Newe & Numa

Shoshone-Paiute Tribes

Duck Valley Indian Reservation

DUCK VALLEY INDIAN RESERVATION
TRIBAL HAZARD MITIGATION PLAN
2012

TRIBAL HAZARDS MITIGATION PLAN

FINAL

January 24, 2012

Cover Artwork

Shoshone-Paiute Tribes Youth Art Contest Winner 2011

Justin Delaney

Age: 12 years

This **Duck Valley Indian Reservation Tribal Hazards Mitigation Plan**
Is completed in the fulfillment of guidelines administered by
Federal Emergency Management Administration for a
Tribal Hazards Mitigation Plan

Business Council:

Terry Gibson, Tribal Chairman
Dennis Smith Sr., Vice-Chairman
James Blossom, Council Member
Cristi Walker, Council Member
Donna Jackson, Council Member
Lynneil Brady, Council Member
Sandra Jones, Council Member
Angele Smith, Executive Secretary

Project Leadership provided by the

Duck Valley Indian Reservation, Tribal Emergency Response Commission
Brent Hunter, Chairman
Shoshone Paiute Fire Department
1935 Fire Lane, Box 219
Owyhee, NV 89832

Planning services, analysis, and document authorship provided by

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This planning effort has been completed with the consultation by a Planning Committee comprised of representatives of administrative Departments from the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, representatives from adjacent government agencies such as the USDI Bureau of Land Management, Owyhee County, Elko County, fire protection districts, highway districts, and planning consultants from Kamiak Ridge, LLC.

Dedication

MARCIE PHILLIPS WAS ONE OF THE 3 AUTHORS OF THE FIRST TRIBAL HAZARDS MITIGATION PLAN IN 2005. WE ALL MISS HER. BORN ON MAY 8, 1962, IN OWYHEE, NEVADA, SHE ENTERED THE SPIRIT WORLD ON JUNE 3, 2011, IN RENO NEVADA.

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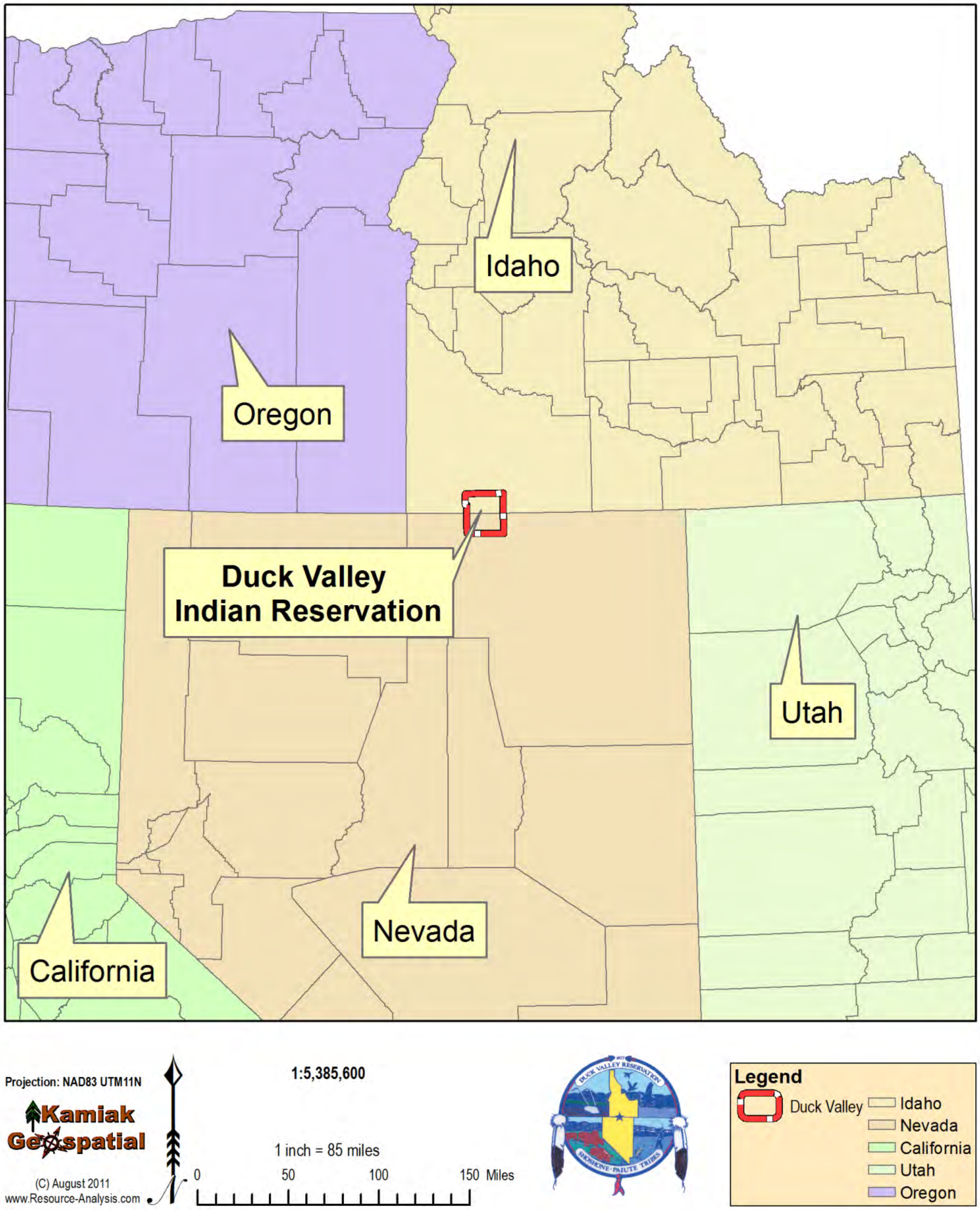
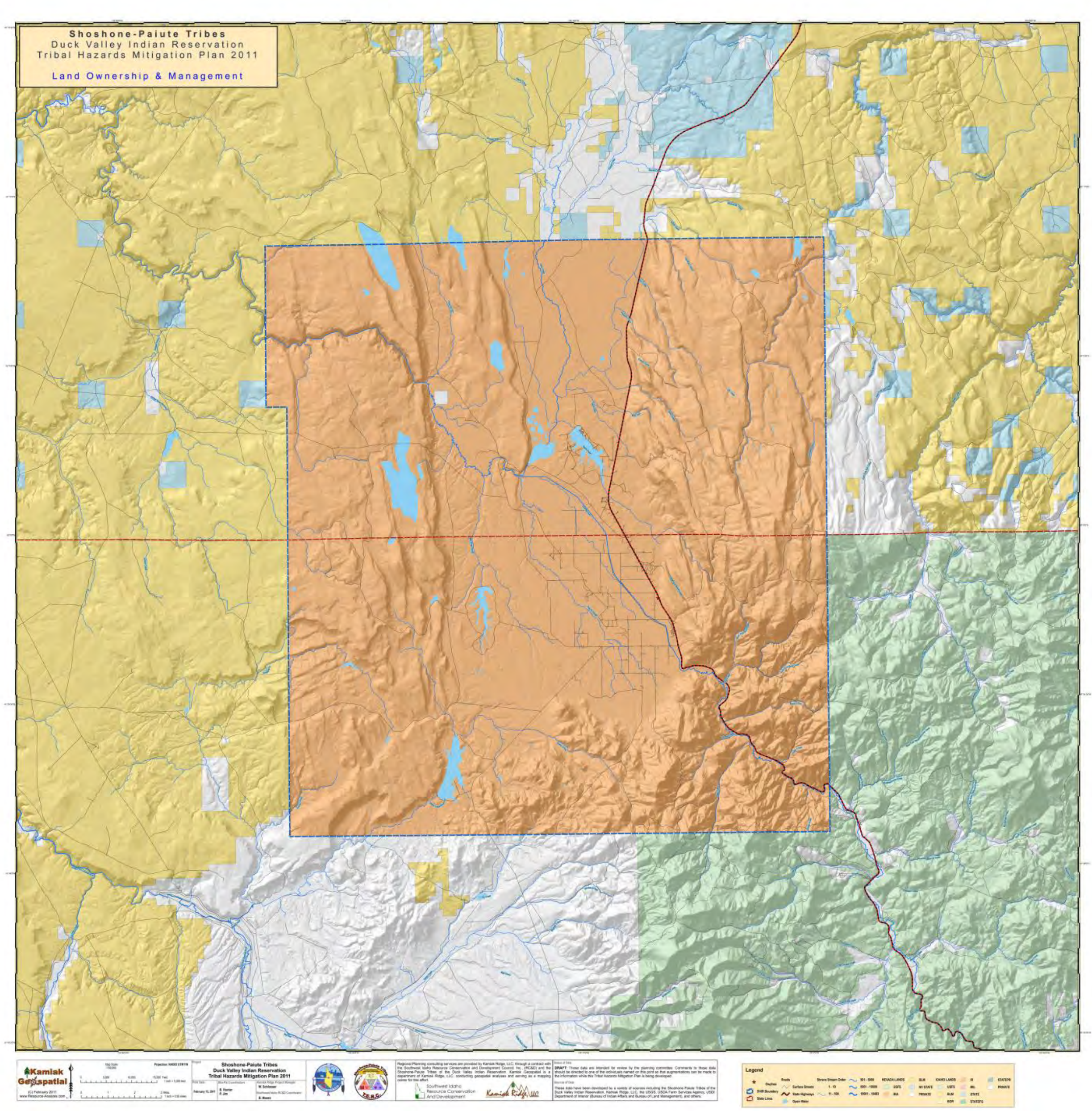


Figure 2. Duck Valley Indian Reservation area ownership.



Chapter 1. Organization, Adoptions, Promulgations, and Acceptance

1.1. Organization of this Document

The Duck Valley Indian Reservation Tribal Hazards Mitigation Plan is organized into several chapters, each addressing a specific component of the natural hazards risk assessment, exposure to risk, resources available for mitigation work, the response to natural disasters, and potential mitigation measures.

Chapter 1 of this document addresses the review by FEMA Region X, and the adoption by the Shoshone-Paiute Tribal Council.

Chapter 2 of this plan lays out a wide overview of the Duck Valley Indian Reservation to describe the demographics, population centers, histories, population density and development, resource economics, land cover, and the valuation of property improvements on the Duck Valley Indian Reservation. Chapter 2 presents an historic and current picture of the people, places, and lands – all independent from natural hazards and the risks of those hazards.

Chapter 3 addresses the planning environment to include FEMA's guidance for the expectations of the Tribal Hazards Mitigation Plan update, and the development of the planning team's mission, vision, and goals. Chapter 3 provides detailed linkages to how this effort integrates with existing plans, programs, and policies of the Shoshone-Paiute Tribes. The planning process is documented and includes details about public involvement conducted throughout the planning process.

Chapter 4 evaluates the overall risk profile for the Duck Valley Indian Reservation in terms of historical occurrence, current exposure to risks, and estimated probability of future risks. Each natural hazard defined in Chapter 4 is evaluated and considered on a Reservation-wide basis with the financial potential for losses from each hazard.

Chapter 5 looks closely at how the previously adopted Duck Valley Indian Reservation Hazard Mitigation Plan was implemented over the past 5 years since its original adoption. Some proposed mitigation measures were completed, some were sustained into the new plan, while others have been removed from further consideration.

Chapter 6 details a discussion of the resources, capabilities, and needs of the Duck Valley Indian Reservation, and associated agencies and organizations, in terms of what is available to serve the citizens of the Reservation and what is needed in terms of the risk exposure identified in this planning document.

Chapter 7 provides a lengthy discussion of how this plan will be implemented, funded, and administered during the next 10 years specifically, and beyond that, in more general terms. The implementation of the previously adopted Tribal Hazards Mitigation Plan (2006) is discussed, along with success and challenges of implementing the previously developed plan. Detailed mitigation measures are proposed in four specific categories of 1) policy related activities, 2) activities to reduce loss potential, 3) resource and capabilities enhancements, and 4) activities to change the characteristics of risk. All combined, this plan details 79 unique mitigation measures to be implemented over the next 10 years on Duck Valley Indian Reservation. Chapter 7 concludes with a formal program of plan maintenance and continued public involvement.

Finally, Chapter 8 provides the reader with additional information including acronyms and abbreviations used in this report, and a Literature Cited section.

This Duck Valley Indian Reservation Tribal Hazards Mitigation Plan has been developed through the efforts of various Tribal Department employees, Reservation-based organizations, Tribal Council, and other agency representatives in an effort to better prepare Duck Valley Indian Reservation residents against natural disasters.

1.2. FEMA Region X Letter of Approval

U.S. Department of Homeland Security
Region X
130 228th Street, SW
Bothell, WA 98021-9796

FEMA

January 24, 2012

Honorable Terry Gibson
Chairman, Shoshone-Paiute Tribes
Duck Valley Indian Reservation
1935 Fire Lane, NV Hwy 225
P.O. Box 219
Owyhee, Nevada 89832

Dear Chairman Gibson:

The U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) has approved the ***Duck Valley Indian Reservation Tribal Hazard Mitigation Plan*** as a Tribal Mitigation Plan, in accordance with 44 CFR Part 201. The Duck Valley Indian Reservation is now eligible to apply directly to FEMA as a grantee for Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) non-emergency programs through January 24, 2017. To continue eligibility, the plan must be reviewed, revised as appropriate and re-submitted for approval within five years from the date of this letter.

As a result of the Disaster Mitigation Act of 2000, States and Tribes are required to develop and maintain hazard mitigation plans compliant with FEMA standards as a condition for receiving non-emergency Stafford Act assistance. Applicable Stafford Act assistance includes Public Assistance (Categories C-G), Fire Management Assistance, Hazard Mitigation Grant Program (HMGP), and Pre-Disaster Mitigation grants.

FEMA's approval of your plan as a Tribal Mitigation Plan provides the Duck Valley Indian Reservation's eligibility to apply for various Stafford Act programs. All requests for assistance, however, will be evaluated individually according to the specific eligibility and other requirements of the particular programs. For example, a mitigation action identified in the approved plan may or may not meet the eligibility requirements for HMGP funding. If you have any questions regarding specific program requirements and eligibility, please contact Braden Allen, Hazard Mitigation Assistance (HMA) Specialist for HMA programs, (425) 487-4749.

We look forward to continuing a productive relationship between FEMA Region 10 and the Duck Valley Indian Reservation. Please contact our Regional Tribal Liaison, Richard Krikava, at (425) 487-4540, or our Regional Mitigation Planning Manager, Kristen Meyers, at (425) 487-4543 with any plan specific questions or for further assistance.

Sincerely,

Kenneth D. Murphy
Regional Administrator

cc: Mark Stephensen, Idaho Bureau of Homeland Security

Electronic cc: Brent Hunter, Tribal Emergency Response Commission
Dr. William E. Schlosser, Kamiak Ridge, LLC

Enclosure

BH:bb

1.3. Authorship and Conveyance

Development of the Duck Valley Indian Reservation Tribal Hazards Mitigation Plan was completed by Kamiak Ridge, LLC, in association with the Planning Committee members. Project Management duties and Lead Authorship of this plan have been supplied by William E. Schlosser, Ph.D., a Regional Planner and Environmental Scientist.

The undersigned do hereby attest and affirm that the Duck Valley Indian Reservation Tribal Hazards Mitigation Plan was completed using information available at the time of its writing. Furthermore, analysis techniques were implemented as appropriate to provide a clear and reasonable assessment of hazard risk exposure within the Duck Valley Indian Reservation. Recommendations made in this Plan have been based on the information and feedback from the Planning Committee members and others, and are proposed with the reasonable expectation that once implemented through a holistic hazard mitigation approach, the results will serve to protect people, structures, infrastructure, the regional economy, and the way of life on the Duck Valley Indian Reservation.

Kamiak Ridge, LLC

By: William E. Schlosser, Ph.D. Kamiak Ridge, LLC Environmental Scientist & Regional Planner Lead Author and Project Mananger	1 November 2011 Date
By: Birgit R. Schlosser, B.A. Kamiak Ridge, LLC Co-Owner & Planning Specialist	1 November 2011 Date

1.4. Shoshone-Paiute Tribes' Resolution of Adoption

RESOLUTION OF THE GOVERNING BODY OF THE SHOSHONE-PAIUTE TRIBES OF THE DUCK VALLEY INDIAN RESERVATION

P.O. Box 219 Owyhee, NV 89832
(208) 759-3100
www.shopaitribes.org

RESOLUTION NUMBER 2012-SPR-016

BE IT RESOLVED BY THE BUSINESS COUNCIL OF THE SHOSHONE-PAIUTE TRIBES,

WHEREAS, This organization is an Indian Organization known as the Shoshone-Paiute Tribes of the Duck Valley Reservation defined under the Indian Reorganization Act of June 18, 1934, as amended, to exercise certain rights of home rule and to be responsible for the promotion of cultural, economic and social welfare of its tribal members; and

WHEREAS, The Duck Valley Reservation is governed by the Shoshone Paiute Tribal Council and is empowered to exercise the legislative and executive authority of the Shoshone Paiute Indians; and

WHEREAS, The Duck Valley Reservation is required through a government-to-government relationship with the Federal Emergency Management Agency (FEMA) to have an approved Tribal Hazards Mitigation Plan which meets the criteria defined in 44 CFR Part 201 as authorized by the Disaster Mitigation Act of 2000 to be eligible for the Public Assistance Program, Fire Management Assistance Program, the Post-Disaster Hazard Mitigation Grant Program and the Pre-Disaster Mitigation Program; and

WHEREAS, The Duck Valley Reservation Tribal Emergency Response Commission (TERC) has worked with the Southwest Idaho Resource Conservation and Development Association, Inc., Kamiak Ridge, LLC, and FEMA Region X, to prepare a qualified Tribal Hazards Mitigation Plan for the Duck Valley Reservation; and

WHEREAS, The Duck Valley Reservation Tribal Hazards Mitigation Plan identifies proposed activities for hazard preparedness and casualty loss reduction, recommends priorities for mitigation, and makes targets for long term reduction in costs and losses from hazards; and,

NOW THEREFORE IT BE RESOLVED, that the Shoshone Paiute Tribal Business Council officially adopts the Duck Valley Reservation Tribal Hazards Mitigation Plan, dated January 10th, 2012, authorizes and requires the TERC Chairman to provide periodic updates to the plan, while providing annual updates to the Shoshone Paiute Tribal Business Council.

