bid invitations, and other documents describing projects or programs funded in whole or in part with federal funds.

Article 4 Activities Conducted Abroad

Recipients must ensure that project activities carried on outside the United States are coordinated as necessary with appropriate government authorities and that appropriate licenses, permits, or approvals are obtained.

Article 5 Age Discrimination Act of 1975

Recipients must comply with the requirements of the Age Discrimination Act of 1975, Pub. L. No. 94-135 (1975) (codified as amended at Title 42, U.S. Code, § 6101 et seq.), which prohibits discrimination on the basis of age in any program or activity receiving federal financial assistance.

Article 6 Americans with Disabilities Act of 1990

Recipients must comply with the requirements of Titles I, II, and III of the Americans with Disabilities Act, Pub. L. No. 101-336 (1990) (codified as amended at 42 U.S.C. §§ 12101–12213), which prohibits recipients from discriminating on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities.

Article 7 Best Practices for Collection and Use of Personally Identifiable Information

Recipients who collect personally identifiable information (PII) are required to have a publicly available privacy policy that describes standards on the usage and maintenance of the PII they collect. DHS defines PII as any information that permits the identity of an individual to be directly or indirectly inferred, including any information that is linked or linkable to that individual. Recipients may also find the DHS Privacy Impact Assessments: Privacy Guidance at http://www.dhs.gov/xlibrary/assets/privacy/privacy_pia_guidance_june2010.pdf and Privacy Template at

https://www.dhs.gov/sites/default/files/publications/privacy_pia_template 2017.pdf as useful resources respectively.

Article 8 Civil Rights Act of 1964 – Title VI

Recipients must comply with the requirements of Title VI of the Civil Rights Act of 1964 (codified as amended at 42 U.S.C. § 2000d et seq.), which provides that no person in the United States will, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. DHS implementing regulations for the Act are found at 6 C.F.R. Part 21 and 44 C.F.R. Part 7.

Article 9 Civil Rights Act of 1968

Recipients must comply with Title VIII of the Civil Rights Act of 1968, Pub. L. No. 90-284, as amended through Pub. L. 113-4, which prohibits recipients from discriminating in the sale, rental, financing, and advertising of dwellings, or in the provision of services in connection therewith, on the basis of race, color, national origin, religion, disability, familial status, and sex (see 42 U.S.C. § 3601 et seq.), as implemented by the U.S. Department of Housing and Urban Development at 24

C.F.R. Part 100. The prohibition on disability discrimination includes the requirement that new multifamily housing with four or more dwelling units—i.e., the public and common use areas and individual apartment units (all units in buildings with elevators and ground-floor units in buildings without elevators)—be designed and constructed with certain accessible features. (See 24 C.F.R. Part 100, Subpart D.)

Article 10 Copyright

Recipients must affix the applicable copyright notices of 17 U.S.C. §§ 401 or 402 and an acknowledgement of U.S. Government sponsorship (including the award number) to any work first produced under federal financial assistance awards.

Article 11 Debarment and Suspension

Recipients are subject to the non-procurement debarment and suspension regulations implementing Executive Orders (E.O.) 12549 and 12689, which are at 2 C.F.R. Part 180 as adopted by DHS at 2 C.F.R. Part 3000. These regulations restrict federal financial assistance awards, subawards, and contracts with certain parties that are debarred, suspended, or otherwise excluded from or ineligible for participation in federal assistance programs or activities.

Article 12 Drug-Free Workplace Regulations

Recipients must comply with drug-free workplace requirements in Subpart B (or Subpart C, if the recipient is an individual) of 2 C.F.R. Part 3001, which adopts the Government-wide implementation (2 C.F.R. Part 182) of Sec. 5152-5158 of the Drug-Free Workplace Act of 1988 (41 U.S.C. §§ 8101-8106).

Article 13 Duplication of Benefits

Any cost allocable to a particular federal financial assistance award provided for in 2 C.F.R. Part 200, Subpart E may not be charged to other federal financial assistance awards to overcome fund deficiencies; to avoid restrictions imposed by federal statutes, regulations, or federal financial assistance award terms and conditions; or for other reasons. However, these prohibitions would not preclude recipients from shifting costs that are allowable under two or more awards in accordance with existing federal statutes, regulations, or the federal financial assistance award terms and conditions.

Article 14 Education Amendments of 1972 (Equal Opportunity in Education Act) –Title IX

Recipients must comply with the requirements of Title IX of the Education Amendments of 1972, Pub. L. 92-318 (1972) (codified as amended at 20 U.S.C. § 1681 et seq.), which provide that no person in the United States will, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any educational program or activity receiving federal financial assistance. DHS implementing regulations are codified at 6 C.F.R. Part 17 and 44 C.F.R. Part 19.

Article 15 Energy Policy and Conservation Act

Recipients must comply with the requirements of the Energy Policy and Conservation Act, Pub. L. 94- 163 (1975) (codified as amended at 42 U.S.C. § 6201 et seq.), which contain policies relating to energy efficiency that are defined in the state energy conservation plan issued in compliance with this Act.

Article 16 False Claims Act and Program Fraud Civil Remedies

Recipients must comply with the requirements of the False Claims Act, 31 U.S.C. §§ 3729-3733, which prohibit the submission of false or fraudulent claims for payment to the federal government. (See 31 U.S.C. §§ 3801-3812, which details the administrative remedies for false claims and statements made.)

Article 17 Federal Debt Status

All recipients are required to be non-delinquent in their repayment of any federal debt. Examples of relevant debt include delinquent payroll and other taxes, audit disallowances, and benefit overpayments. (See OMB Circular A-129.)

Article 18 Federal Leadership on Reducing Text Messaging while Driving

Recipients are encouraged to adopt and enforce policies that ban text messaging while driving as described in E.O. 13513, including conducting initiatives described in Section 3(a) of the Order when on official government business or when performing any work for or on behalf of the federal government.

Article 19 Fly America Act of 1974

Recipients must comply with Preference for U.S. Flag Air Carriers (air carriers holding certificates under 49 U.S.C. § 41102) for international air transportation of people and property to the extent that such service is available, in accordance with the International Air Transportation Fair Competitive Practices Act of 1974, 49 U.S.C. § 40118, and the interpretative guidelines issued by the Comptroller General of the United States in the March 31, 1981, amendment to Comptroller General Decision B-138942.

Article 20 Hotel and Motel Fire Safety Act of 1990

In accordance with Section 6 of the Hotel and Motel Fire Safety Act of 1990, 15 U.S.C. § 2225a, recipients must ensure that all conference, meeting, convention, or training space funded in whole or in part with federal funds complies with the fire prevention and control guidelines of the Federal Fire Prevention and Control Act of 1974, (codified as amended at 15 U.S.C. § 2225.)

Article 21 Limited English Proficiency (Civil Rights Act of 1964, Title VI)

Recipients must comply with Title VI of the Civil Rights Act of 1964, (42 U.S.C. § 2000d et seq.) prohibition against discrimination on the basis of national origin, which requires that recipients of federal financial assistance take reasonable steps to provide meaningful access to persons with limited English proficiency (LEP) to their programs and services. For additional assistance and information regarding language access obligations, please refer to the DHS Recipient Guidance: https://www.dhs.gov/guidance- published-helpdepartment-supported-organizations-provide-meaningful-access-people limited and additional resources on http://www.lep.gov.

Article 22 Lobbying Prohibitions

Recipients must comply with 31 U.S.C. § 1352, which provides that none of the funds provided under a federal financial assistance award may be expended by the recipient to pay any person to influence, or attempt to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any federal action related to a federal award or contract, including any extension, continuation, renewal, amendment, or modification.

Article 23 National Environmental Policy Act

Recipients must comply with the requirements of the National Environmental Policy Act of 1969 (NEPA), Pub. L. 91-190 (1970) (codified as amended at 42 U.S.C. § 4321 et seq.) and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA, which require recipients to use all practicable means within their authority, and consistent with other essential considerations of national policy, to create and maintain conditions under which people and nature can exist in productive harmony and fulfill the social, economic, and other needs of present and future generations of Americans.

Article 24 Nondiscrimination in Matters Pertaining to Faith-Based Organizations

It is DHS policy to ensure the equal treatment of faith- based organizations in social service programs administered or supported by DHS or its component agencies, enabling those organizations to participate in providing important social services to beneficiaries. Recipients must comply with the equal treatment policies and requirements contained in 6 C.F.R. Part 19 and other applicable statues, regulations, and guidance governing the participations of faith-based organizations in individual DHS programs.

Article 25 Non-Supplanting Requirement

Recipients receiving federal financial assistance awards made under programs that prohibit supplanting by law must ensure that federal funds do not replace (supplant) funds that have been budgeted for the same purpose through nonfederal sources.

Article 26 Notice of Funding Opportunity Requirements

All the instructions, guidance, limitations, and other conditions set forth in the Notice of Funding Opportunity (NOFO) for this program are incorporated here by reference in the award terms and conditions. All recipients must comply with any such requirements set forth in the program NOFO.

Article 27 Patents and Intellectual Property Rights

Recipients are subject to the Bayh-Dole Act, 35 U.S.C. § 200 et seq, unless otherwise provided by law. Recipients are subject to the specific requirements governing the development, reporting, and disposition of rights to inventions and patents resulting from federal financial assistance awards located at 37 C.F.R. Part 401 and the standard patent rights clause located at 37 C.F.R. § 401.14.

Article 28 Procurement of Recovered Materials

States, political subdivisions of states, and their contractors must comply with Section 6002 of the Solid Waste Disposal Act, Pub. L. 89-272 (1965), (codified as amended by the Resource Conservation and Recovery Act, 42 U.S.C. § 6962.) The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 C.F.R. Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition.

Article 29 Rehabilitation Act of 1973

Recipients must comply with the requirements of Section 504 of the Rehabilitation Act of 1973, Pub. L. 93-112 (1973) (codified as amended at 29 U.S.C. § 794) which provides that no otherwise qualified handicapped individuals in the United States will, solely by reason of the handicap, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.

Article 30 Reporting of Matters Related to Recipient Integrity and Performance

If the total value of any currently active grants, cooperative agreements, and procurement contracts from all federal awarding agencies exceeds $10,000,000 for any period of time during the period of performance of this federal award, then the recipients must comply with the requirements set forth in the government-wide Award Term and Condition for Recipient Integrity and Performance Matters located at 2 C.F.R. Part 200, Appendix XII, the full text of which is incorporated here by reference in the award terms and conditions.

Article 31 Reporting Subawards and Executive Compensation

Recipients are required to comply with the requirements set forth in the government-wide award term on Reporting Subawards and Executive Compensation located at 2 C.F.R. Part 170, Appendix A, the full text of which is incorporated here by reference in the award terms and conditions.

Article 32 SAFECOM

Recipients receiving federal financial assistance awards made under programs that provide emergency communication equipment and its related activities must comply with the SAFECOM Guidance for Emergency Communication Grants, including provisions on technical standards that ensure and enhance interoperable communications.

Article 33 Terrorist Financing

Recipients must comply with E.O. 13224 and U.S. laws that prohibit transactions with, and the provisions of resources and support to, individuals and organizations associated with terrorism. Recipients are legally responsible to ensure compliance with the Order and laws.

Article 34 Trafficking Victims Protection Act of 2000 (TVPA)

Recipients must comply with the requirements of the government-wide financial assistance award term which implements Section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), codified as amended at 22 U.S.C. § 7104. The award term is located at 2 C.F.R. § 175.15, the full text of which is incorporated here by reference.

Article 35 Universal Identifier and System of Award Management

Recipients are required to comply with the requirements set forth in the government-wide financial assistance award term regarding the System for Award Management and Universal Identifier Requirements located at 2 C.F.R. Part 25, Appendix A, the full text of which is incorporated here by reference.

Article 36 USA PATRIOT Act of 2001

Recipients must comply with requirements of Section 817 of the Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act of 2001 (USA PATRIOT Act), Pub. L. No. 107-56, which amends 18 U.S.C. §§ 175–175c.

Article 37 Use of DHS Seal, Logo and Flags

Recipients must obtain permission from their DHS FAO prior to using the DHS seal(s), logos, crests or reproductions of flags or likenesses of DHS agency officials, including use of the United States Coast Guard seal, logo, crests or reproductions of flags or likenesses of Coast Guard officials.

Article 38 Whistleblower Protection Act

Recipients must comply with the statutory requirements for whistleblower protections (if applicable) at 10 U.S.C § 2409, 41 U.S.C. § 4712, and 10 U.S.C. § 2324, 41 U.S.C. §§ 4304 and 4310.

Article 39 Acceptance of Post Award Changes

In the event FEMA determines that changes are necessary to the award document after an award has been made, including changes to period of performance or terms and conditions, recipients will be notified of the changes in writing. Once notification has been made, any subsequent request for funds will indicate recipient acceptance of the changes to the award. Please call the FEMA/GMD Call Center at (866) 927-5646 or via e-mail to ASKGMD@fema.dhs.gov if you have any questions.

Article 40 Prior Approval for Modification of Approved Budget

Before making any change to the FEMA approved budget for this award, you must request prior written approval from FEMA where required by 2 C.F.R. § 200.308. FEMA is also utilizing its discretion to impose an additional restriction under 2 C.F.R. § 200.308(f) regarding the transfer of funds among direct cost categories, programs, functions, or activities. Therefore, for awards with an approved budget where the federal share is greater than the simplified acquisition threshold (currently $250,000), you may not transfer funds among direct cost categories, programs, functions, or activities without prior written approval from FEMA where the cumulative amount of such transfers exceeds or is expected to exceed ten percent (10%) of the total budget FEMA last approved. You must report any deviations from your FEMA approved budget in the first Federal Financial Report (SF-425) you submit following any budget deviation, regardless of whether the budget deviation requires prior written approval.

Article 41 Disposition of Equipment Acquired Under the Federal Award

When original or replacement equipment acquired under this award by the recipient or its subrecipients is no longer needed for the original project or program or for other activities currently or previously supported by a federal awarding agency, you must request instructions from FEMA to make proper disposition of the equipment pursuant to 2 C.F.R. § 200.313.

Article 42 Environmental Planning and Historic Preservation (EHP) Review

DHS/FEMA funded activities that may require an EHP review are subject to the FEMA Environmental Planning and Historic Preservation (EHP) review process. This review does not address all federal, state, and local requirements. Acceptance of federal funding requires recipient to comply with all federal, state, and local laws. DHS/FEMA is required to consider the potential impacts to natural and cultural resources of all projects funded by DHS/FEMA grant funds, through its EHP Review process, as mandated by the National Environmental Policy Act; National Historic Preservation Act of 1966, as amended; National Flood Insurance Program regulations; and, any other applicable laws and Executive Orders. To access the FEMA EHP screening form and instructions, go to the DHS/FEMA website at: https://www.fema.gov/media-library/assets/documents/90195.. In order to initiate EHP review of your project(s), you must complete all relevant sections of this form and submit it to the Grant Programs Directorate (GPD) along with all other pertinent project information. The EHP review process must be completed before funds are released to carry out the proposed project; otherwise, DHS/FEMA may not be able to fund the project due to noncompliance with EHP laws, executive order, regulations, and policies. If ground disturbing activities occur during construction, applicant will monitor ground disturbance, and if any potential archeological resources are discovered, applicant will immediately cease work in that area and notify the pass-through entity, if applicable, and DHS/FEMA.

Article 43 Award Performance Goals

FEMA will measure the recipient's performance of the grant by comparing the number of supplies needed and requested in its application, the number of supplies acquired and delivered by the end of the period of performance, and the performance metric as stated in the NOFO to equip 100 percent of on-duty active members with Personal Protective Equipment. In order to measure performance, FEMA may request information throughout the period of performance. In its final performance report submitted at closeout, the recipient is required to report on the number of PPE purchased and the percentage of on duty active members provided with PPE in compliance with the standards described in the NOFO.

Article 44 Performance Measures

BRIC aims to implement projects that reduce risks posed by natural hazards, and reduce future losses, by funding priority projects and activities. To achieve these goals, for FY20 BRIC is prioritizing the following types of projects: infrastructure projects, those that mitigate risk to lifelines, those that incorporate nature-based solutions, and projects proposed by applicants who adopt and enforce mandatory tribal-, territory-, or state-wide building codes based on the latest published editions of building codes. FEMA will measure the percent of dollars invested in these priorities, which will indicate that BRIC projects expect to meet the goal of reducing both risk posed by natural hazards and future losses. Based on the review of your application, FEMA has verified that the claimed costs are consistent with the stated program objective. By accepting this award, you certify that the total Federal award will measure the percent of dollars invested in these priorities and costs incurred by the recipient during FY 2020, in keeping with the program objective. BRIC is a new program, and as a result, FEMA will further assess the recipient's performance against the program objective during the award closeout process as outlined in Section F.3 of the FY 2020 BRIC Grant Notice of Funding Opportunity.

Article 45 Changes to Title 2, Code of Federal Regulations

The references in the FY 2020 BRIC NOFO to regulations in 2 C.F.R. Parts 25, 170, and 200 have been superseded by recent revisions by the Office of Management and Budget (OMB). Most of the changes are effective November 12, 2020, with a couple effective August 13, 2020. See OMB, Guidance for Grants and Agreements, Final Guidance, 85 Fed. Reg. 49,506 (Aug. 13, 2020), https://www.govinfo.gov/content/pkg/FR-2020-08-13/pdf/2020-17468.pdf. The FY 2020 BRIC NOFO was published before these rules were revised, but since this award is being made after all revisions went into effect, the revised rules apply to this award. To the extent the requirements or regulatory citations are the same, the FY 2020 BRIC NOFO will continue to apply to this award. Conversely, to the extent there is a conflict between the FY 2020 BRIC NOFO and the revised 2 C.F.R. regulations, the language and citations of the revised 2 C.F.R. regulations will apply. Additional information on the changes to these regulations, including specific revisions regarding closeout and procurement under grants, can be found at https://www.fema.gov/grants/guidance-tools/2-cfr-2020.

Article 46 Construction Project Requirements

Acceptance of Federal funding requires the Recipient and any Subrecipients to comply with all Federal, state and local laws prior to the start of any construction activity. Failure to obtain all appropriate Federal, state and local environmental permits and clearances may jeopardize Federal funding. 2. Any change to the approved scope of work will require re-evaluation by FEMA for Recipient and Subrecipient compliance with the National Environmental Policy Act and other laws and Executive Orders. 3. If ground disturbing activities occur during construction, the Recipient and any Subrecipients must ensure monitoring of ground disturbance and, if any potential archaeological resources are discovered, the Subrecipient will immediately cease construction in that area and notify the Recipient and FEMA.

Article 47 Copyright and Data Rights

The recipient is free to copyright any original work developed in the course of or under this Grant Agreement. The recipient acknowledges that DHS/FEMA reserves a royalty-free, non-exclusive and irrevocable license to reproduce, publish, or otherwise use, and authority others to use, for Federal Government purposes: 1) the copyright in any work developed under an award or subaward; and 2) any rights of copyright to which a recipient or subrecipient purchases ownership with Federal support in a manner consistent with 2 C.F.R. § 200.315. The recipient acknowledges that DHS/FEMA has the right to obtain, reproduce, publish, or otherwise use the data produced under a Federal award and authorize others to so for Federal Government purposes in a manner consistent with 2 C.F.R. § 200.315.

Article 48 Remedies for Noncompliance and Enforcement

FEMA remedies for noncompliance will be processed as specified in 2 C.F.R. §§ 200.339-200.343 , and for acquisitions under this award for open space, FEMA enforcement remedies shall be processed as specified in 44 C.F.R. § 80.19(e), when the Terms and Conditions of this Grant Agreement are not met.

Article 49 Insurance

In compliance with 42 U.S.C. § 4012a(a), when financial assistance is approved for acquisition or construction purposes within the Special Flood Hazard Area (SFHA), flood insurance shall be maintained for the life of the property regardless of transfer of ownership for any properties.

Article 50 HMA Duplication of Benefits

Hazard Mitigation Assistance (HMA) funds cannot duplicate or be duplicated by funds received by or available to Applicants, Subapplicants, or project or planning participants from other sources for the same cost or activity already paid for by another source of funding, such as benefits received from insurance claims, other assistance programs (including previous project or planning grants and subawards from HMA programs), legal awards, or other benefits associated with properties or damage that are or could be subject of litigation. Because the availability of other sources of mitigation grant or loan assistance is subject to available information and the means of each individual Applicant, HMA does not require proof that other assistance (not including insurance) has been sought. However, it is the responsibility of the property owner to report other benefits received, any applications for other assistance, the availability of insurance proceeds, or the potential for other compensation, such as from pending legal claims for damages, relating to the property. Amounts of other grants, loans or other assistance designated for the same purpose as HMA funds, if received, may be used to reduce the non-Federal cost-share. Where the property owner has an insurance policy covering any loss to the property which relates to the proposed HMA project, the means are available for receiving compensation for a loss or, in the case of increased cost of compliance (ICC), assistance toward certain mitigation projects. FEMA will generally require that the property owner file a claim prior to the receipt of HMA funds.

Article 51 Additional Non-Discrimination Requirements

Applicants/Recipients and Subapplicants/Subrecipients will ensure that no discrimination is practiced. Applicants must consider fairness, equity, and equal access when prioritizing and selecting project subapplications to submit with their application. Subapplicants and Subrecipients must ensure fairness, equity, and equal access when consulting and making offers of mitigation to property owners that benefit from mitigation activities.

Article 52 Changes in Scope of Work

Requests for changes to the scope of work (SOW) after award are permissible as long as they do not change the nature or total project cost of the activity, properties identified in the subapplication, the feasibility and effectiveness of the project, or the benefit cost ratio. Requests must be supported by adequate justification from the applicant in order to be processed. The justification is a description of the proposed change, a written explanation of the reason or reasons for the change; an outline of remaining funds available to support the change; and a full description of the work necessary to complete the activity. All approvals will be at FEMA's discretion, and there is no guarantee that SOW changes will be approved.

Article 53 Recoupment of Funds

FEMA will recoup mitigation planning grant funds for grants that do not meet the deliverable criteria of an adopted, FEMA-approved mitigation plan by the end of the performance period.

Article 54 Recovery of Funds

The Recipient will process the recovery of assistance paid to Subrecipients processed through error, misrepresentation, or fraud or if funds are spent inappropriately. Recovered funds shall be submitted to FEMA as soon as the funds are collected, but no later than 90 days from the expiration date of the appropriate grant award agreement.

Article 55 Reporting of Fraud

All fraud identifications will be reported to the Department of Homeland Security Office of Inspector General (OIG). The Recipient agrees to cooperate with investigation conducted by the DHS OIG.

Article 56 Closeout and Final Reports

Because of recent changes to 2 C.F.R. Part 200 that went into effect for awards issued on or after November 12, 2020, the Recipient shall submit a final Federal Financial Report (FFR or SF-425) for project completion, as certified by the Recipient, final Program Performance Report (SF-PPR), and all other closeout documents 120 days after the end date of the performance period per the new 2 C.F.R. § 200.344.

Article 57 Record Retention

Records shall be retained for at least 3 years (except in certain rare circumstances) from the date the final Federal Financial Report for project completion as certified by the Recipient is submitted to FEMA in compliance with 2 C.F.R. Part 200 (specifically the new 2 C.F.R. § 200.334 effective Nov. 12, 2020) and Section 705 of the Stafford Act (42 U.S.C. § 5205).

Article 58 Termination

FEMA may terminate a federal award in whole or in part for one of the following reasons. FEMA and the recipient must still comply with closeout requirements at 2 C.F.R. §§ 200.344-200.345 even if an award is terminated in whole or in part. To the extent that subawards are permitted under this NOFO, passthrough entities should refer to 2 C.F.R. § 200.340 for additional information on termination regarding subawards. Noncompliance: If a recipient fails to comply with the terms and conditions of a federal award, FEMA may terminate the award in whole or in part. If the noncompliance can be corrected, FEMA may first attempt to direct the recipient to correct the noncompliance. This may take the form of a Compliance Notification. If the noncompliance cannot be corrected or the recipient is non-responsive, FEMA may proceed with a Remedy Notification, which could impose a remedy for noncompliance per 2 C.F.R. § 200.339, including termination. Any action to terminate based on noncompliance will follow the requirements of 2 C.F.R. §§ 200.341-200.342 as well as the requirement of 2 C.F.R. § 200.340(c) to report in FAPIIS the recipient's material failure to comply with the award terms and conditions. With the Consent of the Recipient: FEMA may also terminate an award in whole or in part with the consent of the recipient, in which case the parties must agree upon the termination conditions, including the effective date, and in the case of partial termination, the portion to be terminated. Notification by the Recipient: The recipient may terminate the award, in whole or in part, by sending written notification to FEMA setting forth the reasons for such termination, the effective date, and in the case of partial termination, the portion to be terminated. In the case of partial termination, FEMA may determine that a partially terminated award will not accomplish the purpose of the federal award, so FEMA may terminate the award in its entirety. If that occurs, FEMA will follow the requirements of 2 C.F.R. §§ 200.341-200.342 in deciding to fully terminate the award.

Article 59 Standard Condition #1

Any change to the approved scope of work will require re-evaluation for compliance with NEPA and other Laws and Executive Orders.

Article 60 Standard Condition #2

This review does not address all federal, state and local requirements. Acceptance of federal funding requires recipient to comply with all federal, state and local laws. Failure to obtain all appropriate federal, state and local environmental permits and clearances may jeopardize federal funding.

Article 61 Standard Condition #3

If ground disturbing activities occur during construction, applicant will monitor ground disturbance and if any potential archeological resources are discovered, will immediately cease construction in that area and notify the State and FEMA.

Article 62 Standard Condition #1

Any change to the approved scope of work will require re-evaluation for compliance with NEPA and other Laws and Executive Orders.

Article 63 Standard Condition #2

This review does not address all federal, state and local requirements. Acceptance of federal funding requires recipient to comply with all federal, state and local laws. Failure to obtain all appropriate federal, state and local environmental permits and clearances may jeopardize federal funding.

Article 64 Standard Condition #3

If ground disturbing activities occur during construction, applicant will monitor ground disturbance and if any potential archeological resources are discovered, will immediately cease construction in that area and notify the State and FEMA.

State Articles

Article I - Written Authorization

The (name of agency) shall obtain a written authorization from its governing body in support of the Project, which specifies that the Subrecipient agrees:

1. To designate the authorized representative with the authority to bind the governing body;
    a. To provide all matching funds required for the Project;
    b. That any liability arising out of the performance of the Project and assurances will be the responsibility of the Subrecipient; and
    c. Grant funds shall not be used to supplant expenditures controlled by the Subrecipient or its governing body.

Article II – Disposition of Equipment

Acquired Under the Federal Award When original or replacement equipment acquired under this award by the recipient or its sub-recipients is no longer needed for the original project or program or for other activities currently or previously supported by DHS/FEMA, you must request instructions from DEM to make proper disposition of the equipment pursuant to 2 C.F.R. Section 200.313.

Article III - Access to records
The (name of agency) will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the grant award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

Article IV - Period of Performance
The period of performance for each grant award will be determined by the Division of Emergency Management ("DEM") based upon the deadlines imposed on DEM by the terms of the federal grant. All work on the Project must be completed within the period of performance specified in the grant. DEM will periodically review the expenditures of the grant to ensure sufficient progress is made on the Project. If DEM determines that the Project will not be completed within the period of performance, DEM will terminate the grant and re-obligate the funding to other projects.

Article V - Funding Restrictions
Federal funds made available through an award may be used only for the purpose outlined in the award and must be consistent with the statutory authority for the award. Award funds may not be used for matching funds for any other Federal award, lobbying, or intervention in Federal regulatory or adjudicatory proceedings. In addition, Federal funds may not be used to sue the Federal Government or any other government entity.

Article VI - Conflicts of Interest
The (name of agency) will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

Article VII - Construction Projects
For construction projects, the Subrecipient will:

1. Not dispose of, modify the use of, or change the terms of the real property title or other interest in the site and facilities without permission and instructions from the awarding agency. Will record the federal awarding agency directives and will include a covenant in the title of real property acquired in whole or in part with federal assistance funds to assure nondiscrimination during the useful life of the project;

a. Comply with the requirements of the awarding agency with regard to the drafting, review, and approval of construction plans and specifications; and
b. Provide and maintain competent and adequate engineering supervision at the construction site to ensure that the complete work conforms with the approved plans and specifications and will furnish progressive reports and such other information as may be required by the assistance awarding agency or State.

Article VIII - Worker Compensation
The (name of agency) will comply with provisions which require every employer to be insured to protect workers who may be injured on the job at all times during the performance of the work of this Project, as per the worker's compensation laws set forth in NRS 616A, NRS 616B, NRS 616C, NRS 616D, and NRS 617.

Article IX - Nevada Public Records Act and the Freedom of Information Act
The (name of agency) Subrecipient acknowledges that all information submitted in the course of applying for funding under this program or provided in the course of an entity's grant management activities that are under Federal control is subject to the Freedom of Information Act (FOIA) contained in 5 U.S.C. § 552, and the Nevada Public Records Law, contained in Chapter 239 of the Nevada Revised Statutes.

Article X - Reporting Subawards and Executive Compensation
The (name of agency) understands and acknowledges that in order to sub-subaward grant funding, written permission must be granted by DEM in advance of the sub-subaward. The Subrecipient will comply with the requirements set forth in the government-wide Award Term on Reporting Subawards and Executive Compensation located at 2 C.F.R. Part 170, Appendix A, the full text of which is incorporated here by reference in the terms and conditions of your award.

Article XI – Subrecipient Monitoring
The Subrecipient agrees to participate in DEM's annual monitoring visits and to follow up and take corrective action on all identified non-conformances and observations with action, which includes, but is not limited to, the submission and implementation of corrective action plans to the DEM.

Article XII – Assignment and Delegation
The (name of agency) shall neither assign, transfer, nor delegate any rights, obligations, or duties under the Notice of Grant Award without prior approval of the DEM, which includes sub-sub granting funds without prior knowledge or written approval of DEM.

Article XIII – Indemnification and Defense
To the fullest extent permitted by law, the Subrecipient shall indemnify, hold harmless and defend, not excluding the State's right to participate, the State from and against all liability, claims, actions, damages, losses, and expenses, including, without limitation, reasonable attorneys' fees and costs, arising out of any breach of the obligations of Subrecipient under this Agreement, or any alleged negligent or willful acts or omissions of the Subrecipient, its officers, employees, and agents. The Subrecipient's obligation to indemnify the State shall apply in all cases except for claims arising solely from the State's own negligence or willful misconduct. The Subrecipient waives any rights of subrogation against the State. The Subrecipient's duty to defend begins when the State requests defense of any claim arising from this Agreement.

Article XIV – Termination
The DEM retains the right to terminate a sub-grant, for cause, at any time before completion of the grant period when it has determined that the Subrecipient has failed to comply with the conditions of these assurances.

1. The DEM reserves the right to terminate the grant in whole or in part due to the failure of the Subrecipient to comply with any term or condition of the signed and agreed upon assurances, failure to implement audit/monitoring recommendations within the prescribed period of time, failure to communicate with or respond to any State Administrative Agency (SAA) request or communication, to acquire and maintain all required insurance policies, bonds, licenses, permits, and certifications or to make satisfactory progress in performing the program, financial and administrative requirements of the grant.
a. The DEM staff shall provide written notice of the termination and the reasons for such actions to the Subrecipient.
b. The DEM may, upon the termination of the award, procure, on terms and in the manner that it deems appropriate, materials or services to replace those described in the project description of the grant award. The Subrecipient shall be liable to the DEM for any excess costs incurred by the DEM in procuring equivalent materials or services in substitution for materials or services described in the project description of the grant award.

As the duly authorized representative from, (name of agency), hereby certifies that the (name of agency) will comply with the above grant award, assurances, and certifications.

I. Wildfire & State-Owned Buildings

Figure I-1. Carson City County Wildfire Threat Index.

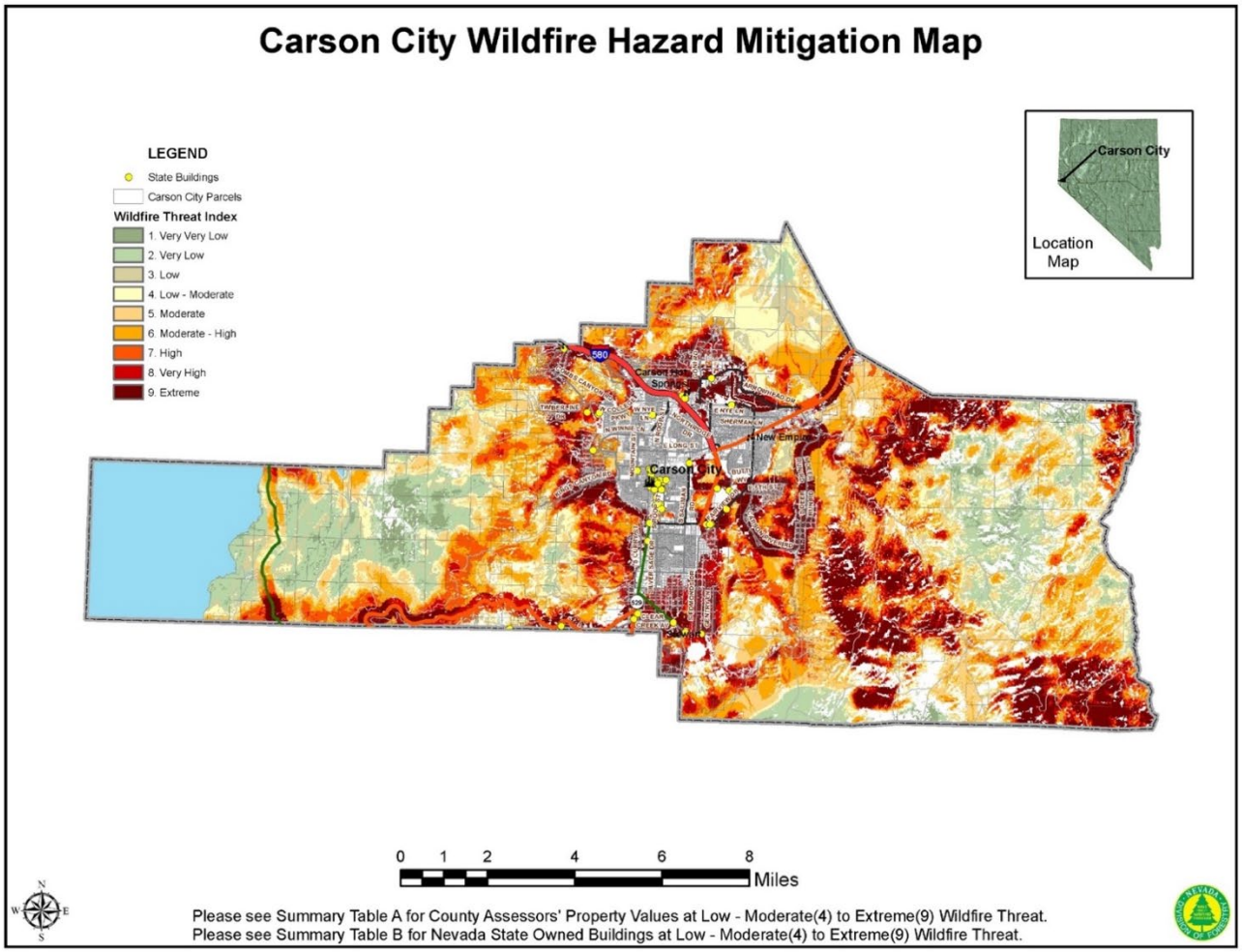


Figure I-2. Churchill County Wildfire Threat Index.

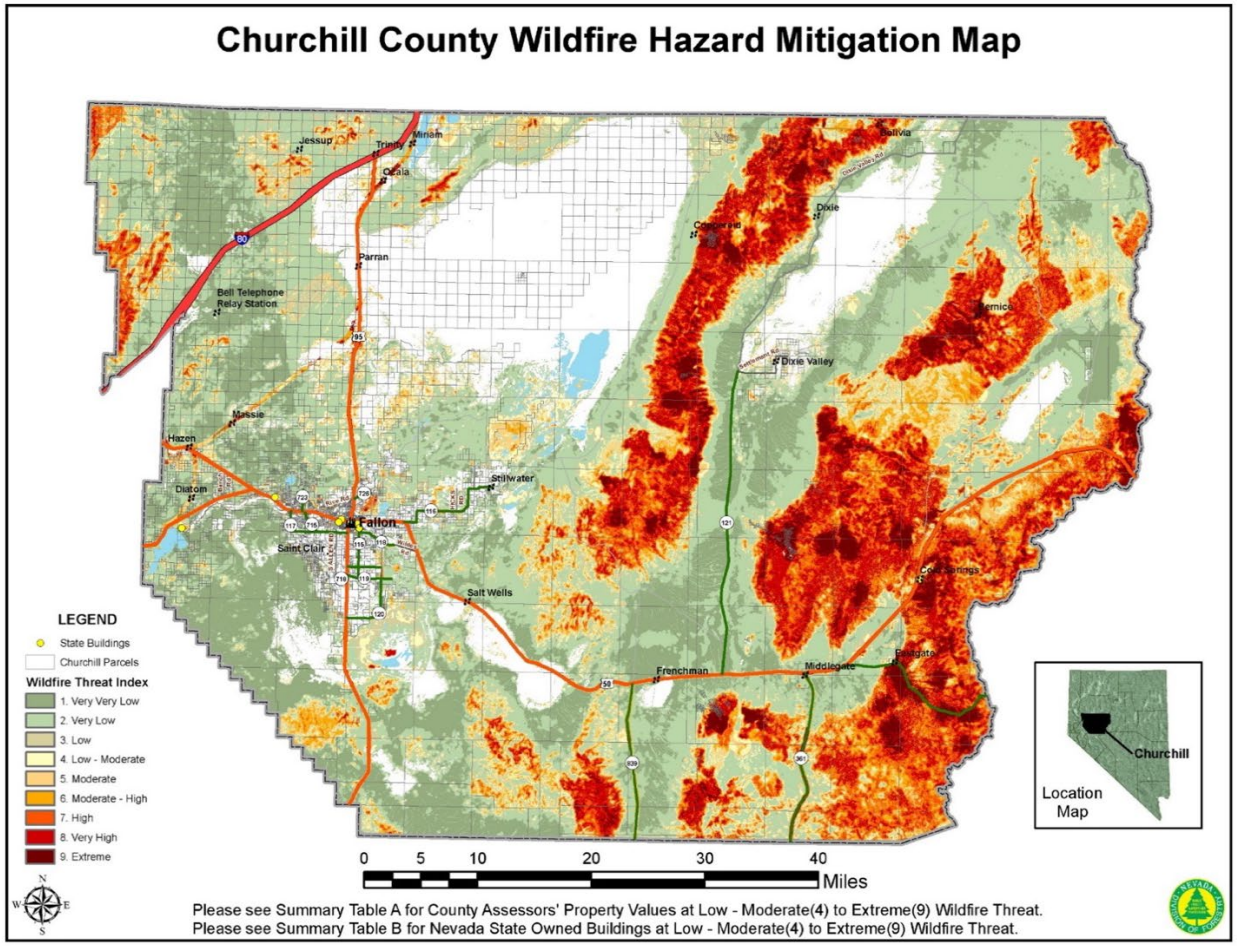


Figure I-3. Clark County Wildfire Threat Index.

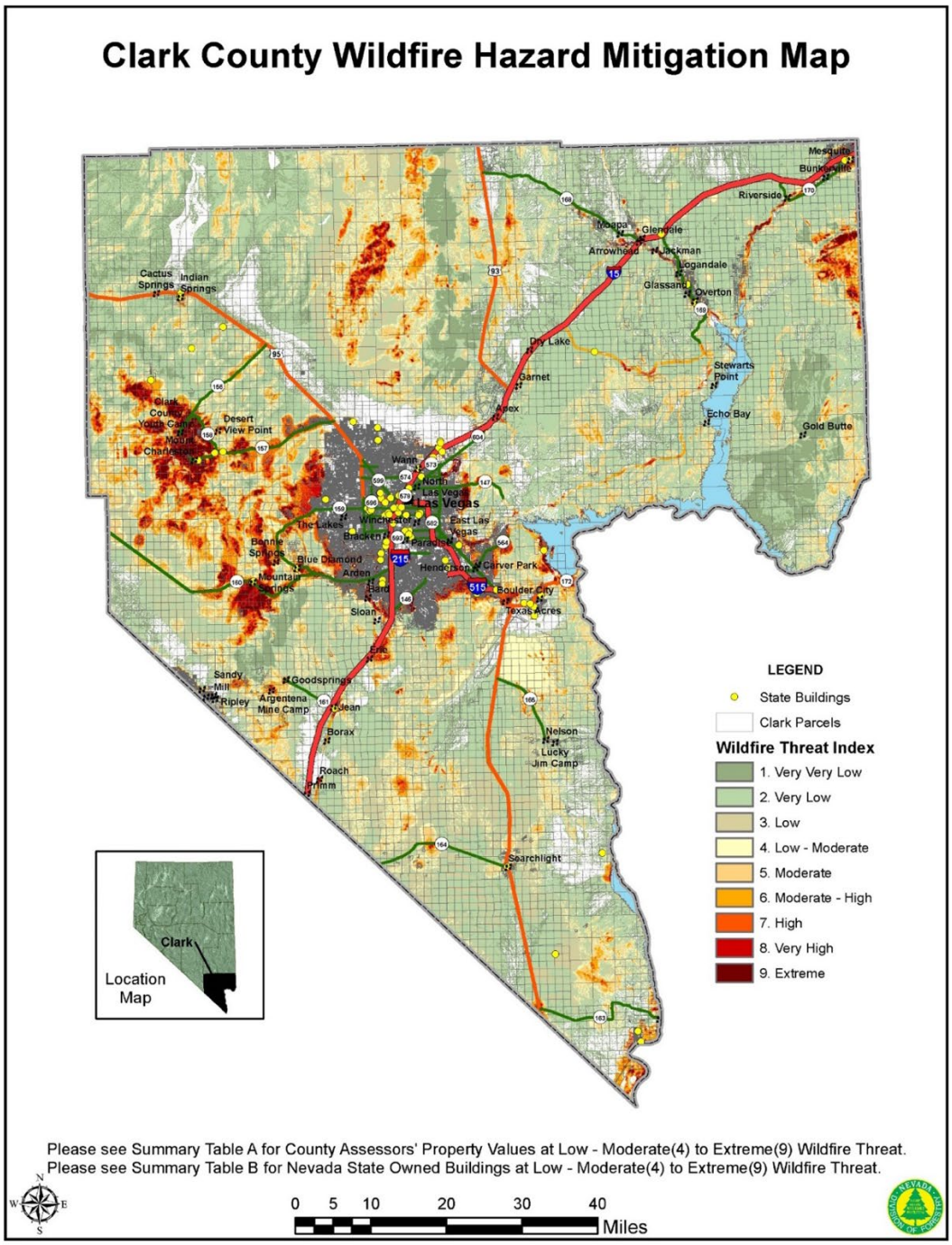


Figure I-4. Douglas County Wildfire Threat Index.

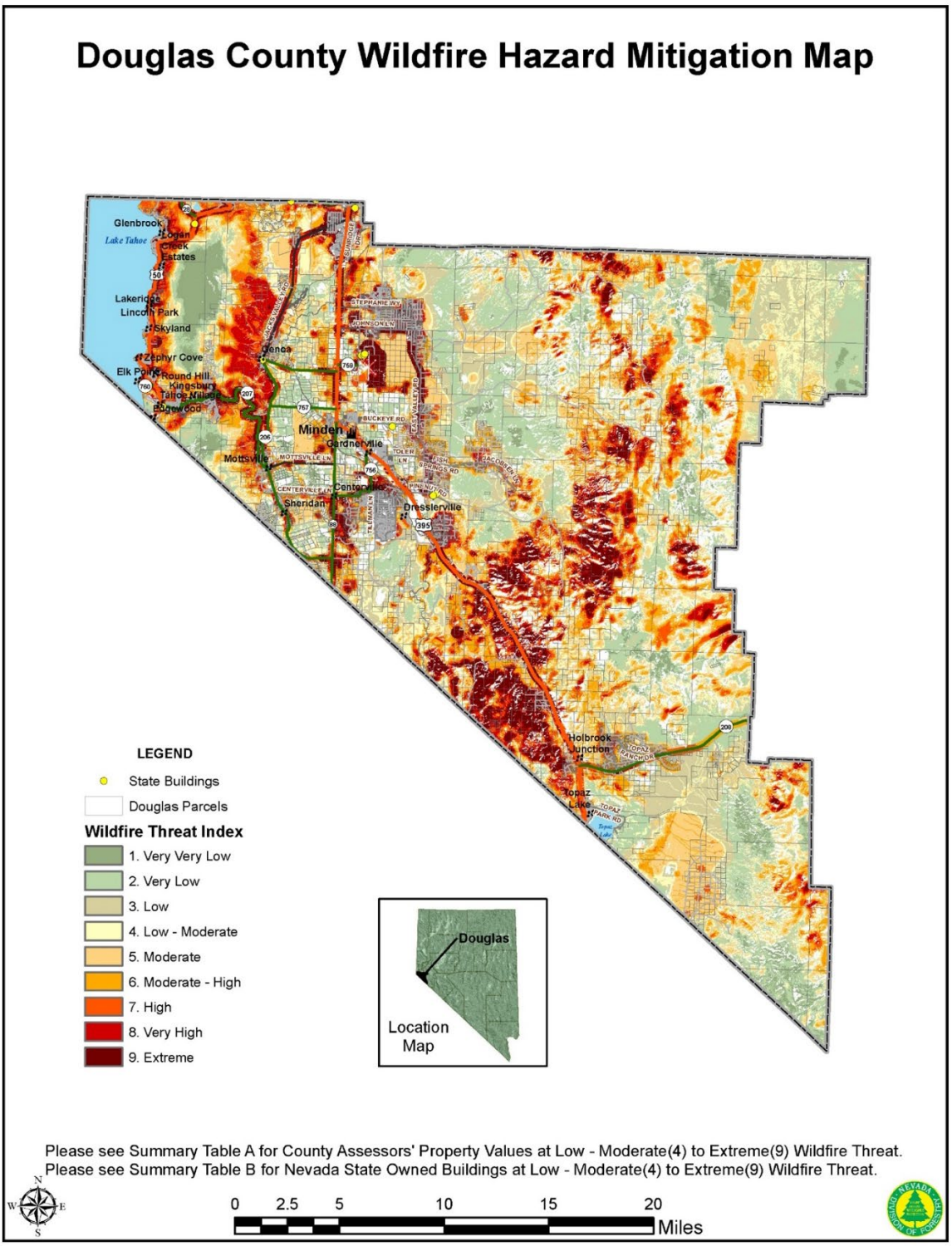


Figure I-5. Elko County Wildfire Threat Index.

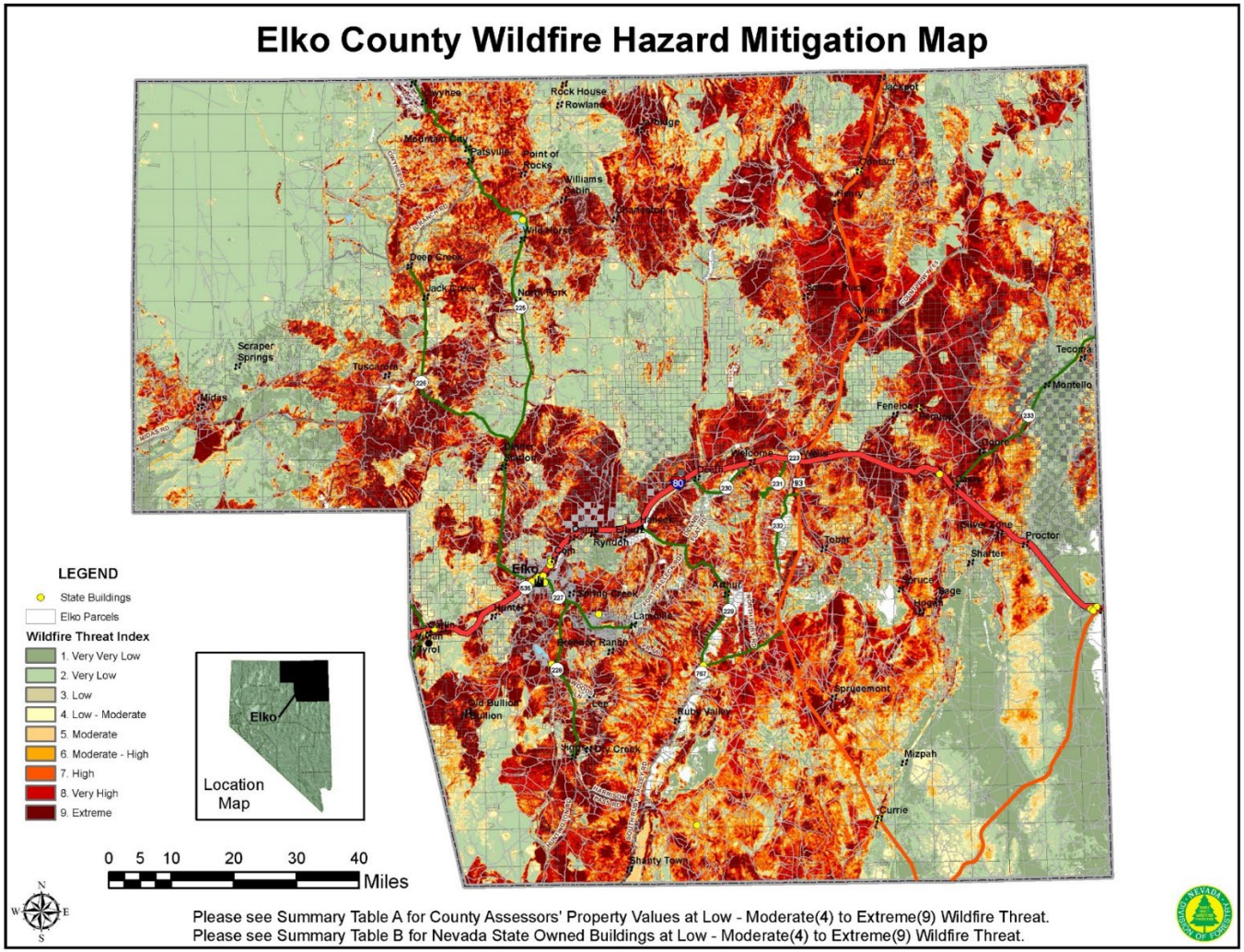


Figure I-6. Esmeralda County Wildfire Threat Index.

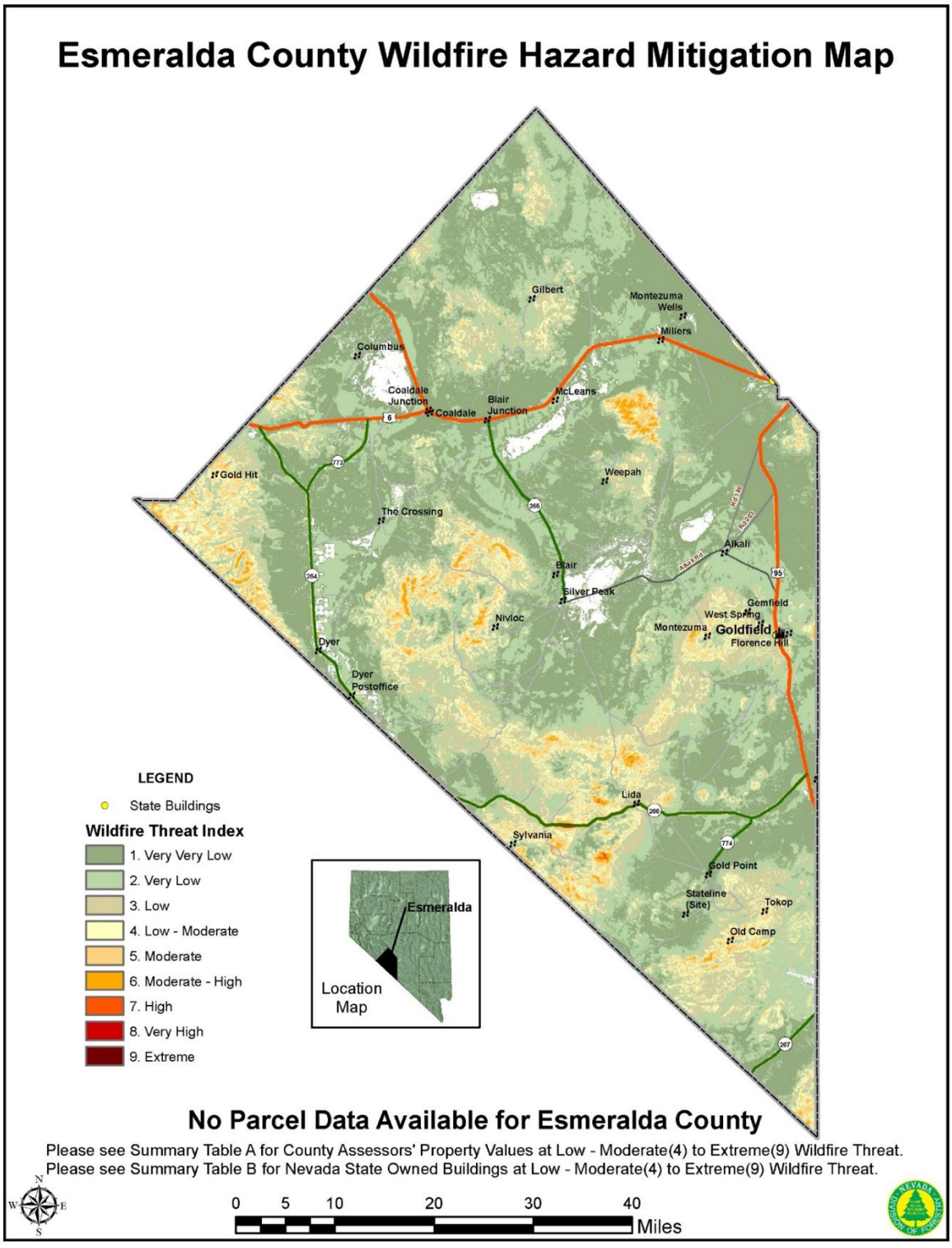


Figure I-7. Eureka County Wildfire Threat Index.

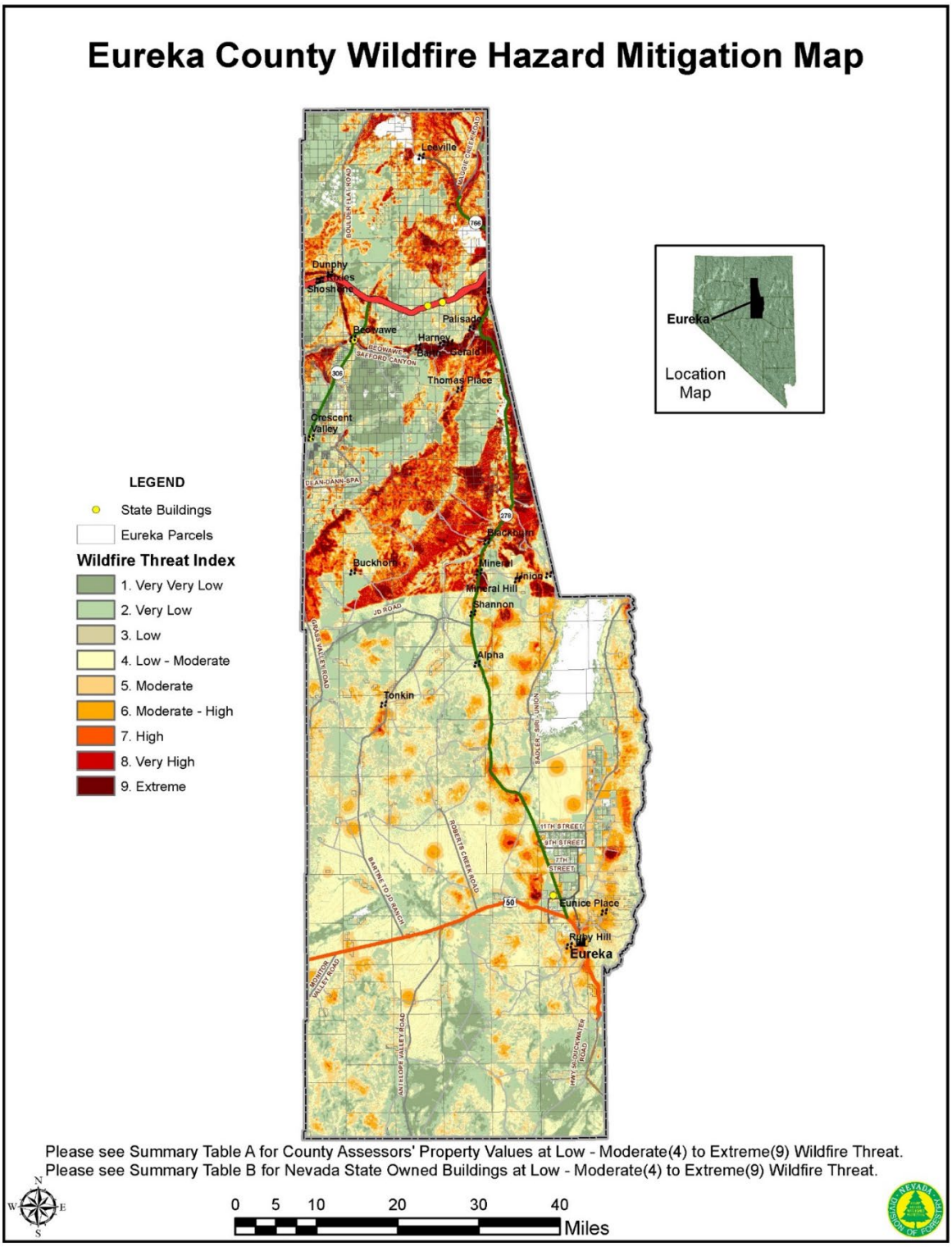


Figure I-8. Humboldt County Wildfire Threat Index.

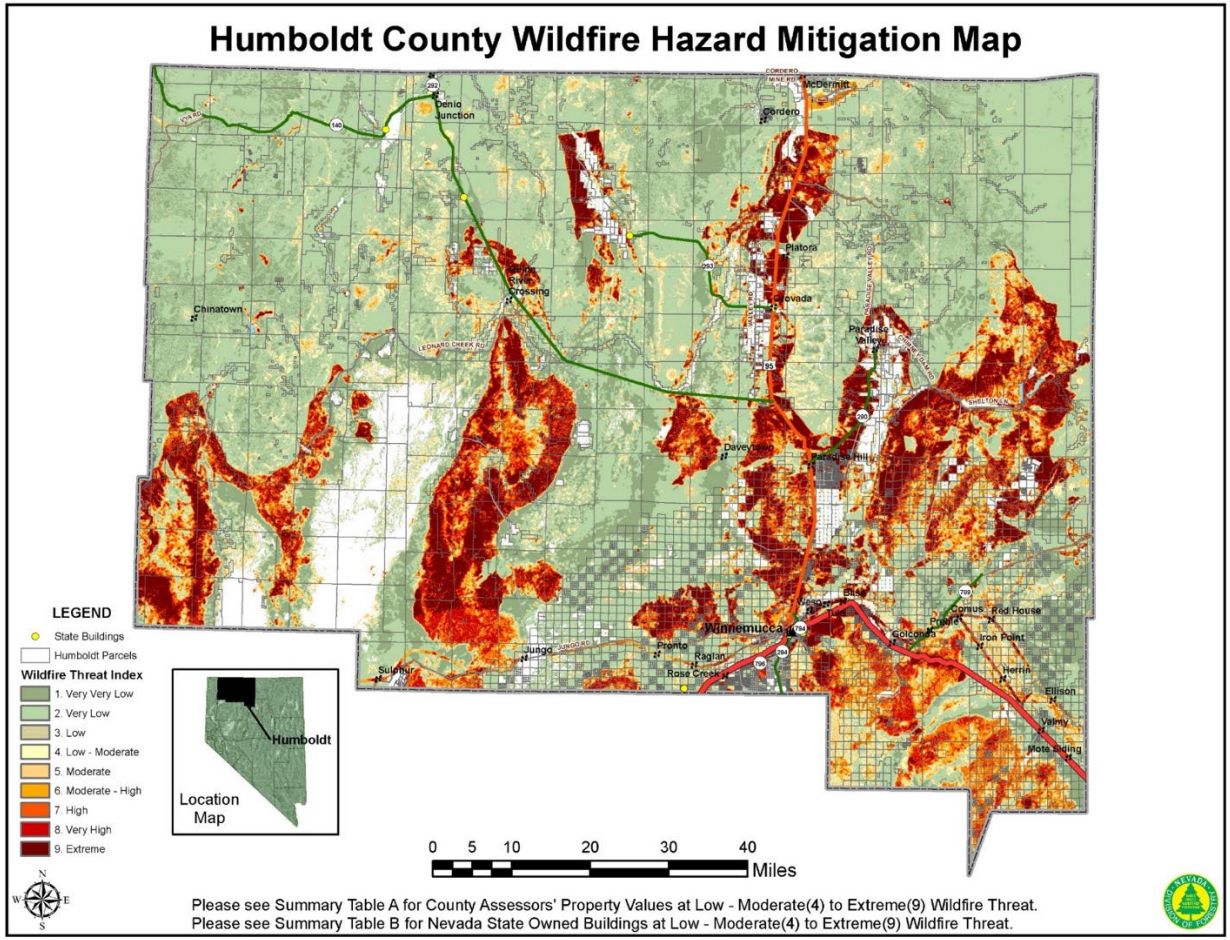


Figure I-9. Lander County Wildfire Threat Index.

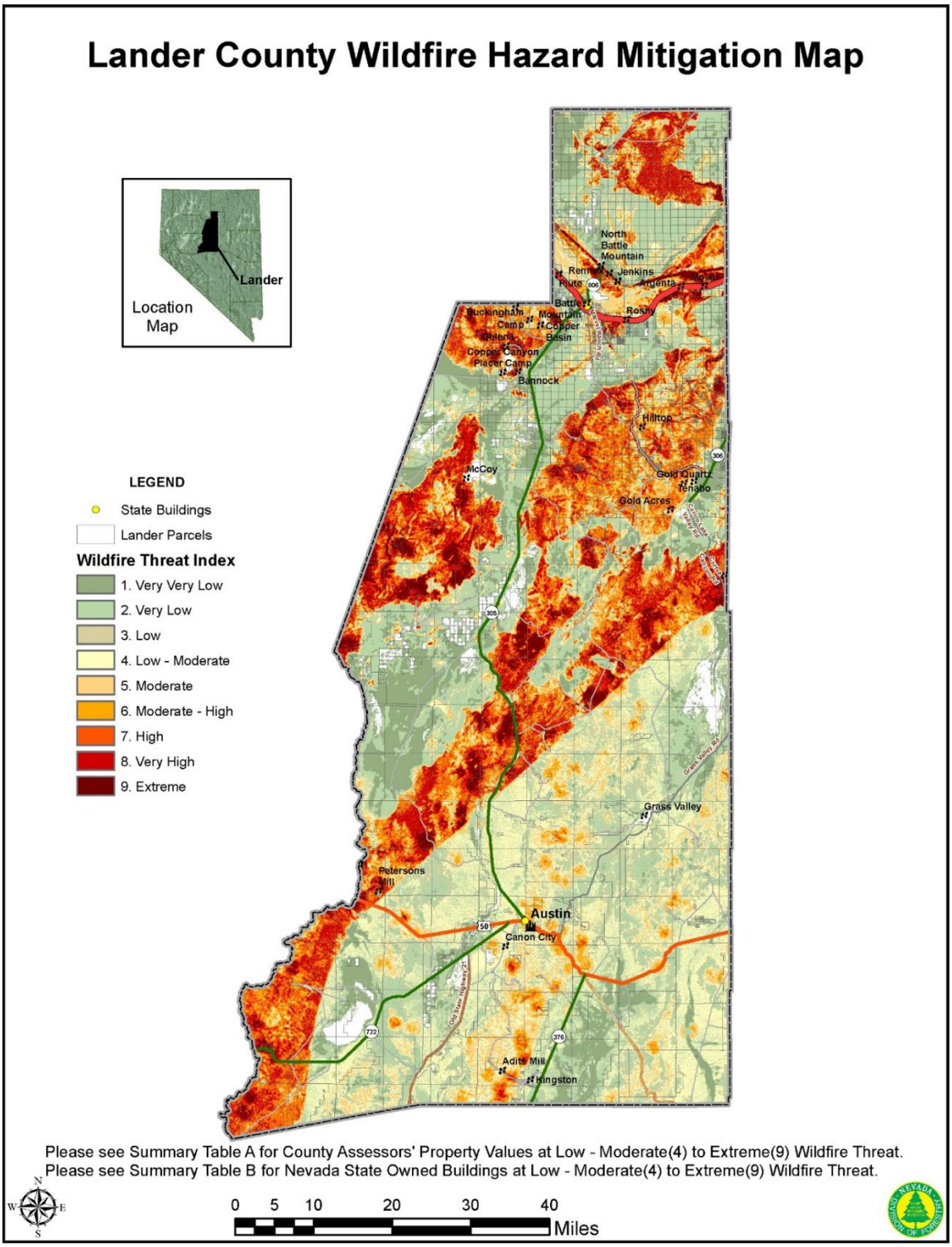


Figure I-10. Lincoln County Wildfire Threat Index.

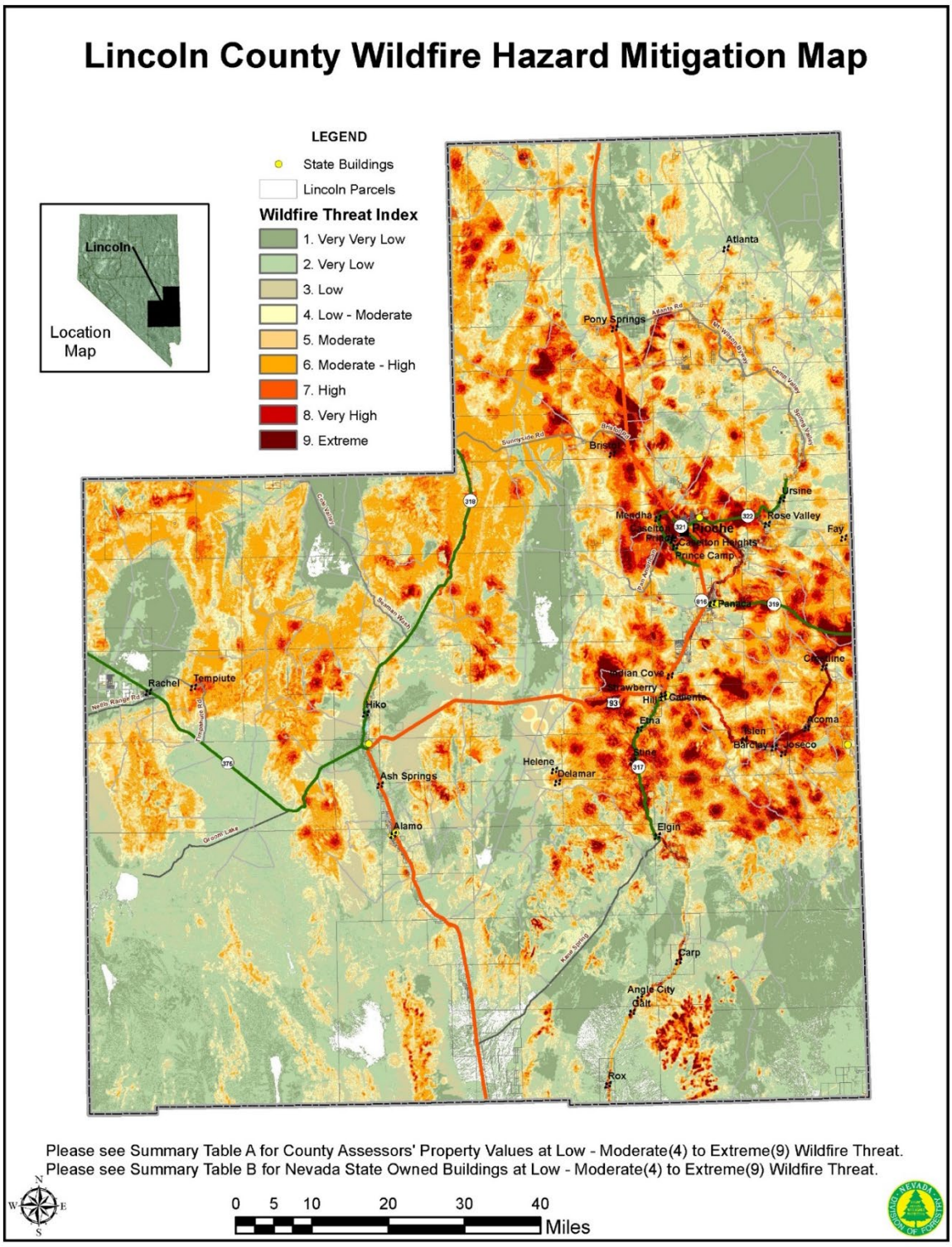


Figure I-11. Lyon County Wildfire Threat Index.

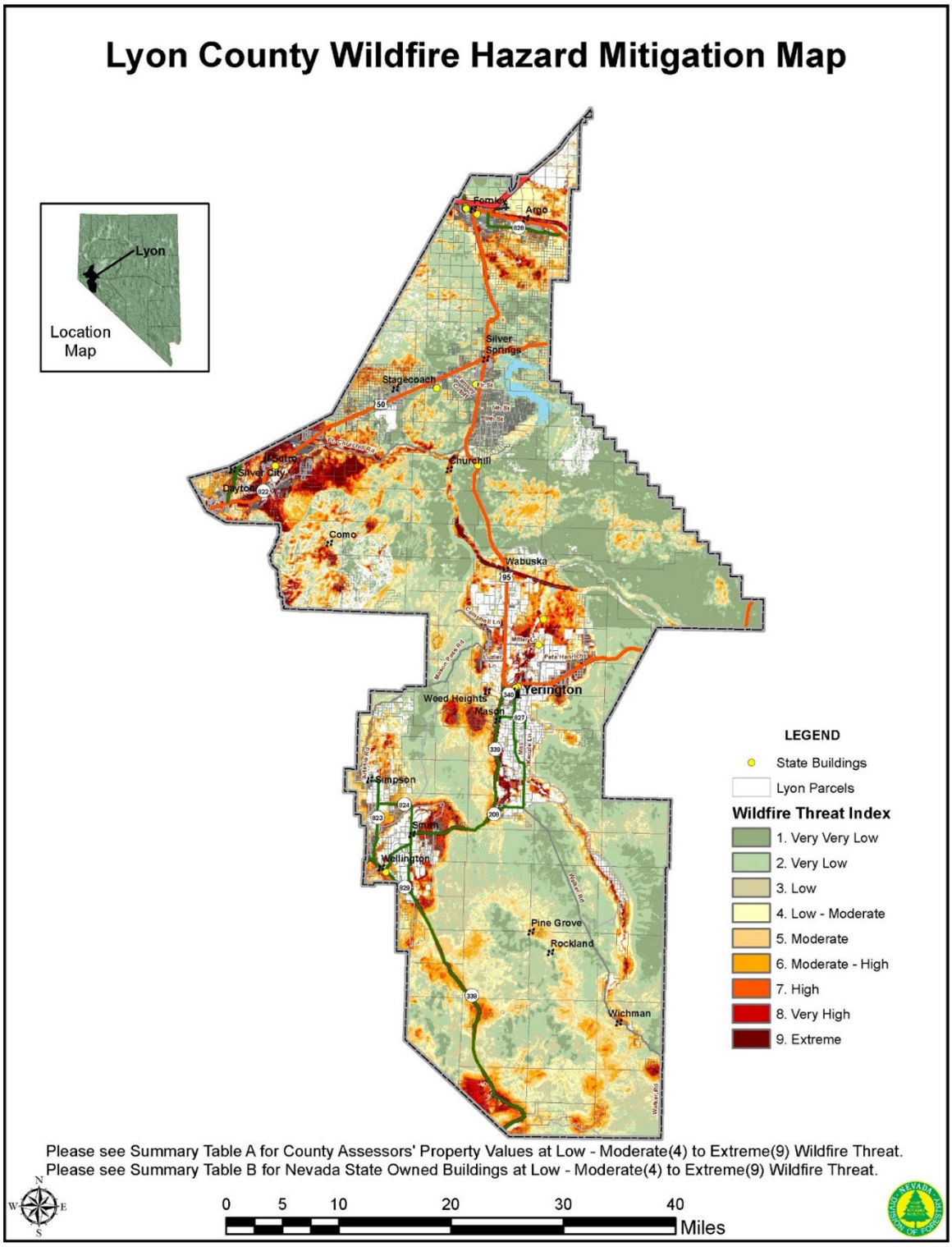


Figure I-12. Mineral County Wildfire Threat Index.

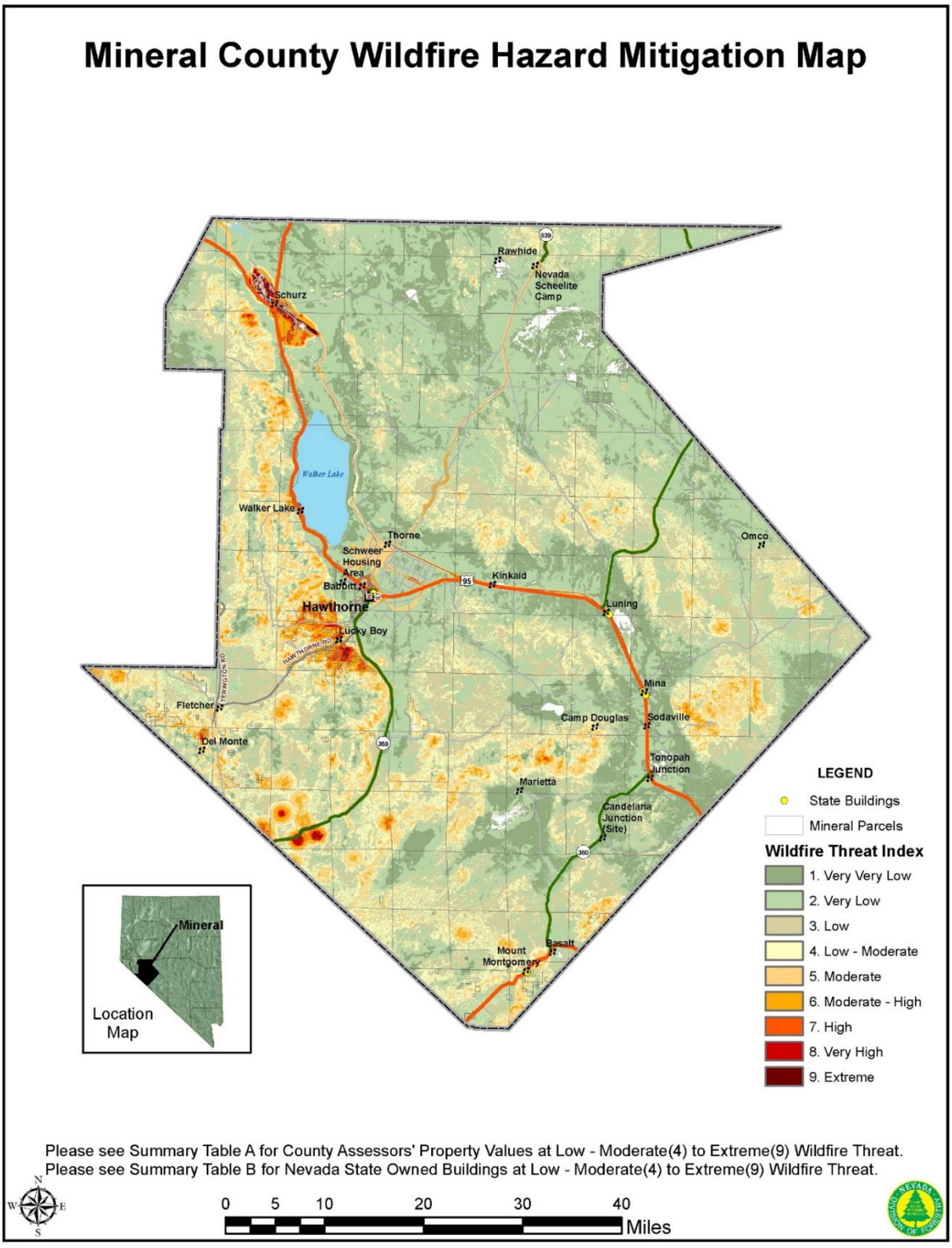


Figure I-13. Nye County Wildfire Threat Index.

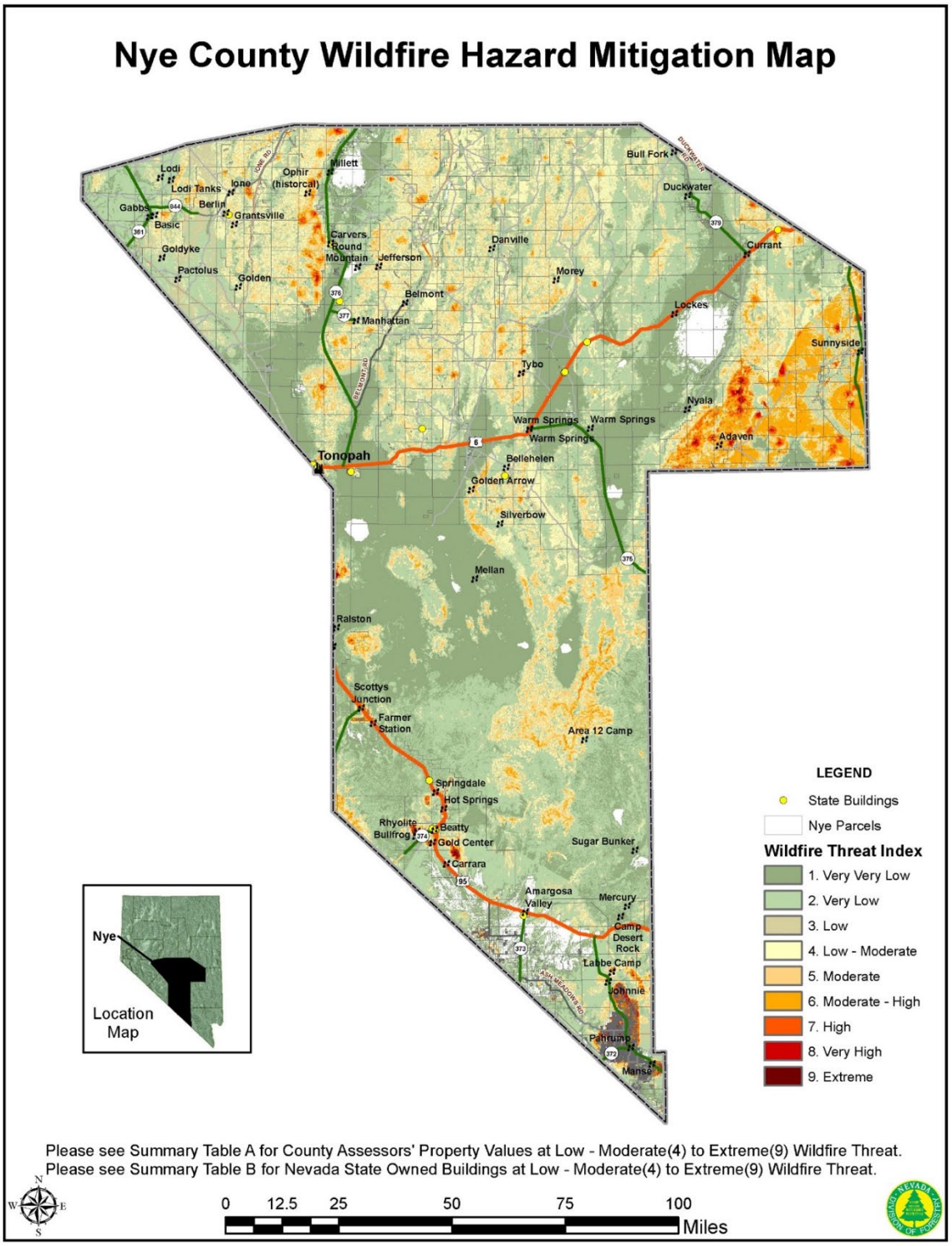


Figure I-14. Pershing County Wildfire Threat Index.

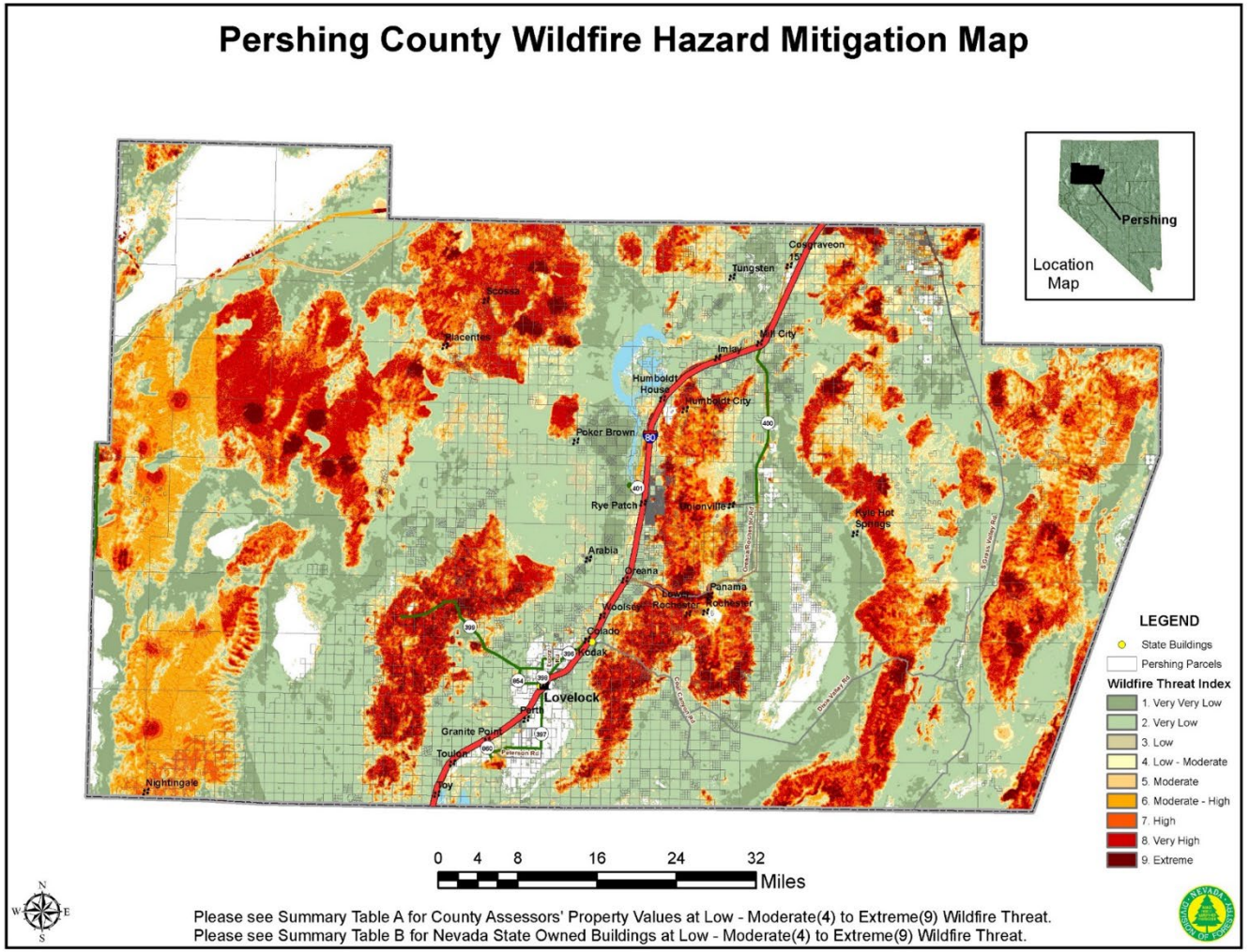


Figure I-15. Storey County Wildfire Threat Index.

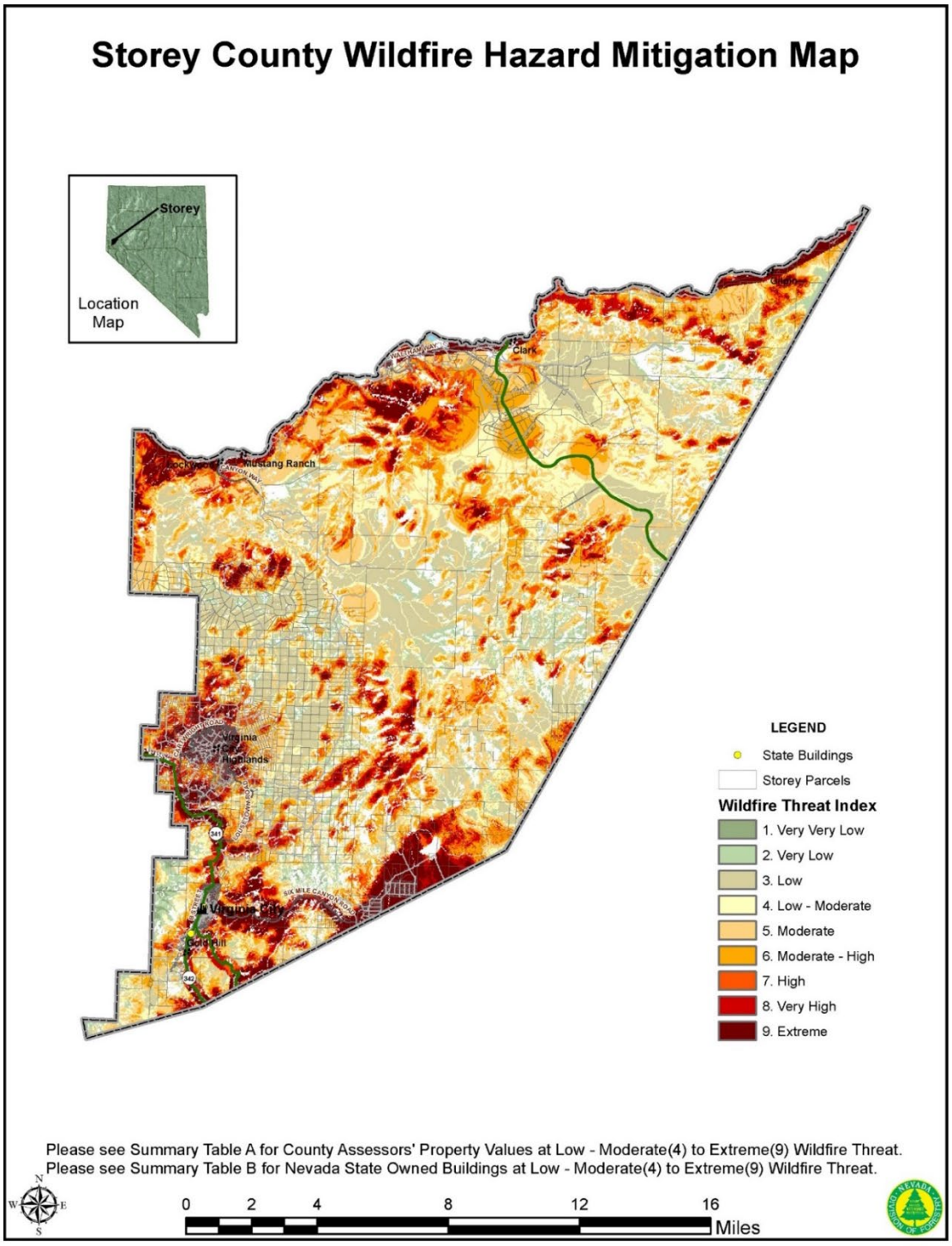


Figure I-16. Washoe County Wildfire Threat Index.

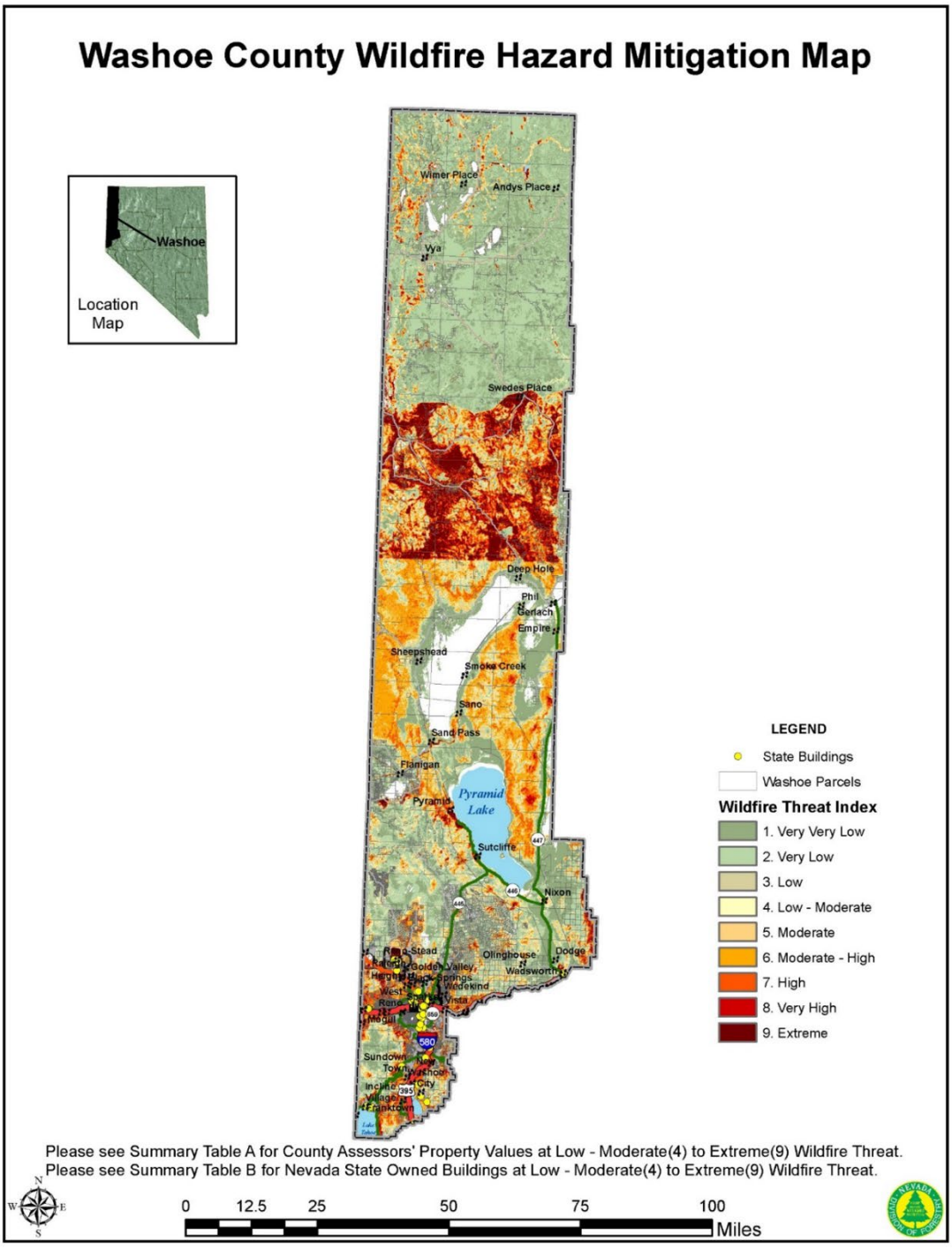


Figure I-17. White Pine Wildfire Threat Index.

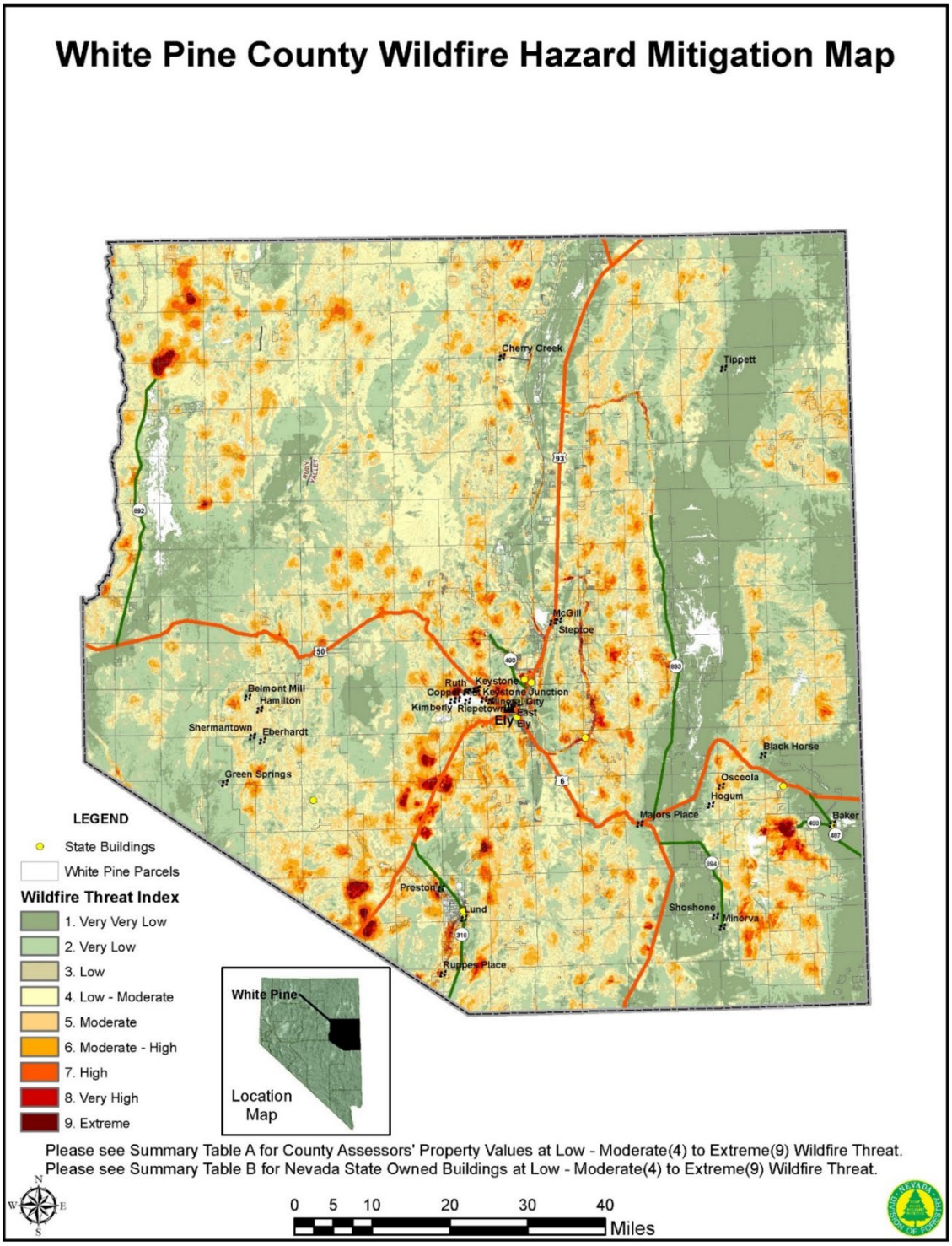


Table I-1. Summary of County Assessors' Property Values Used in GIS Wildfire Index.

SUMMARY TABLE A

Summary of County Assessors' Property Values used in GIS Wildfire Index

Catagory Analysis

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
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 I-2. Number of State Owned Buildings by County and Fire Risk Category.

SUMMARY TABLE B

Number of Nevada State Owned Buildings[1] by County and Fire Risk Index Category[2]

County	Fire Risk Index Categories						County Totals
	Low-Moderate → Extreme						
	4	5	6	7	8	9	
Carson City	0	0	8	14	46	238	306
Churchill	3	70	1	0	0	1	75
Clark	49	23	160	13	34	105	384
Douglas	0	0	4	1	27	23	55
Elko	0	0	0	71	1	252	324
Esmeralda	0	1	2	0	0	0	3
Eureka	0	0	1	2	1	2	6
Humboldt	0	18	8	14	0	18	58
Lander	0	0	0	3	1	5	9
Lincoln	0	11	8	79	11	202	311
Lyon	52	0	11	2	50	23	138
Mineral	0	0	5	2	0	0	7
Nye	11	56	3	4	1	2	77
Pershing	46	1	25	0	0	0	72
Storey	0	0	0	2	4	0	6
Washoe	0	0	0	1	105	69	175
White Pine	6	51	28	1	8	23	117
Risk Category Totals	167	231	264	209	289	963	2,123

Total State Owned Buildings in Nevada - 2,952
State Owned Buildings located in No(0), Very Very Low(1), Very Low(2) or Low Risk(3) Categories - 829

[1]Facility Information obtained from Department of Administration, State Public Works Division
http://publicworks.nv.gov/Buildings/List_of_State_Owned_Buildings/

[2]Fire Risk data obtained from West Wide Wildfire Risk Assessment
http://www.westwideriskassessment.com/

J. Earthquake Vulnerability County & Statewide

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

Available online at the following link:

http://pubs.nbmg.unr.edu/Updated-estimated-losses-p/of2014-05.htm

University of Nevada, Reno

nbmg

Nevada Bureau of Mines and Geology Open-File Report 14-5

Updated
Estimated Losses from Earthquakes near Nevada Communities

Irene M. Seelye, Gary L. Johnson, Craig M. dePolo,
James E. Faulds, and Jonathan G. Price

Edited by Jack Hursh

2014

This report is available as an online document at www.nbmg.unr.edu.

Please use links on the tables to view summary reports for scenarios involving earthquakes of magnitude 5.0, 5.5, 6.0, 6.5, and 7.0 for 38 communities in Nevada.

The Nevada Bureau of Mines and Geology (NBMG) is a research and public service unit of the University of Nevada, Reno and is the state geological survey. Established by the Nevada Legislature as a department within the public service division of the Nevada System of Higher Education, NBMG is part of the Mackay School of Earth Sciences and Engineering within the College of Science and one of the Statewide Programs at the University of Nevada, Reno. NBMG's mission, to provide the State's needs for geological and mineral-resource information and research, is defined in its enabling legislation. NBMG scientists conduct research and publish reports that focus on the economic development, public safety, and quality of life in urban and rural areas of Nevada.