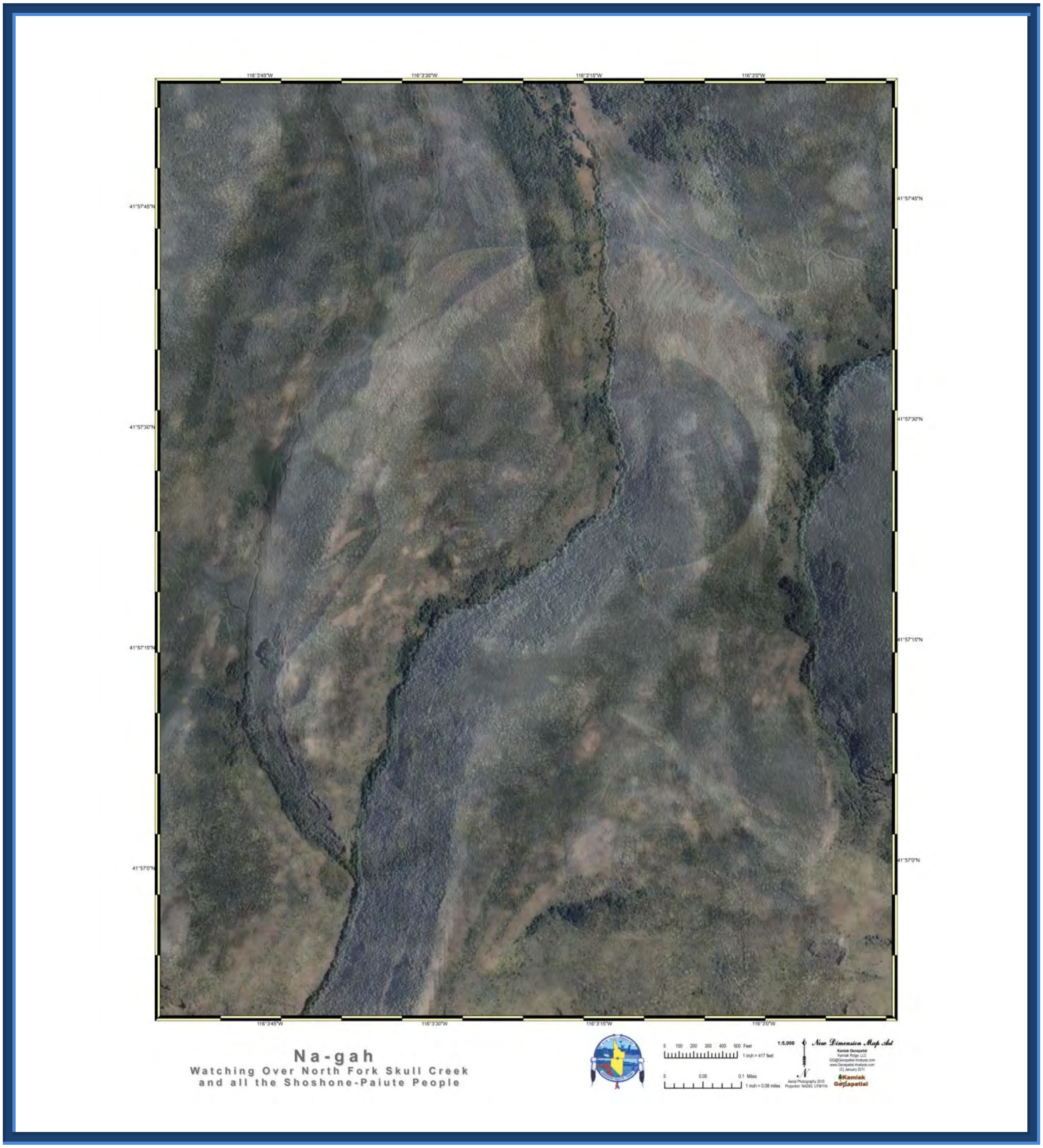
<u>CERTIFICATION</u>

It is hereby certified that the Shoshone Paiute Business Council is composed of 6 Council Members and a Chairman of whom 6 Council Members constituting a quorum and a Chairman were present at a meeting held on the 10th day of January, 2012, and that the foregoing resolution was adopted by an affirmative vote of 6 FOR, 0 AGAINST and 0 ABSTENTIONS pursuant to the authority contained in Article VI, Section 1(a), of the Constitution of the Shoshone-Paiute Tribes approved April 20, 1936.

TERRY GIBSON, Tribal Chairman

Angele Sabori
ANGELE SABORI, Executive Secretary

Figure 3. Na-gah print provided to all Residential Survey respondents.



Why the North Star Stands Still

A Paiute Legend (the story of Na-gah)

Long, long ago, when the world was young, the People of the Sky were so restless and traveled so much that they made trails in the heavens. Now, if we watch the sky all through the night, we can see which way they go.

But one star does not travel. That is the North Star. He cannot travel. He cannot move. When he was on the Earth long, long ago, he was known as Na- gah, the mountain sheep, the son of Shinoh. He was brave, daring, sure- footed, and courageous. His father was so proud of him and loved him so much that he put large earrings on the sides of his head and made him look dignified, important, and commanding.

Every day, Na-gah was climbing, climbing, climbing. He hunted for the roughest and the highest mountains, climbed them, lived among them, and was happy. Once in the very long ago, he found a very high peak. Its sides were steep and smooth, and its sharp peak reached up into the clouds. Na-gah looked up and said, "I wonder what is up there. I will climb to the very highest point."

Around and around the mountain he traveled, looking for a trail. But he could find no trail. There was nothing but sheer cliffs all the way around. This was the first mountain Na-gah had ever seen that he could not climb.

He wondered and wondered what he should do. He felt sure that his father would feel ashamed of him if he knew that there was a mountain that his son could not climb. Na-gah determined that he would find a way up to its top. His father would be proud to see him standing on the top of such a peak.

Again and again he walked around the mountain, stopping now and then to peer up the steep cliff, hoping to see a crevice on which he could find footing. Again and again, he went up as far as he could, but always had to turn around and come down. At last he found a Chipmunk that told him to try a big crack in a rock that went down, not up. The Chipmunk said, "To go up, you must first go down". Down he went into it and soon found a hole that turned upward. His heart was made glad. Up and up he climbed.

Soon it became so dark that he could not see, and the cave was full of loose rocks that slipped under his feet and rolled down. Soon he heard a big, fearsome noise coming up through the shaft at the same time the rolling rocks were dashed to pieces at the bottom. In the darkness he slipped often and skinned his knees. His courage and determination began to fail. He had never before seen a place so dark and dangerous. He was afraid, and he was also very tired.

"I will go back and look again for a better place to climb," he said to himself. "I am not afraid out on the open cliffs, but this dark hole fills me with fear. I'm scared! I want to get out of here!"

But when Na-gah turned to go down, he found that the rolling rocks had closed the cave below him. He could not get down. He saw only one thing now that he could do: He must go on climbing until he came out somewhere.

After a long climb, he saw a little light, and he knew that he was coming out of the hole. "Now I am happy," he said aloud. "I am glad that I really came up through that dark hole."

Looking around him, he became almost breathless, for he found that he was on the top of a very high peak! There was scarcely room for him to turn around, and looking down from this height made him dizzy. He saw great cliffs below him, in every direction, and saw only a small place in which he could move. Nowhere on the outside could he get down, and the cave was closed on the inside..,

"Here I must stay until I die," he said. "But I have climbed my mountain! I have climbed my mountain at last!

He ate a little grass and drank a little water that he found in the holes in the rocks. Then he felt better. He was higher than any mountain he could see and he could look down on the Earth, far below him.

About this time, his father was out walking over the sky. He looked everywhere for his son, but could not find him. He called loudly, "Na-gah! Na- gah!" And his son answered him from the top of the highest cliffs. When Shinoh saw him there, he felt sorrowful, to himself, "My brave son can never come down. Always he must stay on the top of the highest mountain. He can travel and climb no more.

"I will not let my brave son die. I will turn him into a star, and he can stand there and shine where everyone can see him. He shall be a guide mark for all the living things on the Earth or in the sky."

And so Na-gah became a star that every living thing can see. It is the only star that will always be found at the same place. Always he stands still. Directions are set by him. Travelers, looking up at him, can always find their way. He does not move around as the other stars do, and so he is called "the Fixed Star." And because he is in the true north all the time, our people call him Qui-am-i Wintook Poot-see. These words mean "the North Star."

Besides Na-gah, other mountain sheep are in the sky. They are called "Big Dipper" and "Little Dipper." They too have found the great mountain and have been challenged by it. They have seen Na- gah standing on its top, and they want to go on up to him.

Shinoh, the father of North Star, turned them into stars, and you may see them in the sky at the foot of the big mountain. Always they are traveling. They go around and around the mountain, seeking the trail that leads upward to Na-gah, who stands on the top. He is still the North Star.

Chapter 2. Duck Valley Indian Reservation Background

Definitions:

- Newe people = Western Shoshone
- Numa people = Northern Paiute

Figure 4. Native People Lands of the Great Basin and Surrounding Regions (C. Smith 2000, Encyclopedia Brittannica, Inc. 1994).

2.1. History of the Shoshone and Paiute People

In 1492, the historic landing by the Europeans in North America happened in the region already occupied by approximately 500 independent nations. Each nation possessed its own government, culture, language, traditions, customs and beliefs (O'Brien 1989, V. J. Deloria 1994). These independent nations traded with each other, sometimes fought, sometimes negotiated with each other, and forever co-existed.

The cultures of the aboriginal peoples share histories in the form of verbal stories recounted by elders with the younger generations. These stories are often told in the form of legends or epics. These histories have been shared between the generations continuously and provide the continuity of culture and place.

2.1.1. From Time Immemorial

Some of the earliest accounts of the Shoshone and Paiute people are retold and offered here to illuminate "the creation".

Paiute and Shoshone origins

The coyote, like his brother the wolf, was a spiritual being. In the beginning the coyote left his homeland in the Americas and traveled East-ward across the ocean in the direction of the rising sun. In distant lands, he acquired a bride and with her had a great number of children. These children were Indians, the forefathers of the great tribes that were to inhabit the North and South American continents.

Preparing to return home, the coyote put them all in a wosa, a woven willow basket jug with a cork. Before his journey, he was instructed not to open the jug until he reached his country in the Rockies and the Great Basin.

Being a sly and curious person, and hearing singing and the beating of drums within the wosa, the coyote thought it would not hurt to take a peek when he arrived back on the Eastern coast of the American continent. But when he opened the jug, the children inside jumped out and scattered in all directions across North and South America.

By the time he got the cap back on, the only two persons who remained in the wosa were the Western Shoshone and the Paiute. These he brought home with him. When he reached the Great Basin, he opened the jug, and out fell the last two children. They, at once, began to fight.

The coyote kicked them apart and said to them, "You two are my children. Even though the rest got away, you two will be able to fight against the best and beat them."

Thus, the Western Shoshone and Paiutes, or the Newe and Numa peoples, who now live in California, Nevada, Idaho, Utah, and Oregon, began as allies and populated the Great Basin.

2.1.1.1. Oral Tradition

Great Basin mythology includes tales of creation and origin, trickster tales, conquest and miscellaneous tales. Of these, trickster tales are by far the most common, and this feature is a major characteristic that sets Basin traditions apart from those of surrounding areas. Basin concern with origin is much less pronounced in their tales, being more general and specific about a certain group or tribe. It is interesting to note that culture heroes in Basin tales often go back and forth between a series of what might be considered positive and negative actions for themselves and later humans. Sometimes, their deeds are mischievous, sometimes downright deceptive. They are not distinctly positive personalities, being more like humans – both good and bad (C. Smith 2000) .

Oral tradition was an important way of educating children and preparing them for an adult life. It was also a way to preserve customs and culture of the Tribe.

> "Storytelling was one of the most popular pastimes in the winter for both children and adults. The old traditions were shared during long winter nights. Most old men and women could recount stories, but there were some particularly famed for their talents in this respect who acted as superb performers. Their facial expressions, voices and gestures almost told the story without words as they entertained eager listeners with amusing stories, tales of adventure and war, horror stories, and myths and legends of the wondrous days of long ago. In fact, some stories were told graphically in the sign language!" (Clark 1966).

However, storytelling was more than mere entertainment. Oral tradition taught children in story form preparing them for their lives as adults close to nature. Stories provided the information about animals and birds, tribal ways of doing things, tribal history, rituals, the origin of sacred objects and ceremonies.

"The Indians are possessed of peculiarly retentive memories," wrote the famous trapper and guide George Belden, "and are always respectful and attentive to the narratives of their old men. A tale once told is remembered for years, and in like manner is handed down to another generation." One of the sacred duties of Tribal Elders was, and continues to be, to hand down the traditions to the younger generations, thus preserving the continuity of the tribe by keeping alive its history and traditions (Clark 1966).

2.1.1.2. Time Line of Historic Events

- **1820s** First contact with the whiteman, who crossed the Rocky Mountains and Great Basin as they headed for the west coast.
- **1848** Gold discovered in California, which increased white traffic. Era of treaty making with the Shoshone, Paiutes, Bannocks, Utes, and Goshutes to protect the route the white travelers used to enter and exit California.
- **1855** August 7, 1855--First treaty with the Western Shoshone. However, it was not ratified by Congress and as a result the U.S. Government never recognized it, although the Shoshone accepted and continued to hold to the treaty.
- **1860s** Silver mines opened in Nevada, which brought more white people into Newe and Numa country, pushing the Indians into canyons and mountains.
- Start of Civil War. Gold and silver mines became more important to the northern government, which resulted in increased protection by the soldiers of the route to the west through Newe and Numa lands. The army built forts at different locations--Fort Halleck (on the Humboldt River near Starr Valley, Nevada), Fort Ruby (in Ruby Valley, Nevada), and Fort McDermitt (on present Nevada-Oregon border).
- **1863** July 30, 1863--The northWestern Shoshones signed the Box Elder Treaty. The Treaty of Ruby Valley was signed with the Western Shoshone. The treaty was known as the Treaty of Peace and Friendship.
- **1865** A treaty with three Bannock bands and one Western Shoshone band was signed. These Indian bands occupied the Bruneau Valley and the Boise Valley area.
- **1866** The treaty of 1866 contained questionable terms which had to be renegotiated concerning the Indians' land cession. Governors changed before the matter was finalized. The new governor wanted one agency for the Indians in southern Idaho, rather than several which were under consideration. The three Bannock bands (the Boise, Bruneau, and Camas Bannocks) accepted the move to the Shoshone-Bannock reservation at Fort Hall.

- **1877** Two reservations were set aside for the Western Shoshones (34 bands). One was the Carlin Farms comprised of 51.61 acres which was created by an Executive Order. The whites claimed that they had occupied the land before the Executive Order was signed, and on January 16, 1879 the Carlin Farms Reservation was rescinded. Establishment of Duck Valley Reservation, which was partly in Nevada and partly in Idaho (20 miles long and 17 miles wide).
- **1881** First school erected (had 25 students). During this time the Duck Valley Reservation was enlarged to 400 square miles, or 256,000 acres.
- **1887** General Allotment Act of 1887 allotted land to Indians, but it was designed to end tribal life by opening the remainder of reservation lands which were not allotted to non-Indians.
- **1900** A census survey of the Duck Valley Reservation showed a population of 224 Shoshones and 226 Paiutes with a population of 450.
- **1904** September 10, 1904--First telephone line was constructed, and connected the Agency with Elko, Nevada, which was one hundred miles away.
- **1936** Wild Horse Reservoir was built between 1936 and 1937, the dam helped solve the problem of a dwindling water supply from the Owyhee River on the reservation.
- **1967** In 1967 to 1969, a new dam was built at the same site as the old one.

2.1.1.3. Geography and Linguistics

The Great Basin spans roughly 400,000 square miles of land between Rocky Mountains and the Sierra Nevada. Geologically, it includes extreme eastern California, southeast Oregon, all of Nevada, extreme southwest Wyoming, and western Utah (Figure 5). This is an area of interior drainage, featuring high deserts and valleys (around 5,000 feet), both freshwater and saltwater lakes, and mountains more than 12,000 feet high. Except for the high mountains, and especially in the south, there is relatively little precipitation.

Figure 5. Historic locations of living and extinct Uto-Aztecan languages in the USA, pre-European colonization.

The boundaries of the Great Basin cultural area considerably exceeded those of the geographic one. A prominent feature of the Great Basin is its linguistic uniformity. Prior to 1600, between 40,000 and 50,000 people lived in the area. Except for the Hokan-speaking Washoe, all late prehistoric Great Basin dwellers spoke dialects of Numic (Shoshonean) languages. Fluidity was the main characteristic of both territory and identity. Whereas today we speak of the Western Shoshone or Northern Paiute, for linguistic and cultural purposes, these Indians had no such concepts. Since few groups regarded subsistence areas as exclusively controlled, they tended to roam over wide distances, mixing and intermarrying with other Numic-speaking and neighboring groups, which contributed largely to a decentralized type of social and economic organization, and therefore leadership, except in eastern groups after introduction of the horse.

According to Walter Prescott Webb in "The Great Plains" (Webb 1981), anthropologists hold that the spread and use of the horse among the Plains Indians began after 1540, when the horse was reintroduced into Indian country by the Spanish through intertribal trade, and as wild herds began spreading out over the land. The Great Basin Indians welcomed the horse, but did not adopt them as readily as some Indians because of the food needed to support large herds of horses.

2.1.1.3.1. Defining Features of Ute Language

The language traditions of the Great Basin and surrounding areas has been defined by (C. Smith 2000), and is reproduced here (Figure 5).

Except for the Washo of Lake Tahoe, who spoke a language of the Hokan family, all other Great Basin peoples spoke one of six closely related languages of the Numic family of Northern Uto-Aztecan.

Pre-contact aboriginal population figures for the Great Basin are, at best, tentative. Some authorities have placed the total population at 22,000; others suggest a much higher figure, near 45,000 or more. Some thirteen native "groups" occupied the Great Basin at the time of first European exploration. These groups are defined by linguistic, geographic, and material differences, and are known as the:

- Washoe (surrounding Lake Tahoe)
- Northern Paiute (southeastern Oregon and northwestern Nevada)
- Southern Paiute (southeastern Nevada, northwestern Utah, tiny portion of northwestern Arizona)
- Owens Valley Paiute (Owens Valley on the eastern edge of the Sierra Nevada Mountains)
- Panamint Shoshone
- Northern Shoshone (southern Idaho)
- Bannock (southern Idaho)
- Western Shoshone (eastern Nevada and northwestern Utah)
- Eastern Shoshone (western Wyoming)
- Gosiute Shoshone
- Ute (western Colorado and central Utah)
- Kawaiisu (interior southern deserts of California)
- Chemehuevi (interior southern desert of California, near the Colorado River)

By the twentieth century the Indian world had been all but replaced by that of the white men, whose civilization, also changing, raced on at a quickening pace sweeping Indian culture aside. The struggle for Indian identity has started not so long ago and is still in progress. The greatest of all Indian wars continues to be their struggle to adapt to a world not of their choosing. Adaptation has been so effective in some cases that Indians, who formerly were encouraged to adopt the ways of the white man, now fear that such acceptance will destroy the last vestiges of their culture. The physical survival of the Indians was assured at the turn of the 20th century when improved health programs turned the tide of decreasing populations (Ruby and Brown 1988). Preservation of Indian cultures, each unique to the tribes they represent, has proved to be more challenging.

In the little more than one-hundred fifty years since Anglo-European people have been actively concerned with changing Indian ways, a significant amount of the old culture had been lost. Myths and tales of the Newe and Numa have been secured through informants long after they had changed their original way of life. Informants were interested to share about the customs of their forefathers, and the only way to do that was through legend. Some fragments of the original culture can still be saved through a concentrated effort of those who want to remember who they are and where they come from. Although some tribal languages have been preserved, those who speak them become fewer with each year.

2.1.2. History of US Federal Indian Policy

The account of historical federal policy concerning Indians in the United States shows the way it has meandered over time like a river through the floodplain, sometimes cutting deeper into the soil, and at other times dropping sediment to build it up again. Although generalizations about these policies are prone to over-simplification, there have been extremes of events to sometimes annihilate Indians, and sometimes to support sovereign tribal self-governance and autonomy. Pevar (2002) conducted an intensive review of US Federal policy in respect to Indian Tribes, that was released in 2002 by the American Civil Liberties Union (ACLU). The subtitles of this section follow the same generalizations utilized by Pevar.

2.1.2.1. Pre-1492

In 1492, the historic landing by Christopher Columbus (the Europeans) in North America, happened in the region already occupied by approximately 500 independent Indian nations. Each nation possessed its own government, culture, language, traditions, customs and beliefs (O'Brien 1989, V. J. Deloria 1994). These independent nations traded with each other, sometimes fought, sometimes negotiated with each other, and forever co-existed.

The cultures of the aboriginal peoples share histories in the form of verbal stories recounted by elders with the younger generations. These stories are often told in the form of legends or epics. These histories have been shared between the generations continuously and provide the continuity of culture and place.

Although several languages were developed by these independent cultures, there were often "trade languages" shared between groups living in the same large geographical region. The "Ute Language" was one such mixed language that many of the Great Basin Tribes used (Mithun 1999).

2.1.2.1.1. Geography and Linguistics

The Great Basin encompasses roughly 400,000 square miles of land between Rocky Mountains and the Sierra Nevada. Geologically, it includes extreme eastern California, southeast Oregon, all of Nevada, extreme southwest Wyoming, and western Utah. This is an area of interior drainage, featuring high deserts and valleys (around 5,000 feet), both freshwater and saltwater lakes, and mountains more than 12,000 feet high. Except for the high mountains, and especially in the south, there is relatively little precipitation.

The boundaries of the Great Basin cultural area considerably exceeded those of the geographic one. A prominent feature of the Great Basin is its linguistic uniformity. Prior to 1600, between 40,000 and 50,000 people lived in the area. Except for the Hokan-speaking Washoe, all late prehistoric Great Basin dwellers spoke dialects of Numic (Shoshonean) languages. Fluidity was the main characteristic of both territory and identity. Whereas today we speak of the Western Shoshone or Northern Paiute, for linguistic and cultural purposes, these Indians had no such concepts. Since few groups regarded subsistence areas as exclusively controlled, they tended to roam over wide distances, mixing and intermarrying with other Numic-speaking and neighboring groups, which contributed largely to a decentralized type of social and economic organization, and therefore leadership, except in eastern groups after introduction of the horse.

According to Walter Prescott Webb in "The Great Plains" (Webb 1981), anthropologists hold that the spread and use of the horse among the Plains Indians began after 1540, when the horse was reintroduced into Indian country by the Spanish through intertribal trade, and as wild herds began spreading out over the land. The Great Basin Indians welcomed the horse, but did not adopt them as readily as some Indians because of the food needed to support large herds of horses and the region's ability to agriculturally provide this feed.

2.1.2.1.2. Economy and Subsistence

Residents of the Great Basin adapted very successfully to a large number of microenvironments that changed over time with hunting and gathering being the primary activities. The region supported a wide variety of vegetation and animals, although distribution was uneven.

Most groups relied heavily on seed-bearing grasses and pinyon pine seeds as well as roots (camas, yumpa, bitterroot) and berries (buckberry, wolfberry, chokeberry). Birds, rabbits, deer, pronghorn antelope, rodents, fish, insects, and other non-plant resources probably made up around 25 percent of their diet, on average. Animals, especially hares, pronghorn antelope, mule deer, bighorn sheep and insects were also important and formed a major aspect of Great Basin subsistence. Hares were important for both their meat and their skins, the latter being processed into a number of useful items including clothing, and blankets. And in the southern Great Basin, several large reptiles (such as the desert tortoise and the chuckwalla) were eaten. Insects (including crickets, grasshoppers, shore flies, caterpillars, ants) also formed an important and highly nutritious food source and were purposefully hunted or gathered, and some even taken in large communal drives. Waterfowl were also heavily utilized, as were a number of fish species. Two large fish, the Lahontan cutthroat trout and the cui-ui sucker were heavily exploited by the Northern Paiute. For many groups, pinyon pine seeds were the winter staple. Pine nuts were for most all groups the major winter staple, allowing people to establish multi-family camps near pinyon groves. Because of the importance of pinyon nuts in the lives of the Great Basin people, a certain amount of ceremonialism was associated with the pinyon harvest (see Round Dance, below).

2.1.2.1.3. Culture and Social Life

Great Basin Indian technology was simple but effective. People used baskets, constructed mainly from willow, grasses, and roots. Pottery generally appeared with the Shoshonean people. They also made tools and utensils out of stone, obsidian, bone, and wood. Nets, traps, knives, and bow and arrow were used in the hunt. Fish were taken with nets, weirs, spears and harpoons. The fire-hardened digging stick was the main root-gathering implement. Some groups encouraged certain plants by burning brush lands and forests. Both season and location determined the type of shelter and clothing. Brush windbreaks were common in warm weather. Winter houses were typically conical, built of brush, bark and grass over wooden pole frames. As for clothing, most people wore little except in the coldest weather.

The basic social and economic unit was the camp, or nuclear family. This group was self-sufficient, self-governing, and for most of the year socially isolated from other similarly structured units. The Western Shoshones covered a large territory in order to accomplish their subsistence tasks, usually in small, family-based units. They followed specific seasonal rounds that took them from lowlands in the spring and parts of summer to highland and mountain locations in the fall. They came together in larger camps in the valleys in the late fall and winter, and there celebrated the events of the years in song, dance, and story (A. Smith 1993).

This type of interaction allowed people to share information about resources, to observe ceremonies and to trade. It was during these times that members of the bigger social units also exchanged a great deal of information regarding the locations of promising pine nut, fishing, and hunting areas. Additionally, trade relations could be established or reaffirmed, potential marriage partners could meet, and elders could relate to the younger generation the accumulated and collective wisdom and mythology of the group.

Great Basin Indians exchanged hundreds of items between themselves and their neighbors, especially in the late 18th century, including hides, robes, food items, dresses, moccasins, medicinal plants, and horses.

2.1.2.1.4. Religion

Aboriginal Shoshonean peoples recognized various beings or spirits capable of affecting human existence and practiced both individual and group religious ceremonies. People showed respect for plants and animals they had taken. Plants and animals played an important role in mythology. Traditional religious activity among the Great Basin peoples were individual, and group activities. In terms of individual religious activities, nearly all adults sought "power" through a spirit helper that appeared during a dream or during a vision quest. Certain forms of individual life crises, such as birth, puberty, menstruation, and death were also marked by religious rituals, but almost always of a private, rather than a public nature.

The general tenor of Basin life was not especially conducive to collective social and ceremonial activities, and that group ceremonialism was mostly limited to dances held following communal subsistence activities, such as the pinyon harvest, or fish runs, or communal rabbit or pronghorn antelope hunts. The Round Dance was the usual Basin form. It functioned both as a recreational activity as well as a rite of thanks and fertility, aimed at increasing the food supply and bringing rain.

The primary religious figures were the shamans, part-time specialists who possessed considerable "power" and used it for curing illnesses, controlling animals and the weather.

Some Great Basin groups were involved in a number of religious movements, including the Ghost Dance in 1869 and 1889, both of which were designed to revitalize native culture and restore the environment to pre-European levels. In the late 1880s some Great Basin groups adopted the Sun Dance in an effort to ameliorate poor conditions on the reservations.

2.1.2.2. 1492-1787: Tribal Independence

As European expansion became established within the North American Continent, treaties and formal agreements were established between the new arrivals and the established peoples. These exchanges of considerations were made to facilitate the barter of European goods for land, food, and assistance. Several historians have documented that the survival of the European settlers could not have been successful without the assistance provided by Indians (Pevar 2002).

As European settlement expanded and moved into new lands, open conflicts between the native peoples and the European settlers flared. Most controversy centered around land. Sometimes, the settlement “rights” of opposing European countries (e.g., the British and the French) would seek to create alliances with Indian Tribes with one European side to seek aid from Indians in the battle against the other European side. The Tribes would be promised peace or a cessation of land settlement encroachments. Although the foreign government leadership, on a different continent, would proclaim a cessation of the taking of Indian lands in exchange for tribal alliances in certain European conflicts, the settlers/colonists would mostly ignore the guidance of the European leader and settle Indian lands anyway (Galloway 1995).

When the American/British Revolutionary War broke into open conflict, most eastern Indian tribes initially stayed away from the conflict, regarding the fight as a “family quarrel” and leaving the dispute to settle itself (Galloway 1995, Pevar 2002). The battles that ensued spilled over into Indian Country and resulted in Indian villages being burned, battles that killed innocent Indian people, crops that were plundered, and trade routes that were disrupted during critical times of the years. All of the Revolutionary War was fought on Indian lands (Galloway 1995).

Although the European conflicts for land and domination during this time were mainly concentrated in the eastern half of the continent, the influence of the European population’s spread reached from shore to shore and touched the Great Basin Indian tribes in a very dramatic way. As early as the mid-1770s contact with the European settlers resulted in smallpox and other disease epidemics ravaging the population of the Shoshone and Paiute.

2.1.2.3. 1787-1828: Agreements Between Equals

After the United States Government was formed and a Constitution was ratified, the official US position was to regard Indian tribes as having equal status with foreign nations, and efforts were made to maintain good relationships with these Indian nations (Pevar 2002). The United States government was weakened after years of Revolutionary War with England, their desire was to avoid open conflict with Indian tribes. “Indian nations were militarily powerful and still a threat to the young United States” (Porter 1998).

Indian tribes were concerned about the security of land occupancy and the protection of their sovereignty. The US Congress quickly passed laws to assure them that they would not be infringed in those respects. The Northwest Ordinance of 1787 declared: “The utmost good faith shall always be observed toward Indians; their land and property shall never be taken away from them without their consent” (U.S. Congress 1789). In 1790, the US Congress prohibited whites from settling on Indian lands without the consent of the US federal government, restricted Euro-Americans from trading with Indians except within strict standards of conduct defined by the US federal government, and authorized the persecution of Euro-Americans that committed crimes against Indians (Porter 1998). During this time, no US federal laws were passed that limited or questioned the sovereignty of Indian tribes.

Although the US federal policies were in support of this view of Indian sovereignty, the practice of Euro-American settlers moving west into the country occupied by Indians was mostly overlooked by the US Government. Settlers moved into Indian lands, resources were taken, and open conflicts were common (Prucha 1962).

As in many other regions of North America, fur traders were the first Europeans who came into a direct contact with Indians of the Great Basin; at the beginning of the 1800s European fur trappers had already established their presence in the area. Their journals and trade records provide the earliest written historical record of Indian societies in the Great Basin. The documents written about the fur trade are many and varied, offering rich insight into a fascinating era of the initial drama of cultural encounter between the Euro-Americans and Indians (Vibert 1997).

The Lewis & Clark Expedition (1804-06) followed by the opening of the Oregon Trail (1841), opened this region to new European settlers from the east who sought property to settle in and start farming. In the 1820s, Euro-American trappers, traders and settlers began to homestead the region west of the Mississippi all the way to the Pacific Ocean seeking settlements along the Oregon Trail and connecting routes with fertile soils and ranching sites. Although the Shoshone and Paiute Indians were initially friendly and helped their new European neighbors, increasing numbers of pioneers arrived with their radically different ways, which created friction (USH 2010).

The tribes of the Great Basin, for the most part Shoshone, were severely impacted by the Oregon and California Trails and by Mormon emigration to Utah. Beginning with their encounter with Lewis and Clark the Shoshone had generally had friendly relations with American and British fur traders and trappers. At first relationships were friendly with travelers on the trails, but, with time, the volume of emigrants severely impacted natural resources in the areas traversed by the trails. Often travelers treated the Indians they encountered badly and the Indians on their part continued to engage in their traditional avocation of stealing horses and other stock.

In Utah, expanding Mormon settlement pushed natives from the fertile and well-watered valleys where they had lived for generations. The cattle of the Mormons consumed the grasses and other plants which made up the traditional Shoshone diet. While unwilling to compensate the

Shoshone, or the Ute, for their lands, the Mormons did offer food to the Indians. However relations were not smooth, with the Indians being aggressive and demanding while the Mormons found the burden imposed by the Church leadership onerous. The federal government had little presence in the Great Basin and made little effort to ameliorate the situation.

The Indians, their traditional way of life disrupted and in retaliation for outrages suffered at the hands of emigrants, engaged in raiding of travelers along the trails and engaged in aggressive behavior toward Mormon settlers. The efforts of the undisciplined California militia who were stationed in Utah during the Civil War to respond to complaints resulted in the Bear River Massacre (Madsen 1985). Following the massacre a series of treaties were agreed to with the various Shoshone tribes exchanging promises of peace for small annuities and reservations. For the most part Indian title was not addressed in those treaties (Wilkins 1997, Rice 2008).

2.1.2.4. 1828-1887: Relocation of the Indians

The election of President Andrew Jackson in 1828 heralded a new era in the US Federal position to the Indian population in the United States. President Jackson's stated goal became the removal of the eastern Indian tribes to the west. This policy became the formal "removal policy" of the US federal government (V. J. Deloria 1994).

In 1830, the US Congress passed the "Indian Removal Act" to authorize the President to "negotiate" with the eastern Indian tribes for their relocation to west of the Mississippi River (Pevar 2002). The discovery of gold in California in 1848 and in the Black Hills of South Dakota in 1874 brought thousands of settlers to the west who moved into Indian lands. The US Cavalry travelled with settlers to facilitate their settlement of these lands. Treaties were negotiated between the US President and many of the Indian tribes.

2.1.2.4.1. After the Contact Was Established

The Spanish explorers encountered Indians and traded with them, but did not form any colonies. Because of the isolation and relatively harsh environment, the Great Basin was the last region in the contiguous United States to be taken over by the Euro-Americans. However, when the change did come, it was rapid, largely because the ecology of the region is so fragile. Indians guided and traded with early explorers and trappers; many Indians received firearms, alcohol and new diseases during that period. The first Mormon settlers appeared around the time when the United States acquired the Great Basin, in the 1848 Treaty of Guadalupe Hidalgo. Ranchers and farmers soon completed the process, begun by explorers, trappers, emigrants and miners, of resource degradation and destruction of aboriginal habitat.