Updated Estimated Losses from Earthquakes near Nevada Communities

This report estimates losses from earthquakes that could occur near 38 Nevada communities, including all county seats and major population centers (Figure 1). The report uses the loss-estimation computer model of the Federal Emergency Management Agency, HAZUS-MH, to estimate such potential consequences 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. The report also tabulates earthquake probabilities for these communities from the probabilistic seismic hazard analysis of the U.S. Geological Survey (Table 1). Due to the inherent variability between earthquakes and the incomplete and imperfect information about the surface geology of the Earth and human structures, the specific effects of any future earthquake cannot be predicted in detail. The general types and extent of potential effects can be projected, as represented by these loss estimation models. Some factors, such as geologic setting and high visitor volumes, are not modeled by HAZUS but can significantly increase losses and damage.

The primary audiences for this report are emergency managers, emergency responders, and the local and state government officials responsible for action after a natural disaster. HAZUS reports have been quite helpful in response and recovery planning and exercises, identifying opportunities for mitigation, and in the case of an actual earthquake, providing the Governor, through the Chief of the Nevada Division of Emergency Management, with an early estimate of the likely severity of the event. Such information can be critical to decisions regarding disaster declarations, a timely and appropriate emergency response, and securing resources that will be necessary during recovery. As this report covers many of the likely earthquakes that could affect Nevada communities, it also serves as an immediate reference in case of an actual earthquake event, including as a reference point for comparison of the HAZUS reports that the Nevada Bureau of Mines and Geology produces immediately after a significant earthquake event. Another important audience for this report is the general public, including homeowners, operators of businesses, and individuals responsible for the well-being of others.

Earthquakes are inevitable. The report demonstrates that the consequences of earthquakes can be huge in Nevada, particularly if individuals are not prepared. Recommendations on what to do before, during, and after an earthquake are provided by dePolo et al. (2000) and on various websites, including the Nevada Bureau of Mines and Geology (http://www.nbmg.unr.edu/Geohazards/Earthquakes/Earthquakes.html),

Nevada Seismological Laboratory (http://www.seismo.unr.edu/),

and U.S. Geological Survey (http://earthquake.usgs.gov/).

The version of HAZUS-MH 2.1 (Federal Emergency Management Agency, 2012) used for this report was documented by Johnson (2012). Given an earthquake location and magnitude, HAZUS estimates amounts of various types of economic and social loss. This new study uses the most recent version of HAZUS-MH based on ShakeMap inputs and an estimated unreinforced masonry building inventory for Nevada. This had led to an increase in the estimated number of extensively to completely damaged buildings in several communities. An important planning aspect related to this is the number of building inspections that will need to be conducted on short order following a damaging earthquake. A total of 38 communities, which include all major population centers in each of the 17 counties in Nevada (Figure 1), were chosen for study. Some communities were not explicitly listed in the tabulations, because the effects of earthquakes near those cities and towns are included in the effects of nearby communities. For example, losses in North Las Vegas are included in the scenarios for Las Vegas, Henderson, and Boulder City. For earthquake scenarios for each community, the closest Quaternary fault on the map by dePolo (2008) were chosen. Quaternary is the name of a geological time period that covers the past 2.6 million years. Quaternary faults moved more recently than approximately 2.6 million years ago and are likely candidates for future earthquakes. The epicenters of the earthquakes were chosen at the fault position closest to the community. Magnitudes from 5.0 to 7.0 were used to illustrate the impact that increasing magnitude has on losses. Earthquakes larger than magnitude 7.0 have occurred in Nevada (dePolo and dePolo, 1999; dePolo and others, 2000) and will occur here in the future. Thus, damages could be greater than listed in this report.

Five magnitudes for each of 38 communities amount to 190 individual earthquake scenarios, from which separate HAZUS summary reports were produced. Because many of these earthquakes would affect multiple counties or multiple states, separate summary reports were also produced so that the user can view the estimated losses for the county in which the earthquake occurred for the entire state or for all counties in any state within a 100 km radius of the epicenter. For each community, there is a one-page summary with tables, which include total economic loss, numbers of buildings receiving extensive to complete damage, number of people needing public shelter and hospital care, and number of fatalities for the five magnitudes. These data are arranged alphabetically by community name. The tables give a short synopsis of the events, but for exercises and planning, full 20-page summary reports are available online through the provided links.

Table 2 lists the maximum total economic losses estimated by HAZUS for magnitude 6.0 earthquakes near each of the 38 communities. This magnitude is significant, because that was the size of the 21 February 2008 earthquake near Wells, Nevada. When developing the HAZUS program, the Federal Emergency Management Agency calibrated it against known losses from earthquakes in California in the 1980s and early 1990s. When HAZUS has been run for significant earthquakes that have occurred in the United States

since then, the scenario results have generally been within a factor of two or three of reality. On the basis of calculated sensitivity analyses, uncertainties in locating and measuring magnitudes of earthquakes, and variations in local soil and geological conditions, basin effects, direction of propagating seismic waves, how well buildings have been retrofitted to withstand earthquakes, and number of visitors in Nevada at the time of the earthquake, it was concluded that the numbers could vary by a factor of ten. The current best estimate of the actual total economic loss from the Wells Earthquake is slightly more than $10.5 million, about 60% of the value estimated by HAZUS.

Figure 1. Locations of the 38 communities in Nevada for which HAZUS earthquake scenarios have been developed

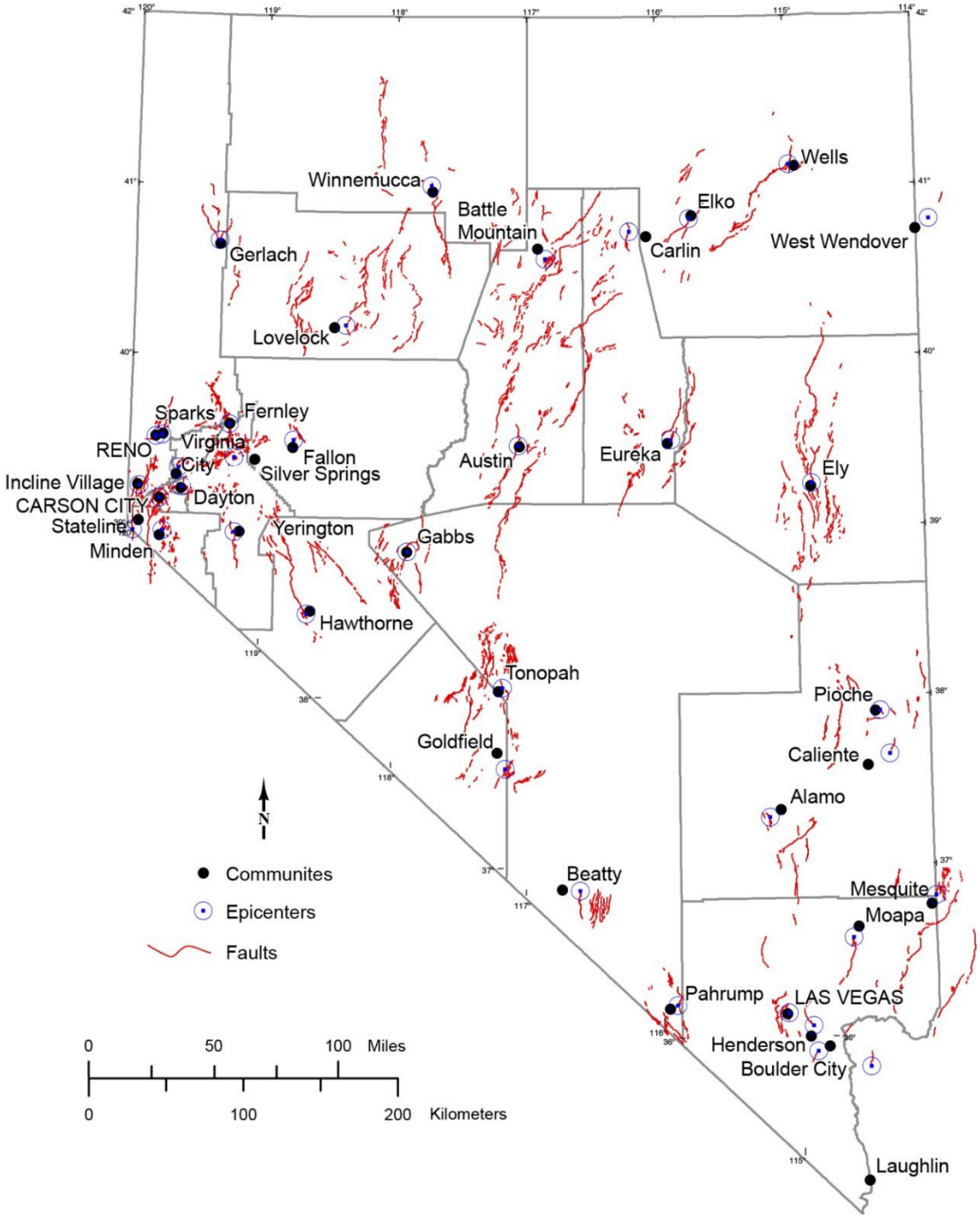


Figure 1. Location of the 38 communities in Nevada for which HAZUS earthquake scenarios have been developed. The faults chosen for the earthquake scenarios are also shown with red lines. The epicenters of the earthquakes shown with thin blue circles were chosen at the fault position that is closest to the community.

Table 1. Probabilities of earthquakes of various magnitudes occurring within 50 years within 50 kilometers (31 miles) of major communities in Nevada.

County	- County seat or other community	% Probability 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

Data are taken from maps produced by the U.S. Geological Survey. Values for magnitude 5.5 are interpolated between values for magnitudes 5.0 and 6.0.

Links from Tables 1 and 2 take the user to the single pages with tables summarizing losses for each community, from which further links take the user to over 400 separate HAZUS summary reports. The individual HAZUS summary reports include the following sections and subsections:

- 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
- Social Impact
  - Shelter Requirements
  - Casualties
- Economic Loss
  - Building Losses
  - Transportation and Utility Lifeline Losses
  - Long-term Indirect Economic Impacts
- Appendix listing population and building value data for counties included in the region

Tables 1 and 2 demonstrate that significant earthquake hazards exist throughout Nevada and that the potential losses from earthquakes are high for many communities. The magnitude 6.0 Wells Earthquake serves as a call for action. The probability that an earthquake of that magnitude or greater will occur in the Las Vegas area is 1.3 times higher than the probability for Wells, and the probability of such an earthquake in the Reno-Sparks-Carson City-Lake Tahoe-Minden area is approximately seven times higher than for Wells. The consequences for our major urban areas are enormous—from billions of dollars in Las Vegas to almost a billion in Reno. The largest projected loses are from the magnitude 7 events near Las Vegas ($21B) and Reno ($4.6B).

Although the risks are locally huge, actions can be taken to reduce those risks. Current building codes no longer allow construction of the types of unreinforced masonry buildings that collapsed in Wells. Over time, the remaining unreinforced masonry buildings in Nevada can be replaced, taken out of service for human occupation, or retrofitted. The HAZUS summary reports for individual earthquake scenarios indicate that much of the damage will be non-structural in nature – that is, not a collapsed building but damage from falling exterior facades, interior light fixtures, and bookshelves; broken china, glassware, pictures, and computers; and ruptured gas and water lines. With a little focused attention, these non-structural hazards can commonly be mitigated inexpensively.

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Ballard, C.M., Johnson, G., and Hastings, J.T., 2009, Nevada Statewide HAZUS Database Update: HAZUS-MH for Nevada: Nevada Bureau of Mines and Geology Open-File Report 09-7, 2 p.

Table 2. HAZUS estimates for maximum total economic loss from a magnitude 6.0 earthquake on a fault close to the communities and probabilities of earthquakes of this size or greater occurring within 50 years and within 50 kilometers (31 miles) of the communities.

County	- County seat or other community	Total economic loss	% Probability	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
	Incline Village	**$140,000,000**	60–70	**8**
	Sparks	**$920,000,000**	67	**4**
White Pine	- Ely	$17,000,000	4–6	21

Disclaimer

The information in this report should be considered preliminary and approximate. It has not been thoroughly edited or peer reviewed. All numbers in this report are estimates derived from HAZUS, the loss-estimation model of the Federal Emergency Management Agency. Individual numbers may vary by a factor of 10, depending on location, depth, and magnitude of the earthquake and on other factors, including local soil and geological conditions, basin effects, direction in which the seismic waves travel, extent to which buildings have been retrofitted to withstand earthquakes, and number of visitors in Nevada at the time of the earthquake.

Note: To view the links in this report, a minimum of Adobe Reader 9.0 should be installed on your computer. Adobe Reader 9.0 can be downloaded for free from this site: http://get.adobe.com/reader/

This study has not been updated but the Nevada Bureau of Mines and Geology (NBMG) indicated no significant overall change.

Alamo, Nevada

Epicenter at 115.24°W longitude, 37.31°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lincoln County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	0
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.25	0.25	0.3	0.4	1.3

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	0
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.82	3.8	5.1	24	33

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	0

People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.1	1.2	2.5	20	29

Austin, Nevada

Epicenter at 117.08°W longitude, 39.49°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lander County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	45	340	570
People needing public shelter	0	0	0	2	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.2	1.1	11	36	71

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	45	340	570
People needing public shelter	0	0	0	2	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3.9	5.5	15	45	81

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	45	340	570

People needing public shelter	0	0	0	2	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	1.4	2.9	12	38	74

Battle Mountain, Nevada

Epicenter at 116.88°W longitude, 40.58°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lander County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	12	59
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.5	2.0	4.1	9.1	17

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	12	59
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	5.2	5.8	8.6	15	29

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	12	59

People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2.9	3.5	6.4	13	24

Beatty, Nevada

Epicenter at 116.62°W longitude, 36.89°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Nye County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	5	82
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.52	0.6	1.3	5	11

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	5	82
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.82	3.9	4.6	12	34

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	5	81

People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.50	1.6	2.3	10	32

Boulder City, Nevada

Epicenter at 114.92°W longitude, 35.95°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	130	1,600	6,000
People needing public shelter	0	0	13	300	1,800
People needing hospital care	0	0	4	50	250
Fatalities	0	0	0	5	41
Total economic loss ($ million)	3	75	590	2,100	5,000

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	130	1,600	6,000
People needing public shelter	0	0	13	300	1,800
People needing hospital care	0	0	4	50	250
Fatalities	0	0	0	5	41
Total economic loss ($ million)	6	79	590	2,100	5,000

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	130	1,600	6,000

People needing public shelter	0	0	13	300	1,800
People needing hospital care	0	0	4	50	250
Fatalities	0	0	0	5	41
Total economic loss ($ million)	5	78	590	2,100	5,000

Caliente, Nevada

Epicenter at 114.35°W longitude, 37.67°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lincoln County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	6	58
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.25	0.5	2	7	20

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	6	58
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.82	4.1	6	15	42

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	6	59

People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2.10	2.4	5	18	52

Carlin, Nevada

Epicenter at 116.23°W longitude, 40.73°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Elko County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	2	31
People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.60	0.9	3.8	14	35

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	2	31
People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.82	4.3	7.5	24	49

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	2	31

People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.80	2.2	6	17	40

Carson City, Nevada

Epicenter at 119.76°W longitude, 39.16°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Carson City County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	310	1,400	2,300
People needing public shelter	0	0	32	160	270
People needing hospital care	0	0	4	48	120
Fatalities	0	0	1	12	32
Total economic loss ($ million)	4	40	180	430	690

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	310	1,400	2,700
People needing public shelter	0	0	33	160	300
People needing hospital care	0	0	5	50	130
Fatalities	0	0	1	12	33
Total economic loss ($ million)	8	50	240	690	1,300

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	310	1,400	2,700

People needing public shelter	0	0	33	160	300
People needing hospital care	0	0	5	50	130
Fatalities	0	0	1	12	33
Total economic loss ($ million)	7	49	250	730	1,400

Dayton, Nevada

Epicenter at 119.60°W longitude, 39.23°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lyon County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	31	250	470
People needing public shelter	0	0	0	7	14
People needing hospital care	0	0	1	5	12
Fatalities	0	0	0	1	2
Total economic loss ($ million)	1.1	7	30	74	120

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	38	440	1,400
People needing public shelter	0	0	1	20	98
People needing hospital care	0	0	1	8	29
Fatalities	0	0	0	1	5
Total economic loss ($ million)	5	18	110	390	890

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	38	430	1,400

People needing public shelter	0	0	1	20	98
People needing hospital care	0	0	1	8	29
Fatalities	0	0	0	1	5
Total economic loss ($ million)	4	18	110	410	950

Elko, Nevada

Epicenter at 115.77°W longitude, 40.81°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Elko County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	180	770	1,200
People needing public shelter	0	0	25	110	170
People needing hospital care	0	0	3	48	120
Fatalities	0	0	1	13	32
Total economic loss ($ million)	3	15	88	280	480

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	180	770	1,200
People needing public shelter	0	1	25	110	170
People needing hospital care	0	0	3	48	120
Fatalities	0	0	0	13	32
Total economic loss ($ million)	6	18	92	290	500

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	180	770	1,200

People needing public shelter	0	0	25	110	170
People needing hospital care	0	0	3	48	120
Fatalities	0	0	0	13	32
Total economic loss ($ million)	3	15	89	280	480

Ely, Nevada

Epicenter at 114.88°W longitude, 39.26°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **White Pine County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	200
People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	1	3
Fatalities	0	0	0	0	1
Total economic loss ($ million)	1.2	3	13	32	64

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	200
People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	1	3
Fatalities	0	0	0	0	1
Total economic loss ($ million)	4.7	7	17	58	89

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	200

People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	1	3
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3	5	15	35	67

Eureka, Nevada

Epicenter at 115.93°W longitude, 39.52°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Eureka County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	25	160	270
People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.2	2	12	32	53

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	25	160	270
People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3.9	6	16	59	69

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	25	160	270

People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	2	4	14	35	58

Fallon, Nevada

Epicenter at 118.77°W longitude, 39.51°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Churchill County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	41	300	610
People needing public shelter	0	0	4	35	61
People needing hospital care	0	0	1	13	29
Fatalities	0	0	0	3	8
Total economic loss ($ million)	3	10	44	130	210

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	41	300	520
People needing public shelter	0	0	4	35	61
People needing hospital care	0	0	1	13	29
Fatalities	0	0	0	3	8
Total economic loss ($ million)	7	14	53	150	280

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	41	300	520

People needing public shelter	0	0	4	35	61
People needing hospital care	0	0	1	13	29
Fatalities	0	0	0	3	8
Total economic loss ($ million)	5	12	51	150	270

Fernley, Nevada

Epicenter at 119.25°W longitude, 39.60°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lyon County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	7	130	400
People needing public shelter	0	0	0	6	23
People needing hospital care	0	0	0	3	9
Fatalities	0	0	0	0	2
Total economic loss ($ million)	1.1	3	20	58	110

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	7	130	440
People needing public shelter	0	0	0	7	28
People needing hospital care	0	0	0	3	11
Fatalities	0	0	0	0	2
Total economic loss ($ million)	4.8	8	44	160	410

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	7	130	440

People needing public shelter	0	0	0	7	28
People needing hospital care	0	0	0	3	11
Fatalities	0	0	0	0	2
Total economic loss ($ million)	3	6	43	160	420

Gabbs, Nevada

Epicenter at 117.91°W longitude, 38.87°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Nye County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	0
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.52	0.52	0.6	0.7	1.9

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	0
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.82	3.8	4.3	7.0	11

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	0

People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1	1	2	2	6

Gerlach, Nevada

Epicenter at 119.36°W longitude, 40.67°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Washoe County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	160
People needing public shelter	0	0	0	1	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.3	2	12	39	81

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	160
People needing public shelter	0	0	0	1	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3.8	5	16	46	88

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	160

People needing public shelter	0	0	0	1	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	2	3	14	43	87

Goldfield, Nevada

Epicenter at 117.17°W longitude, 37.61°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Esmeralda County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	28	140
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.1	0.2	2	6	15

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	28	140
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.8	4.0	5	12	22

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	28	140

People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1	1	3	9	19

Hawthorne, Nevada

Epicenter at 118.65°W longitude, 38.50°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Mineral County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	16	140	240
People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	2	6
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.2	2	10	27	43

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	16	140	140
People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	2	6
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3.9	6	14	34	54

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	16	140	240

People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	2	6
Fatalities	0	0	0	0	1
Total economic loss ($ million)	1.7	4	12	32	55

Henderson, Nevada

Epicenter at 114.95°W longitude, 36.10°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	290	4,400	15,000
People needing public shelter	0	0	100	1,500	6,300
People needing hospital care	0	0	0	140	690
Fatalities	0	0	0	19	140
Total economic loss ($ million)	7	140	990	3,600	8,600

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	290	4,400	15,000
People needing public shelter	0	0	100	1,500	6,300
People needing hospital care	0	0	12	140	690
Fatalities	0	0	0	19	140
Total economic loss ($ million)	11	140	1,000	3,600	8,600

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	290	4,400	15,000

People needing public shelter	0	0	100	1,500	6,300
People needing hospital care	0	0	12	140	690
Fatalities	0	0	0	19	140
Total economic loss ($ million)	10	140	1,000	3,600	8,600

Incline Village, Nevada

Epicenter at 119.92°W longitude, 39.23°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Washoe County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	18	110	270
People needing public shelter	0	0	3	31	69
People needing hospital care	0	0	1	13	33
Fatalities	0	0	0	3	8
Total economic loss ($ million)	1	14	90	320	690

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	20	170	770
People needing public shelter	0	0	4	37	120
People needing hospital care	0	0	1	15	42
Fatalities	0	0	0	3	9
Total economic loss ($ million)	4	21	130	460	990

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	20	180	820

People needing public shelter	0	0	4	38	120
People needing hospital care	0	0	1	15	42
Fatalities	0	0	0	3	9
Total economic loss ($ million)	3	22	140	530	1,200

Las Vegas, Nevada

Epicenter at 115.12°W longitude, 36.17°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	15	2,600	18,000	35,000
People needing public shelter	0	16	1,600	10,000	20,000
People needing hospital care	0	3	100	1,400	4,400
Fatalities	0	0	9	320	1,200
Total economic loss ($ million)	21	470	3,100	11,000	20,000

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	15	2,600	18,000	35,000
People needing public shelter	0	16	1,600	10,000	20,000
People needing hospital care	0	3	110	1,400	4,400
Fatalities	0	0	9	320	1,200
Total economic loss ($ million)	24	470	3,100	11,000	21,000

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	15	2,600	18,000	35,000

People needing public shelter	0	16	1,600	10,000	20,000
People needing hospital care	0	3	100	1,400	4,400
Fatalities	0	0	9	320	1,200
Total economic loss ($ million)	23	470	3,100	11,000	21,000

Laughlin, Nevada

Epicenter at 114.54°W longitude, 35.85°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	6	75
People needing public shelter	0	0	0	3	42
People needing hospital care	0	0	0	1	6
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.4	2	40	240	770

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	6	75
People needing public shelter	0	0	0	3	42
People needing hospital care	0	0	0	1	6
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.8	5	44	240	770

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	7	93

People needing public shelter	0	0	0	3	42
People needing hospital care	0	0	0	1	7
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2.2	3	43	250	790

Lovelock, Nevada

Epicenter at 118.39°W longitude, 40.18°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Pershing County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	6
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.9	2.6	9	21	36

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	9
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	4.6	6.3	13	31	54

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	9

People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2.0	4	11	28	49

Mesquite, Nevada

Epicenter at 114.07°W longitude, 36.67°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	63	470	810
People needing public shelter	0	0	17	120	210
People needing hospital care	0	0	1	13	43
Fatalities	0	0	0	3	11
Total economic loss ($ million)	0.9	9	57	190	330

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	63	470	810
People needing public shelter	0	0	17	120	210
People needing hospital care	0	0	1	13	43
Fatalities	0	0	0	3	11
Total economic loss ($ million)	4.3	13	61	190	330

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	63	470	810

People needing public shelter	0	0	1	120	210
People needing hospital care	0	0	1	13	43
Fatalities	0	0	0	3	11
Total economic loss ($ million)	2.6	11	62	210	370

Minden, Nevada

Epicenter at 119.73°W longitude, 38.97°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Douglas County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	92	370	630
People needing public shelter	0	0	7	30	53
People needing hospital care	0	0	3	35	79
Fatalities	0	0	1	9	22
Total economic loss ($ million)	2	22	92	240	400

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	92	390	800
People needing public shelter	0	0	7	32	76
People needing hospital care	0	0	3	36	83
Fatalities	0	0	1	9	22
Total economic loss ($ million)	6	28	120	350	720

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	92	390	850

People needing public shelter	0	0	7	33	92
People needing hospital care	0	0	3	36	84
Fatalities	0	0	1	9	22
Total economic loss ($ million)	4	29	140	410	450

Moapa, Nevada

Epicenter at 114.65°W longitude, 36.61°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	3	55	270
People needing public shelter	0	0	0	2	25
People needing hospital care	0	0	0	1	8
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.4	2	30	160	580

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	3	55	270
People needing public shelter	0	0	0	2	25
People needing hospital care	0	0	0	1	8
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3.8	5	33	160	590

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	3	55	270

People needing public shelter	0	0	0	2	25
People needing hospital care	0	0	0	1	8
Fatalities	0	0	0	0	1
Total economic loss ($ million)	1	2	31	160	590

Pahrump, Nevada

Epicenter at 115.92°W longitude, 36.22°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Nye County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	4	710	2,000
People needing public shelter	0	0	0	7	23
People needing hospital care	0	0	0	3	14
Fatalities	0	0	0	0	3
Total economic loss ($ million)	0.6	3	12	76	160

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	4	720	2,000
People needing public shelter	0	0	0	8	37
People needing hospital care	0	0	0	3	18
Fatalities	0	0	0	0	3
Total economic loss ($ million)	3.9	7	30	220	720

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	4	720	2,000

People needing public shelter	0	0	0	8	37
People needing hospital care	0	0	0	3	18
Fatalities	0	0	0	0	3
Total economic loss ($ million)	2.7	6	29	220	720

Pioche, Nevada

Epicenter at 114.41°W longitude, 37.92°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lincoln County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	1	44	160
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	2
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.3	0.7	4	15	39

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	1	44	160
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	2
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.8	4.2	7	24	50

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	1	44	160

People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	2
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.8	2.2	6	19	46

Reno, Nevada

Epicenter at 119.80°W longitude, 39.52°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Washoe County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	4	480	3,100	6,100
People needing public shelter	0	2	180	1,200	2,200
People needing hospital care	0	1	19	230	630
Fatalities	0	0	2	58	170
Total economic loss ($ million)	20	200	950	2,700	4,500

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	4	480	3,100	6,100
People needing public shelter	0	2	180	1,200	2,200
People needing hospital care	0	1	19	230	630
Fatalities	0	0	2	58	170
Total economic loss ($ million)	24	200	970	2,700	4,600

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	4	480	3,100	6,100

People needing public shelter	0	2	180	1,200	2,200
People needing hospital care	0	1	19	230	630
Fatalities	0	0	2	58	170
Total economic loss ($ million)	22	200	970	2,700	4,600

Silver Springs, Nevada

Epicenter at 119.21°W longitude, 39.41°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lyon County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	120	510
People needing public shelter	0	0	0	0	4
People needing hospital care	0	0	0	0	2
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.4	3	12	37	84

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	120	560
People needing public shelter	0	0	0	1	7
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	0
Total economic loss ($ million)	5.1	8	29	130	350

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	120	560

People needing public shelter	0	0	0	1	7
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	0
Total economic loss ($ million)	4	7	29	140	360

Sparks, Nevada

Epicenter at 119.76°W longitude, 39.53°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Washoe County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	3	460	3,000	5,800
People needing public shelter	0	1	150	1,100	2,000
People needing hospital care	0	1	19	240	590
Fatalities	0	0	2	61	160
Total economic loss ($ million)	21	180	910	2,600	4,400

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	3	460	3,000	5,800
People needing public shelter	0	1	150	1,100	2,000
People needing hospital care	0	1	19	240	590
Fatalities	0	0	2	61	160
Total economic loss ($ million)	25	190	920	2,700	4,500

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	3	460	3,000	5,800

People needing public shelter	0	1	150	1,100	2,000
People needing hospital care	0	1	19	240	590
Fatalities	0	0	2	61	160
Total economic loss ($ million)	23	180	920	2,700	4,500

Stateline, Nevada

Epicenter at 119.95°W longitude, 38.97°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Douglas County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	5	62	220
People needing public shelter	0	0	0	5	17
People needing hospital care	0	0	0	2	9
Fatalities	0	0	0	0	2
Total economic loss ($ million)	0	6	32	95	180

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	5	66	270
People needing public shelter	0	0	0	5	25
People needing hospital care	0	0	0	2	11
Fatalities	0	0	0	0	2
Total economic loss ($ million)	4	11	52	180	450

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	52	460	1,100

People needing public shelter	0	0	15	110	230
People needing hospital care	0	0	1	16	49
Fatalities	0	0	0	3	12
Total economic loss ($ million)	7	31	160	480	990

Tonopah, Nevada

Epicenter at 117.19°W longitude, 38.08°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Nye County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	49	140
People needing public shelter	0	0	0	2	8
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.0	2.0	6	19	34

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	49	140
People needing public shelter	0	0	0	2	8
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	4.3	5.3	9	23	40

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	49	140

People needing public shelter	0	0	0	2	8
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2	3	6	21	37

Virginia City, Nevada

Epicenter at 119.63°W longitude, 39.34°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Storey County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	3	55	120
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.9	4	13	29	43

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	170	980
People needing public shelter	0	0	0	16	130
People needing hospital care	0	0	1	5	23
Fatalities	0	0	0	0	2
Total economic loss ($ million)	6	19	140	510	1,200

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	170	980

People needing public shelter	0	0	0	16	130
People needing hospital care	0	0	1	5	22
Fatalities	0	0	0	0	3
Total economic loss ($ million)	5	18	130	520	1,200

Wells, Nevada

Epicenter at 115.00°W longitude, 41.12°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Elko County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	29	140	200
People needing public shelter	0	0	0	5	10
People needing hospital care	0	0	0	5	10
Fatalities	0	0	0	1	3
Total economic loss ($ million)	1.1	3	13	41	77

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	29	140	200
People needing public shelter	0	0	0	5	10
People needing hospital care	0	0	0	5	10
Fatalities	0	0	0	1	3
Total economic loss ($ million)	4.4	7	17	59	94

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	29	140	200

People needing public shelter	0	0	0	5	10
People needing hospital care	0	0	0	5	10
Fatalities	0	0	0	1	3
Total economic loss ($ million)	2.1	4	15	43	80

West Wendover, Nevada

Epicenter at 113.94°W longitude, 40.78°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Elko County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	8	120
People needing public shelter	0	0	0	1	20
People needing hospital care	0	0	0	0	3
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.6	0.9	3	13	34

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	8	120
People needing public shelter	0	0	0	1	20
People needing hospital care	0	0	0	0	3
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.8	4.2	6	17	38

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	8	120

People needing public shelter	0	0	0	1	20
People needing hospital care	0	0	0	0	3
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.6	2.3	6	18	43

Winnemucca, Nevada

Epicenter at 117.74°W longitude, 41.00°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Humboldt County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	16	220	490
People needing public shelter	0	0	0	1	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.7	2	14	39	81

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	16	220	490
People needing public shelter	0	0	0	1	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	4.2	6	18	44	87

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	16	220	490

People needing public shelter	0	0	0	1	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	1.8	3.3	15	41	84

Yerington, Nevada

Epicenter at 119.20°W longitude, 38.97°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lyon County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	4	66
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.1	1	3	12	34

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	4	73
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.8	5	13	43	160

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	4	73

People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2.4	3.2	12	49	180

Appendix J

The following tables report estimated losses from earthquakes that could occur near the 38 Nevada communities. These data represent damage from an earthquake for that location only within the specified county. Each table represents results from a specific magnitude that is noted above the table. For each community the table reflects the following data:

- Damage to Essential Facilities: these are separated into five separate building types: Hospitals, Schools, Emergency Operations Center (EOC), Police Stations, and Fire Stations. The number indicates how many facilities of each type will have at least moderate damage to at least 50% of the building. There were no facilities that are estimated to receive complete damage to more than 50% of the building.
- Residential: the estimated number of residential buildings that will be either extensively or completely damaged.
- Non-residential: the estimated number of non-residential buildings that will be either extensively or completely damaged.

MAGNITUDE 5.0

County	- County seat or other community	Essential Facilities					Residential	Non-residential
		Hospital	Schools	EOC	Police	Fire		
Carson City	- Carson City	0	0	0	0	0	0	0
Churchill	- Fallon	0	0	0	0	0	0	0
Clark	- Las Vegas	0	0	0	0	0	0	0
	Boulder City	0	0	0	0	0	0	0
	Henderson	0	0	0	0	0	0	0
	Laughlin	0	0	0	0	0	0	0
	Mesquite	0	0	0	0	0	0	0
	Moapa	0	0	0	0	0	0	0
Douglas	- Minden	0	0	0	0	0	0	0
	Stateline	0	0	0	0	0	0	0
Elko	- Elko	0	0	0	0	0	0	0
	Carlin	0	0	0	0	0	0	0
	Wells	0	0	0	0	0	0	0
	West Wendover	0	0	0	0	0	0	0
Esmeralda	- Goldfield	0	0	0	0	0	0	0
Eureka	- Eureka	0	0	0	0	0	0	0
Humboldt	- Winnemucca	0	0	0	0	0	0	0
Lander	- Battle Mountain	0	0	0	0	0	0	0
	Austin	0	0	0	0	0	0	0
Lincoln	- Pioche	0	0	0	0	0	0	0
	Alamo	0	0	0	0	0	0	0
	Caliente	0	0	0	0	0	0	0
Lyon	- Yerington	0	0	0	0	0	0	0

	Dayton	0	0	0	0	0	0	0
	Fernley	0	0	0	0	0	0	0
	Silver Springs	0	0	0	0	0	0	0
Mineral	- Hawthorne	0	0	0	0	0	0	0
Nye	- Tonopah	0	0	0	0	0	0	0
	Beatty	0	0	0	0	0	0	0
	Gabbs	0	0	0	0	0	0	0
	Pahrump	0	0	0	0	0	0	0
Pershing	- Lovelock	0	0	0	0	0	0	0
Storey	- Virginia City	0	0	0	0	0	0	0
Washoe	- Reno	0	0	0	0	0	0	0
	Gerlach	0	0	0	0	0	0	0
	Incline Village	0	0	0	0	0	0	0
	Sparks	0	0	0	0	0	0	0
White Pine	- Ely	0	0	0	0	0	0	0

MAGNITUDE 5.5

County	- County seat or other community	Essential Facilities					Residential	Non-residential
		Hospital	Schools	EOC	Police	Fire		
Carson City	- Carson City	0	0	0	0	0	2	0
Churchill	- Fallon	0	0	0	0	0	0	0
Clark	- Las Vegas	0	0	0	0	0	8	7
	Boulder City	0	0	0	0	0	1	0
	Henderson	0	0	0	0	0	1	1
	Laughlin	0	0	0	0	0	0	0
	Mesquite	0	0	0	0	0	0	0
	Moapa	0	0	0	0	0	0	0
Douglas	- Minden	0	0	0	0	0	1	0
	Stateline	0	0	0	0	0	0	0
Elko	- Elko	0	0	0	0	0	1	0
	Carlin	0	0	0	0	0	0	0
	Wells	0	0	0	0	0	0	0
	West Wendover	0	0	0	0	0	0	0
Esmeralda	- Goldfield	0	0	0	0	0	0	0
Eureka	- Eureka	0	0	0	0	0	0	0
Humboldt	- Winnemucca	0	0	0	0	0	0	0
Lander	- Battle Mountain	0	0	0	0	0	0	0
	Austin	0	0	0	0	0	0	0
Lincoln	- Pioche	0	0	0	0	0	0	0
	Alamo	0	0	0	0	0	0	0
	Caliente	0	0	0	0	0	0	0
Lyon	- Yerington	0	0	0	0	0	0	0

	Dayton	0	0	0	0	0	0	0
	Fernley	0	0	0	0	0	0	0
	Silver Springs	0	0	0	0	0	0	0
Mineral	- Hawthorne	0	0	0	0	0	0	0
Nye	- Tonopah	0	0	0	0	0	0	0
	Beatty	0	0	0	0	0	0	0
	Gabbs	0	0	0	0	0	0	0
	Pahrump	0	0	0	0	0	0	0
Pershing	- Lovelock	0	0	0	0	0	0	0
Storey	- Virginia City	0	0	0	0	0	0	0
Washoe	- Reno	0	0	0	0	0	2	2
	Gerlach	0	0	0	0	0	0	0
	Incline Village	0	0	0	0	0	0	0
	Sparks	0	0	0	0	0	1	2
White Pine	- Ely	0	0	0	0	0	0	0

MAGNITUDE 6.0

County	- County seat or other community	Essential Facilities					Residential	Non-residential
		Hospital	Schools	EOC	Police	Fire		
Carson City	- Carson City	0	0	0	0	0	251	60
Churchill	- Fallon	0	0	0	0	0	28	13
Clark	- Las Vegas	0	0	0	0	0	1852	786
	Boulder City	0	0	0	0	0	103	31
	Henderson	0	0	0	0	0	222	72
	Laughlin	0	0	0	0	0	0	0
	Mesquite	0	0	0	0	0	41	22
	Moapa	0	0	0	0	0	2	1
Douglas	- Minden	0	0	0	0	0	58	34
	Stateline	0	0	0	0	0	4	1
Elko	- Elko	0	0	0	0	0	109	73
	Carlin	0	0	0	0	0	0	0
	Wells	0	0	0	0	0	26	3
	West Wendover	0	0	0	0	0	0	0
Esmeralda	- Goldfield	0	0	0	0	0	0	0
Eureka	- Eureka	0	0	0	0	0	22	3
Humboldt	- Winnemucca	0	0	0	0	0	16	0
Lander	- Battle Mountain	0	0	0	0	0	0	0
	Austin	0	0	0	0	0	45	0
Lincoln	- Pioche	0	0	0	0	0	1	0
	Alamo	0	0	0	0	0	0	0
	Caliente	0	0	0	0	0	0	0
Lyon	- Yerington	0	0	0	0	0	0	0

	Dayton	0	0	0	0	0	26	5
	Fernley	0	0	0	0	0	6	1
	Silver Springs	0	0	0	0	0	2	0
Mineral	- Hawthorne	0	0	0	0	0	15	1
Nye	- Tonopah	0	0	0	0	0	2	0
	Beatty	0	0	0	0	0	0	0
	Gabbs	0	0	0	0	0	0	0
	Pahrump	0	0	0	0	0	3	1
Pershing	- Lovelock	0	0	0	0	0	0	0
Storey	- Virginia City	0	0	0	0	0	2	1
Washoe	- Reno	0	0	0	0	0	293	191
	Gerlach	0	0	0	0	0	4	2
	Incline Village	0	0	0	0	0	4	14
	Sparks	0	0	0	0	0	269	191
White Pine	- Ely	0	0	0	0	0	4	2

MAGNITUDE 6.5

County	- County seat or other community	Essential Facilities					Residential	Non-residential
		Hospital	Schools	EOC	Police	Fire		
Carson City	- Carson City	0	1	0	0	0	1136	258
Churchill	- Fallon	0	0	1	0	0	223	73
Clark	- Las Vegas	11	16	1	0	7	12628	17859
	Boulder City	0	1	0	0	0	1153	408
	Henderson	0	0	0	0	0	3443	980
	Laughlin	0	0	0	0	0	4	2
	Mesquite	0	2	0	0	0	348	122
	Moapa	0	0	0	0	0	44	9
Douglas	- Minden	0	2	0	0	0	258	116
	Stateline	0	0	0	0	0	52	10
Elko	- Elko	1	0	0	0	0	455	314
	Carlin	0	0	0	0	0	1	1
	Wells	0	2	0	0	0	127	16
	West Wendover	0	0	0	0	0	7	1
Esmeralda	- Goldfield	0	0	0	0	0	28	0
Eureka	- Eureka	0	0	0	0	0	147	17
Humboldt	- Winnemucca	0	0	0	1	0	215	8
Lander	- Battle Mountain	0	3	0	0	0	9	3
	Austin	0	0	0	0	0	335	7
Lincoln	- Pioche	0	0	0	0	0	37	7
	Alamo	0	0	0	0	0	0	0
	Caliente	0	0	0	0	0	5	1
Lyon	- Yerington	0	0	0	0	0	3	1

	Dayton	0	0	0	0	1	217	29
	Fernley	0	0	0	0	0	118	13
	Silver Springs	0	1	0	0	0	110	6
Mineral	- Hawthorne	0	0	0	0	0	130	7
Nye	- Tonopah	1	0	0	0	0	46	3
	Beatty	0	0	0	0	0	5	0
	Gabbs	0	0	0	0	0	0	0
	Pahrump	0	0	0	0	0	684	32
Pershing	- Lovelock	1	0	0	0	0	0	0
Storey	- Virginia City	0	0	0	0	0	48	7
Washoe	- Reno	0	7	0	0	0	2190	951
	Gerlach	0	2	0	0	0	62	9
	Incline Village	0	0	0	0	0	40	70
	Sparks	0	7	0	0	0	2100	915
White Pine	- Ely	1	0	0	0	0	60	21

MAGNITUDE 7.0

County	- County seat or other community	Essential Facilities					Residential	Non-residential
		Hospital	Schools	EOC	Police	Fire		
Carson City	- Carson City	0	0	1	0	0	1868	457
Churchill	- Fallon	0	0	2	0	0	485	122
Clark	- Las Vegas	13	49	1	0	15	24031	10868
	Boulder City	2	4	1	0	0	3244	2794
	Henderson	3	13	1	0	0	11507	3924
	Laughlin	0	0	0	0	0	50	25
	Mesquite	0	2	0	0	0	609	201
	Moapa	0	0	0	0	0	224	45
Douglas	- Minden	0	2	0	0	0	421	208
	Stateline	0	0	0	0	0	161	54
Elko	- Elko	1	0	0	0	0	344	844
	Carlin	0	0	0	0	0	25	6
	Wells	0	2	0	0	0	178	22
	West Wendover	0	0	0	0	0	101	15
Esmeralda	- Goldfield	0	0	0	0	0	134	4
Eureka	- Eureka	0	0	0	0	0	239	32
Humboldt	- Winnemucca	0	0	0	1	0	464	22
Lander	- Battle Mountain	0	3	0	0	0	47	12
	Austin	0	0	0	0	0	558	11
Lincoln	- Pioche	0	0	0	0	0	130	27
	Alamo	0	0	0	0	0	0	0
	Caliente	0	0	1	0	0	49	9
Lyon	- Yerington	0	0	0	0	0	57	9

	Dayton	0	0	0	0	3	414	51
	Fernley	0	1	0	0	0	0	0
	Silver Springs	0	1	0	0	0	489	22
Mineral	- Hawthorne	0	0	0	0	0	229	13
Nye	- Tonopah	1	0	0	0	0	134	7
	Beatty	0	0	0	0	0	82	0
	Gabbs	0	0	0	0	0	0	0
	Pahrump	0	1	0	0	0	1881	84
Pershing	- Lovelock	1	0	0	0	0	5	1
Storey	- Virginia City	0	0	1	0	0	106	16
Washoe	- Reno	0	14	0	0	0	4372	1708
	Gerlach	0	2	0	0	0	124	35
	Incline Village	0	0	0	0	0	125	145
	Sparks	0	14	0	0	0	4138	1620
White Pine	- Ely	1	0	0	0	0	142	53

K. State of Nevada THIRA

In the 2023 update of the NEHMP, relevant Threat and Hazard Identification and Risk Assessment (THIRA) information is integrated into Section 3. Due to the sensitivity of some THIRA information, including the specific scenarios, those with a need to know should contact the State of Nevada, Department of Emergency Management / Homeland Security to request access to the current THIRA. See the current threat and hazard information at:

https://dem.nv.gov/preparedness/Threats_and_Hazards_Information_for_Nevada/

L. Completed Mitigation Actions

Mitigation is effective when action is taken now rather than later. Disasters can strike at any time, so it is important to be prepared to reduce loss of life and property. For mitigation to be effective, everyone must understand risks, address hard choices, and invest in community well-being. The state of Nevada has completed numerous mitigation activities, from multiple agencies.

Please note that it is difficult to capture all of the mitigation activities occurring in Nevada – organizations mentioned in this appendix might be doing more mitigation activities than captured. Likewise, some organizations may have been missed that have participated in mitigation activities.

L.1 SUMMARY OF MITIGATION ACTIVITIES

This appendix contains completed mitigation activities throughout the State of Nevada. Examples of agencies and organizations that have completed mitigation activities include Nevada Bureau of Mines and Geology, Nevada Division of Emergency Management, Clark County's Regional Flood Control District, Nevada Division of Forestry, Southern Nevada Water Authority, The Nature Conservancy, Sierra Avalanche Center, Nevada Department of Transportation, Truckee River Flood Management Authority, Carson Water Sub-Conservancy District, and more. Hazard mitigation outreach and public awareness activities are located in Appendix M. Table L-1 includes mitigation trainings throughout Nevada.

Table L-1. Mitigation Training in Nevada, 2019-2023

Training Code	Title of Training	Dates	Location
FEMA P-154 & ATC-20	Rapid Visual Screening of Buildings for Potential Seismic Hazards and Post-earthquake Safety evaluation of Buildings	5/16/2019	Reno, NV
FEMA E-749	Earthquake Resistant Design Concepts	9/15/2020	Virtual
Building Code Overview	Overview of Building Codes	8/11/2020	Virtual
FEMA E-74	Reducing the Risks of Nonstructural Earthquake Damage	6/15/2020	Virtual
FEMA 154	Rapid Visual Screening of Buildings for Potential Seismic Hazards (Pre-Disaster)	6/12/2020	Virtual
FEMA 232	Homebuilders' Guide to Earthquake Resistant Design and Construction	11/5/2020	Virtual
FEMA 154	Rapid Visual Screening of Buildings for Potential Seismic Hazards (Pre-Disaster)	4/7/2021	Virtual

Table L-1. Mitigation Training in Nevada, 2019-2023			
Training Code	**Title of Training**	**Dates**	**Location**
ATC 20	Post-earthquake Safety Evaluation of Buildings (Post-Disaster)	4/13/2021	Virtual
FEMA P-1000	Safer, Stronger, Smarter: Improving School Natural Hazard Safety	4/22/2021	Virtual
FEMA P-395	Earthquake Safety and Mitigation for Schools	5/25/2021	Virtual
FEMA P-767	Earthquake Mitigation for Hospitals	5/20/2021	Virtual
FEMA P-50 and 50-1	Simplified Seismic Assessment and Retrofit Guidelines of Detached Single-Family, Wood-Frame Dwellings	6/8/2021	Virtual
FEMA E-74	Reducing the Risks of Nonstructural Earthquake Damage	6/8/2022	Virtual
Building Code Overview	Overview of Building Codes	6/7/2022	Virtual
Classroom and Beyond	Reducing Earthquake Risk in the Classroom and Beyond	6/2/2022	Virtual
FEMA 154	Rapid Visual Screening of Buildings for Potential Seismic Hazards (Pre-Disaster)	5/3/2022	Virtual
ATC-20	Post-earthquake Safety Evaluation of Buildings	5/23/2022	Virtual
FEMA 232		5/10/2022	Virtual
FEMA 154	Rapid Visual Screening of Buildings for Potential Seismic Hazards (Pre-Disaster)	5/3/2022	Virtual
FEMA 232	Homebuilders' Guide to Earthquake Resistant Design and Construction	5/12/2022	Virtual
Fall Preparedness Workshop	2022 Eastern Nevada Fall Preparedness Workshop	9/12/23 – 9/16/23	Elko
Fall Preparedness Workshop	2022 Western Nevada Fall Preparedness Workshop	9/26/23 – 9/30/23	Carson City
Fall Preparedness Workshop	2022 Southern Nevada Fall Preparedness Workshop	10/3/23 – 10/7/23	Las Vegas

Table L-1. Mitigation Training in Nevada, 2019-2023			
Training Code	**Title of Training**	**Dates**	**Location**
FEMA 154	Rapid Visual Screening of Buildings for Potential Seismic Hazards (Pre-Disaster)	8/31/2023	Virtual
ATC-20	Post-earthquake Safety Evaluation of Buildings	9/19/2023	Virtual
FEMA P-1000	Safer, Stronger, Smarter: Improving School Natural Hazard Safety	7/12/2023	Virtual
FEMA P-767	Earthquake Mitigation for Hospitals	8/15/2023	Virtual
Classroom and Beyond	Reducing Earthquake Risk in the Classroom and Beyond	7/27/2023	Virtual
Application Development	Regional Application Development Workshop	4/18/2023	Carson City
Application Development	Regional Application Development Workshop	4/19/2023	Las Vegas
Fall Preparedness Workshop	2023 Eastern Nevada Fall Preparedness Workshop	9/26/23 – 9/28/23	Elko
Fall Preparedness Workshop	2023 Southern Nevada Fall Preparedness Workshop	10/3/23 – 10/5/23	Las Vegas
Fall Preparedness Workshop	2023 Western Nevada Fall Preparedness Workshop	10/10/23 – 10/12 23	Carson City

L.2 MITIGATION ACTIVITIES

As discussed in Section 3.3.3, Nevada is earthquake country, with over 250,000 earthquakes recorded within or adjacent to the state since 1857. Earthquake faults occur throughout Nevada, and potential losses from earthquakes are high for many communities. Therefore, it is crucial to be prepared to respond and mitigate structural and content risks.

Following are snapshots of the many mitigation activities per agency. There are far too many to list every mitigation action, so we have limited to taking a portion of actions completed by the many different agencies throughout the state.

L.2.1 Carson City Mitigation Activities

1. NDEP(ESF10) worked with water and wastewater facilities throughout the state to update their Continuity of Operation Plans for the Covid pandemic.
2. NDEP(ESF10) worked with DCNR to update the COOP. NDEP updated their COOP.

3. NDEP(ESF10) worked with Nye County in determining if their buildings needed earthquake assessments for past earthquake damage and potential future damage.
4. NDEP(ESF10) worked with property owners to mitigate the release of hazardous materials.
5. New contract with 211 for COVID Call specialists started September 30.
6. HMP amendment to Storey County – submitted.
7. Mitigation planning.
8. Douglas County burn scar flooding mitigation. TMWA Spill response coordination meeting. Underground Storage Tank fire mitigation outreach in the Tahoe Basin. Coordination with Douglas County, Kingsbury General Improvement District, Incline Village General Improvement District, and Indian Hills Water Utilities on fire mitigation

L.2.2 Churchill County Mitigation Actions

1. We are doing twice a week Covid CBT and contact tracing, all persons tested receive a phone call with the test results. They are in process of putting out RFP for the five-year plan update.
2. Conducted a pandemic shot exercise. Updated hazard mitigation plan.
3. Churchill County continues to offer both vaccines and testing at our drive through testing center. All 3 brands of vaccines are available. We also have purchased a mobile unit to deliver these services to our homebound and remote locations. In addition, we are establishing our own lab in preparation for future events which should remove our dependency on the state lab and also help reduce the back log at the state lab.
4. Creation of two weirs for flood reasons for atmospheric river storms in February/March 2023.

L.2.3 Clark County Mitigation Activities

The following activities have been completed, or are currently in the process of being completed in Clark County:

1. Seismic Data Solutions conducted a project, for the Nevada System of Higher Education in 2010. The project is called the Clark County Microzonation project and involved earthquake parcel classification mapping for increasing public safety within Clark County.
2. According to the 2014 Nevada State Report, obtained online from Western States Seismic Policy Council, Clark County School District submitted a PDM grant application, which was awarded to install automatic gas shut-off valves in their schools and facilities.
3. Noted in Nevada DEM's 2015-2016 Annual Report, Clark County collaborated with the Earthquake Engineering Research Institute on a ground-truthing project. The project verifies URM buildings throughout the county against a list of URM buildings.

4. The Moapa Band of Paiutes just completed a flood mitigation project. They widened the current flood channels and installed approximately 1-1/2 miles of gabion baskets as well as hardened the sewer lagoons from future flooding damage.
5. As a "continuance" on a related construction projects and the NDOT's dispatch initiatives, they continued their PSA procedures by keeping the public informed of any traffic impacts, including how they are applying the COVID-19 safety practices. These practices also apply to interactions and communications with local law enforcement agencies and other municipalities.

   Clark County has run COVID testing sites at Texas Station, Cashman Center, UNLV, Doolittle Senior Center, Centennial High School. Testing numbers for November were 93,476.
6. Continued progress on Fault Characterization Study for the Las Vegas Valley. Research performed through UNR/NSHE.
7. Clark County Department of Building & Fire Prevention is continuing its Las Vegas Valley Earthquake – Fault Characterization Study. It is a $1.7 Million study by UNR/Nevada Bureau of Mines and Geology that is being performed over a five-year period (2016-2021).
8. Clark County Testing Sites did 136,325 COVID tests during the month of December. Year to date through December 31, 2020 was 506,873.
9. For the update to the Clark County Mitigation Plan, working on scope of work for the RFP process with our purchasing department. For vaccinations, Clark County has held special events in various communities to give vaccinations.
10. Hazardous Fuels Reduction in the Mount Potosi area on private land adjacent to USFS and BLM lands.

L.2.4 Douglas County Mitigation Actions

1. Storm Water Department continues to work on basins studies of Pine Nut (reviewing the LOMAR now) and NDOT reached out to the county to pay for he culvert design crossing Toler and 395 in Gardnerville. Trying to find funding for this now.
2. NDOT is reviewing the plans for SR 88 crossing.
3. June 2021 - finish the construction of the State Route 88 crossing project located 200 feet south of Cottonwood Slough. The Construction and DEM Site inspection was completed in June. The project still needs a FEMA LOMR report and analysis complete and filed with the County and FEMA. This work is currently held up in a contract issue and we are working to resolve it.
4. The Highway 88 Flood Management Project was completed and looks great. This project will remove a select number of properties from the flood zone, including the County's primary EOC.
5. We have also been involved in a considerable amount of fuels management work within NV Energy easements and infrastructure. COVID has also been at the top of the list in all forms of mitigation and prevention. Our HMP is being used to develop future grant and study requests.
6. State route 88 Culverts were finished on May 26th. Working on a design project for NDOT for the Toler HWY 395 crossing to up size the culverts for the NDOT R&R project coming up. The county is paying for the plans. NDOT will construct it.

L.2.5 Elko County Mitigation Actions

1. Working on a tabletop and then a full exercise on our water supply to our town, it come 26 miles to reach us and the wells are isolated from us to monitor all of them all the time

L.2.6 Humboldt County Mitigation Actions

1. Tri-County Hazard Mitigation Plan update. Working with Farr-West Engineering as our contractor for Humboldt, Pershing, and Lander Counties. This was done with grant funding through FEMA for this project.
2. Planning a full-scale earthquake exercise for spring 2024.

L.2.7 Lincoln County Mitigation Actions

1. They also are working on a fire fuel mitigation program with NV Energy to reduce the potential of wildland fires in Lincoln County.
2. Working on an application for renewal of the Lincoln County Hazard mitigation plan.
3. Updating Lincoln County HMP.

L.2.8 Nye County Mitigation Actions

1. Month of December: Did Tier 1 COVID19 Vaccine PODS in Amargosa, Beatty, & Pahrump, NV. Several more Tier 1 PODS conducted the first week of January in Tonopah and again in Pahrump, NV. Community based COVID19 testing & by appointment testing continues.

2. Working on several projects around the County including fuels reduction projects with US Forest and NDF. Some have been completed some were delayed due to deployment.
3. Updating Nye County HMP.

L.2.9 Pershing County Mitigation Actions

1. Ongoing efforts with Humboldt and Lander counties to update the Tri-County Hazard Mitigation Plan.

L.2.10 Washoe County Mitigation Actions

1. As a fire department we performed defensible space inspections for the town and made suggestions of what areas needed to be cleared by GGID.
2. Review of the Hazard Mitigation Plan by EMAP. It passed EMAP standards. Identifying Pandemic Mitigation Activities.
3. Created an online project management program to track the progress of mitigation actions identified in the HMP.
4. WCEM worked with local Fire Agencies and community partners to strategize a regional defensible space and yard waste program.
5. TMFPD Crews completed approximately 250 hours of chipping, 50 hours of hauling slash (hazardous fuels), 50 hours of re-seeding on the Loyalton and Pinehaven Fires and treated 49 NV Energy power poles by clearing fuel a minimum of 10' radius around each pole.

L.2.11 Nevada Division of Emergency Management

Multihazard project completion reports, newsletters, and press releases: https://dem.nv.gov/homev3/Home_PublicInfo/

L.2.12 Nevada Division of Forestry Mitigation Actions

1. We have also treated hundreds of acres across the state in wildfire rehabilitation, emergency stabilization, fuel reduction, and forest/rangeland/watershed health projects. NDF has utilized federal grant funds, primarily through the US Forest Service but also the BLM, state funds through Senate Bill SB508, and private funds from NV Energy and other partners to accomplish this work. Much of the work we have accomplished tiers to local community wildfire protection plans as well as hazard mitigation plans at the local government level.
2. Joy Lake Road wildfire fuels reduction project.
3. Clark Co. - 29.5 acres of hazardous fuel reduction
4. Elko Co. - 21 acres of hazardous fuel reduction
5. Lincoln Co. - 3 acres of hazardous fuel reduction
6. White Pine Co. - 12.25 acres of hazardous fuel reduction
7. Washoe Co. - 1 acre of hazardous fuel reduction
8. Lyon Co. - .25 acre of hazardous fuel reduction
9. Nye Co. - plan development for 40 ac. fuel reduction project

10. Washoe Co. - plan development for 6 ac. fuel reduction project
11. Hazardous fuel reduction - 350 acres in Clark, Douglas, Humboldt, Lincoln, Nye and Washoe counties. Defensible space inspections Washoe Co. CWPP update meetings with Elko FPD, East Fork FPD, Clark Co. FPD, FirewiseUSA presentation for Sparks CAB. Risk. Assessments for Galena Forest Est. and Spring Creek HOAs.
12. Hazardous Fuels Reduction in the Mount Potosi area on private land adjacent to USFS and BLM lands.

L.2.13 Nevada Department of Transportation Mitigation Actions

NDOT has conducted studies on earthquake mitigation. The studies include:

1. *The Analytical Investigation into Bridge Column Innovations for Mitigating Earthquake Damage* study focused on how to reduce post-earthquake damage to bridge columns. Not only is the damage expensive, but it may also lead to long-term closure of highways (available here: https://www.nevadadot.com/home/showdocument?id=9139).
2. Another study conducted by NDOT, *Development of Earthquake-Resistant Precast Pier Systems for Accelerated Bridge Construction in Nevada*, addressed the need to expand its accelerated bridge program, using earthquake-resistant elements and connections for bridges with two or more spans (available here: https://www.nevadadot.com/home/showdocument?id=9167).
3. *The Post-Earthquake Assessment of Nevada Bridges Using ShakeMap/ShakeCast* study involved an examination of post-earthquake capacity of Nevada highway bridges. The study used scenario earthquake evaluation (ShakeMap, ShakeCast, and 2014 USGS National Seismic Hazard Map) and engineering study to assess the capacity of bridges. Researchers provided NDOT with a list of potentially vulnerable bridges for use in seismic retrofit planning (available here: https://www.nevadadot.com/home/showdocument?id=9111).
4. In 2018, NDOT will start a seismic retrofit project on I-515 at the Las Vegas Downtown Viaduct.
5. In 2016, NDOT maintained 82 bridges needing renovation by seismic deficiency.

L.2.14 The Great Nevada ShakeOut

The Great Nevada ShakeOut (the ShakeOut) is the largest earthquake drill in Nevada. It occurs annually on the third Thursday of October. The main goal of the ShakeOut is to prepare Nevadans for major earthquakes, before, during, and after. Participants are urged to visit http://www.earthquakecountry.info/roots/seven_steps.html and http://shakeout.org/nevada/ for tips on how to prepare, protect, and recover from a damaging earthquake.

L.2.15 Nevada Bureau of Mines and Geology Mitigation Actions

NBMG continues efforts to get Nevadans ready for earthquakes through talks and the ShakeOut event. The following are examples of NBMG resources are available online:

1. The Earthquake Resources webpage. Access the webpage to view maps, publications, presentations, and additional links & resources regarding earthquakes in Nevada: http://www.nbmg.unr.edu/Geohazards/Earthquakes/EarthquakeResources.html
2. NBMG's Find Your Home or Business on an Earthquake Fault Map webpage. Can be accessed at: http://www.nbmg.unr.edu/geohazards/earthquakes/Home_EQfaultfinder.html
3. Earthquake mitigation saves lives (video linked on NBMG's site)

   https://www.fema.gov/media-library/assets/videos/76530
4. NESC earthquake presentations are available at:

   http://www.nbmg.unr.edu/nesc/Presentations/index.html
5. Preliminary Assessment of Potentially Unreinforced Masonry Buildings

   in Nevada, 2012, by Jonathan G. Price, Gary Johnson, Craig M. dePolo, Wayne Carlson, NBMG Report 54.

   This report is a preliminary assessment of potentially unreinforced masonry buildings (URMs) in Nevada. These are the buildings that are highly susceptible to collapse or partial collapse during earthquakes and are therefore of concern for life safety and economic recovery. Data are compiled from information provided by county assessors' offices and the Public Works Division of the State of Nevada with assumptions that potential URMs are those brick, stone, or cement-block masonry buildings that were constructed before 1974. There are tens of thousands of potential URMs in Nevada. They are located in every county and nearly every community. Many URMs are historically significant, and many are concentrated in downtown business districts and along thoroughfares. It is important to note that not all Nevada URMs have been identified in this study, and some structures identified as potential URMs may not be. Risks from URMs can be reduced by removing the buildings, seismic rehabilitating them, and minimizing human occupancy.

   The report is available as an online document free on the web at the following online link:

   https://pubs.nbmg.unr.edu/Unreinforced-masonry-buildings-p/r054.htm

L.2.16 The Nevada Seismological Laboratory Mitigation Actions

The Seismo Lab has completed mitigation activities, including:

1. As of 2014, an upgrade of communication links and seismometers continues in the Tahoe-Reno region.
2. The USGS awarded $3.7 million to six universities in the fall of 2016, including UNR, to transition their ShakeAlert earthquake early warning system into a production system. This system gives communities time to take action before shaking waves arrive.

The early warning system will be integrated into the Seismo Lab's seismic network. The focus will start in the California portion near Lake Tahoe, and will then expand into Nevada, near Las Vegas.

3. The Seismo Lab has supported multi-hazard sensors on their network. These sensors can be used for fire, earthquake, flood, and avalanche detection.

The Seismo Lab has numerous resources online to aid the public in their own mitigation efforts, a few examples include:

1. Preparedness tips and how to reduce home hazards, go to: http://www.seismo.unr.edu/Preparedness
2. To view an earthquake activity map, go to:

   http://www.seismo.unr.edu/Earthquake
3. Living with Earthquakes in Nevada:

   http://crack.seismo.unr.edu/ep/nvguide/nvguide.pdf
4. Earthquakes in Nevada and How to Survive Them (2010):

   http://crack.seismo.unr.edu/ep/nvsurvival/e16.pdf

L.3 FLOOD MITIGATION ACTIVITIES

As noted in Section 3.3.7.3.3, 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. These stakeholders include Carson Water Subconservancy District, Clark County Regional Flood Control District, Truckee River Flood Management Authority and the "Living River Plan", and the Silver Jackets Program.

L.3.1 Clark County Regional Flood Control District

The Clark County RFCD has completed numerous mitigation activities, and has several projects planned in the near future.

Summary of accomplishments as of July 2023, listed in Clark County RFCD's 2022 Annual Report:

1. Thirteen projects completed in 2019
2. Six projects completed in 2020
3. Seven projects completed in 2021
4. Six projects completed in 2022
5. Seven projects completed so far in 2023 with another seven projects under construction or about to start
6. Social media outreach and creation of the FloodSpot app
7. Proclamations with safety messages

8. Presentations to more than 100,000 students
9. Paid advertising campaigns

Table L-2. Completed RFCD Projects, 2020-2022		
Project	**Completion Date**	**Location**
Vandenberg North Detention Basin and Outfall – Phase I	August 2020	City of North Las Vegas
Pittman Pabco – Boulder Highway Crossing	October 2020	City of Henderson
Flamingo – Boulder Highway North – Boulder Hwy, Sahara to Charleston	November 2020	City of Las Vegas
Range Wash – Ann Branch, Phase 2	December 2020	City of North Las Vegas
Hollywood System, Phase II, Nellis Air Force Base Reach	January 2021	City of North Las Vegas
Duck Creek Haven Street Storm Drain	April 2021	Clark County
Vandenberg North Detention Basin, Collection & Outfall, Phase II	May 2021	City of North Las Vegas
LVW – Moccasin, Sky Canyon Park to Upper LVW	September 2021	City of Las Vegas
Craig Road Storm Drain – El Capitan to Fort Apache	December 2021	Clark County
Beltway Detention Basin, Collection and Outfall	March 2022	City of North Las Vegas
Hollywood System, Centennial Parkway to Speedway #2 DB	May 2022	City of North Las Vegas

Table L-2. Completed RFCD Projects, 2020-2022		
Project	**Completion Date**	**Location**
Duck Creek – Jones Boulevard Storm Drain	October 2022	Clark County
Blue Diamond Channel 02, Decatur – Le Baron Channel to Richmar, Phase I	October 2022	Clark County
Wagon Trail Channel – Sunset to Teco	October 2022	Clark County
Silverado Ranch Detention Basin, Collection and Outfall	November 2022	Clark County
Chickasaw Storm Drain, Local Drainage Improvements	November 2022	City of Henderson
Whitney Ranch Channel Replacement	December 2022	City of Henderson
Anthem Parkway Channel, Horizon Ridge to Siena Heights	May 2023	City of Henderson
Blue Diamond Wash – Arville Street to I-15	June 2023	Clark County

Data obtained from Clark County RFCD's 2021-2022 Annual Report.

https://gustfront.ccrfcd.org/pdf_arch1/public%20information/annual%20reports/AnnualReport-21-22.pdf

Table L-3. RFCD Projects Under Construction or Planned (as of July 10, 2023).		
Project	**Est. Completion Date**	**Location**
Gowan North – El Capitan Branch, Ann Road to Centennial Parkway	September 2023	City of Las Vegas
Outlying Areas – Fairgrounds Detention Basin and Outfall	November 2023	Clark County
Flamingo – Boulder Hwy. North, Charleston – Boulder Hwy. to Maryland Parkway and Maryland Parkway System, Construction	December 2023	City of Las Vegas
Gowan Outfall, Alexander Road, Decatur Blvd. to Simmons Street and Simmons Street to Clayton, Construction	September 2024	City of North Las Vegas

Data obtained from Clark County RFCD's 2021-2022 Annual Report.

For more information, see Clark County RFCD's website: http://www.ccrfcd.org/

L.3.2 Truckee River Flood Management Authority

TRFMA has a Financial Assistance Program for Home Elevation (the Home Elevation Program), which started in 2010. This program allows Washoe County and TRFMA to award grants to homeowners in an approved area (Hidden Valley, Rosewood Lakes, and Eastside Subdivision neighborhoods). Elevating homes in this flood-prone area is cost-effective and makes the properties more resistant to flood damage. For more information regarding the Home Elevation Program, see: http://trfma.org/resources/home-elevation-program/

TRFMA has completed several flood mitigation projects. Table L-4 lists completed flood risk management projects. Project plans aim to reduce flood damages and casualties from a 100-year flood event. TRFMA has a Project Plan Mapbook available online at:

http://trfma.org/wp-content/uploads/2017/03/Mapbook-6-01_14_2015_compressed.pdf

Table L-4. TRFMA Completed Flood Risk Management Projects (as of July 2023).		
Project	**Description**	**Status**
Virginia St. Bridge Replacement	Existing bridge was removed and replaced with a new, hydraulically efficient bridge. The new bridge is capable of passing the 100-year flood flow	Complete- 2016
Reno-Sparks Indian Colony Levee and Floodwall Construction	Constructed a levee and floodwall system (~2,300 ft.). The project also included the construction of a multiuse recreational pathway	Complete- 2009, received two awards
North Truckee Drain Relocation	The existing North Truckee Drain was relocated to move its confluence with the Truckee River to a location downstream of the Steamboat Creek confluence. Project will reduce flooding in the Sparks industrial area.	Complete- Phase I & II
Hidden Valley Home Elevations	Elevation of three homes in the Hidden Valley area	Complete – August 2022

Data obtained from TRFMA.

Description of TRFMA Flood Project Plan Elements (2023)

Downtown Reno & West Reno Reaches

The Truckee River upstream of the I-580 Bridge consists of a confined channel with a series of bridges, floodwalls, and berms crossing and confining the river. The Flood Project elements in this reach consist of both new flood protection projects as well as maintenance for existing infrastructure. These project elements will be prioritized based on targeting (if there is a cooperative agency constructing a related project where the project element can be added and built in a cooperative fashion). For instance, TRFMA provided significant funding for the rebuilding of the Virginia Street Bridge in this reach in 2015-2016.

Booth Street Area: Booth Street Bridge is low to the water and gets inundated during high floods causing water to back up upstream. There is flooding along the north bank of the river with breakouts both upstream and downstream of the Booth Street Bridge.

- Upstream of the bridge a small berm or flood wall may be installed to about 1,500 feet upstream. The bridge ramp on the north side will tie in to the upstream as well as the downstream berm or floodwall.
- Downstream of the bridge a low berm is now proposed along the river that only gives partial protection up to perhaps only 14,000 cfs instead of a full 20,500 cfs flood but allows the river and the neighborhood to remain connected to the river.

Booth to Arlington: Along Riverside Drive there is a natural or small manmade berm that keeps water from overtopping into the neighborhood just north of the bank until around 11,000 cfs, which unfortunately is a common flood event.

- The alternative being advocated here is to protect the river from smaller more frequent floods but not have the large, tall walls necessary to fully protect the river up to the 100-year flood. This low floodwall will allow almost all trees to remain and will not be so intrusive to the river view and trail. The final height of the small wall will be determined in design after full community input.
- Closer to Arlington there is an existing floodwall that will be replaced and made slightly higher to protect to a higher flood level but not 100-year flood level.

Arlington Area: This area has floodwalls on both banks and on the island as well. There are several bridges including the North and South Arlington Bridge and walking bridges.

- TRFMA's role is to provide advice and hydraulic models and data on river hydraulic conditions for redesign/rebuild that Regional Transportation Commission (RTC) is undergoing for Bridges.
- There are also numerous floodwalls; TRFMA may assist technically or even financially in the future depending on the timing and situation of the improvement.

Sierra to Lake Street Bridges: This reach includes the Sierra Street, Virginia Street, Center Street, and Lake Street bridges. The area is very tight to the river, and this can cause flooding into large buildings.

- Virginia Street Bridge was replaced in 2016.
- Sierra Street Bridge is under design for replacement by RTC.
- TRFMA's main role is to advise and provide technical assistance for design (e.g., models, data). TRFMA may help with future floodwall replacement projects as a cooperating agency.

Lake Street to I-580: From Lake Street to I-580 the river is less constrained but there are still buildings near the river.

- The only major project slated in this reach is the removal of the old Wells Bridge

underneath the Wells Ave overpass. The Bridge is extremely low to the river and backs up water.

Meadows Reach

The Meadows Flood Project extends from I-580 down to Vista Narrows east of Sparks. This project includes levee, floodwalls, berms, terracing, bank stability, and stream and riparian restoration activities. The Meadows Flood Project can be broken into phases or segments which include:

- The Reno Sparks Indian Colony Levee and Floodwall – Completed in 2009
- Grand Sierra Resort – Berm and Levee (planned construction 2024-25)
- Truckee Meadows Water Authority Levee (planned construction 2026)
- Reno Tahoe International Airport Berm and terracing (planned construction 2024-25)
- Additional Levee Work North Bank Glendale to Rock (planned construction 2026)
- Mill/McCarran Levees, Terracing, Channel and Riparian Restoration (planned construction 2027-28)
- North Levee and Flood Wall – McCarran to Vista (planned construction 2029-30)
- Vista Narrows Floodplain Terracing (in permitting planned construction 2024 and/or 2025)

The cost to complete the Meadows Project was estimated to be $185 million in 2021. The Meadows Project has tremendous benefit from reducing flooding vs. cost of implementation. In an evaluation done in 2021, the Meadows Project in its entirety (not just cost to complete) has a beneficial cost ratio near $1.6 and over $10 million per year in net economic benefit. In terms of "cost to complete," benefit cost ratio and annual net economic benefit are even greater.

RSIC Levee & Floodwall: The Reno Sparks Indian Colony Levee and Floodwall project is complete and represents nearly one-half mile (2,240 feet) of levee and floodwall. The levee section is approximately 1,170 feet while the floodwall was 1,070 feet. The project cost $5.8 million and was shared between the Flood Project ($1.72 million), Walmart ($2.28 million) and the Reno-Sparks Indian Colony ($1.7 million in land value). The project features a meandering trail along the river side that can be used for recreation.

Grand Sierra Resort Berm & Levee (Glendale Ave to Greg St Bridge): The Grand Sierra Resort (GSR) Berm and Levee Project has been converted from a floodwall to a berm and levee after discussions between GSR and TRFMA staff.

- The berm allows for a gradual outslope that better connects the GSR with the river. The upstream part of the berm consists of approximately 45,000 cubic yards of material with a cost of $1.35 million in 2021 dollars. The berms will be compacted and paved back over or used for other needs. Much of the current berm area has been used for parking.
- The downstream levee across from the pond is larger and involves about 52,000 cubic yards of material with a cost of $1.56 million in 2021 dollars. The GSR levee is in a narrow area between the two berms and requires about 7-8 feet of gain in elevation. The levee

section in this estimate is 350 feet long with an estimated cost of $700,000. There is another narrow area between pond and River that may require a short levee section.

Truckee Meadows Water Authority Levee: In previous plans, this was proposed as a wall. After on field discussion between TRFMA staff and in discussion with TMWA staff this was changed back to a setback levee in one section and a regular levee downstream. The reason for this change is the area that needed the wall the most was where the setback section was. There appeared to be plenty of room for a levee considering the needed elevation gains were less than 10 feet and in some cased only 5 feet.

- The length of the levee is approximately 3000 feet with a cost estimate of $4.5 million in 2021 dollars.
- In discussion it was apparent the TRFMA could get help with access if TRFMA helped TMWA with fencing and security measures, which would drive down the cost.

Reno Tahoe International Airport Berm & Terracing: The berm is an alternative to the earlier idea of a levee. Levees represent an abrupt obstacle to landing aircraft; berms can be more gradual but need to be wider.

- The amount of elevation gains necessary averages between zero and eight feet in this area to protect from a 100-year flood. The estimated fill would be approximately 90,000 cubic yards but may be lower when more detailed design done. At a cost of $30 per yard (brought from Vista Narrows excavation) this would add up to $2.7 million in 2021 dollars.
- This project also has some considerable terracing with a cost of close to $2.4 million in 2021 dollars. Plant species used for terrace need to be low growing because of aircraft safety concerns.

Mill & McCarran Levees, Terracing, River Channel and Riparian Restoration: The Mill/McCarran properties represent by far the largest investment by TRFMA; to date, this investment is over $48 million to acquire 110 acres of land along the river.

- Past plans called for mostly a floodwall on the north bank of the river and a levee on the south with considerable terracing. The new concepts call for moving the river, providing restoration instream as well as terracing and riparian restoration and the use of levees exclusively. This may attract outside funding.
- The current cost estimate for construction of the three (North, South, Intermediate South) levees is $20.4 million. The terracing and river restoration will have an approximate construction cost of near $20 million. When all work is said and done the total investment of this stretch may reach nearly $100 million dollars.
- The outcome will be a fully protected area for the North and South Industrial areas and the Reno Tahoe International Airport. In addition, this area will be ideal for both a nature and conventual park post construction. There will be grading and construction to help facilitate various forms of recreation. We anticipate transferring this area to Reno Parks or another regional park authority for recreational management.

McCarran to Vista – North Bank Levee & Floodwall: The North Bank Levee and floodwall stretches almost 3.2 miles from the McCarran Bridge downstream to Vista.

- Past plans have had this stretch at about 70% floodwall. Going forward TRFMA staff is looking at working with stakeholders and creating plans to make most if not all of this levee. Using levee vs floodwall should reduce costs, avoid seepage problems, and allow for bike paths to be put on top of levee.
- The total cost for this based on 16,600 feet of Levee is $33 .2 million in 2021 dollars. (This part of project is the least studied and researched so cost data is most unsure.)
- The North Truckee Drain's outlet is along this stretch and represents a completed project, partially funded by TRFMA.
- No work is proposed by TRFMA on Steamboat Creek.

Vista Narrows Terracing: The Vista Narrows Floodplain terracing project as currently proposed, consists of excavating floodplain terraces at three locations just East of Sparks, Nevada on the Truckee River. Vista Narrows is key to the entire Truckee Meadows Project as it lowers water levels caused by other elements of the Meadows Project. It provides the water level lowerin that allows for the project to be built while avoiding expensive mitigation in South Reno.

- It does increase peak flows downstream on the order of 730 cfs because of the opening up of the narrows which prevents some of the backwatering into South Reno and UNR farms. The larger Truckee Meadows Project which eliminates flood storage in industrial areas and the airport increases peak flows by another 1,669 cfs. This creates an increase of approximately 2,400 cfs peak flow increase.
- TRFMA has been in discussions with stakeholders downstream about mitigation because of these increased flows. It appears there are several projects in and around Wadsworth that may be useful for mitigation. TRFMA has also discussed this matter with Storey County and have a mitigation project planned for the Lockwood area.
- The cost for the terracing is approximately $42 million in 2021 dollars. Costs for downstream mitigation have not been fully worked out yet.
- These terraces are on both sides of the river and are a total of 8,600 feet long. They create low floodplain and wetlands that provide flow conveyance. The terracing occurs just above the ordinary high-water mark so that the river itself is only marginally impacted along the banks. Because of the height of the banks this means approximately 450,000 cubic yards of materials are to be removed.

Voluntary Home Elevation Program: There are three primary areas that qualify for the home elevation program: 1. Eastside subdivision, 2. Rosewood Lakes, and parts of 3. Hidden Valley Estates. (Not all homes in these subdivisions qualify for the program.)

- Home elevation only makes sense when the costs of other mitigation methods is prohibitive such as when the number of homes protected is not enough to warrant a community flood wall or levee. It also can make sense when the cost to buy out and set aside is too great.

- The current program if in and qualified for a FEMA grant allows the homeowner to get significant home benefit without having to pay income tax. FEMA pays 50-90% of base costs and TRFMA pays the remaining match.
- Currently four homes have been completed since the inception of the program in 2011. The program has delays in getting grants, difficulty in finding qualified engineers and subcontractors.

Lower Truckee River Reach

The aim of TRFMA with the downstream reach is that any effects from the Meadows Flood Project are fully mitigated. That is the residents and habitat along the river are at least as well off as they were before the project started. This means all possible impacts of the Meadows Flood Project need to be minimized and mitigated. The Meadows Project increases peak flow during 100-year and to a lesser degree 50-year events on the Truckee River at Vista. The idea is to study these increases to evaluate what possible impacts are and then propose mitigation for any that may be significant. Mitigation in the downstream reach may consist of restoration projects such as floodplain restoration that can in some cases lower peak flows at least minimally. Mitigation also consists of traditional protection such as levees, floodwalls, and flood proofing vulnerable infrastructure. Other mitigation options include restoring fish passage along the lower reach of the Truckee.

Ecosystem Restoration Projects: Ecosystem restoration is a series of actions taken to reestablish the general structure, function, and dynamic but self-sustaining behavior of the ecosystem. The primary purpose of riverine ecosystem restoration projects is to restore the physical and biological functions of the river channel and floodplains; thereby improving water quality and enhancing habitat for native species of fish and wildlife. Other benefits include flood attenuation, decreased risk of developed property damage (floodplain preservation), riverbank stability, sediment retention (water quality improvement). The community's vision for the Truckee River Flood Project is to achieve flood protection goals through a combination of set back levees, floodwalls, river terracing, bridge replacements, floodplain land acquisitions, instream and riparian restoration, and urban parkways.

- TRFMA has partnered with The Nature Conservancy and numerous other local, state, and federal agencies and non-profit organizations to restore the lower Truckee River ecosystem (from Vista to Pyramid Lake). Partners include US Fish & Wildlife, US Bureau of Land Management, Nevada Division of Environmental Protection, Washoe County, City of Reno, City of Sparks, and Pyramid Lake Paiute Tribe.
- Several high-priority restoration projects have already been completed: 1. Lockwood, 2. Lower Mustang Ranch, 3. Tracy Power Plant, and 4. 102 Ranch (total of 8 miles of river restoration and 450 acres of habitat created in/along the river). Monitoring is ongoing to ensure the projects are functioning as designed.
- To date, the partners have invested more than $28 million to create more than 450 acres of habitat and restore more than 8 miles of the lower Truckee River. An estimated 216 jobs

were created because of this work (full-time equivalents).

- TRFMA has contributed about $2.1 million in sales tax funds for land acquisition, planning, and construction—less than 8% of the overall cost of restoration project implementation. In addition, TRFMA transferred through $4.775 million in State of Nevada grant funds to implement ecosystem restoration projects via Assembly Bill No. 5 (AB-5), passed by the Nevada State Legislature in 2007.
- Similar ecosystem restoration features are planned in the Truckee Meadows reach of the Flood Project. Future work may include a partnership with the Pyramid Lake Paiute Tribe to implement another Truckee River ecosystem restoration project at Wadsworth.

Lockwood & Rainbow Bend: Rainbow Bend is a small community on the south bank of the Truckee River in Storey County. The community is plagued by flooding from Long Valley Creek and to a lesser degree the Truckee River.

- To understand impacts of the Meadows Flood Project a detailed 2-dimensional model was developed by TRFMA. The model showed that the Project and the increase in peak flows could lead to some nuisance street flooding. A small wall/berm was proposed to prevent this problem. The floodwall will be pushed forward as mitigation when the Permit for Vista Narrows is obtained.
- Another major issue is flooding from Long Valley Creek which is not related to the Meadows Project. Long Valley Creek is a large watershed prone to flash flooding. TRFMA assisted Storey County in getting a grant from FEMA regarding a feasibility study on how to control or prevent flooding from the creek.

Wadsworth Bridge Mitigation: On the east bank of the Truckee River in the center of Wadsworth the Truckee River during floods breaks out of its bank during significant flood events. It often floods into a mobile home park and floods mobile homes and some other homes nearby. It also flows downstream and floods a quarry. Because of this known problem a detailed 2-dimensional model was commissioned to supplement other modeling that was done in the area.

- The Meadows Project increases in peak flow exacerbates the problem putting more water down the side channel. A preliminary design was commissioned to look at solutions including possible levee, floodwall, and a bridge replacement to see if this helps mitigate the problem. After an alternatives study, it was found that simply replacing the bridge mitigates the difference in flow levels between the existing conditions and flows with the new project.
- The TRFMA Board of Directors has authorized the Wadsworth Bridge Mitigation to move forward immediately without waiting for the Vista Narrows permitting. The project is in design and permitting and may be let out for construction later this year if permitting gets done.

Table L-5. TRFMA's Flood Project Plan (Local Rate Plan) Elements.*	
Element	**Element Description**
	Downtown Reno Reach (DR)
DR-1	Jones Street to Arlington Avenue Floodwall Construction
DR-2	Jones Street to Arlington Avenue Floodwall Drainage
DR-3	Jones Street and Keystone Avenue Intersection Improvements
DR-4	Booth Street Bridge Removal
DR-5	Pumping Station
DR-6	Pedestrian Safety Closure Structures
DR-7	Pedestrian Bridge Improvement (Arlington Avenue)
DR-8	Floodproofing (existing downtown Reno buildings)
DR-9	Arlington Avenue Bridge Protection
DR-10	Arlington Avenue to Lake Street Floodwall Replacement
DR-11	Sierra Street Bridge Replacement
DR-12	Virginia Street Bridge Replacement
DR-13	Center Street Bridge Replacement
DR-14	Lake Street Bridge Replacement
DR-15	Wells Avenue Pedestrian Bridge Improvements
DR-16	Wells Avenue Bank Stabilization and Bridge Protection
	Truckee Meadows Reach (TM)
TM-1	Reno-Sparks Indian Colony Levee and Floodwall Construction
TM-2	Grand Sierra Resort Floodwall Construction
TM-3	Glendale Avenue

Table L-5. TRFMA's Flood Project Plan (Local Rate Plan) Elements.*	
TM-4	Greg Street to Rock Boulevard Levee Construction
TM-5	Greg Street to Rock Boulevard Terracing
TM-6	Rock Boulevard Bridge Protection
TM-7	Rock Boulevard to McCarran Boulevard Levee Construction (South Bank)
TM-8	Rock Boulevard to McCarran Boulevard Terracing
TM-9	Rock Boulevard to McCarran Boulevard Levee and Floodwall Construction (North Bank)
TM-10	Pumping Station
TM-11	East McCarran Bridge Protection
TM-12	UNR Main Station Farm Facilities Protection
TM-13	McCarran Boulevard to Vista Boulevard Levee and Floodwall Construction
TM-14	Steamboat Creek Terracing
TM-15	North Truckee Drain Relocation (project phase I and II complete)
TM-16	Vista Narrows Terracing
TM-17	Hidden Valley Voluntary Home Elevation Program (program initiated)
TM-18	Eastside Subdivision and Rosewood Lakes Voluntary Home Elevation (program initiated)
TM-19	Mandatory Home Elevation Program (only if necessary; requires additional analysis)
Lower Truckee River Reach (LT)	
LT-1	Lockwood Ecosystem Restoration and Recreational Trailhead (project complete)
LT-2	Rainbow Bend Mitigation

Table L-5. TRFMA's Flood Project Plan (Local Rate Plan) Elements.*	
LT-3	Lower Mustang Ranch (project complete)
LT-4	Tracy Power Plant Ecosystem Restoration (project complete)
LT-5	102 Ranch Ecosystem Restoration
LT-6	Wadsworth Mitigation (additional analysis required)

*As of January 2017. For detailed descriptions for each project element listed in Table L-5, see the following "Truckee River Flood Management Authority; Flood Project Elements Along the Truckee River, Past, Present, and Future."

Truckee River Flood Management Authority

FLOOD PROJECT ELEMENTS ALONG THE TRUCKEE RIVER, PAST, PRESENT, AND FUTURE

Sparks Industrial Area shortly after January 1997 peak flood.

CONTENTS

1. Introduction to Truckee River Flood Management Authority

a. What is the Flood Management Authority

The Truckee River Flood Management Authority (TRFMA) is a joint effort among the cities of Reno and Sparks, Washoe County, and numerous other stakeholders to reduce the devastating impacts of flooding along the Truckee River in Washoe County, Nevada. TRFMA accomplishes this goal by planning, designing, and constructing flood impact reduction projects; maintaining existing flood infrastructure; providing information about flooding for planning and development; and providing logistical support to our first responders during actual flood events.

The purpose of this booklet is to introduce the Flood Project and show locations of possible flood protection project elements along the Truckee River. The Truckee River for the purposes of the project is divided into three reaches:

- The Downtown and West Reno Reach
- The Meadows Reach (From I 580 Bridge to Vista Narrows (East Sparks)
- The Downstream reach (Vista Narrows, (East Sparks) to Pyramid Lake)

In the past TRFMA wanted to complete a large-scale project in cooperation with the U.S. Army Corps of Engineers (USACE). This Corps project once had elements throughout the Reno Sparks area. In 2014 the USACE authorized the project, but the elements only consisted of projects in what we now call the Meadows Reach, and the scope was greatly reduced from previous plans. In 2019, the USACE rejected a locally preferred version of the project plan and TRFMA subsequently rejected the USACE project plan because it caused too much flooding in South Reno. Today the project and TRFMA is funded by 1/8 cent of the Washoe County Sales tax and from other miscellaneous sources including grants from the Federal Emergency Management Agency (FEMA).

b. Functions of the Flood Management Authority

As alluded to above, TRFMA does more than plan, design, and construct flood reduction projects. In addition, the Authority assists local governments in flood plain planning and development. Along these lines TRFMA recently funded a physical map revision of Floodplain Maps for the Federal Emergency Management Agency (FEMA). This will help future planners and developers to ensure that proper mitigation and design is done for structures being built in or near the floodplain. TRFMA also provides information such as hydraulic models and mapping for developers and engineers when they are planning and designing projects. TRFMA also assists with providing information to emergency responders during flooding events including information on the severity and extent of flooding to help them with prioritizing evacuations and other activities during a flood fight.

TRFMA Board of Directors has two elected representatives from Reno, Sparks and Washoe County. The Authority was formed in 2011 and was preceded by the Flood Project and various flood initiatives within Washoe County dating back to 1998 when the sales tax was passed. Past projects, many of which will be included in this booklet, include the purchase of 110 acres of floodplain land near Mill and McCarran Street, providing a portion of funding for the North Truckee Drain realignment and the Virginia Street bridge replacement as well as a flood wall and levee for the Reno Sparks Indian Colony downstream from I-580. In addition, TRFMA has worked with and provided part of the funding for numerous downstream restoration projects including Lockwood, Tracy, 102 Ranch and Mustang.

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2. Section 1 – Downtown and West Reno Reach

Overview of the Downtown and West Reno reach project elements

The Truckee River upstream of the I-580 Bridge (Figure 1) consists of a confined channel with a series of bridges, floodwalls, and berms crossing and confining the river. The project elements in this reach consist of both new flood protection projects as well as maintenance for existing infrastructure. Unlike the Meadows Flood Project downstream of the I-580 bridge, none of the elements have proposed dates when an element or sub project will be addressed. These project elements will be prioritized based on targeting (if there is a cooperative agency constructing a related project where the flood element can be added and built in a cooperative fashion). For instance, TRFMA provided significant funding for the rebuilding of the Virginia Street Bridge in this reach in 2015-16.

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Booth Street Area

- **Booth Street Bridge** is low to the to the water and gets inundated during high floods causing water to backup upstream.
- There is flooding along the north bank of the river with breakouts both upstream and downstream of the Booth Street Bridge.
- Conceptual plans and hydraulic studies have centered around raising the bridge, removing the bridge, and/or putting a floodwall or berm upstream of Booth Street.
- **Downstream from Bridge:** there was a conceptual plan for a large berm to be installed removing half of Riverside Drive as well as most trees along the river. That plan has been scrapped and instead a low berm is now proposed along the river that only gives partial protection up to perhaps only 14,000 cfs instead of a full 20,500 cfs flood but allowing the river and the neighborhood to still remain connected to the river.

Looking Upstream from Booth St. Bridge

Booth Street Bridge - Looking West

- **Upstream of the Bridge** a small berm or flood wall may be installed to about 1,500 feet upstream (see map next page). The bridge ramp on the north side will tie in to the upstream as well as downstream berm or floodwall.

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Booth Street Area Map

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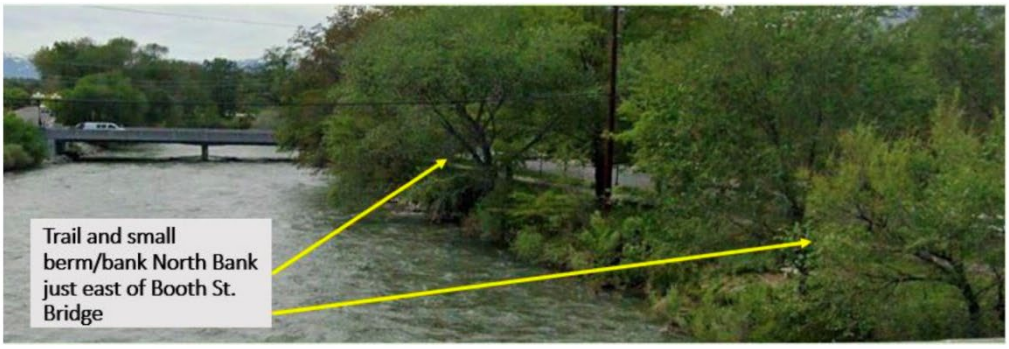
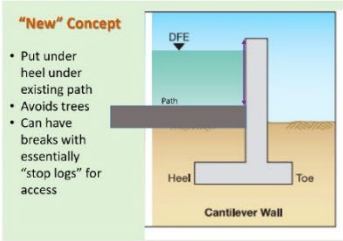
Booth to Arlington



- Along Riverside Drive there is a natural or small manmade berm that keeps water from overtopping into the neighborhood just north of the bank until around 11,000 cfs which unfortunately is a common flood event.
- Previously plans were drawn up to create a large levee/berm that would take out most the road in foreground and make it one way and remove most the trees pictured. The alternative being advocated here is to protect the river from smaller more frequent floods but not have the large, tall walls necessary to fully protect the river to the 100-year flood.
- This low floodwall will allow almost all trees to remain and will not be so intrusive to the river view and trail.
- The final height of the small wall will be determined in design after full community input.
- Closer to Arlington there is an existing floodwall that will be replaced and made slightly higher to protect to a higher flood level but not 100-year flood level.



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Booth to Arlington Map

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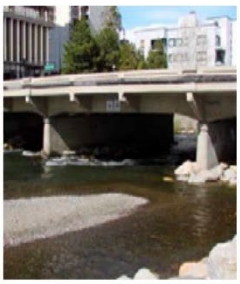
Arlington Area

- This area has floodwalls on both banks and on the island as well.
- There are several bridges including the North and South Arlington Bridge and walking bridges.
- Previous renditions of these map books discussed replacing the bridge to have freeboard during a 100-year flood event. The current standard is that new bridges are to be built to an elevation that will not degrade hydraulic conditions.
- TRFMA's role is to provide advice and hydraulic models and data on river hydraulic conditions for redesign/rebuild that Regional Transportation Commission (RTC) is undergoing for Bridges.
- There are also numerous floodwalls (see picture below and to the right). TRFMA may assist technically or even financially in the future depending on the timing and situation of the improvement.



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Arlington Area Map

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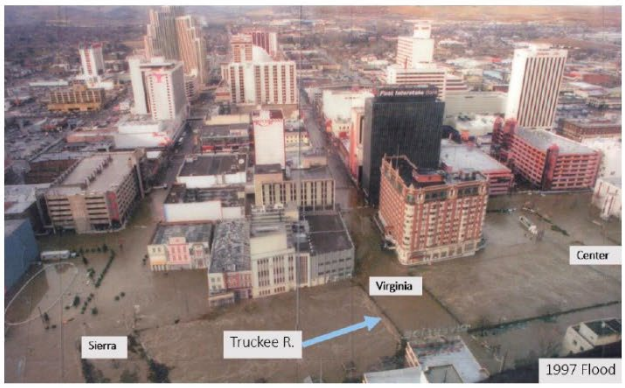
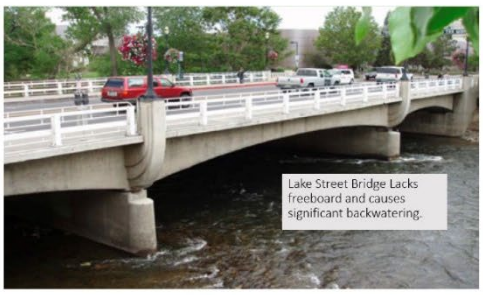
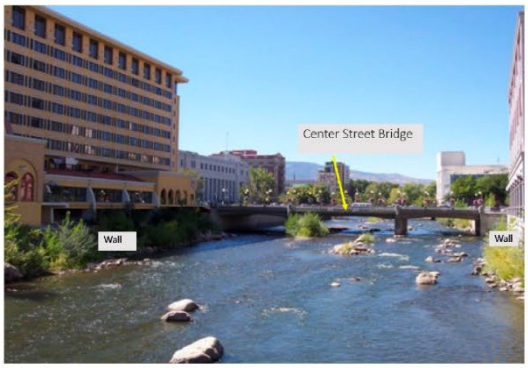
Sierra to Lake Street Bridges Reach

- This reach includes the Sierra Street, Virginia Street, Center Street and Lake Street Bridges.
- The area is very tight to the river, and this can cause flooding into large buildings.
- Virginia Street Bridge was replaced in 2016.
- Sierra Street Bridge is under design for replacement by RTC.
- Except for Lake Street in the future and Virginia Street in the past, TRFMA's role is to advise and provide models and data to aid in design.
- There are numerous flood walls and TRFMA may, depending on timing and circumstances, help with wall replacement projects as a cooperating agency.







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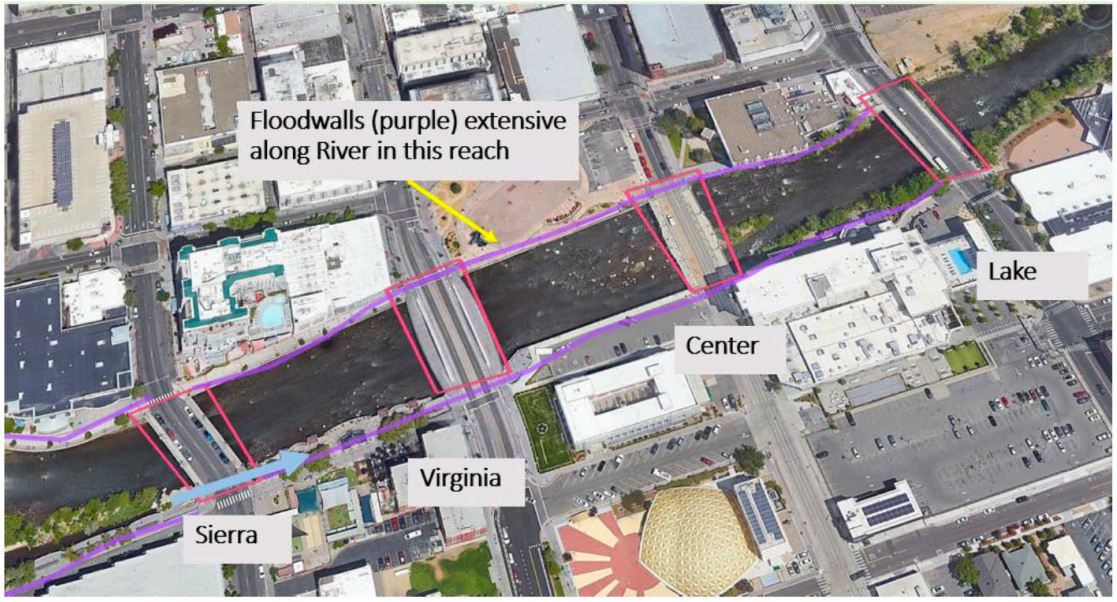
Sierra to Lake Street Bridge Reach



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Lake Street to I-580

- From Lake Street to I- 580 the river is less constrained but there are still buildings near the river.
- Past plans have had several areas as candidates for random bank stability projects, but subsequent evaluation has found no specific needs.
- The only major project slated in this reach is the removal of the old Wells Bridge underneath the Wells Ave overpass. The Bridge is extremely low to the river and backs up water.
- Previous plans also had a pedestrian bridge to replace the old Wells Bridge however, the property on the north bank has changed ownership and there is no push to remove the Wells underpass Bridge, so a new pedestrian bridge is not a priority at this time.