Livestock were allowed to compact the soil and overgraze, ruining the seed grasses. Euro-Americans appropriated scarce water sources and converted natural resource-rich lands to farms. They prohibited the Indians from managing grasslands through regular burnings and cut down vital pinyon groves, used by the Indians for pine nuts, for firewood. Game animals deprived of their own resources and increasingly crowded out, either disappeared or retreated to safer, though far less accessible, regions. In a relatively few years, the environment that had supported tens of thousands of Indians for millennia was gone. Hungry, weakened by disease, and victims of wanton violence, Indian populations began to decline dramatically.

2.1.2.4.2. First Treaties

In the 1850s, Indian agents were sent to the Great Basin to meet with the Shoshone and other tribes that controlled the vast area west of the Rockies. It was the beginning of a treaty-making period with the Bannocks, Utes and Goshutes, as well as Western Shoshones and Paiutes. It was difficult for the US government dealings with the Western Shoshone, who were clearly not organized into single tribes under one chief. Many Newe groups managed to avoid contact with the Euro-Americans. They remained in small bands, hidden in the Owyhee, Jarbridge, and Bruneau canyons. It was suggested in the 1862 Annual Report of the Commissioner of Indian Affairs in Washington D.C., that a treaty, in return for certain considerations, should provide that the Indians shall "pledge themselves at all times hereafter to refrain from depredations and maintain peaceable relations with the United States and its citizens" (McKinney 1983).

James W. Nye, the Governor of Nevada, and James Duane Doty, the Federal Indian Agent for Utah, were among the most active in putting pressure on Washington to conclude a treaty with the Indians. On June 20, 1963, Doty wrote to the Commissioner of Indian Affairs:

> "Many of these Indians have been hostile and have committed depredations upon the persons and property of emigrants and settlers but now express a strong desire for peace."

As a result of the negotiations initiated with the tribes, on October 1, 1863, the Treaty of Ruby Valley – called the Treaty of Peace and Friendship – was signed with the Western Shoshone.

Two and a half years later, on April 12, 1866, Caleb Lyon, the Territorial Governor of Idaho, concluded a treaty with three Bannock bands and one Western Shoshone band that occupied the Bruneau Valley and the Boise area. The terms of this Treaty were considered so questionable that the Indians' land cession later had to be renegotiated. Before the matter was settled, Lyon was succeeded by Governor D.W. Ballard, who attempted to establish a single agency for all of the Indians in southern Idaho, rather than several which were under consideration. The three Bannock tribes who were party to the Bruneau Treaty – the Boise, Bruneau and Camas Bannocks – were willing to be removed to the Bannock-Shoshone reservation at Fort Hall. To this day, the descendants of the bands from that treaty area are still contesting the loss of that land (McKinney 1983).

In the 1850s the government created the first of the Great Basin reservations, on which they planned to transform Indians into Christian farmers (without providing adequate land or material or technical support). Native culture was ruthlessly suppressed. To make matters worse, the extent of Indian land was gradually whittled away, in part as a result of the Dawes Act of 1886. Many Great Basin Indians (up to 40% or more) remained away from the reservations altogether, preferring to take chances on their own.

In the 1860s Euro-American diseases took a heavy toll among the Shoshones throughout Nevada. Bands were totally devastated by smallpox, measles, mumps, and other sicknesses. Many Newe bands were reduced to a pathetically low level. The Indian medicine men tried to use all their wisdom and knowledge of herbs to fight the diseases, but with little effect. The day of the Newe's freedom to live and roam as they chose was over (McKinney 1983).

2.1.2.4.3. First Reservations

In 1873 the government appointed J.W. Powell and Major D.W. Ingalls to study the tribes of the Great Basin and recommend what should be done with them. They provided some valuable information, though their incomplete knowledge of the Indians and the territory prevented them from offering reasonable recommendations. They attempted to name all of the Western Shoshone leaders, their bands and their areas. The report of Powell and Ingalls named thirty-four Western Shoshone bands. Eventually, in 1877 the U.S. government finally set aside two reservations for the Western Shoshone. One, comprising 521.61 acres, was known as Carlin Farms and was created by an Executive Order on May 10, 1877 (Kappler 1902). This reservation was short-lived, for in 1878 Agent Barnes was informed that most of the Carlin Farms land had already been claimed by Euro-Americans. Another Executive Order, on January

16, 1879, followed, rescinding the Carlin Farms Reservation leaving the bands that had occupied it landless in their own country (Kappler 1902, McKinney 1983).

The Western Shoshone, or Duck Valley Indian Reservation "came into existence as the belated, partial performance of a distinct obligation of the United States to the Western Shoshone Indian". Seven years passed since the Shoshones first asked for a reservation at Duck Valley before the government took any action to set it. Authorization was finally given by an Executive order, signed by President R. Hayes in Washington, D.C., on April 16, 1877, establishing the reservation on public domain land lying partly in Nevada and partly in Idaho (Kappler 1902, McKinney 1983, Sho-Pai Tribes 2009). Even though the Shoshone who moved to the reservation showed a great interest in farming and building houses for their families, resistance to the move to Duck Valley persisted among the other bands due to the superstition of the older Indians who had a great influence over their bands. On July 1, 1910, United States President William H. Taft further expanded the reservation by yet another Executive Order (Sho-Pai Tribes 2009) (Figure 7).

The exterior Boundaries of the Western Shoshone Reservation were surveyed by the War Department in 1883. The topographical description concluded that the reservation was about two hundred and thirty-five square miles. It was rectangular in shape and crossed by the Idaho-Nevada boundary line. Though considered to be a vast area, only a small part of it could be made into farming land, the rest utilized for grazing. Based on the subsequent report by the U.S. Government inspector Benedict on the conditions of the reservation, it was concluded that due to a harsh climatic conditions "the Indians will never become self-sustaining here, and it is not wisdom for the government to invest another dollar here for improvements." (McKinney 1983). It was further recommended that the Shoshones be moved from Duck Valley to the Fort Hall Reservation. The total population remaining permanently on the Duck Valley Reservation at the time was about three hundred. Despite the agreement of the Fort Hall bands of Indians to accept Western Shoshones, the latter persevered in their opposition to move and continued to make the Duck Valley Reservation their home.

Within a short amount of time, the number of Western Shoshone on the reserve was about 1,000. Agent Howe at the time wrote, "The Duck Valley Reserve has proved well suited for that purpose, both in regard to its distance from white settlements and the fertility of the soil. The Owyhee River, running through its center, gives ample water for irrigating purposes. The Salmon ascending the river has aided us very much this season, and we hope in another year to utilize them as permanent food."

Duck Valley was one of the two reservations that served as a home for the Western Shoshone from the 1870s until the present. Descendants of the original Newe settlers who moved onto the Duck Valley Reserve still reside on the original lands that their ancestors claimed and cultivated (McKinney 1983). In the 1880s they were joined by a group of Northern Paiutes. A Report by the Commissioner of Indian Affairs said, "Finding that they could live in pleasant relations with the Shoshones, they asked to be permanently settled upon the lands adjoining the Duck Valley Reservation on the north, and in order to help make a start towards self-support, the Shoshones generously and commendably volunteered to assist them in putting [in] their first crop." Thus, an Executive Order dated May 4, 1886 (Kappler 1902), set apart an additional land to the Duck Valley Reservation, "for the use and occupation of the Paddy Cap band of Paiutes and such other Indians as the Secretary of State may see fit to settle thereon" (McKinney 1983).

2.1.2.4.4. Education and Health

With Indians becoming more involved in assimilating with the Euro-American way of life it became important that the children be taught at school and learn from childhood. In March

1880, Indian Commissioner R.E. Trowbridge recommended that “a boarding school for about twenty-five Indian students be erected at Owyhee by the action of the local agent, John How. The authority to spend up to $1,800 on the materials and labor to build it was authorized. The school building was completed in 1881 and for the first year operated as a boarding school, after which it became a day school. In several years another school was built. Both of them experienced environmental and social stresses due to lack of qualified teaching personnel faced with the harsh reality of life on a remote Indian reservation.

From 1884 through 1911 a boarding school operated on the reservation. Thereafter 3 day schools were operated in three separate locations on the reservation. In Owyhee, the Swayne School was built. In 1931, the day schools were closed and all students attended the Swayne School. Students of the higher grades were sent off reservation to boarding schools until 1946 when high school classes were added. In 1956, the reservation school system was consolidated into the Elko County School District of Nevada and today is known as the Owyhee Combined Schools (K-12). Recently, a Community Education Center was placed in Owyhee for GED and higher education courses (Sho-Pai Tribes 2009).

Health care has been an ongoing problem for most of the history of the Duck Valley Indian Reservation. Poor housing and inadequacy of rations provided from the agency, lack of hospital and medical personnel made life difficult. The first full time physician was assigned to Duck Valley in 1882 and by 1897 a small one-room infirmary hospital was built and was replaced in 1920 with a structure which had two seven bed wards. In July of 1937, the native stone hospital was completed with a 20 bed ward, x-ray and laboratory facilities (Sho-Pai Tribes 2009). The native stone hospital was closed in 1976 when the modern Owyhee Community Health Facility (Figure 6) was completed.

Figure 6. Owyhee Community Health Facility

However, life was going on and farming expanded. More ditches were dug and more acreage put under cultivation. As progress was made, housing was improved leading to construction of log houses. Although livestock numbers increased, the quantity of horses numbered in thousands. The Western Shoshone and Paiutes were known for the fine quality of their horses which they were actively selling at the time.

The judicial system was established on the Duck Valley Reservation during these early years. The tribe had its own police force established in 1879 and composed entirely of tribal members.

2.1.2.5. 1887-1934: Allotment and Assimilation

US Federal Indian policy between 1887 and 1934 was forged by the desire to acquire additional lands from Indians for settlement by Euro-Americans, and the desire to assimilate Indians into Euro-American society.

The Dawes Act of 1887 (General Allotment Act) adopted by the US Congress, sought to break up the large communal Indian treaty lands throughout the country by granting individual allotments and then opening up the rest of the reservations for Euro-American settlers. Although this situation was witnessed across the United States as Reservations were dismantled from Treaty Lands owned by the tribes to fractionated ownership patterns with Euro-Americans and Indian Allotments controlling the ownership pattern of Reservations. On many Reservations, the Indian Ownership became a weak minority in comparison to the ownership by Euro-Americans.

The situation on the Duck Valley Indian Reservation was strikingly different. The Duck Valley Indian Reservation was not divided in ownership by the Dawes Act of 1887 (General Allotment Act). The lands of the reservation were considered extremely remote and in a location of high elevation with a short growing season and limited opportunities for cultivation. Irrigation possibilities were limited to the flow through the Owyhee River and other streams, but all of the farming on the Reservation was already cultivated by the Shoshone and Paiute Indians of the Reservation. The potential for further development by Euro-Americans was not considered economically attractive and this Reservation was overlooked for Euro-American settlement (McKinney 1983). To this day, the ownership of the Reservation remains under the control of the Shoshone and Paiute Tribes and is held as Trust Lands by the Bureau of Indian Affairs.

2.1.2.5.1. Reservoir is Suggested

As early as in 1889, the year of drought, Agent Scott urged that a reservoir be built on the Owyhee River. These pleas had been a priority since the time of the Reservation's establishment. Funds were requested for the purpose, followed by the notice that the cost of the reservoir "could exceed the amount of money available for all the reservations in the country" (McKinney 1983). A decade later, the issue was brought up again only to be concluded that building a dam would be still unfeasible.

Two decades after the well-known Dawes Act, Superintendent Calvin Asbury in his annual report in August 1889, mentioned another petition signed by the headmen of the Shoshone and Paiutes requesting that their lands be allotted to them permanently. The desire for land ownership lasted for a considerable number of years. The tribes never got their request due to a shortage of available water, which turned out to be a fortuitous circumstance ending in the U.S. Government's failure to put any land on the Duck Valley Reservation into Allotments.

2.1.2.5.2. Attempts at Annihilating Indian Culture

During these early trying years of the Indian people adjustment to new ways of life, they were seeking spiritual guidance relying of their ancient tradition for a belief in supernatural forces guiding their destinies. They had all lost land and lives in wars with the white people and were desperate to hold on to their traditional culture to restore faith in life as they had once known it. Religious ceremonies became soon forbidden by the Indian Department and the tribal members were forced to hold them in secrecy. It was a beginning of a campaign to force Indians to abandon their own ways of life which continued for many years to come.

2.1.2.5.3. Entering the 20th Century

The 1900 census stated that the population on the Duck Valley Indian Reservation was a total of 450 : 224 – Shoshone and 226 – Paiute. The land was still available, but the water remained a problem with no reservoir built for its storage. In the early 1900s, more Indians moved to the Duck Valley. The tribal population was increasing, while the land for crops was not due to lack of irrigation canals. By this time, vast lands of the Reservation went un-grazed, and the Indian Service leased some areas to non-Indian cattle owners for a fee. On March 7, 1906, the Indians requested the resurveying of the exterior boundary lines in order to settle continuing disputes with the white settlers. It was also the time when the filing of water rights by non-Indians started on tributaries that furnished water to the Reservation. On July 30, 1910, a report on water conditions was again made in which the Agency Superintendent, Joe H. Norris, suggested the construction of a large dam near a point where the river flows out of the canyon into the valley in the southern end of the reservation.

At this point, the reservation had still not been Christianized by any specific religious group, and no churches had been established. Agency Superintendent, Joe H. Norris reported, “the tribes have no council proper, meeting together to hear matters of interest, the tribes have no funds from which they receive annuities, nor have any share in Trust funds... and there has been no land sale for the Western Shoshone Indians”. However, the leasing of reservation lands by agents or superintendents to non-Indians was a regrettable experience shared by many western Indian tribes (McKinney 1983).

It was typical for agents of that period to write in their reports to include the activities of the whites on the Reservation. For this reason, the oral traditions of the Shoshone-Paiute at Duck Valley have become important and allowed the memories of the tribal elders to preserve invaluable information for descendants (McKinney 1983).

The Western Shoshone Reservation continued to raise a considerable amount of money from the leasing of grazing privileges with very little of the funds finding their way to the tribes. With most of the reservation leased to non-Indians for grazing and with more of the Owyhee River’s water being diverted above the reservation to Euro-American use, it was difficult for Indian stockmen to make ends meet (McKinney 1983).

2.1.2.5.4. Early Agriculture and Water Rights

The climate in the high semi-desert valley was not conducive to development of agriculture without additional irrigation. Prior to the 1860s, Western Shoshones had been engaged in irrigation work for white settlers (long before the establishment of the reservation). They were gaining experience in building canals and working to irrigate hay crops. By 1878 more than a thousand of them were engaged in building a viable ranching/farming economy. A small diversion dam was constructed where Owyhee River entered the reservation. They were actively planting and tending fields and making progress in achieving agricultural self-sufficiency. However, the short, only ninety-five days growing season, demanded more irrigation water. At the time when the diversion dam was built, the water supply was already being reduced even during the wettest time of the year. Numerous requests by agents and Indians remained ignored for several decades.

At the turn of the century there was still enough water for the irrigation works, though non-Indians were consistently diverting more water for their own needs. In 1909 the tribes had six thousand acres under irrigation requiring all the water then flowing in the Owyhee River. The same year the government made a small addition to the reservation to protect the water in a tributary that belonged to the tribes upstream from the reservation and to prevent further encroachment by non-Indians in that area (Figure 7, Figure 8).

As the number of Euro-Americans competing for tribal water increased, the problems of the Shoshone-Paiutes of the Duck Valley Indian Reservation mounted. Twice, in 1915 and a decade later (1925), the Bureau of Reclamation acknowledged Duck Valley's prior rights to Owyhee River water. A two-year drought that began in 1918 prompted the tribe to petition the government again to build the reservoir without any success.

Tribal leaders remember the period on the reservation as being a time when the land looked like a dust bowl, when horse and cattle herds shrank severely and people suffered in absence of water. Encroachments on the upper Blue Creek between 1909 and 1928 had so limited the water available to the Duck Valley people that the tribes abandoned their developments on reservation land along that tributary.

In 1928, Commissioner of Indian Affairs Charles H. Burke requested adjudication of Duck Valley rights and estimated that 75,000 acre-feet of impounded water would be necessary to satisfy the legal needs of the tribes and of the non-Indian encroachments (McKinney 1983).

Figure 7. Duck Valley Indian Reservation circa 1877, 1886, 1910.

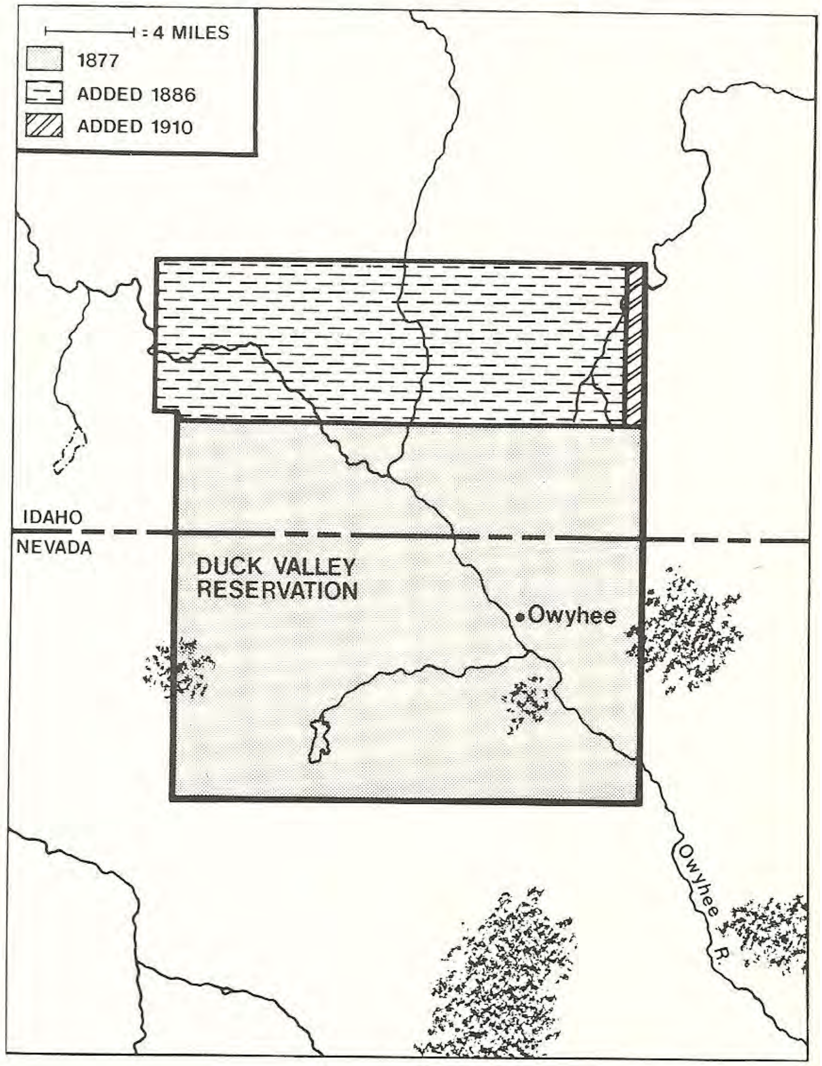
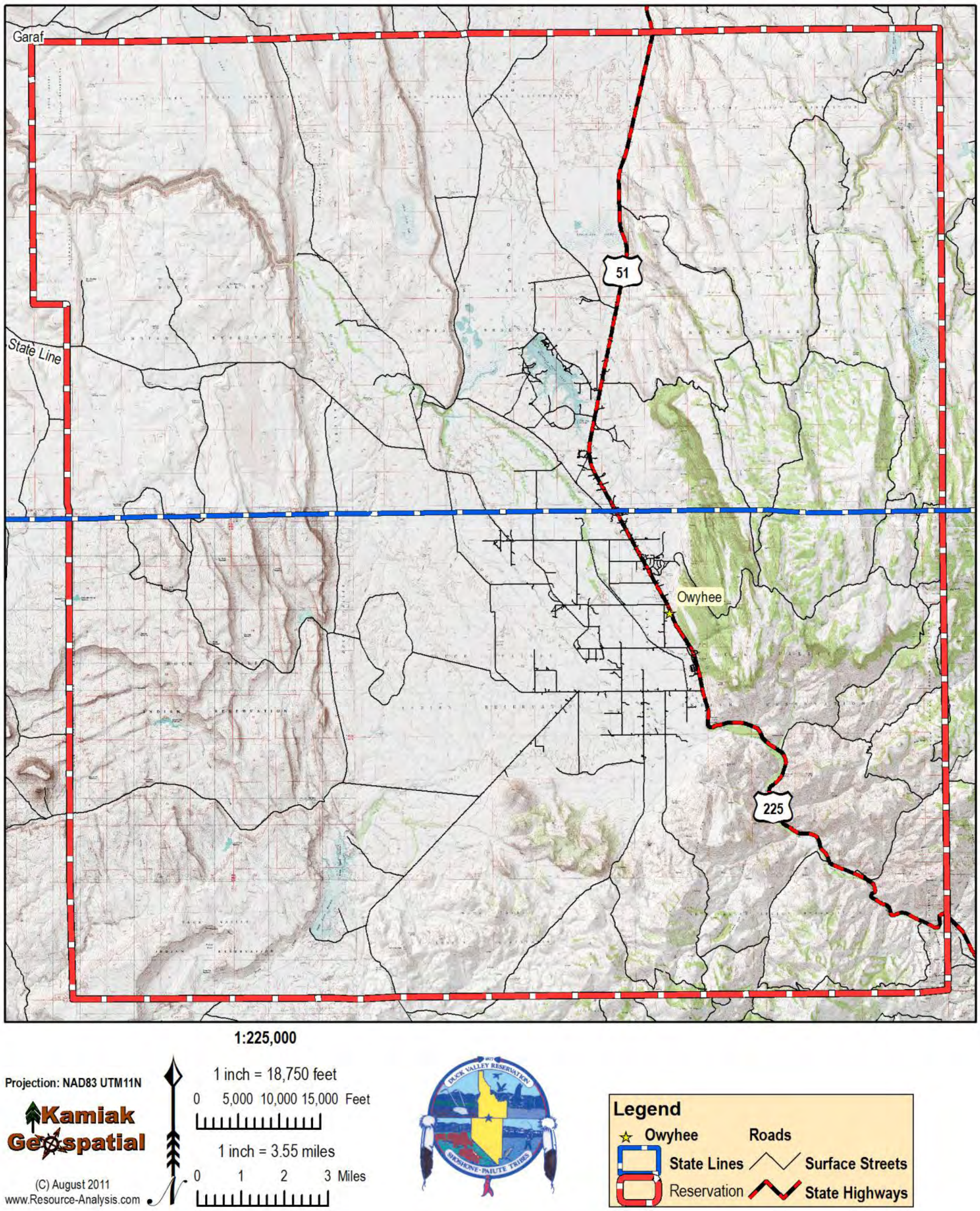


Figure 8. Duck Valley Indian Reservation today (US Geological Survey topographic map).



2.1.2.6. 1934-1953: Indian Reorganization

Indian landholdings in the United States were reduced by nearly two-thirds between 1887 and 1934. Thirty years after passage of the Dawes Act, approximately three million Reservation acres had been alienated in Washington, Oregon and Idaho alone. The process was reversed by passage of the Wheeler-Howard Indian Reorganization Act (IRA) of 1934 (see below), which returned to Indian Tribes some autonomy and ended the loss of Reservation lands by Indians and encouraged Tribes "to set up democratic governments for management of their Reservations". Subsequent federal legislation permitting Indians social and economic programs meant further assimilation of Indians into the Euro-American culture.

Because the Duck Valley Indian Reservation was considered to be unsuitable for farming, due to the extremely short growing season and the limited water supply to the valley, the Dawes Act did not dwindle Indian tenure on the Reservation. Subsequent federal policies aimed at reducing land tenure of Indians passed over Duck Valley with little direct effect.

2.1.2.6.1. Wild Horse Reservoir

Planning for work to build a new dam to serve Duck Valley started at last in 1929 and continued for the next two years resulting in selecting the site for it – the Wild Horse site. The authorship of three extensive reports dedicated to the rights of the Shoshone-Paiutes of Duck Valley Indian Reservation was completed, and itemized the long history of requests for the dam and concluded that "Indians cannot live upon promises and upon hope for a long time". In 1936, the Bureau of Reclamation, acting in concert with the Bureau of Indian Affairs, engaged in buying lands, obtaining title to lands, and condemning land for the reservation site. By 1937, sixty years after the reservation was established, Wild Horse Reservoir was eventually built, originally impounding 36,000 acre-feet of water and providing water enough to irrigate 13,000 acres of Duck Valley's land (McKinney 1983). In 1969 another dam was built to provide for the impoundment of additional water making it possible to impound 72,000 acre-feet of water to guarantee a minimum flow even during a drought year.

However, the controversy over water rights has never vanished. Special interest groups have kept attempting to preempt the Indian rights and acquire control over the reservoir waters for the benefit of tourism and recreation. In October of 1975, a Bureau of Indian Affairs report summarized the study of water rights of the Duck Valley Shoshone-Paiutes. However, the wording of the document has left the controversy unresolved and the compromise solution not achieved.

Today, the tribes have 13,000 acres of subjugated agricultural lands and plans for the development of more farmland. Without sufficient supply of irrigation water, the farming and ranching that has consistently formed the economic base of the Duck Valley Indian Reservation, will be undermined and the future of the tribes will remain insecure.

2.1.2.6.2. Great Depression Era

The worldwide Great Depression greatly affected the US government by limiting the ability and the desire for non-Indians to acquire Indian lands. Cultural movements within the US began to educate non-Indians about the shaping of federal policies during the previous 150 years that led to extreme poverty, devastating epidemics, inadequate food, and substandard education. Public criticism by non-Indians, spurred President Franklin D. Roosevelt to drastically change many important federal policies in regards to Indians and tribes (Pevar 2002).

Discontent with the allotment policy caused the President Roosevelt appointed Commissioner of Indian Affairs, John Collier, to urge Congress to pass the Indian Reorganization Act (IRA) of 1934, [25 U.S.C. Sec. 461-479]. The goal of the IRA was to stem the loss of Indian lands and to assist Indians in acquiring land adequate for self-support. The purpose of the Act was "to rehabilitate the Indian's economic life and to give them a chance to develop the initiative destroyed by a century of oppression and paternalism." (quoting H.R.Rep. No. 1804, 73rd Cong. 2nd Sess., 1 (1934)). The IRA rejected assimilation as a goal and instead sought Indian self-determination. The Act specifically addressed the problem of the loss of Indian land and authorized the Secretary of Interior to acquire land in trust "for the purpose of providing land for Indians" (Courts.gov 2010).

The IRA sought to revitalize tribal governments and tribal members. It strengthened tribal rights to hold title to land and to acquire additional lands, and to stop the allotment process that caused substantial tribal holdings to be divested without their consent.

In addition, the IRA facilitated the US Federal recognition of tribal constitutions and self-governance policies. Although the tribes exercised self-determination since time-immemorial, the recognition of tribal governments through a process of formalization led to several significant cooperative arrangements between recognized tribes and the US Federal government. Shortly after the passage of the IRA, the Secretary of the Interior drafted a model constitution for tribes to consider for adoption. This model constitution called for the formal, written identification of the adopting Tribes' governmental structure and governmental powers (Pevar 2002).

In addition to the written consistency for adopting tribal governments, the IRA created several programs for those tribes that adopted a "consistent constitutional format" intended to benefit tribes. These programs included: the power to employ legal counsel (recognized by the US government), negotiate contracts with state, federal, and local governments, and to prevent the disposition of tribal property by the Secretary of Interior or Congress without the tribe's permission.

In order for a tribe to "qualify" under the IRA, the tribe's constitution had to be "approved" by the Secretary of Interior. The Secretary of Interior required the constitutions that were submitted for approval to hold clauses that subjected the tribes to receive Secretarial approval to every tribal ordinance before it could become effective. This clause was viewed by many tribes as a means of limiting tribal sovereignty and as a result many tribes rejected the IRA's participation requirements. The IRA was accepted by 174 Tribes nationally, and rejected by 78 Tribes (The American Indian Civics Project 1999).

On October 27, 1934, the general council (all voting members) of the Duck Valley Indian Reservation accepted the IRA constitution guidelines. The Shoshone-Paiute Tribes of the Duck Valley Indian Reservation created and adopted an IRA compliant constitution approved by the Secretary of Interior on August 22, 1936 (Library of Congress 2009).

Since that time, the Secretary of Interior has notified "IRA Tribes" (those that formed a government structure under the requirements of the IRA), that they may amend their constitutions and eliminate the requirement of Secretarial approval of their ordinances. Many tribes, but not all, have made this modification (Pevar 2002).

Today, many tribes, including the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, have a government based on executive, legislative and judicial branches. The Shoshone-Paiute Tribal Council (known as the Business Council) composed of a Chairman, Vice-Chairman and five Council Members, all of whom are elected to serve three-year terms. The Business Council directs the Tribal government. The Chairman manages the operations of Tribal government. There are four divisions of tribal administration: Health & Human Services, Judicial Services, Tribal Programs and Support Services (Sho-Pai Tribes 2009).

The Shoshone-Paiute Tribes and all federally recognized tribes in the United States are sovereign in their own lands. That Sovereignty is inherent in the U.S. Constitution, meaning that tribes were recognized as sovereign before the US constitution was written. Tribes and the U.S. government have a long series of treaties or executive orders establishing reservations and tribal rights and authorities. Tribal treaty-making also existed with the British, French, Dutch, and Spanish governments before the birth of the United States as an independent nation.

As elected officials, members of the Shoshone-Paiute Tribal Business Council have a unique governing experience. Their responsibilities include maintaining a government-to-government relationship with federal and state governments. The Shoshone-Paiute Tribal Business Council government also must deal with elected officials from county governments within the Reservation.

Shoshone-Paiute Tribal Business Council members meet with members of the US Congress, cabinet, state governors and even the president of the United States, resolving issues and conducting government business.

During the years following the IRA, new options for tribal self-government within the recognition of the US government was realized. The decades following 1931 witnessed an increase in federal-state cooperation toward improved Indian health care, welfare, agriculture and education. Congress created the Indian Claims Commission (ICC) to work with Indian tribes to seek fair settlement for their land claims. That allowed the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation to receive some form of compensation for their losses in resources as a percentage of their true value.

After the Second World War the government became ever more entangled by conflicting ideologies in its Indian policies. Some spokesmen continued the suppression of traditional Indian culture, while others tried to rectify previous wrongs done to Indians. A program adopted in the 1950s to terminate reservations failed to take into account the basic Indian need for land and was soon reversed (Ruby and Brown 1988).

2.1.2.6.3. Indian New Deal

Conditions improved marginally into the 1940s as a result of the so-called Indian New Deal, which brought a degree of self-determination as well as increased federal support to the tribes helping to alleviate desperate poverty and usher in a renewed period of self-determination. Groups like the Northern Paiutes and Western Shoshone Indians began a series of actions, such as hunting on ancestral lands regardless of state laws and denouncing unfavorable bills before the Nevada legislature, to highlight their push to sovereignty and enforcement of treaty rights. By the 1970s, as a result of federal programs, continued land claims, victories, tribal enterprises, and Indian political actions, life on Great Basin reservations had improved significantly.

2.1.2.7. 1953-1968: Termination

The benevolent attitude reflected in the IRA was short-lived. In 1949, the Hoover Commission issued a report recommending the “complete integration” of Indians into white society. It gave support from the supposition that this process was “in the Indians’ best interests”, and would also save the US Federal Government money (Pevar 2002). President Dwight D. Eisenhower took office in 1953 and directed the abandonment of the IRA’s goals. The policy that replaced the IRA was called the “termination” of the tribes’ trust relationship (Norton 2002).

In 1953, Congress adopted House Concurrent Resolution 108 (popularly known as the “termination policy”). In order “to end [Indians’] status as wards of the United States,” this resolution sought to extinguish the political status of tribes and their trust relationship with the United States. Between 1953 and 1968, more than 100 American Indian tribes were “legally terminated”, thus severing federal trust obligations, and more than 1,360,000 acres of Tribal land were transferred to the public domain, privatized, and sold. To make matters worse, the Bureau of Indian Affairs (BIA), through its Direct Employment Program (better known as the "relocation program"), induced American Indians to move from rural to urban areas, where employment prospects were thought to be better. Between 1953 and 1970, "relocation centers" in Los Angeles, San Francisco, Denver, Minneapolis, and Chicago drew more than 90,000 Indians away from their reservations. In effect, termination was the ultimate assimilation policy (Buck 2008).

Given the absolute linkage between tribal culture, the sense of place, and the dependence on the land they live on, the liquidation of a reservation and the disposal of tribal lands as surplus to be sold "at auction" was a threat felt acutely by all Indians and tribes (V. Deloria 1969).

2.1.2.8. 1968-Present: Tribal Self-Determination

Tribal Sovereignty was again recognized as Federal Indian Policy by the US government shifted again. President Lyndon Johnson declared, "We must affirm the right of the first Americans to remain Indians while exercising their rights of Americans. We must affirm their rights to freedom of choice and self-determination" (Pevar 2002).

The civil rights movement of the 1960s led to the re-examination by the federal government of the termination policy (Etcitty 2004). In a 1970 special message to Congress, President Richard M. Nixon, the Vice-President during the termination era, called for a new federal policy of "self-determination" for Indian nations by denouncing it when he stated, "this, then, must be the goal of any new national policy toward the Indian people; to strengthen the Indian sense of autonomy without threatening his sense of community" (Rothenberg 2006). Thereafter, Congress enacted numerous laws that ostensibly supported self-determination and economic development for Indian tribes, including the Indian Tribal Government Tax Status Act of 1982 (Etcitty 2004).

This policy has received continued support through both congressional and presidential actions, as indicated by the following remarks by President Ronald Reagan in his January 24, 1983, American Indian policy statement (Etcitty 2004):

> ". . . Instead of fostering and encouraging self-government, [federal policies have by and large inhibited the political and economic development of the tribes. Excessive regulation and self-perpetuating bureaucracy have stifled local decision-making, thwarted Indian control of Indian resources, and promoted dependency rather than self-sufficiency . . . The economics of American Indian reservations are extremely depressed with unemployment rates among the highest of the country. Indian leaders have told this Administration that the development of reservation economies is their number one priority. Growing economies provide jobs, promote self-sufficiency, and provide revenue for essential services . . . Tribes have had limited opportunities to invest in their own economies because often there has been no established resource base for community investment and development. Many reservations lack a developed physical infrastructure including utilities, transportation and other public services . . .The federal government's responsibility should not be used to hinder tribes from taking advantage of economic development opportunities . . . A full economic recovery will unleash the potential strength of this private sector and ensure a vigorous economic climate for development which will benefit not only Indian people, but all other Americans as well."