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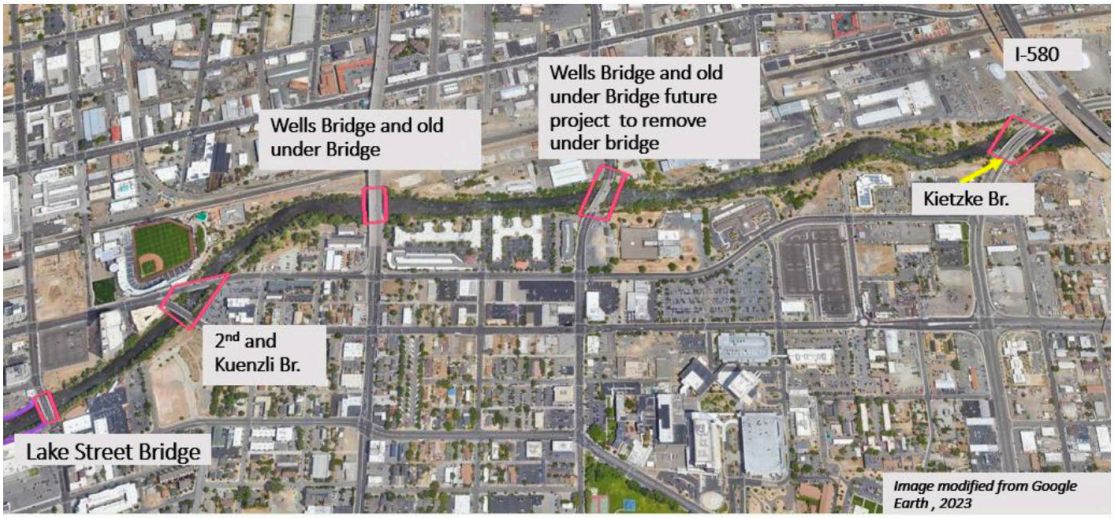
Lake Street Bridge to I-580



Section 2 - The Meadows Reach and Project

The Meadows Flood Project extends from I-580 down to Vista Narrows east of Sparks. This project includes levee, floodwalls, berms, terracing, bank stability, and stream and riparian restoration activities. The Meadows Flood Project can be broken into phases or segments which include:

1. The Reno Sparks Indian Colony Levee and Floodwall – **Completed in 2009**
2. Grand Sierra Resort – Berm and Levee (planned construction 2024-25)
3. Truckee Meadows Water Authority Levee (planned construction 2026)
4. Reno Tahoe International Airport Berm and terracing (planned construction 2024-25)
5. Additional Levee Work North Bank Glendale to Rock (planned construction 2026)
6. Mill/McCarran Levees, Terracing, Channel and Riparian Restoration (planned construction 2027-28)
7. North Levee and Flood Wall – McCarran to Vista (planned construction 2029-30)
8. Vista Narrows Floodplain Terracing (**in permitting** planned construction 2024 and/or 2025)

This plan has many similarities to what was called the "Locally Preferred Plan" (LPP) that was proposed to the USACE as part of the the 2014 authorization of the project. The LPP differed from the USACE chosen plan called the National Economic Development (NED) Plan in that it opened up Vista Narrows slightly in order to not cause greater induced flooding along Steamboat Creek and South of the River. It also had slightly greater proection (higher walls and levees) and other minor differences. The USACE rejected the LPP mostly due to tribal concerns. TRFMA rejected the NED plan because the mitigation for induced flooding that it would cause without opening Vista Narrows is estimated to cost over 300 million dollars and would be a cost solely borne by local authorities that far outweighs the Corps match contribution of 160 million dollar maximum. In response the Meadows Plan was developed. The Truckee Meadows Plan differs in the following ways from the previous LPP plan:

1. It shifts from floodwalls to a berm and levee at the Grand Sierra Resort (GSR). Floodwalls typically cost about twice as much to construct as a levee and also become graffiti magnets and eyesores. In addition, we are working with GSR on easement and cost share agreements that may also reduce costs further.
2. It shifts the TMWA floodwall to levees reducing costs and additional easement agreements may also significantly reduce costs.
3. It shifts the levee at the airport to a berm which is necessary for flight safety and also reduces costs. We have also discussed easements and cost share to further reduce costs.
4. It may add some levee or floodwall to north bank between the TMWA levee and Rock Park. There seems to be a vulnerability there that was not picked up in earlier analyses.
5. It shifts focus from floodwall to levee on the north bank for the Mill/McCarran part of project. In order to do this, the river itself may need to moved. This allows for the opportunity to conduct channel restoration and enhance spawning and rearing habitat for fish in this area. This zone also includes extensive terracing and riparian restoration as it did in the original Living River Plan.
6. Where possible the North Floodwall and Levee from McCarran to Vista will focus on installing levee over floodwalls. Earlier versions had this almost exclusively floodwall. Details on this section have not been worked out in design as others, but savings in using a levee vs. a floodwall can reduce cost by half.

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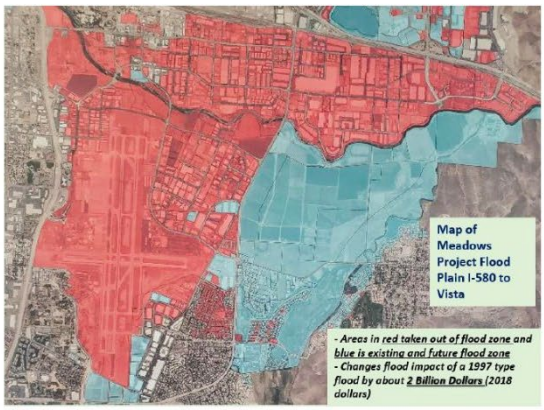
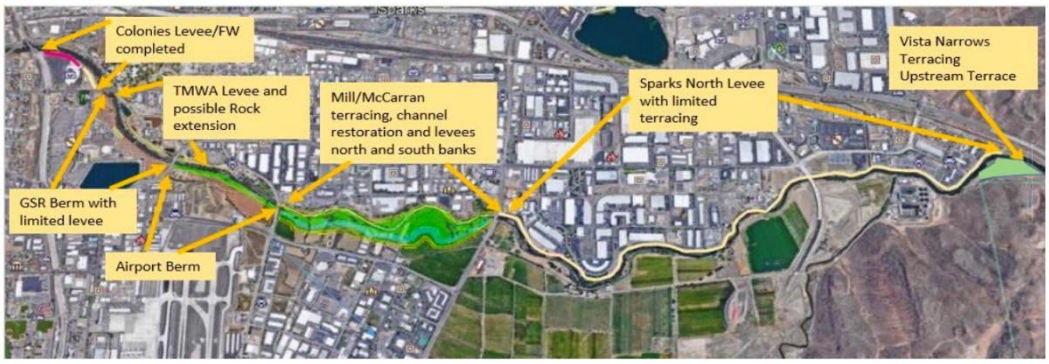
Why the Meadows Project and how much will it cost.

- The cost to complete the Meadows Project **was estimated to be $185 million in 2021.**
- Each component of this project has a cost estimate with the accuracy of the estimates varying. For instance, there are detailed estimates for the Vista Narrows portion of the study vs. rough estimates of cost for the North Levee and Floodwall.
- One reason for the Meadows Project is it has tremendous benefit from reducing flooding vs. cost of implementation. See the area in red which represents areas taken out of the flood zone and note all the infrastructure and buildings present.
- In an evaluation done in 2021, the Meadows Project in its entirety (not just cost to complete) has a beneficial cost ratio near $1.6 and over $10 million per year in net economic benefit.
- In terms of "cost to complete," benefit cost ratio and annual net economic benefit are even greater.



Map of Meadows Reach



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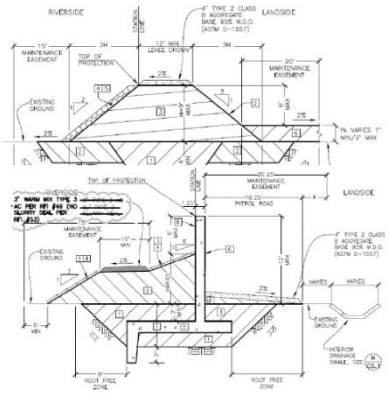
RISC Levee and Floodwall (I-580 to Glendale)

- The Reno Sparks Indian Colony Levee and Floodwall project represents nearly one-half mile (2,240 feet) of levee and floodwall.
- The levee section is approximately 1,170 feet while the floodwall was 1,070 feet.
- The height of the floodwall is of moderate height due to the low nature of the river at this location with an above ground elevation of 12' and a total of over 21 feet when considering the below ground portion.
- The levee is also of moderate height of 9' above grade with a 6-foot deep keyway below.
- Another reason for the heights chosen is they were designed to resist the 1997 flood which is greater than a 100-year event plus there is considerable freeboard.
- The average costs for the levee were $1,294 per lineal foot while the floodwall was over $2,360 per lineal foot. The overall cost for the project was shared between Walmart, the Reno Sparks Indian Colony along with the Flood Project. This cooperation reduced costs.
- The project cost $5.8 million and was shared between the Flood Project ($1.72 million), Walmart ($2.28 million) and the Reno-Sparks Indian Colony ($1.7 million in land value).
- The project features a meandering trail along the river side that can be used for recreation. (Picture to the right)



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RSIC Levee and Floodwall (I-580 to Glendale)

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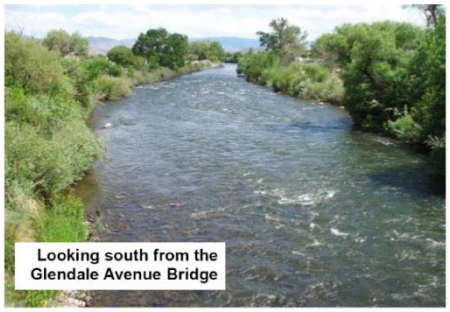
Grand Sierra Resort Berm and Levee (Glendale Ave. to Greg St. Bridge)


Looking south from the Glendale Avenue Bridge

- The Grand Sierra Resort (GSR) Berm and Levee Project has been converted from a floodwall to a berm and levee after discussions between GSR and TRFMA staff.
- The berm allows for a gradual outslope that better connects the GSR with the river.
- The upstream part of the berm consitst of approximately 45,000 cubic yards of material with a cost of of 1.35 million in 2021 dollars.
- The downstream levee across from the pond is larger and involves about 52,000 cubic yards of material with a cost of 1.56 million in 2021 dollars.
- The GSR levee is in a narrow area between the two berms and requires about 7-8 feet of gain in elevation.
- The Levee Section in this estimate is 350 feet long with an estimated cost of $700,000.
- There is another narrow area between pond and River that may require a short levee section.
- The berms will be compacted and paved back over or used for other needs.
- Much of the current berm area has been used for parking.

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GSR Levee (Glendale to Greg Street)

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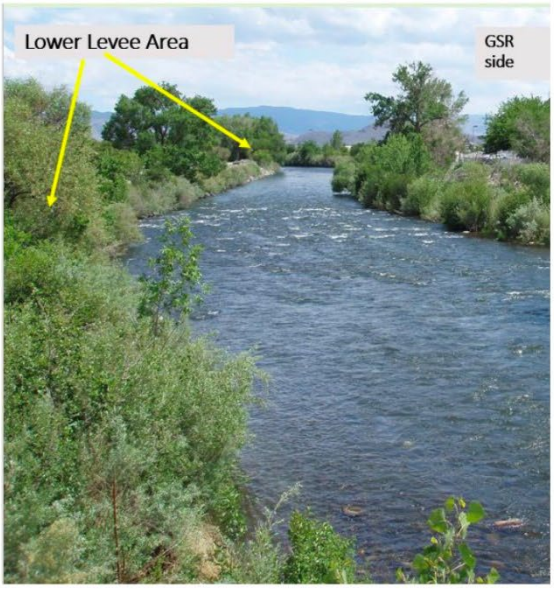
TMWA (Truckee Meadows Water Authority) Setback Levee

- This was proposed as a wall in the 2016 version of the mapbook and in the latest revision of the LPP.
- After on field discussion between TRFMA staff and in discussion with TMWA staff this was changed back to a set back levee in one section and a regular levee downstream.
- The reason for this change is the area that needed the wall the most was where the setback section was.
- There appeared to be plenty of room for a levee considering the needed elevation gains were less than 10 feet and in some cased only 5 feet.
- The length of the levee is approixmatley 3000 feet with a cost estimate of 4.5 million in 2021 dollars.
- In discussion it was apparent we could get help with access if we would help TMWA with fencing and security measures which would drive down the cost.



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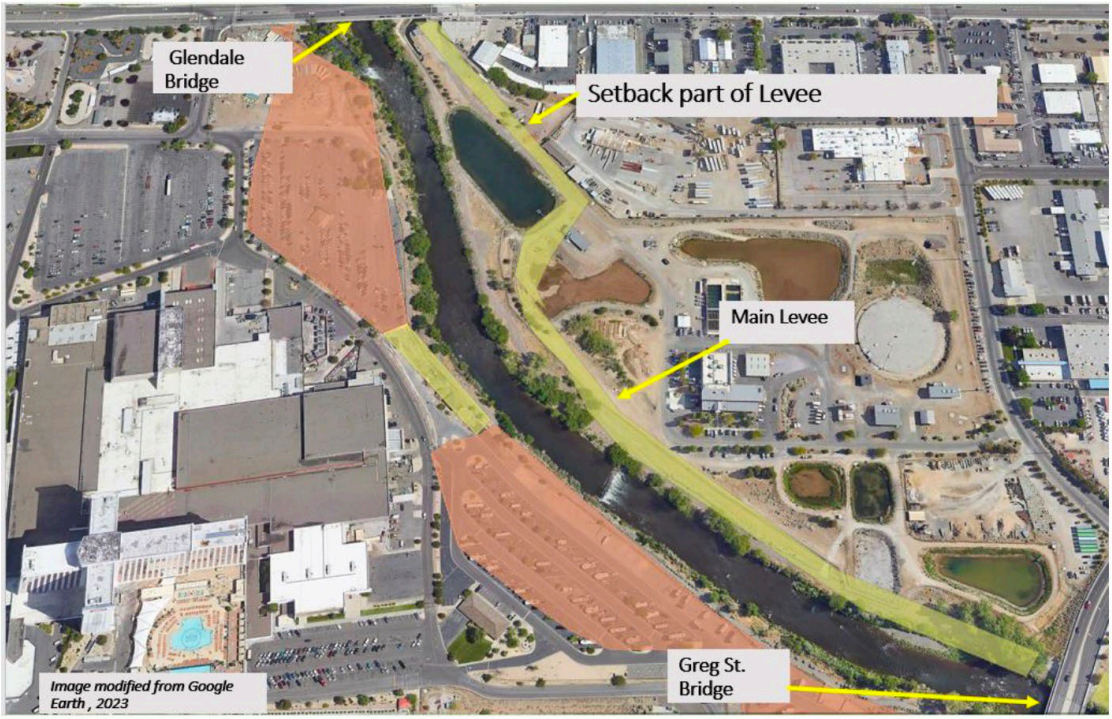
TMWA (Truckee Meadows Water Authority) Levee



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Reno International Airport Berm

- The Reno International Airport Berm is an alternative to the earlier idea of a Levee.
- Levees represent an abrupt obstacle to landing aircraft.
- Berms can be more gradual but need to be wider.
- The amount of elevation gains necessary averages between zero and eight feet in this area to protect from a 100-year flood.
- The estimated fill would be approximately 90,000 cubic yards but may be lower when more detailed design done.
- At a cost of $30 per yard (brought from Vista Narrows excavation) this would add up to 2.7 million in 2021 dollars.
- This project also has some considerable terracing with a cost of close to 2.4 million in 2021 dollars.
- Plant species used for terrace need to be low growing because of aircraft safety concerns.

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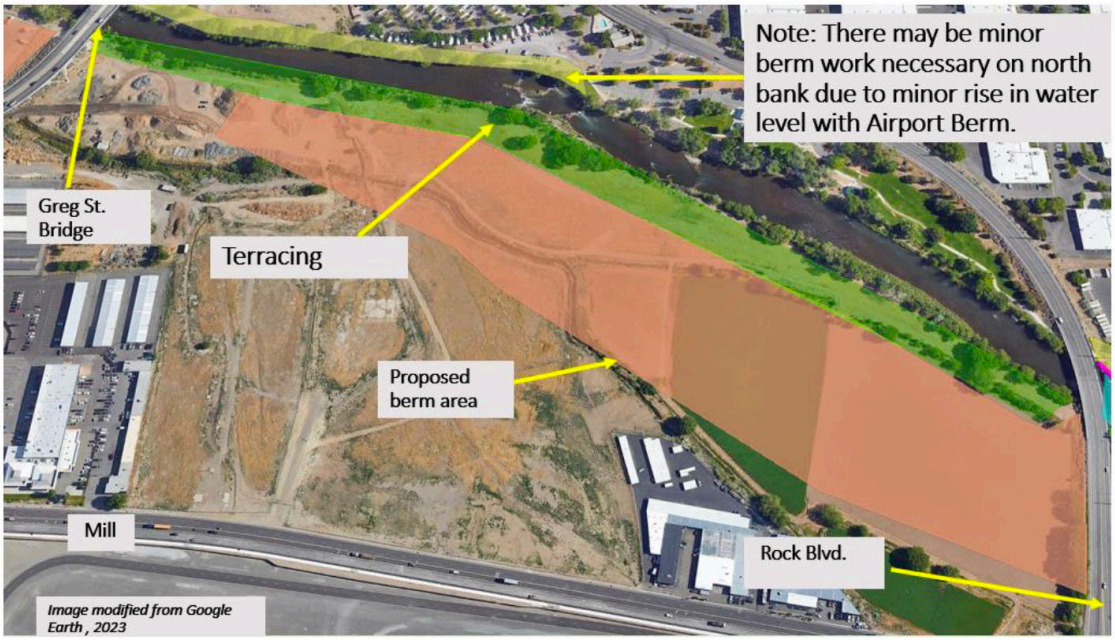
Airport Berm and Terracing (Greg to Rock Blvd. Bridges)



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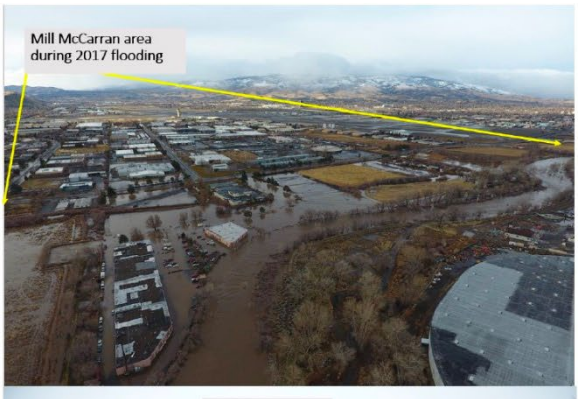

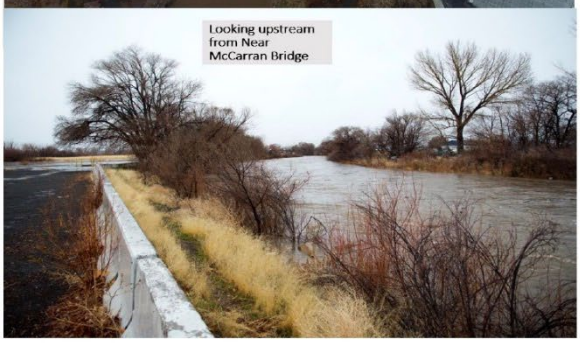

Mill/McCarran Levees and Terracing

- The Mill/McCarran Properties represents by far the largest investment by the Flood Authority.
- The overall investment so far is over $48 million for 110 acres of land along the river. There is also a remaining piece of property that may need to be acquired.
- There is over 1.2 miles of river frontage along the south side of the river along this property.
- Past plans called for mostly a floodwall on the north bank of the river and a levee on the south with considerable terracing.
- The new concepts call for moving the river, providing **restoration instream as well as terracing and riparian restoration** and the use of levees exclusively. This may attract outside funding.
- The current cost estimate for construction of the three (North, South, Intermediate South) levees is $20.4 million.
- The terracing and river restoration will have an approximate construction cost of near $20 million.
- The outcome will be a fully protected area for the North and South Industrial areas and the Reno Tahoe International Airport.
- In addition, this area will be ideal for both a nature and conventual park post construction. There will be grading and construction to help facilitate various forms of recreation. We anticipate transferring this area to Reno Parks or another regional park authority for recreational management.
- When all work is said and done the total investment of this stretch may reach nearly $100 million dollars.
- We hope to start design work this fall (if Vista Narrows portion of project receives permitting.

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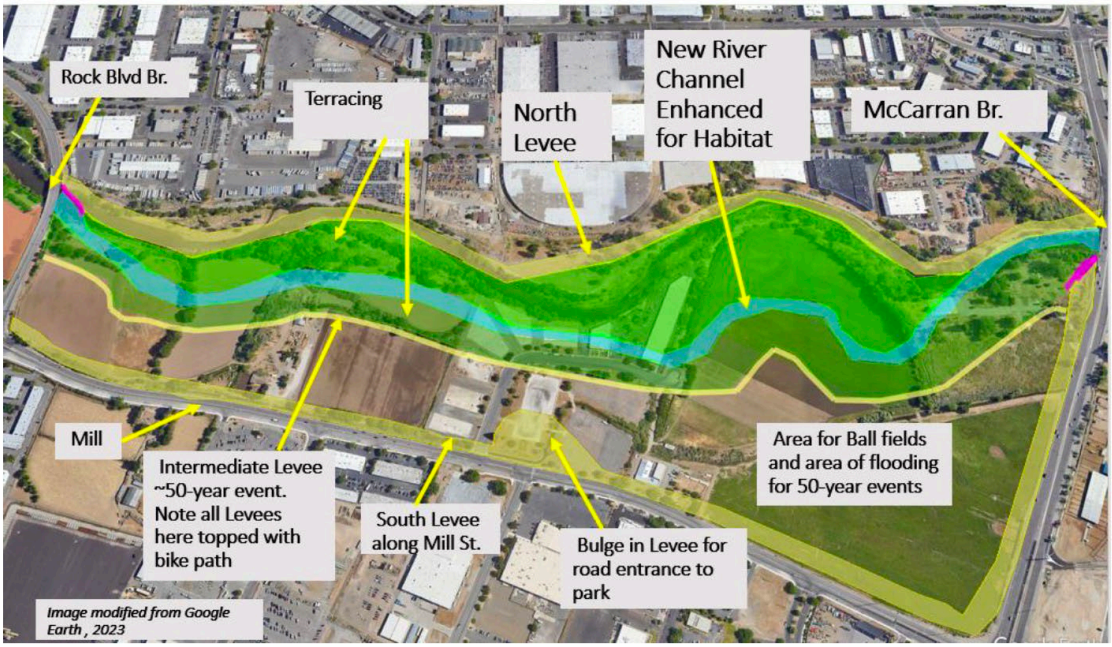
Mill/McCarran Levees and Terracing (from Rock Blvd Bridge to McCarran Blvd Bridge)



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North Bank Levee and Floodwall (McCarran Bridge to East Edge of Sparks Industrial Area)

- The North Bank Levee and floodwall stretches almost 3.2 miles from the McCarran Bridge downstream to Vista.
- Past plans have had this stretch at about 70% floodwall.
- Going forward TRFMA staff is looking at working with stakeholders and creating plans to make most if not all of this levee.
- Using levee vs floodwall should reduce costs, avoid seepage problems, and allow for bike paths to be put on top of levee.
- The total cost for this based on 16,600 feet of Levee is $33 .2 million in 2021 dollars.
- This part of project is the least studied and researched so cost data is most unsure.
- The North Truckee Drain's outlet is along this stretch and represents a completed project, partially funded by TRFMA.
- In past map books, there was random erosion protection and some terracing on Steamboat Creek.
- Those two activities have been eliminated from the Meadows Plan due to mecury concerns on Steamboat Creek and no demonstrated need shown for bank armoring at locations specified.

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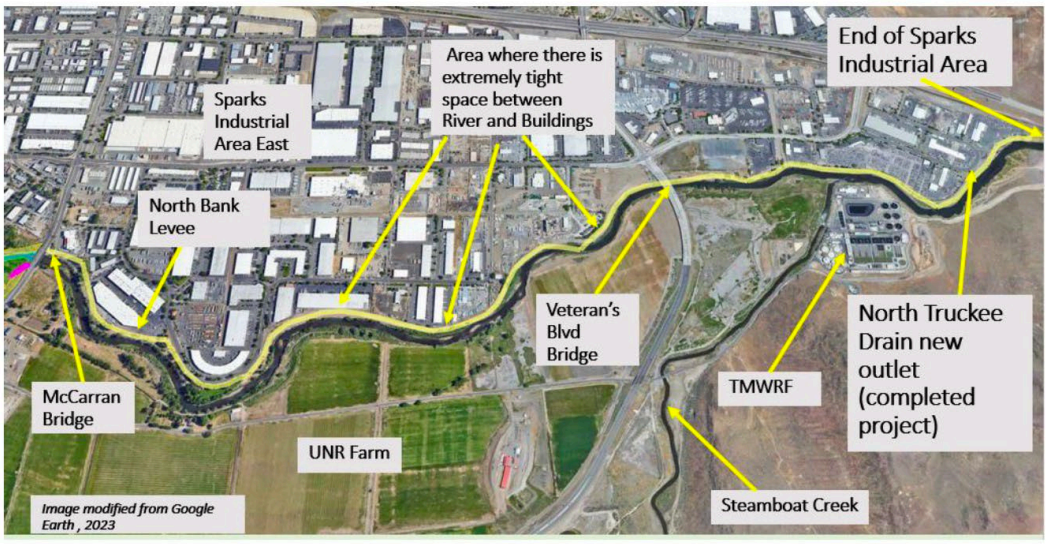
North Bank Levee and Floodwall (McCarran Bridge to East Edge of Sparks Industrial Area)



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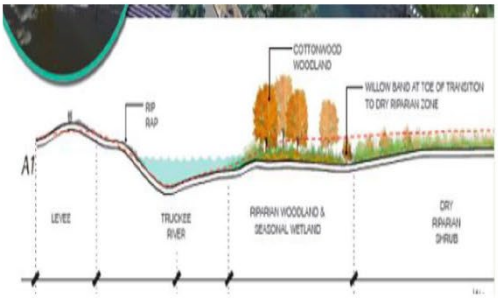
Vista Narrows

- The Vista Narrows Floodplain terracing project as currently proposed, consists of Floodplain terracing at 3 locations just East of Sparks Nevada on the Truckee River, areas in green in river terrace areas map on next page.
- Vista Narrows is key to the entire Truckee Meadows Project as it lowers water levels caused by other elements of the Meadows Project.
- It provides the water level lowering that allows for the project to be built while avoiding expensive mitigation in South Reno.
- It does increase peak flows downstream on the order of 730 cfs because of the opening up of the narrows which prevents some of the backwatering into South Reno and UNR farms.
- The larger Truckee Meadows Project which eliminates flood storage in industrial areas and the airport increases peak flows by another 1,669 cfs.
- This creates an increase of approximately 2,400 cfs peak flow increase.
- We have been in discussions with stakeholders downstream about mitigation because of these increased flows.
- It appears there are several projects in and around Wadsworth that may be useful for mitigation.
- We have also discussed this matter with Storey County and have a mitigation project planned for the Lockwood area.
- The cost for the terracing is approximately $42 million in 2021 dollars.
- Costs for downstream mitigation have not been fully worked out yet.
- These terraces are on both sides of the River and are a total of 8,600 feet long. They create low floodplain and wetlands that provide flow conveyance.
- The terracing occurs just above the ordinary high water mark so that the river itself is only marginally impacted along the banks. Because of the height of the banks this means approximately 450,000 cubic yards of materials are to be removed. Note: the redline denotes the old bank height.



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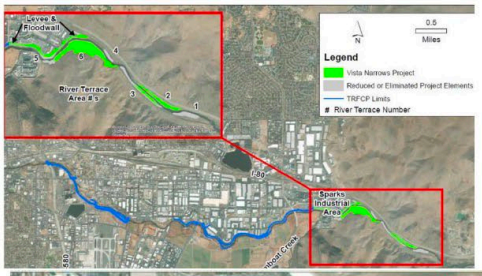
Vista Narrows (East Sparks down the Truckee River Canyon ~ 2 miles)



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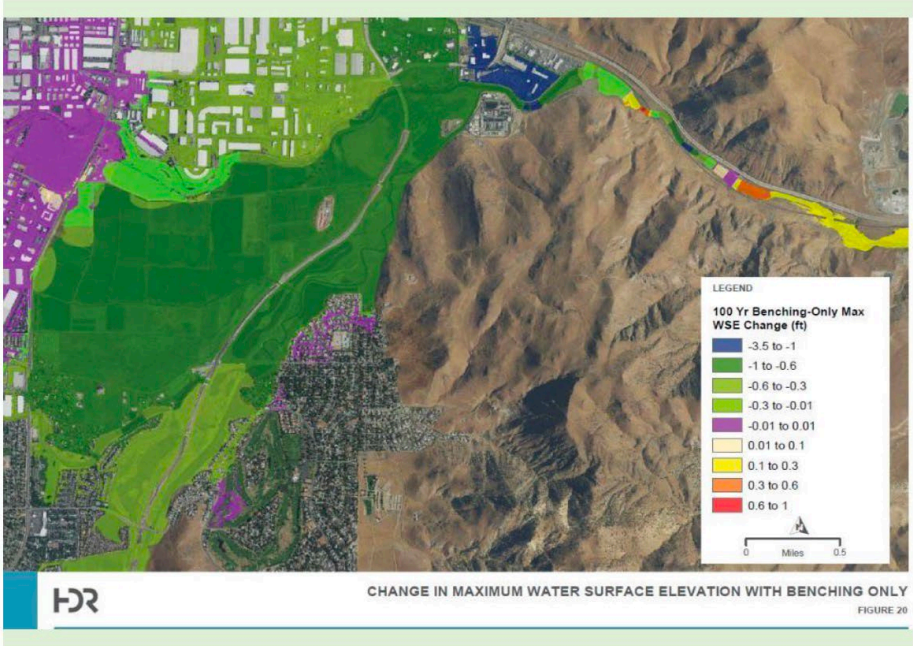
Why Vista Narrows? How Vista Reduces water levels (without cumulative effect of full Meadows Flood project)



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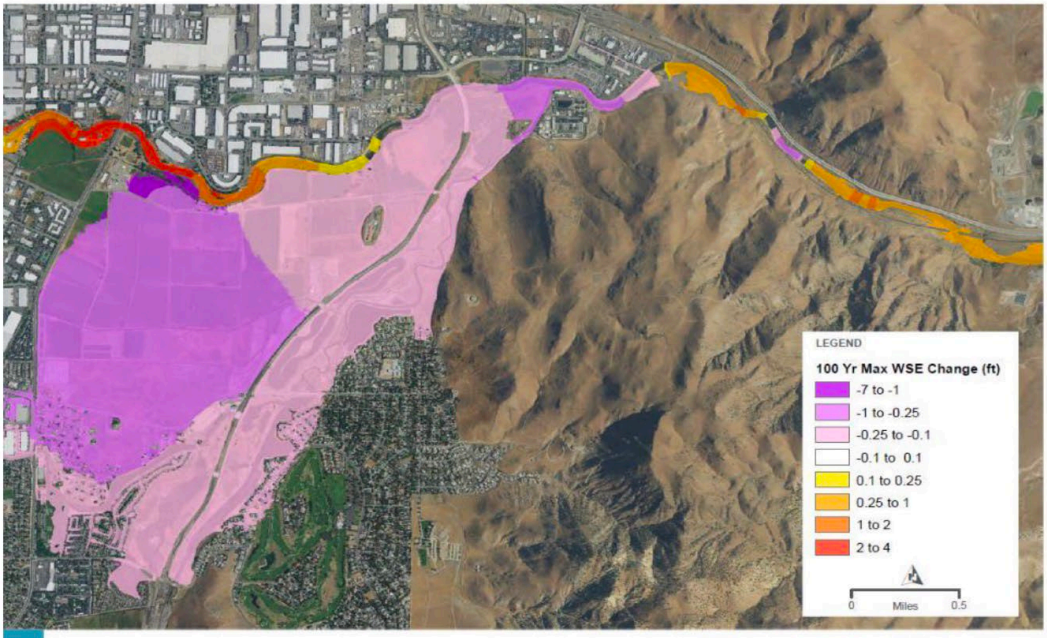
Why Vista Narrows? How Vista Reduces water levels (with full project build out)



CHANGE IN MAXIMUM WATER SURFACE ELEVATION

FIGURE 18

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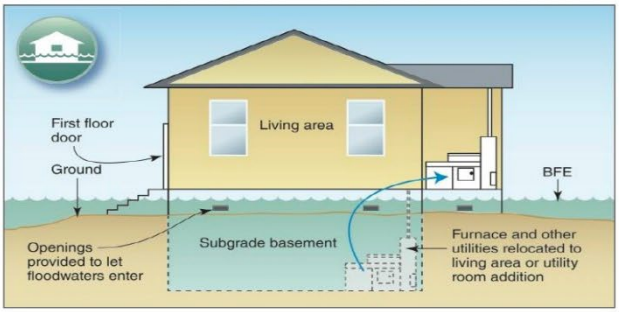
Voluntary Home Elevation for the Steamboat Creek Tributary (Eastside Subdivision, Hidden Valley, and Rosewood Lakes Area)

- There are three primary areas that qualify for the home elevation program**: 1. Eastside subdivision, 2. Rosewood Lakes, and parts of 3. Hidden Valley Estates**.
- **Not all homes in these subdivisions qualify for the program.**
- Home elevation only makes sense when the costs of other mitigation methods is prohibitive such as when the number of homes protected is not enough to warrant a community flood wall or levee.
- It also can make sense when the cost to buy out and set aside is too great.
- The current program if in and qualified for a FEMA grant allows the homeowner to get significant home benefit without having to pay income tax.
- FEMA pays 50-90% of base costs and TRFMA pays the remaining match.
- Currently four homes have been completed since the inception of the program in 2011.
- The program has delays in getting grants, difficulty in finding qualified engineers and subcontractors.



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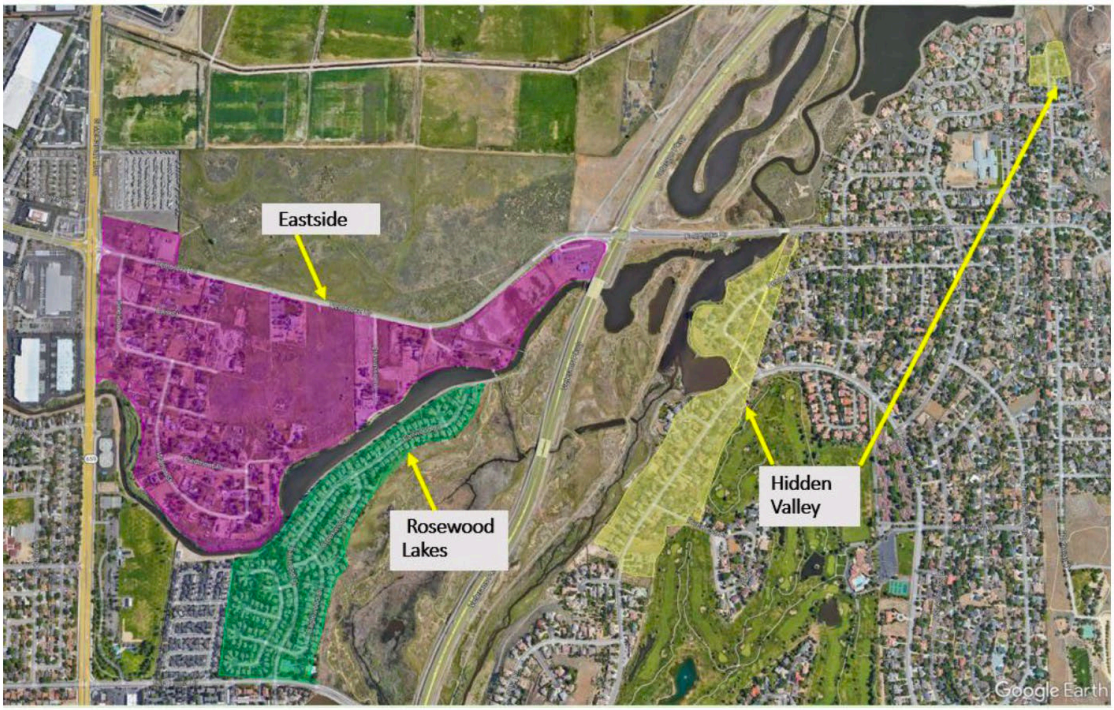
Where is the home elevation program:



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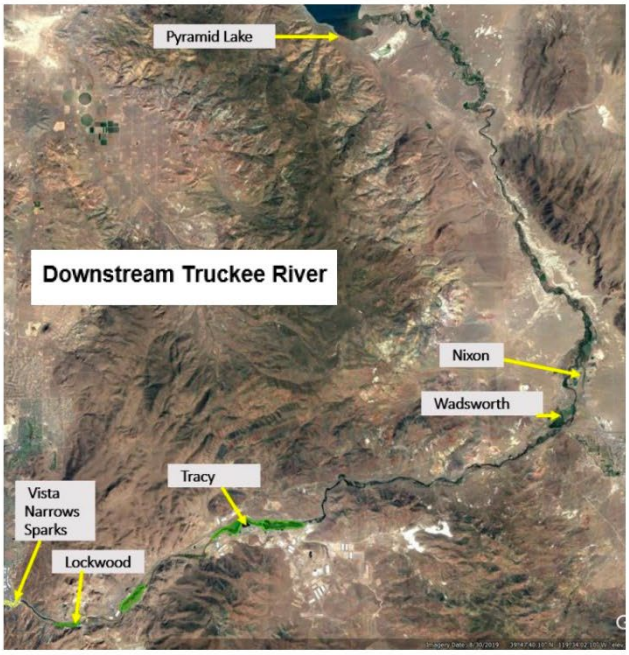
4. Section 3 – Truckee River Downstream Reach Restoration and Mitigation Projects

Goals for the Downstream Reach

- The aim of TRFMA with the downstream reach is that any effects from the Meadows Flood Project are fully mitigated. That is the residents and habitat along the river are at least as well off as they were before the project started. This means all possible impacts of the Meadows Flood Project need to be minimized and mitigated.
- Minimization of impacts include ensuring that whatever actions taken are warranted and other alternatives were explored.
- Mitigation of impacts mean studying possible impacts in detail and then designing ways to take away the negative effects without expense to the downstream stakeholders.
- The Meadows Project increases peak flow during 100-year and to a lesser degree 50-year events on the Truckee River at Vista. The idea is to study these increases to evaluate what possible impacts are and then propose mitigation for any that may be significant.
- Mitigation in the downstream reach may consist of restoration projects such as floodplain restoration that can in some cases lower peak flows at least minimally.
- Mitigation also consists of traditional protection such as levees, floodwalls, and flood proofing vulnerable infrastructure.
- Other mitigation options include restoring fish passage along the lower reach of the Truckee.



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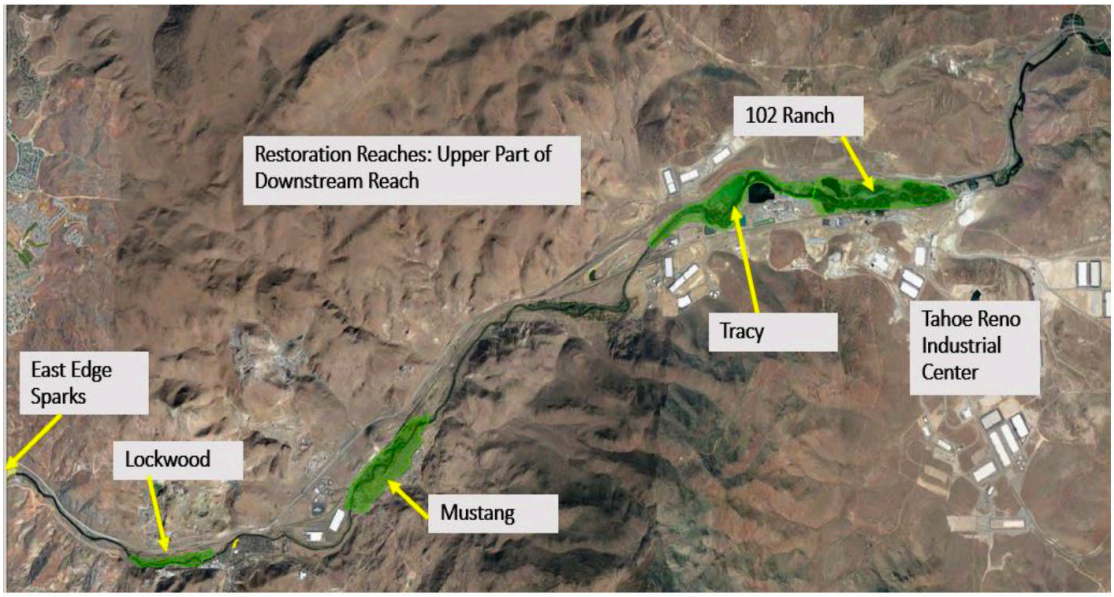
Upper Section of Downstream Reach (Restoration Sites TRFMA has partnered with other entities)



Ecosystem Restoration Projects

- Ecosystem restoration is a series of actions taken to reestablish the general structure, function, and dynamic but self-sustaining behavior of the ecosystem.
- The primary purpose of riverine ecosystem restoration projects is to restore the physical and biological functions of the river channel and floodplains; thereby improving water quality and enhancing habitat for native species of fish and wildlife.
- Other benefits include flood attenuation, decreased risk of developed property damage (floodplain preservation), riverbank stability, sediment retention (water quality improvement).
- The community's vision for the Truckee River Flood Project is to achieve flood protection goals through a combination of set-back levees, floodwalls, river terracing, bridge replacements, floodplain land acquisitions, instream and riparian restoration, and urban parkways.
- The Truckee River Flood Management Authority (TRFMA) is working with many other agencies and entities to restore the lower Truckee River, starting near Vista Narrows just east of Sparks, downstream all the way to Wadsworth, Nevada.

Before & after ecosystem restoration. (Photo courtesy of The Nature Conservancy)

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- Several high-priority restoration projects have already been completed: **1. Lockwood, 2. Lower Mustang Ranch, 3. Tracy Power Plant, and 4. 102 Ranch** (total of 8 miles of river restoration and 450 acres of habitat created in/along the river).
- Monitoring is ongoing to ensure the projects are functioning as designed.
- Similar ecosystem restoration features are planned in the Truckee Meadows reach of the Flood Project.
- Future work may include a partnership with the Pyramid Lake Paiute Tribe to implement another Truckee River ecosystem restoration project at Wadsworth.
- TRFMA has partnered with The Nature Conservancy and numerous other local, state, and federal agencies and non-profit organizations to restore the lower Truckee River ecosystem (from Vista to Pyramid Lake). Partners include US Fish & Wildlife, US Bureau of Land Management, Nevada Division of Environmental Protection, Washoe County, City of Reno, City of Sparks, Pyramid Lake Paiute Tribe
- To date, the partners have invested more than $28 million to create more than 450 acres of habitat and restore more than 8 miles of the lower Truckee River. An estimated 216 jobs were created because of this work (full-time equivalents).
- The agency has contributed about $2.1 million in sales tax funds for land acquisition, planning, and construction—less than 8% of the overall cost of restoration project implementation.
- In addition, TRFMA transferred through $4.775 million in State of Nevada grant funds to implement ecosystem restoration projects via Assembly Bill No. 5 (AB-5), passed by the Nevada State Legislature in 2007.

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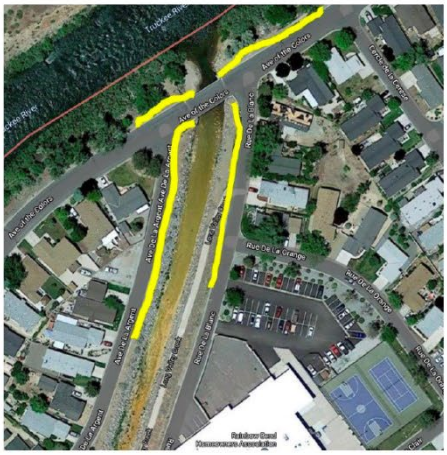
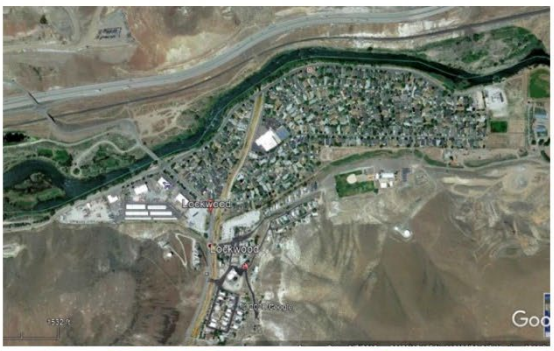
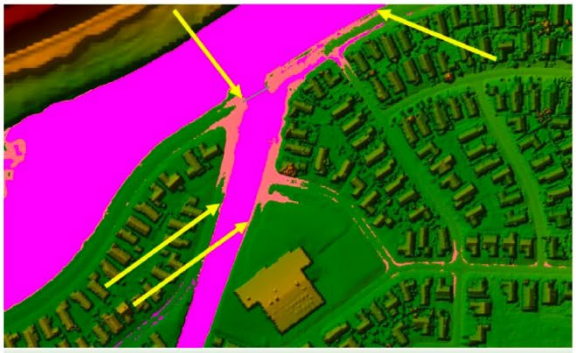
Lockwood and Rainbow Bend

- Rainbow Bend is a small community on the south bank of the Truckee River in Storey County.
- The community is plagued by flooding from Long Valley Creek and to a lesser degree the Truckee River.
- To understand impacts of the Meadows Flood Project a detailed 2-dimensional model was developed.
- The model showed that the Project and the increase in peak flows could lead to some nuisance street flooding.
- A small wall/berm was proposed to prevent this problem. (See area in yellow).







Extent of needed barrier wall or floodwall/levee for 97 event with flow increases has decreased.

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Rainbow Bend Possible Solution:

- The solution was a small floodwall on the order of 8-20 inches high depending on location.
- The flood wall had a very limited extent.
- In some locations it transitioned to a small berm to allow people to get over it in a wheelchair or bike.
- The idea was it to be small and decorative.
- The floodwall will be pushed forward as mitigation when the Permit for Vista Narrows is obtained.
- Another major issue is flooding from Long Valley Creek which is not related to the Meadows Project.
- Long Valley Creek is a large watershed prone to flash flooding (see picture below).
- TRFMA assisted Storey County in getting a grant from FEMA regarding a feasibilty study on how to control or prevent flooding from the creek.

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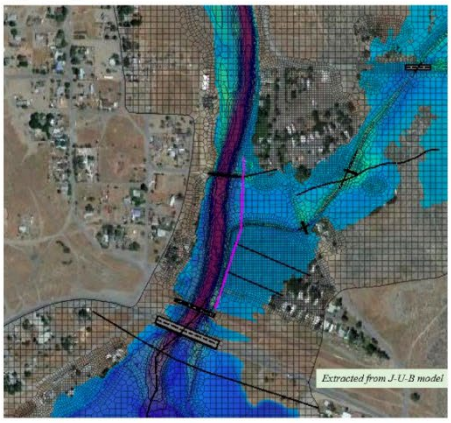
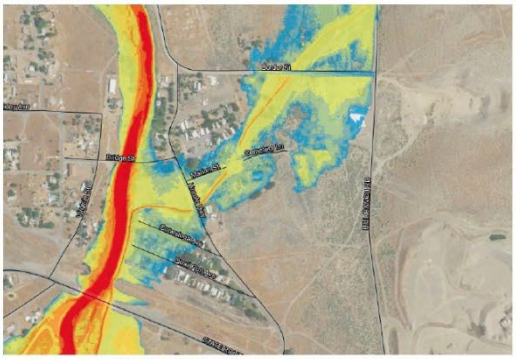
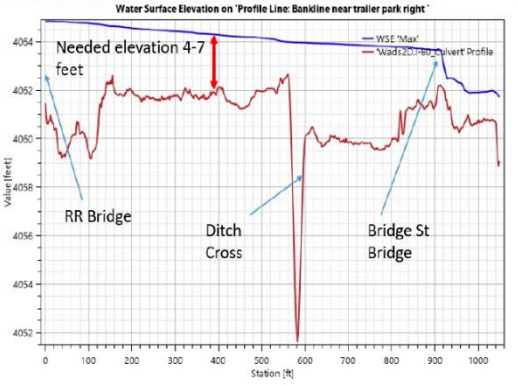
Wadsworth Bridge Mitigation (currently ongoing project)

- On the east bank of the Truckee River in the center of Wadsworth the Truckee River during floods breaks out of its bank during significant flood events.
- It often floods into a mobile home park and floods mobile homes and some other homes nearby.
- It also flows downstream and floods a quarry.
- Because of this known problem a detailed 2-dimensional model was commissioned to supplement other modeling that was done in the area.
- The Meadows Project increases in peak flow exacerbates the problem putting more water down the side channel.
- A preliminary design was commisioned to look at solutions including possible levee, floodwall and a bridge replacement to see if this helps mitigate the problem.







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Wadsworth Bridge Mitigation (currently ongoing project)

- After an alternatives study, it was found that simply replacing the bridge mitigates the difference in flow levels between the existing conditions and flows with the new project.
- The old pedestrian bridge was also in bad shape, and it seems like several stakeholders were pleased with the idea of replacing the bridge. (See picture immediate right)
- The TRFMA Board of Directors has authorized the Wadsworth Bridge Mitigation to move forward immediately without waiting for the Vista Narrows permitting.
- One type of bridge being looked at are the metal bridges with wood floorboards and an arch such as the one below and to the right that is located just downstream from Mayberry Drive in Reno across the Truckee River.
- The project is in design and permitting and may be let out for construction later this year if permitting gets done.

L.3.3 Carson Water Subconservancy District

The following list is an overview of work conducted by CWSD, as of 2020, from the CRS Annual Report. Other CWSD projects are listed in Table L-6.

1. CWSD staff planned and facilitated monthly CWSD Board meetings and periodic CWSD Committee meetings, all of which met open meeting law requirements.
2. CWSD staff followed various water issues and concerns at local, regional, and state water meetings and communicated them to the CWSD Board of Directors.
3. CWSD staff made annual presentations to county, city, and water purveyor boards updating each board on work accomplished and current projects, programs, and studies in the Carson River Watershed.
4. CWSD's General Manager served on the Carson Truckee Water Conservancy District Board of Directors & the Nevada Water Resource Association Board of Directors.
5. CWSD published an updated "2020 CWSD Overview" video.
6. CWSD is following up on the spectacular "I am Carson River Watershed" video with a Community Drinking Water PSA video featuring voices of the local community. This new PSA will be available in early 2021.
7. CWSD applied for and were awarded three federal grants: one from Federal Emergency Management Agency (FEMA), and two from Environmental Protection Agency through Nevada Division of Environmental Protection.
8. CWSD was awarded the 2020 Golden Pinecone Sustainability Award from GREENevada
9. The Carson River Coalition (CRC) Watershed Coordination Program funding has been continued through June 2022. The Watershed Program Manager and Specialist continue to manage the Carson River Coalition (CRC) efforts relating to water quality, floodplain management, invasive species, and environmental education and outreach outlined throughout this document. Accomplishments include:
10. Managed grants including National Fish and Wildlife Foundation (NFWF), NDEP for Watershed Coordination, Watershed-Literacy, Low Impact Development, and new this year, the Carson River Drone Monitoring Program.
11. Organized several CRC Working Group meetings throughout the year addressing environmental outreach and education, river and floodplain, invasive species, water quality and recreation issues.
12. Planned, coordinated, and held 2-day CRC Watershed Management Forum at WNC in March 2020.
13. Began filming for Community Drinking Water PSA.
14. Coordinated and published bi-annual Watershed Connections newsletter.
15. Communicated using our e-blast system to our CRC email list of nearly 900 individuals

providing our newsletter and information on events, grant funding, trainings, and other relevant watershed information.

16. Coordinated social media outreach Facebook, Instagram and our YouTube channel.
17. Updated CWSD's website.
18. Maintained our office as an AmeriCorps Host Site through Truckee Meadows Parks Foundation's State AmeriCorps Program. Hosted two AmeriCorps members during 2020 as Watershed Technicians within the Watershed Coordination Program.
19. Worked on US Bureau of Reclamation water market (transfer/exchange) plan for the Carson River Watershed and identified potential storage alternatives in the Watershed. Project continues through 2021.
20. CWSD funded 10 USGS Streamflow Gages on the Carson River.
21. CWSD funded USGS Water Level Data Collection throughout the watershed.
22. CWSD staff assisted Alpine County with its Groundwater Elevation Water Level Data Collection Monitoring Program (CASGEM) & Groundwater Monitoring on the Mesa above the south end of Carson Valley (Mesa).
23. CWSD Staff created an advisory report of water and sewer rates of the 13 major water purveyors in the Carson River Watershed.
24. CWSD Staff reviewed & corrected State Engineers Groundwater Pumping Reports & Federal Water Diversion Records.
25. CWSD staff sponsored a virtual workshop dealing with Water Resource Issues.
26. CWSD continued to promote the use of Low Impact Development (LID) methods and the adoption of LID ordinances to address polluted runoff issues in our urban environment.
27. CWSD funded USGS Churchill County Groundwater Level and Water Quality Study.
28. CWSD provided an outreach platform for EPA regarding the Carson River Mercury Superfund site at our annual forum and continues to coordinate with EPA during their environmental site review process.
29. Staff coordinated with the USFS and Friends of Hope Valley regarding ecosystem damage and overuse in the Carson East Fork Hot Springs area.
30. Facilitated CRC Floodplain Management Working Group meetings. Staff is working with counties to improve Floodplain Management Plan to help increase community rating system scores for Carson City, Douglas, and Storey Counties.
31. Completed FEMA MAS #9 floodplain projects and hazard mitigation projects forged ahead to create South Dayton Valley Area Drainage Master Plan; North Carson City Drainage Study Restudy and Remapping of Pinenut Wash; HECRAS Model Update for Carson Valley; Public Outreach and Education; and an update or creation of Floodplain Ordinances for each county in the Carson River Watershed.

32. FEMA MAS #10 floodplain and hazard mitigation projects are in process. The projects in this grant include: Phase 1 of Ruhenstroth Area Drainage Master Plan; West Carson City Drainage Study; Physical Map Revision of Carson River below Lahontan Dam in Churchill County; Finalize Comments on Carson Valley Physical Map Revision HEC-RAS Model Update; and Public Outreach and Education.
33. Obtained FEMA MAS #11 funding for floodplain and hazard mitigation projects. Projects in this grant include: Phase 2 to complete Ruhenstroth Area Drainage Master Plan; Smelter Creek Letter of Map Revision (LOMR); Clear Creek LOMR; Web Access System; and Public Outreach and Education.
34. Assisted with coordination of the annual Nevada Flood Awareness (FAW) Week, Nov. 14-20, 2020. Designed and funded newspaper ads for FAW and NevadaFloods.org campaign. CWSD staff helped create the Know Your Risk National Weather Service video for their social media outreach.
35. Participated with USACE for Phase 2 of Alluvial Fan project to provide flood hazard information on several alluvial fans in Douglas County and Carson City.
36. Provided Storey County, Carson City, and Douglas County with National Flood Insurance Program (NFIP) Community Rating System Reports.
37. Assisted Douglas County with Stormwater Management Activity Reporting.
38. CWSD's General Manager was recognized as the 2020 Floodplain Manager of the Year for the Floodplain Management Association's CA/NV/HI region.
39. Distributed $75,000 to CWMAs (Cooperative Weed Management Areas), Conservation Districts and Counties.
40. Completed implementation of National Fish and Wildlife Foundation (NFWF) grant to increase the amount of weed treatments conducted in the watershed. Over 2200 acres treated.
41. Coordinated with Cooperative Weed Management Areas to support weed management throughout the watershed.
42. Held a CRC invasive species working group meeting with federal, state, and local partners to better coordinate weed eradication efforts.
43. Provided funding for the Carson Valley Stream Bank Restoration Projects.
44. Provided funding for River Restoration Projects in Dayton Valley.
45. Provided funding for Lahontan Conservation District to conduct channel clearance projects in Churchill County.
46. Staff coordinated with Alpine Watershed Group (AWG) on their Hope Valley Restoration project, Carson River Stewardship Plan project planning and implementation updates, and the West Fork Carson River Vision planning process which included CA Lahontan Water Quality Board.

47. Staff coordinated with American Rivers, USFS, AWG and others on the proposed Faith Valley Beaver Analog project.
48. Provided funding to River Wranglers for Conserve Carson River Workdays projects throughout the watershed.
49. Staff initiated UAS/Drone program to document riverine damage and monitor projects.

Table L-6. CWSD Completed River Rehabilitation Projects, since 2007.

Project Title	County	Project Type	Project Lead
Grover Hot Spring State Park	Alpine	Meadow rehabilitation/ Water Quality Enhancement	California State Parks, Alpine Watershed Group
Hope Valley Meadow Restoration	Alpine	Meadow and river restoration/ Floodplain and habitat enhancement	Alpine Watershed Group, American Rivers
Markleeville Creek Floodplain Restoration Project	Alpine	Floodplain restoration/river rehabilitation	Alpine County, Alpine Watershed Group
The Lahontan Conservation District's Carson River Restoration Project	Churchill	Bank stabilization/ habitat enhancement	Lahontan Conservation District, Churchill County

For more information, see the CWSD's webpages: http://www.cwsd.org/

and http://www.cwsd.org/river-projects/ and CWSD 2020 Activities and Accomplishments

L.3.4 Nevada Division of Forestry and the City of Reno

NDF and the City of Reno-Public Works department conducted flood mitigation efforts across the North Valleys of Reno in the spring of 2017. The goal was to keep water inside the channel and off of roads. This was done by clearing storm drains and placing sandbags on the banks of a canal. To view the article and video, posted on KLTVN News, see: http://www.ktvn.com/story/35091584/reno-public-works-conducting-flood-mitigation-efforts.

Additionally, the City of Reno completed a bank stabilization project at Oxbow Nature Study Area. The project involved the restoration of the eroded north bank of the Truckee River within the park's boundary. The erosion was due to flooding events in 1997 and 2005. The project involved

reestablishing riparian habitat and allowed for the control of erosion and sediment loading on the Truckee River.

L.3.5 Douglas, Lyon, and Storey Counties

The counties have been working with the USGS to fly LiDAR for future FEMA mapping efforts. This will provide more-detailed data.

L.3.6 The Nature Conservancy

The following are flood-related mitigation projects completed by TNC and partners:

1. **The Lower Truckee River Project:** The goal of the project is to give a natural shape to the Truckee River and reconnect the river to its floodplain. TNC has restored about 10 miles of the Truckee River and its floodplain over the past 14 years. The Lower Truckee River 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. This project lessens flood hazards by reconnecting the river and floodplain, floodwaters are able to spread out into floodplain without doing damage elsewhere. The project has proven to be successful during the flooding emergency of 2017 in Reno-Sparks, as water slowed down and thinly flowed as the floodwaters met the floodplain, protecting life and property.

   To learn more about the Lower Truckee River Project, see: https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placesweprotect/truckee-river-project.xml

2. **The Carson River project:**

   The Carson River project focuses on land protection, restoration, public access, and collaboration. TNC is preserving land through conservation easements and working with landowners. Furthermore, TNC has been improving habitat along the Carson River and its floodplain, as well as enhancing wetlands. TNC has removed dredge spoils and berms in order to reconnect the river to its floodplain, which helps to protect life and property during a flood. TNC has collaborated with numerous stakeholders, from the Carson River Coalition to Floodplains by Design, to enhance flood protection, protect wildlife habitat, improve water quality, and recharge aquifers.

   For more information on the project, see:

   - https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placesweprotect/carson-river-project.xml
   - https://www.nature.org/ourinitiatives/urgentissues/water/protecting-rivers/floodplains-by-design.xml

3. **Lockwood Property**

   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.

TNC, TRFMA, and other partners completed the project. The restoration included one new river meander, 8 riffles, 2 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 continually trying to acquire critical areas along the Truckee River before it is developed and becomes at risk for future flooding.

For more information on the Lockwood property and partners, see:

https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placeswe protect/102-ranch.xml

L.3.7 Spring Thaw of 2023 Emergency Protective Measures

In 2017, record-setting snow accumulations from storms in early February, in addition to flooding in January, meant that there was a risk for flooding as the snow melted. NNG conducted a study identifying areas of major concern and the impacts of potential flooding. FEMA, NNG, Nevada DEM, and counties developed a Spring Flood Plan in order to create courses of action to respond to the potential flooding risk. The county and tribe efforts in response to the flood risk are listed below. Nevada DEM worked to coordinate state support of the efforts.

- Churchill County:
  - Worked with Truckee Carson Irrigation District to install a weir to divert water from Lahontan spillway, allowing larger releases.
  - Worked with NDOT to install three major culverts under US-95 to allow the water to flow into the Carson Lake area without having to close the highway.
  - Developed unprecedented cooperation with local farmers, water districts, state agencies and county entities to protect homes and construct mitigation measures to protect the community.
  - Big Dig – almost 17 miles of drainage ditch constructed to drain the Carson Lake into the Stillwater area before it started flooding the community.
  - Although the Lahontan Reservoir is an irrigation structure and not designed for flood control, The TCID has carefully controlled the releases from the reservoir to mitigate flooding.
  - Due to all the above measures, major flooding was completely avoided in Churchill County despite record snow runoff.
- Lyon County:
  - Worked with Walker River Irrigation District to clean drainage and irrigation ditches to handle floodwaters.
  - Provided equipment to constantly keep bridges clear of debris so water could flow without backing up.

- Built many berms to control the high flows in the Walker River, especially where there is a history of flooding.
- Did an outstanding job of keeping their residents informed and aware.
- Used some of the Nevada DEM HESCO baskets to protect an area with a history of flooding during high river flows.

- Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch:
  - Opted in to the NRS-414A State Mutual Aid. This is only the second tribe to opt in.
  - Was very proactive working with the Walker River Irrigation District and Lyon County to clean irrigation ditches to handle high water flows.
  - Volunteered their resources to help with flood fighting, if necessary, especially the use of their facilities as a staging area and did a great job of informing their tribal members of the issues.

- State of Nevada:
  - NDOT did millions of dollars in mitigation work to protect roads and access to communities.
  - State Health worked with the local jurisdictions to ensure planning was done, and to stage resources such as the Eureka County Casualty Bus for the transportation of patients.
  - Nevada DEM maintained weekly coordination calls to keep everyone informed and coordinated.
  - NNG provided an extraordinary amount of support for planning, and staged High Clearance Vehicles several times when it appeared there would be imminent flooding.

L.3.8 The "Big Dig"

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 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.

L.3.9 Walker River Clean-up Project

The Walker River Clean-up project was the result of the City of Yerington and Lyon County filing 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. 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.

L.4 Wildfire Mitigation Activities

As noted in Section 3.3.19.3 the entire State of Nevada is at risk to wildfires due to fuel loading, ignition risk, weather, and topography. Furthermore, based on reported locations, wildfires are clustered largely near human population centers, though that is where the best detection methods and suppression resources are located. As population continues to grow in Nevada, so will the number of fires in these and other areas. Fire service agencies, cooperators, and the public take many actions to mitigate risks associated with wildfires and seek to achieve a decrease in the amount of damage caused by wildfires. Mitigation actions cannot change the natural conditions that make wildfires possible in Nevada.

L.4.1 Nevada Seismological Laboratory

As noted in section O.2.7, the Seismo Lab has started supporting multi-hazard sensors on their network, including HD fire cameras. AlertTahoe, a joint project between the Seismo Lab and the Forest Guard team (and numerous partners), had early successes in the region in 2014, by helping fire personnel fight smaller fires before they become bigger ones. The expansion phase started in 2014-2015. The cameras are located in key areas, such as mountaintops. The cameras stream real-time images to firefighters and other emergency personnel. AlertTahoe provides many benefits, including early detection, cost, and time-effectiveness. Eventually, the cameras will be equipped with auto-detect software, that way the system does not have to be monitored by firefighting agencies.

As of February 2018, a network, called AlertWildfire, has grown from the AlertTahoe system and has four networks with over 55 cameras. As noted in a Nevada Today article, AlertWildfire covers areas of Nevada and California, with the potential for areas of Oregon and Idaho to come online soon. In 2017, the AlertTahoe/AlertWildfire system was involved in 207 fires in northern Nevada and eastern California (Sierra Nevada). A single camera of the AlertTahoe network, in Santa Barbara, played a critical role in the devastating Southern California fires, Whittier Fire and Thomas Fire.

To view the images and videos, visit:

http://www.alertwildfire.org/tahoe/

https://www.youtube.com/user/nvseismolab/videos.

For more information on AlertWildfire, see: https://www.unr.edu/nevada-today/news/2018/alertwildfire?utm_source=newsletter030118&utm_medium=email&ut

m_content=alertfire&utm_campaign=Nevad
aWeekly

L.4.2 Nevada Division of Forestry

NDF has completed numerous wildfire mitigation activities, including:

1. Prepared and compiled a report to Nevada State Legislature-AB75: Fire-Fuels-Forest Restoration Activities and Accomplishment at Lake Tahoe, Nevada. Some of the highlights from the report include:
    a. 2,507 acres of fuel reduction (prescribed fires, hand thinning) in 2019
    b. 985 acres of fuel reduction in 2021
    c. 1,367 acres of fuel reduction in 2022
    d. Fire prevention education
    e. Public education and communication
2. Highlighted projects:
    a. Spooner Landscape Resilience Project: The Spooner Landscape Resilience Project is a 300-acre environmental improved initiative, spearheaded by the Nevada Tahoe Resource Team and the Nevada Division of Forestry.
    b. Lot X Fuels Reduction and Forest Restoration Project: The Lot X Fuels Reduction and Forest Reforestation Project was funded through a US Forest Service Hazardous Fuels Grant, to improve forest and riparian health in Lot X.
    c. Ruby Lake Estates Project: In partnership with the United States Forest Service, Conservation Crews from Wells and Carlin began work on the Ruby Lake Estates project in October of 2020. Located on the Southeast side of the Ruby Mountains.
    d. Pinyon-Juniper Encroachment Project: This project improved sagebrush habitat and riparian health on approximately 300 acres by reducing the impact of encroaching conifers on sagebrush ecosystems.
    e. NV Energy-SB 508 Initiative: This initiative will fund wildfire fuel reduction, wildlife suppression resources, and restoration/rehabilitation treatments across Nevada within or adjacent to NV Energy Service Areas.
    f. Big Bend Project: Big Bend of the Colorado State Recreation Area is located along the Colorado River in Laughlin, NV. The park protects a rare desert riparian landscape along a riverbank that is largely fractured.
    g. Clear Creek Project: For over ten years, NDF has assisted private landowners, the Nature Conservancy, Nevada State Lands, and Nevada State Parks to reduce the risk of wildlife in the Clear Creek drainage along Highway 50.
    h. South Fork River Project: This project directly addressed water quality parameters in three miles of the South Fork of the Humboldt River and the South Fork Reservoir. The goal of the project was to improve water quality entering and leaving the reservoir

To view project fact sheets online, see: http://forestry.nv.gov/highlighted-projects/

To see more information on activities and accomplishments, see http://forestry.nv.gov/wp-content/uploads/2017/02/AB75-FINAL-REPORT-2016.pdf

L.4.3 Living With Fire

Living With Fire has completed the following mitigation activities:

Published Peer Reviewed Publications (follow hyperlink to find publication online)

- Wildfire Home Retrofit Guide– This guide includes specific recommendations for how to retrofit existing components of a home to withstand wildfire. It is also available in Spanish.
- CodeRED in Washoe County – This factsheet defines CodeRED, explains its importance and gives detailed instructions about how to register.
- Living With Smoke: How to be prepared for smoke exposure – This factsheet reviews what is in wildfire smoke, why it is a health concern, and how to reduce the public health impacts of wildfire smoke.
- Best Management Practices for Livestock and Equine during Wildfire Smoke Events – This factsheet details how to manage livestock when significant smoke impacts the region.
- Little Valley Fire Restoration Update – This factsheet describes the restoration efforts of the Little Valley Fire, an escaped prescribed fire in West Washoe Valley during 2016.
- Flood After Fire Guide – This factsheet explains why there is a risk of flooding after a wildfire and what individuals can do to prepare for potential flood after fire.
- Climate Change Impacts in Nevada – This factsheet provides a summary of climate change in Nevada. It is derived from a report written as part of Nevada's State Climate Initiative. It is also available in Spanish.
- Defensible Space Guide – This guide is almost complete and will be published in late 2023. It culminates several years of meetings to agree upon defensible space language for the region. Work on this guide started in 2021.

Publications Distributed in Nevada and Out of State

2020

- 1,526 publications given in 2020 in Nevada
- 3,456 publications given in 2020 to out-of-state partners
    - 7 different entities requested graphics or publications for their region
    - 4 California entities requested files or publications
    - 3 Colorado entities requested files or publications
    - 2 Montana entities requested files or publications
    - 2 Washington entities requested files or publications

- 1 entity in Wyoming requested files or publications

2021

- 7,077 publications given in 2021 in Nevada
- 7,403 publications given in 2021 to out-of-state partners
  - 16 different out-of-state entities requested graphics or publications for their region
  - 7 California entities requested files or publications
  - 6 Montana entities requested files or publications
  - 2 Oregon entities requested files or publications
  - 1 entity in Arizona requested publications

2022

- 6,242 publications given in 2022 in Nevada
- 5,325 publications given in 2022 to out-of-state partners
  - 15 different out-of-state entities requested graphics or publications for their region
  - 7 California entities requested files or publications
  - 4 Montana entities requested files or publications
  - 3 Arizona entities requested files or publications
  - 1 entity in Oregon requested publications

January 1 – May 1, 2023

- 826 publications given in 2023 in Nevada
- 1,350 publications given in 2023 to out-of-state partners
  - 2 California entities requested files or publications
  - 1 Montana entity requested publications
  - 1 Colorado entity requested files

L.4.4 Tahoe Fire & Fuels Team

Tahoe Fire and Fuels Team (TFFT) focuses on protecting lives, property, and the environment of the Lake Tahoe Basin. It was formed in 2008 and has many partners and sponsors. Prescribed fire operations continue to be performed by multiple agencies. The following happened in 2022:

1. Lake Tahoe fall prescribed fire program, conditions and weather permitting, October 4, 2022.
2. Press release: The Key To Evacuating Quickly and Safely is Preparation, August 11, 2022.

3. Red Flag Warnings and National Fire Danger Rating System, July 21, 2022
4. Agencies share simple tree removal and defensible space steps in urgent call to action, July 21, 2022.
5. Fire restrictions in effect at Lake Tahoe, July 14, 2022.
6. 2022 Fire Season Declared, May 31, 2022.
7. Summer Fire Restrictions in Effect June 1, 2022, May 31, 2022.
8. Lake Tahoe Wildfire Awareness Campaign, May 3, 2022.
9. Spring is Here – It's Time to Think About Your Defensible Space, April 20, 2022.
10. Chipping and Defensible Space Services begin May 9, 2022, April 20, 2022.

TFFT has an interactive prescribed fire operations map, available online, at: http://tahoe.livingwithfire.info/tahoe-fire-fuels-team/

L.4.5 Southern Nevada Public Land Management Act Projects

As stated by the Bureau of Land Management, "Southern Nevada Public Land Management Act (SNPLMA) allows the BLM to sell public land within a specific boundary around Las Vegas. The revenue derived from land sales is split between the State of Nevada General Education fund (5%), the Southern Nevada Water Authority (10%), and a special account available to the Secretary of the Interior for various projects, including: conservation initiatives, Lake Tahoe restoration projects, hazardous fuels reduction and wildfire prevention, environmentally sensitive land acquisitions." For more information, see: https://www.blm.gov/SNPLMA

L.4.5.1 Lake Tahoe Environmental Improvement Program Projects

The Lake Tahoe Environmental Improvement Program (EIP) Project Tracker was launched in 1997, and is a partnership of federal, state, and local agencies, private interests, and the Washoe Tribe (Nevada and California). Hundreds of projects are completed each year. One area EIP projects focus on is forest management. SNPLMA and EIP projects are listed in Table L-7 below. Data was obtained online from the Lake Tahoe EIP Project Tracker, https://eip.laketahoeinfo.org/

Table L-7. SNPLMA and EIP Projects.

Project	Implementers	Duration	Expenditures	Details
Sugar Pine Recruitment: Memorial Point-Slaughterhouse Phase I	NDF, Nevada Tahoe Resource Team (NTRT)	2007-2015	Tahoe Bonds Act (NDSL): $20,618	42 acres of forest fuels reduction treatment, and 49 acres of habitat restore/enhanced.
Forest Restoration III-Nevada	NDF, NTRT	2008-2015	Tahoe Bonds Act: $1,561,758	Forest restoration and fuels reduction in Slaughterhouse

Table L-7. SNPLMA and EIP Projects.				
Project	**Implementers**	**Duration**	**Expenditures**	**Details**
			SNPLMA (BLM): $864,388	Canyon, Tunnel Creek SNPLMA Round 9, 8, 10, and 11. 2,508 acres of forest fuels reduction treatment.
Spooner Hazardous Fuel Reduction & Healthy Forest Restoration	USFS- LTBMU	2010-2018	As of 11/2017: SNPLMA (USFS): $3,971,443	Project will continue to implement treatments on approximately 3,300 acres of the east shore of Lake Tahoe. The project focuses on the WUI.
Incline Hazardous Fuels Reduction & Healthy Forest Restoration/Implementation	USFS-Lake Tahoe Basin Management Unit	2011-2024	As of 11/2017: $1,589,697 SNPLMA	1,008 acres. Project covers North Lake Tahoe and Incline Village- will reduce fuel ladders, standing and down fuel accumulations and canopy densities by modifying vegetation structure and fuel loads.
Rosewood Creek Restoration- Middle Reach (Area A)	Nevada Tahoe Conservation District	2012-2016	U.S. Bureau of Reclamation (BOR): $2,030,000 Tahoe Bonds Act: $672,402 SEZ Mitigation Funds (TRPA): $48,268	5.25 acres of forest fuels treated, project also included habitat restoration and stream restoration.
Upper Haines Canyon-Kingsbury 1000	Tahoe Douglas Fire Protection District (TDFPD)	2015-2018	None provided	The project encompasses 40 acres of forest thinning. The project will protect the

Table L-7. SNPLMA and EIP Projects.				
Project	**Implementers**	**Duration**	**Expenditures**	**Details**
				Tahoe Basin from a wildland fire that could originate outside of the Basin and run into the Basin.
Tahoe Village Fuels Reduction Project	TDFPD	2016-2018	None provided	A 57 acres forest thinning and fuels reduction project. The project is located on undeveloped land west of Tahoe Village HOA community. The project was originally funded by FEMA, and then the funding source was switched to USFS so that pile burning can be utilized to dispose of slash.
Lakeview Lookout CWPP Implementation Project	North Lake Tahoe Fire Protection District (NLTFPD)	2016-2019	None provided	Project is on four privately owned lots, at the edge of a neighborhood in the WUI Defense Zone. Overcrowded and/or diseased tree will be thinned & will be piled & burned in fall/winter
Diamond Peak Lodge Fuels Reduction Project	NLTFPD	2016-2020	Incline Village General Improvement District: $13,163 USFS- Lake Tahoe Basin Management	Project will reduce hazardous wildland fuels on 63 acres in the WUI of Incline Village to mitigate wildfire risk to the community and

Table L-7. SNPLMA and EIP Projects.				
Project	**Implementers**	**Duration**	**Expenditures**	**Details**
			Unit (LTBMU): $32,325	improve forest health.
Glenbrook Fuels Reduction Project	Tahoe Douglas Fire Protection District (TDFPD)	2016-2020	None provided	Project will create a shaded fuel break on 161-200 acres of overstocked forest within the defense zone of the WUI in the region.
Highway 50 Fuels Reduction Project	TDFPD	2016-2020	USFS-LTBMU: $46,604	Project will reduce the risk of catastrophic fire and resulting damage to communities. The project will reduce wildland fuels in the WUI. The project is composed of 138 acres over six units.
Upper Diamond Peak Fuels Reduction Project	NLTFPD	2016-2021	As of 11/2017: $25,658 Incline Village General Improvement District (IVGID)	The project is within the Defense and Threat Zones of the WUI of Incline Village. A fire could restrict evacuation routes for 500 residential units. This project will provide a safer working environment for firefighters, and protect public evacuation routes.
SNPLMA Round 16 Sub Grant- NV Regional Fuels Reduction Project	NLTFPD	2017-2021	None provided	286 acres will be treated using hand thinning. 150 acres will be treated with prescribed fire.

L.4.6 Desert Research Institute

DRI's Wildland Fire Science Center (WFSC) has many capabilities and areas of expertise in wildland fire. For example, WFSC is using UASs (unmanned aircraft system) as a tool to mitigate and predict wildland fires. WFSC's applications of UASs include real time data analytics in support of fire management, situation awareness and safety, integrating UAS observations into fire operations, and fire remote sensing. Moreover, WFSC has hourly and daily forecasts, and assesses fuels, topography, and weather to predict fire spread.

To see more mitigation efforts, please see: https://www.dri.edu/project/climate-engine/

Project Description

The Map of Riparian Vegetation in Nevada (MRVN) identifies the distribution of riparian vegetation across the entire state of Nevada. Despite variations in climate and plant species composition across the state, the enhanced vigor of plants in riparian settings during the hot summers of the arid to semiarid climate provides a greenness signal that can be detected in NDVI data derived from Landsat satellites. By stratifying the landscape of a subregion into units of similar elevation and solar exposure, changes in NDVI due to surface or near surface water availability were differentiated from changes that were due to the amount of vegetation present. Thousands of calibration points were used to identify the best spatial neighborhood to consider, the step sizes for stratifying elevation and insolation data, the minimum NDVI to be considered as potentially riparian, the magnitude of NDVI anomaly that would be classified as riparian, and a limit on upslope position. A further enhancement to the map incorporated the areas near perennial streamlines from the NHDPlus product that had the highest NDVI values. Intensive agriculture (e.g. center pivot) and urban areas were removed by using land ownership maps and manual editing. The final map was tested with 400 independent test points, and producer's accuracy (1.0 – errors of omission) for riparian vegetation was 84.6%, and user's accuracy (1.0 – errors of commission) was 93.5%.

For more information see https://www.dri.edu/project/mrvn/

L.4.7 The Nature Conservancy

TNC and partners are working to preserve habitat, reduce risk of invasive species introduction, and decrease the risk of wildfire by implementing forest management strategies at Independence Lake. Another wildfire mitigation project, at Clear Creek, focuses on forest restoration. The project was designed to reduce the risk of catastrophic fires, help protect water supplies, and enhance wildlife habitat.

L.5 Infestation Mitigation Activities

As noted in Section 3.3.12, infestations can negatively affect Nevada's economy through the destruction of crops and natural resources. Additionally, some of the plant infestations are highly flammable and assist in the spread of wildfires. Although infestation is considered a low risk in Nevada, it is still important to be proactive and continue mitigation activities.

L.5.1 Lake Tahoe EIP Projects

As previously noted, the Lake Tahoe EIP partners focus on projects that will protect and improve natural resources of the Lake Tahoe Basin, such as forest management, water quality, air quality, transportation, and more. The figure below Shows Lake Tahoe EIP mitigation goals and action priorities.

LAKE TAHOE ENVIRONMENTAL IMPROVEMENT PROGRAM

A Blueprint For Climate Resilience

LAKE TAHOE ENVIRONMENTAL IMPROVEMENT PROGRAM

WATERSHEDS AND WATER QUALITY

GOALS

1. Preserve and improve lake clarity and water quality.
2. Restore ecosystem health and resilience.
3. Improve and enhance fish and wildlife habitat.

ACTION PRIORITIES

Stormwater Management Program

- Reduce Stormwater Pollution from: Roads and Highways, Forest Roads, Public and Private Parcels
- Operate and Maintain Stormwater Infrastructure

Watershed Restoration Program

- Acquire Environmentally Sensitive Lands for Restoration and Protection
- Restore Priority Meadows, Wetlands, and Lake Tahoe Tributaries
- Prevent, Control, or Eradicate Terrestrial Invasive Species

Aquatic Invasive Species Program

- Prevent, Control, or Eradicate Aquatic Invasive Species

SUSTAINABLE RECREATION AND TRANSPORTATION

GOALS

1. Preserve and improve air quality.
2. Improve outdoor experiences for visitors and residents while protecting natural resources.
3. Increase the use of alternative modes of transportation and decrease reliance on the private automobile.

ACTION PRIORITIES

- Improve Public Access
- Improve Public Recreation Facilities
- Build, Enhance and Maintain Trail Networks
- Build, Enhance, Operate and Maintain Transit Systems

FOREST HEALTH

GOALS

1. Protect communities from damaging wildfire.
2. Restore ecosystem health and resilience.
3. Improve and enhance wildlife habitat.

ACTION PRIORITIES

Community Wildfire Protection Program

- Reduce Hazardous Fuels
- Implement Defensible Space on Public and Private Parcels and Utility Corridors
- Upgrade Priority Water Infrastructure to Fight Catastrophic Wildfire

Forest Restoration Program

- Restore Native Forest Communities
- Implement Prescribed Fire
- Restore and Protect Native Wildlife

SCIENCE, STEWARDSHIP, AND ACCOUNTABILITY

GOALS

1. Implement leading-edge science to continuously improve projects and promote adaptive management.
2. Protect EIP investments and benefits.
3. Maintain transparency and accountability.
4. Cultivate environmental stewardship.

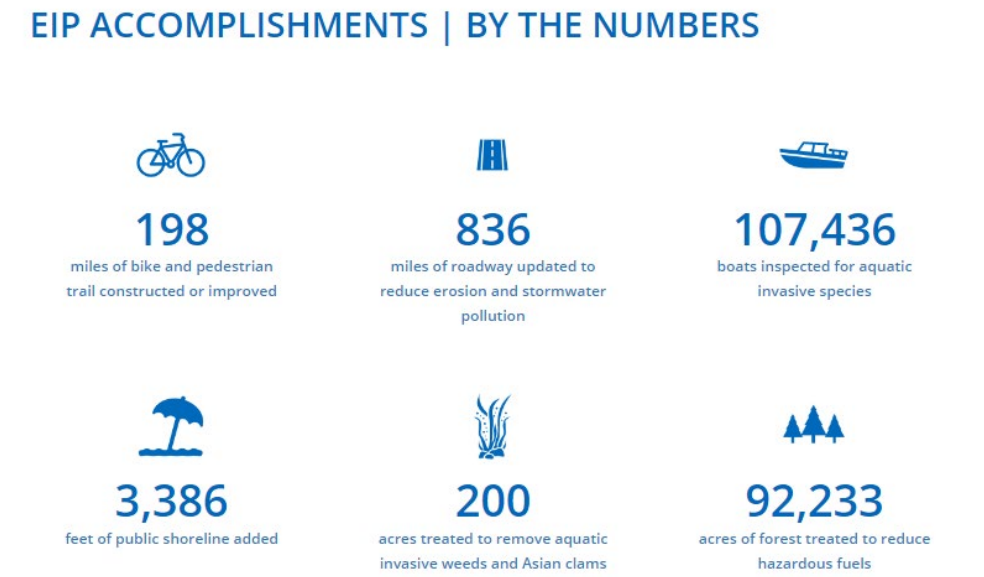
ACTION PRIORITIES

- Conduct Applied Scientific Research
- Implement Programmatic Monitoring and Reporting
- Engage Communities in Environmental Stewardship
- Utilize Innovative Technology

October 2020

Table L-8. Lake Tahoe EIP Infestation Mitigation Projects				
Project	**Implementers**	**Duration**	**Expenditures**	**Details**
Crystal Shores Aquatic Invasive Species Plant Control and Monitoring	Tahoe Resource Conservation District	2014-2019	As of 11/2017: Lake Tahoe License Plate Program (NDSL): $28,200	Aquatic plant removal and other invasive species including invertebrates and warm water fish. Project is being implemented at Crystal Shores West and East, and Crystal Shores Villas.
Sand Harbor Asian Clam Control Project	Tahoe Regional Planning Agency	2016-2017	None provided.	Asian clams (1.5-acre population size) will be treated with gas impermeable bottom barriers.
Elks Point Marina Aquatic Invasive Species Plant Control	Tahoe Regional Planning Agency	2017-2020	As of 11/2017: Nevada Division of Environmental Protection-$10,000	Project includes removal of aquatic invasive plant populations inside Elks Point Marina

Data obtained from the Lake Tahoe EIP Project Tracker, https://eip.laketahoeinfo.org/



For more information see https://eip.laketahoeinfo.org/

L.5.2 Carson Water Subconservancy District

The following infestation mitigation activities have been completed by CWSD:

1. Carson River Watershed Invasive Species Awareness month- June
2. Has materials on the Play.Clean.Go campaign, about how to stop invasive species in your tracks
3. The Nevada State Parks Recreational Motorized Trails' invasive species sign project (2015), to reduce the spread of weeds on motorized trails. CWSD also wants to put up signage throughout the watershed on USFS and BLM trailheads.
4. CWSD met with BLM and USFS staff to build partnerships and enhance and maximize funding.
5. CWSD has four Coordinated Weed Management Areas in the Carson River Watershed, including:
    a. Alpine/Upper Carson Weed Management Area
    b. Carson City Weed Coalition
    c. West Central Lyon County Weed Management Area
    d. Churchill County Weed Management Area
6. Works with Nevada State Parks and NDOW to strategize solutions to aquatic invasive species.

For more information on CWSD's infestation mitigation efforts, see: http://www.cwsd.org/invasive-species/

L.5.3 Nevada State Parks and Nevada Department of Wildlife

In 2014, Nevada State Parks and NDOW opened four northern Nevada aquatic invasive species watercraft inspection/decontamination stations. Funding was provided by USFWS grants and Nevada's AIS watercraft decal. The stations are free to the public, and are important in order to prevent the spread and introduction of invasive species. To view more details on the stations, and the hours of operation, see: http://www.ndow.org/Boat-Inspection-Stations-Open-Combat-Aquatic-Invasive-Species/

L.5.4 Truckee River Fund

The Truckee River Fund was established in 2004 by TMWA. The Truckee River Fund, known as "The Fund", is a non-profit organization, and is used for projects that protect and enhance water quality and/or water resources. Table L-9 lists completed projects under The Fund, while Table O-11 lists approved projects.

Table L-9. Completed Projects under the Truckee River Fund.

Project Name	Description	Sponsor
2017 Spring Invasive Weed Pull & Fall Truckee River Cleanup	Volunteers removed invasive weeds at hot spots along the Truckee River.	Keep Truckee Meadows Beautiful
Mount Rose Noxious Weed Monitoring and Treatment #4	Staff and volunteers removed noxious weeds and scouted/monitored new sites.	Friends of Nevada Wilderness
Trout Creek Pocket Park & Restoration Initiative	The project included the removal of noxious weeds along the creek bank, and re-vegetation of native plants.	Mountain Area Preservation Foundation
Rosewood and Third Creeks Invasive Weed Removal	The project focused on the management and control of spotted knapweed, bull thistle, and common teasel. Invasive weed training was	Nevada Tahoe Conservation District

Table L-9. Completed Projects under the Truckee River Fund.		
Project Name	**Description**	**Sponsor**
	provided, as was educational material.	
Truckee River Cleanup/Invasive Weeds 2016	Project partners and staff identified areas for volunteers to weed pull, tree wrap, remove trash, and spread mulch.	Keep Truckee Meadows Beautiful
Truckee River Cleanup/Invasive Weeds 2015	Project partners and staff identified areas for volunteers to weed pull, tree wrap, remove trash, and spread mulch.	Keep Truckee Meadows Beautiful
Mount Rose Noxious Weed Monitoring and Treatment #3	Invasive and noxious weeds were removed from 50 acres of the Hunter Creek watershed (near Verdi, NV).	Friends of Nevada Wilderness

Table L-10. Approved Projects under the Truckee River Fund		
Project Name	**Description**	**Sponsor**
2018 Spring Invasive Weed Pull & Fall Truckee River Cleanup	The cleanup targets invasive weeds and trash along the Truckee River corridor	Keep Truckee Meadows Beautiful
Truckee River Native and Non-Native Aquatic Plant and Trash Survey	Preparation for a map, delineating aquatic invasive species and trash. The map covers: Tahoe City to Pyramid Lake, Donner Lake, Prosser Reservoir, and Boca Reservoir tributaries.	Tahoe Resource Conservation District
Mount Rose Noxious Weed Monitoring and Treatment #5	Treatment of 75 acres of noxious weeds on Humboldt-Toiyabe National Forest lands.	Friends of Nevada Wilderness
Eyes of the Lake/Truckee River Watershed Volunteer Invasive Species Monitoring	Aquatic species removal (Eurasian milfoil and others)	League to Save Lake Tahoe

Data for Tables L-9 and L-10 obtained from http://truckeeriverfund.org/ projects page.

L.5.5 Alpine Watershed Group

AWG Built a Grover Weed Team in 2018. The purpose of the weed team is to prevent the invasive species from spreading into a meadow while California State Parks completes a trail maintenance project. AWG is sponsoring the 19th Annual Markleeville Creek Day in September of 2018. Volunteers will work on watershed restoration, which includes the removal of invasive weeds. A flyer from the 2016 Markleeville Creek Day is in Appendix M.

L.6 Drought Mitigation Activities

As discussed in Section 3.3.2, droughts are a high/significant risk to the state of Nevada. Not only can droughts cause economic loss and environmental damage, but they can also cause insect infestations, dust storms, and WUI fires.

L.6.1 Southern Nevada Water Authority

SNWA is a non-profit water utility formed to address Southern Nevada's water needs on a regional basis.

MISSION

Our mission is to provide world class water service in a sustainable, adaptive and responsible manner to our customers through reliable, cost effective systems.

GOALS

Assure quality water through reliable and highly efficient system.

Deliver an outstanding customer service experience.

Anticipate and adapt to changing climatic conditions while demonstrating stewardship of our environment.

Develop innovative and sustainable solutions through research and technology.

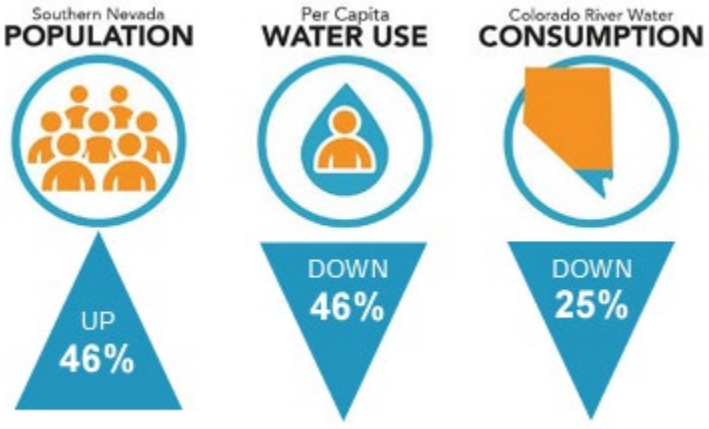
Ensure organizational efficiency and manage financial resources to provide maximum customer value.

Strengthen and uphold a culture of service, excellence and accountability.

Data obtained from https://www.snwa.com/assets/pdf/reports-conservation-plan-2019.pdf

Water conservation strategies include:

- Engaging our community with information and programs that help individuals and organizations change their water use (retrofit).
- Building in future conservation savings by ensuring new development is water efficient.
- Transforming demand through new products and technologies that reduce water demand.
- Curtailing waste and losses by minimizing unproductive losses of water in both utility and customer applications.
- Advancing knowledge through investments that increase our understanding of new opportunities and the influence of existing programs.
- Valuing water appropriately by ensuring water rates and fees reflect the value of resources.



Infographic: SNWA Conservation Progress (2002-2018)

For more information on SNWA and the Water Smart Landscapes rebate program, see:

- https://www.snwa.com/
- https://www.snwa.com/rebates/wsl/index.html

L.6.2 Las Vegas Water District

The Las Vegas Water District (LVWD) is a member agency of SNWA. LVWD adopted mandatory conservation measures in order to combat droughts.

Thanks largely to the adoption of water conservation measures in 2003, conservation efforts in the Las Vegas Valley have helped reduce the community's Colorado River consumption. The community used 26 billion gallons less water in 2021 than in 2002, despite a population increase of about 750,000 residents during that time. This represents a 48 percent decline in the community's per capita water use since 2002.

Recently, the Nevada Legislature passed a law prohibiting the use of Colorado River water to irrigate unused, decorative grass in our valley by the end of 2026. This is grass in medians, roundabouts, business centers, HOA entrances and bordering parking lots and streets. This initiative will save water and help our community manage Colorado River shortage conditions.

Conservation measures that have been used to combat drought include outdoor watering restrictions, landscape watering assignments, turf limitation codes for Clark County and the City of Las Vegas, increases in water rates and water waste fees.

For more information, see: https://www.lvvwd.com/

L.6.3 Truckee Meadows Water Authority

TMWA created a drought plan that was adopted in 2009, called the Water Resource Plan. The current version is for 2016-2035. Some of the actions listed in the drought plan includes:

1. "The Negotiated Settlement", an agreement that allows up to 14,000 acre-feet of storage in

federally operated reservoirs for use during extended droughts.

2. Water treatment plants use as much Truckee River water as possible.
3. Encourage customers to use water efficiently and reduce water use during droughts by converting all water customers to meters.
4. Delay the use of surface water held in upstream reservoirs by maximizing well use during the months of June through October.
5. One billion gallons of water are pumped during the winter months into the aquifer for drought storage.

Drought mitigation projects completed by TMWA include:

1. Arrowcreek Drought Response Phase I Project
   - Pumping supplemental water supply to the upper reaches of the Mt. Rose alluvial fan area in order to reduce the amount of groundwater pumping from wells.
2. North Valleys Integration Project, was completed in June 2016 and cost $17.8 million:
   - Construction of ~29,000 feet of water main in the Lemmon Valley area.
   - Fish Springs groundwater supply to provide up to 8,000 acre-feet per year for use within the North Valleys area.
   - Project will help TMWA conserve additional upstream drought reserves

TMWA has several green projects as follows:

1. TMWA's hydroelectric power plants. TMWA is able to generate more than 90% of the power it uses through clean, renewable hydroelectric power.
2. With the installation of a 30 kWh solar power generation project, since 2011, TMWA has produced nearly as much power as they have consumed.

For more information on TMWA's projects, see: https://tmwa.com/projects/

L.6.4 Desert Research Institute

DRI is conducting drought prevention and mitigation research using UASs. Current UAS research at DRI includes iodine-induced applications for weather modification, digital mapping, visual monitoring, soil stability and thermal stress modeling. These applications focus on drought prediction and prevention.

To see more research being conducted by DRI, see: http://www.dri.edu/uas-research/our-research

L.6.5 Nevada Drought Forum

The drought forum was created in 2015 by Governor Sandoval to bring together experts from various areas to prepare and plan for how the state can deal with droughts.

For more information, see: http://drought.nv.gov/

L.7 Severe Storms Mitigation Activities

As discussed in Section 3.3.15, 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 winter weather events may cause temporary closures, but generally do not cause damage.

L.7.1 Nevada Department of Transportation

A snow fence was constructed in Washoe Valley along U.S. Highway 395, in 2013 by NDOT in order to increase road safety and make snow removal easier. The wooden fence prevents snow from drifting onto the roadway. The fence is 1,400 feet long, and cost $70,000 to construct. Eventually, the fence might extend along the entire Washoe Valley Corridor.

L.8 Avalanche Mitigation Activities

As discussed in Section 3.3.1, avalanches are considered to be low risk in Nevada. Avalanche possibilities exist in Douglas, Elko, Clark, and Washoe Counties. Mitigation are relegated to the local jurisdictions where the hazards exist. The State will support local jurisdiction activities in lessening this hazard where it occurs.

L.8.1 Nevada Department of Transportation

NDOT performs avalanche control on Mt. Rose Highway. The portions of the highway are temporarily closed while NDOT triggers man-made avalanches, reducing the hazard and making the highway safer for travelers.

L.8.2 Nevada Ski Resorts

Ski resorts in Nevada, primarily located in the Lake Tahoe region, perform avalanche mitigation activities regularly.

For example, Mt. Rose Ski Resort performs avalanche control in the Chutes and avalanche-prone areas on Mt. Rose Hwy, and has an agreement with NDOT. Diamond Peak Ski Area, of the Lake Tahoe region, has hosted avalanche awareness courses led by the Sierra Avalanche Center. Heavenly Mountain Resort, of the Lake Tahoe region, has an avalanche dog and avalanche closure boundaries.

In Southern Nevada, Lee Canyon Ski Area and USFS conduct avalanche mitigation by triggering avalanches in areas particularly at risk. Mt. Charleston Ski Area, near Las Vegas, also takes preventative measures, and triggers man-made avalanches, while also checking conditions twice per day.

Avalanche control is conducted by triggering man-made avalanches using explosives. Small slides are forced to lessen the risk of snow buildup, as snow buildup can cause large, hazardous slides. Most ski resorts have ski patrols every morning to look for risks associated with avalanches, including heavy snow formations on ridges, and conditions that make snow unstable (high wind, rising temperatures).

L.8.3 Sierra Avalanche Center

SAC provides backcountry avalanche, snow, and weather information for the greater Lake Tahoe area. Forecasters post daily avalanche advisories and weekly reviews online. SAC also provides information on how to read avalanche advisories, and avalanche education information. Members of the public can submit observations and incidents on SAC's website. Appendix P has examples of avalanche awareness classes led by SAC.

Sierra Avalanche Center's website: https://www.sierraavalanchecenter.org/

Interactive weather station map: https://www.sierraavalanchecenter.org/weather-station-map

L.9 Hazardous Materials Mitigation Activities

As noted in Section 3.3.11, 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.

L.9.1 City of North Las Vegas Office of Emergency Management

The City of North Las Vegas Office of Emergency Management (NLVOEM) and the Office of Economic Development hosted a Hazmat and Transportation Incident Summit, a two-day event, in 2015. The summit is described in Figure O-1 below.