The Self-Determination Act of 1975 and the Self-Governance Act of 1995 opened the way for Indian Tribes and the US Government to enter a new relationship. This was the beginning of significant changes in the federal policies after nearly a century of forceful assimilation and establishment of sovereign rights of tribal governments. The IRA meant the end of the allotment process and more religious and cultural freedom for Indians. In 1968 the US Government amended the existing law to require the consent of Indian Nations before states could assume jurisdiction. By 1986 Congress renewed its nation-to-nation relationship with many of the previously terminated tribes.

The members of the Shoshone-Paiute Tribal Council of the Duck Valley Indian Reservation were elected in 1936. In 1936 the Shoshone-Paiute Tribal Council of the Duck Valley Indian Reservation established its own Constitution under which a council form of government was accepted (1934). The council is made up of an elected chairman and six board members, each serving three-year terms.

The Shoshone-Paiute Tribes' Lands Department assumed complete administrative responsibilities from the Bureau of Indian Affairs for the environmental and natural resource management of the reservation. Natural resource management is a discipline in the management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations. The discipline has given rise to the notion of sustainable development, a principle which forms the basis for land management and environmental governance throughout the world. The Natural Resource Department is comprised of Departments for: Land, Irrigation, Grazing, and National Animal Identification System (Sho-Pai Tribes 2007).

President Barak Obama, in 2009, stated (Obama 2008):

> "My Indian policy starts with honoring the unique government to government relationship between tribes and the federal government and ensuring that our treaty obligations are met and ensuring that Native Americans have a voice in the White House.
>
> "Indian nations have never asked much of the United States, only for what was promised by the treaty obligations made by their forebears. So let me be clear: I believe that treaty commitments are paramount law, I'll fulfill those commitments as President of the United States."

Currently, the Shoshone-Paiute Tribal Council of the Duck Valley Indian Reservation functions as any other sovereign nation. It has its own court system as well as 18 separate tribal departments. As a function of the Justice Department, the Tribe asserts civil jurisdiction over all inhabitants living within the Reservation's boundaries. Health care is provided by the Tribe's Owyhee Community Health Facility, located in Owyhee. In addition to public school system through Elko County, Nevada school system. These facilities provide educational, health and wellness services for all the residents of the reservation, both Indian and non-Indian alike.

A tribally run farm called the "Wilson/101 Ranch" of about 938 acres is one of the operations overseen by the Tribe's Fish, Wildlife, and Parks Department. The Wilson/101 ranch was purchased under Bonneville Power Administration's (BPA) Wildlife Mitigation Program as partial mitigation for wildlife habitat lost due to the construction of the Federal Hydropower System in the Columbia River Basin. The Wilson/101 Ranch is located along the Owyhee River southeast of the exterior boundaries of the Duck Valley Indian Reservation (Sho-Pai Tribes 2011). These lands are currently held as fee simple lands although plans may include their conversion to Tribal Trust properties in the future.

Farming and Ranching are still mainstays of the economy for the Duck Valley Indian Reservation and is reflected in the 12,000 acres of subjugated lands. The Duck Valley Reservation includes 289,819 acres held in trust by the United States Government for the use and occupancy of the Shoshone-Paiute Tribes. Included in the total acreage of the Reservation is 22,231 acres of Wetlands. Wild Horse Reservoir was constructed in 1936 for the Duck Valley Irrigation Project. Tribal membership is over 2,000 with approximately 1,700 living on the reservation. The Shoshone-Paiute Tribes of the Duck Valley Indian Reservation continue to exist within the original territories of their ancestors (Sho-Pai Tribes 2009).

2.2. Demographics

In 2010, the Duck Valley Indian Reservation had a population of about 1,309 living in approximately 493 housing units (Census 2011). Approximately 93% of the population on the Duck Valley Indian Reservation is American Indian or Alaska Native. Shoshone-Paiute Tribal membership is approximately 2,000 tribal members and about 61% of the Shoshone-Paiute Tribal membership resides on the Reservation (Sho-Pai Tribes 2009, Census 2011).

The population and demographic statistics (Table 1) are extracted from the US Census 2010 unless otherwise noted (Census 2011). Across the Duck Valley Indian Reservation, approximately 56% of the total population range between the ages of 20 and 64, and according to the Census.

Table 1. Population and Demographics, Census (2000).

Attribute	Number
Duck Valley Indian Enrollment (approx) (Sho-Pai Tribes 2009)	**2,000**
o Living on the Duck Valley Indian Reservation	1,215
o Living off the Duck Valley Indian Reservation	785
Population Living on Duck Valley Indian Reservation	**1,309**
o American Indian or Alaskan Native	1,215
o Non-Indian and non-Alaskan Native	94
Total Population by Age (living on Duck Valley Indian Reservation)	
o Less than 19 years	376
o 20 to 64 years	933
o 65+ years	132
Housing Tenure	
o Occupied Housing Units	**449**
o o Owner-occupied housing units	283
o o Renter-occupied housing units	166
o Vacant Housing Units (seasonal, recreational, occasional use)	44

2.3. Cultural Resource Policy

For all Cultural Resource information and consultation: be aware that this is confidential information for the purposes of the project at hand only. The level of sensitivity of the information will vary by project.

The Tribal Historic Preservation Office has prepared a summary of tribal policies related to cultural resources as they relate to potential pre-disaster mitigation measures and emergency responses to natural disasters. These statements of policy should be considered for planning purposes related to the preparation of this document and not taken as a specific statement to tribal policies related to all cultural resources for other situations.

Cultural resources include artifacts, land use practices, traditions, language and more. Impacts to these that involve federal triggers (e.g. federal grant or agency money, permits, lands, etc.) require Tribal Historic Preservation Office involvement per Section 106 of the National Historic Preservation Act, 36 CFR 800, http://www.achp.gov/nhpa.html. For other projects, it is prudent to involve the Tribal Historic Preservation Office and/or cultural resource program early in the process to avoid potential costly delays in implementation. Removing or disturbing cultural resources prior to planning or designing or implementing or funding a project in order to circumvent cultural resource law is illegal.

For projects with design and/or planning stages:

- Contact the Tribal Historic Preservation Office early in the process. Ground disturbance, changes to structures, and even priorities planning can have cultural resources impacts.
- Information helpful to the cultural resource assessment:
    - maps, design plans, proposed areas for materials staging, depth of ground disturbance, planned changes to structures (e.g. weatherization, fire proofing, etc.), proposed work schedule, reference any federal money, permit, license, or land that may possibly be involved, contact person for the project. A copy of the current internal information sheet is available from the Tribal Historic Preservation Office.
- If there is federal money, permit, license, etc., involved with the project, the lead federal agency will do the consultation or delegate it to the Tribe or other local entity.
- Include inadvertent discoveries plans in the project plans and contracts.

For projects with no design or planning stage (e.g. fire, tornado, landslide):

- Contact the Tribal Historic Preservation Office or designee as soon as possible.
- Cultural resources do not take precedence over immediate threats to life.
- Involve the Tribal Historic Preservation Office or designee in clean up or other post-crisis planning.
- Note that the Tribal Historic Preservation Office and other cultural resource staff are hazmat and/or First Aid/CPR trained and qualified to be on cleanup and disaster sites.

For Inadvertent Discoveries of Cultural Resources:

- Contact the Tribal Historic Preservation Office or designee immediately.
- Do not move, photograph, or discuss the items with anyone other than cultural resource staff.
- Stop work in immediate area, generally considered to be a 100 foot radius, and remove staff/contractors from that area.
- The Tribal Historic Preservation Office or designee will come as soon as possible. Usually within the hour.

For Inadvertent Discoveries of Possible Human Remains:

- Contact the Tribal Historic Preservation Office or designee immediately.
- Remember that this could be a crime scene. If it obviously is, contact Tribal law enforcement.
- Absolutely no photography (no cell phone photos, no cameras, etc.).
- Cover the suspected remains with soil, plain cloth, or similar.
- Stop work and remove staff/contractors in a 100 foot radius around the remains.
- Inform those present about the confidential nature of the issue.
- Provide security by having a senior staff/contractor stay with the remains, at the edge of the 100 foot radius until the Tribal Historic Preservation Office or cultural resource staff arrive.

These precautions are intended to protect the sanctity of the remains discovered or the cultural characteristics of the site while allowing reasonable protection of people and resources while completing hazard mitigation projects. It is important to recognize that cultural resources extend beyond the physical and temporal constraints of an artifact and extend into the realm of place or situation unique to the site. The Euro-American traditionally views time as linear; for many tribes, it is cyclic. From a Euro-American perspective, the past is long-gone; from a tribal perspective, disturbing the past can have dire consequences in the present (V. J. Deloria 1994).

2.4. Schools

Traditionally, extended families sharing life in a single household provided many teachers for their children. As children grew up, they learned about all aspects of Shoshone and Paiute life and participated in the life of the parents and community. They learned practical skills, including weaving, tool construction, carving, hunting, fishing, root and plant gathering, culture, and other aptitudes. Parents, with tribal elders, were the main instructors of language, oral history, legends, plant use and social development. This kind of education provided Shoshone and Paiute children with necessary survival skills and intellectual challenges; it also encouraged community support and cooperation among all members of the family through study of natural environment and legends.

The Office of Indian Affairs believed that “civilizing” the Indians by separating them from their traditional ways of life and surrounding would only be succeeded through instruction in the English language and exposure to western religion.

From 1884 through 1911 a boarding school operated on the reservation. Thereafter 3 day schools were operated in three separate locations on the reservation. In Owyhee, the Swayne School was built. In 1931, the day schools were closed and all students attended the Swayne School. Students of the higher grades were sent off reservation to boarding schools until 1946 when high school classes were added. In 1956, the reservation school system was consolidated into the Elko County School District of Nevada (Figure 9) and today is known as the Owyhee Combined School (K-12). Recently, a Community Education Center was placed in Owyhee for GED and higher education courses (Sho-Pai Tribes 2009).

Figure 9. Elko County Combined Schools logo & high school entrance.

Total Student Enrollment for Owyhee Combined School (FY2011-12): 243 students

- Elementary: 150
- Jr. High: 31
- High School: 62

Area That Students Come From In Attendance:

- Mountain City: 2 students
- Riddle: 9 students
- Owyhee: 232 students

Owyhee Combined School Staff: 50 staff total

- Administration: 3 total (1- Principal, 1- Vice Principal/Athletic Director, 1- Counselor)
- Certified Teachers: 23 total
  - Elementary: 8 teachers
  - Combined: 4 teachers
  - Jr. High: 3 teachers
  - High School: 8 teachers
- Classified Staff: 24 total
  - Secretaries: 3 total
  - Instructional Aides: 11 total
  - Maintenance: 4 total
  - Transportation: 3 total
  - Food Service: 3 total

2.5. Population Density Indices

Current population density trends on the Duck Valley Indian Reservation have been determined based on the location of structures within the Duck Valley Indian Reservation. This analysis approach has been defined by Schlosser (2010) in the development of Wildland-Urban Interface (WUI) population density indices and is used here (Figure 10). These assessments indicate where the relative density of structures is located. Structures are used as a surrogate for population density, although the number of people living in each structure is not consistent between neighborhoods, and not within one community. As a planning tool, these population density indices indicate where high density is currently located in juxtaposition to other high and low density areas.

The Duck Valley Indian Reservation is approximately 289,319 acres (Table 2). In Figure 10, the white colored areas, surrounding the villages indicate areas of wildlands; where no structures currently exist, encompassing approximately 205,808 acres. Expansive yellow colored areas (from light yellow to bright yellow) can be referred to as Rural, Agricultural, and Interface lands where a scattered number of structures are located.

Interface areas cover about 43,499 acres with only 8 structures. Agricultural lands cover 21,355 acres with 20 structures. The Rural lands identified within the Duck Valley Indian Reservation encompass approximately 3,879 acres and include 16 structures giving a density for these three categories of about 1,555 acres per structure (Table 2).

The areas colored in shades of brown represent the village population densities (the higher the concentration of structures the darker the brown shading) on the Duck Valley Indian Reservation. Approximately 14,778 acres are in this category of population density with about

544 structures, giving a structure density of roughly 27 acres per structure. All of the brown-shaded colored areas are consistent with a rural village population density (Table 2).

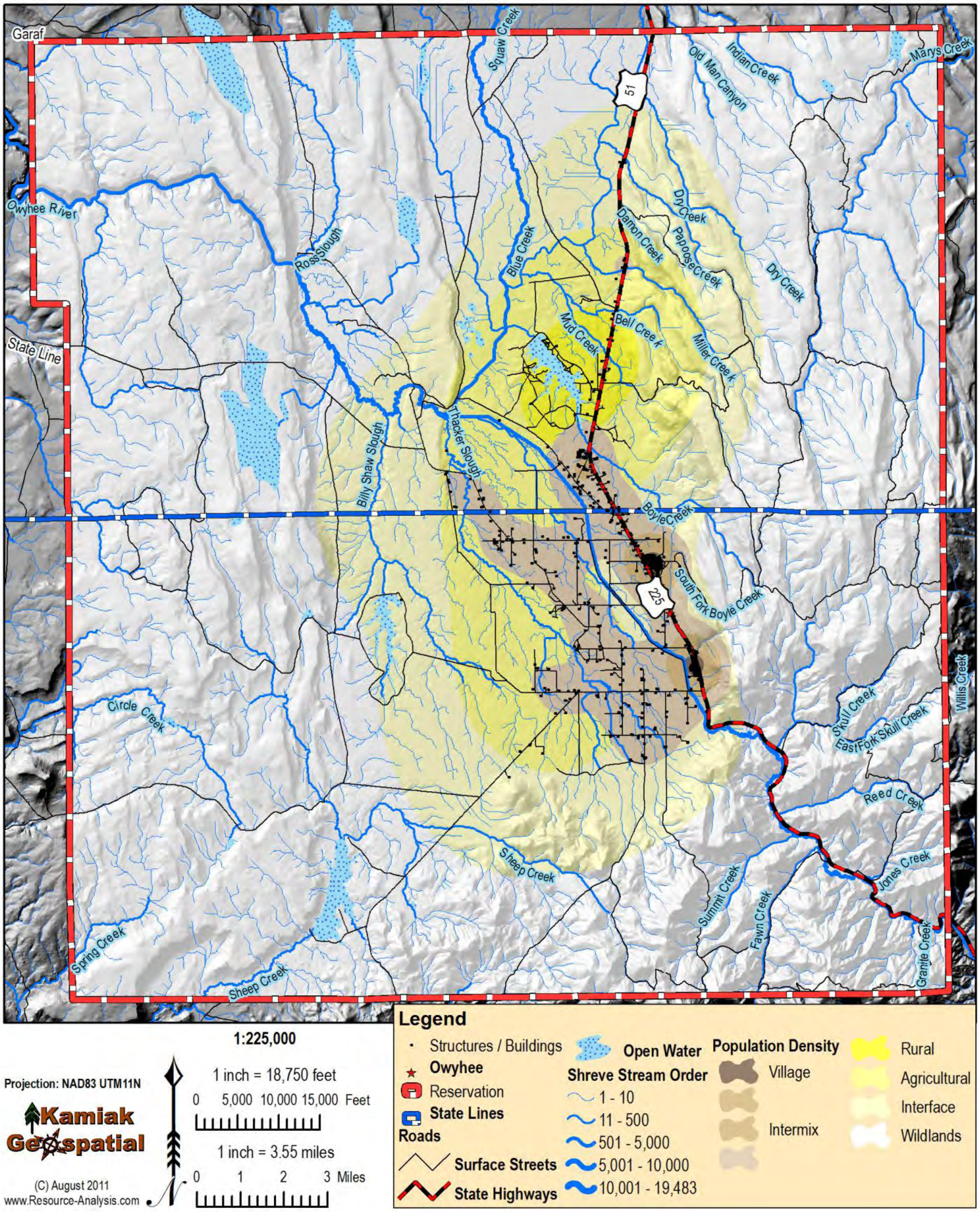
Table 2. Structure Density on the Duck Valley Indian Reservation.

Population Density Classification	Acres (approximate)	Number of Structures	Density (Acres per Structure)
Village	235	200	1.18
	931	70	13.30
Intermix	797	14	56.93
	12,815	260	49.29
Rural Lands	3,879	16	242.44
Agricultural	21,355	20	1,067.75
Interface	43,499	8	5,437.38
Wildlands	205,808	0	N/A
Total, Average	**289,319**	**588**	**492.04**

A time-series study of this analysis procedure in this region, and other areas, has revealed that populations will tend to grow into two different areas unless regulated through planning and zoning efforts to direct or limit the expansion of growth.

This population density analysis was completed for the 2006 Duck Valley Indian Reservation Tribal Hazards Mitigation Plan and produced a very similar population density matrix, as seen while using the current structure locations (Figure 10). The areas experiencing relative growth are the result of new construction west and north of the village (Owyhee) and along the Owyhee River. In this area, the density of structures has increased slightly causing the brown-shaded areas to merge together (Figure 10). Future expansion on the Reservation is expected to be seen between the highest densities of current population concentrations, most likely along Idaho State Highway 51 / Nevada State Highway 225 and between the current moderate densities seen from Owyhee and northerly adjacent to the state highways.

Figure 10. Population Density (Wildland-Urban Interface) Based on 2009 Structure Locations in Idaho, and 2010 structure locations in Nevada.