L.9.2 Nevada Division of Environmental Protection

NDEP participates in Flood Awareness Week. Additionally, 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.

NDEP's BWQP Source Water Protection Program focuses on identifying potential threats (human activities and land uses) which may affect or contaminate a public drinking water well if a failure were to occur (i.e., mechanical failure, accident, spill, etc.) and to manage/mitigate these potential threats through source restrictions and land use practices.

NDEP's BSDW Closure of Orphaned/Abandoned Wells Project is funded through the Safe Drinking Water Act. Closure of abandoned wells mitigates drinking water pollution.

Source Water Protection and Watershed Management in Washoe County Team Projects, ostensibly lead by NDEP BWQP, NDEP BSDW and Resource Concepts, Inc. The team mission is to create a plan that can be used as a tool for communities in Washoe County to help protect drinking water sources and manage the Truckee River watershed to maintain and/or improve water quality. Specific mitigation projects will be conducted under this plan.

L.10 High Hazard Potential Dam Projects

Local policies, programs and capabilities that exist for HHPD are mostly county and city programs for flood control projects, water storage or wastewater treatment facilities. These programs typically have programs that include either staff engineers, operators and maintenance crews or contracted engineers, operators, and maintenance crews. These programs are able maintain and make improvements to HHPD facilities within a timely manner. Currently, there are no current local policies, programs, and capabilities within the state for non-government owned HHPDs though some private companies within the state maintain their own dam policies, programs, and capabilities.

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.

South Fork Dam, NV00226, J-785 – This dam is the only dam in the state owned and operated by NDWR. The dam is classified as a high-hazard structure. Since 2019, NDWR has been undertaking a Toe Drain and Relief Well Rehabilitation Project to address seepage concerns. Layers within the dam foundation yielded pore water pressures increasing with depth indicating artesian heads. Groundwater was also encountered several feet below ground surface, indicating a blockage within the existing toe drain. As a result, work was contracted to abandon and redrill two relief wells at the toe drain, clean out the existing toe drain and install two new access portals, install a new trench drain to be connected to the existing toe drain, and line two drainage channels with a bituminous geomembrane liner to inhibit vegetation and allow seepage flows to be directed away from the dam. This work has been largely completed as of August 2023.

There have been a few notable submitted and upcoming projects related to GISTM (Global Industry Standards on Tailings Management) for tailings facilities in the state. The GISTM specifies its own hazard classification for structures and guides owners/operators on standards for risk reduction. As a result, we have received and permitted one submittal so far in 2023 for an engineering design change to add a buttress to an existing facility: **North Block Tailings Impoundment Dam NV10414, J-791**. We are also aware of one upcoming submittal to add a buttress and relocate the existing reclaim pond for **Phoenix Tailings Dam, NV00131, J-725.**

We are actively working with the owner to decommission **Sunflower Reservoir Dam NV00047** due to concerns of unauthorized repairs to the embankment and inoperable outlet works which could result in overtopping.

We are working with the owners of **Bishop Creek Dam NV00050** to possibly decommission the structure due to unsafe conditions at the dam. There is a large slump/slip of soil on the downstream face from a 1984 failure and the upstream concrete cover has largely collapsed from a 2021 earthquake event, exposing material that could be susceptible to failure if the reservoir were to be filled. The reservoir is ordered to remained drained and we have been working with the owner to connect them with financial resources to decommission the structure.

L.11 Miscellaneous Mitigation Activities

This section lists miscellaneous mitigation activities throughout Nevada.

L.11.1 City of North Las Vegas Office of Emergency Management

NLVOEM and Galena Properties conducted a tabletop exercise to test, train, and exercise the City's revised and updated Continuity of Operations and Continuity of Government Plans in June 2017. Figure L-2 describes the tabletop exercise.

In February 2018, NLVOEM held a CERT Program training class for Spanish-speaking CERT members to become CERT Certified. Figure L-3 describes the training class and includes comments from NLVOEM's Emergency Manager.

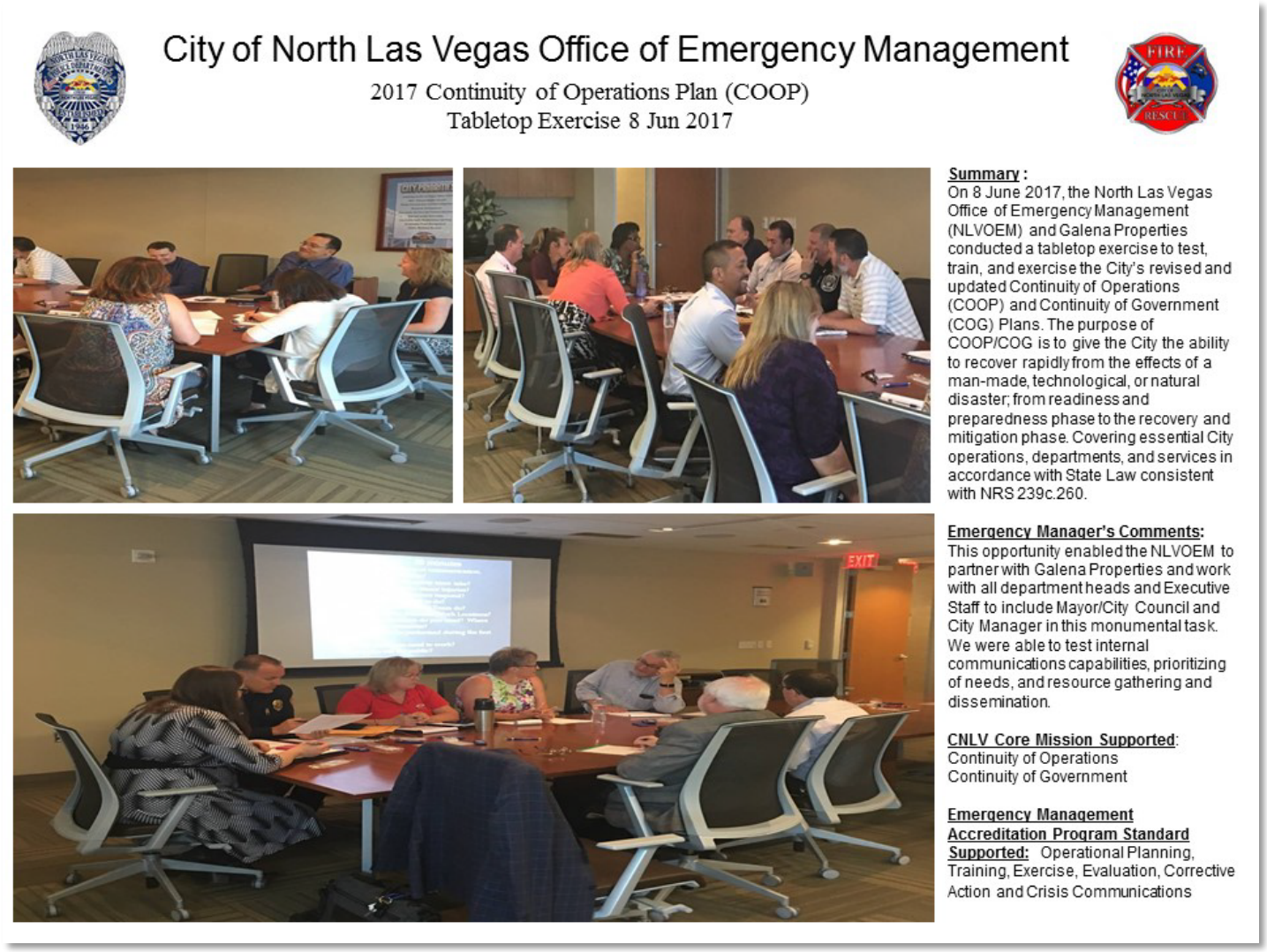


Figure L-2. A flyer describing the City of North Las Vegas's 2017 Tabletop Exercise.

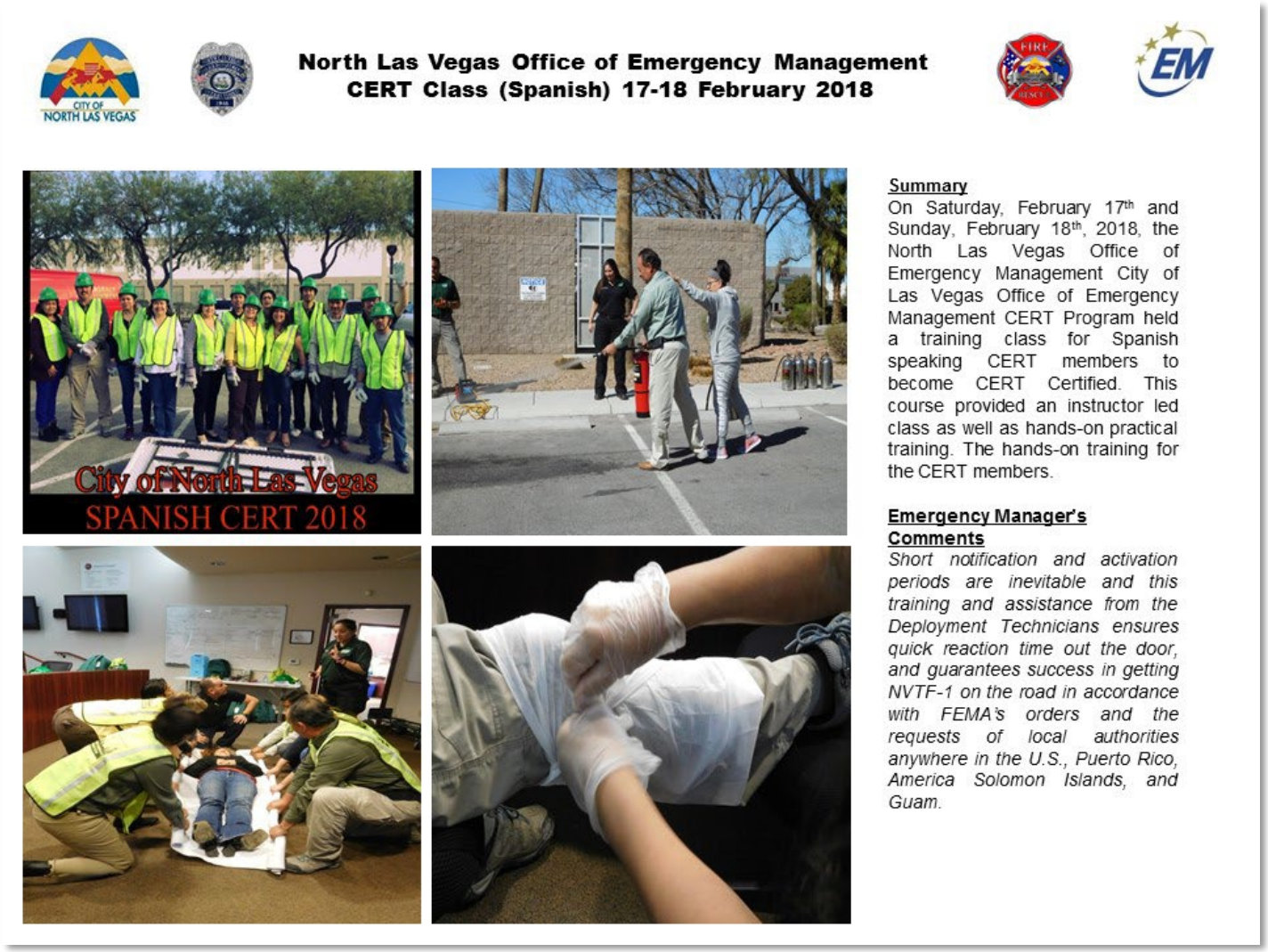


Figure L-3. A flyer describing the City of North Las Vegas's 2018 CERT clas

M. Public Outreach

Public outreach is an essential part of hazard mitigation planning. By engaging and educating the public about hazards and mitigation strategies, individuals are motivated to take action and get involved. Outreach efforts aid planners in recognizing public concerns and priorities, making for a more thorough hazard mitigation plan. The NHM Working Group members provide information on mitigation activities at meetings with members, staff, the public and other organizations, etc. speaking about the planning process and offering information about how to provide input.

Please note that it is difficult to capture all of the outreach efforts occurring in Nevada – organizations mentioned in this appendix might be doing more outreach than captured. Likewise, some organizations may have been missed that have participated in outreach efforts. NV DEM Mitigation conducted monthly surveys in an attempt to collect public outreach events as well as mitigation actions. These surveys were conducted monthly in order to get a better idea of events happening as they occurred but is challenged by limitation to those who responded to the surveys each month.

M.1 OUTREACH METHODS

Local, state, and federal agencies participated in outreach efforts, in addition to non-profit and private sectors. In order to reach a large audience, a wide variety of outreach methods were used. The following resources were used for public outreach and awareness efforts:

- Social media: Facebook, Twitter, YouTube, and Instagram.
- Online resources: web GIS applications and websites.
- Public Meetings and Presentations
- Flyers: distributed online and in person.
- Media Coverage: Press releases and radio announcements.

M.1.1 Social Media

Numerous agencies utilize social media sites to educate the public of hazards and mitigation. The following organizations are active on social media sites and provide helpful information to the public:

- Nevada Division of Emergency Management

  https://www.facebook.com/NVEmergencyMgmt/
  https://twitter.com/nvemergencymgmt?lang=en

- Nevada Bureau of Mines and Geology

  https://www.facebook.com/NevadaGeology/

  https://www.instagram.com/nevadageology/

- Nevada Division of Forestry

  https://www.facebook.com/NevadaDivisionSouth/

  https://www.facebook.com/NevadaForestry/

https://www.facebook.com/pg/NevadaDivisionNorth/photos/?ref=page_internal

- Nevada Department of Public Safety
  https://www.facebook.com/NevadaDPS/
  https://twitter.com/nevadadps?lang=en
- Nevada Division of Insurance
  https://www.facebook.com/NevadaDivisionOfInsurance/
- Nevada Seismological Laboratory
  https://www.facebook.com/NevadaSeismo/
  https://twitter.com/NVSeismoLab?lang=en
- Truckee River Flood Management Advisory
  https://www.facebook.com/trfma/
  https://twitter.com/TruckeeRiverFMA?lang=en
- Nevada Floods
  https://www.facebook.com/NevadaFloods/?hc_location=ufi
- Weather Ready Nation Ambassadors
  https://twitter.com/WRNAmbassadors?lang=en
- Federal Emergency Management Agency
  https://www.facebook.com/FEMA/
- Clark County's Regional Flood Control District
  https://www.facebook.com/RegionalFloodControlDistrict
  https://twitter.com/RegionalFlood
  https://www.youtube.com/user/CCRFCD
  https://www.instagram.com/regionalflood/
- The Great Nevada Shakeout
  https://www.instagram.com/greatshakeout/
  https://www.shakeout.org/nevada/index.html
  https://www.facebook.com/GreatShakeOut/
  https://twitter.com/nvearthquakes
  https://www.youtube.com/user/greatshakeout
- Southern Nevada Water Authority
  https://www.facebook.com/thesnwa/
  https://es-la.facebook.com/snwaenespanol/

https://twitter.com/SNWA_H2O

https://www.youtube.com/user/snwavideo

- Nevada Department of Transportation

  https://www.facebook.com/NevadaDOT/

  https://twitter.com/nevadadot?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor

- Living With Fire

  https://www.facebook.com/LivingWithFire/

  https://www.youtube.com/playlist?list=PLE2F3834692634B77

- North Lake Tahoe Fire Protection District

  https://www.facebook.com/NorthLakeTahoeFire/?hc_ref=ARRHycNmwcemaNfXqTjYIGEZjx4D-SU0U55MdJmZzAYM0N20xxKo-XOQsVaEXc4RE7w&fref=nf

  https://twitter.com/ntfpd_?lang=en

- Desert Research Institute

  https://www.facebook.com/driscience/

  https://twitter.com/DRIScience?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor

  https://www.instagram.com/driscience/

- The Nature Conservancy in Nevada

  https://www.facebook.com/NatureNevada/

  https://twitter.com/nature_nevada?lang=en

- Alpine Watershed Group

  https://www.facebook.com/AlpineWatershedGroup/

  https://twitter.com/alpinewatershed

- Truckee Meadows Water Authority

  https://www.facebook.com/truckeemeadowswaterauthority/

  https://twitter.com/tmwa?lang=en

- Sierra Avalanche Center

  https://www.facebook.com/sacnonprofit/

  https://www.instagram.com/savycenter/?hl=en

  https://twitter.com/sierraavalanche?lang=en

M.1.2 Online Resources

M.1.2.1 Nevada Bureau of Mines and Geology

NBMG has many online resources available to the public, http://www.nbmg.unr.edu/.

- MyHAZARDS is created and maintained by NBMG and is updated monthly. This user-friendly web application allows citizens to identify flood, fire, earthquake, and radon hazards in Nevada. https://gisweb.unr.edu/MyHAZARDS/

M.1.2.2 Nevada Division of Emergency Management

Nevada DEM has a lot of information available online, including NHMWG meeting minutes, agendas, notifications, and disaster preparedness tips, among other information.

See: http://dem.nv.gov/ and https://dem.nv.gov/DEM/DEM_Public_Meeting_Information/

M.1.2.3 Nevada Division of Forestry

NDF has the Nevada Natural Resources and Fire Information Portal available online. Use the GIS application to see wildfire threats, fire intensity, precautions, and preparedness measures. See: http://forestry.nv.gov/ and https://nevadaresourcesandwildfireinfo.com/Map/Public.

M.1.2.4 Carson Water Subconservancy District

CWSD has an online Outreach and Education webpage, which is available for viewing at: http://www.cwsd.org/outreach-and-education/.

M.1.2.5 State of Nevada Division of Water Resources

NDWR information available online, including news, programs, mapping and data, hearings, calendar, and helpful links. Please see: http://water.nv.gov/index.aspx.

M.1.3 Flyers, Media Coverage, and Presentations

Flyers are typically posted and shared on social media sites, as well as websites. Flyers, in addition to banners, are also posted throughout communities. Examples of outreach flyers are in section M.2.

Media releases and radio announcements have been used to announce hazard mitigation-related events, such as Nevada's Flood Awareness Week. This information is also posted on the NV DEM website and provided with each outreach event held by NV DEM Mitigation

Presentations on hazards in Nevada and NHMWG are posted on various websites.

M.2 PUBLIC OUTREACH AND AWARENESS EXAMPLES

Hazard and mitigation presentations, talks, and events are tracked in the Table M-1. Outreach data was provided by the NHMWG. Tables M-2 and M-3 lists Living with Fire 2016 summary and presentations. Table P-4 summarizes Nevada Wildfire Awareness Month activities from 2014-2017. Following the tables, there are examples of outreach efforts (flyers, brochures, social media posts) throughout the state of Nevada.

Table M-1. Public Awareness and Outreach Events in Nevada.				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Living with Fire virtual presentation to D'Andrea Wildfire Prevention Group	Presentation	University of Nevada Reno Extension Living with Fire	October 2020	Reno, Nevada
Public Meetings by Living With Fire	Presentation, flyers distributed to community and via website	University of Nevada Reno Extension Living with Fire	October 22, 2020	Reno, Nevada
Community Outreach for flood	Community outreach to collect past experiences about flooding	Carson City Public Works	October 2020	Carson City
Great Nevada Shakeout	Shakeout event for county, supplied earthquake awareness outreach, two presentations at local businesses	Washoe County EM	October 2020	Reno
COVID Testing Sites	COVID testing sites and educational outreach	Clark Count	November 2020	Clark County
Wildfire outreach	Community outreach for wildland fires, COVID, and idea that debris flow flash flooding may occur this winter over burn scars. Involved our all-hazards LEPC in the discussions as well as our community members in email outreaches.	East Fork Fire/Douglas Co EM		Douglas County
Shakeout, COVID-19	Extensive community outreach IRT COVID19, preparing for "the Great ShakeOut" annual earthquake drill. Requested Nye County B&G construct a fire break around the community of Belmont, NV.	Nye County EM		Nye County
Wildfire outreach	We have completed community outreach and education in multiple counties related to wildland fire prevention and awareness	NV Division of Forestry		Statewide
Pandemic	Minimum of bi-weekly Community outreach related to pandemic via traditional and social medias	University of Nevada, Reno		Washoe County

Table M-1. Public Awareness and Outreach Events in Nevada.

Event	Description	Presenting Agency	Dates	Location
	Weekly meetings to discuss and implement physical and non-physical mitigation strategies for COVID			
Wildfire	The Living With Fire Program gave a weekly Zoom workshop on how to prepare for wildfire. Week 1: Nevada Division of Insurance talked about Wildfire & Insurance. Week 2: Washoe County Animal Services talked about animal evacuation for disasters. Week 3: Northern NV American Red Cross talked about packing a evacuation Go-Bag Week 4: Living With Fire talked about Defensible Space. Week 5: Living With Fire talked about Retrofitting one's home to reduce the wildfire threat	University of Nevada Reno Extension – Living with Fire Program		Washoe County
Wildfire	The Living With Fire (LWF) Program hosted a virtual presentation event to D'Andrea Wildfire Prevention Group. LWF worked with the D'Andrea HOA for this presentation. 52 people attended. Other agencies were in attendance. Sparks City Councilman - Paul Anderson, Nevada Division of Forestry's Fire Adapted Nevada, Bureau of Land Management - Carson City District, Sparks Fire Department all attended to answer questions. LWF hosted the event and also had a speaker talk about retrofitting your home to reduce the wildfire	University of Nevada Reno Extension – Living with Fire program		Statewide
Flood	Conducted a community outreach to collect past experiences about flooding	Carson City Public Works		Carson City
HMP update	Community outreach HMP EOP INTEGRATION	Lyon County EM		Lyon County
Earthquake	Earthquake Awareness through the Great Nevada Shakeout	Washoe County – City of Sparks		Washoe County
Pandemic	we performed community outreach in November for the covid 19 pandemic	Lincoln County EM and Lincoln County Fire District		Lincoln County

Table M-1. Public Awareness and Outreach Events in Nevada.				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Flood Awareness	Douglas County, Storm Water Department tried to hold a Flood Awareness workshop at the Community Center. But with the restrictions that were put in place, that was canceled, and the info is online	Douglas County Community Development and Public works, stormwater		Douglas County
Flood	Flood awareness week	Nevada Division of Water Resources	Nov 14-20	Carson City
Flood	Watershed Wednesdays Forum	Carson Water Subconservancy District		Carson City
Pandemic	The NHA continues to provide community outreach related to the current pandemic and ways individuals can help mitigate the effects. Outreach efforts include a weekly newsletter (Weekly Wrap Up) which is distributed to over 1,000 individuals throughout NV and elsewhere as well as data and analysis support to other agencies, supporting additional mitigation measures such as the Washoe County Risk Meter.	NHA		Washoe County
Pandemic	We hold a meeting of all the area public and private agencies to discuss currant activities and any special operations going on. Dec, Jan Feb and Mar we helped coordinate our local Covid 19 testing and then 3 Shot clinics	West Wendover Fire, Elko County Fire, Elko Hospital, and West Wendover Medical Clinic		Elko County
Wildfire	Wildfire prevention and preparedness outreach to Elko community. The Living With Fire Program sponsored the Silver State Stampede Rodeo in Elko, NV to promote wildfire preparedness. Outreach included a speech by Jamie Roice-Gomes, Manager of LWF to 4,500 rodeo attendees, multiple wildfire prevention and preparedness messages on the jumbotron, speaking to attendees as they walk into the entrance, 3 preparedness and 5 prevention banners posted throughout the rodeo and publications about retrofitting one's home to reduce the wildfire threat were handed out to attendees	University of Nevada Cooperative Extension and BLM Nevada State Office		Elko County

Table M-1. Public Awareness and Outreach Events in Nevada.				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Wildfire	Wildlife preparedness. 1) Social media posts about wildfire preparedness on Facebook, Twitter, recordings of wildfire prep Zoom workshops on YouTube and Instagram.2) Livingwithfire.com and TahoeLivingWithFire.com 3) Zoom workshop hosted by Living with Fire on wildfire smoke modeling, impacts of wildfire smoke, and how to prepare it. This presentation featured that National Weather Service- Reno office's Chris Smallcomb and Washoe County Health Department Air Quality Division's Brendan Schneider. The Living with Fire Program's outreach coordinator, Megan Kay produced and hosted the Living with Fire Podcast which became live July 30. 5) Media Coverage: 1)Press release about the release of the Living With Fire podcast 2) Television interview via telephone on News Channel 4 and Fox 11 3) Radio interview for Plumas County, California 4) Telephone interview for This is Reno online news source	University of Nevada Cooperative Extension Living with Fire Program		Statewide
	Flyers included in the utility bill	Utility		Carson City
Flood	Community outreach related to any natural hazard- flood. Held a booth at a community event to discuss flooding issues with residents. Public Presentation. Floodplain model demonstrations given. Local Floodplain Manager present to field questions, address public concerns, provide a detailed explanation of current hazards and the potential strategies to mitigate against future flooding events	Division of Water Resources, Storey County local floodplain manager, Nevada Rural Water Association		Storey County
Wildfire	Hand out Smokey Bear prevention materials at Storey County 4th of July celebration. Prevention Awareness at Big Bend State Park, July 3-6 Prevention Patrol Mesquite, July 3-5	Nevada Division of Forestry	July 3-5	Statewide
Wildfire	University of Nevada Reno Extension Living with Fire Program and Nevada Division of Forestry Fire Adapted Nevada	Washoe County EM		Washoe County
Wildfire	The Living with Fire Program and Fire Adapted Nevada held the first Virtual Nevada Network of Fire Adapted Communities 2020 Summit. Here's a link for the recorded videos: https://www.livingwithfire.com/resources/living-with-fire-videos/	University of Nevada Reno Extension Living with Fire		Statewide

Table M-1. Public Awareness and Outreach Events in Nevada.				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
	The theme was "Creating a Toolbox for a Fire Adapted Nevada" This helped residents learn of resources to help their community become fire adapted. Of the many speakers it's noted that national, renown speaker talked about community destruction during extreme fire and Senator Catherine Cortez Masto also spoke	Program and Nevada Division of Forestry Fire Adapted Nevada		
Pandemic/HMP Update	held meetings for HMP renewal, Vaccine Planning for COVID-19, EOP updates	Lincoln County EM		Lincoln County
Wildfire/EQ/Pandemic	Pandemic, wildfire, earthquake outreach throughout our area of operation	NASF Emergency Management, N4 and Fed		Churchill County
Flood	Gave training on How to Prepare for a Community Assistance Visit for local Floodplain Management. Social Media posts	Nevada Division of Water Resources		Statewide
Wildfire	5 residences: Old Clear Creek (Douglas County): Fire Adapted Communities booklet; Wildfire Home Retrofit Guide; Be Ember Aware; Wildfire Evacuation Checklist; Firescaping: Landscape Design for Defensible Space; Thinning & Sanitation: Tools for the Management of Bark Beetles; Cheatgrass flyer; Living with Fire virtual series 2021 flyer	Nevada Division of Forestry		Douglas County
Pandemic	We have been news bulletins, social media, media coverage to increase the vaccination rates in Clark County	Clark County EM		Clark County
EQ and Flood	During School Safety and Security assessments, information was delivered to school administrative staff on the threats within the area and how they can mitigate earthquake and flood hazards	Washoe County School District		Washoe County
Flood	The flood information letter went out to all property owners located within the 100-year flood plain	Douglas County Storm Drain and Community Development		Douglas County
Pandemic	we continue to use all available methods of social media to educate and inform the community of our vaccine and testing efforts	Churchill County EM		Churchill County

Table M-1. Public Awareness and Outreach Events in Nevada.				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Flood	The NDWR Water Planning and Drought Resiliency program team participated in the Nevada Rural Water Association Virtual Conference (NvRWA) on 5/4/21. The Team gave a presentation on water conservation plans requirements and the American Water Works Association (AWWA) free water audit software. Both of these topics promote drought resiliency in Nevada	Nevada Division of Water Resources	5/4/21	Statewide
All hazards	Community outreach related to any natural hazards such as flood, wildfire, earthquake, pandemic or any other natural hazard using social media: Facebook, Twitter, YouTube, and Instagram.Online resources: web GIS applications and websites. Public Meetings and Presentations. Flyers: distributed online and in person. Media Coverage: Press releases and radio announcement	East Fork Fire Protection District, Tahoe Douglas Fire Protection District, Douglas County EM, Douglas County Manager's Office		Douglas County
Flood	We have done extensive flood hazard outreach this month	Carson Water Subconservancy District and Staff from other counties		Carson City, Douglas County, Lyon County, Storey County, Churchill County
All hazards	We do outreach messaging on a regular basis on various social media platforms. Many are through our County PIO and media distribution	Nye County EM		Nye County
Pandemic	The City continues to promote testing and vaccinations on the City website for the COVID-19 pandemic. The action was done using social media platforms and public meetings at City Council meetings	Clark County EM		Clark County
Pandemic	Carson City Health and Human Services participated in National Night Out in Carson City in early August 2021. At the event the public was educated about	Carson City Health and Human Services	August 2021	Carson City

Table M-1. Public Awareness and Outreach Events in Nevada.

Event	Description	Presenting Agency	Dates	Location
	natural hazards residents of Carson City are at risk to experience. Additionally, the public was educated on how to make a preparedness kit for their family and pets. CCHHS did social media posts each Thursday in the month of September for Preparedness Month. Additionally, we published two articles in the local paper (hard copy and online) on how to be prepared for a natural disaster			
Wildfire	NDEP Posted Caldor Fire updates on all social media updates	Bureau of Corrective Actions, Superfund Branch, ESF10		Carson City
All Hazard	Participation (as Chair) in the Nevada Hazard Mitigation Working Group meeting on 09/27/2021	Nevada Governor's Office of Energy	9/27/2021	Statewide
Wildfire	Safety Event at Town Center Shopping Center, Las Vegas, with Smokey Bear	Nevada Division of Forestry, Southern Region Fire Staff		Clark County
All hazards	National Preparedness Month-Social Media push on Twitter and partnered with Ready.gov and Media release. Preparedness Training to Rural CERT programs. Promoted "Turn Around Don't Drown" campaign to rural communities. Announced October Shake Out 2021 registration to rural communities. Worked with FEMA on Get Out the Vaccine Campaign, recruited volunteers and visited community outreach locations. coordinated 2 day Urban Area THIRA/SRA workshops	Clark County EM		Clark County

Community Workshops

LWF collaborated with partners to create each of the following workshops, which serve to increase the adoption of FAC concepts:

2020 Workshop Series: 5 Ways to Prepare Your Family and Property for Wildfire

In 2020, we led a five-part virtual workshop series that focused on preparing the home and family for wildfire. The workshop series occurred on Zoom and included audience participation and interactive polling features. The workshops reached 1,107 direct contacts. Partners that we collaborated with to produce these workshops included Nevada Division of Insurance, Washoe County Regional Animal Services, and the Northern Nevada American Red Cross. The workshops were titled:

- Nevada Insurance Division's Perspective on the Insurance Industry and Wildfire
- Animal Services and Disaster Preparedness
- Packing an Evacuation Go Bag
- 5 Steps to Creating Effective Defensible Space
- Retrofitting Your Home to Increase Wildfire Survival

We surveyed participants from the workshop series to assess knowledge gain, intended behavior change (willingness to act on new knowledge and change a behavior), and if the workshop was valuable to attend (Table 1). Over 92% of participants reported an increase in knowledge and over 60% plan to use the information to become more prepared for fire.

Table M-2. Survey results from workshop series "5 Ways to Prepare Family and Property for Wildfire."

Topic	Knowledge Assessment	Willingness to Act	Valuable to Attend
Fire Homeowner's Insurance (n=38)	92%	65%	73%
Preparing Animals and Livestock for Fire (n=35)	N/A	100%	91%
Preparing an Evacuation Go-Bag (n=69)	93%	61%	76%
Defensible Space (n=51)	98%	98%	100%
Home Hardening (n=41)	100%	100%	100%

2020 Wildfire Home Retrofit Workshops

We partnered with UC Cooperative Extension, Cal Fire, and the Tahoe Resource Conservation District to create a 20-page technically illustrated guide detailing how to retrofit homes for wildfire. The publication received 35 reviews from local fire chiefs and fire practitioners before being submitted for peer review. To teach the information within the guide, we co-organized

two home retrofit workshops in 2020 with the Tahoe Resource Conservation District – one for the public and one for building professionals. The workshops were all virtual and had attendance from all over the western U.S., including high attendance from Nevada.

The public workshop reached 91 direct contacts. We surveyed the participants to assess knowledge and behavioral change after attending the workshops. 40% of participants learned that defensible space inspections are free in the Lake Tahoe Basin, and 37% learned that there are free chipping programs available – these are critical pieces of knowledge that can help the public remove hazardous fuels from their properties. 34% of respondents said that they did not know what to do to retrofit their homes and our presentations were able to educate them about easy next steps.

The practitioner workshop reached 260 direct contacts. There were individuals from Nevada, California, Colorado, Wyoming, Washington, Texas, and Utah. The virtual workshop was very dynamic and culminated a year's worth of practicing virtual programming. 78% of participants responded that they were more comfortable with home retrofitting concepts after the workshop and 70% of participants said that they learned information that they did not already know. Participants were asked what kind of action they were going to take because of their attendance (to measure intended behavioral change). A sample of responses are as follows:

> *"Bring these new resources to my fire safe council"*
>
> *"Use this information to educate my immediate neighbors"*
>
> *"I will personally address more of my own WUI (Wildland Urban Interface) issues at home over the winter"*
>
> *"Feel better about speaking with the public and doing on-site inspections"*
>
> *"I am going to work with members of my community to start a mitigation and hardening program"*
>
> *"Start brainstorming ideas for how to communicate to our region based on what I learned today and what you have shared. Thank you!"*
>
> *"This was fantastic. I enjoyed the interactive portions. Thank you all for putting this together. I can't imagine it being any better, and I look forward to the upcoming publication following today's presentation."*

2021 The Living With Fire Virtual Workshop Series (As part of the Nevada Wildfire Awareness Campaign)

In 2021, we continued to use virtual programming as a teaching strategy to reach public audiences across Nevada. We organized a nine-part virtual series that covered wildland fire topics. All videos and presentation slides were made ADA accessible and are available on the LWF website. The workshops reached 1,004 direct contacts. Living With Fire collaborated with 12 partners for this series. Collaborating partners included Washoe County Extension Horticulture team, Carson City Fire Department, Bureau of Land Management and U.S. Forest Service, Desert Research Institute, NV Energy, National Weather Service – Reno Office, Former Chief Scientist for Wildfire and Durability, Insurance Institute for Business & Home Safety Research Center, Nevada Division of Forestry, the Nevada Department of Wildlife, U.S. Army Corps of Engineers and Tahoe Douglas Fire Protection District. The workshops were titled:

- Firewise Landscaping
- Wildfire Evacuation Preparedness
- Perspectives of a Wildland Fire Investigator
- The Timeline of Climate, Weather and Fire
- Protect, Prevent and Prepare with NV Energy
- Wildfire Smoke and Health
- Home Hardening
- Reseeding and Flood After Wildfire
- Prescribed Fire in Tahoe and Nevada

We surveyed participants from the workshop series to assess knowledge gain, intended behavior change (willingness to act on new knowledge and change a behavior), and if the workshop was valuable to attend (Table 2). Over 50% of participants learned new concepts and 25% - 100% of participants stated a willingness to implement new tools or strategies.

Table M-3. Survey results from "The Living With Fire Virtual Workshop Series."

Topic	Knowledge Assessment	Willingness to Act	Valuable to Attend
Firewise Landscaping (n=75)	52%	99%	95%
Evacuation Preparedness (n=28)	40%	81%	100%
Fire Investigations (n=8)	100%	25%	100%
Climate, Weather, and Fire (n=6)	66%	100%	100%
Prepare with NV Energy (n=20)	66%	N/A	100%
Wildfire Smoke and Health (n=23)	61%	87%	91%
Home Hardening (n=23)	60%	56%	89%
Reseeding and Flooding After Fire (n=28)	57%	75%	100%
Prescribed Fire (n=28)	68%	68%	90%

We used a follow-up survey for the attendees of this workshop series to assess behavioral changes. Data shows that after interacting with LWF, 35% implemented defensible space, 18%

organized a community meeting, and 16% retrofitted their homes. These percentages were calculated as a mean across all nine surveys. Self-reported behavior changes are reflected in the following comments:

> *"Changed landscaping around the perimeter of our house"*
>
> *"Cleaned around the outside of the house and stocked a to-go bag"*
>
> *"I installed ember barrier screens under my porches. The screens also keep leaf litter from accumulating under the porch"*
>
> *"Used the information to inform clients and coworkers about best practices"*
>
> *"Enclosed soffits and made Firewise changes to landscaping"*

2022 "The Living With Fire Community Tour" (As part of the Nevada Wildfire Awareness Campaign)

In 2022, we moved back to in-person workshops because we found that virtual attendance was decreasing. We conducted a five-stop tour to high-fire hazard communities across the state where we worked with local stakeholders and agencies, met with community members, and provided a series of informational talks from our LWF team and fire agency partners. Each community event involved multiple talks that we had to coordinate and review beforehand. Living With Fire collaborated with partners during each of the following workshops. The events included the following topics/locations:

- Las Vegas – Included three presentations, with one from LWF titled "How to Reduce the Health Impacts of Wildfire Smoke." Other presentations were from the American Lung Association and the Clark County Dept. of Environment and Sustainability. (6 contacts)
- Mount Charleston – Included seven presentations with one from LWF titled "Defensible Space and Home Hardening." Other presentations were from Mt. Charleston Fire Protection District, Clark County Fire Department, Las Vegas Metropolitan Police Department, Clark County Office of Emergency Management, NV Energy, NDF, and the U.S. Forest Service. (42 contacts)
- Topaz Ranch Estates – Included eight presentations, including one from LWF titled "Defensible Space and Home Hardening." Other presentations were from East Fork Fire Protection District, Douglas County Sheriff's Office, Douglas County Government, NDF and BLM. (60 contacts)
- Spring Creek – Included seven presentations, including one from LWF titled "Defensible Space, Home Hardening, and Evacuation Tips." Other presentations were from Elko County Sheriff's Office, Elko County Fire Protection District, NV Energy, NDF, U.S. Forest Service, and BLM. (37 contacts)
- Tahoe Basin – Included two presentations in Spanish by UNR Extension. The LWF team created the presentations and worked with Jeanette and Monica to translate. Attendees were given LWF publications in Spanish. (6 contacts)

We evaluated the presentations that we gave during the tour to better understand participant knowledge change and intent to change behavior (Tables 3 & 4). We found moderate levels of knowledge change and intent to act compared to other community workshops that we have led.

Table M-4. Survey results about knowledge change from the "Living With Fire Community Tour" (n=59).			
This workshop changed my understanding of…			
	Fully	**Moderately**	**Slightly**
Wildfire Evacuation	31%	36%	17%
Wildfire Preparedness	34%	36%	15%
Fuels Reduction	32%	25%	32%
Agency Collaboration	37%	29%	7%
Overall worth attendance	73%	7%	n/a

Table M-5: Survey results about intent to change behavior from the "Living With Fire Community Tour" (n=59).	
After this workshop, I plan to…	
Create defensible space	60%
Perform home hardening	45%
Get an inspection	30%
Organize a community event	20%
Pack a go-bag	56%
Register for alerts	31%

Nevada Wildfire Awareness Campaign

A primary public teaching tool that we use is an annual wildfire awareness campaign titled the Nevada Wildfire Awareness Campaign (NWAC). To create the educational materials for this campaign, we lead a stakeholder working group that includes local, state, and federal fire agencies. Materials include graphic messaging, social media and marketing content, and proclamations with local governing bodies. Every year, we agree on a theme with partners and create the theme artwork displayed on large banners, posters, billboards and social media posts.

The number of banners, partner agencies and counties involved are summarized in Table 5. In 2020, the theme was also showcased on billboards in Elko, Reno and Las Vegas.

Table M-6. Annual details about the Nevada Wildfire Awareness Campaign.

Year	Theme	# of Banners	# of Proclamations	# of Counties	Partner Agencies	Direct Contacts	Indirect Contacts
2020	*"Wildfire Knows No Boundaries . Make Yours"*	50	3	10	22	376	2,745,862
2021	*"Is Your Home Ignition Resistant?"*	73	13	12	43	7,179	6,159
2022	"*Battle Born. Wildfire Ready."*	60	16	14	43	1,862	63,506
2023	*"Protect Our Home. Prepare for Wildfire"*	70	*	16	43	*	*

The grant period ended May 1, 2023, and NWAC occurred during the month of May. Contacts and proclamations were not established by May 1.

ONLINE OUTREACH:

Living With Fire Website

The website serves as a clearinghouse of wildfire preparedness information, peer-reviewed publications, videos and webinars, curricula packages, and event information. Maintaining the website requires significant input, with content uploading and website redesign based on new peer-reviewed content. Since 2019, we have redesigned the website twice to be ADA compliant and to better display new content from publications like the *Wildfire Home Retrofit Guide* and the *Flood After Fire Guide.* Users can learn details of wildfire preparedness through the Get Prepared, Get Informed, and Get Involved pages. See more at (www.livingwithfire.com). Website statistics including followers and engagement are listed in Table 7.

Social Media

We use the social media platforms Twitter, Facebook, and Instagram to teach about wildfire concepts and promote community events. Reach and engagement on all social media platforms is detailed in Table 7.

Table M-7. Living With Fire social media and website statistics for 2020- May 1, 2023.				
Platform	**Total Posts**	**Total Reach**	**Engagement**	**Total Followers**
2020				
Facebook	275	31,708	2,758	n/a
Instagram	108	1,153	1,234	n/a
Twitter	184	25,991	n/a	184
Website	n/a	24,751	39,116	19,610
2021				
Facebook	235	144,280	6,625	254
Instagram	165	8,048	764	100
Twitter	261	693,605	8,563	277
Website	n/a	25,604	51,460	25,842
2022				
Facebook	160	82,793	2,257	2,200
Instagram	86	6,975	816	471
Twitter	149	193,614	3,804	471
Website	n/a	37,861	23,346	19,806
Jan 1 – April 30, 2023				
Facebook	22	5,219	400	2,289
Instagram	15	1,582	391	533
Twitter	23	16,634	481	811
Website	n/a	10,843	6,003	5,219

ASSIST UNDERSERVED COMMUNITIES

Spanish Translation of Living With Fire Resources

Through these translation activities, Living With Fire successfully provided underserved Spanish speaking communities with essential wildfire preparedness resources in their native language.

- Translated the fact sheet *Living With Smoke: How to be prepared for smoke exposure* into Spanish, titled *VIVIR CON HUMO: CÓMO ESTAR PREPARADO EN CASO DE EXPOSICIÓN AL HUMO DE INCENDIOS.* This translation allowed Spanish-speaking community members to access crucial information on preparing for smoke exposure during wildfires.
- Translated the fact sheet *CodeRED in Washoe County* into Spanish, called *CodeRED en el condado de Washoe.* By providing a Spanish translation of this information, Living With Fire ensured that underserved communities gained awareness and understanding of the CodeRED emergency alert system in their county.
- Translated the *Wildfire Home Retrofit Guide* into Spanish, called *GUÍA DE ADAPTACIÓN DE VIVIENDAS EN CASO DE INCENDIOS FORESTALES*. This translation enabled Living With Fire to provide Spanish-speaking residents with guidelines and instructions for retrofitting their homes to better withstand wildfires.
- Translated the *Be Ember Aware!* publication into Spanish, called *¡Cuidado con las brasas!* Through this translation, Living With Fire empowered Spanish-speaking individuals with essential information about embers and the steps they can take to protect their homes from ember-driven wildfire ignition.
- Translated LivingWithFire.com into Spanish (https://www.livingwithfire.com/es/) By providing a Spanish translation of the Living With Fire website, Living With Fire ensured that Spanish-speaking community members could access comprehensive information on wildfire preparedness.

Outreach to Tribal Communities

Living With Fire engaged with tribal communities, established partnerships with relevant organizations, provided targeted outreach through conferences, podcasts, and cultural events, and contributed to the planning of a cultural prescribed fire training exchange. These efforts supported community resilience, raised awareness about wildfire risks, and fostered collaboration between agencies and tribal communities to enhance wildfire preparedness in tribal communities.

- Living With Fire engaged in a meeting with Wilfred J. Nabahe, the Native American Coordinator at the Bureau of Land Management's Battle Mountain District in Nevada. The purpose of the meeting was to discuss strategies aimed at enhancing outreach efforts to underserved tribal communities across Nevada.
- Living With Fire Podcast Episode:
  On September 9, 2021, Living With Fire published episode 4 of the "Living With Fire" podcast titled "A Necessary Disturbance: Cultural Fire on Washoe Tribal Lands in Lake Tahoe." In this episode, Living With Fire interviewed Rhiana Jones, Interim Director of

the Washoe Environmental Protection Department, and Washoe Tribal Council member Helen Fillmore. The interview explained how the forced removal of Washoe people and their practices from the land has impacted ecosystems. This podcast episode served as a valuable platform to share the experiences and perspectives of tribal communities in relation to wildfire management and cultural practices.

- Tribal EPA Region 9 Annual Conference:
  LWF attended the 2022 Tribal EPA Region 9 Annual Conference in Lake Tahoe from October 25-27, 2022. During the conference, 150 direct contacts were made with tribes across Region 9, and 108 publications were distributed. This outreach effort allowed Living With Fire to engage with tribal communities, raise awareness about wildfire risks, and provide resources and information to support their preparedness efforts.
- Cultural Willow Burn:
  On February 14, 2023, LWF attended a cultural willow burn organized by the Washoe Environmental Protection Department near the Dresslerville community. This event provided an opportunity for Living With Fire to observe and participate in a culturally significant fire management practice conducted by the Washoe tribe. By actively engaging in the event, Living With Fire gained firsthand knowledge and appreciation for traditional approaches to land management and wildfire mitigation within tribal communities.
- Discussion with Nevada Tribal Emergency Coordinating Council (TECC):
  On February 28, 2023, LWT virtually met with Josie Burnett and Jay Martin from the Nevada Tribal Emergency Coordinating Council (TECC). The purpose of the discussion was to explore tribal outreach opportunities and discuss collaboration possibilities. As a result of this conversation, Living With Fire was invited to table at the 2023 Nevada Rural Preparedness
- Summit. This opportunity allowed for further engagement with tribal communities and the sharing of resources and information related to wildfire preparedness.
- Planning Meetings for Washoe Tribe Cultural Prescribed Fire Training Exchange (TREX):
  Between December 7, 2022, and May 1, 2023, LWF facilitated three meetings with The Washoe Tribe of California and Nevada and other agency partners to plan a cultural prescribed fire training exchange (TREX). The focus was on developing a collaborative training program that integrates traditional knowledge and modern fire management practices. Living With Fire's active leadership in these meetings provided exceptional opportunities to interact with the Washoe Tribe, provide valuable support, and assess their specific needs.

Note: Data provided by Living With Fire.

Carson Water Subconservancy District

Activities conducted by CWSD in 2020 to provide outreach and education included:

1. Continued the "I AM Carson River Watershed" Campaign including the Walk through the Watershed videos in English & Spanish and the logo sticker distribution. Both were promoted on social media and traditional media throughout 2020.
2. Monitored watershed boundary signs in the Nevada portion of the watershed.
3. Completed and launched the updated "2020 CWSD Overview" video.
4. Began filming of Community Drinking Water PSA featuring local community members which is scheduled to launch in early 2021.
5. Carson Water Subconservancy District 2020 Activities and Accomplishments Looking Ahead to 2021.
6. Completed "Working with the Carson River" presentation on River Geomorphology for decision makers and county staff.
7. Continued to update and manage the CWSD website, making it more user friendly, clear, and comprehensive.
8. Sent CRC e-blasts via Mail Chimp to nearly 900 individuals.
9. Developed biannual digital newsletter sent to nearly 900 individuals watershed wide. Hardcopies provided to libraries throughout the watershed.
10. Conducted FEMA outreach events for flood awareness program. Activities conducted to support Alpine Watershed Group Environmental Education Program in 2020 included:
11. CWSD provided $25,000 in funding assistance to AWG to support their programs.
12. Created E-Waiver forms to eliminate paper at river events.
13. Provided drone mapping for monitoring to assist with West Fork Restoration Project.

Activities conducted to support River Wranglers Environmental Education Program in 2020 included:

1. CWSD provided $26,000 in funding to River Wranglers (RW) to conduct Conserve Carson River Workdays. The RW EE Coordinator maintained partnerships with local schools and offered opportunities for students to increase their knowledge and understanding of water quality, environmental, and flooding issues in the watershed.
2. Provided filming assistance with online outreach events. Recreation:
3. Applied for a NV State Parks Recreation Trail Grant to expand the Carson River Aquatic Trail. Awards will be announced Spring of 2021.

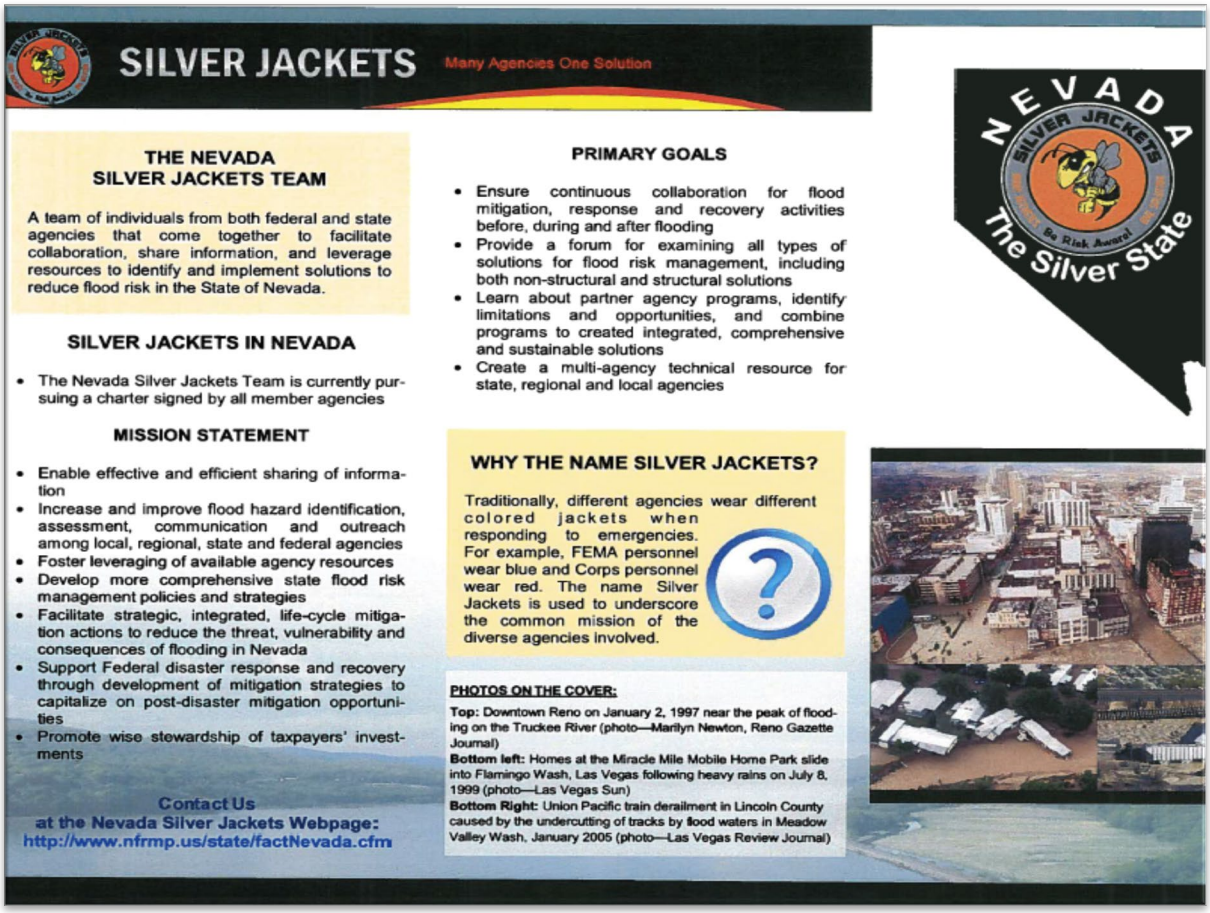


Figure M-3. Flyer describing the Silver Jackets program, which aims to establish solutions to flood hazard issues. For more information, visit: https://www.iwr.usace.army.mil/Silver-Jackets/State-Teams/Nevada/.

Nevada Silver Jackets

Flood Risk Informational Games

Nevada Flood Fighter

http://nevadafloods.org/outreach/virtual-outreach#floodfighter

Game Creator: USACE and NV Department of Water Resources

Ages: 8+

In Nevada Flood Fighter, the player simulates the job of a water management engineer. The game demonstrates what goes into reservoir management. The water management engineer must construct a levee and reservoir system that will withstand a heavy rain event and not flood the town. Students will learn:

- Flooding effects from heavy rainfall
- Multiple priorities of reservoir management
- Flood management systems (reservoirs, dams, levees)

Flood VR

https://floodvr.com/

Game Creator: Clark County Regional Flood Control District

Ages: 8+

This 360 virtual reality flood experience video simulates what can happen when driving through moving water during a flash flood.

- Demonstrates to players that just a few inches of water can inhibit a vehicle.
- The immersive platform allows viewers to experience the danger of driving through a flood.

Nevada Flood Story Maps

http://nevadafloods.org/index.php/education-resources/C7

Game Creator: USACE and NV Department of Water Resources

Ages: All ages

The Nevada Flooding ESRI storymaps are an outreach tool that teach users about historical and present-day flooding in Nevada on an interactive storytelling platform. Historical accounts from individuals who lived through significant flood events offer a powerful perspective on the danger of floods. These also offer tips for flood safety that are relevant for all ages. There are currently six storymaps for students to explore:

- Virgin River Flooding
- Muddy River Flooding
- Walker River Flooding
- Humboldt River Flooding
- Truckee River Flooding
- Carson River Flooding

Complementary worksheets for select storymaps are also available to teachers.

High Water Marks

http://nevadafloods.org/outreach/high-water-mark

Ages: All ages

High water marks demonstrate the highest flood depth in an area. These offer a visual representation of the power of floods! Often these high water marks are well above the average height of a person. There are two high water mark signs around Nevada:

- Wingfield Park, Reno
- Carson City

The signs also have a QR code that links back to the related flooding storymap.

Figure M-3. Flyer from http://nevadafloods.org/outreach/virtual-outreachfloodflighter and http://nevadafloods.org/outreach/high-water-mark

West Fork Carson River Vision Project

The Lahontan Regional Water Quality Control Board invites community members and anyone who has an interest in the Carson River to participate in the West Fork Carson River Vision Project process. We need your help to guide restoration and protection efforts in the Carson River watershed.

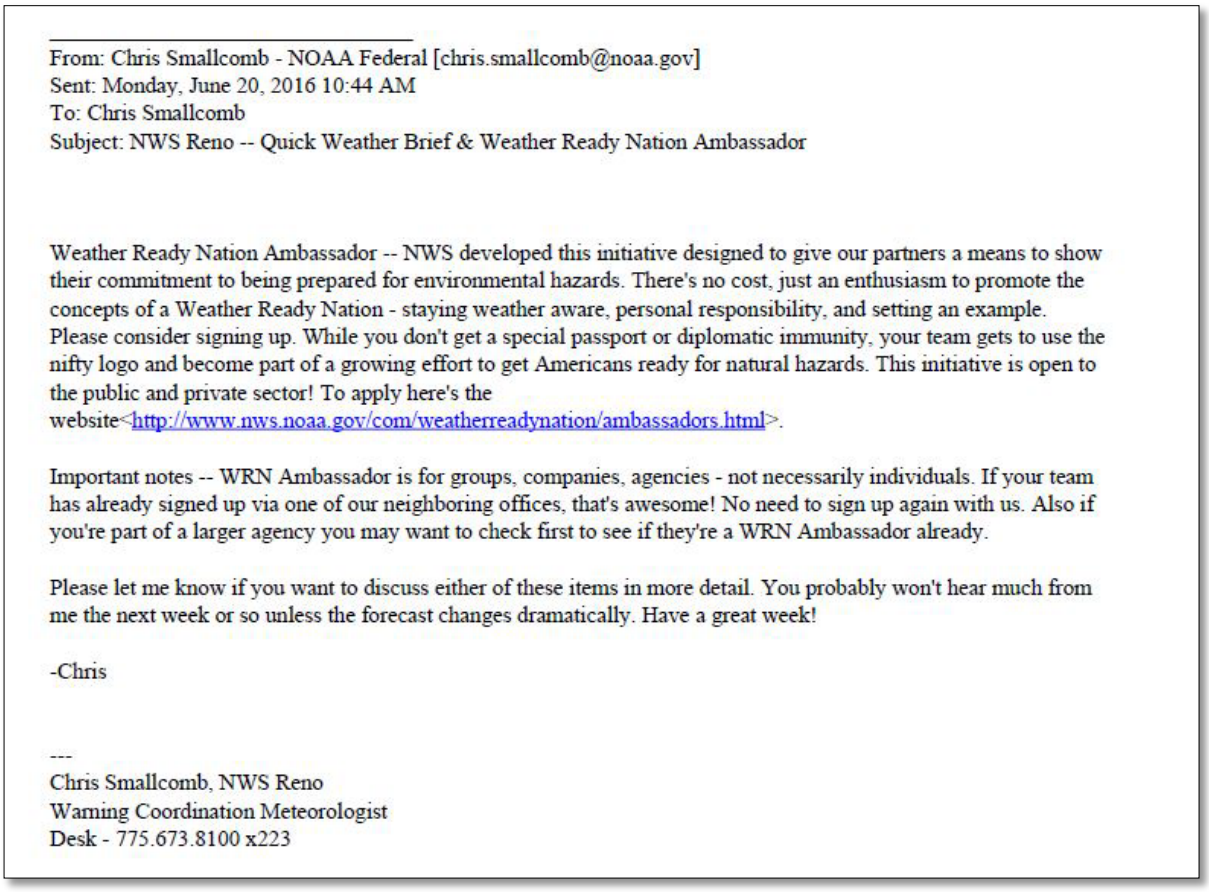
How to be involved:

Check out the project documents and subscribe to the email list here.

Catch up on our past Vision Project Stakeholder Forums:

- March 8, 2022: *Ranching for Improved Water Quality— West Fork Carson River Vision Project Forum #4*
- March 9, 2021: *Recreation: Trends, Impacts, and Solutions for the West Fork Carson Watershed— West Fork Carson River Vision Project Forum #3*
- November 10, 2020: *Restoration Projects in the West Fork Carson River Watershed — West Fork Carson River Vision Project Forum #2*
- September 8, 2020: *Roads & Water Quality — West Fork Carson River Vision Project Forum #1*

Figure M-4: Website information on West Fork Carson River Vision Project at West Fork Carson River Vision Project | awg-website (alpinewatershedgroup.org).



From: Chris Smallcomb - NOAA Federal [chris.smallcomb@noaa.gov]
Sent: Monday, June 20, 2016 10:44 AM
To: Chris Smallcomb
Subject: NWS Reno -- Quick Weather Brief & Weather Ready Nation Ambassador

Weather Ready Nation Ambassador -- NWS developed this initiative designed to give our partners a means to show their commitment to being prepared for environmental hazards. There's no cost, just an enthusiasm to promote the concepts of a Weather Ready Nation - staying weather aware, personal responsibility, and setting an example. Please consider signing up. While you don't get a special passport or diplomatic immunity, your team gets to use the nifty logo and become part of a growing effort to get Americans ready for natural hazards. This initiative is open to the public and private sector! To apply here's the website<http://www.nws.noaa.gov/com/weatherreadynation/ambassadors.html>.

Important notes -- WRN Ambassador is for groups, companies, agencies - not necessarily individuals. If your team has already signed up via one of our neighboring offices, that's awesome! No need to sign up again with us. Also if you're part of a larger agency you may want to check first to see if they're a WRN Ambassador already.

Please let me know if you want to discuss either of these items in more detail. You probably won't hear much from me the next week or so unless the forecast changes dramatically. Have a great week!

-Chris

Chris Smallcomb, NWS Reno
Warning Coordination Meteorologist
Desk - 775.673.8100 x223

Figure M-6: Weather Ready Nation Ambassador Recruiting Memo.

Figure M-7. NWS-Reno's Facebook post about an outreach activity at Aviation Roundup, which draws thousands of people.

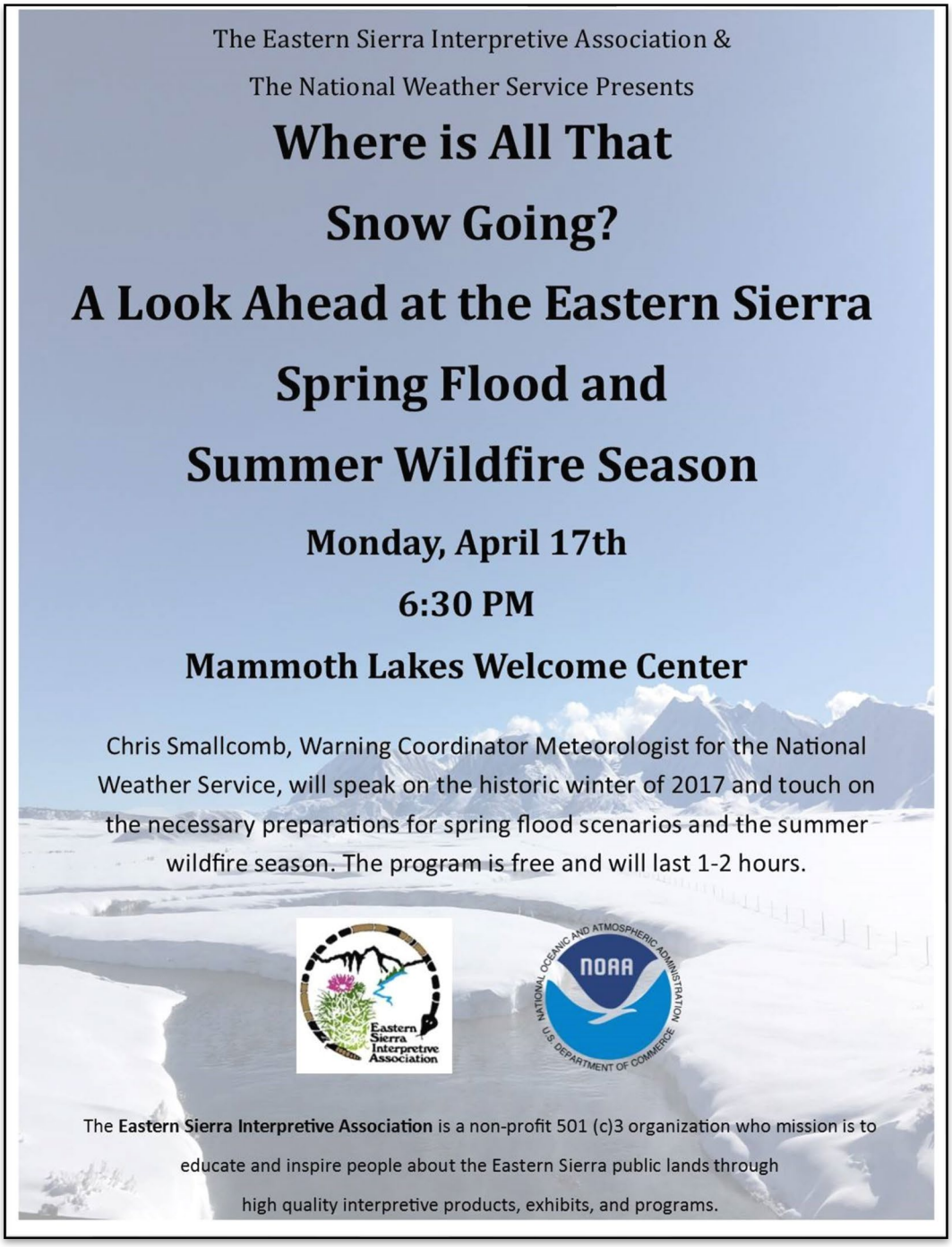
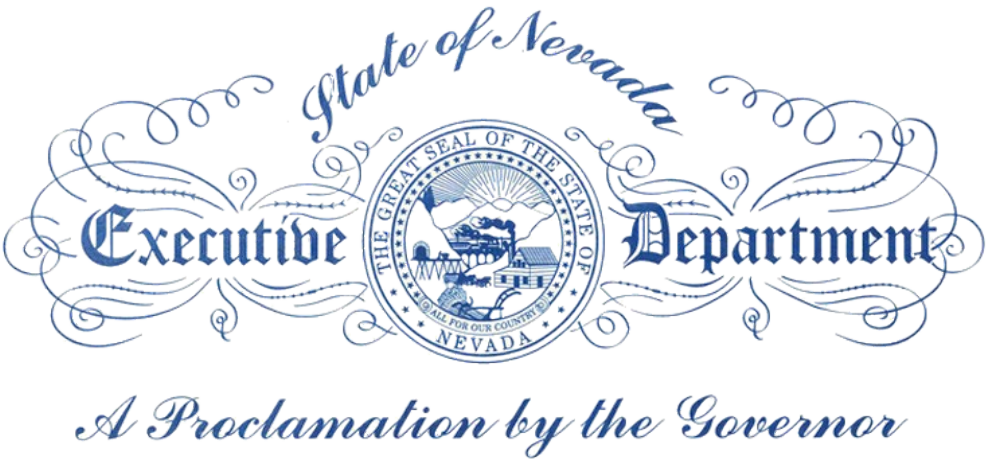


Figure M-8. A flyer posted on NWS-Reno's Facebook page about a presentation on the spring flood and summer wildfire season,

Figure M-9. A flyer posted on NWS-Reno's Facebook page about a presentation on winter weather in the Sierra & Western Nevada.



WHEREAS, *wildfires can occur at any time, and they can significantly impact Nevada's environmental and economic well-being and Nevadans' health and social welfare; and*

WHEREAS, *in order to increase the chance of surviving a wildfire, residents must prepare their homes in advance by ensuring proper management of vegetation surrounding their home, strictly adhering to fire prevention building construction codes, and generally maintaining their homes to resist ignition by wildfires; and*

WHEREAS, *residents are encouraged to become knowledgeable about wildfire safety and commit to becoming fire adapted in their communities to increase their chance of safely surviving a wildfire; and*

WHEREAS, *by completing a wildfire evacuation checklist in advance, preparing a to-go bag, and by having an established family evacuation plan, residents can save precious time during a wildfire evacuation; and*

WHEREAS, *in 2021, approximately 610 fires burned over 134,000 acres in Nevada causing thousands of residents to evacuate their homes; and*

WHEREAS, *in 2021 the largest fire to reach Nevada was the Tamarack Fire, which burned approximately 69,000 acres in California and Nevada. The largest wildfire that originated in Nevada was the Cherrywood Fire in Nye County, which burned over 26,000 acres; and*

WHEREAS, *I call upon Nevadans to raise their awareness and work together to prepare for the 2022 wildfire season by committing to the theme of the 2022 Nevada Wildfire Awareness Campaign of, "Battle Born. Wildfire Ready;"*

NOW, THEREFORE, I, STEVE SISOLAK, GOVERNOR OF THE STATE OF NEVADA, do hereby proclaim the months of May – October 2022, as

NEVADA WILDFIRE AWARENESS CAMPAIGN

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the State of Nevada to be affixed at the State Capitol in Carson City, this 20th day of April 2022.

By the Governor: Governor

Barbara K. Cegavske

Secretary of State

By Deputy

Figure M-10. Executive Order posted on gov.nv.gov executive orders for Wildfire Awareness Campaign May – October 2022.

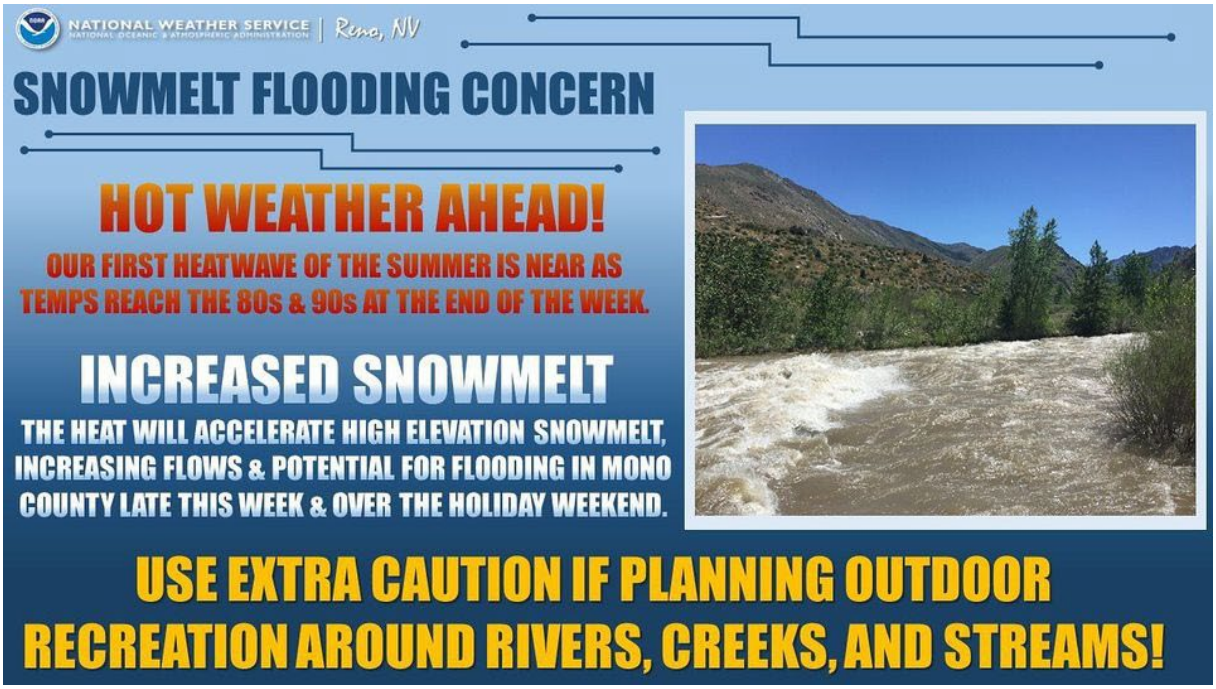


Figure M-11. A flyer posted on NWS-Reno's Facebook page, about the 2023 Snowmelt Flooding.

Figure M-12. A flyer posted on Nevada DEM's Facebook page, about wildland fire safety. For more information, see: https://www.nfpa.org/education.

Figure M-13. Notice posted on City of Henderson Government regarding Cooling Centers open to the public during the high heat warning. June 29, 2023.

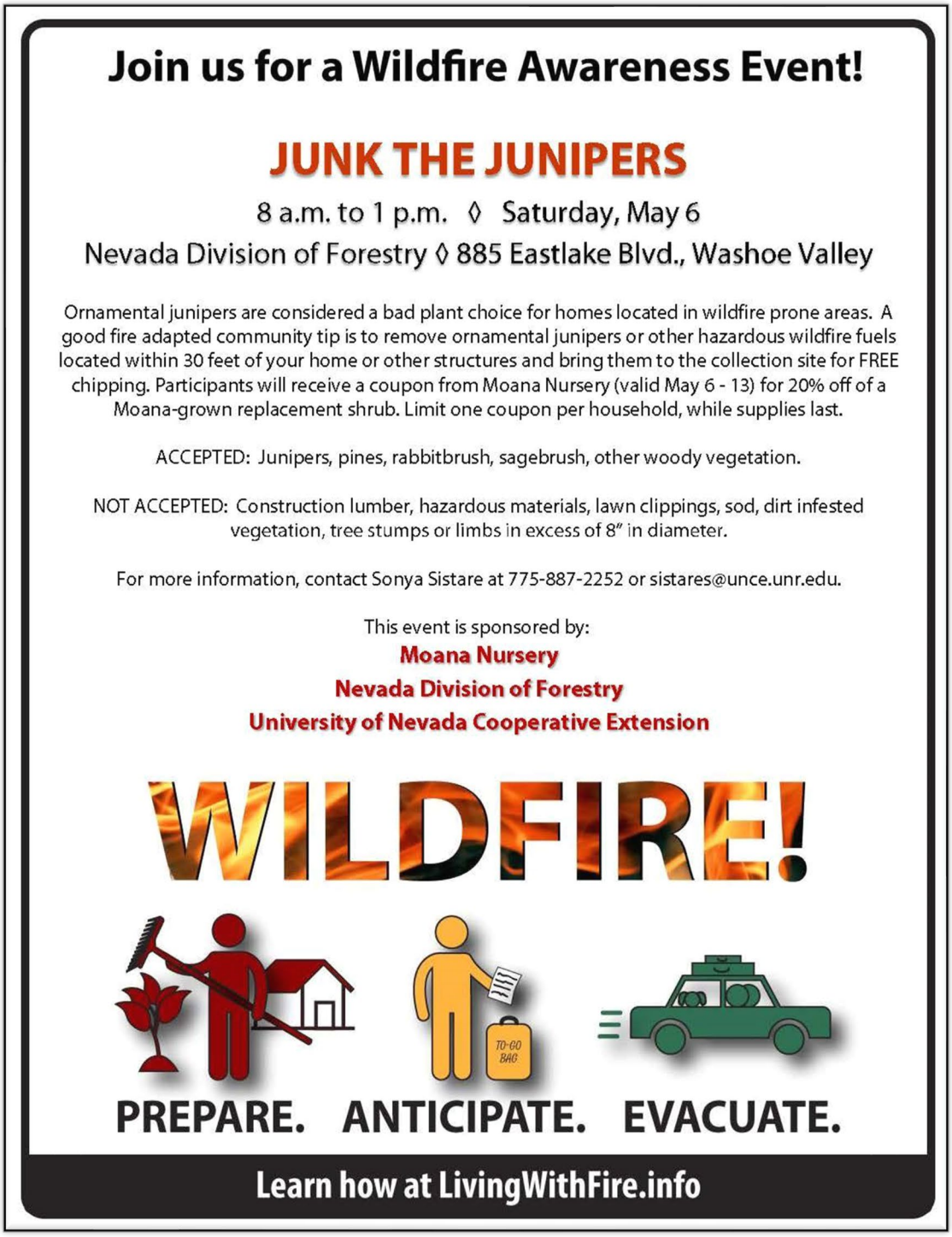
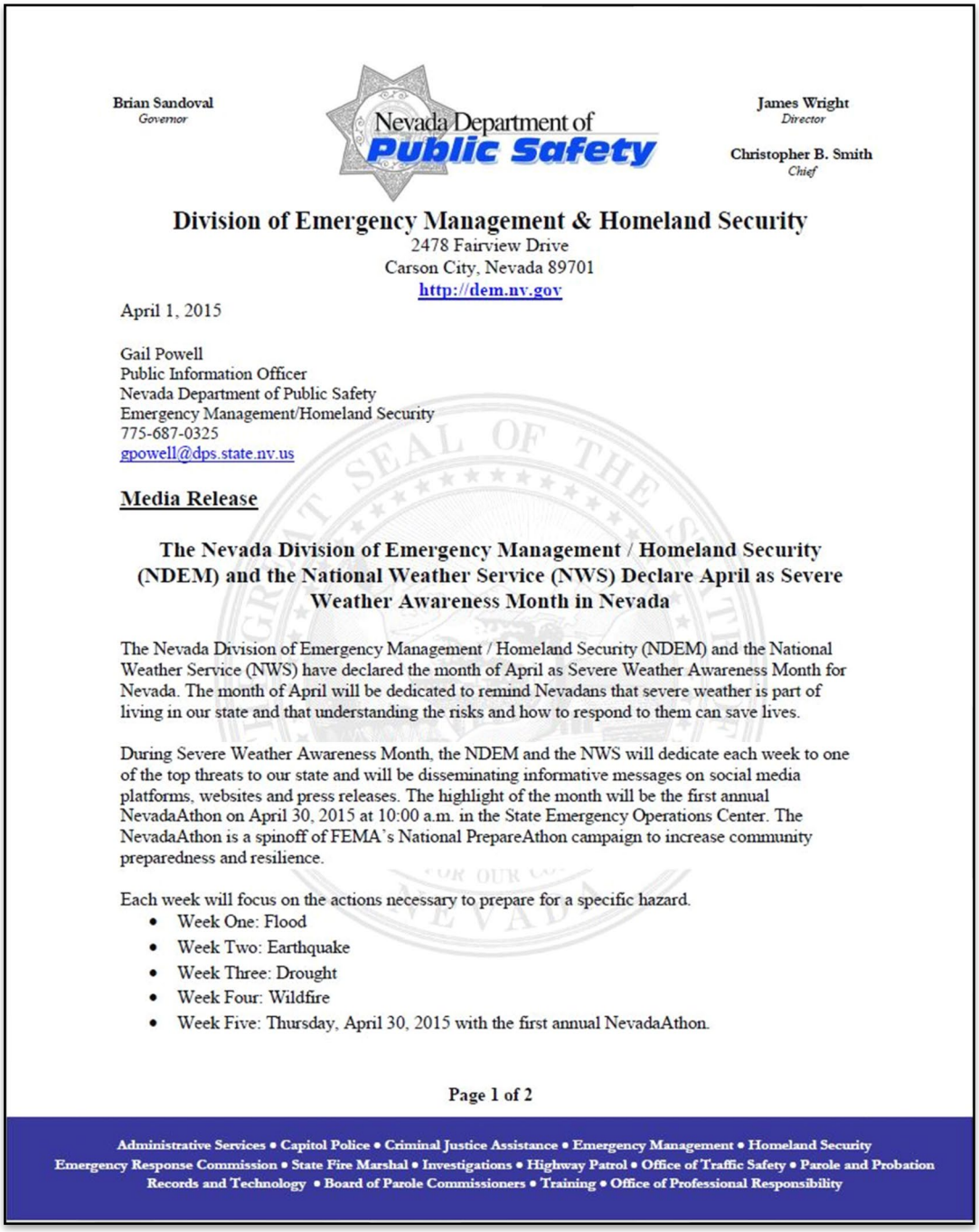


Figure M-14. A flyer for a Wildfire Awareness Event, Junk the Junipers, posted on NDF's Facebook page.



Brian Sandoval
Governor

Nevada Department of Public Safety

James Wright
Director

Christopher B. Smith
Chief

Division of Emergency Management & Homeland Security
2478 Fairview Drive
Carson City, Nevada 89701
http://dem.nv.gov

April 1, 2015

Gail Powell
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Nevada Department of Public Safety
Emergency Management/Homeland Security
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Media Release

The Nevada Division of Emergency Management / Homeland Security (NDEM) and the National Weather Service (NWS) Declare April as Severe Weather Awareness Month in Nevada

The Nevada Division of Emergency Management / Homeland Security (NDEM) and the National Weather Service (NWS) have declared the month of April as Severe Weather Awareness Month for Nevada. The month of April will be dedicated to remind Nevadans that severe weather is part of living in our state and that understanding the risks and how to respond to them can save lives.

During Severe Weather Awareness Month, the NDEM and the NWS will dedicate each week to one of the top threats to our state and will be disseminating informative messages on social media platforms, websites and press releases. The highlight of the month will be the first annual NevadaAthon on April 30, 2015 at 10:00 a.m. in the State Emergency Operations Center. The NevadaAthon is a spinoff of FEMA's National PrepareAthon campaign to increase community preparedness and resilience.

Each week will focus on the actions necessary to prepare for a specific hazard.

- Week One: Flood
- Week Two: Earthquake
- Week Three: Drought
- Week Four: Wildfire
- Week Five: Thursday, April 30, 2015 with the first annual NevadaAthon.

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Administrative Services • Capitol Police • Criminal Justice Assistance • Emergency Management • Homeland Security
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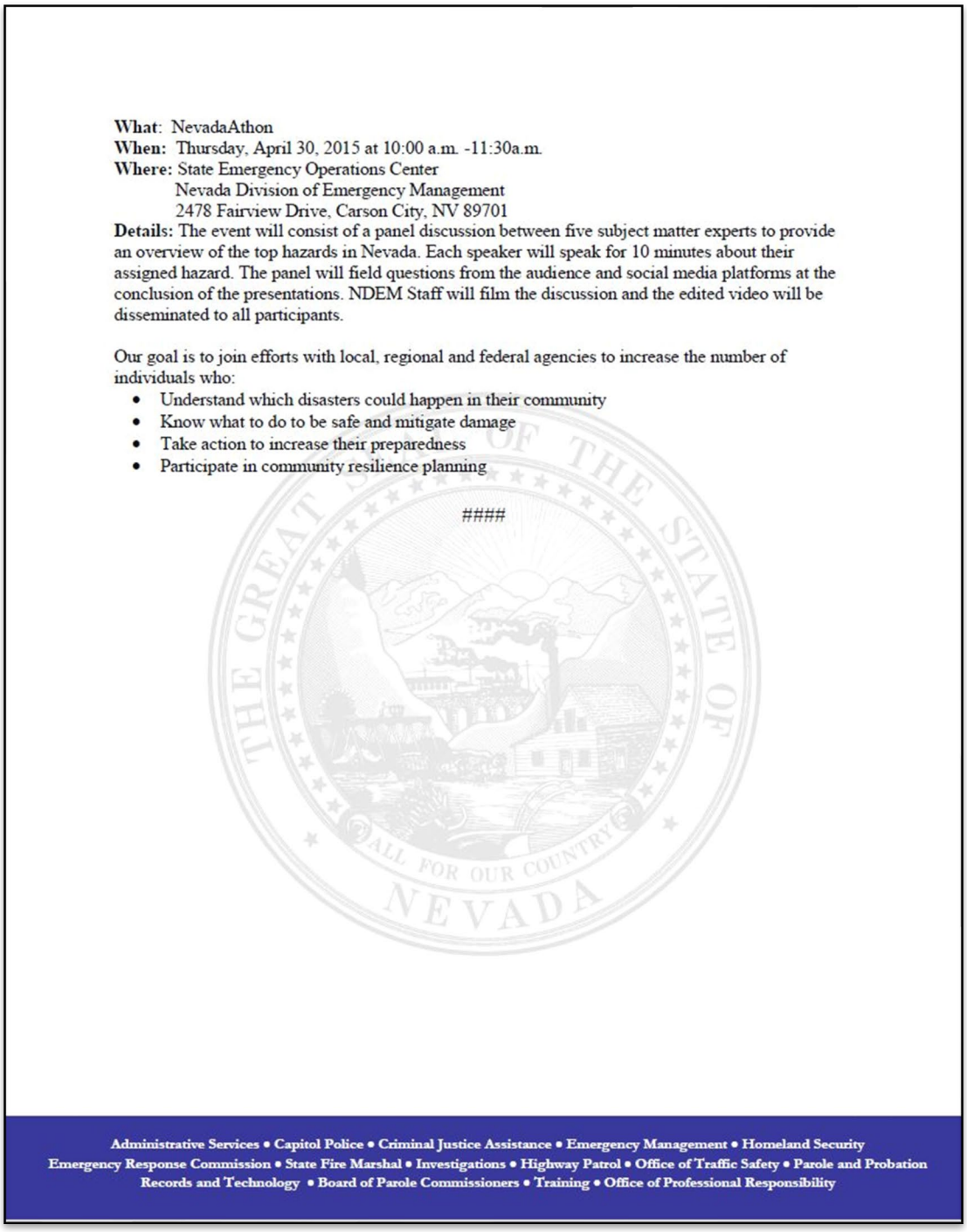
Figure M-15. A media release from 2015, declaring April as Severe Weather Awareness Month in Nevada.



What: NevadaAthon
When: Thursday, April 30, 2015 at 10:00 a.m. -11:30a.m.
Where: State Emergency Operations Center
Nevada Division of Emergency Management
2478 Fairview Drive, Carson City, NV 89701
Details: The event will consist of a panel discussion between five subject matter experts to provide an overview of the top hazards in Nevada. Each speaker will speak for 10 minutes about their assigned hazard. The panel will field questions from the audience and social media platforms at the conclusion of the presentations. NDEM Staff will film the discussion and the edited video will be disseminated to all participants.

Our goal is to join efforts with local, regional and federal agencies to increase the number of individuals who:

- Understand which disasters could happen in their community
- Know what to do to be safe and mitigate damage
- Take action to increase their preparedness
- Participate in community resilience planning

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Figure M-15. Continued.

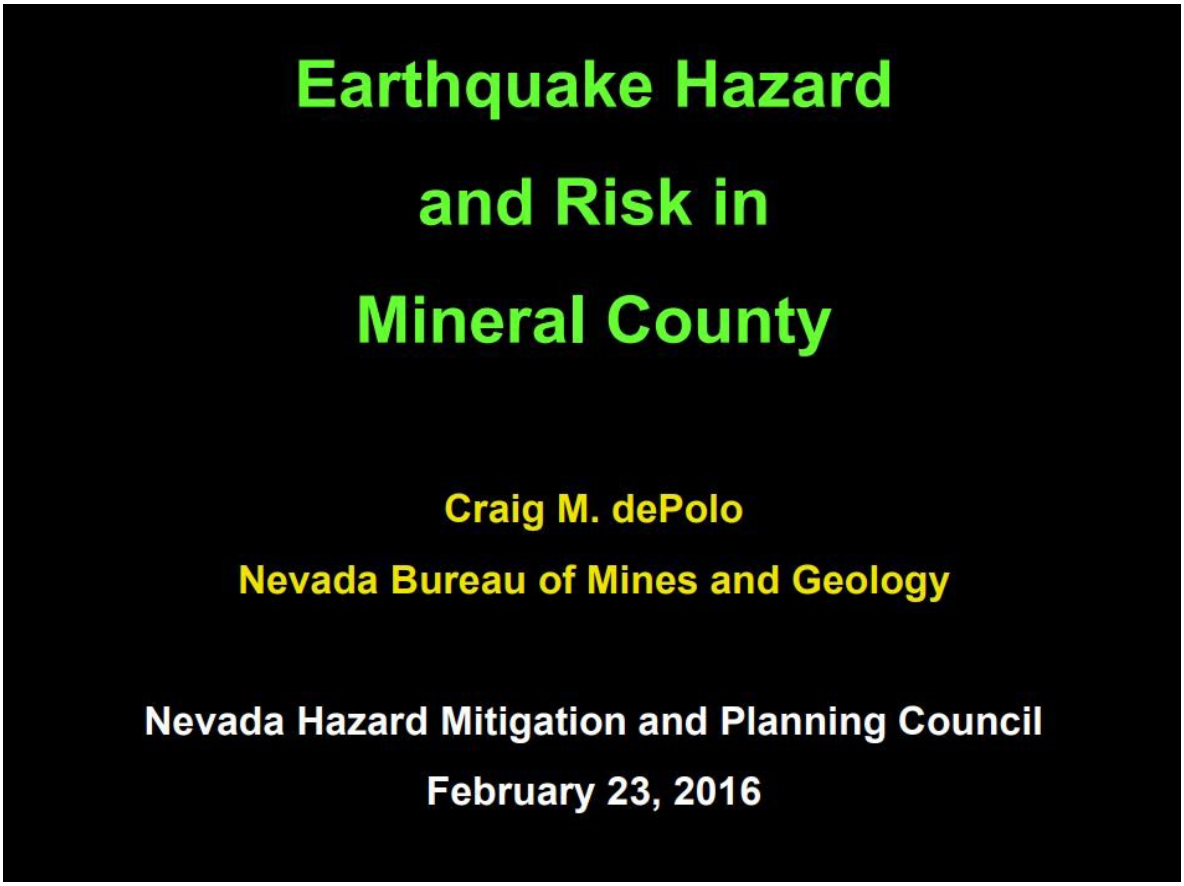
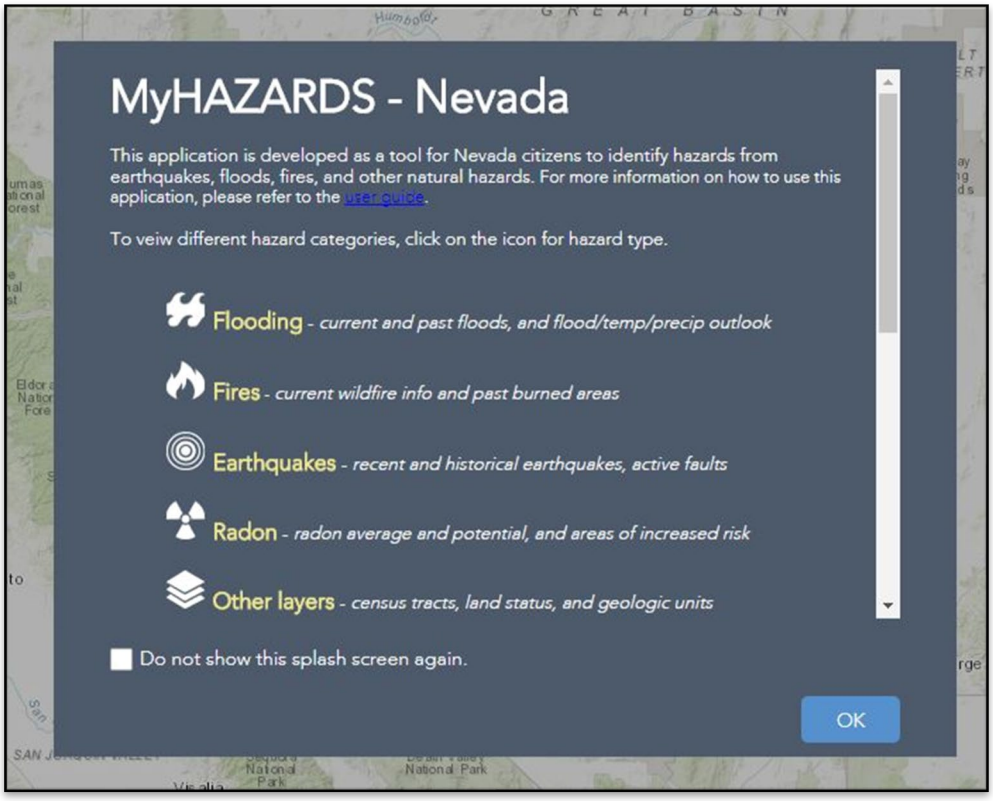


Figure M-16. An earthquake hazard presentation, presented by a NHM Planning Subcommittee member. For more presentations on earthquake hazards, please see:

http://www.nbmg.unr.edu/nhmpc/Presentations/index.html.



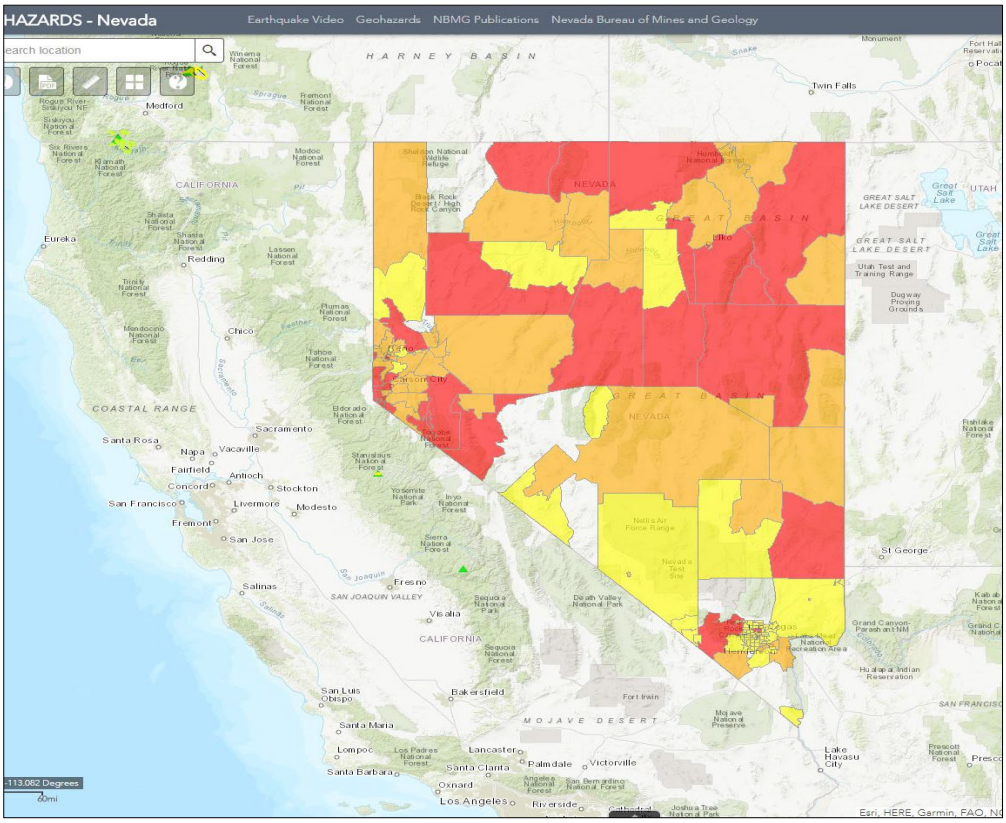


Figure M-17. Screenshots of MyHAZARDS, an online mapping service created and published by NBMG. To access, please see: https://gisweb.unr.edu/MyHAZARDS/.

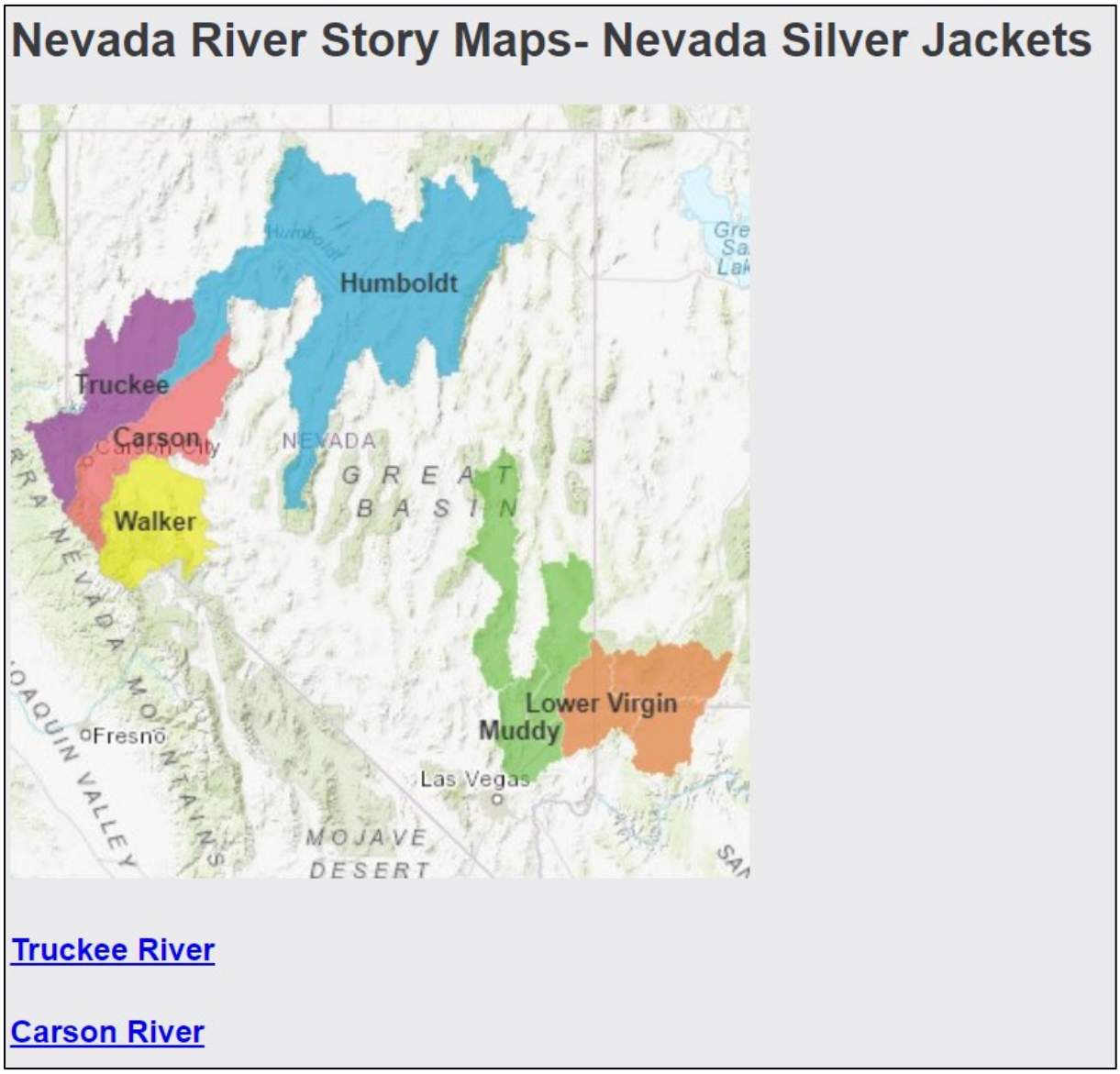


Figure M-18. Storey Maps posted on www.nevadafloods.org website.

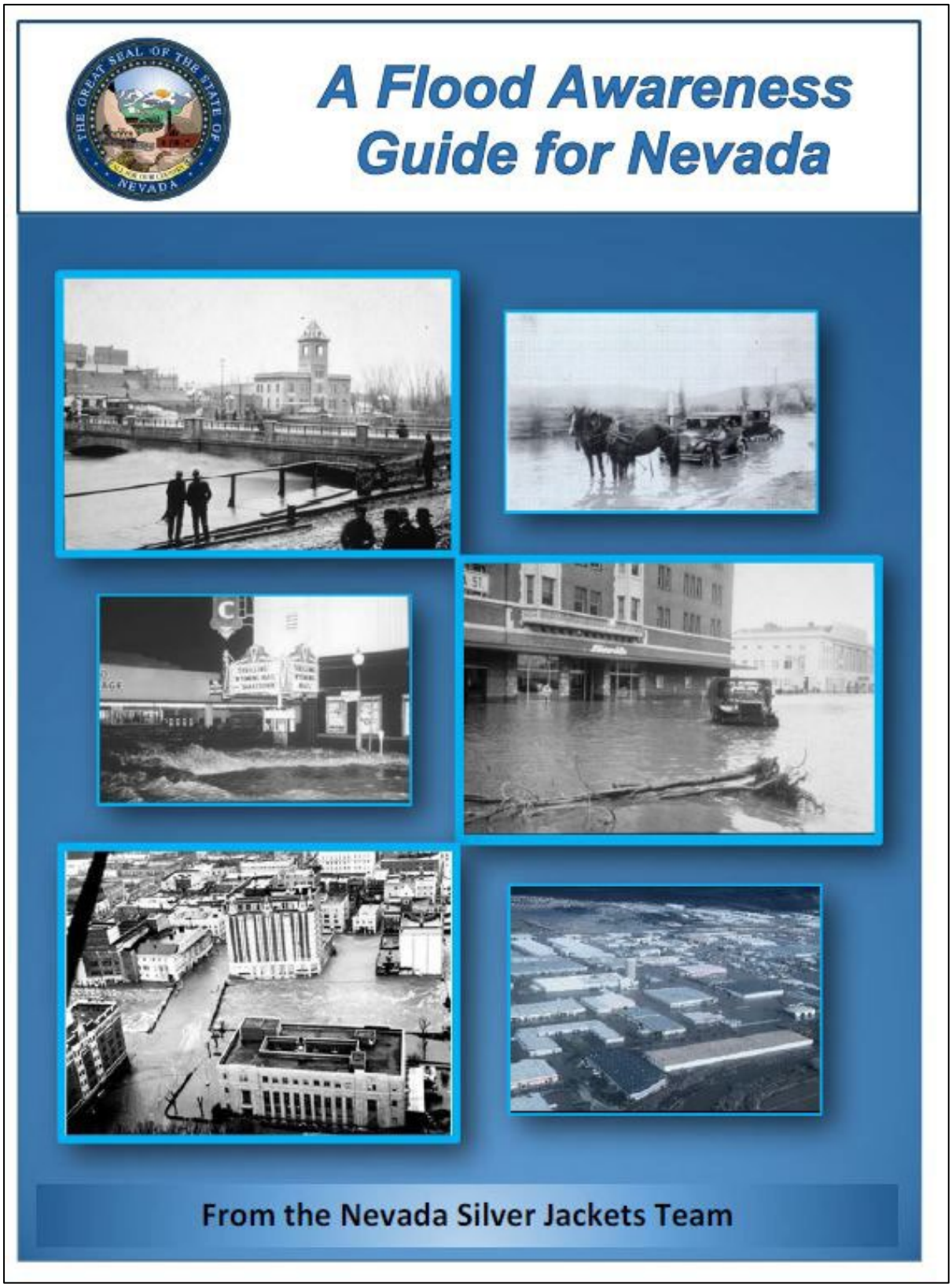


Figure M-19. The Nevada Flooding Booklet, published by the Nevada Silver Jackets team available on the www.nevadafloods.org website.

STATE OF NEVADA

BRIAN SANDOVAL
Governor

BRADLEY CROWELL
Director

JASON KING, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
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http://water.nv.gov

October 3, 2017

Greetings!

Welcome to the Flood Awareness Guide for Nevada. This guide was developed to help communities in Nevada understand their flood risks, different types of flooding, and the history of flooding in Nevada. It also provides a few tips for flood safety and preparedness before, during, and after a flood, and relevant information about flooding in Nevada communities that can benefit homeowners, community residents, and community officials or planners.

By educating the residents of Nevada about flood risks in areas prone to flooding events, this guide will enable them to take effective, individual preventive measures to reduce risks to safety and damage to property. It will also enable them to take local action and have a stake in planning and acting to reduce their community risks from flooding. Residents in Nevada communities will become better prepared to deal with an actual flood event and will better understand what to do in an emergency situation.

The development of this guide was made possible by the Nevada Silver Jackets team. The Nevada Silver Jackets team is composed of a group of partnering federal, state, and local agencies that are interested in the protection of life and property from flooding. The Nevada Silver Jackets team is led by the Nevada Division of Water Resources (NDWR) and supported by the U.S. Army Corps of Engineers (USACE). The goal of the NDWR Floodplain Management Program is to create flood resilient communities in Nevada that encourage the protection of life, property, water quality, environmental values, and the preservation of natural floodplain functions.

Thank you to all the Nevada Silver Jackets team partnering agencies for your commitment to mitigating flood risk and making our communities safer from flooding.

Bunny L. Bishop

State Floodplain Manager/NFIP Coordinator
Division of Water Resources

Figure M-19. Continued.

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Figure M-19. Continued.

From: Meghan Collins [Meghan.Collins@dri.edu]
Sent: Tuesday, January 05, 2016 4:33 PM
To: Karen I. Johnson
Subject: Hazard Mitigation and Education

Hi Karen,

I am the Environmental Education Lead at the Desert Research Institute, and I am currently working on a NOAA grant on environmental literacy, adaptation, and using real DRI science in educational exercises. If funded, the grant will allow DRI and GreenPower to do education and outreach related to climate change, persistent drought, and other weather-related hazards. We are proposing several Green Boxes (travelling science kits), service learning projects, and a massive open online course. I have been looking at the Nevada Hazard Mitigation Plan, and I have been aligning some portions of our proposed programs to the recommendations therein.

I'm writing to see if DEM has any educational materials or tools that we could help to disseminate through this grant. Our projects would be a very strong platform to help educate the public about emergency management, and your tools and materials would be a good complement to the outreach that we are planning. I am happy to explain more about the project.

I am in the office until the 7th, after which I am on annual leave for about two weeks. It would be great to speak with you before then about this if you are interested.

Best,
Meghan Collins

Figure M-20. An email from the Desert Research Institute about aligning outreach programs to recommendations in the State Enhanced HMP.

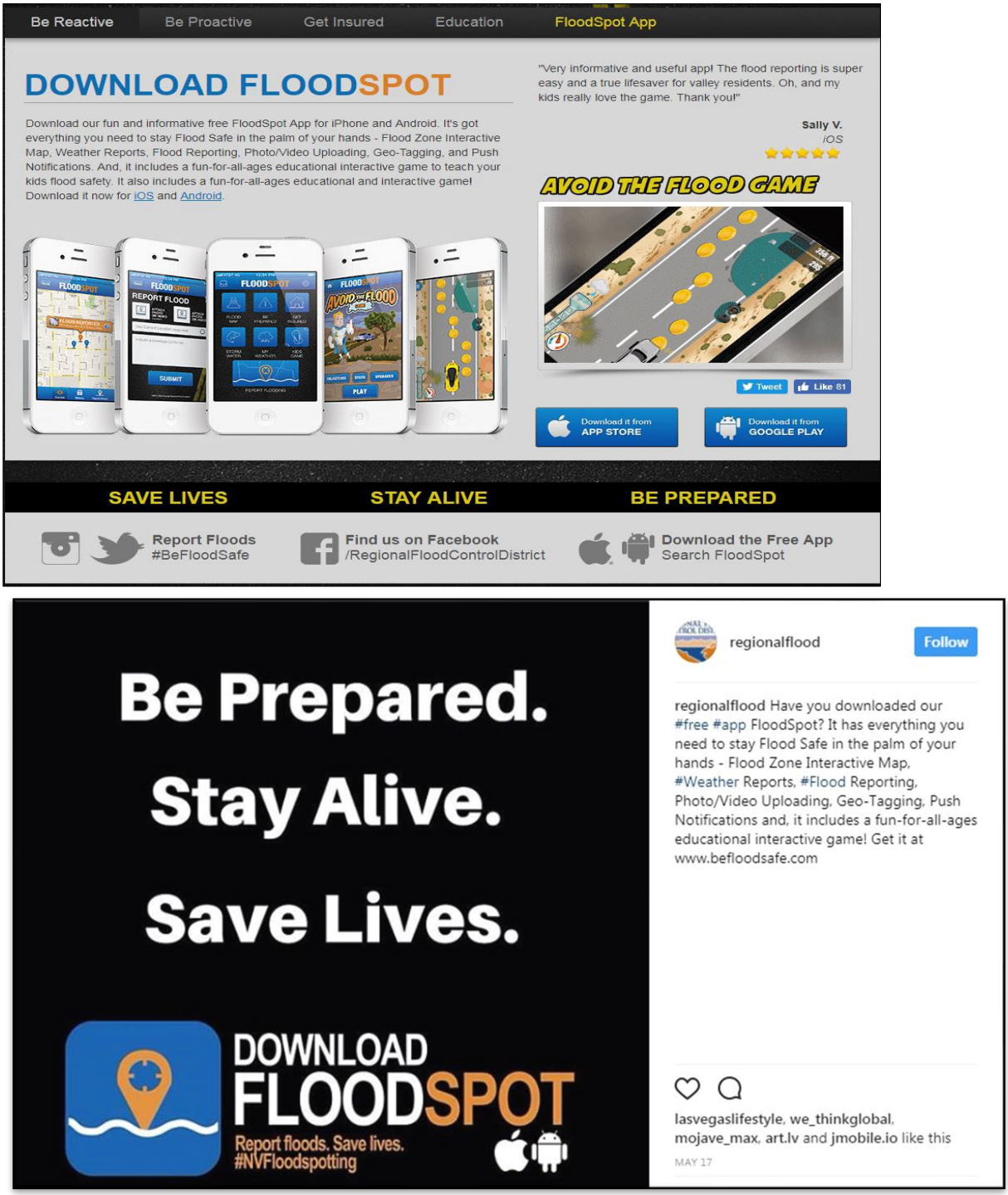


Figure M-21. Flyers posted on Clark County Regional Flood Control District's Instagram page, highlighting a free app called "Flood Spot". The purpose of the app is to educate users about flood safety.

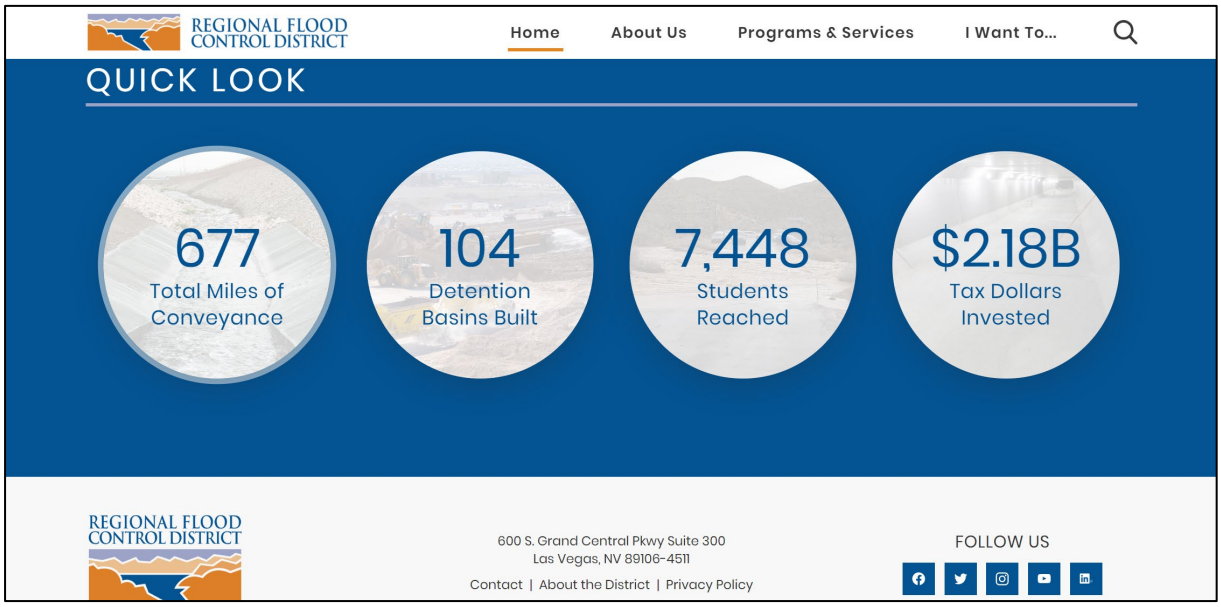


Figure M-22. Quick look of statistics of mitigation from www.regionalflood.org website July 2023.

State of Nevada
Executive Department

A Proclamation by the Governor

WHEREAS, *flooding creates emergencies of great concern to the State of Nevada, with imminent threat to life and property, as well as the potential for hundreds of millions of dollars in damage to homes, businesses, and local community infrastructure; and*

WHEREAS, *since 1955, Nevada has received 18 presidential disaster declarations for flooding. 2022 marks the 5th year since Northern Nevada's devastating floods of 2017; and this summer bringing the wettest monsoon season in a decade to Southern Nevada, we must remain vigilant against such disasters; and*

WHEREAS, *since 1955, Nevada has received 18 presidential disaster declarations for flooding. 2022 marks the 5th year since Northern Nevada's devastating floods of 2017; and this summer bringing the wettest monsoon season in a decade to Southern Nevada, we must remain vigilant against such disasters; and*

WHEREAS, *flood hazard, flood risk reduction, vulnerability, and preparedness information are available from local, state, and federal partners and should be studied and observed throughout the year to reduce the impacts of flooding to communities, lives, and property; and*

WHEREAS, *the Nevada Flood Awareness Committee is committed to developing comprehensive and sustainable solutions to flood hazard issues, including flood awareness and outreach activities, flood hazard mitigation planning and projects, floodplain management, and flood and inundation mapping; and*

WHEREAS, *the Nevada Flood Awareness Committee continues to engage and inform Nevadans about how to prepare before, during, and after floods, as well as the importance of flood insurance to help create safer and more resilient communities; and ask all Nevadans to observe Nevada Floods Awareness Week by preparing their homes and communities for floods;*

NOW, THEREFORE, I, STEVE SISOLAK, GOVERNOR OF THE STATE OF NEVADA, do hereby proclaim the week of November 13 - 19, 2022, as

FLOOD AWARENESS WEEK IN NEVADA

Figure M-23. Governor's Executive Oder for Flood Awareness Week 2022.

Using Floods To Prevent Flood Damage In Nevada

By NOAH GLICK • APR 4, 2017

Tweet
Share
Google+
Email

A photo taken from a drone shows River Fork Ranch in Genoa, Nevada during February's flooding. The plains were designed to hold water rather than sending it downstream to Fallon.

JOHN HUMPHREY

Figure M-24. A screenshot of a story from an interview between Reno Public Radio and TRFMA, about ecosystem restoration and flood mitigation efforts along the Truckee River. To read or listen to the story, please see:

http://trfma.org/2017/04/using-floods-to-prevent-flood-damage-in-nevada/.

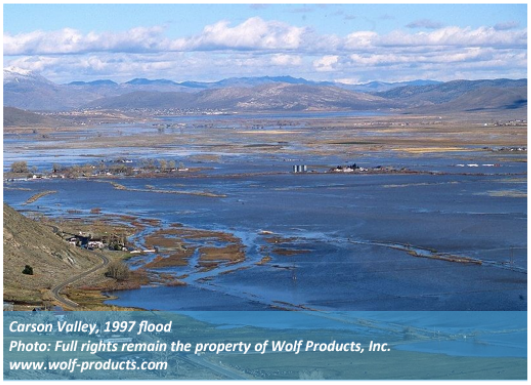
The 25th Anniversary of the 1997 Flood: Where Are We Now?

By Max Robinson, CWSD Water Resource Specialist 1

To perennial residents of the Carson River Watershed (CRW), the Flood of 1997 is a lucid, quarter-century-old memory that is still discussed today. In the 25 years since that perilous and costly holiday season, the watershed, as with much of the western U.S., has experienced a growth in population and a loss of understanding as to how the country's "driest state" could endure such a deluge. Like many natural disasters, flooding is best remembered when experienced firsthand. So, to keep with the season's traditions of reflection and resolution, I'd like to invite all members of our watershed, from longstanding to just arriving, to look back at the Flood of 1997 and revisit what occurred and how far we've come.

The Perfect Storm

The Flood of 1997 was one of the most devastating floods in recorded history within the watersheds of western Nevada. The story of the Flood of 1997 began in late



Carson Valley, 1997 flood
Photo: Full rights remain the property of Wolf Products, Inc.
www.wolf-products.com

Mountains and provided torrential rains from the valley floors to above 10,000 feet in elevation. This rain event began on December 30, 1996 and persisted through January 3, 1997. The combination of storms resulted in intense flooding in what is referred to as a rain-on-snow

Carson City, 1997 flood
Photo courtesy of USGS

and highly-saturated-soils flood event. The abundant snowpack, compounded with rainfall, produced significant quantities of direct runoff as well as snowmelt runoff, producing a catastrophic flooding situation for the region and its residents.

In the Carson River system, flows from the East and West Forks into the Carson Valley were the highest on record. As flood waters progressed through Carson and Eagle Valleys toward Carson City, they were attenuated in the natural floodplain, the low-lying ground adjacent to the river. However, the amount of floodwater flowing through the system, combined with additional flows draining from the Carson Range into Eagle Valley and prior existing snow accumulation, were intense enough to cause flooding and record flows in the Carson City area. Throughout the entirety of the watershed, floodwaters destroyed six United States Geological Survey (USGS) river gauges and damaged 29 others. This resulted in inconsistent data from the flood event. However, at the USGS Fort Churchill gauge just

Figure M-25. A screenshot of an article about the 25th Anniversary of the 1997 Flood from CWSD's Winter 2022/2023 Newsletter

https://www.cwsd.org/wp-content/uploads/2022/12/Newsletter-Winter-2022-23-FINAL.pdf.

Figure M-26. Sierra Avalanche Center post on Facebook of Avalanche Awareness presentation in December 2022.

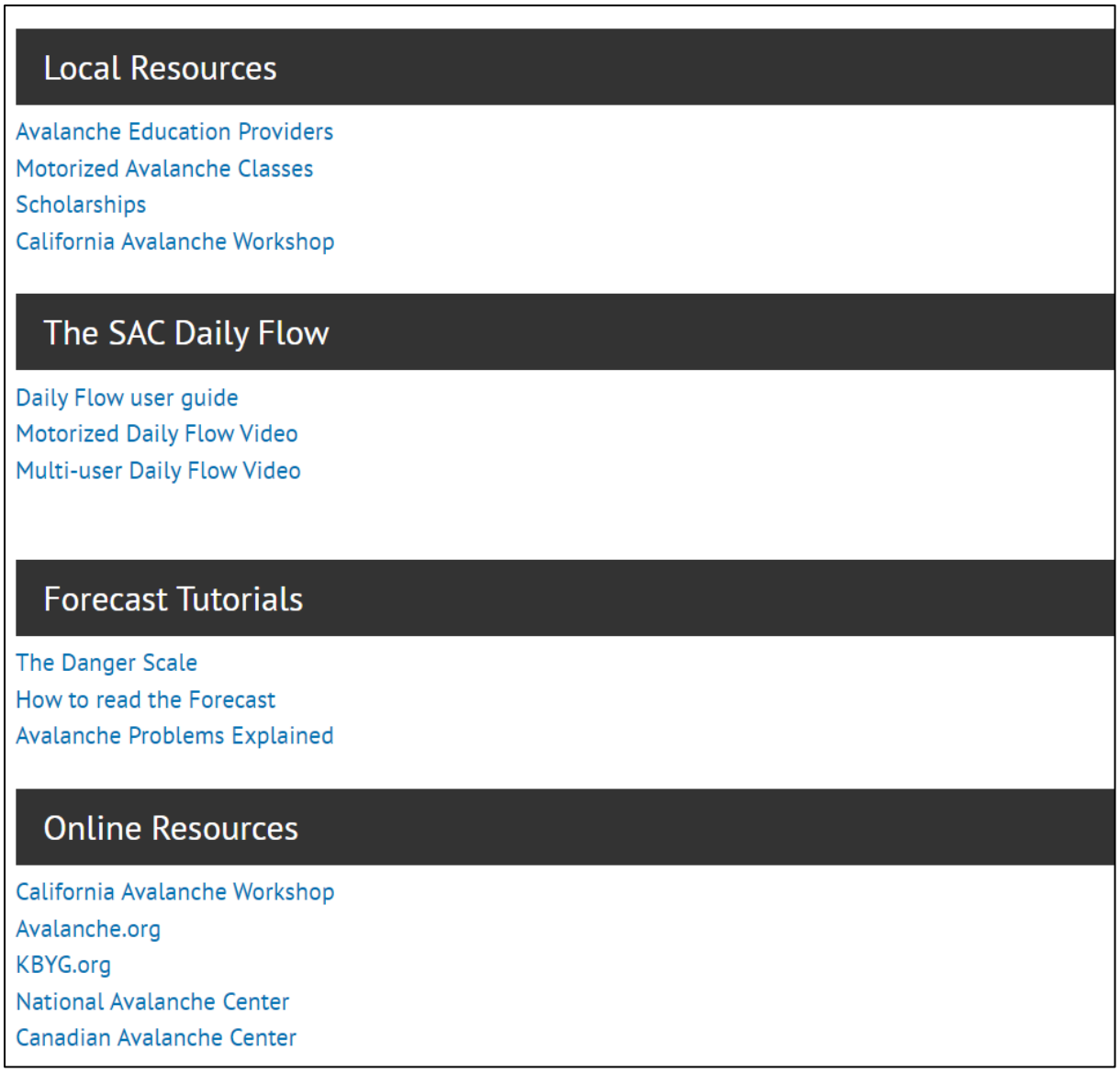


Figure M-27. Sierra Avalanche Center's website, listing avalanche awareness courses. https://www.sierraavalanchecenter.org/education.

Figure M-28. Shakeout information posted on NV DEM Facebook page.

Figure M-29. A flyer describing FEMA's HM Assistance Grant Programs.

Available Funding

PDM and FMA funding depend on the amounts Congress appropriates each year.

HMGP funding is usually 15 percent of the amount of Federal assistance provided to a State, territory, or federally-recognized tribe following a Presidentially declared disaster.

General Requirements

All mitigation projects must be cost-effective, technically feasible and effective, and meet Environmental Planning and Historic Preservation (EHP) requirements in accordance with HMA Guidance. In addition, all mitigation activities must adhere to all relevant statutes, regulations, and requirements including other applicable Federal, State, territorial, federally-recognized tribal, and local laws, implementing regulations, and Executive Orders.

All Applicants and subapplicants must have hazard mitigation plans that meet the requirements of 44 CFR Part 201.

Program Comparisons

Cost Sharing

In general, HMA funds may be used to pay up to 75 percent of the eligible activity costs. The remaining 25 percent of eligible costs are derived from non-Federal sources.

The table below outlines the Federal and State cost share requirements.

Program Cost Share Requirements	Mitigation Activity Award (Percent of Federal/ Non-Federal Share)
HMGP	75 / 25
PDM	75 / 25
PDM (subrecipient is small impoverished community)	90 / 10
PDM (federally-recognized tribal Recipient is small impoverished community)	90 / 10
FMA (Insured properties and planning grants)	75 / 25
FMA (repetitive loss property with repetitive loss strategy)	90 / 10
FMA (severe repetitive loss property with repetitive loss strategy)	100 / 0

Eligible Applicants and Subapplicants

States, territories, and federally-recognized tribal governments are eligible HMA Applicants. Each State, territory, and federally-recognized tribal government shall designate one agency to serve as the Applicant for each HMA program. All interested subapplicants must apply to the Applicant.

Individuals and businesses may not apply directly to the State, territory, or FEMA, but eligible local governments may apply on their behalf.

The table below identifies, in general, eligible subapplicants.

Eligible Subapplicants	HMGP	PDM	FMA
State agencies	✔	✔	✔
Federally-recognized tribes	✔	✔	✔
Local governments/communities*	✔	✔	✔
Private nonprofit organizations (PNPs)	✔		

✔ = Subapplicant is eligible for program funding

* Local governments/community may include non federally-recognized tribes, or consistent with definition of local government at 44 CFR 201.2, may include any Indian tribe or authorized tribal organization, or Alaska Native village or organization that is not federally-recognized per 25 U.S.C. 479a et seq.

Figure M-29. Continued.

Eligible Activities

The table below summarizes eligible activities that may be funded by HMA programs. Detailed descriptions of these activities can be found in the HMA Guidance.

Eligible Activities	HMGP	PDM	FMA
1. **Mitigation Projects**	✓	✓	✓
Property Acquisition and Structure Demolition	✓	✓	✓
Property Acquisition and Structure Relocation	✓	✓	✓
Structure Elevation	✓	✓	✓
Mitigation Reconstruction	✓	✓	✓
Dry Floodproofing of Historic Residential Structures	✓	✓	✓
Dry Floodproofing of Non-Residential Structures	✓	✓	✓
Generators	✓	✓	
Localized Flood Risk Reduction Projects	✓	✓	✓
Non-Localized Flood Risk Reduction Projects	✓	✓	
Structural Retrofitting of Existing Buildings	✓	✓	✓
Non-Structural Retrofitting of Existing Buildings and Facilities	✓	✓	✓
Safe Room Construction	✓	✓	
Wind Retrofit for One- and Two-Family Residences	✓	✓	
Infrastructure Retrofit	✓	✓	✓
Soil Stabilization	✓	✓	✓
Wildfire Mitigation	✓	✓	
Post-Disaster Code Enforcement	✓		
Advance Assistance	✓		
5 Percent Initiative Projects*	✓		
Miscellaneous/Other**	✓	✓	✓
2. **Hazard Mitigation Planning**	✓	✓	✓
Planning-Related Activities	✓		
3. **Technical Assistance**			✓
4. **Management Costs**	✓	✓	✓

* FEMA allows increasing the 5% Initiative amount up to 10% for a Presidential major disaster declaration under HMGP. The additional 5% Initiative funding can be used for activities that promote disaster-resistant codes for all hazards. As a condition of the award, either a disaster-resistant building code must be adopted or an improved Building Code Effectiveness Grading Schedule is required.

** Miscellaneous/Other indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects will be approved provided funding is available.

Management Costs

For HMGP only: The Recipient may request up to 4.89 percent of the HMGP allocation for management costs. The Recipient is responsible for determining the amount, if any, of funds that will be passed through to the subrecipient(s) for their management costs.

Applicants for PDM and FMA may apply for a maximum of 10 percent of the total funds requested in their award application budget (Federal and non-Federal shares) for management costs to support the project and planning subapplications included as part of their application.

Subapplicants for PDM and FMA may apply for a maximum of 5 percent of the total funds requested in a subapplication for management costs.

National Flood Insurance Program (NFIP) Participation

NATIONAL FLOOD INSURANCE PROGRAM

There are a number of ways that HMA eligibility is related to the NFIP:

Subapplicant Eligibility:

All subapplicants for FMA must be participating in the NFIP, and not be withdrawn or suspended, to be eligible to apply for grant funds. Certain political subdivisions (i.e., regional flood control districts or county governments) may apply and act as subrecipients if they are part of a community that is participating in the NFIP where the political subdivision provides zoning and building code enforcement or planning and community development professional services for that community.

Project Eligibility:

HMGP and PDM mitigation project subapplications for projects sited within a Special Flood Hazard Area (SFHA) are eligible only if the jurisdiction in which the project is located is participating in the NFIP. There is no NFIP participation requirement for HMGP and PDM project subapplications located outside of the SFHA.

Property Eligibility:

Properties included in a project subapplication for FMA funding must be NFIP-insured at the time of the application submittal. Flood insurance must be maintained for the life of the structure.

Figure M-29. Continued.

Figure M-30. A flyer posted on NWS-Reno's Facebook page for Nevada Flood Awareness Week.

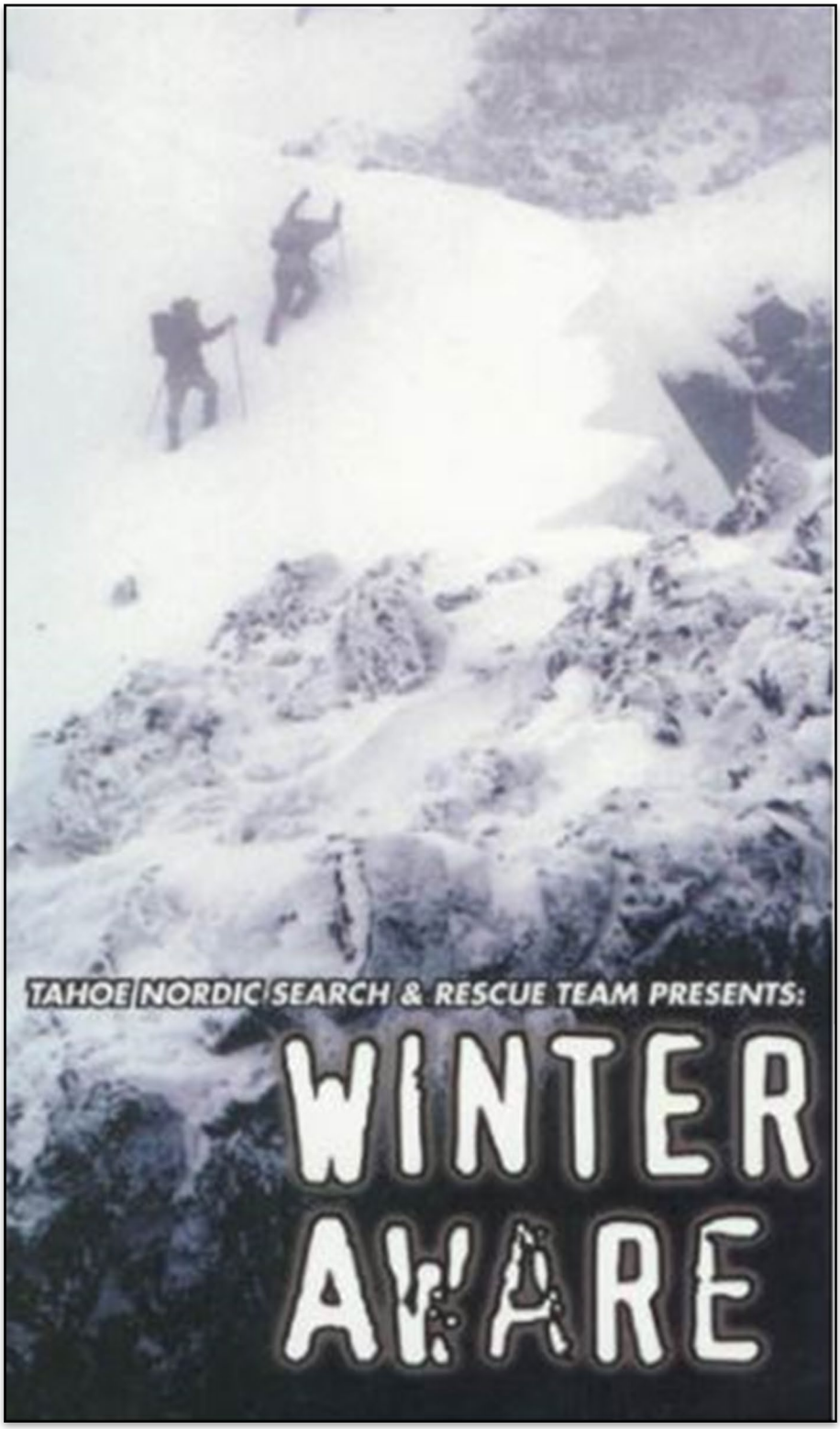


Figure M-31. Winter Aware, a video presented by the Tahoe Nordic Search and Rescue. To view more details on the video, and information on where to obtain a free copy, see: http://www.tahoenordicsar.com/Education/WinterAware.shtml.

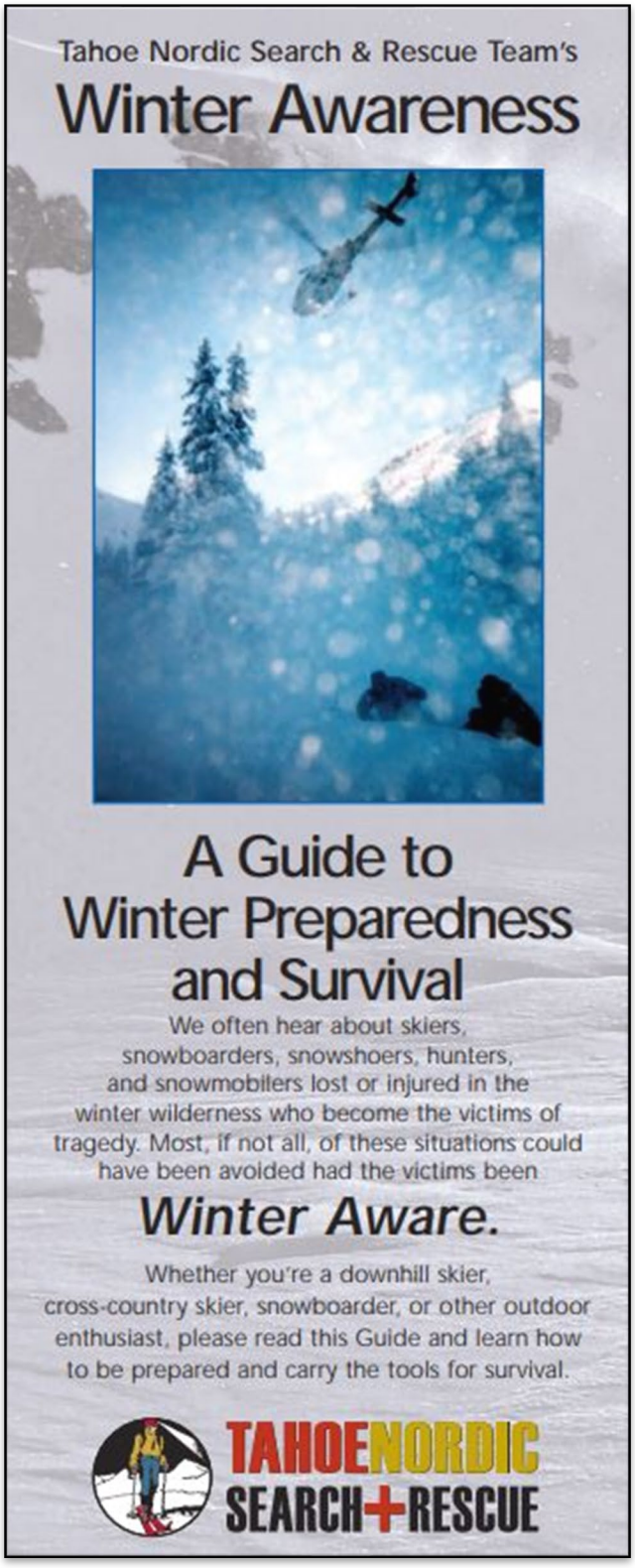


Figure M-32. Tahoe Nordic SAR's Winter Awareness Guide. The guide is available online at http://www.tahoenordicsar.com/TSARsml.pdf.

Figure M-33. A flyer posted on Southern Nevada Water Authority's Facebook page, about free educational courses.

Figure M-34. A certificate of recognition for the City of North Las Vegas regarding their participation in NOAA's Weather Ready Nation program.

N.Nevada Ditches

Table N-1. Nevada Ditches from:

http://nevada.hometownlocator.com/features/cultural,class,canal,startrow,1.cfm

Canal/Ditch Name	County	Topographic Quadrangle Name
	CARSON CITY	
Mexican Ditch	Carson City (city)	New Empire
	CHURCHILL	
A Line Canal	Churchill	Fallon
Baily Drain	Churchill	Stillwater
Branch 5 Drain	Churchill	Grimes Point
Branch One Drain	Churchill	Indian Lakes
Carson Lake 1 Drain	Churchill	South of Fallon
Carson Lake A1 Extension Drain	Churchill	South of Fallon
Carson Lake Drain	Churchill	Grimes Point
D 3 Canal	Churchill	Indian Lakes
D Canal	Churchill	Grimes Point
D Line Canal	Churchill	Indian Lakes
E Line Canal	Churchill	Fallon
East Canal	Churchill	Foxtail Lake
East Lee Drain	Churchill	Carson Lake
Erb Drain	Churchill	Soda Lake East
F 2 Drain	Churchill	Indian Lakes
G 3 Canal	Churchill	South of Fallon
G Line Canal	Churchill	South of Fallon

Canal/Ditch Name	County	Topographic Quadrangle Name
G Line Drain	Churchill	South of Fallon
G Line Extension Drain	Churchill	South of Fallon
Goose Lake Bypass	Churchill	Foxtail Lake
Grimes Slough	Churchill	Grimes Point
Grimes Slough Extension	Churchill	Grimes Point
Gummow Drain	Churchill	Fallon
Harmon Drain	Churchill	Grimes Point
Harmon Number One Drain	Churchill	Grimes Point
Hazen Drain	Churchill	Hazen
Hunter Drain	Churchill	Foxtail Lake
Kent Drain	Churchill	Stillwater
Kent Lake Drain	Churchill	Stillwater
KX Lateral Canal	Churchill	Hazen
L 12 Canal	Churchill	Grimes Point
L 3 Drain	Churchill	Grimes Point
L D Drain	Churchill	Fallon
L Drain	Churchill	Grimes Point
L Line Canal	Churchill	Fallon
L2 Drain	Churchill	Fallon
Lead Bypass Canal	Churchill	Stillwater
Lead Lake Canal	Churchill	Foxtail Lake
Lower Diagonal Drain	Churchill	Lahontan Mountains
Lower Diagonal Number 1 Drain	Churchill	Grimes Point

Canal/Ditch Name	County	Topographic Quadrangle Name
Lower Humboldt Drain	Churchill	Ocala
Lower Soda Lake Drain	Churchill	Soda Lake East
Mills Drain	Churchill	Fallon
Mussi Drain	Churchill	Indian Lakes
N Line Canal	Churchill	Sheckler Reservoir
New River Drain	Churchill	Grimes Point
New River Extension Branch Drain	Churchill	Fallon
Norton Drain	Churchill	Stillwater
O Line Canal	Churchill	Indian Lakes
Paiute Diversion Drain	Churchill	Stillwater
Paiute Drain	Churchill	Stillwater
Patrick Drain	Churchill	Stillwater
Pierson Slough	Churchill	Carson Lake
Ponte Drain	Churchill	Soda Lake East
R Drain	Churchill	Soda Lake East
R Line Canal	Churchill	Grimes Point
Rice Ditch	Churchill	Carson Lake
Rock Dam Ditch	Churchill	Lahontan Dam
Rock Dam Ditch Number 1	Churchill	Lahontan Dam
S 2 Canal	Churchill	Stillwater
S 5 A Drain	Churchill	Stillwater
S 5 Canal	Churchill	Indian Lakes
S 7 Canal	Churchill	Grimes Point

Canal/Ditch Name	County	Topographic Quadrangle Name
S Line Canal	Churchill	Grimes Point
Shaffner Branch	Churchill	Indian Lakes
Shaffner Drain	Churchill	Indian Lakes
Sheckler 1 Drain	Churchill	Fallon
Sheckler Drain	Churchill	Fallon
Sky Lateral	Churchill	Lahontan Dam
Soda Lake Drain	Churchill	Soda Lake East
S-One Canal	Churchill	Grimes Point
South Upper Soda Lake Drain	Churchill	Fallon
Stillwater Point Reservoir Diversion Canal	Churchill	Lahontan Mountains
Stillwater Slough Cutoff	Churchill	Stillwater
S-Two Canal	Churchill	Grimes Point
Swope Drain	Churchill	Stillwater
T Line Canal	Churchill	Soda Lake East
Thoma Drain	Churchill	Fallon
UID Drain	Churchill	Soda Lake East
Upper Paiute Drain	Churchill	Indian Lakes
Upper Paiute Number Two	Churchill	Stillwater
Upper Soda Lake 1 Drain	Churchill	Fallon
Upper Soda Lake Drain	Churchill	Fallon
Upper West Side Drain	Churchill	Sheckler Reservoir
V Line Canal	Churchill	Sheckler Reservoir
Vencill Drain	Churchill	Indian Lakes

Canal/Ditch Name	County	Topographic Quadrangle Name
Wade Drain	Churchill	Soda Lake East
West Canal	Churchill	Foxtail Lake
West Carson Lake Drain	Churchill	South of Fallon
West Lee Drain	Churchill	Carson Lake
Westside Drain	Churchill	Fallon
Winsett Drain	Churchill	Lahontan Mountains
	CLARK	
Boulder City Lateral	Clark	Boulder Beach
Bunkerville Ditch	Clark	Mesquite
Henderson Lateral	Clark	Henderson
Las Vegas Valley Lateral	Clark	Henderson
	DOUGLAS	
Allerman Canal	Douglas	Gardnerville
Big Ditch	Douglas	Minden
Edna Wilslef Ditch	Douglas	Gardnerville
Falke and Tillman Ditch	Douglas	Carters Station
Fredericksburg Ditch	Douglas	Woodfords
Heise Company Ditch	Douglas	Minden
Heyburn Ditch	Douglas	Genoa
Highline Ditch	Douglas	Risue Canyon
Lower Old Virginia Canal	Douglas	Gardnerville
Middle Ditch	Douglas	Minden
Middle River Ditch	Douglas	Minden

Canal/Ditch Name	County	Topographic Quadrangle Name
Old Virginia Canal	Douglas	Gardnerville
Park and Bull Slough	Douglas	Minden
Saint Louis Straight Ditch	Douglas	Minden
Topaz Canal	Douglas	Long Dry Canyon
Upper New Virginia Canal	Douglas	Gardnerville
	ELKO	
Agency Canal	Elko	Owyhee
Agency Canal	Elko	The Point
Duck Valley Canal	Elko	The Point
Hankins Bellinger Ditch	Elko	West of Lee
High Line Canal	Elko	Squaw Valley Ranch
Hilton Ditch	Elko	Te-Moak Well
Homer Ditch	Elko	Dry Creek Reservoir
Main Canal	Elko	Owyhee
Main Canal	Elko	Mountain View Lake
O'Connells Ditch	Elko	Green Mountain
Sheep Creek Ditch	Elko	The Point
Suttles Ditch	Elko	Green Mountain
Swamp Ditch	Elko	Noon Rock
Thacker Lateral	Elko	The Point
White Rock Lateral	Elko	The Point
White Rock Lateral	Elko	The Point
	EUREKA	

Canal/Ditch Name	County	Topographic Quadrangle Name
Anderson Canal	Eureka	Beowawe
Corbett Canal	Eureka	Beowawe
Highline Canal	Eureka	Beowawe
Merchant Canal	Eureka	Bobs Flat
Rose Canal	Eureka	Dunphy
Westside Ditch	Eureka	The Geysers
	HUMBOLDT	
Big Cedar Creek Ditch	Humboldt	Schoolhouse Butte
Bull Creek Ditch	Humboldt	Schoolhouse Butte
French Canal	Humboldt	Pole Creek
Hammond Ditch	Humboldt	Red House Flat East
Humboldt Canal	Humboldt	Golconda Butte
Knott Creek Channel	Humboldt	Knott Creek
Little Cedar Creek Ditch	Humboldt	Schoolhouse Butte
Lyng Ditch	Humboldt	Willow Point
	LANDER	
Blue House Ditch	Lander	Argenta
Fred Ahles Ditch	Lander	Dutch Flat
Gimble Four Ditch	Lander	Battle Mountain
Gimble One Ditch	Lander	Battle Mountain
Gimble Two Ditch	Lander	Battle Mountain
Lower Twenty-five Ditch	Lander	Battle Mountain
Rock Creek Ditch	Lander	Dunphy

Canal/Ditch Name	County	Topographic Quadrangle Name
T-S Ditch	Lander	Stony Point
Twenty Five Ditch	Lander	Battle Mountain
White House Ditch	Lander	Argenta
	LINCOLN	
Alamo Company Canal	Lincoln	Alamo
Alamo Company East Ditch	Lincoln	Alamo
Garden Springs Pipe Line	Lincoln	Blue Nose Peak
Mesquite Ditch	Lincoln	Mesquite
New East Ditch	Lincoln	Ash Springs
Number Four Ditch	Lincoln	Ash Springs
Number One Ditch	Lincoln	Ash Springs
Number Three Ditch	Lincoln	Ash Springs
	LYON	
A Drain	Lyon	Fernley East
Back Fox Ditch	Lyon	Yerington
Buckland Ditch	Lyon	Silver Springs South
Campbell Ditch	Lyon	Mason Butte
Colony Ditch	Lyon	Oreana Peak
D and GW Ditch	Lyon	Wilson Canyon
Dayton Town Ditch	Lyon	Dayton
East Campbell Ditch	Lyon	Mason Butte
Fernley Drain	Lyon	Fernley East
Fox Ditch	Lyon	Yerington

Canal/Ditch Name	County	Topographic Quadrangle Name
Gee Ditch	Lyon	Flowery Peak
Greenwood Ditch	Lyon	Yerington
Hall Ditch	Lyon	Yerington
High Ditch	Lyon	Yerington
Hillbun Ditch	Lyon	Wilson Canyon
Houghman and Howard Ditch	Lyon	Churchill Butte
Joggles Ditch	Lyon	Hinkson Slough
K2B Canal	Lyon	Fernley East
Kelly Alkali Ditch	Lyon	Wilson Canyon
Koch Ditch	Lyon	Misfits Flat
Lee Sanders Ditch	Lyon	Wilson Canyon
Lower Charlebois Ditch	Lyon	Yerington SE
Main Fox Ditch	Lyon	Yerington
McLeod Ditch	Lyon	Yerington
Merritt Ditch	Lyon	Hinkson Slough
Mickey Ditch	Lyon	Yerington
Nelson Ditch	Lyon	Yerington
Nichols-Merritt Ditch	Lyon	Mason Butte
Plymouth Canal	Lyon	Smith
Randall Ditch	Lyon	Dayton
Sand Ridge Ditch	Lyon	Mason Butte
Sanders Canal	Lyon	Wilson Canyon
Saroni Canal	Lyon	Desert Creek Ranch

Canal/Ditch Name	County	Topographic Quadrangle Name
Spragg-Alcorn-Bewley Ditch	Lyon	Mason Butte
Spragg-Woodcock Ditch	Lyon	Yerington
Streiff Drain	Lyon	Fernley East
Strosnider East Ditch	Lyon	Yerington SE
Strosnider West Ditch	Lyon	Yerington SE
Truckee Canal	Lyon	Fernley East
Tunnel Ditch	Lyon	Wilson Canyon
Upper Cardelli Ditch	Lyon	Flowery Peak
Upper Charlebois Ditch	Lyon	Yerington SE
Wabuska Drain	Lyon	Mason Butte
West Campbell Ditch	Lyon	Mason Butte
West Hyland Ditch	Lyon	Mason Butte
West Side Canal	Lyon	Wilson Canyon
Wiley Ditch	Lyon	Nye Canyon
Woods Ditch	Lyon	Yerington
	MINERAL	
Canal Number One	Mineral	Schurz
Canal Number Two	Mineral	Schurz
Drain Number One	Mineral	Schurz
Lateral One-A	Mineral	Schurz
Lateral Two-A	Mineral	Schurz
Lateral Two-B	Mineral	Schurz
Lateral Two-D	Mineral	Schurz

Canal/Ditch Name	County	Topographic Quadrangle Name
Lateral Two-E	Mineral	Schurz
	PERSHING	
American Canal	Pershing	Lovelock
Army Drain	Pershing	Granite Point
Big Five Canal	Pershing	Wildhorse Pass
Fairview Slough	Pershing	Lovelock
Graveyard Drain	Pershing	Lovelock
Irish-American Canal	Pershing	Lovelock
Johnson Drain	Pershing	Lovelock
Lakeshore Ditch	Pershing	Granite Point
Lovelock Drain	Pershing	Lovelock
Lower Taylor Ditch	Pershing	West of Lovelock
Old Channel Canal	Pershing	Lovelock
Pitt-Taylor Diversion Canal	Pershing	Imlay
Reed Ditch	Pershing	Lovelock
Rodgers Ditch	Pershing	Lovelock
Rudell Ditch	Pershing	Lovelock
Seven Ditch	Pershing	Wildhorse Pass
Seventeen Ditch	Pershing	Wildhorse Pass
Sommers Ditch	Pershing	Wildhorse Pass
Taylor Canal	Pershing	Lovelock
Toulon Drain	Pershing	Granite Point
Union Canal	Pershing	Lovelock

Canal/Ditch Name	County	Topographic Quadrangle Name
Union Canal	Pershing	Lovelock
Union Rodgers Canal	Pershing	Lovelock
Willow Slough	Pershing	West of Lovelock
Young Canal	Pershing	Lovelock
	STOREY	
McCarran Ditch	Storey	Patrick
	WASHOE	
Big Ditch	Washoe	Virginia City
Chandler Ditch	Washoe	Steamboat
Cochran Ditch	Washoe	Mount Rose NE
Coldron Ditch	Washoe	Verdi
Crane Ditch	Washoe	Steamboat
Highland Ditch	Washoe	Reno
Lake Ditch	Washoe	Reno
Last Chance Ditch	Washoe	Reno
North Truckee Drain	Washoe	Vista
North Truckee Irrigation Ditch	Washoe	Vista
Orr Ditch	Washoe	Vista
Pioneer Ditch	Washoe	Vista
Prosser Valley Ditch	Washoe	Reno
Pyramid Lake Fishway	Washoe	Pah Rah Mountain
Steamboat Ditch	Washoe	Verdi
	WHITE PINE	

Canal/Ditch Name	County	Topographic Quadrangle Name
Chin Creek Ditch	White Pine	Chin Creek Reservoir
Duck Creek Overflow Canal	White Pine	McGill
Dunham McGill Ditch	White Pine	McGill
Hamblin Valley Flood Water Wash Ditch	White Pine	Tweedy Wash
John Magnuson Ditch	White Pine	Mattier Creek

The following maps have been created and updated in order to highlight the widespread distribution of ditches and canals across the state and in select urban areas. On the Reno area map, spillways and additional stream data was removed in order to focus more on ditch locations.

Figure N-1.

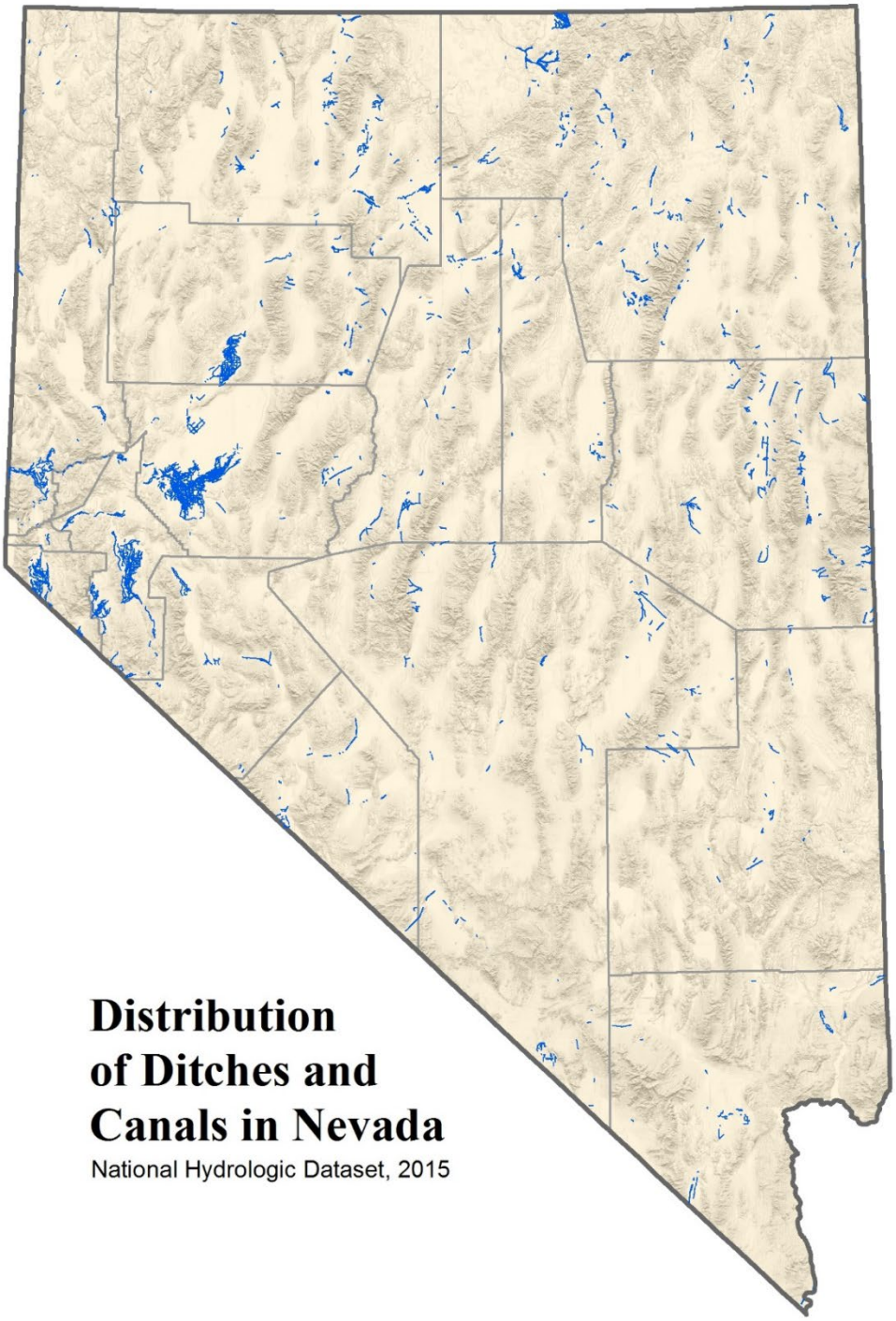


Figure N-2. Ditches in the Reno area.

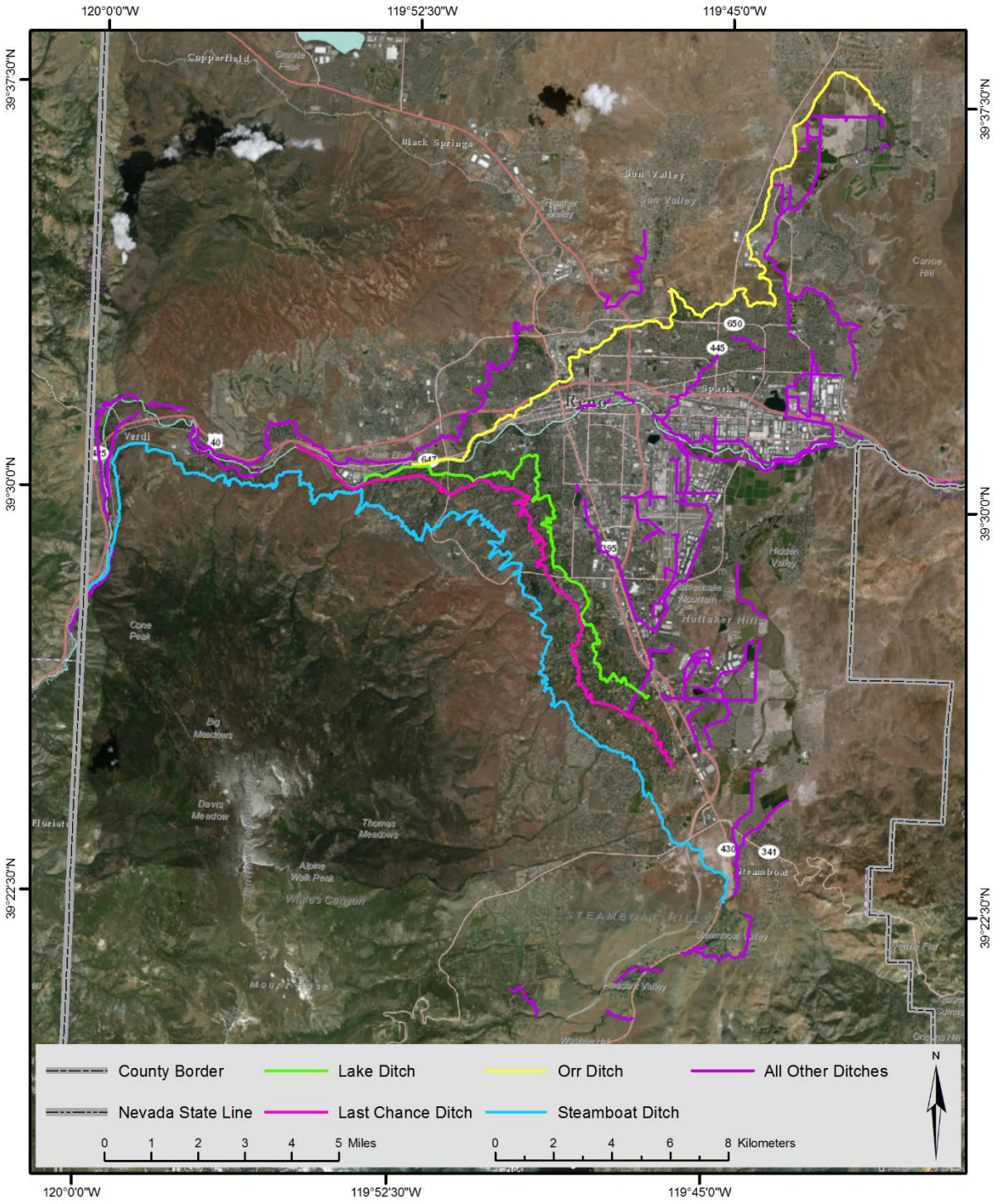
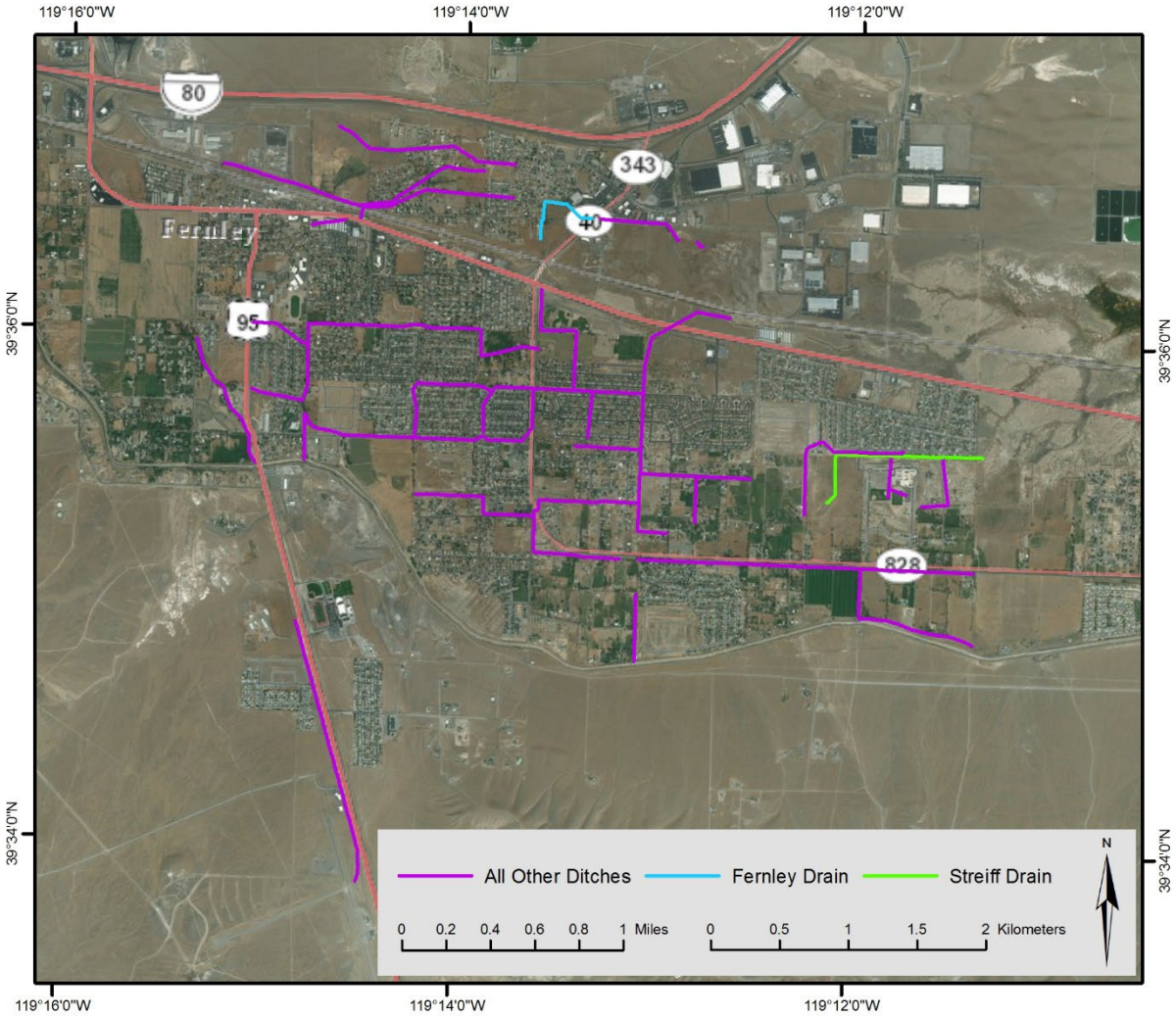


Figure N-3. Ditches in the Fernley area.



O. State Mitigation Plan Review Guide

State Mitigation Plan Review Tool

The State Mitigation Plan Review Tool (Plan Review Tool) demonstrates and documents how the state mitigation plan meets the regulations set forth in 44 CFR Part 201 and offers FEMA mitigation planners an opportunity to provide feedback to the state.

The Regulation Checklist must be completed by FEMA. The FEMA Plan Approver must reference the State Mitigation Planning Policy Guide when completing the Plan Review Tool. The purpose of the checklist is to identify the location of relevant or applicable content in the plan by element/sub-element and to determine if each requirement has been "Met" or "Not Met."

The Required Revisions summary at the bottom of each element must clearly explain the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is "Not Met." Sub-elements should be referenced by the appropriate number, where applicable (e.g., S2-a, S2-b). Requirements for each element and sub-element are described in detail in Sections 3 and 4 of the State Mitigation Planning Policy Guide.

The HHPD section and FMAG sub-elements only need to be completed if the state is pursuing eligibility for those grant programs.

The Plan Assessment must be completed by FEMA. This assessment provides more comprehensive feedback to the state to acknowledge where the plan exceeds minimum requirements and provides suggestions for improvements. FEMA will describe the strengths that are demonstrated and highlight examples of best practices. FEMA's suggestions for improvement are not required to be made for plan approval.

For greater clarification of the elements in the regulation checklist, please see Sections 3 and 4 in the State Mitigation Planning Policy Guide. This document defines terms and phrases used within this review tool.

1. Plan and Review Information

Plan Information			
State	Nevada		
Title and Date of Plan	The State of Nevada Enhanced Hazard Mitigation Plan July 31, 2023		
Plan Update Version	5		
State Point of Contact Name	Janell Woodward		
Title	State Hazard Mitigation Officer		
Agency	Nevada Division of Emergency Management / Homeland Security		
Address	2478 Fairview Drive Carson City, NV 89701		
Phone Number	775-687-0467		
Email	janell.woodward@dem.nv.gov		
Meets mitigation planning requirements for HHPD?	Choose an item.	Meets mitigation planning requirements for FMAG?	Choose an item.

Review Information	
Date Received by FEMA region	Click or tap to enter a date.
FEMA Reviewer (Planning – Name / Title)	Click or tap here to enter text.
FEMA Reviewer (HMA – Name / Title)	Click or tap here to enter text.
FEMA Reviewer (Name / Title)	Click or tap here to enter text.
FEMA Reviewer (Name / Title)	Click or tap here to enter text.
FEMA Approver (Name / Title)	Click or tap here to enter text.
Plan Status (Not Approved, Approvable Pending Adoption, Approved)	Click or tap here to enter text.

SUMMARY	YES	NO
STANDARD STATE MITIGATION PLAN		
Does the plan meet the standard state mitigation plan requirements?	☐	☐
ENHANCED STATE MITIGATION PLAN		
Does the plan meet the enhanced state mitigation plan requirements?	☐	☐

2. Standard State Mitigation Plan Regulation Checklist

PLANNING PROCESS

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S1. Does the plan include a description of the process used to develop the plan? [44 CFR §§ 201.4(b) and 201.4(c)(1)]		
S1-a. Does the plan 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?	Section 2: 2.1.1-How (p. 2-1 – 2-2), 2.1.2 – Who (pp. 2-3 - 2-4), 2.1.3 - Agencies (pp. 2-4 - 2-6), 2.1.4 – Integration of County and state HMP (P. 2-7 – 2-10) 2.1.4 – schedule / milestones (pp. 2-7 - 2-10), 2.3.1-2.3.3 – Integration with existing plans and programs (pp. 2-19 – 2-23)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S2. Does the plan describe how the state coordinated with other agencies and stakeholders? [44 CFR §§ 201.4(b) and 201.4(c)(1)]		
S2-a. Does the plan describe how the state coordinated with other state agencies, appropriate federal agencies, and other stakeholders, and how they were involved in the process?	Section 2: 2.2.1 – State & Federal (pp. 2-13 - 2-14) 2.2.2 – Interest groups (pp. 2-14 2.2.3 – Changes in Federal & State coordination (2-14 – 2-15) 2.2.4 Silver Jackets (p. 2-16), 2.2.5 NV Environmental Protection (pp. 2-16 - 2-17)	Choose an item.
Planning Process Required Revisions: Click or tap here to enter text.		

HAZARD IDENTIFICATION AND RISK ASSESSMENT

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S3. Does the risk assessment include an overview of the type and location of all natural hazards that can affect the state? [44 CFR § 201.4(c)(2)(i)]		
S3-a. Does the plan include a current overview of all natural hazards that can affect the state, including the type, location and previous occurrences?	Section 3 3.2.1 – ID and screening hazards (pp. 3-10 – 3-13) 3.2.3 – Hazard ranking, including criteria for probability, magnitude, warning, duration (pp. 3-21 – 3-23) as well as risk categorization	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S4. Does the risk assessment provide an overview of the probabilities of future hazard events? [44 CFR § 201.4(c)(2)(i)]		
S4-a. Does the risk assessment 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?	Section 3 3.3.1-3.3.16 – Natural hazard profiles that include five new hazard maps for each with a corresponding NRI hazard maps for risk index score, exposure, historic loss ratio, expected annual loss, annualized frequency - (3-27 – 3-365) Sections 3.3.17 – Technological Hazards (pp. 3-366 – 3-405)	Choose an item.
S4-b. Does the probability 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?	Section 3 3.3.1-3.3.16 – Natural hazard profiles that include a new subsection for each on the impact of climate change. - (3-27 – 3-365) Sections 3.3.17 – Technological Hazards (pp. 3-366 – 3-405) In addition, detailed quantitative assessments for the impact of climate change were added for the five hazards that are the focus in the State Climate Strategy - 3.2.2 – pp. 3-19 – 3-20) - heat & heatwave, drought, loss of snow, floods, wildfire.	Choose an item.
S5. Does the risk assessment address the vulnerability of state assets located in hazard areas and estimate the potential dollar losses to these assets? [44 CFR §§ 201.4(c)(2)(ii) and 201.4(c)(2)(iii)]		
S5-a. Does the risk assessment include an overview and analysis of the vulnerability to state assets from the identified hazards as well as a summary of the most vulnerable assets?	3.6.1 - Updated assessment of state critical facilities (pp. 3-426 – 3-427) Table 3-52 – State Critical Facilities and Infrastructure (pp. 3-427)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S5-b. Does the risk assessment estimate potential dollar losses to state assets located in identified hazard areas?	Section 3 Section 3.6.3 – Estimating Losses to State Facilities (pp. 3-429 – 3-34) 3.6.3.1 – New earthquake HAZUS run and losses due to earthquakes from the three major scenarios. (pp. 3-429 – 3-431) 3.6.3.2 – New assessment of flood losses to state facilities (pp. 3-432 – 3-433) 3.6.3.3 – New assessment of wildfire losses to state facilities. (pp. 3-433 – 3-434) Appendix G – New HAZUS runs on major rivers Appendix J has a detailed study of earthquake vulnerability across the state.	Choose an item.
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)]		
S6-a. Does the risk assessment provide an overview and analysis of vulnerable jurisdictions based on the state and local government risk assessments?	Section 3 Section 3-7 Vulnerability Assessment and Analysis of Potential Losses (pp. 3-435 – 3-451) 3.7.1 – Updated Earthquake vulnerability and loss values (pp. 3-435– 3-442) 3.7.2 – Updated Vulnerability and loss values for major river flood (pp. 3-442 – 3-447) 3.7.3 – Updated vulnerability and loss values for wildfire (pp. 3-447 – 3-451) Appendix G – New HAZUS runs on major rivers Appendix J has a detailed study of earthquake vulnerability across the state.	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S6-b. Does the risk assessment 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?	Section 3 Section 3-7 (pp. 3-435 – 3-451)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S7. Was the risk assessment revised to reflect changes in development? [44 CFR § 201.4(d)]		

S7-a. Does the plan provide a summary of recent development and potential or projected development in hazard-prone areas based on state and local government risk assessments?	Section 3 in general. The entire section was updated with new assessments for each hazard. Of note, each hazard with an NRI equivalent has five sets of new NRI hazard maps for risk index score, exposure, historic loss ratio, expected annual loss, annualized frequency 3.1 – New maps based on NRI demographic themes (pp. 3-3 – 3-7) 3.5.4 – New projected losses for earthquake, fire flood based on current NRI data. (pp. 3-413 – 3-423) 3.5.5 – Results in Changes in Development (pp. 3-452) 3.6.3.1 – New HAZUS runs for the three major earthquake scenarios. (pp. 3-429 – 3-431) 3.7.1 – Updated Earthquake vulnerability values (pp. 3-435 – 3-442) 3.7.2 – Updated Vulnerability values for major river flood (pp. 3-442 – 3-447) Section 3.7.3 Updated Vulnerability values for Wildfire (pp. 3-3.5.3447 – 3-451) Section 5.3.2.1 – Intense Changes in Land Use (pp. 5-22 – 5-24) Section 5.3.2.2 – Changes in Demographics (5-24 – 5-25) Section 5.3.2.3 – Changes in Social Vulnerability (pp. 5-25 – 5-26) Section 5.3.2.4 – Changes in Vulnerability to State Facilities (pp. 5-26 – 5-27) Appendix G – New HAZUS runs on major rivers	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
	Appendix J has a detailed study of earthquake vulnerability across the state.	
Hazard Identification and Risk Assessment Required Revisions: Click or tap here to enter text.		

STATE MITIGATION CAPABILITIES

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S8. 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)]		
S8-a. Does the plan include an evaluation of state laws, regulations, policies and programs related to hazards that improve or impede resilience to future natural hazard events and other future conditions, including the effects of climate change?	Section 4: 4.2.2 – Policies Related to Development in Hazard-Prone Areas (pp. 4-49)	Choose an item.
S8-b. Does the plan include a general discussion of state funding capabilities for hazard mitigation actions and projects?	Section 4: 4.2.3 (p. 4-49), Table 4-5 – HMA Grant Funding (p. 4-52 – 4-53) Figure 4-1 (p. 4-54) Table 4-6 – PDM & HMGP Funding by Hazard Type (p. 4-54) Figure 4-2 (p. 4-55) Figure 4-3 (p. 4-55)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S8-c. Does the plan include a summary of 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, and changes since the previous plan approval?	Section 4: 4.2.2 – Policies Related to Development in Hazard-Prone Areas (p. 4-49) 4.2.4 – Hazard Management Capabilities Changes (pp. 4-49 - 4-56), Table 4-8 – Local and Tribal Capabilities General Analysis (pp. 4-61 - 4-63)	Choose an item.
State Mitigation Capabilities Required Revisions: Click or tap here to enter text.		

MITIGATION STRATEGY

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S9. Does the mitigation strategy include goals to reduce long-term vulnerabilities from the identified hazards? [44 CFR § 201.4(c)(3)(i)]		
S9-a. Does the plan 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?	Section 4.1.1 – Hazard Mitigation Goal Assessment Overview (pp. 4-2 – 4-3)	Choose an item.
S9-b. Are the goals consistent with the hazards and vulnerabilities identified in the risk assessment?	4.1.1 – Table 4-1 – Goals 3-7 align with the main disasters of concern in the State Climate Strategy (Figure 3-12 p. 3-43) with loss of snow covered under drought.	Choose an item.
S10. Does the plan prioritize mitigation actions to reduce vulnerabilities identified in the risk assessment? [44 CFR §§ 201.4(c)(3)(i), 201.4(c)(3)(ii) and 201.4(c)(3)(iii)]		
S10-a. Does the plan identify actions based on the current risk assessment to reduce the vulnerability of jurisdictions within the state, as well as the vulnerability of state assets as described in Elements S5 and S6?	Section 4.1.2 – Mitigation Goals & Strategic Actions (4-3 – 4-19) Section 4.42 – Evaluation and Prioritization of Strategic Actions and Activities– Table 4-10 (pp. 4-66 – 4-90)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S10-b. Does the plan describe the process used by the state to evaluate and prioritize actions that are cost-effective, environmentally sound, and technically feasible?	Section 4.42 – Evaluation and Prioritization of Strategic Actions and Activities (pp. 4-65 – 4-66)	Choose an item.
S10-c. Does the plan describe how each action contributes to the hazard mitigation goals?	Section 4.1.2 – Mitigation Goals & Strategic Actions (4-3 – 4-19) Section 4.42 – Evaluation and Prioritization of Strategic Actions and Activities– Table 4-10 (pp. 4-66 – 4-90)	Choose an item.
S10-d. Does the plan describe how local government mitigation strategies link to the state mitigation strategy?	Section 4.4.3 (p. 4-92)	Choose an item.
S11. Does the plan identify current and potential sources of funding to implement mitigation actions and activities? [44 CFR § 201.4(c)(3)(iv)]		
S11-a. Do mitigation activities include the identification of current and/or potential sources of federal, state, local or private funding for implementation?	Section 4.4.2 – Table 4-10 (pp. 4-66 – 4-90) Section 4.5.1 – Current funding - Table 4-11 - (p. 4-94 – 4-95) Section 4.5.2 – Potential funding – Table 4-12 (pp. 4-95 – 4-96)	Choose an item.
S11-b. Does the plan identify FEMA mitigation funding sources (if applicable), including, but not limited to: HMGP, BRIC, FMA and PA Mitigation, at a minimum?	Section 4.4.2 – Table 4-10 (pp. 4-66 – 4-90) Section 4.5.1 – Current funding - Table 4-11 - (p. 4-94 – 4-95) Section 4.5.2 – Potential funding – Table 4-12 (pp. 4-95 – 4-96)	
S12. Was the plan updated to reflect progress in statewide mitigation efforts and changes in priorities? [44 CFR § 201.4(d)]		
S12-a. Does the plan provide a narrative of the status of each mitigation action in the previous plan?	Section 4.42 – Evaluation and Prioritization of Strategic Actions and Activities– Table 4-10 (pp. 4-66 – 4-90)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S12-b. Was the prioritization of mitigation actions and activities updated based on the updated analysis of risks, capabilities and progress?	Section 4.42 – Evaluation and Prioritization of Strategic Actions and Activities– Table 4-10 (pp. 4-66 – 4-90)	Choose an item.
Mitigation Strategy Required Revisions: Click or tap here to enter text.		

LOCAL PLANNING COORDINATION AND CAPABILITY BUILDING

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S13. Does the plan generally describe and analyze the effectiveness of local government mitigation policies, programs, and capabilities? [44 CFR § 201.4(c)(3)(ii)]		
S13-a. Does the plan provide a summary of current local government policies, programs and capabilities of jurisdictions to accomplish hazard mitigation?	Section 5: 5.1.1 – Analysis of Policies (pp. 5-2 – 5-3) 5.1.3 – Local Mitigation Plan Development (pp. 5-4 – 5-6)	Choose an item.
S13-b. Does the plan describe the effectiveness of local government mitigation policies, programs and capabilities?	Section 4 & 5: 4.3.1 – Local Capability Description (pp. 4-57 – 4-58) Table 4-8 – Local and tribal capability analysis - (pp. 4-61 – 4-63) Assessment (pp. 4-57 – 4-60) 5.1.1 – Analysis of Policies (pp. 5-2 – 5-3)	Choose an item.
S14. Does the plan describe the process to support the development of approvable local government mitigation plans? [44 CFR §§ 201.3(c)(5) and 201.4(c)(4)(i)]		
S14-a. Does the plan describe how the state supports developing or updating FEMA-approvable mitigation plans?	Section 5: 5.1.3 – Development of Local Mitigation Plans (pp. 5-4 - 5-15)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S14-b. Does the plan provide a brief summary of 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 and steps to remove barriers to help local governments advance mitigation planning, including how plan and jurisdiction coverage data and trends inform those steps?	Section 5: 5.1.2 - Barriers and Solutions to Local Hazard Mitigation Planning (pp. 5-3 – 5-4)	Choose an item.
S15. Does the plan describe the criteria for prioritizing funding? [44 CFR § 201.4(c)(4)(iii)]		
S15-a. Does the plan describe criteria for prioritizing jurisdictions to receive planning and project grants under available federal and non-federal programs?	Sections 5 & 8: 5.1.4 – Funding & Technical Assistance for the Past 5 Years (pp. 5-15 – 5-16) 5.3 – Prioritizing Local Assistance (pp. 5-19 – 5-27) Figure 5-2 – NHMWG Prioritization Form (p. 5-21) 8.2.3 System to Rank the Measures According to the State's Eligibility Criteria (pp. 8-45 - 8-46) Figure 8-2 (pp. 8-12 – 8-13)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S16. Does the plan describe the process and time frame to review, coordinate, and link local and tribal mitigation plans with the state mitigation plan? [44 CFR §§ 201.3(c)(6), 201.4(c)(2)(ii), 201.4(c)(3)(iii), and 201.4(c)(4)(ii)]		
S16-a. Does the plan describe the state's process and time frame to review and submit approvable local and tribal mitigation plans to FEMA?	Section 5: 5.1.3 – Development of Local Mitigation Plans (pp. 5-4 – 5-115) 5.2.1 – Process and Timeframe to Review Local Plans (pp. 5-17 – 5-18) Table 5-2 – Current Status of Local Hazard Plan Development and Updates (pp. 5-7 - 5-8) Table 5-3 – Current Status of Nevada Tribal Hazard Plan Development and Updates (pp. 5-9 - 5-10)	Choose an item.
S16-b. Does the plan 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?	Section 5: 5.2.1 – Process and Timeframe to Review Local Plans (pp. 5-17) 5.2.2 – Coordinate and Link Local Plans to the State Hazard Mitigation Plan (pp. 5-17)	Choose an item.
Local Planning Coordination and Capability Building Required Revisions: Click or tap here to enter text.		

REVIEW, EVALUATION, AND IMPLEMENTATION

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S17. Is there a description of the method and schedule for keeping the plan current? [44 CFR §§ 201.4(c)(5)(i) and 201.4(d)]		
S17-a. Does the plan describe the agency/office responsible for monitoring, evaluating and updating the plan?	Section 2 & 6: Section 2.1.2 – Who was Involved on the NHMP Update Process (pp. 2-3) Table 2-1 NHMWG Members and Alternates (pp. 2-3 – 2-4) 6.1 (pp. 6-1 - 6-4) Appendix B – NHMWG Charter & Members	Choose an item.
S17-b. Does the plan describe the schedule for monitoring, evaluating, and updating the plan?	Section 6: 6.1 – Monitoring, Evaluating, and updating the Plan(pp. 6-1 - 6-4)	Choose an item.
S18. Does the plan describe the systems for monitoring implementation and reviewing progress? [44 CFR §§ 201.4(c)(5)(ii) and 201.4(c)(5)(iii)]		
S18-a. Does the plan describe the system for tracking the implementation of the mitigation activities and projects identified in the mitigation strategy, including all mitigation activities and not just those funded by FEMA?	Section 6: 6.2 – Monitoring Progress for Mitigation Activities (pp. 6-5 - 6-14)	Choose an item.
S18-b. Does the system include the schedule, the agency/office responsible for coordination, and the role of the agencies/offices identified in the mitigation strategy as responsible for implementation of actions?	Section 6: 6.2.1 – Monitoring Progress of Mitigation Activities (p. 6-5 - 6-6)	Choose an item.
S18-c. Does the plan describe a system for reviewing progress on achieving the mitigation strategy's goals that includes the criteria and process for evaluating progress?	Section 6: 6.2.5 – Reviewing Progress on Implementing Activities and Projects (p. 6-6) Figure 6-2 – Sample quarterly report (pp. 6-7 – 6-12)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
Review, Evaluation, and Implementation Required Revisions: Click or tap here to enter text.		

ADOPTION AND ASSURANCES

Requirements	Location in Plan (section and/or page number)	Met / Not Met
S19. Did the state provide documentation that the plan has been formally adopted? [44 CFR § 201.4(c)(6)]		
S19-a. Did the state provide documentation of formal adoption by the highest elected official or designee prior to FEMA approval?	Section 1.2 – description of process (pp. 1-1 – 1-2) Appendix A – pending FEMA approval	Choose an item.
S20. Did the state provide assurances? [44 CFR § 201.4(c)(7)]		
S20-a. Does the plan include assurances that the state will manage and administer FEMA funding in accordance with applicable federal statutes and regulations?	1.2.1 – State Authority (p. 1-2) 1.2.4 – Assurance to Comply with Federal Laws and Regulations (p. 1-9) Appendix H – Federal & State Assurances	Choose an item.
S20-b. Does the plan include assurances that the state will update its plan whenever necessary to reflect changes in state or federal laws and statutes?	1.2.4 – Assurance to Comply with Federal Laws and Regulations (1-9)	Choose an item.
Adoption and Assurances Required Revisions: Click or tap here to enter text.		

Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD1. Did Element S2 (planning process) describe how the state dam safety agency, other agencies, and stakeholders participated in the planning process and contributed expertise, data, studies, information, etc. relative to high hazard potential dams?		

HHPD1-a. Does the plan describe how the state dam safety agency, other agencies, and stakeholders were involved in the planning process?	Section 2: 2.1.2 – Who was Involved in the NEHMP Update Process? (pp. 2-3 – 2-4) Section 3: 3.3.17.3 – Location, Severity, and Probability of Future Events (pp.3-372 – 3-379) Table 2-1 NHMWG Members and Alternates (P. 2-3 – 2-4) 2.1.3 - How Other Agencies Participated in the NHMP Update Process (pp. 2-4 – 2-7) Table 2-2 – Documentation of Agency Participation in the Update Process (pp. 2-4 – 2-7) Section 2.2.1 - Involvement of Federal and State Agencies in the Planning Process (pp. 2-19 – 2-23) 2.3.1 – Integration of Existing Plans (p. 2-19 – 2-23) Table 2-6 – Integration of the NEHMP with other State Planning Efforts (p. 2-19 – 2-23) 2.3.3 Integration of the NEHMP with FEMA Programs and Initiatives (p. 2-23 – 2-26) Table 2-7 - Integration of NEHMP and Local Mitigation Plans with FEMA Mitigation Programs and Initiatives. (p. 2-23 – 2-26) Section 3:	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
	3.3.17.3 Location, Severity, and Probability of Future Events (pp. 3-372 – 3-379) Section 8: 8.1.1 – Integration with Other Planning Initiatives (p. 8-4) 8.1.2 – Integration with FEMA Programs (PP. 8-4 – 8-5) Appendix F: High Hazard Dam Supplement.	
HHPD1-b. Does the plan describe the types of data contributed?	Section 3: 3.3.17.3 Location, Severity, and Probability of Future Events (pp. 3-372 – 3-379) Appendix F: High Hazard Dam Supplement.	Choose an item.
HHPD2. Did Element S6 (risk assessment) address all dam risk for high hazard potential dams in the risk assessment?		
HHPD2-a. Does the plan provide a list of high hazard potential dams that have been identified by the state with their names, National Inventory of Dams identification numbers, locations by jurisdiction, and other relevant information, as well as maps?	Section 3: 3.3.17.3 Location, Severity, and Probability of Future Events (pp. 3-372 – 3-379) Figures 3-209 – 3-212 – Maps of dam sites. (pp.3-373 - 3-376) Appendix F: List of Dams by County (pp. F-1 – F-2) Appendix F: List of Dams (pp. F-4 – F-16)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD2-b. Does the plan summarize statewide vulnerabilities to/from high hazard potential dams from hazards and the potential consequences associated with dam incidents?	3.3.17.3 Location, Severity, and Probability of Future Events (pp. 3-372 – 3-379) Figures 3-211 – 3-212 – Maps of downstream hazard potential. (pp. 3-375 - 3-376)	Choose an item.
HHPD2-c. Does the plan document limitations and describe the approach to address deficiencies?	Appendix F: High Hazard Dam Supplement (pp. F-17 – F-22)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD3. Did Element S9 (mitigation goals) include mitigation goals to reduce long-term vulnerabilities from high hazard potential dams?		
HHPD3-a. Does the plan address a reduction in vulnerabilities to/from high hazard potential dams from hazards and the potential consequences associated with dam incidents as part of their own goals or with other long-term strategies?	Section 3: 3.5.3 - State's Vulnerability Based on Local, County, and Tribal Assessments as well as State Assessments (pp. 3-413, 3-414, 3-416, 3-419, 3-422) 3.7.2 – Flood (pp. 3-442 – 3-447) Section 4: 4.1.1 – Hazard Mitigation Goal Assessment Overview (pp. 4-2 – 4-3) Table 4-1 - Goals and Lead Agencies (p. 4-2 - 4-3) 4.1.2 – Mitigation Goals and Strategic Actions (pp. 4-3 – 4-18) Table 4-2 – Mitigation Goals and Strategic Actions (pp. 4-4 – 4-18) 4.4.2 – Evaluation and Prioritization of Strategic Actions and Activities (pp. 4-73, **4-74**, **4-75**, **4-77**, **4-78**) Table 4-10 – Strategic Action Plan Matrix (pp. 4-73, **4-74**, **4-75**, **4-77**, **4-78**) Appendix L Completed Mitigation Actions L.10 High Hazard Potential Dam Projects (p. L-98)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD3-b. Does the plan link the proposed actions to reduce long-term vulnerabilities consistent with the goals?	Section 4: 4.1.1 – Hazard Mitigation Goal Assessment Overview (pp. 4-2 – 4-3) Table 4-1 - Goals and Lead Agencies (p. 4-3) 4.1.2 – Mitigation Goals and Strategic Actions (pp. 4-10 – 4-11) Table 4-2 – Mitigation Goals and Strategic Actions (pp. 4-10 – 4-11) 4.4.2 – Evaluation and Prioritization of Strategic Actions and Activities (pp. 4-73, **4-74**, **4-75**, **4-77**, **4-78**) Table 4-10 – Strategic Action Plan Matrix (pp. 4-73, **4-74**, **4-75**, **4-77**, **4-78**)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD4. Did Element S10 (mitigation actions) prioritize mitigation actions and activities to reduce vulnerabilities from high hazard potential dams?		
HHPD4-a. Does the plan include actions to reduce vulnerabilities to/from high hazard potential dams?	Section 4: 4.1.1 – Hazard Mitigation Goal Assessment Overview (pp. 4-2 – 4-3) Table 4-1 - Goals and Lead Agencies (p. 4-3) 4.1.2 – Mitigation Goals and Strategic Actions (pp. 4-10 – 4-11) Table 4-2 – Mitigation Goals and Strategic Actions (pp. 4-10 – 4-11) 4.4.2 – Evaluation and Prioritization of Strategic Actions and Activities (pp. 4-73, 4-74, 4-75, 4-77, 4-78) Table 4-10 – Strategic Action Plan Matrix (pp. 4-73, 4-74, 4-75, 4-77, 4-78) Appendix L Completed Mitigation Actions L.10 High Hazard Potential Dam Projects (p. L-98)	Choose an item.
HHPD4-b. Does the plan describe the process to evaluate and prioritize actions related to high hazard potential dams that are cost-effective, environmentally sound and technically feasible?	Section 3.3.17 – Mitigation – (3-378) Appendix L Completed Mitigation Actions L.10 High Hazard Potential Dam Projects (p. L-98)	Choose an item.
HHPD4-c. Does the plan describe how each action to reduce risks related to high hazard potential dams contributes to the goals and describe how strategies are linked to the state mitigation strategy?	Section 3.3.17 – Mitigation – (3-369) Appendix L Completed Mitigation Actions L.10 High Hazard Potential Dam Projects (p. L-98)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD5. Did Element S11 (funding sources) identify current and potential sources of funding to implement mitigation actions and activities for high hazard potential dams?		
HHPD5-a. Does the plan include various funding sources to mitigate vulnerabilities to and from high hazard potential dams from hazards and the potential consequences associated with dam incidents, as well as funding sources to rehabilitate or remove high hazard potential dams?	Section 4: 4.5.1 – Funding Sources (p. 4-93) Table 4-12 – Potential Funding Sources for Strategic Mitigation Activities (p. 4-95 -m4-96)	Choose an item.
HHPD6. Did Element S13 (local coordination) generally describe and analyze the effectiveness of local mitigation policies, programs, and capabilities that address high hazard potential dams?		
HHPD6-a. Does the plan provide a summary of the local policies, programs, and capabilities to implement mitigation actions and reduce vulnerabilities from high hazard potential dams from hazards and the potential consequences associated with dam incidents?	Section 4 Appendix F: Nevada High Hazard Potential Dams Supplement Appendix L Completed Mitigation Actions L.10 High Hazard Potential Dam Projects (p. L-98)	Choose an item.
HHPD6-b. Does the plan describe challenges to implementing local mitigation policies, programs and capabilities to reduce vulnerabilities to and from high hazard potential dams and the approach to overcome these challenges?	Appendix F: Nevada High Hazard Potential Dams Supplement	Choose an item.
HHPD6-c. Does the plan describe opportunities for implementing mitigation actions to reduce risks to and from high hazard potential dams through local capabilities?	Appendix F: Nevada High Hazard Potential Dams Supplement	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD7. Did Element S15 (prioritizing funding) describe the criteria for prioritizing funding for high hazard potential dams?		
HHPD7-a. Does the plan describe the method for funding actions to reduce vulnerabilities to and from high hazard potential dams if these actions were prioritized differently than mitigation actions for other hazards?	Section 4: Dams were prioritized along with all other actions. 4.5 – Funding Sources (pp. 4-93 – 4-96) Table 4-10 – Strategic Action Plan Matrix (pp. 4-73, **4-74**, **4-75**, **4-77**, **4-78**) Table 4-12 – Potential Funding Sources for Strategic Mitigation Activities. (p. 4-95 – 4-96)	Choose an item.
HHPD7-b. Does the plan document limitations and describe the approach to addressing deficiencies?	Section 4: 4.2.2 Policies Related to Development in Hazard-Prone Areas (p. 4-49) 4.2.4 – Hazard Management Capabilities Changes (p. 4-49 – 4-56) Section 5: 5.1.2 Barriers and Solutions to Local Hazard Mitigation Planning (pp. 5-3 – 5-4)	Choose an item.
HHPD Required Revisions: Click or tap here to enter text.		

FIRE MANAGEMENT ASSISTANCE GRANTS

Requirements	Location in Plan (section and/or page number)	Met / Not Met
FMAG1. Does the plan address wildfire risks? [44 CFR 201.4(c)(2); 44 CFR § 204.51(d)(2)]		
FMAG1-a. Does the risk assessment provide an overview of the location and previous occurrences of wildfire hazards in the state?	Section 3 3.3.16.2 History (pp. 3-300 – 3-315) Multiple tables and figures describing past fires and showing locations.	Choose an item.
FMAG1-b. Does the risk assessment provide an overview of the probability of future wildfire events that includes projected changes in the location, intensity, frequency and/or duration of wildfire hazards?	3.3.16.3 Location, Severity, and Probability of Future Events (pp. 3-315 – 3-345) Figure 3-191 – Map of Extreme Wildfire Risk (p. 3-322) Table 3-35 – Wildfire Hazard Ratings for Nevada Communities (pp. 3-323 – 3-328) Figures 3-193 – 3-196 – Wildfire Expected Annual Loss and Annualized Frequency (pp. 3-342 – 3-345) 3.5.4 State's Vulnerability in Terms of Jurisdictions Most Threatened and Vulnerable. (pp. 3-413 – 3-423) Table 3-50 – Projected Losses by County) Figure 3-221 Expected Annual Loss by County (p. 3-420) Figure 3-224 – Wildfire Exposure by County (p. 3-423)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
FMAG1-c. Does the risk assessment address the vulnerability of state assets located in wildfire hazard areas and estimate the potential dollar losses to those assets?	Section 3: 3.6.3.3 Loss Estimation for Wildland/Urban Interface Fires for State Facilities (pp. 3-432 – 3-433)	Choose an item.

FMAG1-d. Does the risk assessment include an overview and analysis of local governments' vulnerability to wildfires and the potential losses to vulnerable structures?	3.3.16.3 Figures 3-182 & 3-183 NRI Exposure by census tract (pp. 3-299 – 3-300) Table 3-35 Wildfire Hazard Ratings by community (pp. 3-323 – 3-328) Figures 3-193 & 3-194 Expected Annual Loss due to wildfire by census tract. (pp. 3-342 – 3-343) Figure 3-193 & 3-194 3-196 – Wildfire Expected Annual Loss by census tract (pp. 3-342 – 3-343) Figures 3-195 & 3-196 Wildfire annualized frequency by census tract (pp. 3-344 – 3-345) 3.5.4 State's Vulnerability in Terms of Jurisdictions Most Threatened and Vulnerable. (pp. 3-413 – 3-423) Table 3-50 – Projected Losses by County (pp. 3-414) Figure 3-218 – Wildfire risk index by county (p. 3-417) Figure 3-221 -Expected Annual Loss by County (p. 3-420) Figure 3-224 – Wildfire Exposure by County (p. 3-423) Figure 3-224 Wildfire Exposure by County (p. 3-423)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
	3.7.3 – Wildfire (pp. 3-447 – 3-451) Table 3-62 – Wildfire vulnerability by County (p. 3-448) Table 3-63 Wildfire Vulnerability for other County Lands and Tribal Lands (p. 3-450)	
FMAG2. Does the plan's mitigation strategy contain wildfire-related mitigation initiatives? [44 CFR 201.4(c)(3); 44 CFR § 204.51(d)(2)]		
FMAG2-a. Does the mitigation strategy identify mitigation actions and activities 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?	Section 3: 3.3.16.3 Location, Table 3-36 – Wildfire Mitigation Goals and Strategic Actions (pp. 3-334 – 3-341) Section 4: 4.1.1 Hazard Mitigation Goal Assessment Overview Goal #5 (pp. 4-2 – 4-16) 4.4.2 Evaluation and Prioritization of Strategic Actions and Activities (4-59 – 4-86) Table 4-10 Strategic Action Plan Matrix (pp. 4-61 – 4-84)	Choose an item.
FMAG Required Revisions: Click or tap here to enter text.		

3. Enhanced State Mitigation Plan Regulation Checklist

ENHANCED STATE PREREQUISITES

Requirements	Location in Plan (section and/or page number)	Met / Not Met
E1. Does the enhanced plan include all elements of the standard state mitigation plan? [44 CFR § 201.5(b)]		
E1-a. Does the enhanced plan meet all the required elements of the standard state mitigation plan?	Entire Plan	Choose an item.
E2. Regarding HMA, is the state maintaining the capability to meet application time frames and submitting complete project applications? [44 CFR § 201.5(b)(2)(iii)(A)]		
E2-a. Are all applications complete and submitted by the end of each program's respective application period?	Section 8: 8.3.1 – Effective Management of HMA Programs - (pp. 8-16 - 8-19)	Choose an item.
E2-b. Are all applications entered into FEMA's electronic data systems (i.e., NEMIS, eGrants, and/or FEMA GO)?	Section 8: 8.3.3 – Quarterly Progress Report and Monitoring (p. 8-20) 8.3.4 – Mitigation Activities and Closeout (pp. 8-21)	Choose an item.
E2-c. Is a complete Minimum Criteria Checklist for Project Subapplicants or equivalent documentation prepared for all subapplications?	Section 8: 8.2.1 – Establishing Eligibility Criteria for Multi-Hazard Mitigation Measures (pp8-7 – 8-10) Figure 8-2 Review, Ranking, and Selection Process (pp. 8-8 – 8-9) Figure 8-3 – NHMWG Application Prioritization Form (p. 8-10) Figure 8-4 – Mitigation Activities Review Process (p.8-16) Figure 8.5 – Sample Award Tracking Report (p. 8-19)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
E2-d. Are all applications determined to be complete by FEMA within 90 days of submittal or selection for further review, or after the first request for information response?	Section 8: 8.3.1 – Effective Management of HMA Programs (pp. 8-15 - 8-18) Figure 8-4 – Mitigation Activities Review Process (p.8-16) Figure 8.5 – Sample Award Tracking Report (p. 8-18)	Choose an item.
E3. Regarding 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)]		
E3-a. Are all applications and amendments 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?	Section 8: 8.3.2 – Environmental Review and Benefit Cost Analysis (p. 8-19)	Choose an item.
E4. Regarding 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)]		
E4-a. Are all progress reports complete and submitted on time?	Section 8: 8.3.1 – Effective Management of HMA Programs (pp. 8-16 - 8-19) Figure 8-4 – Mitigation Activities Review Process (p.8-16) Figure 8.5 – Sample Award Tracking Report (p. 8-19) 8.3.3 Quarterly Progress Report and Monitoring (p. 8-20) 8.3.4 Mitigation Activities Completion and Closeout (p. 8-21)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
E4-b. Are all FFR SF-425s submitted on time?	Section 8: 8.3.1 – Effective Management of HMA Programs (pp. 8-16 - 8-19) Figure 8-4 – Mitigation Activities Review Process (p.8-16) Figure 8.5 – Sample Award Tracking Report (p. 8-19) 8.3.3 Quarterly Progress Report and Monitoring (p. 8-20) 8.3.4 Mitigation Activities Completion and Closeout (p. 8-21)	Choose an item.
E4-c. Does the state consistently comply with the Financial Management Standard requirements described in 2 CFR §§ 200.300 to 200.309?	Section 8: 8.3.1 – Effective Management of HMA Programs (pp. 8-16 - 8-19) Figure 8-4 – Mitigation Activities Review Process (p.8-16) Figure 8.5 – Sample Award Tracking Report (p. 8-19) 8.3.3 Quarterly Progress Report and Monitoring (p. 8-20) 8.3.4 Mitigation Activities Completion and Closeout (p. 8-21)	Choose an item.
E5. Regarding 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)]		
E5-a. Is all work as part of HMA subawards completed by the end of the period of performance, as described in the HMA Guidance?	Section 8: 8.3.4 (p. 8-21)	Choose an item.
E5-b. Have there been no major findings on the last single audit obtained by the state related to HMA programs?	Section 8: 8.3 (pp. 8-14 - 8-21)	Choose an item.
E5-c. Are all grant closeout activities, including financial reconciliation, completed within 120 days from the end of the performance period as outlined in 2 CFR 200.344?	Section 8: 8.3 (pp. 8-14 - 8-21)	Choose an item.
E5-d. Have actual expenditures been documented and are they consistent with SF-424A or SF-424C?	Section 8: 8.2 (pp. 8-7 - 8-13)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
Enhanced State Prerequisites Required Revisions: Click or tap here to enter text.		