2.6. Structure Assessment & Values

The summary of structure values within the Duck Valley Indian Reservation has been collected by the Shoshone-Paiute Tribes and is summarized here. The data included the building locations (in GIS) for the entire Duck Valley Indian Reservation assembled by the Kamiak Ridge, LLC, and the Sho-Pai Fire Department staff. The data were used to summarized the building attributes such as building materials, roofing, and value. The Shoshone-Paiute Tribes also assembled data for insured values of each structure and apparent use (residential, school, church, tribal, etc.).

The result of the data on the Duck Valley Indian Reservation is an encompassing assessment of structure values for use in determining the loss exposure potential posed by natural disasters. This summary will be referenced throughout this document to refer to the structural valuations of the Duck Valley Indian Reservation and the exposure to risk presented by natural disasters.

The analysis determined that there are approximately 588 structures (permanent, temporary, and out-buildings) located on the Duck Valley Indian Reservation with a total value of approximately $71.2 million (Table 3). Permanent structures referenced in Table 2 refer to approximately 588 structures which are permanent and used a primary structure. The structures referenced in Table 2 do not count garages co-located with primary homes.

The values in Table 3 are illustrative of the resources potentially at risk to loss from natural disasters on the Duck Valley Indian Reservation. It is important to recognize, however, that these values only articulate the financial investment in structures used for residences, businesses, government services, and community infrastructure (water and waste). These values do not articulate the potential loss of life, damages to the ecosystem, or the traditional way of life for the residents living on the Duck Valley Indian Reservation.

It is also necessary to note that the structures included in this analysis include homes, businesses, offices, and community structures, as well as garages, sheds, equipment storage buildings and associated structures. The 588 structures identified in this assessment are not solely used for housing (Table 3).

Table 3. Value of structural improvements within Duck Valley Indian Reservation.

Structure Type	Total Number of Structures	Souls Living in Structures	Total Value
BIA (all uses)	7	0	$1,250,000
Churches	6	0	$2,220,000
Commercial	24	0	$5,509,500
Hospital	3	0	$ 5,509,196
Residential (including abandoned)	498	1,036	$47,602,361
School (all uses)	13	0	$3,875,000
Sho-Pai Tribes (all uses)	37	0	$5,250,050
Total	**588**	**1,036**	**$71,216,107**

2.7. Transportation Systems

Primary access through the Duck Valley Indian Reservation is from the north, through Idaho State Highway 51 and from the south, through Nevada State Highway 255. There are no other primary access routes connecting the Duck Valley Indian Reservation to other metropolitan areas.

Local access roads provide access to all areas of the Reservation including populated places, homes, wildlands, farms, hunting and gathering areas, and other locations. While use of these access routes is important for local residents, natural resource workers, and others, the linkages of these access routes to the major access routes (State Highways) on the Duck Valley Indian Reservation is critical in terms of the ability of people to escape threatening situations related to natural hazards and for emergency responders to take action to events.

Access routes are displayed on most of the area maps shown in this planning document. Approximately 378 miles of roads blanket the Duck Valley Indian Reservation. Approximately 26 miles of those roads are maintained as State Highways, and 352 miles are local roads.

Figure 11. Antelope of Duck Valley.

Chapter 3. Planning Process

The Duck Valley Indian Reservation Tribal Hazards Mitigation Plan has been developed by representatives of the Duck Valley Indian Reservation during 2010 and 2011 and focuses on short-term and long-term measures with a detailed 5-year implementation strategy.

The Shoshone-Paiute Tribes of the Duck Valley Indian Reservation completed a Tribal Hazards Mitigation Plan in 2005, approved by FEMA and adopted by the Tribal Council. At that time, the Tribal Hazards Mitigation Plan was treated as a State Standard Mitigation Plan with an authorization for only 3 years. Since the time of approval, Tribal Hazard Mitigation Plans are treated as a unique structure with a 5-year planning horizon. This plan will be updated and re-approved 5 years from the adoption date of this plan.

The Duck Valley Indian Reservation Tribal Hazards Mitigation Plan has been completed to be consistent with the Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended by the Disaster Mitigation Act of 2000 (P.L. 106-390); the National Flood Insurance Act of 1968, as amended by the National Flood Insurance Reform Act of 2004 (P.L. 108-264); and 44 Code of Federal Regulations (CFR) Part 201 – Mitigation Planning, inclusive of all amendments through September 1, 2011. The requirements have been summarized in the Federal Emergency Management Agency (FEMA) Crosswalk used to analyze a plan's compliance with these federal regulations (release date March 2010).

Planning leadership was provided by the Shoshone-Paiute Tribal Emergency Response Commission. The Southwest Idaho Resource Conservation and Development Council, Inc., located in Meridian, Idaho, worked with the Shoshone-Paiute Tribes to secure grant funding from FEMA Region X. The Southwest Idaho Resource Conservation and Development Council, working with the Shoshone-Paiute Tribal Emergency Response Commission contracted with Kamiak Ridge, LLC, of Pullman, Washington, through a competitive bidding process, to assist the Tribes in developing the Tribal Hazards Mitigation Plan. Representatives from many of the Tribe's Departments participated in the plan's development through attendance at planning meetings, by providing important planning documents to the planning team's efforts, and by collaborating during information exchange, planning meetings, and with the document's development.

The planning committee formed a broad multi-jurisdictional planning committee with representatives of adjacent jurisdictions including the US Forest Service, Bureau of Lands, representatives from states and counties of Idaho and Nevada, commercial enterprises, and others. Their attendance and participation in the planning process provided many opportunities for collaboration in mitigation planning as well as familiarity with the situation on the Reservation.

Public involvement activities included planning committee meetings, press releases, a residential survey, a youth art contest, public meetings and open public review opportunities during the plan's development (each will be described in detail in this planning document).

Effective November 1, 2004, a Local Hazard Mitigation Plan approved by FEMA became a requirement for Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation Program (PDM) eligibility. The HMGP and PDM programs provide funding through state emergency management agencies to support local mitigation planning and projects to reduce potential disaster damages.

The Tribal Hazard Mitigation Plan requirements for HMGP and PDM eligibility are based on the Disaster Mitigation Act of 2000, which amended the Stafford Disaster Relief Act, to promote and integrate cost-effective mitigation activities on Tribal Reservations. Local hazard mitigation plans are required to meet minimum requirements of the Stafford Act-Section 322, as outlined in the criteria contained in 44 CFR Part 201. The Plan's criteria summarized for this effort cover the planning process, risk assessment, mitigation strategy, plan maintenance, and adoption process.

3.1. Development and Approval Process

The Duck Valley Indian Reservation Tribal Hazards Mitigation Plan was drafted in sections by Kamiak Ridge, LLC, led by the Kamiak Ridge Environmental Planner, William E. Schlosser, Ph.D. All sections of the plan were subjected to an internal review at Kamiak Ridge when first written. After the internal review of sections of the document, it was submitted to the Tribal Hazards Mitigation Planning Committee, next to the Tribal Council, and then an open public review.

One public meeting with hosted dinner was conducted on June 23, 2011, prior to the assemblage of the draft Tribal Hazards Mitigation Plan. The suggestions and recommendations from the public meetings were incorporated into the draft that was provided to the Tribal Hazards Mitigation Planning Committee members and the Tribal Council for review. Public review of the document was conducted during September and October 2011. Public review comment opportunities were made open for all residents of the Duck Valley Indian Reservation, representatives from neighboring jurisdictions, and other interested parties. Once received, these comments were incorporated into the final Duck Valley Indian Reservation Tribal Hazards Mitigation Plan.

This process provided an opportunity for Tribal departments, neighboring governments, regional agencies, businesses, academia, and non-profit interests to be involved in the planning process. It also facilitated the review and incorporation of existing plans, studies, reports, and technical information throughout the Tribal Hazards Mitigation Plan's development. This effort utilizes the best and most appropriate science from all partners and integrates local and regional knowledge about hazard risks and exposure, while meeting the needs of Duck Valley Indian Reservation residents and visitors.

Shortly after the formation of the Duck Valley Indian Reservation Tribal Hazards Mitigation Planning Committee, from January through March 2011, the Mission, Vision, and Goal statements from the 2006 plan were reviewed, updated, revised, debated, and then agreed on by the Planning Committee members to reflect a holistic and comprehensive expression of these planning efforts.

During the initial Planning Committee meetings, the extent of the analysis and the protection afforded by projects implemented through this Tribal Hazards Mitigation Plan were discussed. The **definition of "public"** for this effort was determined to be all residents and visitors on the Duck Valley Indian Reservation. No distinction was made between Indian and non-Indian, Tribal member and non-Tribal member. The extent of the analysis was determined to be all areas within the Duck Valley Indian Reservation. The efforts detailed for this entire Tribal Hazards Mitigation Plan focus on the approximately 289,319 acres of the Duck Valley Indian Reservation.

3.1.1. Mission Statement

To make Duck Valley Indian Reservation residents, communities, Tribal government, and businesses less vulnerable to the negative effects of natural hazards through the effective administration of hazard mitigation grant programs, hazard risk assessments, wise and efficient mitigation measures, and a coordinated approach to mitigation policy through tribal, federal, state, regional, and local planning efforts. Our combined prioritization will be the protection of people, structures, infrastructure, economy, and unique ecosystems that contribute to our way of life and the sustainability of the local and regional economy.

3.1.2. Vision Statement

Institutionalize and promote a reservation-wide hazard mitigation ethic through leadership, professionalism, and excellence, leading the way to a safe, sustainable Duck Valley Indian Reservation.

3.1.3. Goals

The Duck Valley Indian Reservation Tribal Hazards Mitigation Plan Committee has adopted a series of primary goals intended to benefit the Reservation.

- Prioritize the protection of people, structures, infrastructure, economy, and unique ecosystems that contribute to our way of life and the sustainability of the local and regional economy;
- To reduce the threats to public health and safety posed by natural hazards;
- Educate people and communities about the unique challenges of hazard mitigation in their daily lives;
- Establish mitigation priorities and develop mitigation strategies on the Duck Valley Indian Reservation;
- Reduce the negative environmental impacts of natural hazards;
- Reduce the long-term costs of disaster recovery and disaster mitigation through intelligent and strategic mitigation policies and practices; and
- Identify and manage for sustainable land use on the Duck Valley Indian Reservation in light of natural hazards and our management of the land resources.

3.2. FEMA Disaster Mitigation Planning

The Shoshone-Paiute Tribes were awarded a government-to-government grant to complete the planning for this Tribal Hazards Mitigation Plan. FEMA reviews the final version of a plan prior to Tribal adoption to determine if the plan meets the criteria defined in the CFRs, but FEMA is unable to approve the plan prior to adoption by the tribal jurisdiction. The Duck Valley Indian Reservation Tribal Hazards Mitigation Plan has been developed and internally evaluated to adhere to a variety of FEMA developed criteria specifically defined in the Tribal Multi-Hazard Mitigation Plan Review Crosswalk (FEMA Region 10, released March 2010).

3.3. State Hazard Mitigation Plans

3.3.1. Idaho State Hazard Mitigation Plan

The Idaho State Hazard Mitigation Plan (Idaho BHS 2010) was prepared by the Idaho Bureau of Homeland Security (IBHS) to reduce disaster assistance costs and preserve disaster assistance eligibility for the State and the local governments within its borders. It was approved by FEMA and adopted by the state. The Plan is a comprehensive, statewide mitigation planning effort conducted in Idaho. It identified hazards and associated vulnerabilities within the State and provides a comprehensive statewide strategy to reduce future disaster losses through sound mitigation projects. Specifically, the Plan:

- Identified and profiled hazards in the State of Idaho
- Assessed statewide risks from hazards present in the State.
- Established a Framework for statewide Mitigation Planning and Implementation.

- Developed Opportunities for State, Regional, Tribal, and Local Mitigation Planning and Implementation.
- Facilitated Integration of Mitigation into community development before disasters occur, and during disaster recovery.

The 2007 Idaho State Hazard Mitigation Plan was a major, FEMA-required update and revision of the 2004 plan. In November 2010 it was updated again on this regularly scheduled update of every three years, and adopted by the state.

The Plan analyzes risk using updated techniques to understand potential consequences (i.e., number of properties affected and dollar values of damage). The 2010 Plan profiles 12 hazards including flood, earthquake, wildfire, landslide, dam/levee failure, avalanche, drought, lightning, severe storm, wind/tornado, volcanic eruption, and hazardous materials. Of these hazards, from a statewide perspective, the three most significant are:

- Flood
- Earthquake
- Wildfire

The State of Idaho BHS determined that each of these hazards could result in an event that would cause over $1 billion in damages. Of those 12 hazards listed by the State of Idaho, this Duck Valley Indian Reservation Tribal Hazards Mitigation Plan includes assessments and risk profiles for 10 natural disasters including flood, earthquake, wildfire, landslide, dam/levee failure, drought, lightning, severe storm, and wind/tornado (avalanche is excluded from the Duck Valley Indian Reservation Tribal Hazard Mitigation Plan profile).

Specifically, the Idaho State HMP 2010 updated plan:

- Assesses statewide risk from hazards present in the State.
- Establishes a Framework for statewide Mitigation Planning and Implementation.
- Develops Opportunities for State, Regional, Tribal, and Local Mitigation Planning and Implementation.
- Facilitates Integration of Mitigation into community development before disasters occur, and during disaster recovery.

3.3.2. Nevada State Hazard Mitigation Plan

The standard version of the Nevada State Hazard Mitigation Plan (Nevada DPS 2010) was originally submitted by the Nevada Division of Emergency Management (NDEM) and approved by FEMA in 2004; it was updated in 2007 and again in the current 2010 iteration. Since 2007, the Nevada Hazard Mitigation Planning Committee (NHMPC), NHMPC Planning Subcommittee, NDEM staff and the University of Nevada Reno, Nevada Bureau of Mines and Geology staff contributed to the 2010 update.

The State of Nevada completed and adopted an Enhanced Hazard Mitigation Plan approved by FEMA in November 2010. The hazards considered for inclusion in the Nevada HMP included a consideration of a long list of potential natural and man caused hazards (Table 4).

Table 4. Nevada State Profile of Hazards.

Hazard Type	Should It Be Profiled?	Explanation
Natural Hazards		
Avalanche	Yes	Avalanches affect a small portion of the State—Tahoe, Lee Canyon, and Ruby Mountains.

Table 4. Nevada State Profile of Hazards.

Hazard Type	Should It Be Profiled?	Explanation
Canal failure	Yes	Nevada has experienced localized flooding due to failure of irrigation canal walls. The committee decided that it should be included under the Flood category.
Coastal storm	No	Nevada is not located in an area prone to coastal storms.
Coastal erosion	No	Nevada is not located in an area prone to coastal erosion.
Dam failure	Yes	There have been no federal declarations due to dam failure; however, Nevada has several high-hazard dams. The committee decided that it should be included under the Flood category.
Drought	Yes	Statewide drought declarations were issued in 2002 and 2004.
Earthquakes	Yes	Nevada ranks as the third state in frequency of large earthquakes over the last 150 years.
Epidemic	Yes	This hazard could cause an extreme economic downturn for the State of Nevada particularly in the casino industry.
Expansive soils	Yes	Expansive soils have caused infrastructure damage in the Reno-Sparks area.
Flood	Yes	Flood damage occurs regularly in Nevada. Flooding may result from rapid snow-melt, thunderstorm-induced flash floods, mudslides, dam failure, or failure of canal walls.
Infestations	Yes	Infestations impact Nevada's economy through the direct destruction of crops and natural resources as well as indirectly by increasing susceptibility to wildfire.
Landslide	Yes	In Nevada, rockslides are more common than the normal landslide seen in other areas. They tend to be localized; however, this hazard can occur with earthquakes, major storms, floods, and melting ice and snow.
Severe Weather Hazards: The subcommittee decided that the following severe weather hazards should be profiled individually		
Extreme heat	Yes	This hazard can affect areas across the entire state.
Hail and thunderstorms	Yes	The entire state is susceptible to thunderstorms which cause localized flooding and wildfire.
Severe winter storm and extreme snowfall	Yes	Normally Nevada can handle winter storms except when these storms are severe.
Tornado	Yes	Although tornados in Nevada are rare, they do occur.
Windstorm	Yes	All counties in Nevada are susceptible to severe and strong windstorms which have caused property damage.
Land subsidence and ground failure	Yes	The southern part of the State is particularly vulnerable to land subsidence due to groundwater extraction. Other parts of the state are also affected by subsidence or more rapid ground failure due to mine dewatering or the presence of underground mine workings adjacent to populated areas. (Definition has been expanded)
Tsunami/seiche	Yes	Lake Tahoe could have 10-meter-high waves generated by an earthquake under or adjacent to the lake.
Volcano	Yes	Nevada is downwind from potential volcanic eruptions, most importantly Mammoth Lakes, Mt. Lassen, and Mt. Shasta, California. Major eruptions could cause ash fall in Nevada.
Wildfire	Yes	The terrain, vegetation and weather conditions in the State of Nevada are favorable for the ignition and rapid spread of wildland fires.
Human-caused		
Hazmat	Yes	All Hazardous Material Events preparedness, planning, response and mitigation efforts are addressed separately from this plan under the State Emergency Response Commission and the Department of Conservation and Natural Resources.
Terrorism/WMD	Yes	All Terrorism/WMD preparedness, planning, response and mitigation efforts are addressed separately from this plan by the Office of Homeland Security.

Of those hazards listed in the state's HMP with indicated profile for inclusion in that Plan, the natural hazards listed (with a Yes by the state) and color coded with a yellow highlight were also included in this Duck Valley Indian Reservation Tribal Hazards Mitigation Plan (2011).