INTEGRATED PLANNING

Requirements	Location in Plan (section and/or page number)	Met / Not Met
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)]		
E6-a. Does the enhanced plan demonstrate integration with other state and/or regional planning initiatives?	Section 8: 8.1 (pp. 8-1 - 8-6)	Choose an item.
E6-b. Does the enhanced plan demonstrate integration of FEMA mitigation programs and initiatives?	Section 8: 8.1.2 (p. 8-5 – 8-6)	Choose an item.
Integrated Planning Required Revisions: Click or tap here to enter text.		

DEMONSTRATING COMMITMENT TO A COMPREHENSIVE STATE MITIGATION PROGRAM

Requirements	Location in Plan (section and/or page number)	Met / Not Met
E7. Does the state demonstrate commitment to a comprehensive mitigation program? [44 CFR §§ 201.3(c), 201.5(b)(4) and 201.6(d)]		
E7-a. Does the state demonstrate commitment to statewide programs, initiatives and plans that advance mitigation and resilience?	Section 8: 8.2 (pp. 8-7 - 8-13), 8.6 (pp. 8-29 - 8-40)	Choose an item.
E7-b. Does the state demonstrate a commitment to mitigation training and capability building?	Section 5: 5.1 (pp. 5-1 - 5-16)	Choose an item.

Requirements	Location in Plan (section and/or page number)	Met / Not Met
E7-c. Does the state demonstrate a commitment to its mitigation planning responsibilities by helping local governments update and adopt their plans before they expire?	Section 8: 8.2 (pp. 8-7 - 8-13), 8.6 (pp. 8-29 - 8-40)	Choose an item.
Demonstrating a Commitment to a Comprehensive State Mitigation Program Required Revisions: Click or tap here to enter text.		

EFFECTIVE USE OF EXISTING MITIGATION PROGRAMS TO ACHIEVE MITIGATION GOALS

Requirements	Location in Plan (section and/or page number)	Met / Not Met
E8. Is the state effectively using existing mitigation programs to achieve mitigation goals? [44 CFR §§ 201.5(a) and 201.5(b)(3)]		
E8-a. Does the state demonstrate and document the full and effective use of existing FEMA programs (if funding is available)?	Section 8: 8.5 (pp. 8-26 - 8-35), Table 8-3 (p 8-33 – 8-34)	Choose an item.
E8-b. Does the state demonstrate and document the full and effective use of non-FEMA programs?	Section 8: 8.5.2 (pp. 8-30 - 8-32)	Choose an item.
Effective Use of Existing Mitigation Programs to Achieve Mitigation Goals Required Revisions: Click or tap here to enter text.		

DOCUMENTATION OF THE STATE'S IMPLEMENTATION CAPABILITY

Requirements	Location in Plan (section and/or page number)	Met / Not Met
E9. Does the enhanced plan document capability to implement mitigation actions? [44 CFR §§ 201.5(b)(2)(i), 201.5(b)(2)(ii), and 201.5(b)(2)(iv)]		
E9-a. Does the enhanced plan 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?	Section 8: 8.2.3 (pp. 8-12 - 8-13)	Choose an item.
E9-b. Does the enhanced plan describe how the state will assess the effectiveness of mitigation actions, mitigation the agencies that are involved as well as the timeline, and use the results to inform the mitigation strategy?	Section 8: 8.3 (pp. 8-14 - 8-21), 8.4.1 (pp. 8-22 - 8-23), 8.4.2 (pp. 8-23 - 8-26)	Choose an item.
Documentation of the State's Implementation Capability Required Revisions: Click or tap here to enter text.		

4. Plan Assessment

The Plan Assessment comments can be used to help guide the ongoing maintenance and update of your mitigation plan.

Standard State Mitigation Plan Requirements

PLANNING PROCESS

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

HAZARD IDENTIFICATION AND RISK ASSESSMENT

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

STATE MITIGATION CAPABILITIES

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

MITIGATION STRATEGY

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

LOCAL PLANNING COORDINATION AND CAPABILITY BUILDING

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

REVIEW, EVALUATION, AND IMPLEMENTATION

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

ADOPTION AND ASSURANCES

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

HIGH HAZARD POTENTIAL DAMS

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

FIRE MANAGEMENT ASSISTANCE GRANTS

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

Enhanced State Mitigation Plan Requirements

ENHANCED STATE PREREQUISITES

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

INTEGRATED PLANNING

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

DEMONSTRATING A COMMITMENT TO A COMPREHENSIVE MITIGATION PROGRAM

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

EFFECTIVE USE OF EXISTING MITIGATION PROGRAMS TO ACHIEVE MITIGATION GOALS

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

DOCUMENTATION OF THE STATE'S IMPLEMENTATION CAPABILITY

Strengths

- [Insert plan assessment comments]

Opportunities for Improvement

- [Insert plan assessment comments]

P. Drought Study

Desert Research Institute

Science Environment Solutions

Assessment of Drought Resiliency in Rural Northern Nevada – Additional Studies

Wells, NV

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Contents

Introduction

Unusually severe to exceptional multi-year droughts are not an uncommon occurrence in Nevada. Although groundwater sources tend to be more resilient to short-term droughts than surface water sources, the intensity and length of the recent drought and the increase in population in recent decades have led to questions about the vulnerability of all of the state's municipal water systems. This includes those serving areas outside of urban centers. In 2013, the Nevada Drought Response Committee (DRC) held a strategic planning workshop during which the workgroup identified a goal of strengthening the resiliency of municipal water systems. The DRC recommended the development of public water supply vulnerability studies in the 2014 strategic plan.

The Nevada Division of Emergency Management (NDEM), in accordance with its mission of providing guidance to the state of Nevada and local jurisdictions on pre-disaster mitigation issues, desires to survey public water supply systems and domestic wells in rural northern Nevada to determine the vulnerability of those systems and sources to the effect of long-term drought. The NDEM also desires to develop guidelines to promote drought resiliency for municipal water systems and develop drought mitigation recommendations for rural water systems.

Most rural communities rely on groundwater to serve their customers. Generally, groundwater systems provide more resiliencies during drought periods because groundwater storage is typically much larger than surface water systems (e.g. reservoirs). Although the groundwater does allow small communities a certain amount of relief during short drought periods, groundwater levels can be depleted during long periods of drought. This study assesses the occurrence of drought and the potential effects on groundwater systems in northern rural Nevada.

This drought resiliency analysis focuses on small communities in northern Nevada. This includes communities north of highway 50 including Gerlach, Wadsworth, and Vya. This analysis also includes a general assessment of the potential impact drought may have on domestic wells. The domestic well analysis focuses on the expected shallow water table declines within each hydrographic basin in northern Nevada.

Objectives

This report presents the results a study designed to complete the following tasks:

1. Survey northern rural Nevada municipal/community water supply systems
2. Determine criteria for drought vulnerability of public water supply systems
3. Determine drought vulnerability for domestic wells
4. Develop municipal/community water system drought resiliency recommendations

5. Review and update the NV State Hazard Mitigation Plan's Drought Risk Assessment.

Background

Three or four major droughts occurred in the U.S. during the more than 100-year period for which records are available, not including the extreme and exceptional drought currently affecting Nevada and California. Two of the major droughts in that interval include the Dust Bowl of the 1930's and another drought during the 1950's. Both of those events persisted for a duration lasting between five and seven years, and both affected very large geographic areas (NOAA, 2008).

Medieval-era (1100-1300 CE) droughts were no more severe than modern droughts, but they persisted longer than any recent drought event, lasting 30-50 years

(https://www.nasa.gov/press/2015/february/nasa-study-finds-carbon-emissions-could-dramatically-increase-risk-of-us). The likelihood of such persistent mega-droughts in the second half of this century may be exacerbated in the Southwest and Central Plains (Cook et al., 2015).

In designing a drought scenario for this study, a 15-year period of 50 percent recharge was selected as it represents a more severe and more persistent drought than has been recorded for the region, but still represents a fairly realistic scenario. There are several means by which drought is identified and its severity quantified, including the Palmer Drought Severity Index (Palmer, 1965), which is a comparison of current soil moisture to average soil moisture. For the present study, annual precipitation totals from each basin (wrcc.dri.edu) were compared to the mean total. In general, annual totals on the order of 50 percent of normal precipitation constitute some of the driest years on record.

Methods

The study presented here was conducted primarily through numerical modeling. While a previous report (Pohll et al., 2016) focused on more populated areas, the NDEM requested that three additional towns be included in the study: Gerlach, Wadsworth, and Vya (Figure 1). Estimations of the perennial yields for these basins are shown in Table 1. However, it should be noted that although these basins were selected based on the state's estimation of perennial yield, these values were further researched and reevaluated, and generally served only as a starting point for calibration of mountain block recharge and interbasin flow.

Modeling Methods

MODFLOW-NWT (Niswonger et al., 2011) was used to simulate the groundwater system within the selected hydrographic areas. MODFLOW is considered the industry standard and has been extensively tested and verified by numerous hydrogeologists. The model was developed within the Groundwater Modeling System (GMS) environment (version 10.0). GMS acts as a database for all of the hydrogeologic information and provides an easy to use pre- and post-processor to MODFLOW.

Model domains were defined by a 1-layer mesh of 0.386 mi^2 (1 km^2) grid cells fit to the shape of the hydrographic basin. Surface elevations were defined by a DEM, and grid cell thicknesses were determined by the difference between the surface elevation and a uniform bottom elevation. All models use the convertible layer option in MODFLOW, which allows for a variable saturated thickness as defined by the simulated water table position.

While the design of the individual basin models will be discussed later in this document, in general, models were developed to include zones of mountain block groundwater recharge, evapotranspiration (ET) over phreatophyte zones, rivers and streams, and interbasin flow where applicable. Hydraulic conductivities were determined by physical properties of the formations, analysis of aquifer test results where available, and use of the parameter estimation (PEST) function in GMS. With the exception of the municipal wells in some basins, the functionality and pumping rates of wells in these basins were not available. Therefore, each well with existing water rights as stated by the NDWR was assumed to be active and pumping at the full water right issued to that well, including those wells with only supplementary water rights.

For all modeled hydrographic basins, three simulation periods were developed. First, a steady-state model was created to represent pre-development water levels. Steady state models were calibrated to observed water levels, such that the ratio of the mean absolute error to the total simulated head drop was less than 10%. These water levels were then used as the initial conditions for two sets of transient models – one set modeling normal mountain block recharge conditions, and one set modeling drought conditions, for which recharge was reduced by 50% from normal. Each transient simulation was run for 15 years. All wells were modeled as pumping at their full water right, with the exception of domestic wells which were pumped at 0.7 AFA, in contrast to their associated water right of 2.0 AFA. Additionally, the municipal wells in the Dodge Flat/Tracy Segment/Fernley Area (Wadsworth) model were pumped at rates as reported by the local municipalities. Note that the 2013 estimated pumping rates shown in Table 1 are in many cases simply a percentage of the total water rights, and because their accuracy was unknown, these numbers were not used. Comparisons of water level difference plots between the transient and steady state simulations show the basin-wide drawdown effects of simple pumping versus the effects of lost recharge due to drought conditions. Plots of drawdown over time were also created for selected municipal wells and springs to assess drought vulnerability for the public water supply and to better inform recommendations for drought resiliency.

Dodge Flat / Tracy Segment / Fernley Area (Wadsworth)

The town of Wadsworth lies at the junction of three hydrographic basins – Dodge Flat (Basin 82), Tracy Segment (Basin 83), and Fernley Area (Basin 76). These basins are bound by the Pah Rah Mountains to the west, the Virginia Range to the south, the Truckee Range to the north, and the Hot Springs Mountains to the east. The Truckee River flows east through the Tracy Segment, then bends to the north to flow through Dodge Flat, ultimately terminating in Pyramid Lake, north of the Dodge Flat basin. At the eastern end of the Tracy Segment, river water is diverted into the Truckee Canal, which flows parallel to the river within the Tracy Segment, then bends to the southeast to flow through the Fernley

Area. Water in the canal is used for irrigation purposes in the southern Fernley Area. The town of Wadsworth and the surrounding area obtain water from 4 municipal wells and several quasimunicipal wells located in the Dodge Flat and Tracy Segment (Figure 2).

Steady-State Model Design

The Dodge Flat / Tracy Segment / Fernley Area model uses the results of a previously designed model as its initial condition (Pohll, 2015). It should be stated that the model incorporates only the sections of these three basins that are hydrologically relevant to the Wadsworth/Fernley area, and most notably omits a sizable portion of the Tracy Segment. This model is significantly more complicated than the others described in this report, and consists of 29,376 200 m x 200 m grid cells in 3 layers. Layers 1 and 2 are 110 m (360 ft) and 190 m (620 ft) thick, respectively. The bottommost layer (Layer 3) is defined by the bedrock surface. Surface elevations were determined by a DEM. Briefly summarized here, the model design is described in detail in Pohll, 2015.

The Pohll model was designed to simulate a steady-state condition representing the period 2000-2005. The head resulting from this simulation was then used as the initial condition for a transient model representing 2006-2010. This period was used to calibrate the storage parameters (specific yield and specific storage) and to validate the ability of the model to simulate water level trends. Groundwater sources and sinks in the Elko Segment include mountain block recharge, agricultural recharge, evapotranspiration, interbasin flow, and well pumping. Unlike the other models described in this report, both the steady state and transient calibration periods do include well pumping. The Truckee River and Truckee Canal also act as sources and sinks of groundwater.

Recharge was modeled as several specified flow arcs in layers 1 and 2 along the base of the mountain ranges bounding the basins, and was estimated to be approximately 3300 AFA. Interbasin flow was assumed to move into the model domain along the Truckee River canyon and exit in the north toward Pyramid Lake, and to the southeast toward Hazen. The hydraulic head values along these boundaries were determined by interpolation of measured water levels, or estimated from land surface elevations if no water level data were available. The head values were assumed to remain constant during all simulations and were applied to layers 1 and 2.

Evapotranspiration zones were applied to areas populated by phreatophytes, which fall primarily along the banks of the Truckee River and in irrigated areas along the Truckee Canal. The maximum groundwater ET rates were 0.0016, 0.016, and 0.016 ft/day for greasewood, playa, and cottonwood areas, respectively. The extinction depths were specified as 23, 3.3, and 16 ft for greasewood, playa, and cottonwood areas, respectively.

Interactions between the aquifer and the Truckee River and Truckee Canal were simulated using the streamflow routing package (SFR2; Niswonger and Prudic, 2005). The SFR2 package calculates flux between the surface water body and the aquifer using a number of parameters, including geometric parameters, topology of the stream network, streambed elevations, and width for each reach. Seepage from lateral canals was estimated to be approximately 3300 AFA, based on conveyance efficiencies and diversion rates. The flow budget for the steady-state model is detailed in Table 2.

Most of the hydraulic conductivity measurements within the study area were taken from Pohll et al., 2001, with a few additional measurements taken in the Wadsworth area as presented in Epstein, et al. 2007. Hydraulic testing included pumping, recovery, and packer testing and was performed from 1997 - 2006. The model was calibrated using the pilot point method, with final hydraulic conductivities ranging from 0.3 ft/d to 164 ft/d in isolated areas of the basins.

Transient Model Design

Two transient models were run – one with recharge rates set to 50% of those used in the steady-state model and using Truckee River and Truckee Canal drought condition flow rates as predicted by Pohll, 2016, and one with 100% of the steady-state recharge, to assess the effect of lost mountain block recharge as opposed to simple pumping. Truckee River and Truckee Canal flow rates for the model using 100% of normal recharge were taken from the transient predictive model described in Pohll, 2015. Heads calculated by the 2006-2010 transient simulation presented in Pohll, 2015 were used as the initial condition for the transient drought model, which was run to 15 years. For both models, municipal and quasimunicipal wells were pumped at rates reported by the local municipalities. All other well types were allowed to pump at their full water right, with domestic wells pumping at a rate of 83.5 ft^3/d (0.7 AFA). Heads calculated by the steady-state simulation were used as the initial condition for the transient models, and both models were run to 15 years.

Results

A comparison of drawdown resulting from transient models run at 50% and 100% of steady-state recharge does indicate a decline in groundwater levels in zones of mountain block recharge when under drought conditions. Interestingly, isolated regions in the Fernley Area show a small increase in groundwater levels under drought conditions. This occurs as a result of increased flow volumes in the Truckee Canal - while the steady state and 2006-2010 transient models were run using

historical flow values, the drought model used estimated flow values for a drought under the new Truckee River Operating Agreement (TROA) regulations, which increased the volume allocated to the canal.

Two municipal wells in the Wadsworth area were selected to show the effects of drawdown over time (Figures 3 and 4). Results show a relatively insignificant effect of drought on the municipal supply. PLPT Municipal Well 3 shows an average decline of 0.1255 ft/yr (1.88 ft total) over 15 years of drought conditions, while the Stampmill 1 well actually shows an average increase of 0.0079 ft/yr (0.12 ft total) over the same time period. Fluctuations in these wells result from changes in river and canal flow volumes and seepage rates and are minimal. However, domestic wells located in or near the mountain block, where drawdown due to lost mountain block recharge is greater, may experience up to 14 feet of drawdown as a direct result of a 15-year severe drought (Figure 5).

Conclusions

- Municipal supply wells are resilient to the impact of a 15-year severe drought.
- The most significant impact of drought occurs in the mountain block.
- Domestic wells located in or near the mountain block may be impacted by a 15-year severe drought.
- Changing water regulations may result in increased groundwater elevations relative to the present, even during drought conditions.

Smoke Creek Desert (Gerlach)

The Smoke Creek Desert, referred to as basin 021, is located primarily in northwestern Nevada in Washoe County, and extends to the west into Lassen County, California. The town of Gerlach is located just east of the basin in the San Emidio Desert, but obtains its water from two mountain springs in the Granite Range at the northeastern boundary of the Smoke Creek Desert. Stream and groundwater flow discharges to the southwest-northeast trending playa located on the southeast side of the basin. The basin is sparsely populated, with no active municipal wells (Figure 6).

Steady-State Model Design

The Smoke Creek Desert model consists of 2902 1 km x 1 km grid cells. Cell elevations were determined by a DEM, and the base of the model was set at 2000 ft AMSL. Groundwater sources and sinks in the Smoke Creek Desert include mountain block recharge, spring flow, evapotranspiration, interbasin flow, and well pumping – though pumping was not included in the steady-state model. Mountain streams also act as head dependent sources and sinks of groundwater.

Recharge was modeled as several zones covering higher elevation areas in the hills and mountains bounding the basin. Previous studies have estimated the total mountain block recharge in the basin during non-drought years to be between 13,000 and 19,000 AFA (Glancy and Rush, 1968). The average value of 16,000 AFA was used in the initial model design, then adjusted manually to improve steadystate model calibration. The same study also estimated a 200 AFA underflow from the San Emidio Desert to the east and a 180 AFA underflow from Dry Valley to the southwest, which were applied to the model as specified flow boundaries.

Evapotranspiration zones were applied to the playa and areas populated by phreatophytes, and were calibrated such that basin-wide ET fell between the estimated values of 13,000 and 19,000 AFA (Glancy and Rush, 1968). The mountain streams of Smoke Creek, Buffalo Creek, and Squaw Creek are in communication with the underlying aquifer, and were modeled as head-dependent boundaries using the River (RIV) Package in MODFLOW.

The primary focus of this model was to determine the potential effects of drought on the two mountain springs providing water to Gerlach. A recent modeling study (Aqua, 2009) attempted to determine the effect of pumping on spring flow volumes in the Smoke Creek Desert. As part of that study, data loggers were placed in the springs to determine flow volumes. From November 2007 to February 2009, the flow in Garden Spring fluctuated between 37 and 53 gpm (59.7 and 85.5 AFA), while the flow in Railroad Spring held constant at 200 gpm (322.6 AFA). The springs were modeled using the Drain (DRN) Package in MODFLOW, and the model was calibrated to the measured spring flows. Though not a source of water for the town of Gerlach, a third un-named spring in the playa south of Garden and Railroad Springs was also modeled to more accurately calibrate the model, using a flow rate equal to the water rights for that spring. The flow budget for the steady-state model is detailed in Table 3.

As little data was available to indicate the hydraulic conductivities of the basin materials, zonal values for the mountains and basin sediments were estimated based on rock and sediment types, then calibrated using the PEST function in GMS. The final hydraulic conductivities used in this model range from 0.015 ft/d in the Granite Range to 30 ft/d in the stream alluvium.

Transient Model Design

Two transient models were run – one with recharge rates set to 50% of those used in the steady-state model, and one with 100% of the steady-state recharge, to assess the effect of lost mountain block recharge as opposed to simple pumping. All well types were allowed to pump at their full water right, with domestic wells pumping at a rate of 83.5 ft^3/d (0.7 AFA). Heads calculated by the steady-state simulation were used as the initial condition for the transient models, and both models were run to 15 years.

Results

The model run with 100% of normal recharge and all wells pumping at the full water right showed no change in the flow rate of either spring servicing Gerlach. This model therefore indicates that the current rates of pumping in this basin will not affect spring flow, a finding corroborated by the 2009 Aqua study.

A comparison of drawdown resulting from transient models run at 50% and 100% of steady-state recharge does indicate a decline in spring flow when under drought conditions. After 15 years of drought conditions, Garden Spring showed a decline of approximately 31.1 AFA (Figure 7), while Railroad Spring showed a decline of only 1.6 AFA (Figure 8). The model also indicated that wells located in Smoke Creek Basin may experience drawdown as a result of an extended drought, but that this drawdown would be less than 2 feet (Figure 9).

Conclusions

- The most significant impact of drought occurs in the mountain block.
- Springs providing water to Gerlach may be impacted. The model indicates an approximate flow reduction of 8% after 15 years of severe drought.
- Pumping in the Smoke Creek Desert does not appear to impact springs providing water to Gerlach.

Long Valley (Vya)

Long Valley, referred to as basin 009, is located in northwestern Nevada in Washoe County. The basin trends south to north, and is bound by the Hays Canyon Range to the west and various individual mountains and hills to the north, south, and east. Stream and groundwater flow discharges to playa lakes located primarily in the north basin. The basin is sparsely populated, with no active municipal wells (Figure 10).

Steady-State Model Design

The Long Valley model consists of 1161 1 km x 1 km grid cells. Cell elevations were determined by a DEM, and the base of the model was set at 4500 ft AMSL. Groundwater sources and sinks in Long Valley include mountain block recharge, evapotranspiration, interbasin flow, and well pumping – though pumping was not included in the steady-state model.

Recharge was modeled as several zones covering higher elevation areas in the mountains bounding the basin. Previous studies have estimated the total mountain block recharge in the basin during nondrought years to be approximately 6,000 AFA (Sinclair, 1963). This study also estimated evapotranspiration in the basin to be approximately 11,000 AFA. The study resolved this imbalance by suggesting that Long Valley may receive a significant amount of interbasin flow from Massacre Lake Valley to the east, Boulder Valley to the southwest, and Surprise Valley to the west. However, a separate study of Surprise Valley has stated that it is a closed basin (California

Department of Water Resources, 1986). Additionally, Sinclair's estimated recharge rates in Massacre Lake Valley and Boulder Valley are quite low (3500 AFA and 2000 AFA, respectively), and they are therefore unlikely to contribute the apparent 5000 AFA difference between estimated recharge and evapotranspiration. As the Sinclair study provided no other evidence for this assertion beyond a mass balance error, it is likely that the estimate of evapotranspiration is high, and the perennial yield of the basin is in fact less than 11,000 AFA.

Evapotranspiration zones were applied to playas and to areas populated by phreatophytes. A maximum ET rate of 0.002 ft/d was applied to the playas with an extinction depth of 5 ft below the surface, while phreatophyte zones were assigned a maximum ET rate of 0.0007 ft/d with an extinction depth of 30 ft. A constant head boundary was placed in the largest playa zone to serve as a point of reference for the heads calculated in the steady state model, and the model was calibrated such that this boundary condition would not act as a significant source or sink of water. This boundary condition was removed before the transient simulations were performed. The flow budget for the steady-state model is detailed in Table 4.

As little data was available to indicate the hydraulic conductivities of the basin materials, zonal values for the mountains and basin sediments were estimated based on rock and sediment types, then calibrated using the PEST function in GMS. The final hydraulic conductivities used in this model range from 0.01 ft/d in the Hays Canyon Range to 3.5 ft/d in the alluvium of the central basin.

Transient Model Design

Two transient models were run – one with recharge rates set to 50% of those used in the steady-state model, and one with 100% of the steady-state recharge, to assess the effect of lost mountain block recharge as opposed to simple pumping. All well types were allowed to pump at their full water right, with domestic wells pumping at a rate of 83.5 ft^3/d (0.7 AFA). Heads calculated by the steady-state simulation were used as the initial condition for the transient models, and both models were run to 15 years.

Results

Transient models show the development of cones of depression surrounding irrigation wells along the western side of the basin, with a maximum drawdown of approximately 66 ft over 15 years (Figure 11).

A comparison of drawdown resulting from transient models run at 50% and 100% of steady-state recharge shows does indicate a decline in groundwater levels in zones of mountain block recharge when under drought conditions. Irrigation and domestic wells located in or near the mountain block

may experience up to 10 feet of drawdown as a direct result of a 15-year severe drought (Figure 12).

Conclusions

- The currently accepted value of perennial yield for this basin may be an overestimate.
- Irrigation and domestic wells located in or near the mountain block may be impacted by a 15year severe drought.
- The majority of the simulated drawdown is concentrated in the area of irrigation wells, indicating that irrigation well pumping exerts a dominant influence on water level decline in Long Valley.
- Water level decline due to pumping presents a more significant threat to resilience than a 15year severe drought.

Conclusions

In this study, the effects of persistent, severe drought on groundwater levels in three hydrographic basins in Northern Nevada were assessed. This was carried out by running two transient groundwater flow simulations: one in which the mountains receive the full volume of normal recharge, and one in which the mountains received only 50 percent of normal recharge. In each simulation, domestic wells were pumped at 0.7 AFA, which is smaller than the 2 AFA water right, but represents a more realistic value. All other wells were pumped at their full water right duty, with the exception of municipal and quasimunicipal wells in the Dodge Flat/Tracy Segment/Fernley Area (Wadsworth) model, which were pumped at rates as reported by local municipalities. The simulations were run over a period of 15 years, and the difference in water levels at year-15 was interpreted as the effect of the reduction in recharge in the mountains, as all other features of the simulations – besides recharge – were identical. Differences in water level between the two scenarios in year-15 were measured at the location of municipal wells, and the difference in water level was also mapped throughout the model domain to show region of greater and lesser sensitivity.

The differences in water levels between the 50 percent (drought) and 100 percent (normal) recharge scenarios in year-15 was generally small compared to the net decline in water level at a given location due to pumping. The largest difference in water level between the drought and normal recharge simulations in year-15 usually occurred in the mountains, where recharge is delivered to model. This result is not surprising because the reduction in recharge propagates through the model at a rate governed by the hydraulic diffusivity, which is the ratio of the hydraulic conductivity to the specific storage parameter (or the ratio of transmissivity to storativity). As a result regions near the recharge zone “feel” the effects of a sudden reduction in recharge much earlier than points farther from the recharge zone. A corollary to this observation is that wells located near the mountain block tend to be less resilient than wells near the center of the valley.

The reduction in recharge is not instantaneously communicated to all locations in the basin. As a result, the effect of the reduction in recharge is not evident at any of the municipal wells during the 15-year simulation period. With the values of hydraulic conductivity, *K,* and specific storage, S_s, used in the transient simulations, the time delay, t_{delay}, between the onset of a reduction in recharge and its expression as additional drawdown in a pumped well is approximated by:

$$t_{delay} = \frac{S_s}{K} d^2$$

where *d* is the shortest horizontal distance between the recharge zone and the well in question. A well located 10,000 feet from the recharge zone, for example, would respond to a sudden change in the recharge rate in the mountain block after approximately 5.5 years.

In the Dodge Flat/Tracy Segment/Fernley Area (Wadsworth) simulations, water levels were reduced at most by 14 feet in the 50 percent recharge scenario after 15 years, relative to the full recharge case. This difference is interpreted as an effect of the drought. However, these levels of drawdown are seen only in domestic wells located near mountain block recharge zones. Municipal wells are located at a sufficient distance from recharge zones, and are primarily affected by flow rates in the Truckee River and Truckee Canal. Assuming predicted flow rates are accurate, models indicate that municipal and quasimunicipal wells in this area are resilient to an extended drought.

Similarly, the Long Valley (Vya) simulations yielded a difference in water levels of up to 10 feet at domestic and irrigation wells located near the mountain block under the 50 percent recharge drought scenario.

In the Smoke Creek Desert, flow rates in the two springs providing water to Gerlach in the 50 percent recharge case were reduced by approximately 8%, relative to the 100 percent recharge case after 15 years of simulation. The effects of pumping in the basin did not affect spring flow.

On balance, the influence of a persistent, severe 15-years drought on groundwater elevation in the three modeled basins is relatively minimal, at least when compared to the rate of decline due to pumping.

Recommendations

The most significant impacts of the simulated drought occur first in the mountains, where groundwater is recharged. Wells and springs in and near the mountain block tend to be affected earlier and more severely by a sudden reduction in recharge. For that reason, it is recommended that new wells be drilled as close to the center of the valley as possible.

Water level records are available at varying temporal resolution for some wells. Additional water level monitoring in more extant wells and flow rate monitoring in springs would provide valuable highresolution feedback on aquifer and well performance.

While the effects of a simulated drought were small compared to the effect of pumping, the decline due to pumping alone is cause for concern, as it poses the greatest present threat to the resilience of municipal water resources.

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Tables

Table 1. Groundwater pumping by basin, *from* Nevada Statewide Assessment of Groundwater Pumpage, 2013. Volumes in acre-feet.

Hydrographic Area	Basin / Municipality	MM	IND	ENV	IRR	STK	MUN	QM	DOM	REC	COM	OTH	TO
82 & 83	Dodge Flat & Tracy Segment / Wadsworth	657	1,175	0	0	0	66	1,030	4,506	727	0	845	9,(
21	Smoke Creek Desert / Gerlach	0	0	0	4,576	89	0	0	12	449	8	0	5,1
9	Long Valley / Vya	0	0	0	107	70	0	0	5	0	0	0	1

MM = Mining and Milling, IND = Industrial and Construction, ENV = Environmental, IRR = Irrigation, STK = Stock, MUN = Municipal, QM = Quasi-municipal, DOM = Domestic, REC = Recreation and Wildlife, COM = Commercial, OTH = Other, PY = Perennial Yield

Table 2. Flow budget for the Dodge Flat/Tracy Segment/Fernley Area (Wadworth) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	391993	3285
Interbasin Flow	176840	1482
River/Canal Seepage	1967474	16486
Agricultural Recharge	292169	2448
Sinks		
Evapotranspiration	-769389	6447
Interbasin Flow	-706305	5918
River/Canal Seepage	-1065022	8924
Pumping Wells	-680984	5706

Summary	**Sources-Sinks (ft^3/d)**	**Percent Difference**
	-1.90	-0.000059

Table 3. Flow budget for the Smoke Creek Desert (Gerlach) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	1773270	14859
Creek Seepage	32395	271

Interbasin Flow	45351	380
Sinks		
Evapotranspiration	-1591526	-13336
Creek Seepage	-117249	-983
Drains (Springs)	-142239	-1192
Summary	**Sources - Sinks (ft^3/d)**	**Percent Difference**
	1.20	0.000065

Table 4. Flow budget for the Long Valley (Vya) steady-state simulation.

	Rate (ft^3/d)	**Rate (AFA)**
Sources		
Mountain Block Recharge	714194	5984
Constant Head	9447	79
Interbasin Flow	298356	2500
Sinks		
Evapotranspiration	-1012802	-8487
Constant Head	-9196	-77
Summary	**Sources - Sinks (ft^3/d)**	**Percent Difference**
	0.005859375	5.7332578e-007

Figures

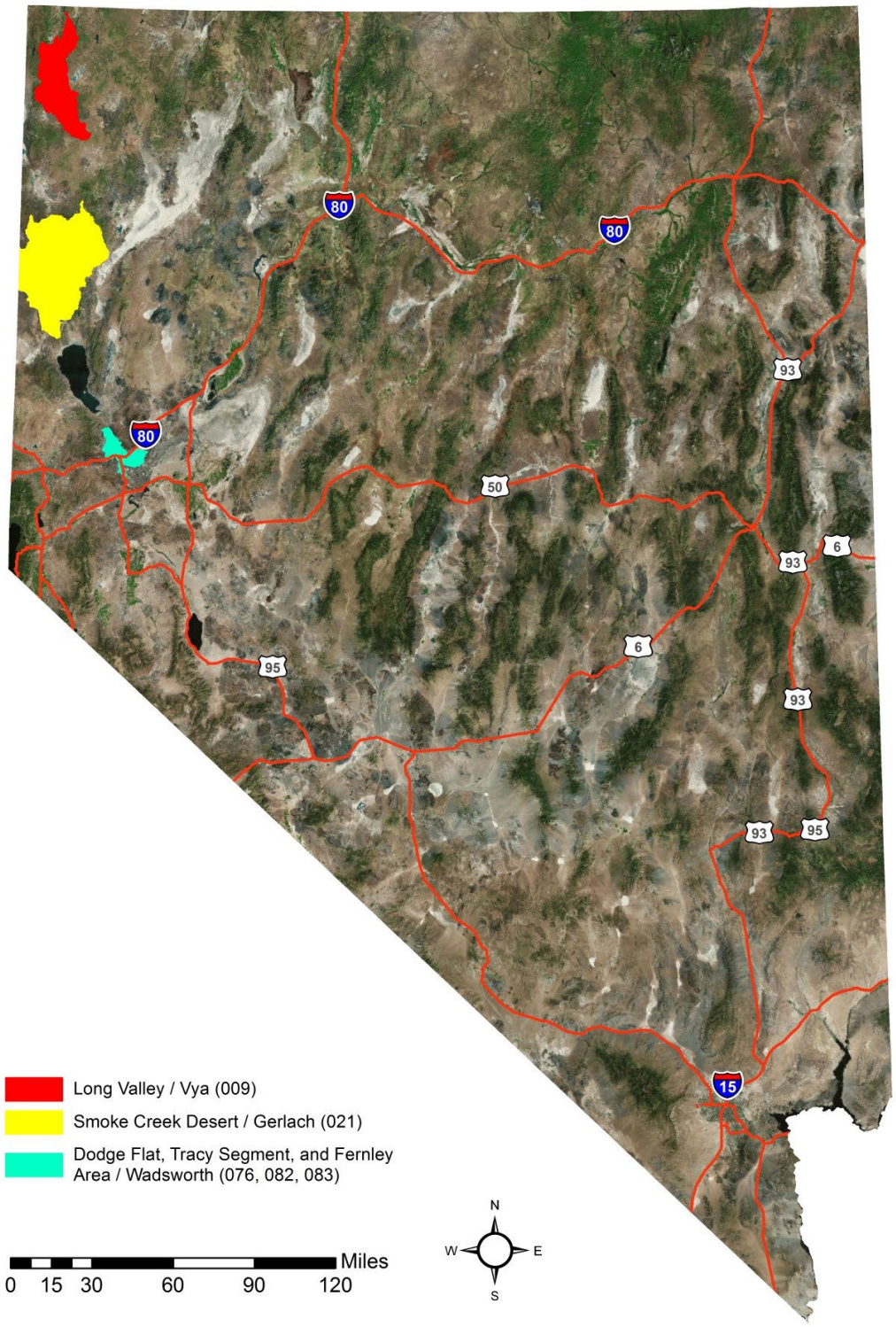

Figure 1. Hydrographic areas modeled for the study presented in this report.

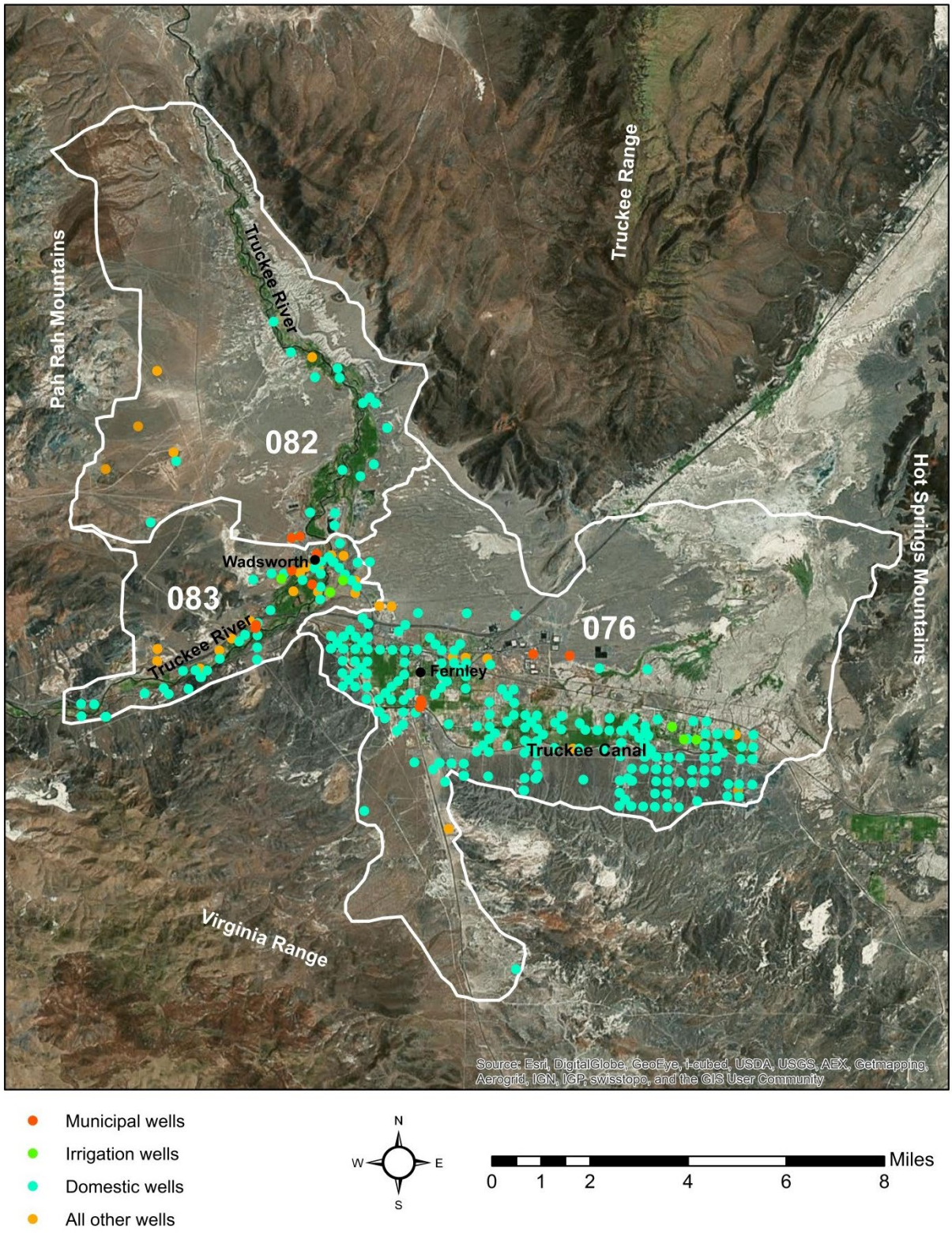

Figure 2. Dodge Flat (82), Fernley Area (76) and Tracy Segment (83) and locations of wells used in transient simulations.

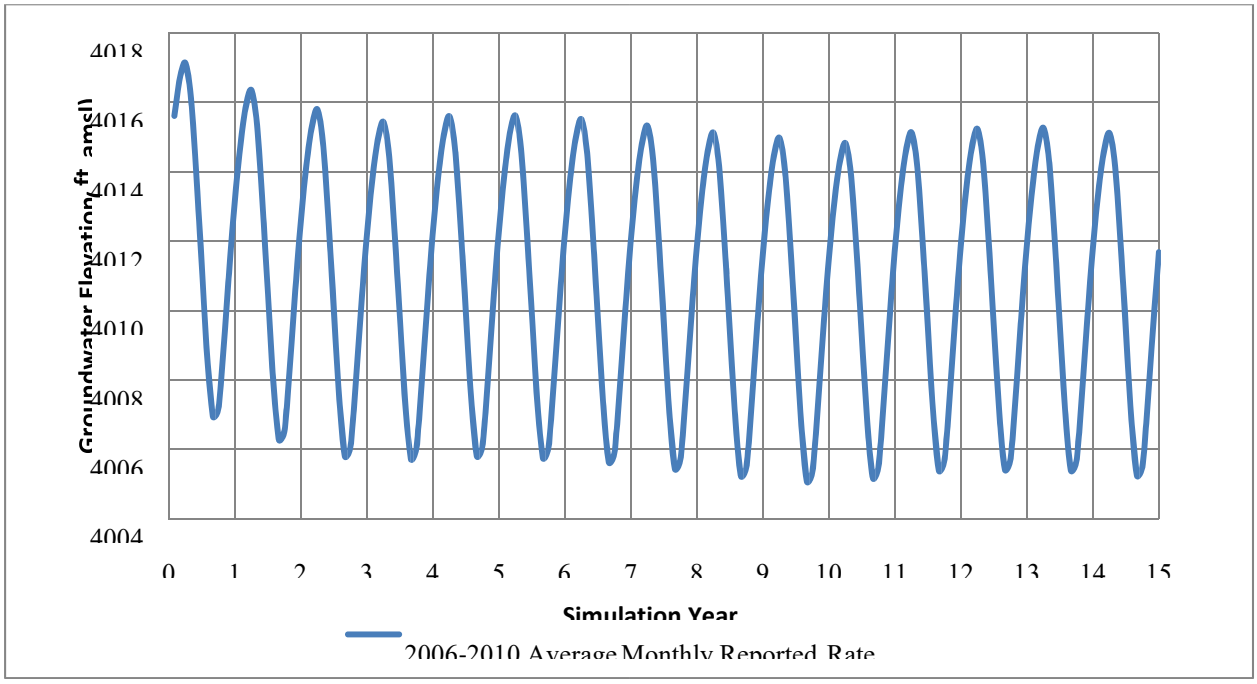

Figure 3. Groundwater levels at PLPT Municipal Well 3 over model duration.

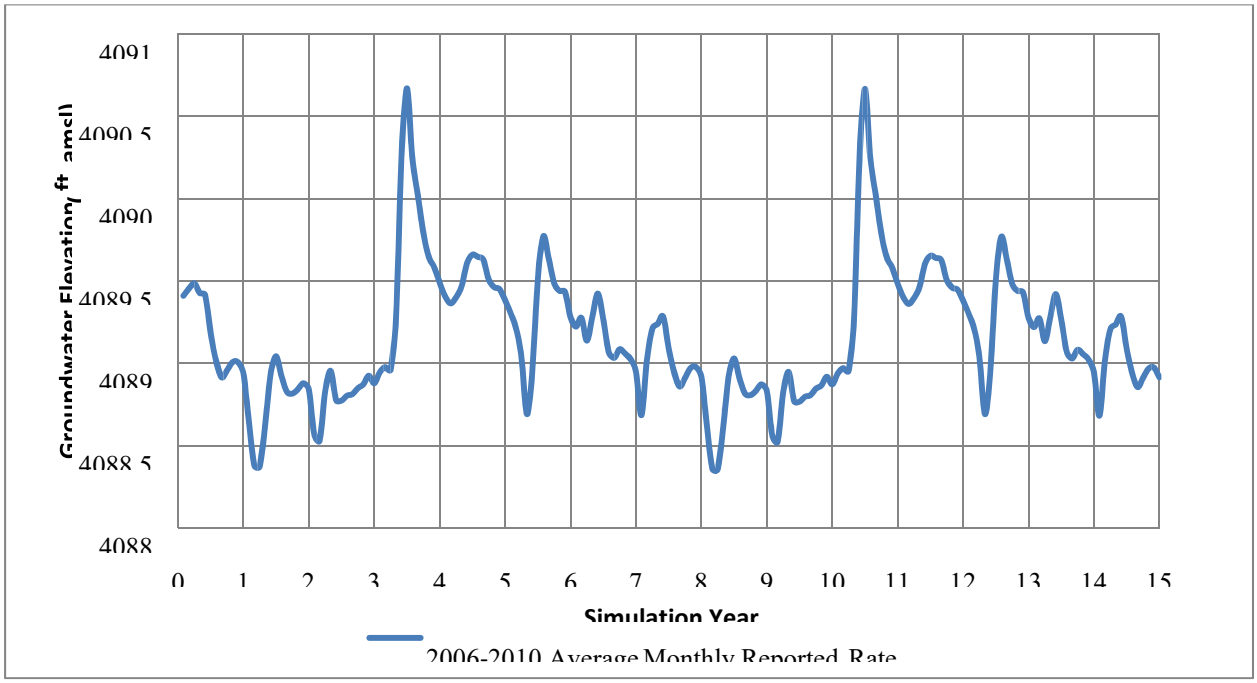

Figure 4. Groundwater levels at Stampmill 1 over model duration.

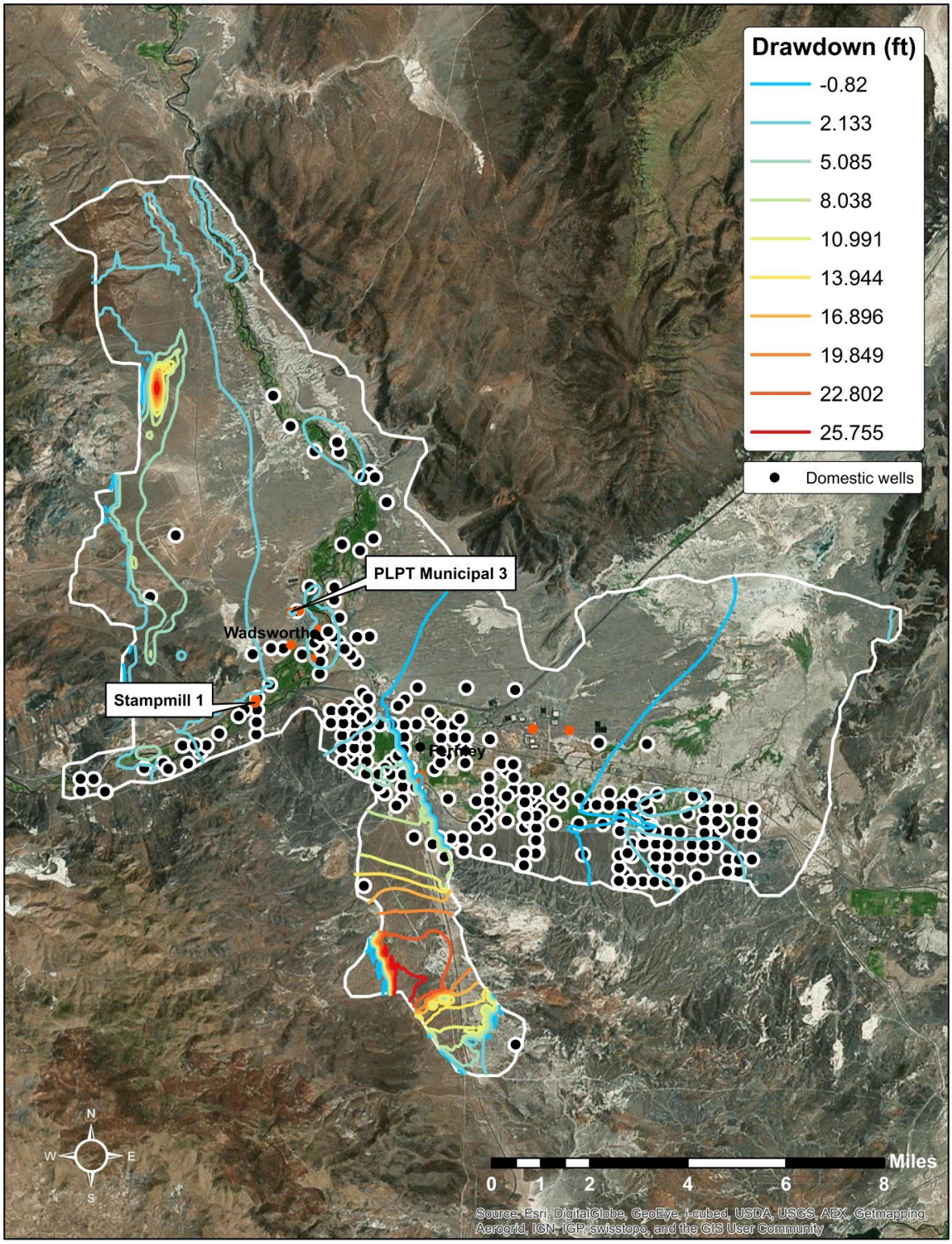

Figure 5. Difference in Dodge Flat / Fernley Area / Tracy Segment drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

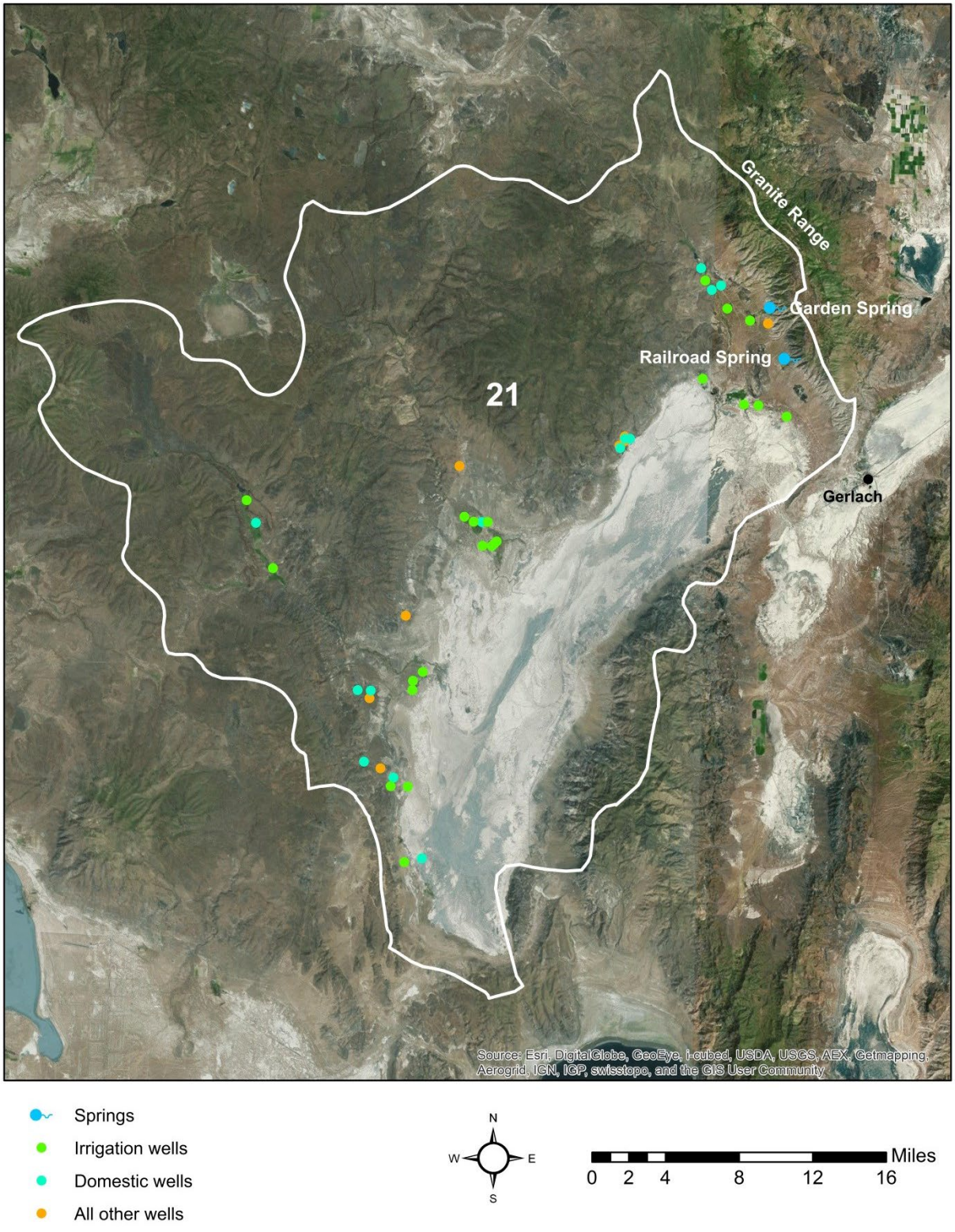

Figure 6. Smoke Creek Desert (21) and locations of wells and springs used in transient

simulations.

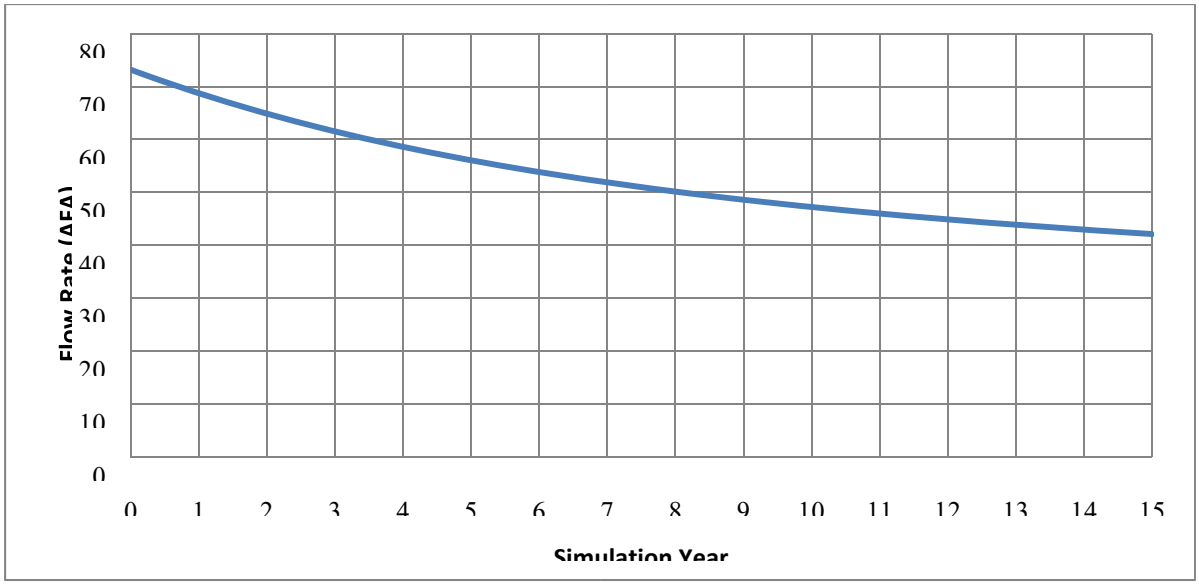

Figure 7. Declines in flow rates for Garden Spring over 15 years of drought conditions.

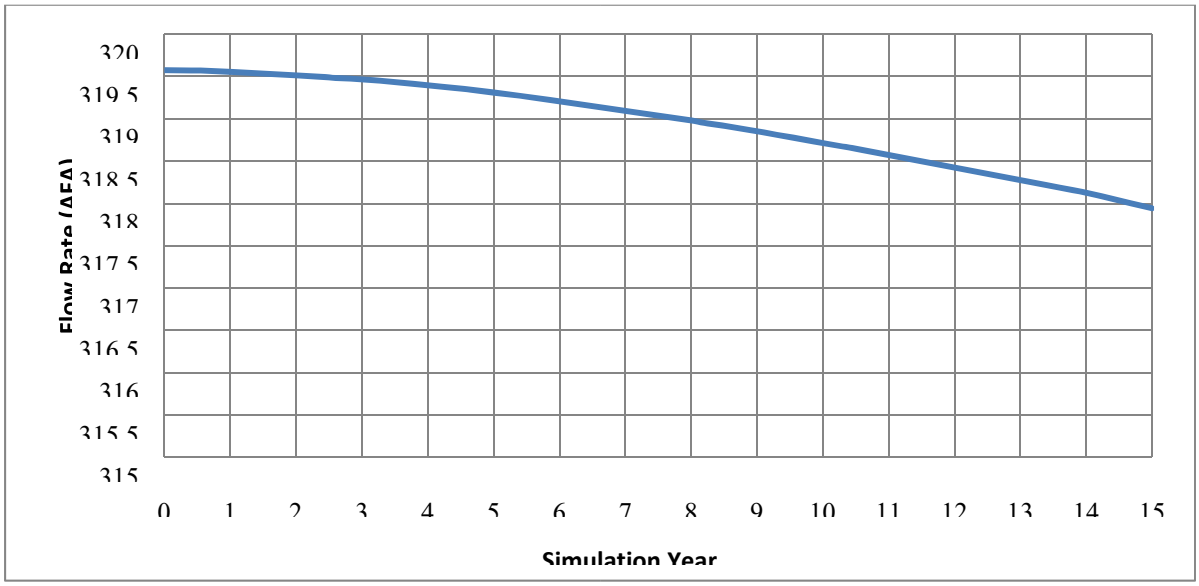

Figure 8. Declines in flow rates for Railroad Spring over 15 years of drought conditions.

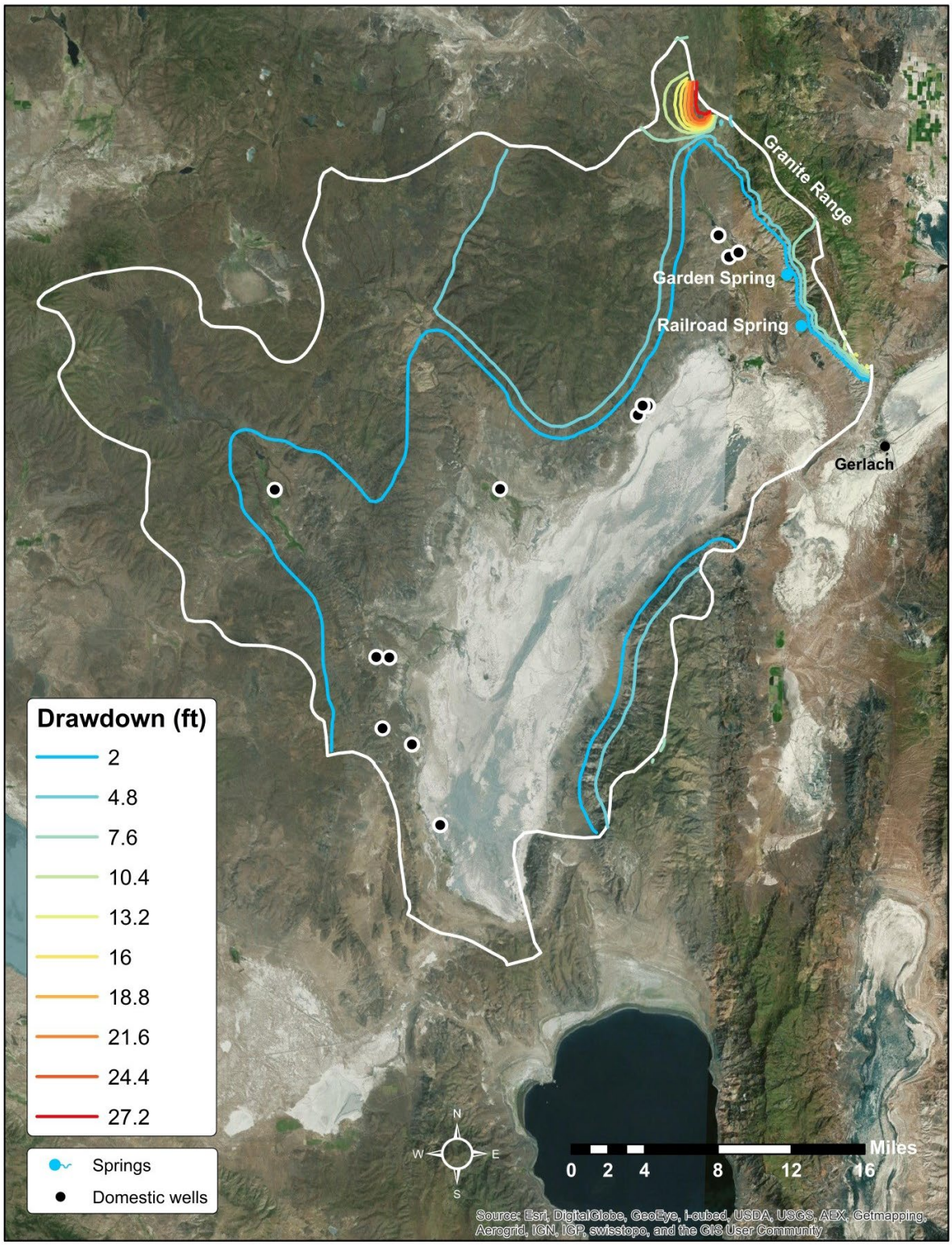

Figure 9. Difference in Smoke Creek Desert drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

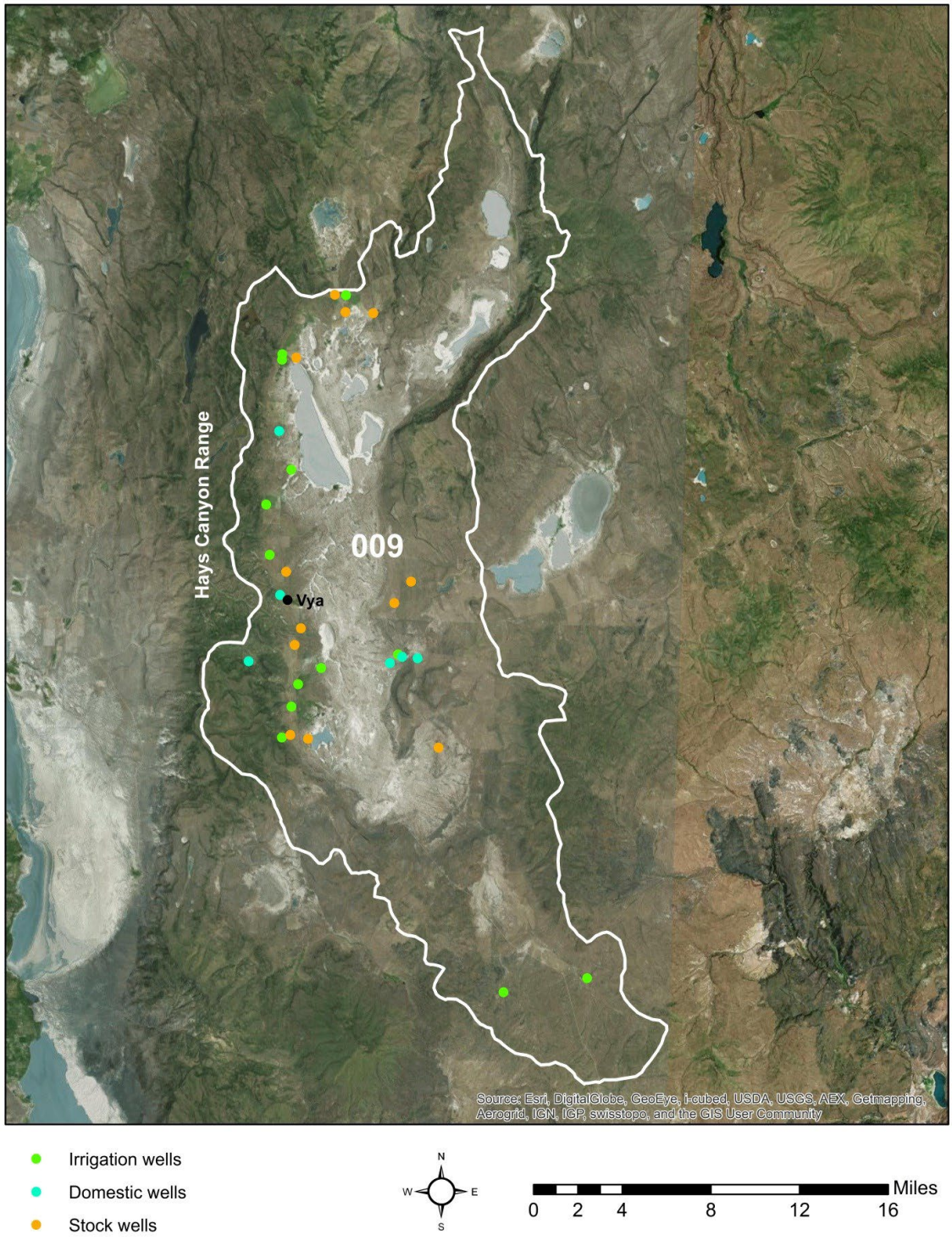

Figure 10. Long Valley (009) and locations of wells used in transient simulations.

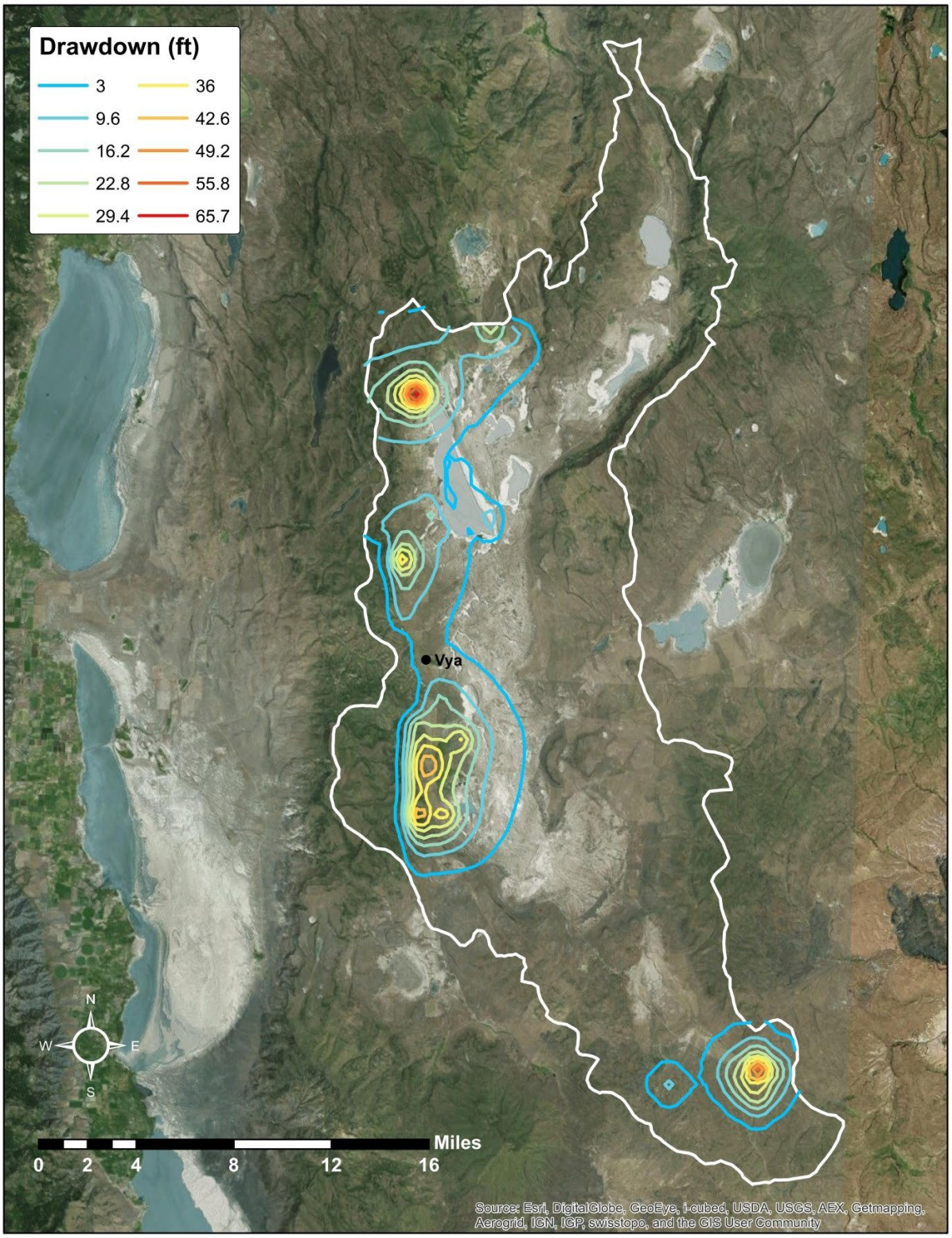

Figure 11. Drawdown in Long Valley after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

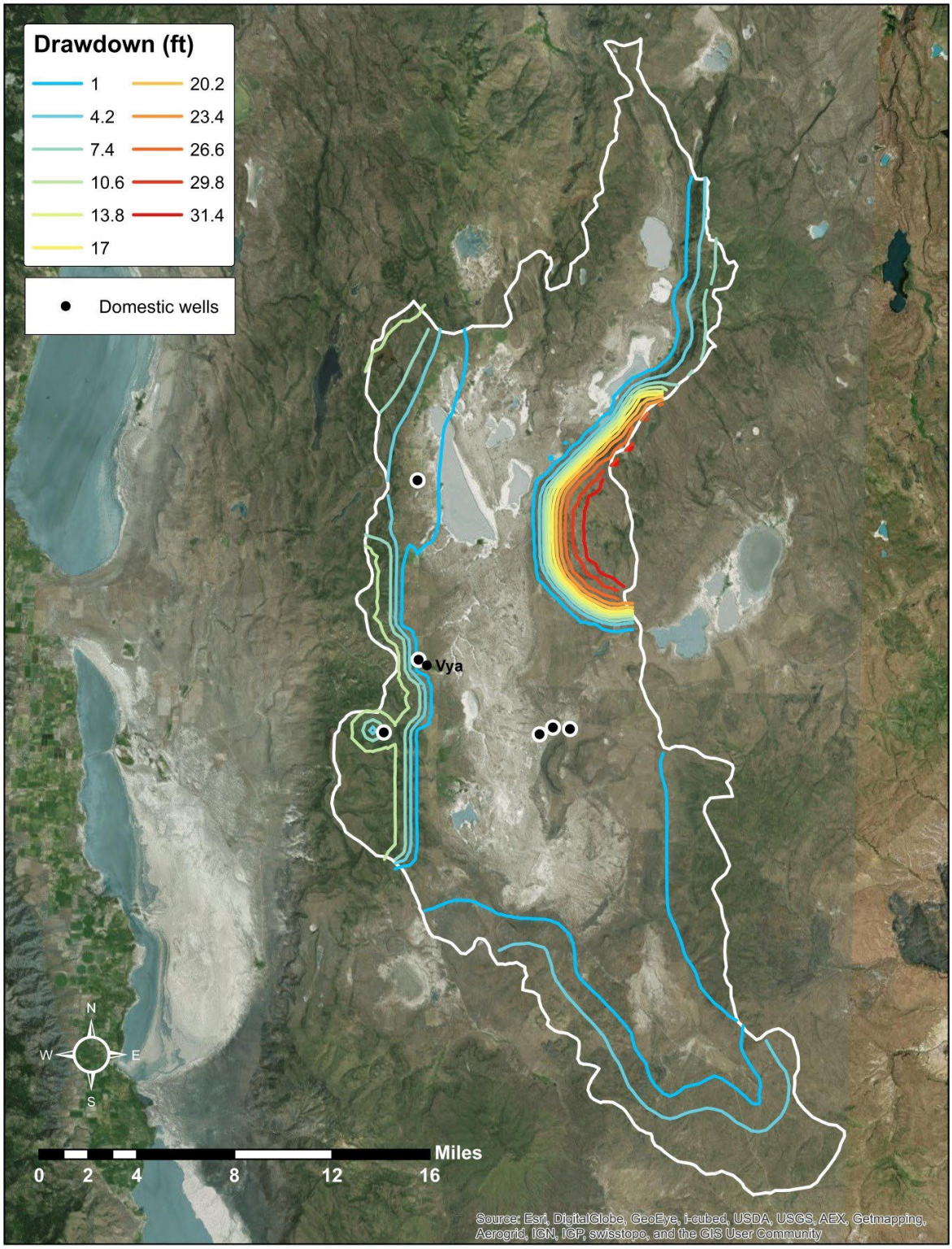

Figure 12. Difference in Long Valley drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

Q.Loss Avoidance Study

The information contained in this appendix does not reflect Nevada Hazard Mitigation Plan appendix letters or naming conventions, and has its original table of contents

Loss Avoidance Study

Severe Storms and Flooding

FEMA-4303-DR-NV January 2017
FEMA-4307-DR-NV February 2017

Hazard Mitigation Performance Analysis

Joint Field Office, Carson City, NV

July 2017

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Table of Contents

Executive Summary

Hazard Mitigation is defined as a "sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects". In order to fulfill their responsibility to the public, it is incumbent upon Federal, State, Local, and Tribal Emergency Managers to regularly review the efficacy of past mitigation projects where public funding is involved. Flooding in NW Nevada during January and February 2017 provided an opportunity to evaluate two mitigation projects initiated as a result of previous disasters in and around the Reno/Carson City area.

The following criteria were considered in selecting analysis sites:

- The project had to have been completed and in place at the time of the January and February events
- The project was located within the declared disaster area
- The project was "tested" by the recent flood event

The Truckee River Flood Project

The first project is located on Mill Street and North Edison Way in east Reno along the banks of the Truckee River. The project is part of a much larger plan managed by the Truckee River Floodplain Management Authority (TRFMA) with many facets, ranging east to west through the greater Reno/Sparks area. It is unique in that it is part of a large, on-going project that will take many years to complete, and acquisition of two remaining buildings is still under negotiation. An exception was made to the "completed project" criteria listed above because the project provides a clear "before and after mitigation" picture, in that both of the buildings that are still occupied were flooded in the recent storms. The N. Edison Way site was a retail/light industrial complex that had been subject to flooding on numerous occasions. The project boundary encompasses approximately 147 acres.

The goal of the Truckee River Management Project is the acquisition and demolition of ten retail/light industrial buildings and one building that was formerly used as a Monastery, as well as acquisition of surrounding farmlands, all of which have been subject to repeated flood loss over the years. Six of the ten buildings have been acquired and demolished. Two are scheduled for demolition, and two are still occupied. Once all the buildings have been demolished, and foundations and utilities removed, the land will be converted to a public park, *creating the only undeveloped space* along the Truckee River in Reno. While the vast majority of the funds were provided by the TRFMA, FEMA Pre-Disaster Mitigation (PDM) Grant funds subsidized the demolition of seven of the 11 buildings to date, and will likely make further contributions.

This project can be considered a success even in its transitional state. In the aftermath of the 2017 floods, the two remaining structures sustained damage due to flooding (a minimum of 1 foot of water was recorded at the site), with claims totaling $475,290. The acquisition of the remaining buildings located within project boundaries avoided losses in excess of 5 million dollars.

Project costs for business relocation and demolition totaled $1,167,347, while losses avoided totaled $3,864,207. This resulted in a loss avoidance ratio of 3.31. Thus far, FEMA has obligated at total of $561,490 to this project. The TRFMA anticipates requesting an additional $300,000 to complete the demolition of the Monastery building.

The Vicee Canyon Basin Expansion Project

The second project was located on the northwest side of Carson City and involved the reforestation of the entire Vicee Canyon watershed and the expansion of a retention basin located at the eastern end of the watershed. The project was initiated in the aftermath of the 2004 Waterfall Wildfire that consumed 8,700 acres encompassing several canyons on the western edge of the city.

Mitigation measures enacted in the Vicee Watershed fell into three general categories: soil remediation, fire control, and debris flow/runoff retention. Measures included hydro-seeding, placement of straw mulch, erosion control blankets and fiber rolls, as well as the installation of check dams, gravel bag berms, and sand bag barriers. Existing infiltration ponds were cleaned out to expand their holding capacity, and Carson City undertook an expansion project that, when completed, increased the capacity of the retention basin from 15 acre-feet to just over 200 acre-feet, more than adequate for a 500-year event.

Project costs for reforestation, infiltration pond improvement, and retention pond expansion totaled $4,625,550, while estimated losses avoided totaled $11,997,746. This resulted in a loss avoidance ratio of 3.59. The Federal share was a relatively small $793,987. (All numbers expressed in 2017 dollars.)

This study is intended for Federal, State, Tribal, and Local emergency and facilities managers, as well as anyone responsible for inspecting and repairing eligible facilities after a disaster. It is intended to be informational rather than instructional. With a better understanding of the PDM and PA grant programs and illustrated case studies, the intended audience should be in a better position to fully utilize these programs. The study's goal is to demonstrate the cost-effectiveness of mitigation actions.

Nevada Mitigation Projects Losses Avoided			
Project	Mitigation Costs	Losses Avoided	Loss Avoidance Ratio
Truckee River	$1,167,347	$3,864,207	3.31
Vicee Canyon	$4,625,550	$11,997,746	3.59

1. Introduction

Hazard Mitigation is defined as a "sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects". This Loss Avoidance Study examines the effectiveness of two projects initiated in northwest Nevada; one in Reno and one in Carson City.

These projects were funded under several different authorities, including FEMA's Pre-Disaster

Mitigation Grant Program (PDM), FEMA Public Assistance (PA) Grants, the State of Nevada,

Carson City, the National Resources Conservation Service, and the Truckee River Flood Management Authority. The Federal grants are all part of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (The Stafford Act), which provides grants for states and communities to implement hazard mitigation measures.

Nevada's unique geography, coupled with the several major rivers that cascade down from the Sierra-Nevada Mountains in the Reno/Carson City area, contributes to the regular floods that occur. The following section of the study provides an overview of the geographic characteristics of Nevada, as well as a brief history of flooding that has occurred throughout the state.

1.1 Nevada Geography

Nevada covers 110,567 square miles of western North America. It is bordered by California to the west and south, Oregon and Idaho to the north, Utah to the east, and Arizona to the southeast. Nevada shares geographic features with all its neighbors. Most of the state is characterized by the mountain ranges and flat valleys of the Great Basin and Range Region. It is high mountain desert with a mean elevation of 5,500 feet. Denver may be the "Mile-High" city, but Nevada is the mile-high state. This altitude contributes to the extremes in climate and weather conditions experienced throughout the state. The northeastern portion of the state is supported by lava bedrock and features miles of open prairie that is part of the Columbia Plateau. The entire western/southern border is dominated by the Sierra-Nevada Mountain Range, which covers a relatively small area of the state but has an enormous impact on the state's climate. (See *Figure 1: Nevada Geography*)

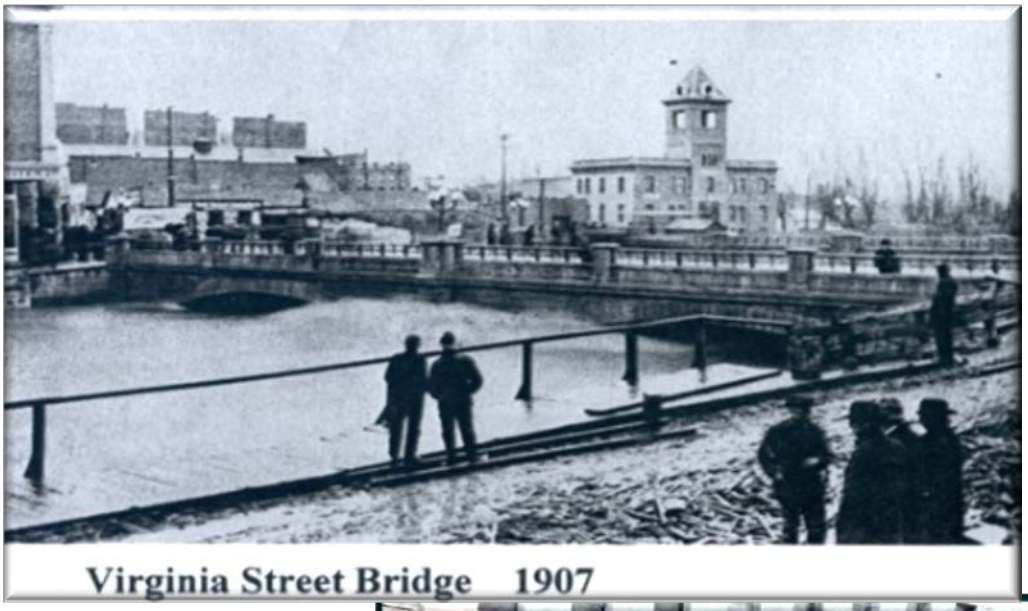
Nevada is essentially a dry state; less than 1 percent of the total area is covered with water. Its major lakes are Pyramid, Mead, Mojave, Tahoe, and Walker. Major rivers include the White, the Humboldt, the Truckee, the Carson, and the Walker. The White River and two smaller rivers flow south into Lake Mead, and from there into the Colorado. Several rivers flow into the Humboldt as it winds its way from east to west across the northern portion of the state, ending in the Humboldt Sink, a large, intermittent dry lake bed, a remnant of the prehistoric Lake Lahontan. The Truckee, Carson, and Walker rivers all originate in the Sierra-Nevada Mountains and cross into Nevada near Reno and Carson City. (Nevada Geography from NETSTATE, http://www.netstate.com/states/geography/nv_geography.htm)

1.2 Flooding History of Nevada

Given its climate and geography, it can probably be said with a high degree of certainty that flooding isn't the first thing that comes to mind when people think about Nevada. Status as the driest state belies the true history of flooding in the region, but floods have been recorded in every part of the state, in nearly every month of the year. Rapidly melting snowpack, torrential rain, and isolated thunderstorms have swollen rivers and created flash floods that have created havoc, destroyed property, and taken human lives throughout Nevada's history.

Figure 1: Nevada Geography

One of the earliest recorded events was in the winter of 1861-1862, when Nevada was still a territory. Flooding in the Carson Valley resulted in loss of both life and property. Nearly three decades later, during the winter of 1889-1890, Carson Valley flooded once again when unexpected Chinook winds caused snowmelt in January, sending a wall of ice and debris into the river channel.



Flooding in and around Las Vegas during the winter of 1906-1907 left the town's residents cut off from supplies, while to the north, the Truckee River inundated downtown Reno. In 1910, the

Meadow Valley Wash flooded, carrying away most of a train, and in 1941, when heavy thunderstorms soaked much of Nevada, a half-mile of railroad track was washed away, causing a massive trail derailment.

Figure 3: Downtown Reno, 1950

November and December 1950 saw record-breaking floods in the

Walker, Carson, and Truckee River basins. Unseasonably warm temperatures melted the early snow cover and combined with a series of storms to overwhelm the northern part of the state. Estimates of damage in Reno compiled by the US Army Corps of Engineers totaled $1,982,000 ($20,050,356 in 2017 dollars). (*Floods of November-December 1950 in Western Nevada*, USGS Publications Library,

Water Supply Paper 1137-H. (https://pubs.er.usgs.gov/publication/wsp1137H)

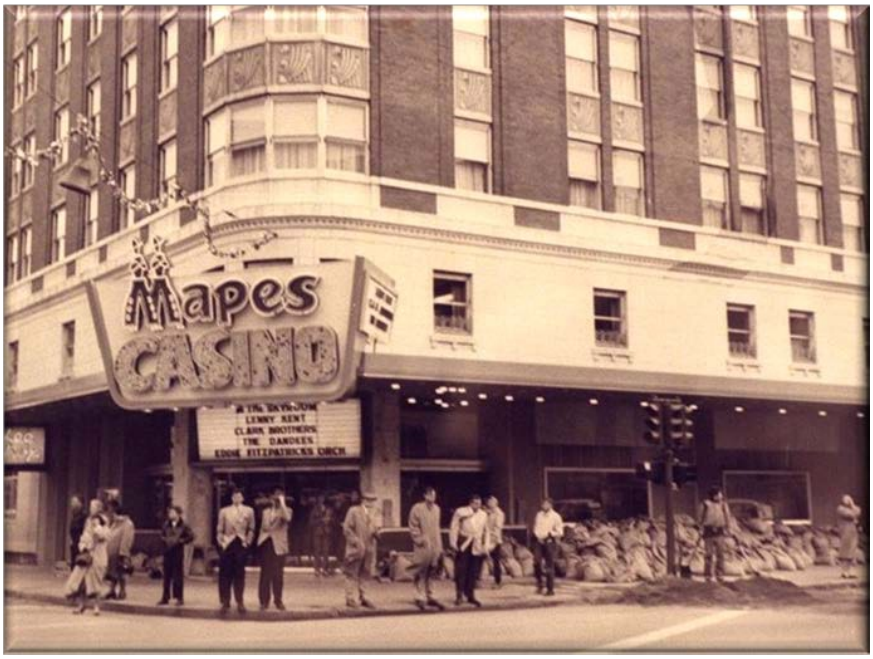


Figure 4: Mapes Casino Prior to 1955 Flooding

Called the "Storm of the Century", wet snow and heavy rain fell in the Sierras and northwest Nevada for 10 days during the Christmas season of 1955. It was reported that two inches of rain fell on Reno in the two days before Christmas. Power lines came down, bridges were destroyed, and four feet of high water poured into downtown Reno.

Figure 5: Mapes Casino in Aftermath of 1955 Flooding

In January 1962, snow storms blanketed northeastern Nevada. Because of the extremely cold temperatures that froze the ground, February rains could not penetrate the soil and the resultant flooding overwhelmed Winnemucca, Battle Mountain, Elko, and other localities in the Humboldt River Basin.

Battle Mountain was flooded to a depth of three feet, and angry residents, who blamed the Southern Pacific Railroad Company's raised track bed for keeping the river water from receding, dynamited a section of the tracks to release the water. Flashfloods in the area caused severe flooding in September 1974 and July 1975, creating walls of water, some 30 to 40 feet high.

Figure 6: Flooding in Downtown Reno, 1997

(*Floods in the Driest State*, Mark McLaughlin, 2012.NevadaFloods.org. http://www.nevadafloods.org/flood_dry_state.htm)

Reno

The 1997 New Year's flood caused $650 million damage ($987 million in 2017 dollars), while the relatively mild storms of 2006 caused $18 million damage along the Truckee River ($27 million in 2017 dollars). After December 1996 snow storms built a snowpack that was 180 percent of normal, a subtropical storm system brought unseasonably warm rain from December 30 to January 2. Over 16 inches of rain were recorded during this period. The rain depleted the snowpack (20 percent of the high altitude snowpack and 80 percent of the snowpack below 7,000 feet) and dumped it into the Truckee River. (*Floods of January 1997 in the Carson River Basin, California and Nevada*, USGS Publications Library, Fact Sheet 183-97. https://pubs.er.usgs.gov/publication/fs18397)

Downtown Reno[1] Flooding History

Date	Peak Flow	Return Freq.	
Early 1862 - Ark Storm		2x 100yr	
March 18, 1907	18,500 cfs	90 yr	
January 16, 1909	10,100 cfs	30 yr	
March 26, 1928	18,800 cfs	90 yr	
December 11, 1937	17,000 cfs	80 yr	
November 21, 1950	19,900 cfs	95 yr	
December 4, 1950	11,700 cfs	35 yr	Flood Control Act of 1954
December 23, 1955	20,800 cfs	100 yr	
February 2, 1963	18,400 cfs	90 yr	
December 23, 1964	11,300 cfs	35 yr	
February 17, 1986	14,400 cfs	50 yr	WRDA 1988
January 1, 1997	23,200 cfs	117 yr	
December 31, 2005	16,400 cfs	70 yr	WRRDA 2014

[1] At the Reno Gage located just west of the Hwy 395 bridge

Figure 7: History of Flooding in Downtown Reno

Figure 8 shows the extent of flooding in the area north and south of the Truckee River on the east side of Reno. The industrial park shown in *Figure 11* can been seen in the map below, running east to west along the north side of the river. The red boundary lines indicate the location of the Truckee River Management Project discussed in *Section 3*.

For more information on the history of Nevada flooding, visit NevadaFloods.org.

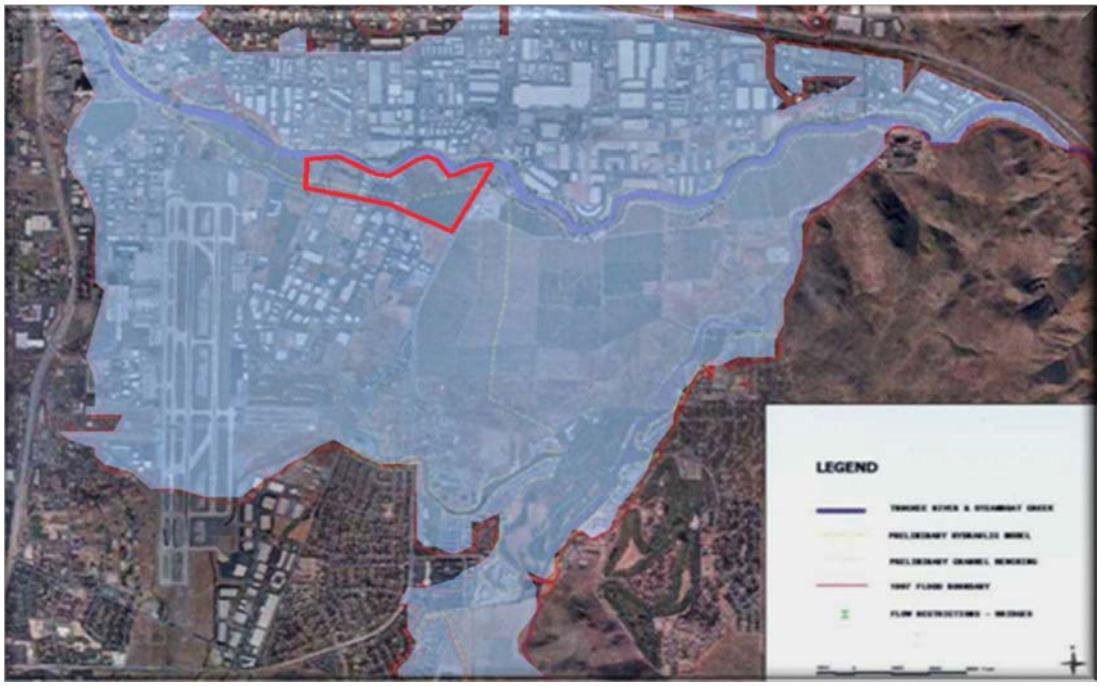


Figure 8: 1997 Flood Boundaries Surrounding N. Edison Way Project Site

Carson City

Although the flood of 1997 represented a large-scale disaster, it was not an unprecedented event in Carson City history. Records dating back to 1851 indicate that nine major flood events occurred in the 49 years to 1900. Both the Carson River and west side tributaries caused significant flooding to the city. During the next 100 years, 19 flood events were recorded. A major flood event occurred over New Year's Eve in 2005, a 25-year event, causing over $2 million in damage to private and public facilities.

Since the city was founded in 1851, 31 major flood events have occurred, one about every 5 to 7 years. Two of these, in 1955 and 1997, have been categorized as 100-year floods; all other events fell between the 10– and 50–year flood events.

(*Carson City Storm Water Management Program: Past and Recent Flood Information*. Carson City Public Works Department.

http://www.carsonsw.org/floodplain-management/past-flood-info/)

Figure 9: Carson City Flooding, 1997

1.3 Recent Northern Nevada Flooding Events

In January and February 2017, a series of severe, record-breaking rainstorms hit the snowpacked mountains and saturated foothills and basins of northwest Nevada, concentrating in the Reno/Sparks and Carson City area. After Governor Brian Sandoval issued a State of Emergency declaration, the President signed two separate disaster declarations, FEMA-4303-DR-NV and FEMA-4307-DR-NV. A total of nine counties, as well as six tribal land areas, were included in one or both declarations.

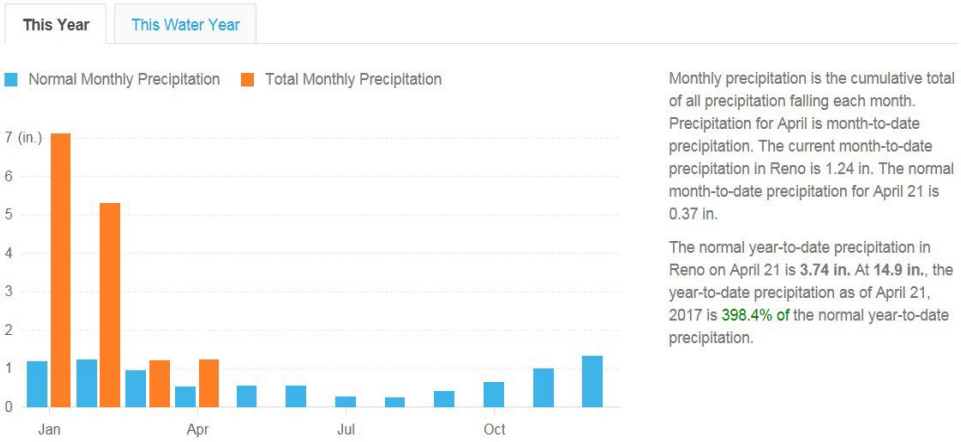


Figure 10: Average Monthly Rainfall in Reno, Nevada Compared with 2017 Totals, Year-to-Date

The contrast between normal precipitation, and the 2017 events is staggering. As shown in *Figure 10* above, normal January/February precipitation for Reno averages just over one inch per month. Precipitation for January 2017 was over *seven inches*, with February precipitation recorded at about *5.25 inches*. Normal year-to-date precipitation for April 21 in Reno is 3.74 inches. Year-to-date for April 21, 2017 was 14.9 inches, nearly four times the norm.

Fortunately, the Truckee River, which flows through downtown Reno, did not flood the downtown district as badly as expected. It did, however, overflow into east Sparks, causing significant damage to the industrial area, and the Lockwood suburb east of Reno. Drainage ditches, sloughs, and floodplains were overwhelmed, challenging homeowners and businesses, and resulting in an order for Storey County residents to boil their water before drinking. (*After rain, northern Nevada assesses flooding damage.* USA Today, January 10, 2017. https://www.usatoday.com/story/news/nationnow/2017/01/10/northern-nevada-flood-damage/96384374/)

Figure 11: Reno/Sparks Industrial Area Flooding

2. Hazards and Performance Analysis

Hazards and Performance Analysis (HPA) is a technical group within the FEMA Hazard Mitigation Branch that provides engineering, architectural, economic, and scientific assistance to Federal, State, Tribal, and Local partners in support of disaster response and recovery.

This Loss Avoidance Study (LAS) was developed by drawing on the expertise of civil engineers and HPA Specialists. The study took approximately two and a half months from initiation to completion. This LAS is significant in that it was completed entirely by FEMA employees (with significant contributions from State and Local officials) without the added time, expense, and logistics of using outside contractors, saving taxpayers hundreds of thousands of dollars and making the information available within months of the disaster, rather than years.

Because of the nature of the projects being studied, and the data available, this report may rightly be considered a hybrid between a typical 404 LAS (focusing on residential mitigation projects) and a 406 Case Study (focusing on specific public facilities projects).

2.1 Purpose of a Loss Avoidance Study

A LAS provides validation for existing and future mitigation projects and measures. The ability to assess the economic performance of mitigation projects over a period of time is important because it demonstrates the value of investing in mitigation projects rather than making repeated and costly repairs.

2.2 LAS Methodology

Losses avoided by mitigation measures are typically determined by comparing the cost of the mitigation project with the estimated cost of damage that *would have been caused* by a given event had the project not been in place.

Losses avoided by the mitigation of a property are calculated by comparing damage from inundation that would likely have been caused were the mitigation project not in place (Mitigation Project Absent [MP_A]) with damage that actually occurred with the project in place, if any (Mitigation Project Complete [MPc]).

MP_A = Damage and expenses that would have occurred had the property not been elevated or acquired. A dollar value is placed on this Mitigation Project Absent (MP_A) scenario.

MP_C = This number may include any damage that actually occurred during the event (for elevations only), plus the cost of mitigation. If there was no damage to the structure, or in the case of acquisitions, this number simply represents the costs of mitigation. A dollar value is then placed on this Mitigation Project Complete (MP_C) scenario.

LA = Losses Avoided in Dollars

The difference between the two scenarios is calculated to determine losses avoided in dollars as shown in the following equation:

$$\$ [MP_A] - \$ [MPc] = \$LA$$

In this study, the LAS team visited two sites (one retail/commercial and one public works) where mitigation measures were applied as a result of flooding from prior events. In the first case, the Truckee River Flood Project, the study calculated the extent of damage the properties would have suffered had they not been acquired and demolished. The LAS team used a depth damage calculation that determined the dollar value of losses avoided based on depth of inundation at the building sites, had they not been mitigated. This dollar value was then compared with the actual cost to mitigate the area to determine cost-effectiveness of the measure.

The second project evaluated in this study involved the substantial expansion of the Carson City Retention Basin and restoration of the watershed's natural erosion protection. In this case, an entire subdivision, as well as the Carson Tahoe Health Center, lay in the path of the floodway. Because the area was sparsely populated when the last major flood occurred (1997), no properties in the area had been elevated or acquired as a result of past flooding. In spite of this, estimates of potential damage can be calculated based on average property values, home sizes, etc., to arrive at a realistic, conservative losses avoided total.

2.3 Data Collection

Effective and meaningful LAS reports are developed using data collected in the field in combination with measurements, structural information, and historical data obtained from any one of several Local, State, Tribal, and/or Federal websites and agencies.

Collecting usable data from the project sites is critical for the development of meaningful reports. Due to the perishable nature of the data being collected, most notably, evidence of a high-water mark (HWM), time is of the essence with site inspections.

Site visits were conducted in late April. Normally, this would not present an ideal scenario for conducting an effective LAS, since evidence of a HWM may not be easily obtained. Fortunately, in the case of the Truckee River project, photographs taken in the immediate aftermath of the storms provide ample evidence of the extent of flooding. The Carson City project assessment depends more on calculations of water storage capacity compared with a "no mitigation" scenario to evaluate the project's effectiveness.

Photographs were taken and data records were collected for each of the properties. Project records provided by State and Local agency representatives included data such as project start date, pre-mitigation First Floor Elevation (FFE), cost of mitigation, depth of flooding, and project completion date.

Completion Date

The completion date of the mitigation project is required for the calculations to be expressed in current dollar values.

Structure Type

Different numeric formulas are used to calculate losses, depending on structure type.

Replacement values vary according to whether the building was residential or commercial, and the type of foundation used in construction.

Square Footage

Square footage information is used to calculate the cost of reconstruction and content replacement. Square footage data is typically available from any one of several sources, including the State Mitigation Office, the local Tax Assessors Office, or in the case of the Truckee River project, from FEMA Public Assistance project worksheets created for a prior disaster declaration.

2.4 Calculating Losses Avoided

Losses Avoided Compared with Total Mitigation Costs

Loss avoidance studies compare the total losses avoided with the actual cost to elevate or acquire properties included in the study (or, with public works projects, the cost to complete the installation or upgrade of the project). As these numbers are calculated, the difference between the cost of mitigation and total losses avoided will be either positive or negative for any single event. The total cost of mitigation for each project is derived from grant program data records and represents actual and/or projected costs.

An acquisition typically requires a contractor to completely disconnect all utilities and demolish all standing structures, including the slab, where one exists. The property can then be repurposed to provide public land use while limiting the potential for future loss of life or property.

While the Truckee River project provided concrete examples of losses avoided, the Vicee Canyon project forced reliance on hypothetical losses, given that the successful execution of the project eliminated the possibility of locating any "tested" properties. Therefore, this report has been constructed as a hybrid between a traditional Loss Avoidance Study and a Best Practices document.

Loss Avoidance Ratio

The Loss Avoidance Ratio (LAR) is calculated by comparing the Losses Avoided (LA) to the Cost of Mitigation (CM), in today's dollars. A LAR of greater than 1 indicates that project benefits have exceeded project costs and the mitigation activity is determined to be cost effective and performing successfully. A ratio below one indicates that mitigation benefits have not yet exceeded project costs.

The LAR is calculated as follows: LA ÷ CM = LAR

Where LA = Losses Avoided in Dollars

And CM = Cost of Mitigation in 2017 Dollars

For example:

$26,864,993.95 (LA) ÷ $24,263,106.00 (CM) = 1.11 LAR

This ratio, being greater-than-one, indicates that, overall, the mitigation benefits have exceeded project costs for the event being studied.

Note: It is important to remember that while the cost of mitigation is a one-time expense, losses avoided, and therefore, the loss avoidance ratio, will increase if a mitigated property is subjected to multiple events over time.

2.5 Project Effectiveness Analysis

Once all data is collected, it is entered into a customized spreadsheet. Formulas in the spreadsheet automate the calculation of critical numbers. The data is then reviewed and crosschecked for accuracy.

Data sets necessary for completion of this study included:

- Field measurements collected by HPA team
- U.S. Geological Survey data
- U.S. Army Corps of Engineers data
- Other primary sources as listed in *Appendix A*

To complete project analysis for a LAS, the following calculations must be performed or estimated.

- Structural damage repair costs (known and estimated)
- Content loss estimates
- Displacement costs (loss of use, one-time and recurring personal or business property costs, transfer of services, moving, and associated fees, such as inspection and licensing)
- Total Losses Avoided
- Loss Avoidance Ratio

3. Truckee River Flood Project

The Truckee River Flood Project, managed and executed by the Truckee River Floodplain Management Authority (TRFMA), is a long-term mitigation and restoration project that extends along the Truckee River from the west side of Reno to the eastern city limits, with a possible extension to Pyramid Lake, east of the metro area. Funding for the TRFMA, and the projects it has developed, comes from a .125 cent citizen-approved tax levy that was initiated in the aftermath of the 1997 flooding.

Figure 12: Truckee River Floodplain Management Project Boundaries

This study focuses on one phase of the overall Truckee River Management Plan, located on N. Edison Way and along Mill Street in east Reno. The scope of this phase includes the acquisition and demolition of eight retail/light industrial buildings, one building that housed a call center, one used as a cooperative education classroom building, and one building originally built as a Monastery (all located adjacent to the Truckee River), as well as acquisition of surrounding farmlands, all of which have been subject to repeated flood loss over the years. Six of the eleven buildings have been acquired and demolished. Three are scheduled for demolition, and two are still occupied. Once all the buildings have been demolished, and foundations and utilities removed, the land will be converted to a public park.

It is important to note that this study provides a snapshot of the Truckee River project as it stands at the time of writing. Because it is an on-going project, not all the costs or potential benefits accrued can be considered in this study.

Project Highlights

Several aspects of this project are worth highlighting. According to the TRFMA Project Manager, much of the land within the project boundaries was under consideration for sale to developers whose intent was to build apartment buildings, condos, and other for-profit business ventures. This would have caused a number of problems:

- Land prices would have increased substantially, making any future acquisition much less cost effective.
- Construction in the floodway would have created a high-density building and population area that would have increased future emergency response and mitigation costs.
- According to TRFMA estimates, the current floodplain map understates the base flood level (BFE) by as much as 6 to 12 inches, which could result in contractors building from a base level lower than actual flood levels for that area.

It cannot be overstressed that the vast majority of this project was funded by the citizens of Reno through the .125 percent sales tax, making this project a prime example of the positive benefits of cooperation between Federal and Local authorities.

The following sections provide background information on the project and details of the costs and losses avoided for the Truckee River project.

RESTORING PUBLIC LANDS

3.1 Background

The project boundaries include approximately 147 acres of land, bordered on the east by South McCarren Boulevard, on the south by Mill Street, on the west by South Rock Boulevard, and on the north by the Truckee River (*Figure 12*). The subject properties were first acquired in 2010 with funding provided through the .125 cent tax levy.

Demolition of the first six structures was completed in March 2012. Demolition of the largest structure, formerly used as a call center, is slated to begin in late summer 2017. These seven structures will be the focus of loss avoidance calculations for this study. The building used as a cooperative education classroom will be demolished sometime in the near future, but no date has been set. Two other structures are currently occupied and remain in negotiation for acquisition. The last structure, built as a Monastery, was most recently used as a meth treatment center.

Vandalism, including removal of key plumbing components, has resulted in extensive damage to the building, and, according to the TRFMA Project Manager it is no longer usable for any purpose. TRFMA plans to demolish this building at an unspecified future date.

While this project does not meet the traditional criteria for a LAS, (that the mitigation project be completed before the study is conducted), the status of this project provides the perfect opportunity to compare the results of mitigation efforts, given the recent damages that occurred in the two buildings that have not been acquired.

Figure 13: N. Edison Way Flooding 2017

All structures are located in the Truckee River floodplain, and five of the structures were previously designated as repetitive loss structures. According to FEMA National Flood Insurance Program (NFIP) claims reports, all structures experienced significant damage during the 1997, 2005, and 2017 events (*Table 1*), including loss of life in 1997 during maintenance activities required in response to an embankment failure. *Figure 13* shows the N. Edison Way location in the aftermath of the 2017 flooding once waters had begun to recede.

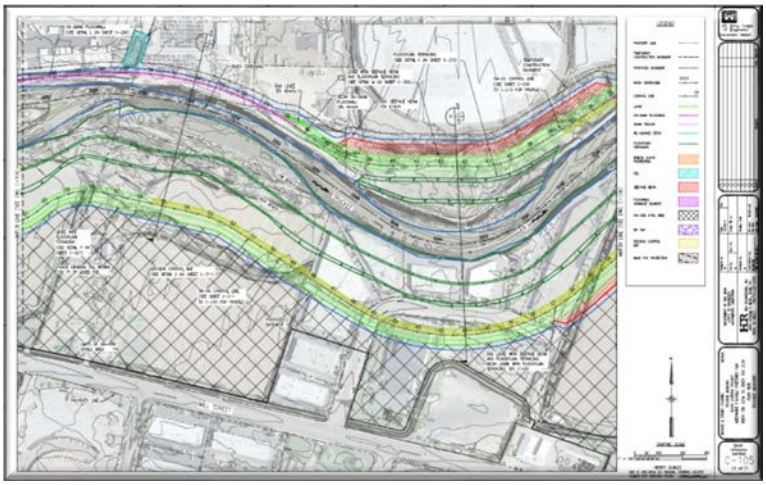


Figure 14: Truckee River Restoration Design Showing Graded Terraces

After 500 community meetings and 20,000 volunteer hours, the Truckee River Flood Management Project successfully developed a "Living River Plan" with the support of the community.

3.2 Mitigation Measures

Each year, the number of FEMA funded property acquisitions has increased. Besides being a permanent solution to hazard-related problems, property acquisition achieves many other objectives, such as protecting critical habitat, providing opportunities for recreation, increasing the capacity of a given area to withstand inundation, and/or enhancing other natural or cultural resources. New guidance for acquisitions is detailed in the Code of Federal Regulations, *44 CFR – Part 80*, which was amended in 1997.

Project Scope

The long-term Truckee River Flood Project includes:

- Acquisition of all structures within project boundaries
- Environmental impacts assessment
- Asbestos abatement activities
- Building demolition
- Removal of utilities not required for use as a park
- Expansion of the Truckee waterway to include terraced benches
- Construction of floodwalls and levees on the north side of the river

According to FEMA guidelines, an acquired property must be deed-restricted in perpetuity to open space uses to restore and/or conserve its natural floodplain functions

- Reclamation of the land by removal of all concrete foundations*
- Landscaping and installation of park facilities

* The TRMA has elected to leave the concrete foundations from the demolished buildings in place for the time being, because it is the most cost-effective and efficient means of dust and weed control.

3.3 Data Collection

For the Truckee River project, the first phase of the Loss Avoidance Study required collecting the following data:

- Cost of local commercial construction, per square foot
- Square Footage (SF) of the structure(s)
- Structure type (single or multi-story, slab on grade, or pier and beam foundation)
- Cost in dollars of the mitigation measure
- Date of mitigation project completion
- High-Water Mark at each site

3.4 Project Funding

As noted in the introductory paragraph of *Section 3*, the vast majority of funds for the Truckee River Flood Project have come from a .125 cent citizen-approved tax levy, and those funds represent only a portion of the larger Truckee River Flood Management Plan. The TRFMA has so far been approved for $828,794 in FEMA PDM grant funding to help cover demolition and relocation costs incurred for six of the N. Edison Way structures and the call center on Mill Street. Of this amount, $267,300 was de-obligated due to a combination of cost-savings realized by the TRFMA and their decision to delay removal of the concrete pads left from the six demolished structures, as noted in *Section 3.2*. At this writing, FEMA has distributed $311,490 that was used to help pay for the demolition of six of the properties on N. Edison Way. The additional $250,000 is scheduled to be distributed once the call center building has been demolished, but, according to the Project Manager, cost-savings are likely to result in a deobligation of a portion of those funds. All property acquisition funds came from the tax levy, and are therefore not included in the Loss Avoidance Ratio calculations, since no FEMA funds were involved.

Thus far, FEMA PDM Grant funds have been used solely for the demolition of the six light industrial structures. FEMA grant funds have been approved, but as of this writing, have not been distributed for the demolition of the larger call center building, scheduled for demolition in late summer/early autumn 2017. The TRFMA will cover all costs involved with demolition of the former classroom building, and are in process of completing a grant application for demolition of the Monastery.

Grant Funding to Date

Total FEMA Approved Costs	**$828,794**
FEMA Grant Amount	**$561,494**

Figure 15: Edison Way Park Boundaries and Mitigation Plans

(*Edison Way BCA Report.* October 6, 2009. Truckee River Flood Management Authority, p. 1, and *Truckee River Flood Management Project Subgrant Application*, 2010, p.32)

3.5 Project Costs

For the purposes of this study, project costs include only the amount spent and/or estimated for the six N. Edison Way addresses and the call center located on Mill Street. Acquisition costs are not considered in this summary, since those costs were wrapped into the larger floodplain management plan, and no FEMA funds were used.

Asbestos abatement and building demolition for N. Edison Way properties	**$834,597**
Asbestos abatement and building demolition for Mill Street call center	**$332,750**
Total	**$1,167,347**

(*Edison Way BCA Report.* P. 1, October 6, 2009. Truckee River Flood Management Authority, and *TRFMA – Mill Street Demolition*, p. 14, Subgrant Project Application, Mill St Grant Application.pdf.)

Truckee River Damage History – Edison Way Industrial Park		
Date	Description	Amount of Damage
Jan. 1997	Building damages	$416,885
Dec. 2005	Building damages	$796,503

Mar. 2017	Content and Building Damages	$475,290
	Total	$1,688,678.00

Table 1: History of Truckee River Damages to Edison Way Industrial Park

(*North Edison Way NFIP Loss Claims Reports*, FEMA NFIP Database, July 2017.)

3.6 Project Effectiveness Analysis

3.6.1 Losses Avoided Estimation

Information on loss estimation comes from two sources, historical and projected.

Historical

Based on FEMA damage claims, losses were recorded for this site during the 1997, 2005, and 2017 floods totaling over $1.6 million.

Projected

As noted above, only the six demolished buildings and the call center will be considered in the losses avoided calculation, given that two of the buildings are still occupied, and demolition of the two remaining abandoned buildings has not been scheduled. Note that the final figure represents building construction costs only.

The different building types and uses of the seven structures dictate that losses avoided be calculated using average building construction costs (derived from RS Means data) applied to the total square footage of the six buildings that have already been demolished, combined with the estimated cost of construction for the call center building on Mill Street.

The TRFMA conducted a loss analysis that was submitted as part of their grant application for the N. Edison Way properties. Their estimate for annualized losses came to $27,261 per structure, with a "lifetime" estimate of $388,993 per structure (2010 dollars). According to NFIP Claims reports, the two buildings on N. Edison Way that are still occupied had a combined claims total of $475,290 in 2017 alone. Their "lifetime" claims loss would likely be much higher.

(FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 45.pdf and FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 415.pdf)

The Mill Street grant application estimates $590,964 in losses avoided for the former call center. (*TRFMA – Mill Street Demolition*, p. 13, Subgrant Project Application, Mill St Grant Application.pdf.)

3.6.2 Losses Avoided Calculation

Project costs represent the total estimated costs for the demolition and relocation of the six businesses located on N. Edison Way combined with the estimated costs for asbestos abatement

and demolition of the call center building on Mill Street. (*Edison Way BCA Report.* P. 1, October 6, 2009. Truckee River Flood Management Authority.)

Estimated losses were computed using the total square footage of the seven buildings, multiplied by the average cost of construction of similar commercial facilities found in the RS Means reference guide. Damage depth percentage was based on a flood depth of 1 foot, the minimum recorded during the 2017 flood event at this site. (*RS Means 2017 Building Construction Costs Book*, 36th Annual Edition, published by RSMeans.)

Project Cost	**$1,167,347**
Estimated Losses	**$5,031,554**
Losses Avoided	**$3,864,207**
Loss Avoidance Ratio	**3.31**

4. Carson City Retention Basin Expansion Project

The Carson City Retention Basin Project was initiated in October 2004 with a request for FEMA resources by the Public Works Department of Carson City, Nevada. Major goals of the project included restoration of the natural erosion protections offered by vegetation in the watershed and expansion of the capacity of a small basin at the foot of Vicee Canyon so that it would better protect the city water supply, the Silver Oaks neighborhood, and the Carson Tahoe Health Center, just east and southeast of the basin.

Figure 16: Waterfall Wildfire in Vicee Canyon, July 2004

The project was initiated in the aftermath of the Waterfall Wildfire in July 2004, which burned for a full week, consuming over 8,700 acres. The fire destroyed vegetation—Bitterbrush, Mountain Sagebrush, Mountain Shrub, and Jeffrey Pine—growing in the canyon, leaving behind a thick layer of ash. With groundcover gone, the potential increase in runoff was estimated to go from a pre-burn rate of 38 cubic feet per second (CFS) to a bulked flow (water and debris) of 617 CFS. (*Funding for Emergency Protective Measures – Waterfall Wildfire,* FEMA-1540-DR-NV, October 2004, p. 12). Several threats to the community and environment were identified in the initial assessment (See *Section 4.3 Risk Assessment*).

Background, needs assessment, mitigation efforts, funding and execution of the project are explained in the following sections.

4.1 Background

Carson City is located in Eagle Valley, on the eastern slope of the Sierra-Nevada

Mountains. As noted in the introduction to this LAS, the combination of snowmelt and intense spring rain often results in conditions that overwhelm waterways all along the foothills. These conditions can be exacerbated by other events that alter the capacity to retain and/or channel the runoff.

Figure 17: Vicee Canyon in Summer

Two recent events demonstrated the critical value of the natural landscaping of the canyon, as well as the need to expand the existing "borrow pit" (where, over the years, dirt and rock was extracted for use in various construction projects) to create a high-capacity retention basin that would protect homes and businesses downstream of the canyon.

Figure 18: Typical Vicee Canyon Vegetation - Pre-Fire

First, in 1997, a 100-year storm event caused wide-spread flooding that resulted in tens of millions of dollars in damage throughout NW Nevada. Floodwaters rushing down Vicee Canyon overwhelmed the borrow pit, and rushed along the boundary between the Vicee Canyon and Ash Canyon watersheds, heading straight toward the city hospital at depths reported up to 2 feet. Only sandbagging saved the hospital from being flooded. It was immediately apparent that a 15 acre-foot basin was inadequate.

The 1997 flood was followed by the Waterfall Wildfire in 2004, which created an increased threat for flooding, erosion, and debris flow when it stripped the canyon of groundcover and left a deposit of ash across the entire area. A Presidential disaster declaration followed the Waterfall Wildfire, enabling local authorities to take steps to restore the natural protections provided by canyon vegetation, as well as expand the retention basin.

The Vicee Canyon has served multiple purposes for several decades. In addition to being a popular site for hiking and bicycling, Vicee Canyon is an important part of the canyon system that feeds the municipal water supply for Carson City. Since the early 1990's a series of infiltration ponds have served to slow the runoff from the top of Vicee Canyon so that, through natural gravitation forces, the water can make its way into the water table and contribute to the city water supply rather than enter the city's drainage system and be lost downstream. The borrow pit near the bottom of the watershed provided a basin where debris and excessive runoff could collect, protecting areas of the city immediately to the east and southeast of the canyon.

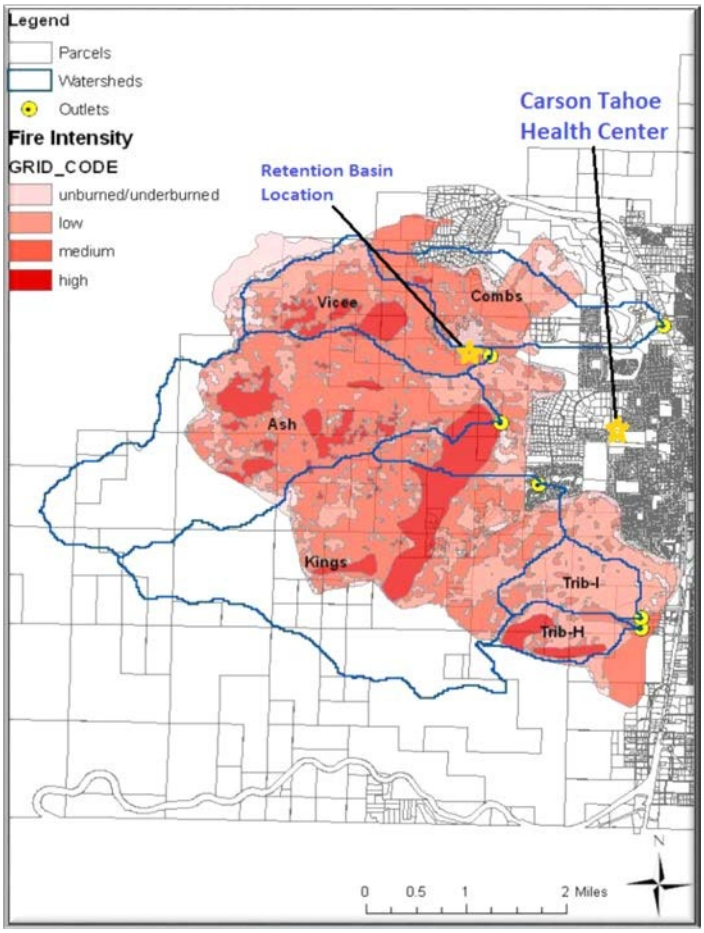


Figure 19: Waterfall Wildfire Map

Vicee Canyon is one of several that run from the upper slopes of the foothills down to the western edge of Carson City. As shown in *Figure 19*, the entire Vicee Watershed was included in the fire. The bottom of the drainage shares a boundary with the Silver Oaks subdivision containing over 500 homes. Just to the south of Silver Oaks there are approximately 100 homes at risk, as well as the site of the Carson City Hospital (now the Carson Tahoe Health Center). The safety of residents, patients, staff, and the protection of property were among the several concerns raised as a result of the compromised watershed.

Risk from flooding below Vicee Canyon did not become a major concern until the 1990s when the large farm located at the base of the watershed was developed as a suburban neighborhood. The historic 1997 floods saw the basin overwhelmed by runoff. Fortunately, the basin's overflow channel (the "natural" result of the removal of earth when the site was a borrow pit) helped divert the floodwaters away from the Silver Oaks neighborhood. Unfortunately, the water was diverted into the flats just south of Silver Oaks, inundating the hospital site, located 1.15 miles southeast of the basin, with 18-24 inches of water. Extensive sandbagging saved the hospital from being flooded, but eye-witnesses reported that water in the parking lot around the hospital reached the bottom of car windows.

Figure 20 shows the drainage basin and neighborhood in November 2004, just a few months after the Waterfall fire. It is apparent from this aerial photograph that the basin had very little depth. In fact its holding capacity was a mere 15 acre-feet.

Figure 20: Vicee Watershed and Adjacent Neighborhood- November 2004

4.2 Historical Flood Data

The following table lists the annual peak water flow recorded from 1979 to 1997 by USGS gauge #10311260 located in the Vicee Canyon. The peak CFS for 1997, which resulted in widespread flooding in the area, clearly demonstrates the critical necessity of implementing mitigation measures at in the Vicee Canyon watershed to protect against such events.

Table 2: Historical Flood Record – Vicee Canyon

Vicee Canyon Hydrology – Historical Flood Record			
Year	Peak CFS	Year	Peak CFS
January 11, 1979	2	May 4, 1993	4
January 14, 1980	10	April 16, 1994	4
February 16, 1982	200	March 28, 1995	16
December 27, 1983	1.7	February 25, 1995	9
May 30, 1984	1.5	January 2, 1997	3,800
April 26, 1992	0.8		
Source: USGS: Nevada Flood Chronology https://nevada.usgs.gov/crfld/Carson/hydrodata_gagingstation10311260.cfm			

4.3 Risk Assessment

Studies conducted in 2004 by FEMA on behalf of the Public Works Department of Carson City, along with a report from the Waterfall Wildfire Burn Area Emergency Response (BAER) Team reached several conclusions.

- Threats to life and property: The Silver Oaks development is comprised of 516 homes ranging in value from $323,892 to $971,677 (2004 dollars) that sit in the path of runoff if the drainage basin were to be overwhelmed.
- Geologic instability and landslide potential: Heavy rainfall on an area of highly erodible soil can combine to create unstable conditions with the potential for very large debris flows. Sixty-four percent of the Vicee Watershed was given a HIGH soil erosion hazard rating in the aftermath of the fire.
- Increased discharge: The post-burn 5-year peak discharge was calculated to potentially reach 617 CFS. This volume is the equivalent of the FEMA Flood Insurance Study (FIS) 100-year event.

- Carson City and Virginia City municipal water supplies: In addition to concerns about debris flows and sediment buildup in streams that feed the water treatment plant,

  pipelines that run through Vicee Canyon were considered to be at "immediate risk". The pipelines were deemed vulnerable in several places where they cross streams.

- Invasive weed threat: Of the several noxious weed species identified in the area,

  Cheatgrass is designated as a high threat potential. It is an aggressive plant with a shallow root system that presents a high erosion potential. (This is mentioned here because, while expansion of the retention basin is the main focus of this report, revegetation of the watershed was a critical part of the overall mitigation project.)

- Infiltration ponds and sediment catchment basins: The lower portion of the Vicee Canyon Watershed includes a series of infiltration ponds (*Figure 22*) designed to capture surface water so it will work its way down to the water table and help feed the municipal water supply. Without effective mitigation measures being implemented, these ponds would be subjected to increased sedimentation with ash, silt, and debris, thereby reducing their functional discharge of water into the ground.

- Additional risks: USGS gauging stations and Carson City storm drain infrastructure, as well as roads and drainage infrastructure within the burn area, would all be subject to damage as a result of debris flows, soil deposits, flooding, and water and wind erosion if mitigation measures were not implemented.

(*DR-1540-NV: Analysis of the Capacity Expansion Phases for the Existing Vicee Debris Basin,*

Vicee Basin DR1540 NV Analysis.pdf, (FEMA) 2005, and *Waterfall Fire,* Casey Shannon, Inyo

National Forest Waterfall Fire BAER Team Hydrologist, July, 2004)

4.4 Mitigation Measures

Mitigation measures enacted in the Vicee Watershed fall into three general categories: soil remediation, fire control, and debris flow/runoff retention. These are not three distinct categories, in that steps taken to ameliorate the effects of one factor often affect the other areas. For example, steps taken to reduce the potential for future wildfires has a profound effect on debris flow moderation and runoff retention.

Soil Remediation

Remediation measures included hydro-seeding, placement of straw mulch, erosion control blankets, and fiber rolls, as well as the installation of check dams, gravel bag berms, and sand bag barriers.

Log Erosion Barriers (LEBs) were employed to trap sediment from side slopes, preventing material from entering stream channels and keeping sediment on site. This was done in combination with contour felling of trees in areas where the wildfire killed standing trees while leaving the burned "snags". The snags were felled and installed perpendicular to the slope in high severity burn areas.

Straw wattles were installed to capture and retain sediment on slopes and reduce soil creep until vegetation could re-establish. Wattles (interwoven branches, twigs, and/or straw—often shaped into log-like rolls) were installed on hillsides behind vulnerable homes, public facilities, and on slope contours where trees were not available for installation of LEBs.

(*Funding for Emergency Protective Measures – Waterfall Wildfire,* p. 9. FEMA-1540-DR-NV, October 2004.)

Wildfire Fuel Reduction

As described above, in high severity burn areas, standing snags were felled to build LEBs. This process also served to clear the area of potential fuel for future wildfires. Wood that was not useable for LEBs was removed from the area.

Figure 21: Vicee Canyon Post-Fire

Debris Flow Moderation and Runoff Retention

Assessments conducted by the USDA Forest Service, Carson City Public Works, and the USGS all concluded that the soil composition in Vicee Canyon leads to a high degree of instability with the potential to produce a large debris flow.

Many of the steps taken to remediate the soil and reduce fuel contributed to the moderation of debris flow in the watershed. To augment these effects, existing water infiltration ponds were cleaned out to increase holding capacity (*Figure 22*). Other run-off management measures included the installation of soil-stabilizing gabions (a rock or soil-filled cage) at various places along Vicee Creek, water pipeline reinforcement, and installation of an early warning system at the top of the watershed.

Perhaps the most significant element of this project was the expansion of a retention basin at the base of the Vicee Watershed. Expansion of the basin was targeted as the best solution to help protect the homes and other structures in the immediate vicinity. The original goal of the project, to be completed in three stages, was to expand the capacity of the retention basin from 15 acrefeet to 200 acre-feet.

(*Waterfall Fire – Vicee Basin Emergency Protective Measures Memo,* Carson City Nevada, Public Works Department, October 28, 2004, p. 7)

In its final analysis, FEMA concluded that the 68 acre-feet of storage created by Phase I was "sufficient to slow down and partially contain" the runoff and debris flow that might be caused by a post-fire 5-year event (roughly equivalent to a pre-fire 100-year event). (*DR-1540-NV: Analysis of the Capacity Expansion Phases for the Existing Vicee Debris Basin,* p. 1. [FEMA] 2005.)

Figure 22: Vicee Canyon Infiltration Ponds - 2017

4.5 Retention Basin Project Description

Carson City Public Works elected to go beyond the minimum that FEMA had approved and sought additional funding to expand the basin to a capacity of 68 acre-feet during Phase 1, and to a final capacity of 200 acre-feet in Phase 2. According to Robb Fellows, Senior Project Manager for Carson City Public Works, their thinking was that it made the most sense to achieve the greatest level of protection possible by maximizing the existing basin footprint. The basin now has a capacity of 165 acre-feet to the level of the basin outlet, and 212 acre-feet to the basin rim, and is capable of withstanding runoff from a 500-year flood event.

The initial evaluation for Phase 1 required the removal of 80,000 cubic yards (CY) of rock and soil. Once work began, the basin was surveyed and city engineers calculated the volume using specific topographic information. Taking the 6-percent slope into account, it was estimated that for Phase 1, a total of 150,000 cubic yards of material would need to be removed to achieve a

storage volume of 68 acre-feet within the existing footprint of the basin. (*DR-1540-NV Vicee Basin Analysis - Memo.pdf*, p. 2. Carson City Public Works Department, October 28, 2004.)

The diagram in *Figure 23* details the site grading plan engineered to full capacity (200 acrefeet), with down drain and discharge aprons included. The diagram also displays proposed improvements to the inlet and outlet structures that were part of the final phase of the project.

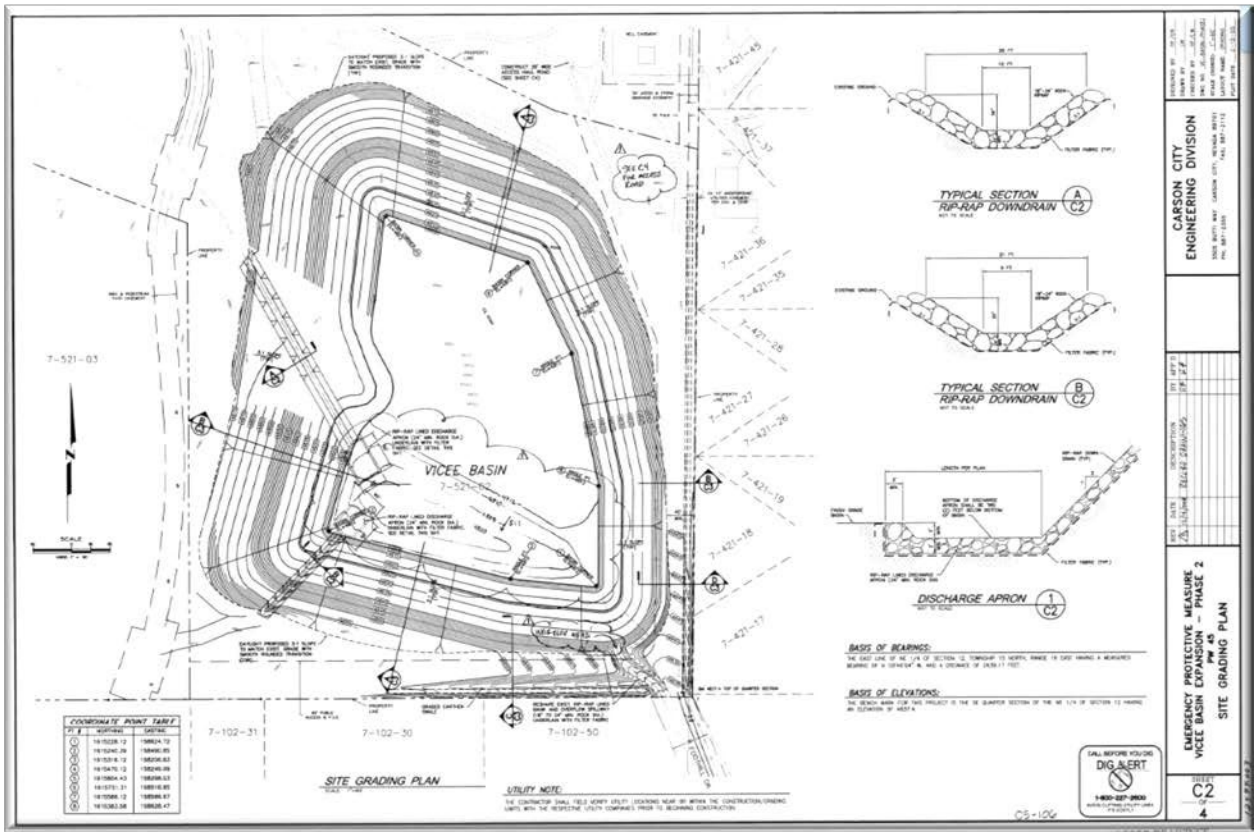


Figure 23: Engineering Diagram for Vicee Canyon Retention Basin

The existing inlet and outlet structures were initially deemed adequate for the project without modification in the first phase, but the topographical study conducted once excavation began dictated the necessity of modifying the outlet to serve as an effective overflow spillway for the retention basin. (*DR-1540-NV Vicee Basin Analysis - Memo.pdf,* p. 10, Carson City Public Works Department, October 28, 2004.)

Accordingly, the rock-lined channel connecting the two sections of the retention basin was removed during the initial phase of the project. The rock was salvaged and stored on the west side of the basin for future use. *Figure 24* shows the basin after the project was complete, filled to about 60 percent capacity. For a sense of scale, note the upper body of a person standing above the near edge of the basin, roughly forty feet above the water line.

Figure 24: Vicee Canyon Retention Basin - 2017

4.5.1 Pre-Project Processes

Once damage and risk assessments were completed, three major steps were required before work could begin on the retention basin.

- Determine potential use and disposal of basin material.

  The existing basin material was found to meet "Select Borrow" specifications, and could therefore be used for road bed material in a local freeway project. An agreement was reached with the construction contractor to use the basin material for this purpose, which then became an "in-kind" payment that covered the majority of the expansion costs for Phase 2.
- Collect bids from haul contractors for movement of the materials.

  The lowest bid to move the 80,000 cubic yards for Phase 1 was $3.30 per cubic yard (CY), plus additional costs for providing a bond, access to the basin, and dust control, for a total cost of $297,143. This part of the project was estimated to take 35 working days. Removal of the additional 70,000 CY was rebid at $4.15 per CY. Additional costs for this phase of the project, added to the cost of hauling the material came to $321,733.

  See *Appendix H* for a breakdown of all project costs.

- Coordinate with State and Federal agencies for necessary permits and sign-offs.

  The Nevada Department of Transportation (NDOT) requested an encroachment permit to approve the haul route from the basin to the freeway project. The Nevada Department of Emergency Planning (NDEP) was contacted concerning any known cultural sites (there is one in the vicinity, but lies well northwest of the project and not at risk of impact). No permits were required by the Carson City Planning Department.

(*Waterfall Fire – Vicee Basin Emergency Protective Measures Memo,* p. 2, Carson City Nevada, Public Works Department, October 28, 2004)

4.5.2 Project Timeline

July 26, 2004	Waterfall Fire ends.
July 27, 2004	USDA BAER team recommends Vicee watershed major flood threat to Carson City.
October 2004	Reforestation complete.
October 28, 2004	Carson City requests the basin to be expanded as an emergency measure. Expansion broken into phases, first phase to expand to 68 acre-feet.
November 8, 2004	Phase 1 work begins.
January 19, 2005	Phase 1 scope of work amended to account for actual field conditions.
January 2005	Special Use Permit approved to expand basin.
February 2005	Freeway contractor agrees to continue to haul material from basin at no cost to city, basin expanded to final volume of 200 acre-feet.
August 23, 2005	Basin completed.
December 31, 2005	Flood disaster in Carson City.
December 15, 2006	Repairs completed on basin due to flood disaster.

4.5.3 Agencies Involved

Nevada Department of Emergency Management (NDEM)

USDA Natural Resource Conservation Service

USFS National Fire Plan

Burn Area Emergency Response Team (BAER)

FEMA PA Division

Nevada Division of Forestry

Carson City

Nevada Cooperative Extension

Nevada State Parks

Carson Colony of the Washoe Tribe of Nevada and California

Bureau of Land Management (BLM)

Nevada Fire Safety Council

4.5.4 Funding Sources

Emergency Fire Rehabilitation (EFR)

FEMA Public Assistance Program

National Resource Conservation Service (NRCS)

4.6 Project Costs

Estimated project costs are detailed in *Appendix H*. The total cost reported by the Public Works Department for the retention basin project was $2,759,300 ($3,457,715 in 2017 dollars). The cost for reforestation for the entire burn area was $6,438,619 ($8,341,676 in 2017 dollars). No records exist of the exact amount that was spent for Vicee Canyon alone, but a usable estimate can be obtained by calculating the relative size of Vicee Canyon to the entire burn area of 8,700 acres. Vicee Canyon covers 1,230 acres, or 14 percent of the total. The figures below are expressed in 2017 dollars. (USDA Forest Service Waterfall Wildfire BAER Report, pg. 8. FS 2500-8. July 26, 2004.)

Reclamation	**$1,167,835**
Infiltration system improvement and basin expansion	**$3,457,715**
Total Cost Estimate	**$4,625,550.00**

The eligible Federal share, expressed in 2017 dollars was $1,058,884. FEMA's total contribution to the project was $612,848 ($793,987 in 2017 dollars). (FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 45.pdf, pg. 5, and FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 415.pdf, pg. 4.)

Phase 2 of the project presents a prime example of cooperation among local entities to manage a project in a way that benefits all participants and the community at large. When the Carson City Public Works Department decided to expand the basin beyond the 68 acre-feet approved by FEMA, they were forced to find additional funding. As it happened, the contractor being used to remove the earth and rock from the basin was also a major player in the construction of the Interstate 580 loop that now skirts the eastern side of Carson City. Tests of the material were conducted to verify its use as roadbed material, and an agreement was reached whereby the contractor would keep the excavated material for use in the highway construction project in lieu of a cash payment. The bulk of the city's expenses for the final phase of the project were used to cover administrative costs only, such as overseeing the excavation and removal of material. By the time the project was completed, a total 600 CY of material was removed, and the in-kind payment of excavated material saved the city an estimated 1.7 million dollars. (*Waterfall Fire – Vicee Basin Emergency Protective Measures Memo,* pp. 8-9, Carson City Nevada, Public Works Department, October 28, 2004.)

4.7 Project Effectiveness Analysis

4.7.1 Loss Estimation Calculation

Even though no event subsequent to the completion of this project has "tested" its effectiveness, it is an easy enough matter to estimate the potential losses that might be incurred in the event of a 100-year flood without the drainage basin in place.

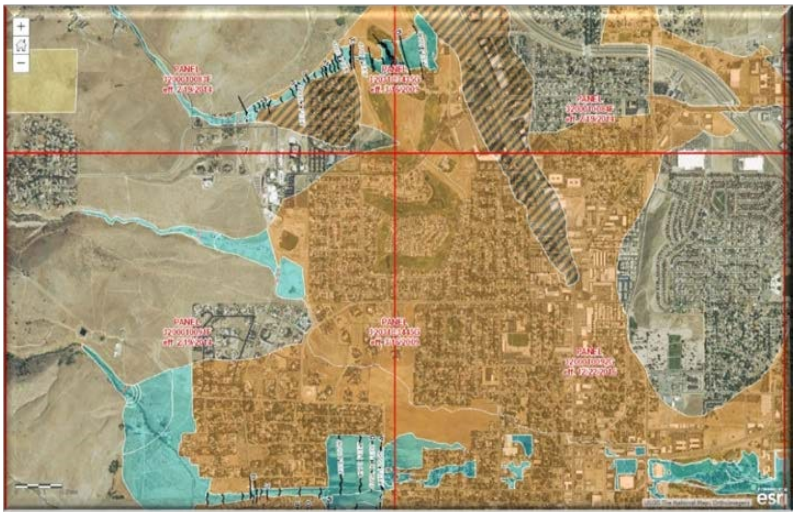


Figure 25. Vicee Canyon 500-Year Event Map

As seen in *Figure 24*, the eastern side of the retention basin is a large embankment that provides a barrier to the Silver Oaks neighborhood. This embankment has been in place since before the subdivision, having been a by-product of the site being used as a borrow pit. According to FEMA Flood Insurance Rate Maps (FIRMS), it would take a 500-year event to overwhelm this embankment and flood the entire neighborhood. The areas shaded in light brown in *Figure 25* indicate the reach of a 500-year event.

At much greater risk are the approximately 100 houses that lie just southeast of the retention basin. As noted in *Section 4.1*, this area was flooded during the 1997 flood to a depth of 2 feet well past the hospital, over a mile southeast of the retention basin. When water overwhelmed the

Figure 26: Vicee and Ash Canyon Watersheds

basin as it existed then, it was diverted to the southeast, where it followed the dividing line between the Vicee Canyon Watershed and the Ash Canyon Watershed (*Figure 19*). It is important to note that although the site of the Carson Tahoe Health Center appears to be under its greatest threat from Ash Canyon Creek, and is located in the 500-year zone, it was the 1997 flood, a 100-year event, which most recently flooded the site with runoff from the Vicee Canyon Watershed. Accordingly, this report calculates the potential losses of the neighborhood southeast of the basin and the Carson Tahoe Health Center.

Losses avoided for this study are calculated using four factors:

- Estimated depth of flooding
- The cost of building repairs, content replacement, and dislocation for a "typical" house located along the watershed boundary
- The cost of building repairs, content replacement, and loss of service for the Carson Tahoe Health Center (based on FEMA Benefit Cost Analysis (BCA) Software estimates)
- The BAER report estimate of the "cost of doing nothing"

Estimated Depth of Flooding

Studies conducted by FEMA, Carson City Public Works, the USGS, and the USFS BAER Team reveal several critical pieces of information that have a bearing on potential flood depth:

- The unique soil composition, along with the high soil erosion rating, sedimentation potential, and estimated vegetative recovery period combine to create a "high risk of debris flows and very high probability of increased ash and silt in the streams and just above the water treatment plant". (*USDA Forest Service Waterfall Wildfire BAER Report,* Pp. 2-4, FS 2500-8, July 26, 2004.)

- The post-burn 5-year peak discharge was calculated to potentially reach 617 CFS. This volume is the equivalent of the FEMA Flood Insurance Study (FIS) 100-year event. (*DR-*

  1540-NV Vicee Basin Analysis - Memo.pdf. Carson City Public Works Department, October 28, 2004. Pp. 1-2)

- Without the presence of the retention basin, in the event of a 100-year flood, houses in the area just southeast (including the Carson Tahoe Health Center) could be inundated with anywhere from *6 to 24 inches*, depending on the severity of the flood and the specific location of a given structure within the flooded area. (Estimate calculations based on historical data and eye-witness accounts.)

Residential Structure Losses Avoided

The calculations in *Table 3*, below, represent the most conservative picture of an incident that could affect the at-risk area without reforestation measures and the existence of the retention basin in its expanded state. The first four entries in are actual addresses in the neighborhood immediately southeast of the retention basin, randomly selected from different areas in the neighborhood. The fifth entry represents the average size and cost of construction for a new house in Carson City. (Resi-Cost Instant. http://www.home-cost.com/construction-cost-persf.html) These entries are intended as examples only, and do not represent real losses avoided.

To keep estimates conservative, the depth of flooding was limited to just 6 inches, the lower end of the range for a 100-year flood. Costs for displacement, structural repair, and content replacement are based on Depth of Damage Calculation tables used in previous FEMA Loss Avoidance Studies. As this table demonstrates, losses avoided for only 1 house of the average Carson City size (the smallest in this neighborhood), flooded to a depth of only 6 inches, would be $98,230. Minor damage to as few as 10 houses could easily reach losses of nearly $1 million.

Table 3: Estimate of Losses Avoided Southeast of Vicee Canyon

Address	Square Feet	Flood Depth in Feet	2017 Building Replacement Value	Displacement in Days	Displacement Costs	Structural % of Damage	Contents % of Damage	Structural Damage Costs	Contents Damage Costs	Total Losses Avoided
1300 Chaparrel	2,421	0.50	$ 323,445.60	23	$ 5,084.15	18.35	10.70	$ 59,352.27	$ 34,608.68	**$ 99,045.10**
1775 Chaparrel	2,678	0.50	$ 357,780.80	23	$ 5,084.15	18.35	10.70	$ 65,652.78	$ 38,282.55	**$109,019.47**
1884 Brush Dr.	3,333	0.50	$ 445,288.80	23	$ 5,084.15	18.35	10.70	$ 81,710.49	$ 47,645.90	**$134,440.55**
1920 Winne Ln.	3,875	0.50	$ 517,700.00	23	$ 5,084.15	18.35	10.70	$ 94,997.95	$ 55,393.90	**$155,476.00**
Carson City Average	2,400	0.50	$ 320,640.00	23	$ 5,084.15	18.35	10.70	$ 58,837.44	$ 34,308.48	**$ 98,230.07**

Community Facilities Losses Avoided

As previously noted, the Carson City hospital site was threatened with floodwaters during the 1997 event. Only extensive sandbagging prevented what would likely have been substantial losses.

Based on hospital construction costs of $272 per square foot (2017 dollars), structural damage costs for the 137,233 square foot building, with a 6-inch flood depth, would exceed $10.8 million. (EV Studio. Construction Cost per Square Foot for Hospitals. February 2011. http://evstudio.com/construction-cost-per-square-foot-for-hospitals/)

Using these conservative estimates, it is reasonable to conclude that a single 100-year event, in the absence of long-term mitigation measures, could easily exceed $12 million in losses to residential and community facilities with a flood depth of just 6 inches.

Infrastructure Losses Avoided

This study also draws upon the findings of a "Cost of No Action" study conducted by the USDA Forest Service BAER team in the immediate aftermath of the Waterfall Wildfire. Four parameters were used to determine the loss of resources for the entire burn area if no mitigation measures were enacted: loss of site productivity, loss of roads, impact of sediment on road drainage infrastructure, and impact of sediment on municipal water systems. It is important to note that these costs pertain to infrastructure only, and do not take into account the potential for losses in the surrounding areas, as detailed above.

Table 4: Cost of "No-Action"

Cost of No Action	
Loss of site productivity	$668,514
Loss of roads	$237,089
Impact of sediment on road drainage infrastructure	$1,727,425
Impact of sediment on municipal water systems	$2,159,281
Total cost of no-action	**$4,792,309.00**

Analysis by Carson City Public Works determined that Vicee Canyon was the most unstable of all those in the burn area, and would likely contribute one-third of the potential losses in the case of a 100-year event. Therefore, the numbers in the preceding table represent one-third of the totals calculated in the BAER Report, and are expressed in 2017 dollars.

(*USDA Forest Service Waterfall Wildfire BAER Report*, p. 8. FS 2500-8. July 26, 2004.)

4.7.2 Summary of Vicee Canyon Losses Avoided

Combining potential losses for infrastructure, community facilities, and residential structures, a single 100-year event, in the absence of mitigation measures, could reasonably exceed $16 million.

Losses Avoided Calculation

Based on the assumptions described in the preceding section, the calculated estimate of losses avoided as a result of the canyon vegetation restoration, infiltration pond improvement, and expansion of the retention basin is just shy of $12 million. All figures are expressed in 2017 dollars.

Total Cost of Mitigation	**$4,625,550**
(Includes canyon restoration, infiltration improvements, and retention basin expansion)	
Estimate of Potential Losses	**$16,623,296.00**
(Total of potential infrastructure losses—the cost of no action, plus estimated residential and community facilities losses)	
Losses Avoided	**$11,997,746**
Loss Avoidance Ratio	**3.59**

5. Value Added Benefits of Mitigation

This report has demonstrated the extraordinary success of two recent mitigation projects initiated in Northeast Nevada through the cooperative efforts of Federal, State, and Local authorities. Loss avoidance calculations show that these projects were cost effective and beneficial.

It must be remembered that not all of the benefits of mitigation projects can be summarized in a table or calculated in a formula. The life and health of a neighborhood or community and its natural environment have value that goes far beyond the dollars spent or saved through mitigation efforts.

Strengthened Ecosystem Resilience

Public works projects often contribute to the health of a community by returning rivers and their surrounding lands to a more natural, environmentally efficient state. Absent the barriers created by building roadways, or construction of concrete pads that reduce natural absorption functionality, these areas are much better suited to withstanding the effects of storms and other natural events.

Sustained Neighborhood Values

A significant community challenge is the abandonment of homes and/or businesses that are severely damaged due to natural disaster. Abandoned structures with broken windows, surrounded by tall grass and weeds, will immediately present insurance, maintenance, and security issues that devalue a neighborhood. Relocation of vital community service facilities will also have an adverse effect on the quality of life for all residents. Public works projects that protect entire neighborhoods will have a significant impact on property values.

Improved Community Resilience

Hazard Mitigation provides a community with the ability to minimize losses, recover quickly, and be resilient in response to a natural disaster event. This strengthens the economic base and provides the residents with confidence and hope for the future.

Expanded Public Lands Use

Projects like the Truckee River Management Project help create parks and other public use areas that not only prevent future losses, but also improve quality of life for residents and visitors alike. These intangible benefits can make the difference between a good place to live and a great place to live.

Appendix A Resource and Guidance Documents

35 North Edison Way NFIP Loss Claims Report, FEMA NFIP Database, July 2017.

Appendix D

65 North Edison Way NFIP Loss Claims Report, FEMA NFIP Database, July 2017.

Appendix E

Carson City Storm Water Management Program: Past and Recent Flood Information. Carson City Public Works Department. http://www.carsonsw.org/floodplain-management/past-flood-info/

DR-1540-NV: Analysis of the Capacity Expansion Phases for the Existing Vicee Debris Basin.pdf (FEMA) 2005. *Appendix I*

Edison Way BCA Report. October 6, 2009. Truckee River Flood Management Authority. *Appendix C*

EV Studio. Construction Cost per Square Foot for Hospitals. February 2011. http://evstudio.com/construction-cost-per-square-foot-for-hospitals/

FEMA Benefit/Cost Analysis Software. https://www.fema.gov/benefit-cost-analysis

FEMA N. Edison Way Closeout Acknowledgement, PDMC-PJ-09-NV-2010-006. Closeout Acknowledgement.pdf. *Appendix F*

FEMA Map Service Center. https://msc.fema.gov/portal/search

FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 45.pdf *Appendix N*

FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 415.pdf *Appendix N*

Floods in the Driest State, Mark McLaughlin, 2012. NevadaFloods.org. http://www.nevadafloods.org/flood_dry_state.htm

Floods of January 1997 in the Carson River Basin, California and Nevada, USGS Publications Library, Fact Sheet 183-97. https://pubs.er.usgs.gov/publication/fs18397

Floods of November-December 1950 in Western Nevada, USGS Publications Library, Water Supply Paper 1137-H. https://pubs.er.usgs.gov/publication/wsp1137H

Funding for Emergency Protective Measures – Waterfall Wildfire. FEMA-1540-DR-NV, October 2004. *Appendix K*

Netstate.com http://www.netstate.com/states/geography/nv_geography.htm

Resi-Cost Instant. http://www.home-cost.com/construction-cost-per-sf.html

RS Means 2017 Building Construction Costs Book, 36th Annual Edition, published by RSMeans.

TRFMA – Mill Street Demolition, Subgrant Project Application, Mill St Grant

Application.pdf. *Appendix G*

US Inflation Calculator http://www.usinflationcalculator.com/

After rain, northern Nevada assesses flooding damage. USA Today, January 10, 2017. https://www.usatoday.com/story/news/nation-now/2017/01/10/northern-nevada-flooddamage/96384374/

USDA Forest Service Waterfall Wildfire BAER Report. FS 2500-8. July 26, 2004.

Appendix L

USGS: Nevada Flood

Chronology https://nevada.usgs.gov/crfld/Carson/hydrodata_gagingstation10311260.cfm

Waterfall Fire. USDA BAER Hydrology Report, Casey Shannon, Inyo National Forest Waterfall Wildfire BAER Team Hydrologist. July, 2004. *Appendix M*

Waterfall Fire – Vicee Basin Emergency Protective Measures Memo, Carson City Nevada, Public Works Department, October 28, 2004. *Appendix J*

Appendix B Terminology

Acquisition – Purchase of residential property through the Hazard Mitigation Grants Program (HMGP) or of commercial property through the FEMA Public Assistance (PA) or Pre-Disaster Mitigation (PDM) programs.

BAER Team – Burned Area Emergency Response Teams represent a cooperative effort among several

Federal agencies, including the U. S. Forest Service, National Resource Conservation Service, Bureau of Indian Affairs, and U. S. Geological Service, as well as State, Tribal, and Local Forestry and Emergency Management agencies.

Base Flood Elevation (BFE) – The one-percent annual chance flood level.

Building Replacement Cost (BRC) – Calculated by multiplying the BRV by the livable square footage of the subject property.

Building Replacement Value (BRV) – Based on RSMeans data, the current cost to construct a new residence, identified by U.S. region, expressed in dollars per square foot.

Cost of Mitigation – The total cost involved in completing the mitigation project, whether an elevation, acquisition, or public works infrastructure. Value expressed includes Federal funds provided through the specific grant program along with individual contribution (usually a 75/25 split).

Elevation – The process of raising a residential or commercial property, through one of several methods (raised berm, cinderblock piers, concrete pilings, etc.).

FEMA BCA Software – Enterprise software provide by FEMA to grant applicants for the purpose of conducting a benefit/cost analysis.

First Floor Elevation After Mitigation (FFE-AM) – The elevation of the first floor, expressed in NAVD88 terms, of the property after mitigation efforts have been completed.

First Floor Elevation Before Mitigation (BFE BM) – The elevation, expressed in NAVD88 terms of the main floor of the building prior to any mitigation efforts. Data derived from State Mitigation office.

Flood Depth – Level of inundation that would have occurred inside a subject property, measured from the FFE. Calculated by subtracting FFE-BM from HWM.

Gabion – A cage, cylinder, or box filled with rocks, concrete, or sometimes sand and soil for use in civil engineering, road building, military applications and landscaping.

Ground Elevation (GRE) – Height of ground level, measured from sea level. Expressed in standardized NAVD88 terms.

Hazard Mitigation (HM) – The effort to reduce loss of life and property by lessening the impact of disasters.

Hazards and Performance Analysis (HPA) – The group within the FEMA Hazard Mitigation Branch that provides engineering, architectural, economic, and scientific

assistance to Federal, State, and Local (including Tribal) partners in support of disaster response and recovery.

High-Water Mark – Somewhat self-explanatory, the high-water mark represents the highest level a body of water reaches during a flood. Typically determined by finding debris residue or stains left on buildings or plants.

Loss Avoidance Ratio (LAR) – Calculated figure derived by dividing the Total Losses Avoided by the Cost of Mitigation. A LAR of 1 indicates that the losses avoided are equal to the cost of mitigation.

Loss Avoidance Study (LAS) – A cost/benefit analysis conducted by the FEMA HM HPA team. The purpose of the study is to test the effectiveness of hazard mitigation efforts and report on the findings.

Losses Avoided – Calculated dollar amount that reflects the dollars saved by implementing mitigation measures. Includes construction, content, and displacement costs.

NAVD88 – North American Vertical Datum of 1988. The standard established in 1991 for measuring the vertical distance from sea level to local ground level.

One percent annual chance flood – A 1 percent annual chance flood (or base flood) has a 1 percent chance to be equaled or exceeded in any given year.

PA Program – FEMA Public Assistance grant program, which provides assistance to State, Tribal, and Local governments, and certain types of private, nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.

PDM – The Pre-Disaster Mitigation Program, authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, is designed to assist States, U.S. Territories, Federally recognized Tribes, and Local communities in implementing a sustained pre-disaster natural hazard mitigation program.

RSMeans data – Software and/or reference manuals that provide construction cost-estimating information for all phases of the construction life cycle.

Special Flood Hazard Area (SFHA) – An area identified by FEMA as an area with a special flood or mudflow, and/or flood-related erosion hazard, as shown on a flood hazard boundary map or flood insurance rate map.

Appendix C Edison Way BCA Report Excerpt

06 Oct 2009	Project: **Edison Way Demolitions**				Pg 1 of 62
Total Benefits:	**$1,368,168**	Total Costs:	**$834,597**	BCR:	**1.64**
Project Number:	Disaster #:	Program:	PDM	Agency:	**Truckee River Flood Project**
State: **Nevada**	Point of Contact: Mimi Fujii-Strickler			Analyst:	K McLeod

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Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$27,261	Annual:	$0	Annual:	$27,261
Present Value:	$388,993	Present Value:	$0	Present Value:	$388,993

Mitigation Benefits:	$388,993	Mitigation Costs:	$214,500
Benefits Minus Costs:	$174,493	Benefit-Cost Ratio:	1.81

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Depth-Damage Functions Using Office One-Story (Default)

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.4%	0.0%	$8,106	0.0%	0.0%	$0
-1.0	0.4%	0.0%	$8,106	0.0%	0.0%	$0
0.0	0.9%	0.0%	$18,239	0.0%	0.0%	$0
1.0	12.3%	0.0%	$249,261	0.0%	0.0%	$0
2.0	17.5%	0.0%	$354,639	0.0%	0.0%	$0
3.0	22.2%	0.0%	$449,885	0.0%	0.0%	$0

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Appendix D NFIP Loss Claims for 35 N. Edison Way

Company Number:	18058	Policy Number :	8702894409	Dt of Loss :	01/08/2017
Open Date :	01/09/2017	Close Date :	03/07/2017	Claim Status :	Closed
Pol Eff Date :	11/22/2016	Pol Exp Dat :	11/22/2017	Org New Bus Dt:	11/22/2006
End Eff Date :	11/22/2016	Org Const Date:	07/01/1977	As of Date :	03/31/2017
Insureds Name :	JOHN HOWITT			Community :	320020
Address 1 :					
Address 2 :	35 N EDISON WAY STE 37				
City :	RENO	State :	NV	Zip Code :	89502 2352
Addr Key :	NV65 37UNWY32535				
Program :	Regular	Rate Method :	Manual	Policy Status :	Active
Condo Ind :	Non-Condo	Condo Units :	1	Catastrope Nbr:	000
Occupancy :	Unknown	Building Type :	One Floor	Bsmt/Enclosure:	None
Post Firm :	N	Flood Zone :	AE	Loc Contents :	Low floor above ground level
Course Const. :	N	Base Flood :	9999.0	Dis Assistance:	Not required
State Owned :	N	Low Floor :	9999.0	Cause of Loss :	Stream/river/lake
Elev. Bldg :	N	Elevation Diff:	999	Foundation Typ:	Not reported or invalid
Small Business:	N	Water Depth :	0	Wall Structure:	Not reported or invalid
Flood Proof :	N	Duration Water:	0	Wall Surface :	Not reported or invalid
Bldg Coverage :	0	Cont Coverage :	304,500	ICC Covg :	0
Bldg Val - ACV:	0	Cont Value :	725000		
Bldg Val - RCV:	0				
Bldg Dmg - ACV:	0	Cont Dmg - ACV:	379,396		
Bldg Dmg - RCV:	0	Cont Dmg - RCV:	435,733		
Bldg Paid :	.00	Cont Paid :	304,500.00	ICC Paid :	.00
Bldg Recovery :	.00	Cont Recovery :	.00	ICC Recovery :	.00
Bldg Reserves :	.00	Cont Reserves :	.00	ICC Reserve :	.00
CWOP Building :					
CWOP Contents :					
CWOP ICC :					
Content Remove:	0	Mobile Remove :	0	Flood Expense :	0
Salvage Amt :	.00	Subrogation :	.00		
Allocated LAE :	7,308.00			Alloc. ICC :	.00
Longitude :	-119.749599	Latitude :	39.516347		
GEO Result :	S8HPNTSCZA	GEO Census :	320319800001000		

Jump to policy
Jump to errors
Jump to txns/rejects

Company Number:	18058	Policy Number :	8702894409	Dt of Loss :	02/10/2017
Open Date :	02/10/2017	Close Date :	/ /	Claim Status :	Active/Open
Pol Eff Date :	11/22/2016	Pol Exp Dat :	11/22/2017	Org New Bus Dt:	11/22/2006
End Eff Date :	02/04/2017	Org Const Date:	07/01/1977	As of Date :	03/31/2017
Insureds Name :	JOHN HOWITT			Community :	320020
Address 1 :					
Address 2 :	35 N EDISON WAY STE 37				
City :	RENO	State :	NV	Zip Code :	89502 2352
Addr Key :	NV65 37UNWY32535				
Program :	Regular	Rate Method :	Manual	Policy Status :	Active
Condo Ind :	Non-Condo	Condo Units :	1	Catastrope Nbr:	000
Occupancy :	Unknown	Building Type :	One Floor	Bsmt/Enclosure:	None
Post Firm :	N	Flood Zone :	AE	Loc Contents :	Low floor above ground level
Course Const. :	N	Base Flood :	9999.0	Dis Assistance:	Not required
State Owned :	N	Low Floor :	9999.0	Cause of Loss :	Stream/river/lake
Elev. Bldg :	N	Elevation Diff:	999	Foundation Typ:	Not reported or invalid
Small Business:	N	Water Depth :	1	Wall Structure:	Not reported or invalid
Flood Proof :	N	Duration Water:	0	Wall Surface :	Not reported or invalid
Bldg Coverage :	0	Cont Coverage :	500,000	ICC Covg :	0
Bldg Val - ACV:	0	Cont Value :	0		
Bldg Val - RCV:	0				
Bldg Dmg - ACV:	0	Cont Dmg - ACV:	0		
Bldg Dmg - RCV:	0	Cont Dmg - RCV:	0		
Bldg Paid :	.00	Cont Paid :	.00	ICC Paid :	.00
Bldg Recovery :	.00	Cont Recovery :	.00	ICC Recovery :	.00
Bldg Reserves :	.00	Cont Reserves :	20,000.00	ICC Reserve :	.00
CWOP Building :					
CWOP Contents :					
CWOP ICC :					
Content Remove:	0	Mobile Remove :	0	Flood Expense :	0

Appendix E NFIP Loss Claims for 65 N. Edison Way

```
Company Number: 18058              Policy Number : 0020001833          Dt of Loss     : 12/31/2005
Open Date     : 01/03/2006         Close Date    : 03/13/2006          Claim Status   : Closed

Pol Eff Date  : 05/31/2005         Pol Exp Dat   : 05/31/2006         Org New Bus Dt: 05/31/2003
End Eff Date  : 05/31/2005         Org Const Date: 12/05/1983         As of Date     : 03/31/2017

Insureds Name : NCESCJ AND FERON/ R AND JDIFRA                        Community      : 320020
Address 1     :
Address 2     : 65 N EDISON WAY STE 1
City          : RENO                          State : NV              Zip Code       : 89502 2371
Addr Key      : NV65  1UNWY32565

Program       : Regular            Rate Method   : Manual             Policy Status : Active
Condo Ind     : Non-Condo          Condo Units   :     1             Catastrope Nbr: 000
Occupancy     : Non-Resident.      Building Type : One Floor          Bsmt/Enclosure: None
Post Firm     : N                  Flood Zone    : A                 Loc Contents  : Low floor above ground level
Course Const. : N                  Base Flood    :   9999.0          Dis Assistance: Not required
State Owned   : N                  Low Floor     :   9999.0          Cause of Loss : Stream/river/lake
Elev. Bldg    : N                  Elevation Diff:   999             Foundation Typ: Not reported or invalid
Small Business: N                  Water Depth   :   26              Wall Structure: Not reported or invalid
Flood Proof   : N                  Duration Water:   0               Wall Surface  : Not reported or invalid

Bldg Coverage :          500,000   Cont Coverage :              0    ICC Covg      :        30,000
Bldg Val - ACV:          477,708   Cont Value    :              0
Bldg Val - RCV:          620,400
Bldg Dmg - ACV:          146,276   Cont Dmg - ACV:              0
Bldg Dmg - RCV:          157,397   Cont Dmg - RCV:              0
Bldg Paid     :      141,275.37    Cont Paid     :            .00   ICC Paid      :           .00
Bldg Recovery :             .00   Cont Recovery :            .00   ICC Recovery  :           .00
Bldg Reserves :             .00   Cont Reserves :            .00   ICC Reserve   :           .00
CWOP Building :
CWOP Contents :
CWOP ICC      :
Content Remove:               0   Mobile Remove :              0   Flood Expense :             0
Salvage Amt   :             .00   Subrogation   :            .00
Allocated LAE :        3,620.13                                    Alloc. ICC    :           .00

Longitude     :   -119.750506      Latitude      :     39.516012
GEO Result    : S8HPNTSCZA         GEO Census    : 320319800001000

Jump to policy
Jump to errors
Jump to txns/rejects
-------------------------------------------------------------------------------------------------------------

Company Number: 18058              Policy Number : 0020001833          Dt of Loss     : 01/08/2017
Open Date     : 01/09/2017         Close Date    : 02/22/2017          Claim Status   : Closed

Pol Eff Date  : 09/23/2016         Pol Exp Dat   : 09/23/2017         Org New Bus Dt: 05/31/2003
End Eff Date  : 09/23/2016         Org Const Date: 12/05/1983         As of Date     : 03/31/2017

Insureds Name : J AND FERON/ R AND JDIFRA                             Community      : 320020
Address 1     :
Address 2     : 65 N EDISON WAY STE 1
City          : RENO                          State : NV              Zip Code       : 89502 2371
Addr Key      : NV65  1UNWY32565

Program       : Regular            Rate Method   : Manual             Policy Status : Active
Condo Ind     : Non-Condo          Condo Units   :     1             Catastrope Nbr: 000
Occupancy     : Unknown            Building Type : One Floor          Bsmt/Enclosure: None
Post Firm     : N                  Flood Zone    : A                 Loc Contents  : Low floor above ground level
Course Const. : N                  Base Flood    :   9999.0          Dis Assistance: Not required
State Owned   : N                  Low Floor     :   9999.0          Cause of Loss : Stream/river/lake
Elev. Bldg    : N                  Elevation Diff:   999             Foundation Typ: Not reported or invalid
Small Business: N                  Water Depth   :     2             Wall Structure: Not reported or invalid
Flood Proof   : N                  Duration Water:   0               Wall Surface  : Not reported or invalid

Bldg Coverage :          500,000   Cont Coverage :              0    ICC Covg      :        30,000
Bldg Val - ACV:          561,881   Cont Value    :              0
Bldg Val - RCV:          811,977
Bldg Dmg - ACV:          161,028   Cont Dmg - ACV:              0
Bldg Dmg - RCV:          180,852   Cont Dmg - RCV:              0
Bldg Paid     :      156,028.24    Cont Paid     :            .00   ICC Paid      :           .00
Bldg Recovery :             .00   Cont Recovery :            .00   ICC Recovery  :           .00
Bldg Reserves :             .00   Cont Reserves :            .00   ICC Reserve   :           .00
CWOP Building :
CWOP Contents :
CWOP ICC      :
Content Remove:               0   Mobile Remove :              0   Flood Expense :             0
```

```
Salvage Amt   :              .00   Subrogation   :              .00
Allocated LAE :         4,702.15                                   Alloc. ICC    :          .00

Longitude     :   -119.750506       Latitude      :     39.516012
GEO Result    : S8HPNTSCZA          GEO Census    : 320319800001000

Jump to policy
Jump to errors
Jump to txns/rejects
-------------------------------------------------------------------------------------------------------

Company Number: 18058               Policy Number : 0020001833          Dt of Loss    : 02/09/2017
Open Date     : 02/20/2017          Close Date    : 02/22/2017          Claim Status  : Closed

Pol Eff Date  : 09/23/2016          Pol Exp Dat   : 09/23/2017          Org New Bus Dt: 05/31/2003
End Eff Date  : 09/23/2016          Org Const Date: 12/05/1983          As of Date    : 03/31/2017

Insureds Name : J AND FERON/ R AND JDIFRA                               Community     : 320020
Address 1     :
Address 2     : 65 N EDISON WAY STE 1
City          : RENO                        State : NV                  Zip Code      : 89502 2371
Addr Key      : NV65  1UNWY32565

Program       : Regular             Rate Method   : Manual              Policy Status : Active
Condo Ind     : Non-Condo           Condo Units   :     1               Catastrope Nbr: 000
Occupancy     : Unknown             Building Type : One Floor           Bsmt/Enclosure: None
Post Firm     : N                   Flood Zone    : A                   Loc Contents  : Low floor above ground level
Course Const. : N                   Base Flood    :   9999.0            Dis Assistance: Not required
State Owned   : N                   Low Floor     :   9999.0            Cause of Loss : Stream/river/lake
Elev. Bldg    : N                   Elevation Diff:   999               Foundation Typ: Not reported or invalid
Small Business: N                   Water Depth   :    1              Wall Structure: Not reported or invalid
Flood Proof   : N                   Duration Water:   0                 Wall Surface  : Not reported or invalid

Bldg Coverage :          500,000    Cont Coverage :                0    ICC Covg      :        30,000
Bldg Val - ACV:          562,586    Cont Value    :                0
Bldg Val - RCV:          812,997
Bldg Dmg - ACV:           19,761    Cont Dmg - ACV:                0
Bldg Dmg - RCV:           19,761    Cont Dmg - RCV:                0
Bldg Paid     :        14,761.58    Cont Paid     :              .00    ICC Paid      :          .00
Bldg Recovery :              .00    Cont Recovery :              .00    ICC Recovery  :          .00
Bldg Reserves :              .00    Cont Reserves :              .00    ICC Reserve   :          .00
CWOP Building :
CWOP Contents :
CWOP ICC      :
Content Remove:                0    Mobile Remove :                0    Flood Expense :            0
Salvage Amt   :              .00    Subrogation   :              .00
Allocated LAE :         1,200.00                                   Alloc. ICC    :          .00

Longitude     :   -119.750506       Latitude      :     39.516012
GEO Result    : S8HPNTSCZA          GEO Census    : 320319800001000
```

Appendix F N. Edison Way Closeout Acknowledgement

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

December 30, 2013

Mr. Richard Martin
Emergency Management Program Officer
Nevada Division of Emergency Management (NDEM)
2478 Fairview Drive
Carson City, NV 89701

Reference: Closeout Acknowledgement, PDMC-PJ-09-NV-2010-006
Truckee River Flood Project
Edison Way Demolition

Dear Mr. Martin:

We are writing in response to your December 20, 2013, letter which forwarded closeout documentation for the above-referenced Pre-Disaster Mitigation (PDM) Program subgrant. We acknowledge receipt of the final budget summary and supporting documentation. Your closeout documentation shows:

Total approved cost of:	$ 771,725.00
Amount obligated (federal share 75%)	$ 311,490.47
Total eligible costs	$ 415,320.63
Total payments processed	$ 311,490.47
De-obligation amount	$ 267,303.28

There was a de-obligation amount listed due to the project not requiring re-vegetation due to the construction of a small levee in the project location, per U.S. Army Corps recommendation.

This subgrant is closed effective the date of this letter, however, please be advised that the grant may be subject to Federal audit. Financial and programmatic records supporting grant reimbursement claims must be retained for at least three years from the final State action, in accordance with Title 44, Code of Federal Regulations, Section 13.42. This grant's final closeout date will be when all subgrants are closed and all close-out actions identified in the Hazard Mitigation Assistance Unified Guidance are complete.

If you have any questions or need further assistance, please contact Joan Flack, Hazard Mitigation Specialist, at (510) 627-7023, or by email at joan.flack@fema.dhs.gov.

Sincerely,

Sally Ziolkowski, Director
Mitigation Division

www.fema.gov

Appendix G Mill St. Grant Application

200.1 - Acquisition of Private Real Property (Structures and Land) - Riverine					Federal Share: $ 250,000.00
Item Name	**Cost Classification**	**Unit Quantity**	**Unit of Measure**	**Unit Cost ($)**	**Cost Estimate ($)**
Env Abatement - 5205 Mill St	Demolition And Removal	1.00	Each	$ 30,000.00	$ 30,000.00
Demolition of 5205 Mill St	Demolition And Removal	1.00	Each	$ 220,000.00	$ 220,000.00
Grant Administration	Administrative Expense	1.00	Each	$ 82,750.00	$ 82,750.00
				Total Cost	$ 332,750.00

Total Project Cost Estimate: $ 332,750.00

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Cost Share		
Activity Cost Estimate	$ 332,750.00	
Federal Share Percentage	75.13148009%	
Non-Federal Share Percentage	24.86851991%	
	Dollars	Percentage
Proposed Federal Share	$ 250,000.00	75.13148009%
Proposed Non-Federal Share	$ 82,750.00	24.86851991%

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Cost Effectiveness	
Attach the Benefit Cost Analysis (BCA), if completed for this project	
TruckeeRiver_ExCondRAS_reportfiles.zip TruckeeRiver_ExCondRAS_GRANT_part1.zip TruckeeRiver_ExCondRAS_GRANT_part2.zip Edison Way BCA Report_11-30-09.pdf EdisonWayDemo_BCA.zip	
Net Present Value of Project Benefits (A)	$ 590964.0
Total Project Cost Estimate (B)	$ 332750.0
What is the Benefit Cost Ratio for the entire project (A/B)?	1.776
If you would like to make any comments, please enter them below.	
Cost estimates for demolition are based upon actual demolition costs associated with previous edison way demolitions. BCA Summary (See attached backup documentation): Net Present Value of Project Benefits: $590,964 Total Project Cost Estimate: $332,750.00 Project BCA: 1.776	
Attachments:	

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Appendix H Carson City Retention Basin Cost Detail

Description	Quantity	Price	Cost
Phase 0 (initial emergency response)			
Remove Material	80,000 CY	$3.44	$275,600.00
Labor	1	$10,293.92	$10,293.92
Equipment	1	$3,859.00	$3,859.00
Equipment Rental	1	$1,480.00	$1,480.00
Signs	1	$1,600.00	$1,600.00
Permit Fees	1	$400.00	$400.00
Bituminous Concrete Overlay	1995	$2.00	$3,910.00
		Subtotal	$297,142.92
Phase I			
Remove Material	70,000 CY	$4.15	$290,500.00
Temporary Haul Roads/Bonds	1	$15,950.00	$15,950.00
Labor	1	$8,522.40	$8,522.40
Equipment Estimate	1	$2,121.50	$2,121.50
Topo for Quantity Verification	1	$2,280.00	$2,280.00
Install 42" RCP for Haul Rd.	24	$65.00	$1,560.00
Install 15"CMP for Haul Rd.	40	$20.00	$800.00
		Subtotal	$321,733.90
Phase II			
Remove Material	320,000 CY	$5.50	$1,760,000.00
Engineering plans	1	$23,340.00	$23,340.00
Chipping and clearing	1	$31,798.20	$31,798.20
Haul Road	1	$28,621.80	$28,621.80
Construction staking	1	$3,600.00	$3,600.00
Install inlets and outlets	1	$122,760.00	$122,760.00
Finish grading	1	$24,393.60	$24,393.60
Erosion protection	1	$78,596.00	$78,596.00
Permit fee	1	$400.00	$400.00
Performance/labor bond	1	$20,000.00	$20,000.00
Labor	1	$18,076.00	$18,076.00
Equipment	1	$2,837.25	$2,837.25
Aggregate base for haul road	1	$26,000.00	$26,000.00
		Subtotal	$2,140,422.85
Project Totals			
Phase 0			$297,142.92
Phase I			$321,733.90
Phase II			$2,140,422.85
		Total	$2,759,299.67

(*Waterfall Fire – Vicee Basin Emergency Protective Measures Memo,* pp. 8-9, Carson City Nevada, Public Works Department, October 28, 2004.)

Appendix I Analysis of the Capacity Expansion Phases for the Existing Vicee Debris Basin Excerpt

DR-1540-NV: Analysis of the Capacity Expansion Phases for the existing Vicee Canyon Debris Basin

According to an email (dated 2-10-05) from Rob Fellows, Senior Project Manager for Carson City, Phase 1A of the completed expansion of the Vicee Canyon Debris Basin yields approximately **68 acre-feet** of storage and the Phase 2 expansion proposes to yield **200 acre-feet** of storage. It is our opinion that the Phase 1A expansion provides adequate storage to protect downstream points from the impact of debris flow and sedimentation from a 5-year storm event in the Vicee Canyon watershed. This opinion is supported by the following argument.

FEMA performed post-fire hydrological calculations for Vicee Canyon. The location of the point of calculation in FEMA's study (called Vicee Canyon Outlet hereinafter) is approximately 0.5 mile upstream from the location of the debris basin. However, the values estimated by FEMA for the volume of flow and sediment are applicable to the location of the debris basin because of the following reasons:

1. Given the narrow shape of the watershed in between the Vicee Canyon Outlet and the debris basin, the intermediate drainage area is relatively small and the runoff added to the stream in the intermediate drainage area is not significant.
2. There is the possibility that part of the 5-year surface runoff spreads out or branches out of the main water course and thus may reduce the flow and balance-out with the extra water running into the stream in the intermediate drainage area.
3. Although the intermediate drainage area is also burned and might contribute some additional sediment and debris to the total flow, this effect may be offset by the sediment trap capacity within the intermediate drainage area and stream segment which have a milder slope than the Vicee Canyon upstream segments.

According to FEMA's estimates the volume of the post-fire 5-year clear-water runoff from Vicee Canyon is approximately **109 acre-feet**. Considering the bulking factor of 49.7% assigned to this intensely burned drainage area (as shown in Appendix A, Table 7 of the October 2004 FEMA Summary Report), the total volume of water plus sediment and debris would be **163 acre-feet** for the post-fire 5-year event. Accordingly, the total volume of sediment and debris under post-burn conditions for the 5-year event is approximately **54 acre-feet** (163 ac-ft x 49.7%), which is approximately 20% smaller than the new Phase 1A debris basin capacity.

Previous experience with debris basins receiving runoff from burned areas include two basins used in post-fire management operations for the Cerro Grande Fire in New Mexico. Both of these basins were overrun by the runoff volume and yet were able to trap almost the entire bed load and a large portion of the suspended load. The point here is that in order for a sediment or debris basin to be effective it does not have to completely contain and infiltrate the entire runoff volume. The **68 acre-feet** of storage of the Phase 1A expansion is sufficient to slow down and partially contain the flow and provide more than enough capacity to contain the sediment produced in a 5-year event.

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Appendix J Vicee Basin Emergency Protective Measures – Memo Excerpt

Waterfall Fire
FEMA-DR-1540-NV

Summary of Peak Discharge and Sediment Yield

			5-year Peak Discharge (cfs)				5-year Peak Sediment Yield		
Basin ID	Area	Discharge Point Location	Pre-burn	Post-burn	Post-burn	ratio	Pre-burn	Post-burn	ratio
	(sq. mi.)			(clear flow)	(bulked flow)		(ac-ft)	(ac-ft)	
Combs Canyon	1.74	At U.S. Route 395	34	121	158	4.7	2.49	5.73	2.3
Vicee Canyon	1.64	3500' U/S of Bike Trail	38	412	617	16.4	5.53	14.22	2.57
Ash Canyon	5.25	At Ash Canyon Road	117	555	658	5.6	19	19.28	2.59
Kings Canyon	6.35	At Long Ranch Park	120	533	619	5.2	16	16.38	2.12
Tributary I	0.77	At Rhodes Street	16	99	148	9.5	1.17	3.07	2.63
Tributary H	0.57	At Boyle Street	13	122	183	14.1	1.94	5.11	2.63

FEMA Flood Insurance Study Discharges (for comparison)

	Area		FEMA FIS DISCHARGES (cfs)		
Basin ID	(sq. mi.)	Discharge Point Location	10-yr	50-yr	100-yr
Combs Canyon	3	At U.S. Highway 395	95	425	760
Vicee Canyon	2	At confluence with Ash Canyon Creek	45	250	475
Ash Canyon	6	Near Lonview Way	220	950	1660
Kings Canyon	5	Near Canyon Drive	160	765	1390

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PUBLIC WORKS DEPARTMENT

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Fx: 775-887-2283

PLANNING
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Carson City, NV 89706-1319
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Fx: 775-887-2278

CARSON CITY NEVADA

Consolidated Municipality and State Capital

Memo

To: Al Harting - FEMA

From: Robert D. Fellows, P.E.
Senior Project Manager

Subject: Waterfall Fire - Disaster 1540 NV
Vicee Basin Emergency Protective Measures - Phase 1

Date: October 28, 2004

Due to the nature of the threat to Carson City of the Vicee Canyon watershed where the 5-year pre-burn flow of 38 cfs increases to 619 cfs post-burn, addition volume in Vicee basin is necessary. Using the pre-burn 100-year flow of 475 cfs, which resulted in a basin capacity of 150 acre feet of storage, a basic ratio between the values 475/150 and 619/X show a need to provide about 200 acre feet of ultimate storage. Since time frames are limited and expansion of the basin would involve further engineering analysis, a first phase is proposed which would provide 1/3 of the ultimate volume or about 65 acre feet. The current size (600ft x 400ft area) of the existing basin contains approximately 15 acres feet which leaves 50 acre feet needed. When 50 acre feet is converted to cubic yards the result is about 80,000 cubic yards. The existing inlet and outlet structures to the basin will not be disturbed, but the existing rock-lined connection between the small and larger areas will be removed. The rock will be salvaged and stored near the edge of the basin on the north side. All other work will be within the existing footprint of the basin. The basin is located on city property and lies northwest of Winnie Lane at the end of Foothill Road, Section 12, T15N, R19E. The existing basin lies within a "B" flood zone.

The outline below shows the emergency processes the city is using to remove the material from the existing basin.

1. Determine the material use and disposal site. The material was tested by both Lumos and Associates and NDOT for use in the Freeway road bed. The material meets the "Select Borrow" specifications and can be used by the freeway contractor.

2. Determine if the Freeway contractor will accept the material. Ames Construction was contacted and has provided a "material acceptance agreement" to the City for review and execution.

3. Collect bids from haul contractors able to move the material to the freeway project. Four contractors provided bids to move 80,000 bank yards on material from Vicee basin to the freeway project. The low bid cost per yard was $3.30. Other costs associated with the work were separated but include providing a bond (adds $3,000) and provide access to the basin and dust control, etc (adds $6,800). The total contract would be $273,700. The contract time would be 35 working days. A standard city contract being drafted for Action Crane and

(NSPO 1-06)

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DEVELOPMENT SERVICES DEPARTMENT

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CARSON CITY NEVADA

Consolidated Municipality and State Capital

Memo

To: Paul Anderson - FEMA and Bert Prescott - NEM

From: Robert D. Fellows, P.E. and John Flansberg, P.E.
Senior Project Manager Deputy City Engineer

Subject: Version 2 to PW 45 - Vicee Basin Expansion

Date: February 23, 2005

This is the final portion of the work for this PW as setup with FEMA last Fall. FEMA instructed the City to divide the project into 2 parts, part 1 within the existing basin and part 2 expanded to the north of the existing basin. FEMA engineering analysis confirmed that the amount of 5-year post burn flow was 617 cfs (exhibit A) which the city then confirmed that 200 acre-feet of storage was necessary to contain the 617 cfs (exhibit B). **This is a very time critical project not only for the great risk to life and property but the window of opportunity is closing.** The disposal area for the basin material, the NDOT freeway, is being worked on at the same time and has accommodated the material from the basin. Within a month, the space available within the Freeway will be gone. This fact has cut the costs to remove and dispose of the material nearly in half of what the FEMA cost codes allow.

This version to PW 45 results in the expansion of the existing basin into north which required much more effort on the part of the city . Below is accounting of each item.

- Secure right of entry across WNCC for this portion - completed, (exhibit C)
- Secure NDOT approval to accept the more material - completed, (exhibit D)
- Secure acceptance from Freeway contractor, Ames Construction, to place material at no extra cost - completed, (exhibit D)
- Secure NDOT encroachment permit to haul material to Freeway - completed, (exhibit E)
- Secure City Special Use Permit - completed, (exhibit F)
- Secure Air Quality permit - completed, (exhibit G)
- Secure engineering plans - completed, (exhibit H)
- Secure cultural survey - completed with no issues, (exhibit I)
- Secure environmental survey - completed with no issues, (exhibit J)

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...LOPMENT
...ICES
DEPARTMENT

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CARSON CITY NEVADA

Consolidated Municipality and State Capital

Memo

To: Bert Prescott

From: Robert D. Fellows, P.E. — Senior Project Manager
John Flansberg, P.E. — Deputy City Engineer

Subject: Version 1 to PW 45 - Vicee Basin Expansion Quantity Error

Date: April 7, 2005

As discussed with you recently, the City has had opportunity to more precisely determine the amount of material contained in the phase 1 portion of the Vicee Basin and include previous missed items needed to make the emergency measure functional and stable. Removing earth is only part of what is needed to make the emergency measure effective. Please forward this request on to FEMA as soon as possible.

This emergency work only removes material from the existing footprint of the basin. The original estimate (version 0) used a direct conversion of 50 acre-feet to 80,000 cubic yards plus the existing volume of 15 acre-feet to gain a total perceived storage volume of 65 acre-feet. After the work was in progress, the basin was surveyed, then city engineering staff designed and calculated the volume using actual topographic information. The ground slopes from 4875 to 4840 of which the storage volume of the basin is contained from 4840 to 4823. This approximately 6% ground slope results in a material removal of approximately 150,000 cubic yards to yield a storage volume of approximately 68 acre-feet within the existing footprint of the basin. Furthermore, the original PW scope did not know that the inlets and outlet to the existing basin would need to be altered to accommodate 68 acre-feet storage. Below is a revised scope of work for version 1.

Version 1 to the PW continues to remove all earthen material within the basin to create one large basin, provides necessary inlets/outlet, grading, and side slope erosion control. The new basin will have 3:1 side slopes with a top dimension of 600 feet E-W and 400 feet N-S (5.5 acres) and a bottom dimension of 400 feet E-W and 150 feet N-S (1.4 acres). All existing rock will be moved to the west edge of the basin to within 25 feet to 40 feet to the top of the basin for future use. The main inlet channel and smaller southerly inlet channel will be re-installed to conform to the 3:1 basin side slopes. The main inlet channel measures 324 feet long by 50 lineal feet wide and contains a 60 feet by 40 feet apron on the basin

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Appendix K Funding for Emergency Protective Measures – Waterfall Wildfire Excerpt

5. Types of Emergency Projects in Progress

Types of emergency protective measures that are currently underway and are funded under the PA Program are described below.

Soil Stabilization and Erosion Control Measures

These measures were installed to stabilize slopes and drainages, reducing runoff, flow velocity, sediment transport, and slope failure. Measures typically consisted of the application of hydroseeding; placement of straw mulch, erosion control blankets, and fiber rolls; and installation of check dams, gravel bag berms, and sand bag barriers in swales and channels. Measures were considered to be eligible if they provided protection to existing residences or other structures – for example, hydroseeding was considered eligible if it stabilized a slope that would otherwise fail and cause damage to homes located at the base of the slope.

Log Erosion Barriers (LEB) and Contour Felling of Trees. The purpose of this treatment is to trap sediments from side slopes to prevent material from entering stream channels and to keep sediment on site. Trees will be felled and installed perpendicular to the slope in areas designated on the treatment map. LEBs will be installed in high severity areas where there is timber available.

Straw Wattles. The purpose of this treatment is to capture and retain sediment on slopes, reduce soil creep and sheet rill/erosion until vegetation re-establishes. Wattles will be installed on hillsides behind vulnerable homes, public facilities and on slope contours where sufficient trees are not available for contour felling as designated on treatment map.

Scope

The analyses were completed for the six watersheds listed in Table 3 below. These watersheds, all of which were affected by the fire, drain directly into Carson City. See Figure 1 of Appendix A for the location of these watersheds.

Table 3: Watersheds Analyzed

Watershed	Drainage Area (sq mi)
Combs Canyon	1.74
Vicee Canyon	1.64
Ash Canyon	5.25
Kings Canyon	6.35
Tributary I	0.77
Tributary H	0.57

Peak Flow Analysis for the 5-Year Storm

The 5-year peak discharges for pre-burn conditions were calculated using the USACE's HEC-HMS model. Precipitation is discussed in Section 2, above. For purposes of this analysis, the 5-year, 24-hour rainfall intensity was used. The results of the HEC-HMS model matched favorably with USGS regional regression equations published for Region 5 in Nevada (USGS, 2000). These discharges were then adjusted to account for post-burn hydrologic conditions based upon the burn severity reported by the BAER team and a bulking factor. The post-burn adjustment factors were determined through comparisons of pre- and post-burn rainfall-runoff models that are calibrated based on similar fire events. Table 4 below provides the results of this analysis. Discharge values are shown in cubic feet per second (cfs).

Table 4: Summary of 5-Year Peak Discharges

Watershed			5-Year Peak Discharge (cfs)		
Basin	Drainage Area (sq mi)	Discharge Point Location	Pre-Burn	Post-Burn (Bulked)	Ratio
Combs Canyon	1.74	At U.S. Route 395	34	158	4.7
Vicee Canyon	1.64	3500 feet upstream of Bike Trail	38	617	16.4
Ash Canyon	5.25	At Ash Canyon Road	117	658	5.6
Kings Canyon	6.35	At Long Ranch Park	120	619	5.2
Tributary I	0.77	At Rhodes Street	16	148	9.5
Tributary H	0.57	At Boyle Street	13	183	14.1

As shown in the last column of the table above, the largest increase in post-fire flows occurs in Vicee Canyon. The reason for the large increase is that the entire Vicee Canyon watershed is within the burn area, as shown in Figure 1 of Appendix A.

Appendix L USDA Forest Service Waterfall Fire BAER Report Excerpt

mountain range. The igneous rock is granitic in composition (i.e., granite, granodiorite and monzonite) belonging to the Sierra Nevada batholith (Trexler, 1977; Archibold, 1969).

The metamorphic rock is more resistant to weathering than the igneous rock which weathers to what is colloquially referred to as "decomposed granite." The decomposed granite is the major source of landslide materials.

This area along the eastern side of the Sierra Nevada Mountain Range is seismically active. Several faults that are 300 years or younger lie parallel to the older faults which trend north by northeast. The older and younger faults define the boundary between the uplifted and downthrown blocks found in the basin and range province in western Nevada. Carson City lies on a downthrown block.

Geologically recent (i.e., 2 million years and younger) processes include the seismic activity and subsequent land sliding that has occurred in response to a combination of earthquakes and rainfall. This land sliding includes debris slides and debris flows. Deposits of these landslide events now blanket the area under Carson City and to the west of Carson City and include alluvial fans and aprons.

Q. Miles of Stream Channels by Order or Class: 18.6 miles of perennial stream and 23 miles of intermittent streams.

R. Transportation System

Trails: 3 miles Roads: 29.28 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres) 2,860 (33% low); 3,990 (45% moderate); 1,261 (14% high); 688 (8%) unburned
USFS (acres): 838 (low); 1,462 (moderate); 415 (high)
Other lands (acres): 2,022 (low); 2,528 (moderate); 846 (high)

B. Water-Repellent Soil (acres): 2,000

C. Soil Erosion Hazard Rating (acres):
616 (7% low) 2,552 (29% moderate) 5,631 (64% high)

D. Erosion Potential: 15-30 tons/acre

E. Sediment Potential: 2,534 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years):	10 years, 50-100 for trees
B. Design Chance of Success, (percent):	80%
C. Equivalent Design Recurrence Interval, (years):	25 years
D. Design Storm Duration, (hours):	6 hours
E. Design Storm Magnitude, (inches):	2 inches
F. Design Flow, (cubic feet / second/ square mile):	14 cfsm
G. Estimated Reduction in Infiltration, (percent):	18% of the area
H. Adjusted Design Flow, (cfs per square mile):	16.8 cfsm

USDA FOREST SERVICE
Waterfall Fire BAER Report

FS-2500-8 (7/00)
Date of Report: July 26, 2004

PART V - SUMMARY OF ANALYSIS

A. Description of Watershed Emergency:

The Waterfall Fire is located west of U.S. Highway 395 directly above Carson City, Nevada. The burned area includes areas within eleven watersheds including Kings Canyon, Ash Canyon, Coombs and Vicee Canyons. The headwaters on the burn area follow the watershed divide on the Carson Range of the Sierra Nevada. The canyons affected are headwater tributaries to the Carson River to the east. This area is prone to summer thunderstorms often resulting in flash flooding.

Landownership within the fire includes: USFS, Washoe Tribe of CA and NV, Carson City, State of Nevada, Private, Nevada State Board of Regents, and Tahoe State Park. In addition to being the scenic backdrop for the Capital City, the area generates most of the city's municipal water supply. Initial assessments indicate that post fire impacts may include excessive water run off, debris flows, mud slides and other threats to Carson City's municipal water supply and water quality, infrastructure of the municipal water system, human life and property. Also at risk are down slope subdivision drain systems, sewer systems, and roadways.

Threats to life and property: Over 516 homes ranging from $250,000 to $750,000 in value are at risk from increased run-off directly downstream of the Waterfall Fire within the Carson City. Areas where the fire burned directly above and into subdivisions are at risk of rock falls, flooding and debris flows, especially in the Ash, and Kings Canyon areas.

Geologic instability and landside potential: The combination of vegetation loss from the wildfire with rainfall may result in landsliding. Computer models were used to derive hazard ratings for management decision-making. These include predicting initiation sites of landslides using Level I Stability Analysis (Hammond et al. 1992; Koler, 1998) and estimating runout distances of debris flows (Benda and Cundy, 1990). Results from the computer modeling indicate that a moderate-high to a high probability of landsliding occurrence will take place within the fire area during the next ten years until re-vegetation takes place. The probability increases from a moderate to a high hazard rating in response to rainfall – specifically rainfall events that have a frequency of 60 minutes or greater for return intervals of 2 to 25 years. Lesser rainfall frequencies are unlikely to result in landsliding.

The highest hazard runoff areas are the existing alluvial fans/aprons located in the North King Canyon Creek, Premier Mine, and Ash Canyon Creek areas. The Ash Canyon Creek area has the greatest risk because of the likelihood of debris flow reaching housing developments. High hazard areas have also been identified in the Vicee and Coombs Canyon areas but the runout areas are not as significant because the number of buildings and houses are much less prevalent than in the other high hazard areas.

Public safety and closures: The fire area is easily accessible all along the eastern perimeter. This area receives very high use from city residents and visitors.There is an existing and continuing public safety and hazard situation on the fire. The public can gain access to the steep terrain and unstable canyons in several areas. Carson City has closed the fire to all public access at this time. USFS and the private landowners will need to work together to control use of the area for the sake of public safety. Signage, public information kiosks, media releases and barriers will be needed to meet the public safety needs for at least the next year and a half.

Wind erosion and public safety: The Waterfall Fire lies adjacent to U.S. Highway 395 and directly adjacent to Carson City. The local winds are consistant in the afternoon along the mountain front in Carson City. The dust and ash from this fire could cause public safety problems related to decreased visibility and health problems. Blowing ash could also impact the municipal water supply, as the City uses surface water supplies that lie within the burned area.

Carson City and Virginia City municipal water supplies: The Waterfall Fire occurred in a designated municipal watershed. It is the sole municipal watershed for Carson City. Potential impacts of the Waterfall Fire to surface water supplies to Carson City include increases in sediment load and turbidity in the creeks that supply surface water to Carson City, and a possible increase in pH. The increased sediment load to the surface water treatment plant will likely cause temporary shutdown of the plant during precipitation events and heavy runoff periods. Landslides and/or mudslides would likely create the same effects, but may have the potential for longer-term disruption of operations if they occur in the stream bottoms. Hydrologists have confirmed that there is a high risk of debris flows and very high probability of increased ash and silt in the streams and just above the water quality treatment plant. The highest potential comes with the first moderate

3

to high storm event. This would cause damage to the buildings and system infrastructure associated with the water quality treatment plant.

Sedimentation caused by the fire will also reduce the infiltration capacity of the Vicee Canyon recharge infiltration basins by plugging the bottom substrates with fine-grained material. Other debris carried downstream during major precipitation events may also interrupt recharge capabilities.

Also at immediate risk are the pipelines in Lakeview, Timberline, Vicee and Ash Canyons that supply water from Marlette/Hobart Water System to Virginia City and Carson City. These pipelines are vulnerable in several places where they cross streams. There are two pipelines, one that supplies water to the historic inverted siphon to Virginia City (which is their only source of municipal water) and another to the Ash Canyon Water Treatment Plant in Carson City. The access road to the Marlette Lake pump was within the fire and was burned. The Marlette Lake pump operates on diesel fuel and must be trucked in three times a week. The road is at risk of damage from increased flows and is not to a high enough standard to accommodate those flows. Loss of access on this road to the Marlette/Hobart Water System would inhibit system adjustments and the delivery of diesel fuel to the Marlette Lake pump, which would reduce and stop the flow to Virginia City and Carson City within a few days.

Threat to soil loss and loss of productivity: High severity burn occurred on 1,261 (14%) acres, and moderate severity burn occurred on 3,990 acres (45%). Acres of low severity burned areas are 2,860 (33%). (The remaining 8% not burned.) This level of severity has created localized hydrophobic soil conditions, removed overstory vegetation and organic duff cover. The majority of the high burn severity area is in the Kings Canyon and Ash Canyon subwatersheds. The majority of the high burn severity areas are on very steep slopes, and have a mixed moderate to fine sandy loam surface. There is as much as three inches of burnt ash on the high severity burn areas and no natural mulch on the soil surface. These soils are perched above the perennial streams in the Kings and Ash canyons. High and moderate burn severity areas have very high erosion potentials. This situation places high risks upon water quality as well as threatening long-term site productivity and quality, and could contribute to debris flow during larger watershed events, posing a potential threat to life and property.

Threat to stream and Carson River water quality: Sediment yield is expected to increase from moderate and high severity burn areas as discussed previously. Key streams considered to be at extremely high risk from increased sediment yields are Ash Canyon and Kings Canyon Creek. These creeks flow through the City's drainage system and into the Carson River. These channels and pipes are not sized to compensate for this increase in expected waterflows or filter the sediment load. Therefore the Carson River can expect an increase in ash, storm flow, sediment and debris with the first substantial thunderstorm event and with spring runoff.

Threat to aquatic ecosystem integrity: Many of the riparian zones and aspen stands were burned at moderate and high intensities. These habitats are particularly important as they provide for high biodiversity, travel corridors, and local microclimates. In addition, Kings and Ash Canyon Creeks are recreational fisheries, with brook and rainbow trout. The lack of overhead shading vegetation due to the fire, and the resulting increased sedimentation into the creeks threaten aquatic environments. Preliminary assessments by Nevada Department of Wildlife found a total loss of the recreational fisheries. The threat of overland flow, debris flows and slope failure above the actual stream beds in steep areas will overwhelm these systems with sediment and threaten the natural restoration of the woody vegetation.

Threat to terrestrial ecosystem integrity: There are no Federally listed plants or animals known to exist in the watershed. No critical habitat exists in the watershed. There are no state listed plants or habitat known to exist in the burn area.

The Waterfall Fire burned approximately 2,767 acres of forested stands. These areas were important to species such as black bear, goshawk, flammulated owl, bats, and many other types of cavity nesting birds. The long period in which it will take for this habitat to reestablish will have an adverse effect to forest dependent species. The Waterfall Fire burned nearly all of the winter range and significantly impacted the summer range for the Carson River mule deer herd. Damage to the winter range amounted to the loss of important bitterbrush, sagebrush, sagebrush/perennial grass, and Sierra mountain shrub foraging habitats. Loss of these vegetation types has created a forage deficit on the winter range. Damage to summer range amounted to the loss of overstory cover, hiding cover, and forage with the removal of almost all brush and shrubs and a substantial portion of the overstory trees. There is long-term loss of deer winter range and other wildlife habitats in the Waterfall Fire area through type conversion to a non-native cheatgrass and/or other noxious weed dominated vegetation type. This can alter the fire cycle such that some shrub/brush habitats may not return.

D. Probability of Treatment Success

Treatment	Year 1	Year 3	Year 5	Beyond BAER
Land	75	90	90	90
Channel	75	80	90	90
Roads	80	85	95	90
Cultural	80	90	90	90
Warning System	80	80	80	90

E. Cost of No-Action (Including Loss):

Four parameters were used to determine the loss of resources if no treatment were appplied. These include loss of site productivity valued at $1,550,000 and loss of roads valued at $550,000. Impacts of sediment on road drainage infrastructure $4,000,000. Impacts of sediment on Carson City and Virginia City water systems $5,000,000. Total cost of no action is $11,100,000.

A non-calculated cost of the no action alternative also includes the anticipation of cheat grass invasion into the burned areas. Much of the cost of the action alternative is associated with revegatation of native and non-native desirable species $250,000. Additional costs of the no action, which has not been is the loss of the aesthetic value to local citizens and tourists.

F. Cost of Selected Alternative (Including Loss):

The cost of implementing the proposed treatments is $6,438,619. And . Assuming an 80% treatment success, the total value of successful implementation the total cost of the alternative is the value of successful implementation $17,538,619.

G. Skills Represented on Burned-Area Survey Team:

Team Leader
Asst. Team Leader Writer/Editor
Public Information Officer
Forester, Fuels Management
Vegetation
Engineering
Water Supply
Recreation
Wildlife
Archaeology
Hydrology
Soil Scientist
Geologist
GIS, Computer Specialist
Urban Forestry
Washoe Tribe, Colony Representative
Recreation access
Implementation Specialist
Suppression Rehabilitation

Team Leaders: Genny Wilson, Jenny Scanland Asst.

Email: gewilson@fs.fed.us Phone: 775-355-5386 FAX: 775-355-3599
Email: jennys@ndf.state.nv.us Phone: 775-684-2514 FAX: 775-687-4244

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Date of Report: July 26, 2004

H. Treatment Narrative:

Land Treatments

Log Erosion Barriers (LEB) and Contour Felling of Trees: The purpose of this treatment is to trap sediments from side slopes to prevent material from entering stream channels and to keep sediment on site. Trees will be felled and installed perpendicular to the slope in areas designated on the treatment map. An estimated 30 to 40 LEB/acre will be installed. This treatment will vary depending on localized conditions. LEBs will be installed in high severity areas where there is timber available.

It is extremely important that soil productivity be protected on both private and public lands. These soils are essential in ensuring that all lands are revegetated with the desired species. This will ensure decreased weed and cheat grass infestations on all lands. Wyden amendment spending authority is being requested to ensure a funding mechanism for private, State and City lands. Due to the emergency nature of this incident no funding is currently available for treatments on private, State and City lands. Partnership contributions would be made through their participation in BAER assessment and implementation which is listed in the funding table as a separate line item. The Emergency Watershed Program, through the NRCS, is unfunded at this time as that funded was totally expended in the southern CA fires.

Straw Wattles: The purpose of this treatment is to capture and retain sediment on slopes, reduce soil creep and sheet rill/erosion until vegetation re-establishes. Wattles will be installed on hillsides behind vulnerable homes and on slope contours where sufficient trees are not available for contour felling as designated on treatment map. An estimated 30-40 wattles/acre will be installed. This treatment will occur depending on localized conditions.

It is extremely important that soil productivity be protected on both private and public lands. These soils are essential in ensuring that all lands are revegetated with the desired species. This will ensure decreased weed and cheat grass infestations on all lands. Wyden amendment spending authority is being requested to ensure a funding mechanism for private, State and City lands. Due to the emergency nature of this incident no funding is currently available for treatments on private, State and City lands. Partnership contributions would be made through their participation in BAER assessment and implementation which is listed in the funding table as a separate line item. The Emergency Watershed Program, through the NRCS, is unfunded at this time as that funded was totally expended in the southern CA fires.

Seeding: The purpose of this treatment is to minimize soil wind and water erosion by providing a vegetative surface cover, and to prevent the introduction and increase of noxious and invasive weeds. Seeding will be done with four different seed mixes tailored to fit specific areas of the burn. Some areas will applied by air and some will be applied with a seed drill. The seeding will overlap with the LEB's, straw wattles and with the straw mulching in some areas. Aerial seeding is necessary due to the very steep slopes in the upper elevations of the burn areas and lack of road access to this area.

Seeding of all lands with consistent seed mixes and across the entire watershed will decrease the application costs to all parties. It is extremely important that soil productivity be protected on both private and public lands. These soils are essential in ensuring that all lands are revegetated with the desired species. This will ensure decreased weed and cheat grass infestations on all lands. Wyden amendment spending authority is being requested to ensure a funding mechanism for private, State and City lands. Due to the emergency nature of this incident no funding is currently available for treatments on private, State and City lands. Partnership contributions would be made through their participation in BAER assessment and implementation which is listed in the funding table as a separate line item. The Emergency Watershed Program, through the NRCS, is unfunded at this time as that funded was totally expended in the southern CA fires.

Appendix M BAER Hydrology Report Excerpt

Waterfall Fire

July, 2004

Casey Shannon, Inyo National Forest

Waterfall fire BAER Team Hydrologist

Potential Values at Risk - Watershed

Listed are values at risk identified that could potentially be impacted as a result of post-fire watershed conditions within and downstream of the fire perimeter and are subject to hazards caused by the burn. Hydrologic values at risk for the Waterfall Fire are as follows:

- Water quality of the domestic water supply for Carson City, Nevada. The Carson City water system diverts water for domestic and culinary use from two primary sources that have watersheds within the burn area; North Fork Kings Canyon Creek and Ash Canyon Creek. Spring flow from a spring near North Fork Kings Canyon is also diverted. These sources are at risk to excessive sedimentation and likely ash contamination as a result of the fire.
- Infrastructure of the Carson City water system; primarily the diversion structures and headgates at North Fork Kings Canyon Creek and Ash Canyon Creek, the holding ponds and treatment plant at the Quill treatment plant, a spring diversion box near North Fork Kings Canyon Creek and the Vicee Canyon Aqueduct that descends the canyon from Hobart Reservoir. Water to Virginia City is also delivered through this same aqueduct system may be affected. The above items are subject to damage or destruction from potential debris flows and flooding as a result of post fire watershed conditions and an additional threat to water quality. Destruction and damage of the diversion structures and aqueduct could result in an indefinite loss of water service and supply to Carson City and Virginia City residents.
- Residential homes found within and oriented with potential flood and debris flow paths below the main drainages within the burn area. Houses have been identified as being at risk in the event of a significant post-fire precipitation event that could be damaged and may possibly have a threat to human life. Residential drainage systems may be ineffective in handling increased runoff and possibly could damage homes and surrounding property. Homes located below an unnamed drainage adjacent to the Premier Mine site and below Ash Creek Canyon are noted, homes below the North Fork Kings Canyon Creek may be affected and with a possibility of flooding to homes below the Vicee Canyon detention basins. Houses and businesses may be flooded by overwhelmed storm drains.
- Infiltration ponds and sediment catchment basins located on lower Vicee Canyon. Carson City has infiltration basins along the lower Vicee Canyon drainage designed to capture surface flows behind gabion structures and excavated storage areas in order to increase ground water supplies for wells the City uses for domestic water supply. Below the infiltration ponds, three large sediment detention basins with armored spillways are found designed to capture sediment and flood flows in order to prevent downstream flooding and sedimentation in the residential areas and city drainage infrastructure. Along this reach the channel has been armored in between the basins to reduce channel incision and to channel flows into the basins. The infiltration basins are subject to increased sedimentation with silt, ash and debris that will decrease the function

of ground water recharge and possibly structural damage as a result of large debris flows and floods. The integrity of this system is important to reduce the chance of flooding and sedimentation into residential subdivisions downstream, the Vicee Canyon drainage enters the City drainage system below the last detention basin.

- United States Geological Survey' (USGS) gauging stations. Located on Vicee Canyon, Ash Canyon Creek, North Fork Kings Canyon Creek, Kings Canyon Creek, the stations are along the canyon bottoms and are subject to damage from debris flows and flooding.
- Carson City storm drain infrastructure. If significant flooding and increased sedimentation occurs in the drainages of the burn area, the City' storm drain system may be overwhelmed with sediment and debris, possibly causing damage to homes and businesses as a result of clogged storm drains forcing flows out of the system. Sediment and ash loads that move through the City drainage system have the potential to impact the water quality of Carson River.
- Roads and drainage infrastructure within the burn area will receive increased runoff and be subject to accelerated erosion and increase sediment loads to stream channels. Additional sediment loads within the drainages pose an increased threat to deposition and debris flows downstream towards values at risk within Carson City. In addition to this potential condition, wind caused erosion will likely deposit loads of fine grained soil, silt and ash within drainage channels adding to the debris flow potential.
- Drainages into Indian Colony and adjacent areas in Carson City. Ephemeral drainages discharge onto residential areas and businesses with poor water controls, increased runoff expected from the burn area may cause flooding and sedimentation to these areas.

Resource Condition Assessment –Hydrology

The Waterfall Fire burned within four sixth order watersheds (Hydrologic Units or HUC's) named Kings Canyon Creek, Ash Canyon Creek, Vicee Canyon Creek and Combs Canyon along with small portions of adjoining watersheds. Perennial flows from Ash Canyon Creek and North Fork Kings Canyon Creek are partly diverted into the Carson City Water distribution system and these watersheds are considered important municipal watersheds. Ash Canyon and Kings Canyon comprise a high percentage of the Carson City water supply. The remainder of the surface flows from these creeks supply appropriated water uses downstream for irrigation and stock watering purposes. Beneficial uses for the waters of Ash Canyon Creek and North Fork Kings Canyon Creek are domestic and culinary use, recreation, stock watering, irrigation and fire protection. Vicee Canyon Creek is also a perennial stream and is not diverted for domestic water uses, surface flows seasonally extend to the lower reaches above Carson City where they are captured into infiltration basins to enhance local aquifers that the City extracts ground water from for water supply. Combs Canyon is an ephemeral stream that flows primarily during snow melt or from rain runoff. All of the primary watersheds in the burn area have multiple ephemeral streams as tributaries.

The watersheds range in elevation from 5000 feet above sea level to approximately 9300 feet and have a moderate to steep gradients. All drainages discharge onto typical alluvial debris type fans and then onto outwash flood plains where Carson City presently exists. Excessive flows that occur from the main drainages of the fire area are routed through the Carson City storm drain system and then directed to the Carson River, east of Carson City which also has several beneficial uses and water quality concerns.

Stream flows sustain riparian vegetation important to aquatic species and wildlife, water quality, quantity and provide channel structure and integrity. Current (as of July, 2004) base stream flows for Ash Canyon Creek, North Fork Kings Canyon Creek and Vicee Canyon Creek are as follows: Ash: 1.5 to 2.3 cubic feet per second (CFS), North Kings: 1.0 to 1.5 CFS, and Vicee < 0.10 CFS. All perennial streams are spring dominated systems and have snow driven runoff peaks in late spring/early summer. The majority of precipitation in the region occurs during the late fall through late spring months in the form of rain and snow, primarily snow above 6000 feet elevation. A smaller percentage of precipitation occurs primarily during convective type storms during the summer months. Summer thunderstorms can be locally intense and have the potential to cause floods and debris flows.

Average annual precipitation for the burn area ranges from 12 inches (water) at Carson City to 30 inches plus in the upper watersheds. All watersheds within the fire area have histories of flood and debris flow events caused by summer convection type storms and more typically from intense winter/spring rain on snow events which can create the most significant flood events. Peak flows, predicted post fire peak flows are discussed in a separate section of this report.

Post Fire Watershed Conditions/Fire Consequences/Emergency Determinations/Water Quality Concerns

Aerial and land reconnaissance was completed of the burned watersheds and also along the wild land urban interface areas of the fire. Local information from specialists and city officials was obtained in order to better understand watershed characteristics and city infrastructure associated with the fire area. The following describes the post-fire watershed conditions by watershed (sixth field Hydrologic Units), fire consequences to values at risk and emergency determinations. Water quality concerns are discussed also.

Appendix N Vicee Canyon Project Worksheet Excerpt

PROJECT WORKSHEET REPORT

DECLARATION NO. FEMA-NV - DR1629
FIPS NO. 510-09700-00
APPLICANT NAME CARSON CITY
SUBDIVISION
FEMA PW # 415 VSN 1 REF# CC-4

PREPARED DATE 08/26/2009
REPORT DATE 12/21/2009 07:45
INF TYPE ○ INF ● NON-INF ○ REC

COST ESTIMATE

ITEM	VSN	CODE	MATERIAL AND/OR DESCRIPTION	UOM	QTY	UNIT PRICE	COST
1	0	0000	TO BE COMPLETED	LS	1	$.00	$0.00
2	0	9999	TYPE 2 ROAD BASE MATERIAL	CY	223	$10.00	$2,230.00
3	0	3020	FILL (UNCLASSIFIED)	CY	12440	$6.00	$74,640.00
4	0	3390	TOPSOIL AND SEEDING (HYDR.)	SY	14000	$1.00	$14,000.00
5	0	0909	HAZARD MITIGATION PROPOSAL	LS	1	$23,915.00	$23,915.00
6	1	9991	LESS PRIOR APPROVED COSTS	LS	1	$-114,785.00	($114,785.00)
7	1	9990	TOTAL FIR ELIGIBLE COST	LS	1	$49,767.00	$49,767.00

Eligible Amounts:		
	Total (this version)	($65,018.00)
	Total Oblig To Date	$49,767.00
	Unobligated + Obligated	$49,767.00
	Federal Share for Obligated and Unobligated	$37,325.25

PROJECT WORKSHEET REPORT

DECLARATION NO. FEMA-NV - DR1540
FIPS NO. 510-09700-00
APPLICANT NAME CARSON CITY
SUBDIVISION
FEMA PW # 45 VSN 1 REF# CC-020

PREPARED DATE 06/01/2005
REPORT DATE 07/27/2005 11:20
INF TYPE ○ INF ● NON-INF ○ REC

COST ESTIMATE

ITEM	VSN	CODE	MATERIAL AND/OR DESCRIPTION	UOM	QTY	UNIT PRICE	COST
20	1	3352	CMP 15" (FURNISH AND INSTALL)	LF	40	$20.00	$800.00

Eligible Amounts:		
	Total (this version)	$470,221.70
	Total Oblig To Date	$767,364.62
	Unobligated + Obligated	$767,364.62
	Federal Share for Obligated and Unobligated	$575,523.47

Appendix O List of Tables

Appendix P List of Figures

R. Radiological Emergency Response Plan

Nevada Revised Statutes (NRS) Chapter 459 designates the Nevada Division of Public and Behavioral Health as the state radiation control agency. NRS 459 further mandates the agency to develop programs to evaluate and respond to hazards from sources of ionizing radiation. Examples of these radiation sources include machine-made radiation such as Radiation Producing Machines (including Mammography) and Radioactive Materials used in medicine, research and industry.

675 Fairview Drive, Suite 218
Carson City. NV 89701
Phone: (775) 687-7550
Fax: (775) 687-7552
Email: radiationcontrolprogram@health.nv.gov

Due to the sensitive nature of information contained in the, *State of Nevada Radiological and Nuclear Concept of Operations*, the plan is not included here. For assistance, refer to the following links:

https://dpbh.nv.gov/Reg/Radiation_Control_Programs/

https://dpbh.nv.gov/Reg/Radiation-Incidents/Radiation-Incidents_-_Home/

S. State of Nevada Mitigation Success Stories

MITIGATION SUCCESSES

Nevada Division of Emergency Management/Homeland Security
Hazard Mitigation Section

PURPOSE

The purpose of this report is to highlight mitigation successes, since Nevada's highest volume of declared disasters in State History. In 2017 Nevada experienced unprecedented natural disasters, and as a result areas of vulnerability and severe damage were identified for Hazard Mitigation Activities. Within this page is a highlighted summary of mitigation achievements in the last 6 years. The subsequent pages break this summary out into individual projects across Nevada that have successfully mitigated against hazards to present and for the future.

Risk and Issue History

Loss/Damage Occurrence	Population Affected	Location	Project/Activity
Numerous power outages.	58,993+	Carson City	Portable Well Generators x 4
Numerous power outages	58,933+	Carson City	4 Stationary Well Generator
Flooding- 1986, 1997, 2005	204 homeowner properties, cascading affects to services and infrastructure	Douglas County	SR 88 Drain Culvert
Flooding - 2017	9 Homeowner properties	Washoe County	Home Acquisitions
Flooding 1997, 2017	24 Homeowner Properties	Washoe County	Home Elevation

APPENDIX S State of Nevada Mitigation Success Stories

Mitigation Activity

Location	task	% Done	Completion date	funding source	Activity Cost
Carson City, NV	Purchase of 4 Portable Emergency Well Generators	100%	07/31/2019	DR 4303 HMGP 2017	$1,115,125
Carson City, NV	Purchase of 4 Stationary Emergency Well Generators	100%	10/31/2019	DR 4307 HMGP 2017	$1,343,868
Douglas County, NV	Drain Culvert	100%	08/14/2021	PDM 2014	$2,148,900
Washoe County, NV	Home Acquisitions	90%		DR 4303 HMGP 2017	$2,204,581
Washoe County, NV	Home Elevation	70%		PDM 2016, HMGP 2017-DR 4303, HMGP Post Fire 5154	$3,744,680

Budget Overview

Total Report Mitigation Activity Cost	Total Report Avoided Damages After mitigation	Total Report BCA
$10,557,154	**$17,299,180**	**1.63**

MITIGATION SUCCESSES

Nevada Division of Emergency Management/Homeland Security
Hazard Mitigation Section

SUMMARY- CARSON CITY- EMERGENCY WELL GENERATORS

Carson City's Public Works Department provides potable water through approximately 17,500 service connections (residential, commercial, and governmental) within an overall service area that extends north to the Goni Canyon Area, south to the Douglas County border, east to the Lyon County border, and west to the Sierra foothills. The total population of Carson City is over 54,742. Water production facilities include the Quill Surface Water Treatment plant and 30 groundwater wells. Additional water is supplied from Douglas County to the south via a 24" transmission main. While the City has over 30 ground water wells, the four most critical wells in the Carson City water system are Wells 3, 24, 41 and 55. Carson City Wells 10,11, 40, and 51 are also critical facilities.

Carson City weather regularly includes severe thunderstorm wind events in the summer months, windstorms with gusts more than 80 to 100 miles per hour in the winter, and winter storms that generate either heavy rainfall that leads to flooding or light snowfall (up to 5 inches) to heavy snowfall (12-24 inches). Such storm events result in frequent power outages.

In January and February 2017, Carson City suffered from two large winter storm and flooding events each lasting several days and resulting in emergency declarations. While there were minor power outages periodically throughout both events, fortunately there was no loss of water service due to power outage. However, the magnitude of these events demonstrated the need to have backup power resources in place. The severity of each of these events could have been exacerbated had residents and businesses been without critical water supplies.

To mitigate against the outlined vulnerability Carson City purchased and installed four stationary emergency generators and purchased four portable emergency generators as back up for the protection of critical facilities which serve water to the residents of Carson City. One of the stationary generators is near a Riverview sewer lift station which allows for a shared generator use to also protect a critical sewer facility.

Carson City - Emergency Well Generators

Risk and Issue History

Loss/Damage occurrence	Population Affected	Project/Activity
Numerous power outages with potential to affect water supply.	Carson City Wells 10B, 11, 40, 51	Purchased Portable Well Generator
Numerous power outages with potential to affect water supply.	Carson City Wells-3,24,41,55	Purchased 4 Stationary Well Generators

Mitigation Activity

task	% Done	Completion date	funding source	notes
Purchase of 4 Portable Emergency Well Generators	**100%**	**07/31/2019**	**DR 4303 HMGP 2017**	
Purchase of 4 Stationary Emergency Well Generators	**100%**	**10/31/2019**	**DR 4307 HMGP 2017**	

Budget Overview

Mitigation Activity cost	Avoided Damages After Mitigation	BCA
$1,115,125	**$8,832,220**	**6.57**
$1,343,868	**$8,832,344**	**6.57**

CONCLUSIONS/RECOMMENDATIONS

MITIGATION SUCCESSES

Nevada Division of Emergency Management/Homeland Security
Hazard Mitigation Section

SUMMARY- DOUGLAS COUNTY- SR 88 CULVERT

State Route 88 Flood Mitigation Project was implemented to reduce damages to roadway infrastructure, decrease costs and repair time, and reduce community impacts due to roadway closures resulting from flood damage to the State Route 88 bridge at the East Fork Carson River, as well as minimize or eliminate the risk of flooding for approximately 204 residences, existing public facilities including the Douglas County's Emergency Command Center, Douglas County Library, East Fork Swimming Pool, and several commercial buildings.

The project constructed concrete culverts beneath State Route 88 that serve to pass high flows under State Route 88 and thereby reduce potential for overtopping and damage at the existing East Fork Carson River and Cottonwood Slough bridges. The project also included removal of a former bridge abutment located upstream of the existing bridge structure that served only to introduce unsteady and unstable flow conditions at the bridge during flood events.

The outcomes of this project included: 1) Increased ability for high flows to pass beneath State Route 88 at both the East Fork Carson River and Cottonwood Slough crossings, 2) Reduced frequency that State Route 88 is and resulting impacts at East Fork Carson River and Cottonwood Slough bridge, 4) Removal of old bridge abutment, located immediately upstream of East Fork Carson River bridge, and, 5) Reduction in flood risks to numerous residences, and existing public facilities. The result of breaking the damage-repair cycle reduced the necessary budget for providing emergency services associated with flood events, as well as economic impacts associated with roadway closures being drastically reduced. The project also reduced the likelihood of river-related flood impacts to nearby residences and businesses. Based upon the post project model results in the Preliminary Hydraulic Analysis (Attachment 17), it is estimated that over 204 properties will benefit from lower flood depth levels and approximately 133 of these will be removed from the primary flood zone. Of the 204, 100 of these residences are NFIP insured. Sixty of the NFIP residences will potentially be completely removed from the flood zone. Estimating a conservative average flood insurance premium of $1,000 per year this could save the community $60,000 in flood insurance premiums per year. It is likely that the remaining properties with reduced flood depths would also receive a reduction in their flood insurance premiums.

Douglas County- SR 88 Culvert

Risk and Issue history

Loss/Damage Occurrence	Population Affected	Project/Activity
1986,1997,2005	1) Interruption of the primary bi-state highway connecting Carson Valley with Alpine County and surrounding communities in California. 2) Loss of use of SR 88 during these events forces traffic volumes of about 11,000 ADT to alternate community streets. 3) Increased response times for emergency services which also must take alternate routes to respond to calls for assistance. 4) Significant damage to the areas surrounding the existing bridge abutments, resulting in significant and unexpected costs to the residents. 5) Flood risks to 204 residences, existing public facilities, and some existing commercial buildings.	SR 88 Drain Culvert

Mitigation Activity

Task	% Done	Completion date	Funding source	Notes
DOUGLAS COUNTY- SR 88 CULVERT	**100%**	**08/14/2021**	**PDM 2014**	

Budget Overview

Mitigation Activity Cost	Avoided Damages After mitigation	notes
$2,148,900	**$3,618,280**	**1.684**

CONCLUSIONS/RECOMMENDATIONS

MITIGATION SUCCESSES

Nevada Division of Emergency Management/Homeland Security
Hazard Mitigation Section

SUMMARY- WASHOE COUNTY- SWAN LAKE FLOODING- HOME ACQUISITION

The Swan Lake closed basin, unlike a riverine setting, receives and holds water from precipitation for sustained periods of time and can result in persistent and sustained flooding. Evaporation is the only means by which flood waters leave the basin. Persistent basin flooding may result in a situation where certain residents cannot safely access their homes or property for many months, onsite septic systems are temporarily unusable and in limited cases, flood waters may enter occupied living spaces. The acquisition and demolition of nine residential properties and subsequent creation of permanent open space will eliminate the future mitigation costs associated with these certain properties and eliminate any possible risks to first responders who would be called upon to assist these residents.

Starting in September 2016 and continuing through February 2017, record setting precipitation events lead to significant water runoff into the Swan Lake closed basin. This resulted in persistent flooding of certain areas around the Swan Lake closed basin leading to impacts to both public infrastructure and private residences. In response, activities to contain Swan Lake and remove flood waters from certain public and residential areas began. While these activities were successful in eliminating standing flood water from many residential areas, apart from a certain area along Pompe Drive, flood impacts had made four proposed residential properties, as well as other properties not inclusive of this project, temporarily uninhabitable due to either the presence of flood water within the occupied space of specific residences loss of on-site septic systems, or safe access. As a result, five of the families were placed into long term housing while the others moved out and left their homes.

The acquisition and demolition of the proposed 4 residential properties and subsequent creation of permanent open space will eliminate the future mitigation costs associated with these certain properties and eliminate any possible risks to first responders who would be called upon to assist these residents.

Washoe County-Swan Lake flooding- home acquisition

Risk and Issue History

loss/damage occurence	population affected	location of Vulnerability	Project/Activity
2018	4 residences within the Swan Lake area of Washoe County NV.	Swan Lake of Lemmon Valley within Washoe County NV	Home Acquisition of 4 Homes

Mitigation Activity

Task	% Done	Completion date	funding source	notes
Acquisition and Demolition of 4 homes	**90%**		**HMGP 2017-DR 4307**	

Budget Overview

Mitigation Activity Cost	Avoided Damages After Mitigation	Notes
$ 979,813	**$1,104,000**	**1.13 BCA**

CONCLUSIONS/RECOMMENDATIONS

MITIGATION SUCCESSES

Nevada Division of Emergency Management/Homeland Security
Hazard Mitigation Section

SUMMARY- WASHOE COUNTY- HIDDEN VALLEY- HOME ELEVATIONS

The Truckee River Flood Management Project (Flood Project) identified flood prone single family residential structures for elevation within the Hidden Valley Subdivision/ area in Reno. These structures are located within the floodplain of Steamboat Creek and/ or Boynton Slough, within the Backwater Zone of the Truckee River. Since the Base Flood Elevation (BFE) was determined, updated topo and better modeling techniques have shown that the BFE is in fact 4.8 feet higher than was originally called for and these homes were built too low. Home Elevation is considered by FEMA to be one of the best ways to protect your home, your family and your possessions. The projects highlighted in this report plans to elevate the lowest floor of these identified homes that were constructed below the Base Flood Elevation (BFE). Each residence will be elevated to at least 3 feet above the BFE. However, TRFMA will coordinate with the homeowners to encourage elevation higher than 3 feet above BFE since the cost of additional elevation and floodproof materials is minimal once the home is already mobilized. This project will increase life and safety during a flood event while reducing FEMA costs of potential payouts in claims. Betterments are borne by homeowners. The structures all have been damaged repeatedly due to historical flooding. As an example, at least one of these homes has historically been on the repetitive loss list. Elevating these homes will reduce future costs on the NFIP program due to inevitable future flooding in this area. This will also improve life and safety issues as these residents will have a refuge during a flood event. It will also reduce risks to first responders who are sent into these flooded areas to serve or save these residents. Often these flood waters are near freezing in temperature and may be hazardous or contaminated. Any interaction that prevents personnel from entering these flooded areas is of benefit.

Washoe County- Hidden valley- home elevations

Risk and Issue History

Loss/Damage Occurrence	Population Affected	Location of Vulnerability	Project/Activity
1986, 1997, 2005, 2017	24 residences within the Hidden Valley area of Washoe County NV.	Hidden Valley of Reno within Washoe County NV	Home Elevation

Mitigation Activity

Task	% Done	Completion Date	Funding Source	Notes
Group 1- 10 Home Elvations	**100%**	**08/2022**	**PDM 2016**	
Group 2- 11 Home Elevations			**HMGP 2017-DR 4303**	
Group 3- 3 Homes			**HMGP- Post Fire 5154**	

Budget Overview

Mitigation Activity Cost	Avoided Damages After Mitigation	Notes
$1,750,000	**$1,750,000**	**1.0 BCA**
$ 1,379,975	**$1,379,975**	**1.0 BCA**
$614,705	**$614,705**	**1.0 BCA**

CONCLUSIONS/RECOMMENDATIONS

T. State of Nevada Critical Buildings' Vulnerability

This appendix contains analysis of the vulnerability of State of Nevada critical buildings to hazards based on natural hazards in State of Nevada EHMP and also 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. In addition, a standard value of $1,150 per square foot replacement value was used for each building as in Section 3.6.1 and 3.7. As depicted in Section 3.6.1, the total value of critical state buildings is shown in Table T-1. The full table of critical buildings is available on request from DEM.

Table 3-52. State Critical Facilities and Infrastructure

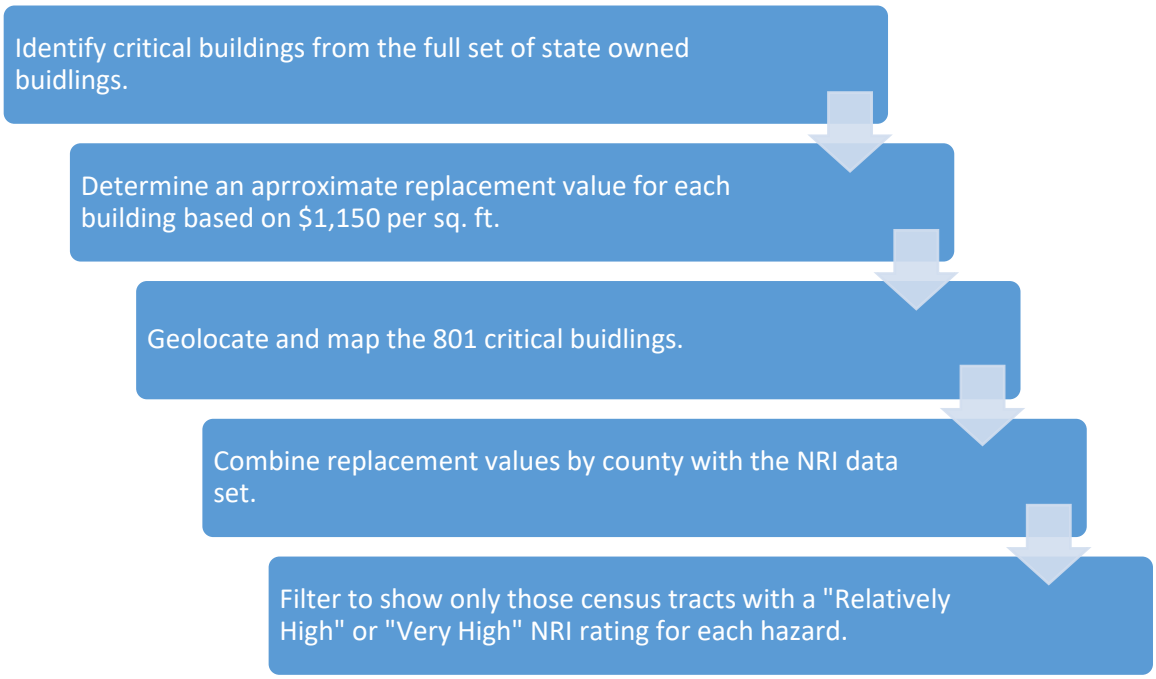
State Departments	Number of Buildings	Facility Replacement Value
Administrative	30	$63,898,250
Conservation and Natural Resources	90	$12,726,500
Military	62	$209,453,500
Nevada System of Higher Education	117	$1,045,487,250
Veteran Services	9	$51,442,500
Department of Wildlife	22	$1,669,250
Department 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[1]	1	$3,000,000
Total	**801**	**$2,679,382,750**

[1] Caliente Bridge maintained by HHS. NDOT maintains its own inventory of bridges.

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.

The process for conducting the State critical building vulnerability assessment is as follows:



The vulnerability maps are only included for those hazards selected for the NRI and that have an NRI rating of "Relatively High" or "Very High." These levels of NRI risk rating were chosen to focus on areas in which the risk is significant enough to impact state buildings. 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). The NRI ratings are based on a comparison with jurisdictions nationally. Therefore, Nevada's hazards may be relatively higher or lower than expected based on a comparison of Nevada jurisdictions only.

Note that subsidence is in the State of Nevada EHMP and is in half of the states' HMPs, but is not included because there is no reliable, nationwide dataset.

Table T-2 is a summary of the hazards profiled.

Table T-2. Hazards Profiled in Appendix T.		
Hazard	**Appendix T Map Yes/No**	**Reason for non-inclusion**
Avalanche	No	No census tracts of "Relatively High" or "Very High"
Drought	Yes	N/A
Earthquake	Yes	N/A
Expansive Soils	No	Not profiled in the NRI
Extreme Heat (Heat Wave)	Yes	N/A
Fissures & Subsidence	No	Not profiled in the NRI
Floods	Yes	N/A
Infectious Diseases	No	Not profiled in the NRI
Infestation	No	Not profiled in the NRI
Landslide	Yes	N/A
Seiche	No	Not profiled in the NRI
Strong Wind	No	No census tracts of "Relatively High" or "Very High"
Thunderstorm (Hail)	No	No census tracts of "Relatively High" or "Very High"
Thunderstorm (Lightning)	Yes	N/A
Tornado	No	No census tracts of "Relatively High" or "Very High"
Volcano	No	No census tracts of "Relatively High" or "Very High"

Table T-2. Hazards Profiled in Appendix T.		
Hazard	**Appendix T Map Yes/No**	**Reason for non-inclusion**
Winter Storm (Ice Storm)	No	No census tracts of "Relatively High" or "Very High"
Winter Storm (Cold Wave)	Yes	N/A
Wildfire	Yes	N/A

Overall State Critical Building Vulnerability

Figure T-1. Overall State Critical Buildings Vulnerability - Statewide.

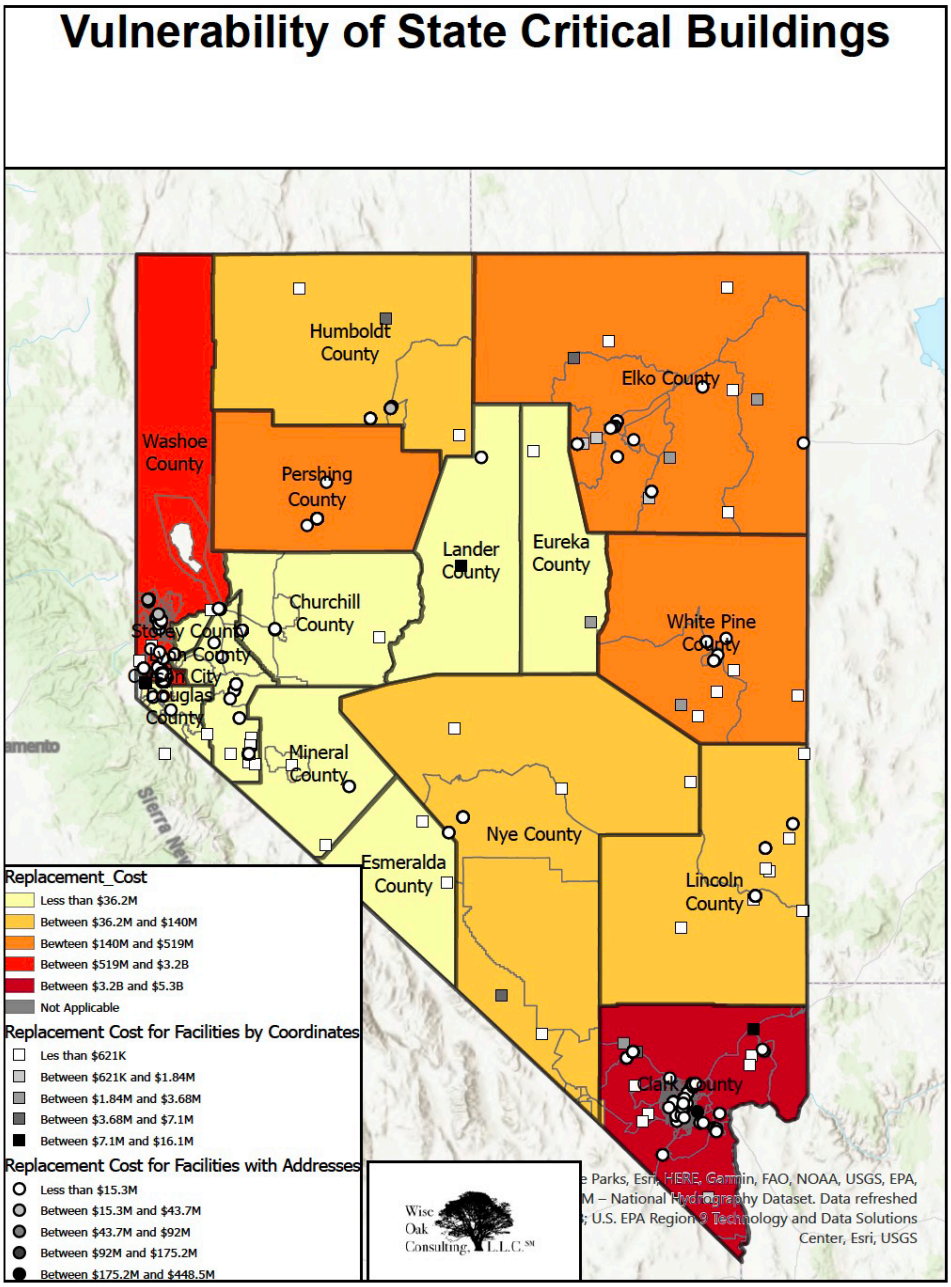
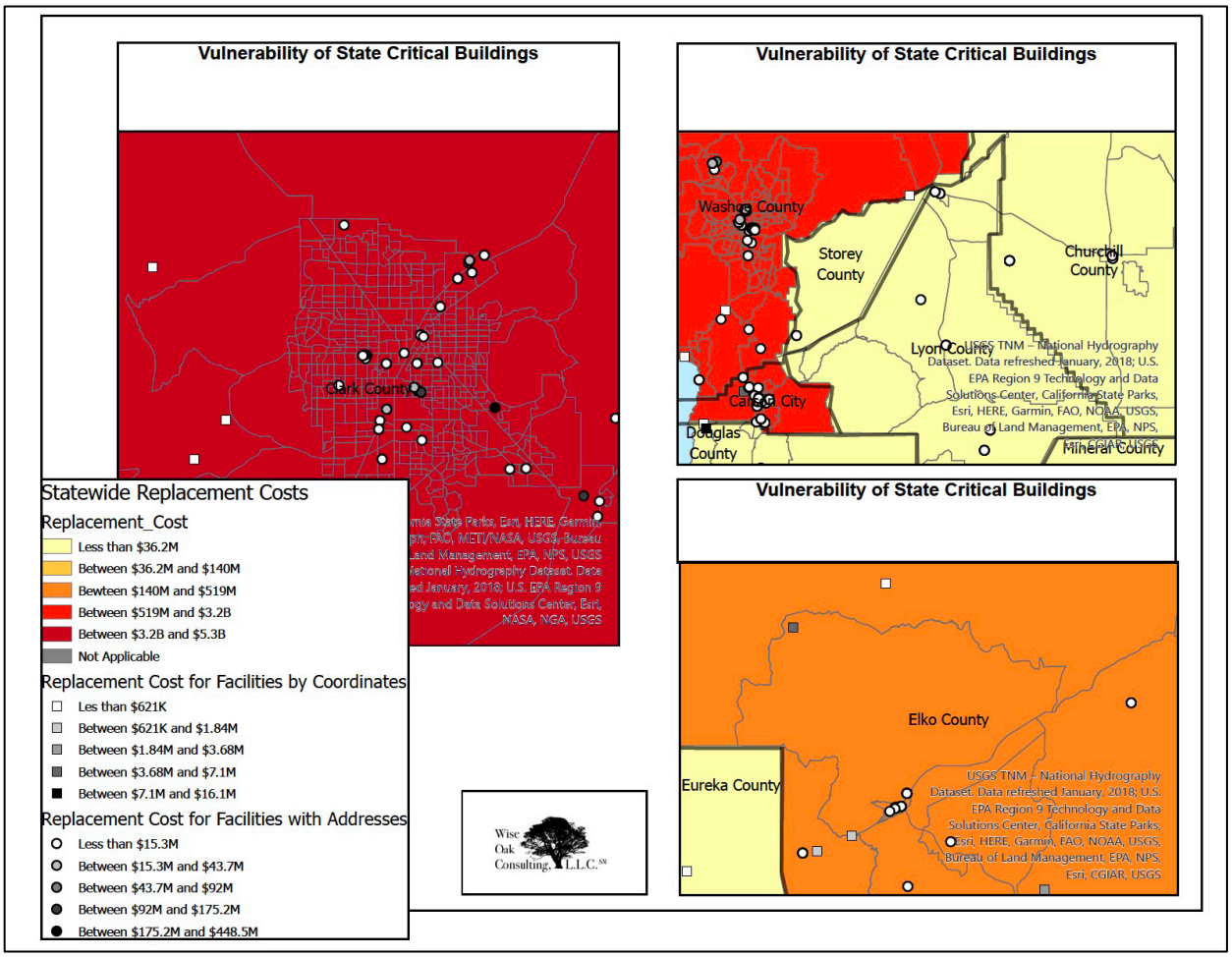


Figure T-2. Overall State Critical Buildings Vulnerability – More Heavily Populated Areas.



Drought

While drought affects agriculture more than state facilities, many critical state facilities are pump houses, which could be affected by drought.

Figure T-3. Drought State Critical Buildings Vulnerability - Statewide.

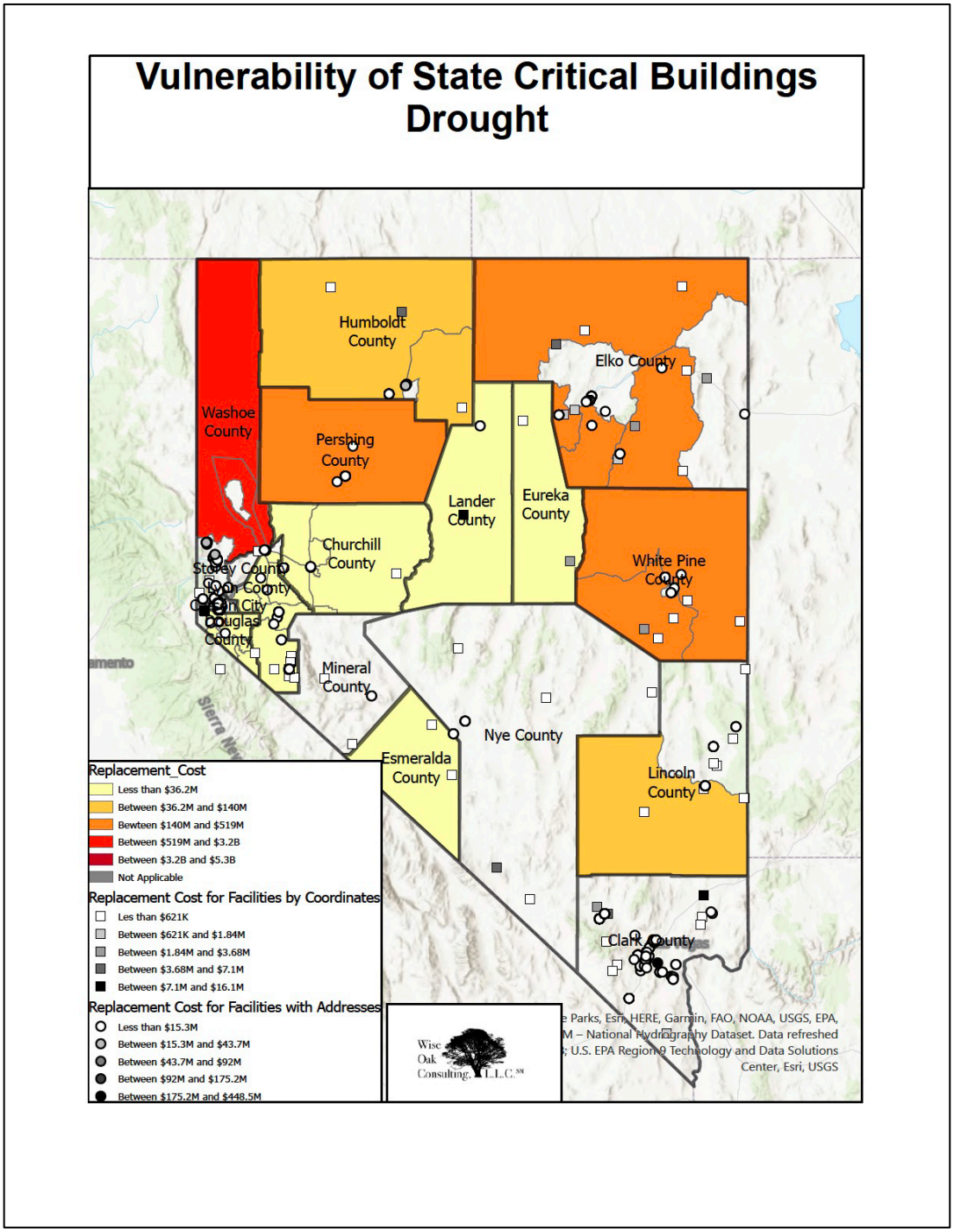
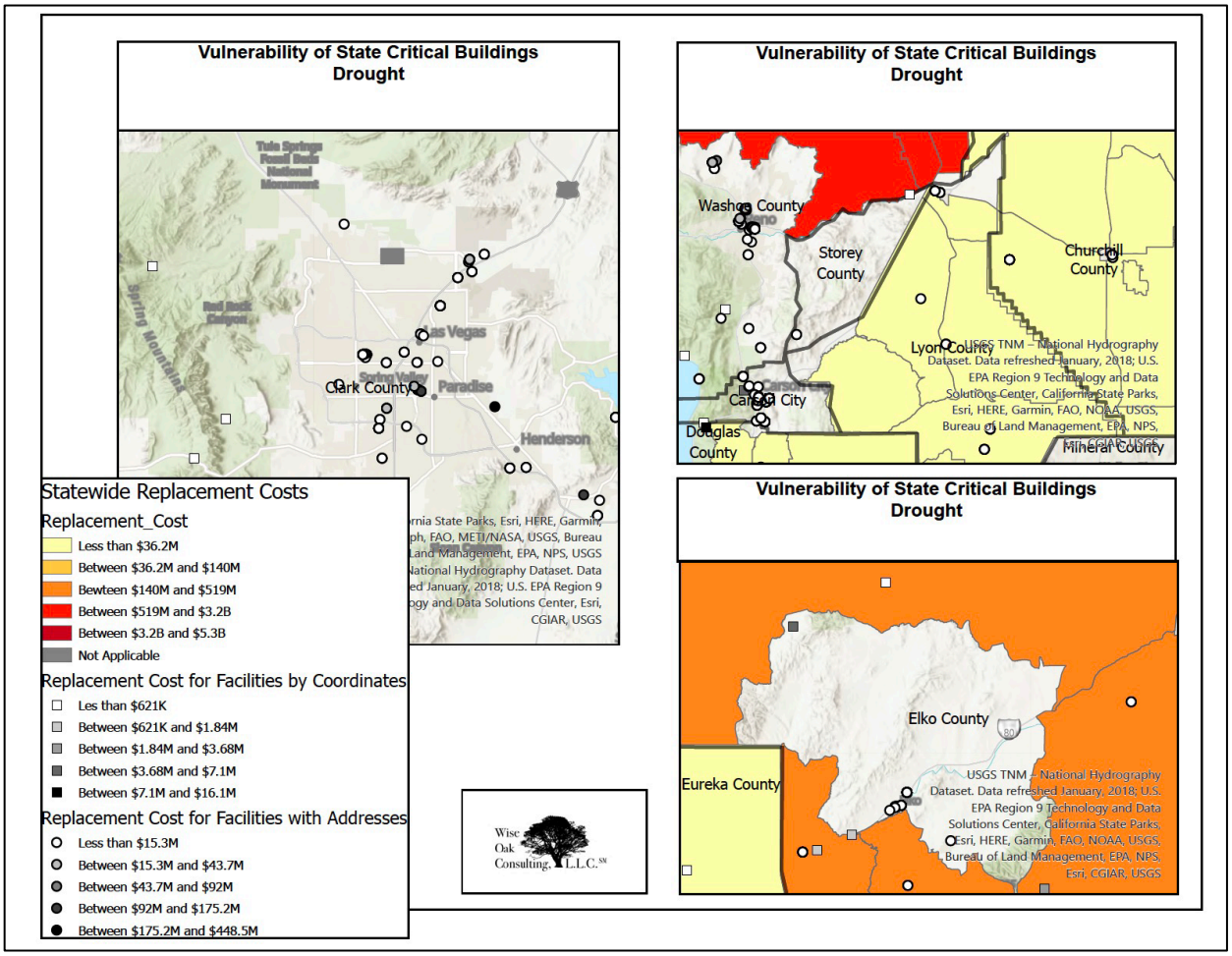


Figure T-4. Drought State Critical Buildings Vulnerability – More Heavily Populated Areas.



Earthquake

Figure T-5. Earthquake State Critical Buildings Vulnerability - Statewide.

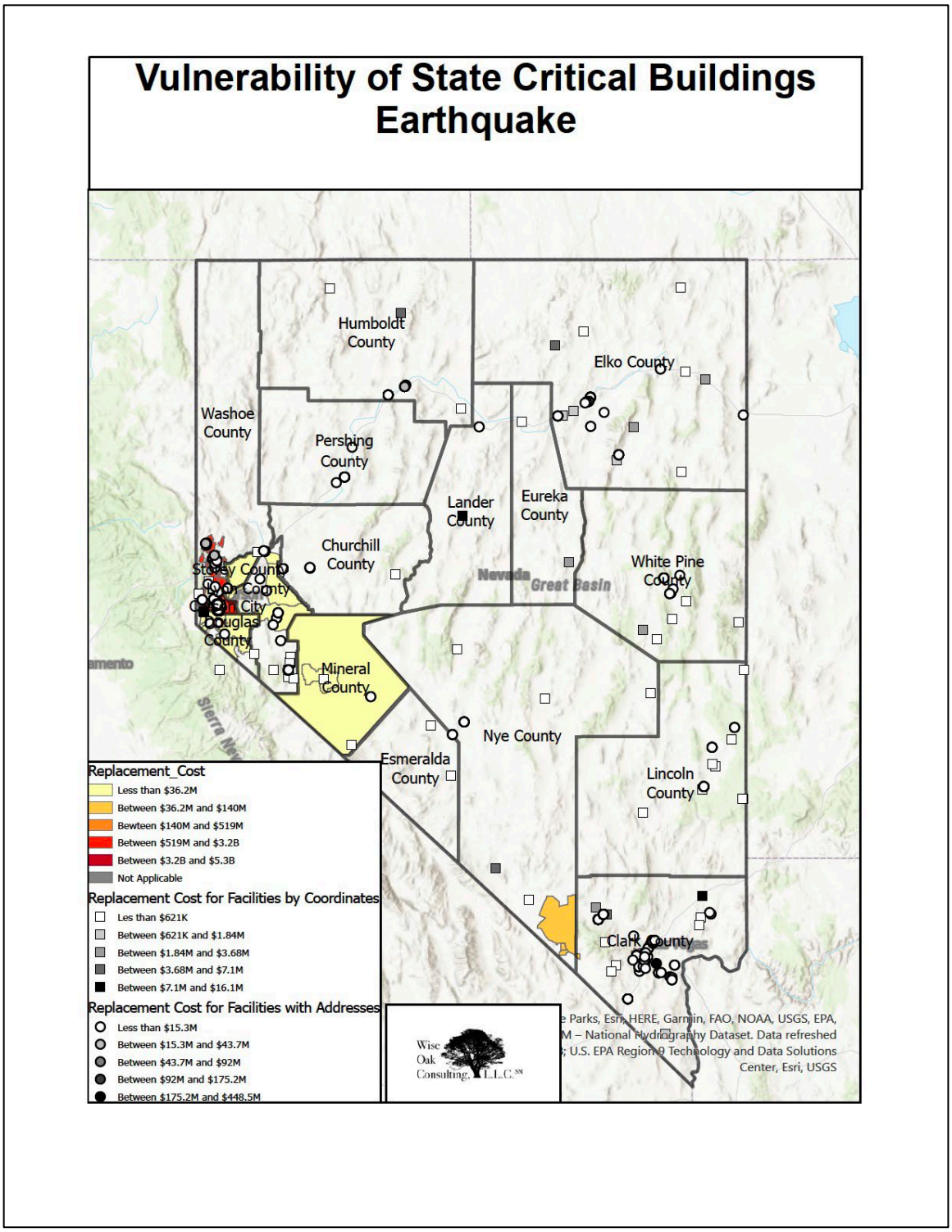
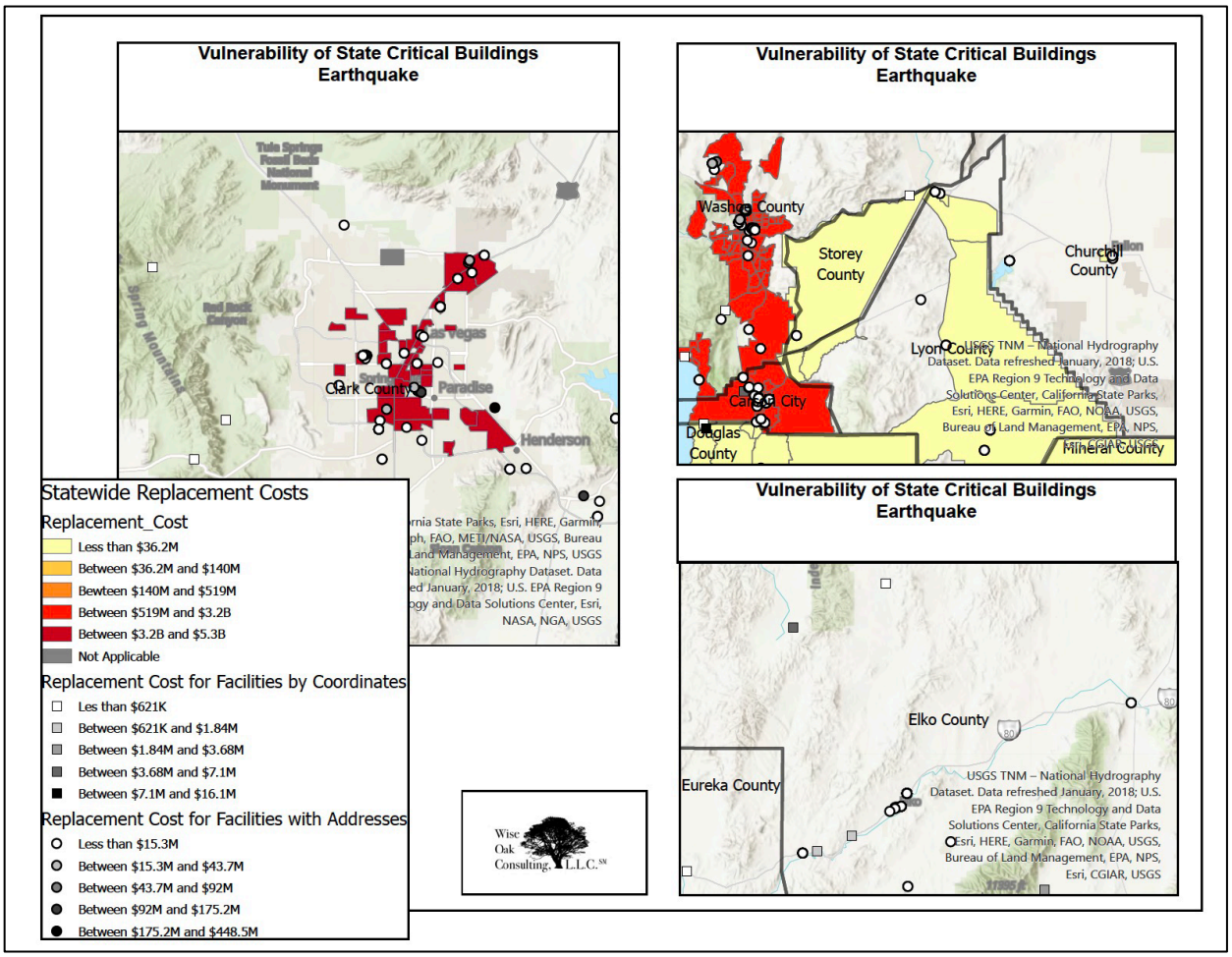


Figure T-6. Earthquake State Critical Buildings Vulnerability – More Heavily Populated Areas.



Extreme Heat

While extreme heat affects agriculture and humans more than state facilities, many critical state facilities are pump houses, which could be affected by extreme heat.

Figure T-7. Extreme Heat State Critical Buildings Vulnerability - Statewide.

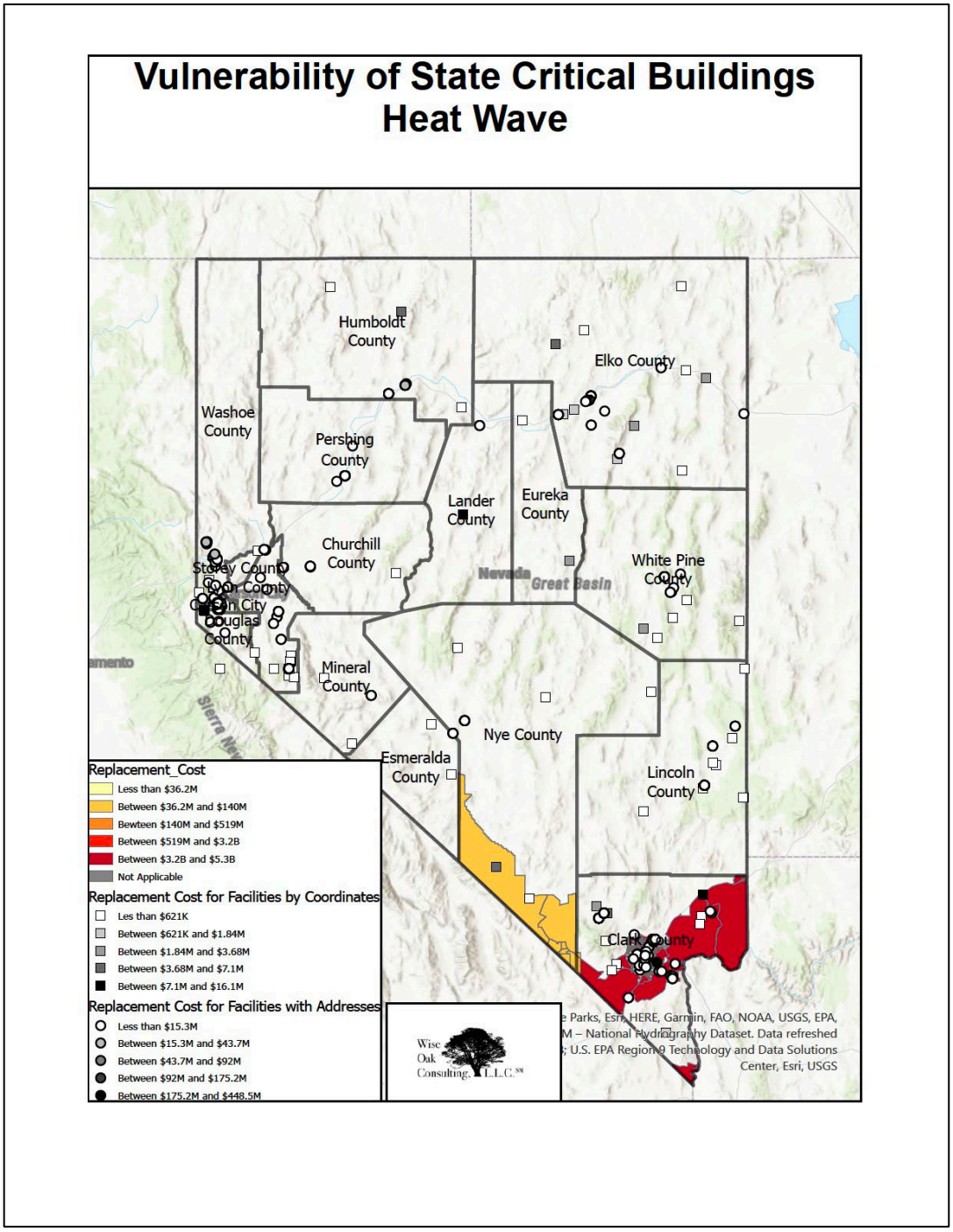
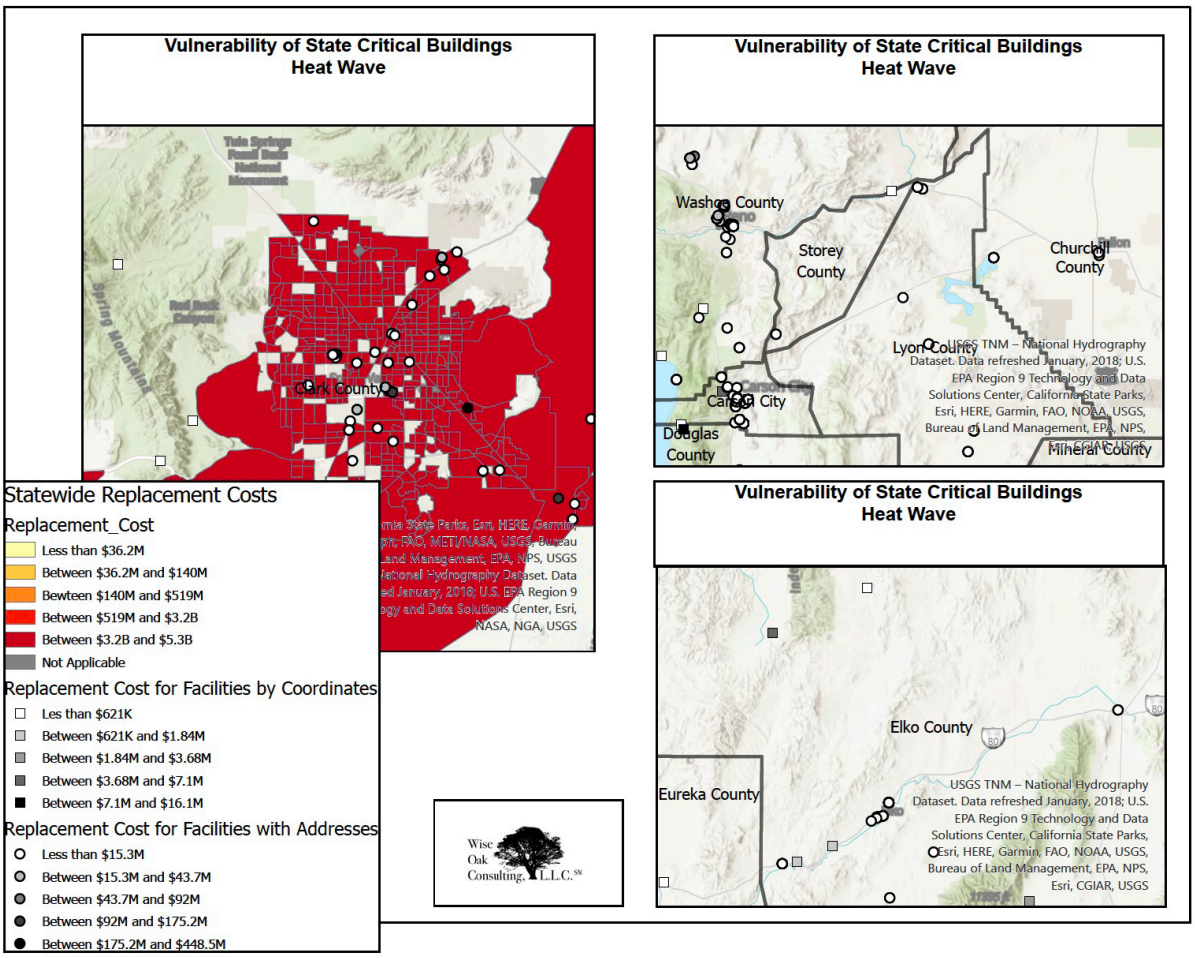


Figure T-8. Extreme Heat State Critical Buildings Vulnerability – More Heavily Populated Areas.



Floods

Figure T-9. Floods State Critical Buildings Vulnerability - Statewide.

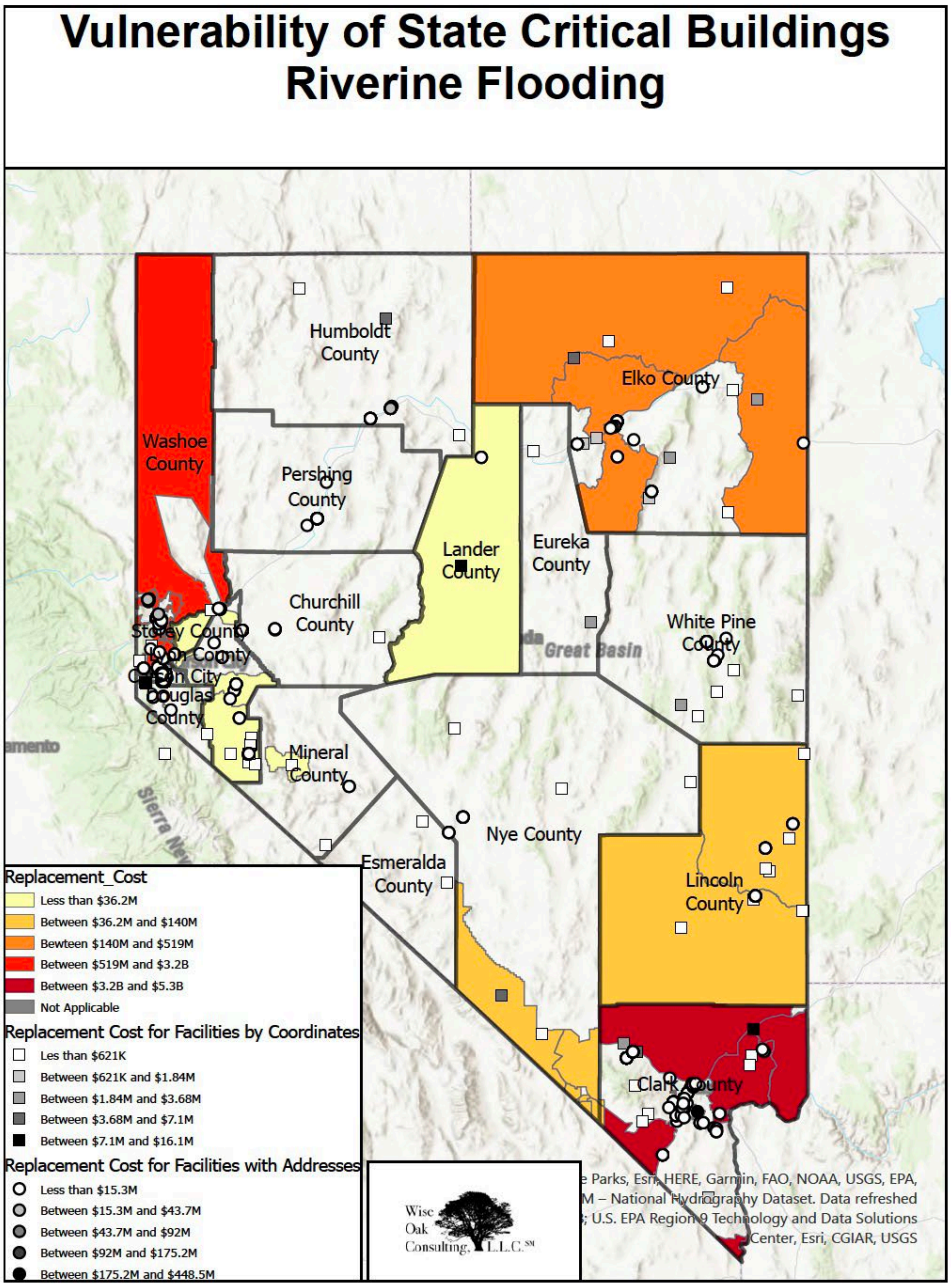
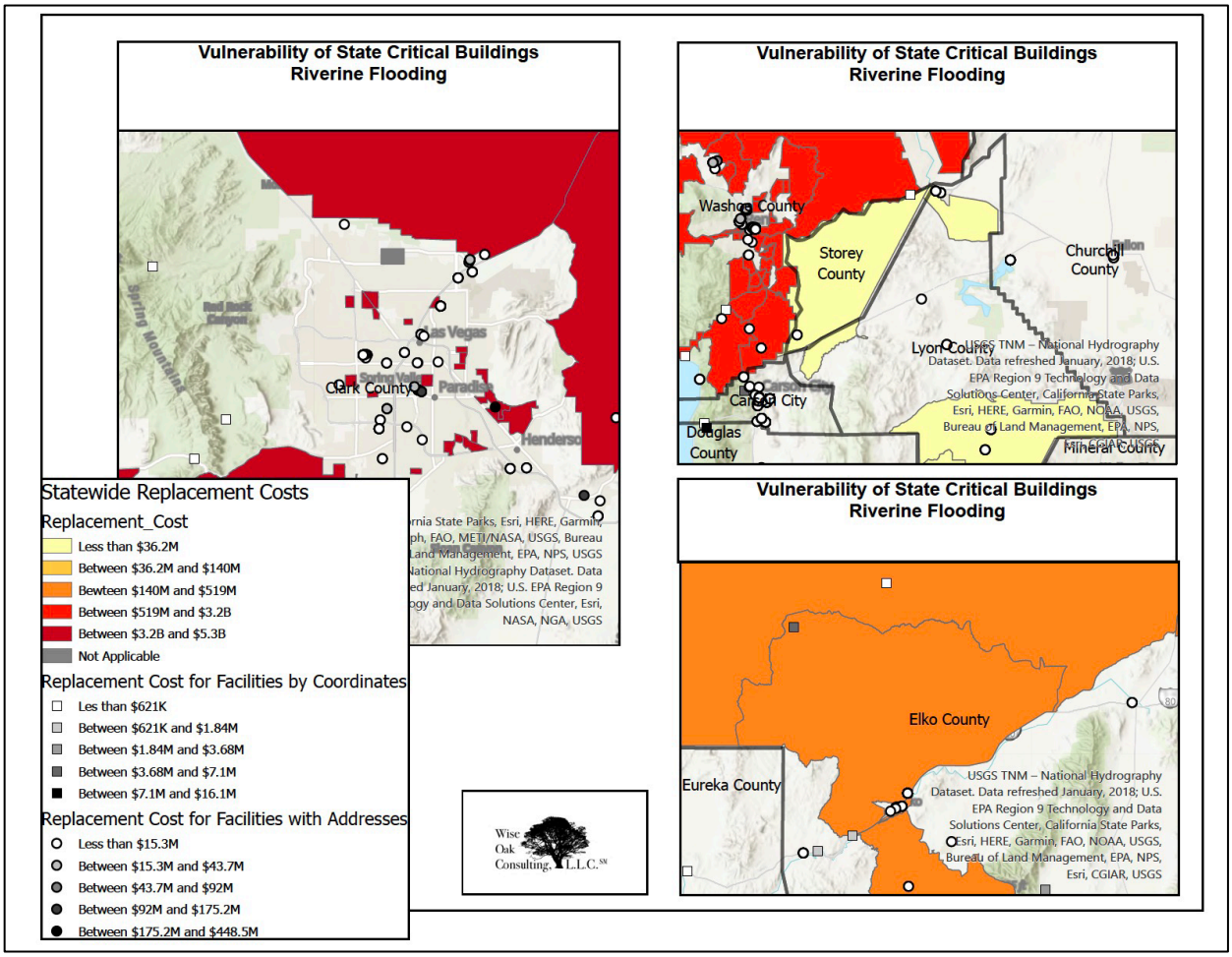


Figure T-10. Floods State Critical Buildings Vulnerability – More Heavily Populated Areas.



Landslide

Figure T-11. Landslide State Critical Buildings Vulnerability - Statewide.

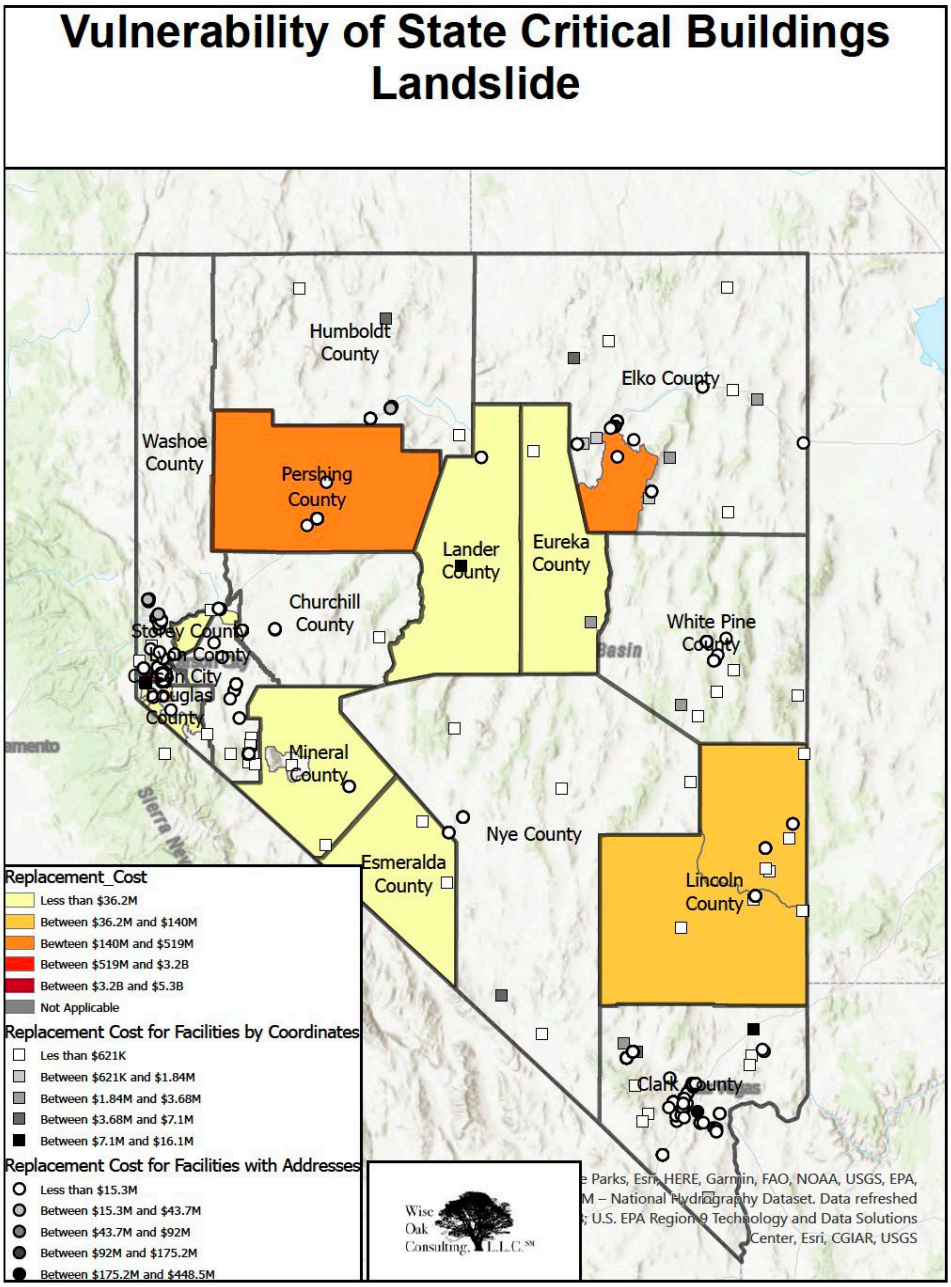
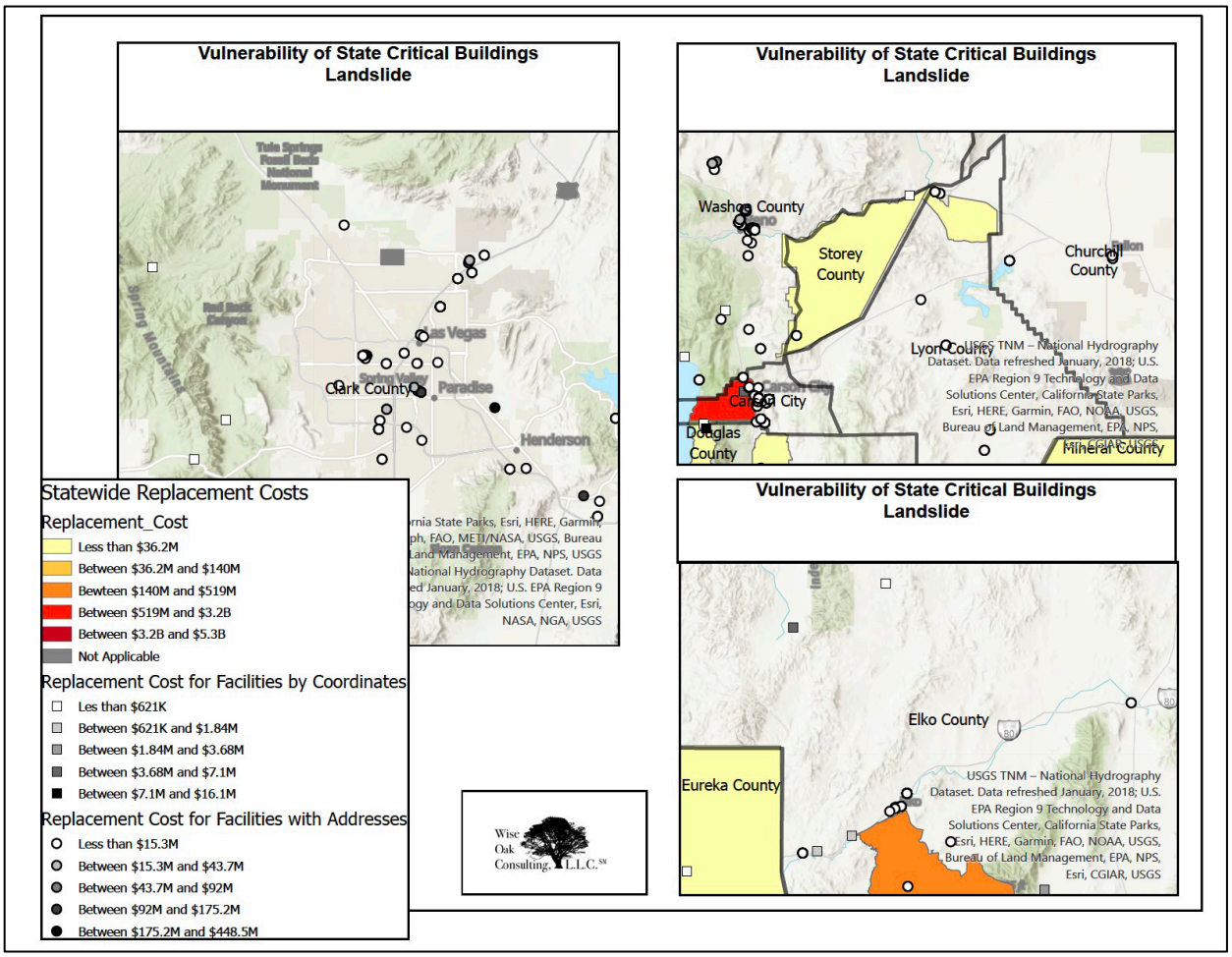


Figure T-12. Landslide State Critical Buildings Vulnerability – More Heavily Populated Areas.



Thunderstorms

Figure T-13. Lightning State Critical Buildings Vulnerability - Statewide.

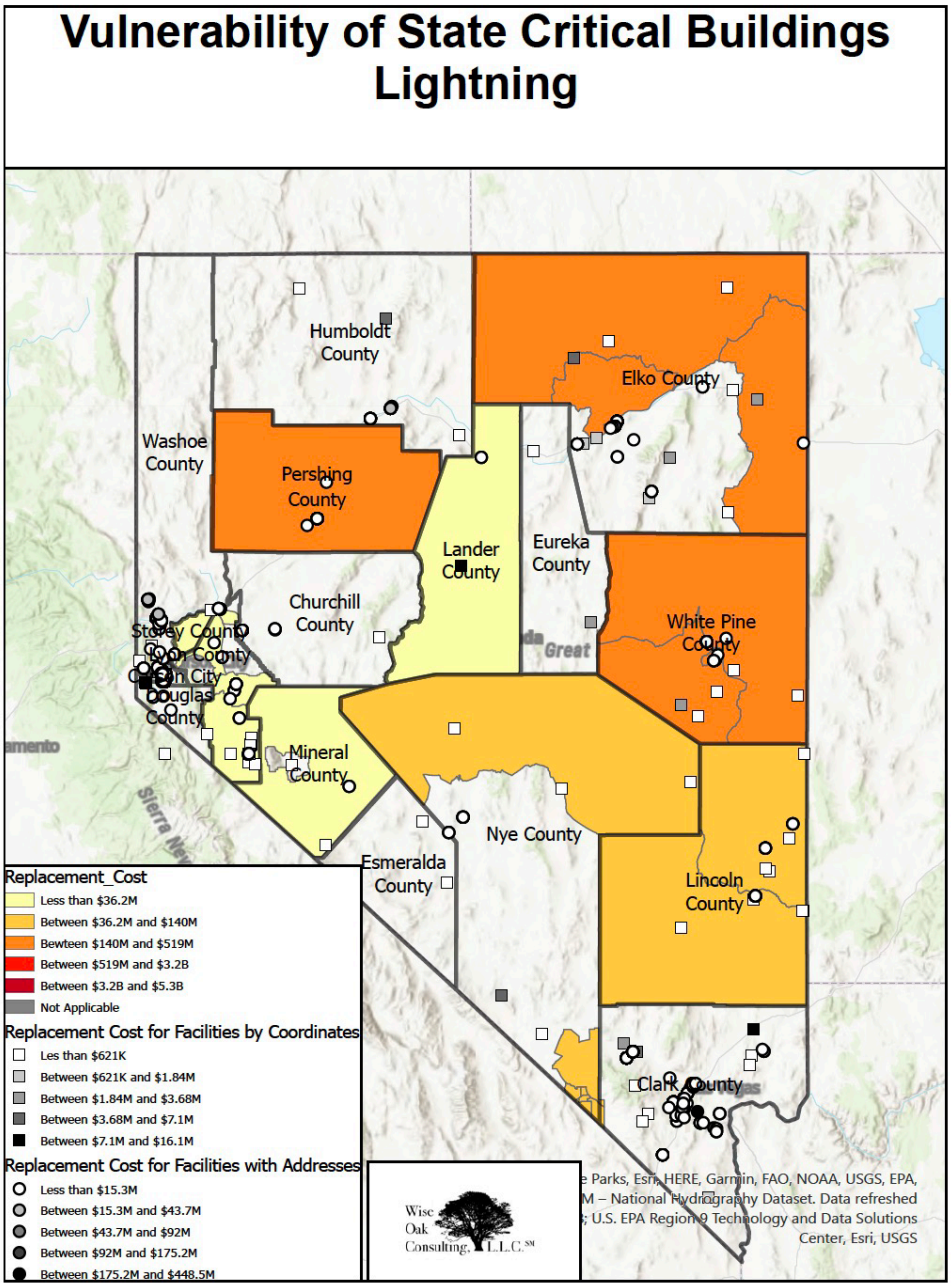
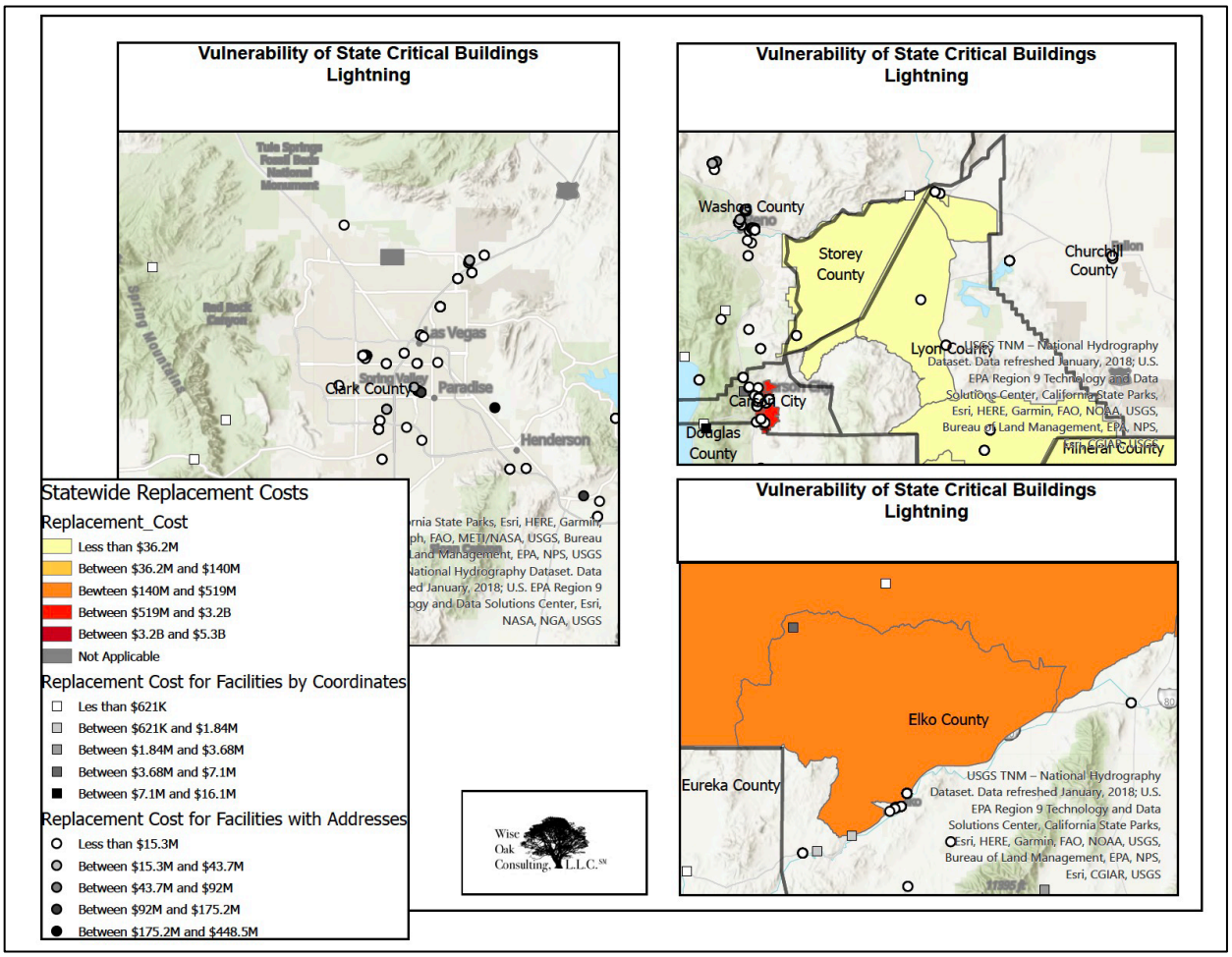


Figure T-14. Lightning State Critical Buildings Vulnerability – More Heavily Populated Areas.



Wildfire

Figure T-15. Wildfire State Critical Buildings Vulnerability - Statewide.

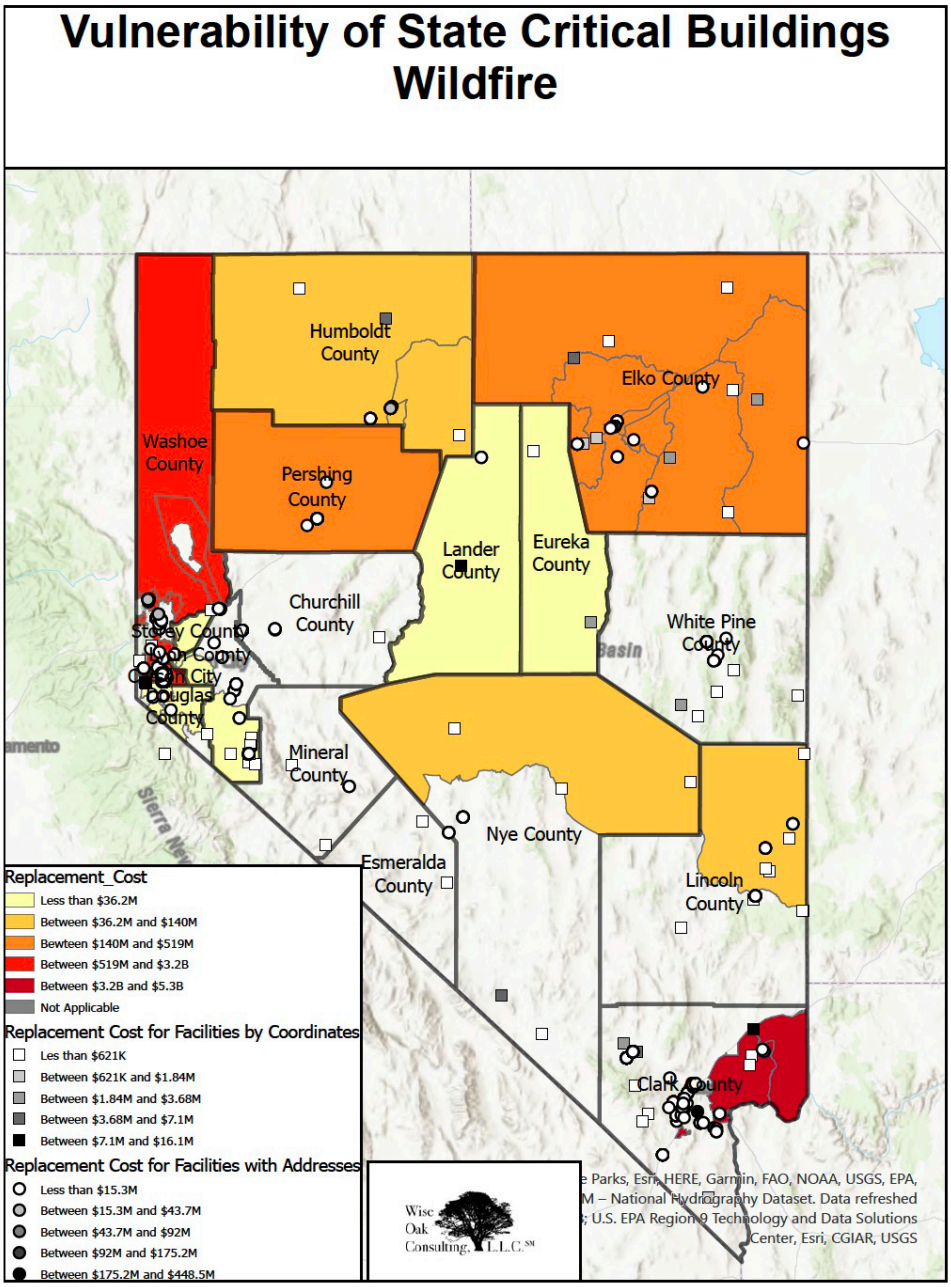
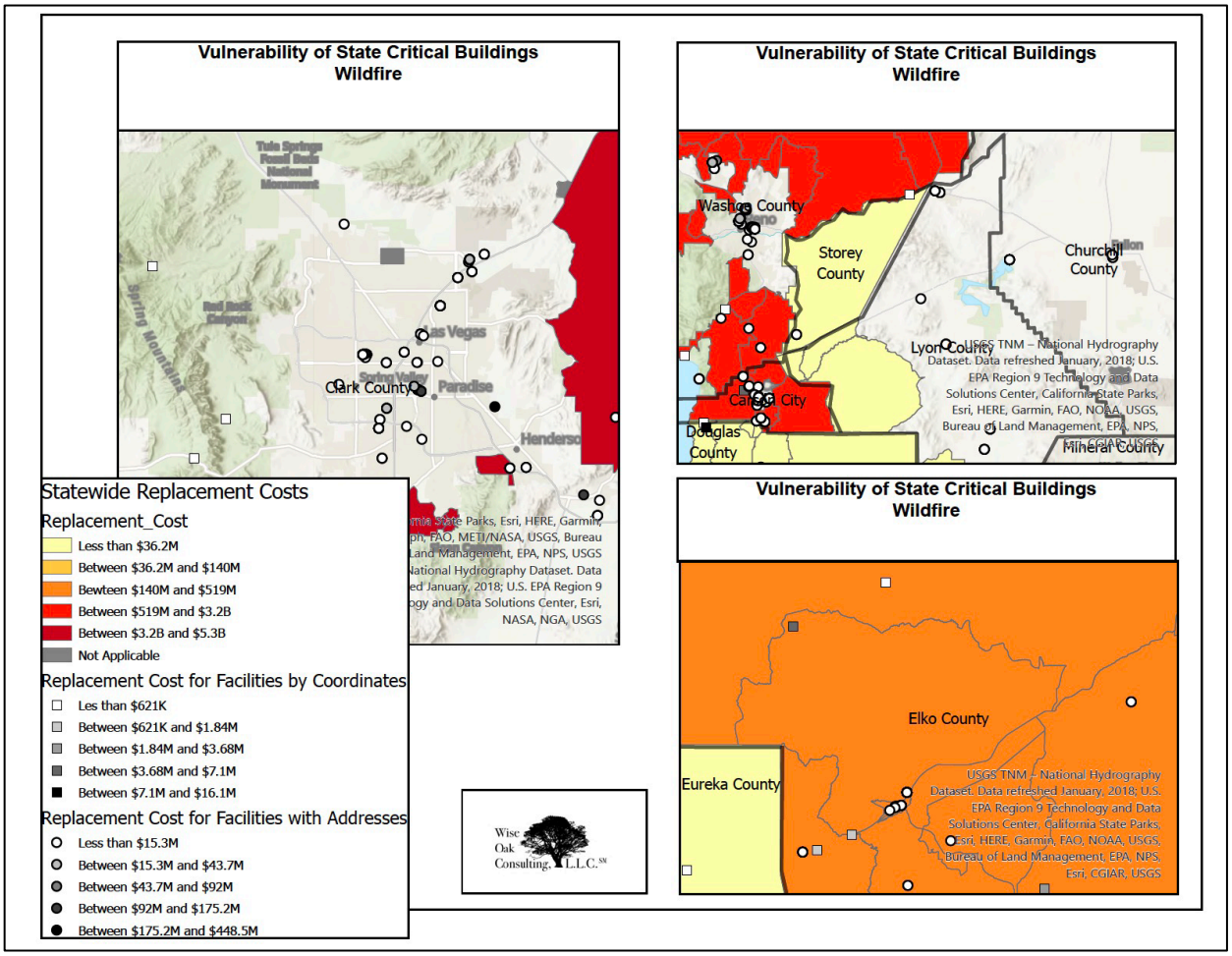


Figure T-16. Wildfire State Critical Buildings Vulnerability – More Heavily Populated Areas.



Winter Storms and Extreme Cold

Figure T-17. Cold Wave State Critical Buildings Vulnerability - Statewide.

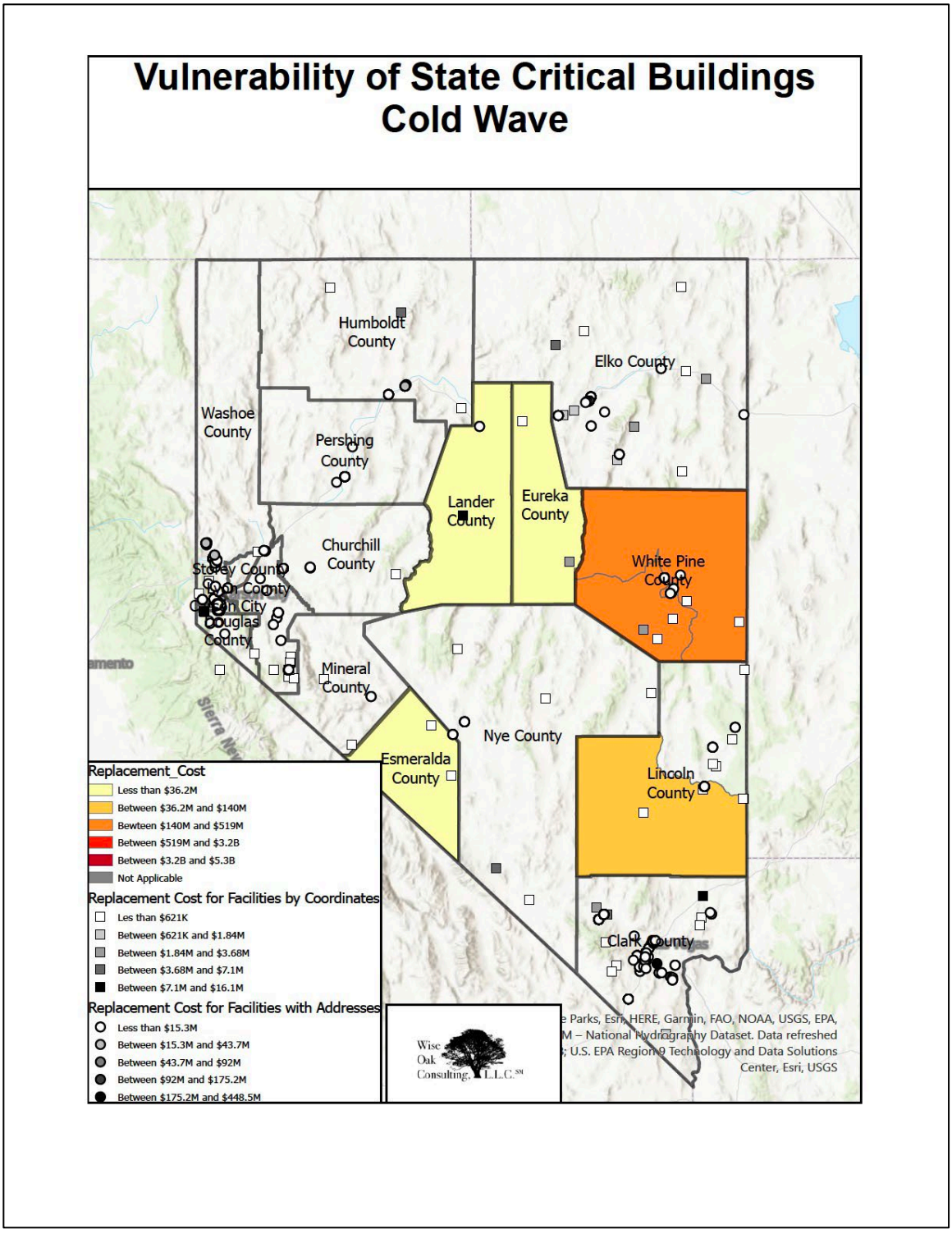


Figure T-18. Cold Wave State Critical Buildings Vulnerability – More Heavily Populated Areas.