3.4. Tribal Hazard Mitigation Planning

In 2007, FEMA released Hazard Mitigation Plan regulations that define Hazard Mitigation Plan requirements specifically designed to account for the unique hazard mitigation planning needs of Tribal governments. A Tribal Hazards Mitigation Plan requires a different and often broader planning process than a State Plan. The Duck Valley Indian Reservation Tribal Hazards Mitigation Plan has used this set of criteria as a template for assessing potential risks on the Duck Valley Indian Reservation and developing a comprehensive and integrated disaster mitigation approach.

The Duck Valley Indian Reservation is located along the border of the Columbia Plateau and north of the Great Basin, partially located in each Idaho and Nevada. The Duck Valley Indian Reservation has a land area of approximately 289,319 acres. There are no incorporated cities on the Reservation. South of the Reservation, along Nevada State Route 225, Mountain City, Nevada is home to a small community.

The Duck Valley Indian Reservation is surrounded by Owyhee County, Idaho, and Elko County, Nevada. Federal lands, held by the US Forest Service and the Bureau of Lands surround the Reservation with state lands (both Idaho and Nevada) and private lands intermixed with them.

The invitation to participate in the development of the Duck Valley Indian Reservation Tribal Hazard Mitigation Plan was extended to Elko County and Owyhee County Emergency Service Departments, and to the Idaho Bureau of Homeland Security and Nevada Division of Emergency Management. Idaho Department of Lands and Nevada Department of Forestry were also invited to participate in the planning process. The invitation was accepted by Owyhee County Emergency Management, Elko County Emergency Management, the State of Idaho BHS, the US Forest Service, the Bureau of Lands, Indian Health Board of Nevada, Natural Resources Conservation Service, Southwest Idaho RC&D, Raft River Electric Coop, and Mountain City to participate as planning members in this effort. Tribal representation was extensive with most tribal departments and the Bureau of Indian Affairs represented at each planning meeting. Through this endeavor it is expected that the cross-jurisdictional cooperation between the Shoshone-Paiute Tribes and the Counties and States will be enhanced in terms of disaster preparedness and pre-disaster hazard mitigation. The full list of planning participants is presented in Table 5.

3.5. Planning Committee Membership

Leadership for the Duck Valley Indian Reservation's hazard mitigation planning effort was provided by the Tribal Emergency Response Commission (TERC) and Fire Management Program; Brent Hunter the TERC Chairman and Shoshone-Paiute Tribes' Fire Management Officer. The Southwest Idaho RC&D program, Bill Moore, assisted with the grant application and financial management between the Tribes, Kamiak Ridge and FEMA. Project Management by the contractor, Kamiak Ridge, LLC, was provided by Project Manager Dr. William E. Schlosser, an Environmental Scientist and Regional Planner. Together, these three individuals provided leadership for the Planning Committee and cooperated in all phases of the plan's development.

Figure 12. TERC Planning Committee provided planning leadership for the Shoshone-Paiute Tribes.

Committee communication and information dissemination was facilitated by the Project Manager through the provision of available information via e-mail and a project File Transfer Protocol (FTP) internet site for sharing electronic files used in the development of the planning document. These data included information about the Committee meetings, copies of FEMA guidance for developing plans, other relevant documents for the Planning Committee use, as well as the schedule of meetings and outreach efforts.

The FTP internet site established for use by the Planning Committee (hosted by Kamiak Ridge) allowed the Planning Committee members and the Project Manager to share documents, photographs, and other electronic files for use in the planning process. In addition, the large map set files, were created and stored in Adobe Acrobat PDF (Portable Document Format) files, were made available for download by all Planning Committee members. These document sets included detailed mapping for the Reservation and surrounding areas. One map set was also created for the entire Reservation showing all of the risk profiles and population densities. Each map set was formatted to display on a variety of sizes from 24"x24" sheets to 44"x44' within Adobe Acrobat Reader.

This format of providing mapping analysis products (in PDF format and at high resolution) was selected for the ability to display detailed attributes otherwise not recognizable when reduced to a normal page size of 8½"x11". These maps were used by the Planning Committee members, participating agencies, organizations and local citizenry while developing an understanding of risk exposure and potential mitigation measures and incorporating the "sense of place". All of the wall maps were made a permanent fixture on the walls of the Owyhee Fire Station meeting room where the meetings were held. These maps replaced the maps created in 2005 and 2006 for the previous version of the Duck Valley Indian Reservation Hazards Mitigation Plan.

Committee members were provided draft sections of the analysis as they were developed. This issuance of sections, as developed, allowed the Planning Committee members an ability to comment and provide feedback as the analysis progressed. Thus, the entire Planning Committee shared to the same perspective of risk exposure, vulnerability to losses, and potential mitigation measures.

At the launch of the planning process, potential Planning Committee members were invited by the Planning Committee leadership. The invited members included representatives from each Tribal Department, adjacent agency representatives (regional, county, state, and federal), fire protection organizations, school districts, and public service organizations.

Formal letters of invitation to serve on the Planning Committee were sent on behalf of the Shoshone-Paiute Tribes, by Dr. Schlosser of Kamiak Ridge. The invitation was met by 25 dedicated individuals who attended many planning committee sessions, and another 20 individuals who attended infrequently but participated over e-mail, telephone, and written correspondence (Table 5). These respondents became the core of the Planning Committee. All Duck Valley Indian Tribal Departments were invited to attend and participate on this Planning Committee. Invitation letters were also sent to administrative representatives of organizations and agencies, including:

- Owyhee County Emergency Management
- Elko County Emergency Management
- Idaho Bureau of Homeland Security
- Nevada Division of Emergency Management
- State of Idaho Transportation Department
- Nevada Department of Transportation
- Idaho Department of Lands
- Nevada Division of Forestry
- USDI: Bureau of Indian Affairs
- USDI Bureau of Land Management
- National Weather Service (from National Oceanic and Atmospheric Administration – NOAA)
- Owyhee Combined Schools (K-12)

The participation indicated by the Planning Committee attendance in Table 5 should not be considered the sole means of participation. People also participated in joint work through correspondence, discussions, the sharing of materials and collaboration with others. Many of the participants, such as the federal agency representatives, were faced with a federal budget reduction, a threat of federal shut-down (April), and federal debt ceiling debates (August). One key agency support loss, resulted in the removal of federal support for RC&D Councils across the country in April. Although the Southwest Idaho RC&D is a non-profit organization, its support from the federal budget was a critical component of the coordinator's role in planning committee participation in the planning effort for the Tribal Hazards Mitigation Plan.

Shrinking budgets and limited resources to commit to this planning effort was a repeated scenario with many of the cooperators and Tribal Department representatives. These individuals were all kept up to date through regular e-mails and information sharing strategies that allowed a broad-based sharing of ideas and insights.

3.6. Planning Committee Meetings

Coordination for the update of the Duck Valley Indian Reservation Tribal Hazards Mitigation Plan started soon after award of the grant by FEMA to the Southwest Idaho RC&D and the Shoshone-Paiute Tribes in March 2010. The Southwest Idaho RC&D and the Shoshone-Paiute Tribes coordinated on scheduling the plan of action for the update and launched a competitive bidding package to select a planning consultant to assist the Tribes in developing the update. The Southwest Idaho RC&D and the Shoshone-Paiute Tribes selected Kamiak Ridge, LLC, with planning consultant Dr. Schlosser to provide this service. Dr. Schlosser was the planning consultant who worked with the Tribes and the RC&D in 2005-06 to complete the Tribes' first FEMA compliant Hazards Mitigation Plan. A pre-work meeting was held between the Southwest Idaho RC&D, the Shoshone-Paiute Tribes, and Kamiak Ridge staff in November 2010, at the Fire Station and in the Tribal Council Headquarters.

Seven planning committee meetings were held between January 2011 and September 2011, on the third Thursday of each month. Meeting attendance is summarized in Table 5 and graphically shown in Figure 13. A summary of the Planning Committee meeting discussion points is included in this section.

November 4, 2010: This pre-planning session was a meeting with William and Birgit Schlosser, of Kamiak Ridge, Bill Moore of the Southwest Idaho RC&D, the Shoshone-Paiute Tribes' Chairman Robert Bear, and members of the Tribal Business Council in the Council Chambers, to discuss the initiation of the Tribal Hazards Mitigation Plan update. Chairman Bear authorized Kamiak Ridge to prepare letters of invitation for the representatives of adjacent jurisdictions, federal, state, county, and business representatives, to participate with the Tribes in the development of this planning event. Chairman Bear also shared the Tribes' commitment to actively participate in the planning event and to implement the recommendations to be developed. Similar letters of invitation were prepared by Dr. Schlosser for the Tribal Departments, requesting their participation in the development of the Tribal Hazards Mitigation Plan and cooperation with the off-Reservation representatives.

Based on this meeting, Dr. Schlosser of Kamiak Ridge initiated correspondence with potential planning committee members extending the invitation from the Chairman to the representatives. Written letters, telephone calls, and/or personal visits were made to those invited participants. Nearly 50 people attended planning sessions to cooperate with the Shoshone-Paiute Tribes, including Emergency Management personnel from adjacent Tribes; the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation (Idaho), Te-Moak Tribe of Western Shoshone Indians (Elko Band Colony of Nevada), and the Indian Health Board of Nevada (Table 5).

January 20, 2011: This introductory meeting of the planning committee was to orient Tribal Departments and adjacent jurisdiction representatives, federal and state agencies and others, to the FEMA sponsored tribal hazard mitigation planning approach and included a slide presentation communicating the purpose and components of a FEMA Tribal Hazards Mitigation Plan. FEMA definitions were provided, plan requirements were detailed and the Phase I Hazard Profile (Table 16) was introduced. The Risk Assessment approach, vulnerability appraisal and mitigation strategies were outlined for attendees. Additional Potential Planning Committee members were identified and the importance of public involvement was emphasized.

At this meeting, emergency responder attendees were asked to complete Resource, Capabilities, and Needs surveys in reference to their organization's response for an on-Reservation, or near-Reservation emergency. Tribal Departments were also requested to complete a Departmental Survey summarizing their Department's staff and resources available for emergency response. All surveys collected during this planning process are summarized in this document.

The Mission, Vision, Goals, and hazards to profile were reviewed from the 2006 plan and updated for the current planning effort. This review process continued for three of the planning sessions of January through March.

February 17, 2011: The Planning Committee meeting was attended by representatives from Tribal Divisions and Departments as well as representatives from other organizations and agencies and followed a progressive schedule of accomplishments based on themed meetings. This "meeting theme" technique began with the discussion and identification of the goals, objectives, and vision of the planning process. This meeting also revisited the Phase I Hazard Profile (Table 16) discussions and update, which identified the combined potential for a hazard to occur and the potential of disaster events to impact people, structures, infrastructure, the economy, and traditional way of life of the Duck Valley Indian Reservation. At this meeting, the Planning Committee identified and endorsed the plan of work to accomplish a hazard resistant community philosophy. Existing Duck Valley Indian Reservation policies, plans and programs were identified for inclusion in the plan. Tribal Departmental Surveys and Resources, Capabilities, and Needs Surveys began to be returned for summary into the plan. Outreach efforts and public involvement plans were initiated.

Attendees participated in a discussion concerning a hazard risk profile developed for the disasters identified in the Phase I Hazard Profile (Table 16), including wildfire, earthquakes, seismic shaking hazards, and severe storms. We shared other sources of data including the integration of assessments of value for structures on the Duck Valley Indian Reservation.

The public outreach program was also discussed to agree on the approach to be used in this planning process. The public outreach program developed by the Planning Committee included a residential mail survey, public meetings, press releases, and a Youth Art Contest.

1. Recap of January meeting discussions
    a. Phase I Hazard Risk Exposure Summary
    b. Updates to the SHELDUS and Presidential Declaration summaries, Wildfire Summary
2. Public Outreach Opportunities: Sho-Pai News, Youth Art Contest, Residential Survey, Arbor Day Celebration, Display at Tribal Headquarters
    a. Youth Art Contest Update
    b. Adjacent Jurisdictions' Opportunities
3. Potential Mitigation Measures
    a. Tribal & Cooperator Activities
    b. Administrative, physical, biological, preparedness, etc. Open discussions of activities

March 17, 2011: Planning meeting discussions took place about the risk exposures across the Duck Valley Indian Reservation. A presentation and extended discussions were augmented with large-size formatted map sets including aerial photography, floodplains (FEMA has not mapped Flood Insurance Rate Maps (FIRM) on the Reservation), landslide prone landscapes, wildfire risk quantification including fire-prone landscapes, seismic shaking hazards and fault lines, high wind and severe weather landscapes, as well as other descriptive mapping products. These map sets were provided to the Planning Committee members and others as requested. They cover the walls of the Owyhee Fire Station meeting room where all planning committee meetings are held.

Public outreach efforts were discussed at great length concerning the Youth Art Contest and a local Planning Committee member who would share the program with the youth on the Reservation. Additional public outreach activities included setting dates (early- to mid-June) and venue for the public meeting, the format and content of the residential mail survey, and press releases to the Sho-Pai Newspaper (Tribal newspaper). Ongoing discussions continued at this planning meeting regarding Duck Valley Indian Tribal policies, plans and programs for inclusion in the Tribal Hazards Mitigation Plan.

Summary of agenda items included:

1. Yakama Nation Relief Mission by Sho-Pai TERC
2. Recap of January & February meeting discussions
    a. Phase I Hazard Risk Exposure Summary
    b. Public Outreach Opportunities
        i. Youth Art Contest Update
        ii. Residential Survey is Launched!
        iii. ii. Adjacent Jurisdictions' Opportunities
    c. Surveys by Departments & Cooperators
3. Potential Mitigation Measures
    a. Tribal & Cooperator Activities
    b. Administrative, physical, biological, preparedness, etc. Open discussions of activities

May 19, 2011: The Planning Committee reviewed wildfire, landslides, and earthquake hazard mapping presented by Kamiak Ridge in March with significant updates provided through commentary and ideas from the Planning Committee members. Hazard Risk Assessments for Landslides, Seismic Shaking Hazards, expansive soils, and Wildfire were viewed and discussed. A summary of "normal weather" on the Duck Valley Indian Reservation was shared in a sub-chapter format. The weather discussion was augmented with past presidential disaster declarations, summary of events in the region, and how the Basin and Range Ecoregion and the Great Basin interface creates extreme weather situations along the joining of these regions.

This initial risk exposure profile was shared with the Planning Committee to detail the value and number of structures at risk from each natural hazard evaluated. Ideas for presentation and augmentation were discussed. These exposure profiles also assisted with the discussion of potential mitigation measures.

Discussions regarding plans, programs, and policies, and the Youth Art Contest continued. The initial findings from the residential mail survey were shared with the Planning Committee and discussed at length.

All Planning Committee members were urged to share potential mitigation measures on the Duck Valley Indian Reservation based on observations in their daily lives on the Reservation, the information being shared for hazard risk assessments, and the findings of the residential Mail Survey.

Summary of agenda items included:

1. Recap of past meeting discussions
    a. Phase I Hazard Risk Exposure Review
    b. Public Outreach Opportunities
        i. Youth Art Contest Update
        ii. Residential Survey
        iii. Public Meeting (June 16)
    c. Surveys by Departments & Cooperators
2. Sections of THMP Review and discussions
    a. Review of Wildfire, Landslide, Expansive Soils, Earthquakes, Floods
    b. Close look at Severe Weather
3. Implementation of Past Hazard Plan Projects

The summary of past mitigation plan included the entire previous Hazard Mitigation Plan adopted in 2005, with emphasis on the mitigation measures and projects identified in the 2005 Hazard Mitigation Plan approved by FEMA and adopted by the Tribal Council. All comments were discussed and documented for inclusion in the revision. All of the projects previously identified but not implemented were considered for inclusion in the potential mitigation measures to be "carried forward" into this planning effort. Some were dismissed as no longer applicable, while others were elevated in importance. All of these items are documented in Chapter 5, Implementation Record. Those carried forward in this plan have been documented in Chapter 7, Proposed Mitigation Measures.

June 23, 2011: The planning committee meeting involved in the development of the Tribal Hazards Mitigation Plan was conducted. This meeting focused on a review of the public mail survey preliminary results. Plans were made and implemented to run the public mail survey in the Sho-Pai News to collect additional responses. All participants in the Public Mail survey were promised a Map Art print by Kamiak Ridge featuring Skull Creek (on Reservation) with the image of a Mountain Sheep Ram, named Na-gah, accompanied by the Tribal Legend of Na-gah climbing the mountain so high he became the North Star. Participants in the public mail survey were also entered to win a flat screen TV raffle at the rodeo on the 4th of July. Total response was from 106 households on the Reservation.

The Youth Art Contest submissions were displayed for the planning committee to consider. All of the submitted artwork came from the 12 and younger age group. There were three qualified submissions. The planning committee chose **Justin Delaney**'s artwork as first place by a majority show of hands. Coming in second was **David Powers** and in third was **Kaitlyn Teller**. Brent Hunter stated that he will send out congratulation letters and ask for them to sign a W-9 for payment. The older youth category had no submissions as of this meeting so the planning committee unanimously voted to extend the contest into September. A plan to work again with the school was made with duties assigned to coordinate their effort.

The summary of the Tribal Departmental surveys was also discussed with a request for the few outstanding Departments to complete and return them. A total of 11 Tribal Departments completed and returned the Tribal Departmental Surveys and are included in this Tribal Hazards Mitigation Plan.

The report on surveys returned for inclusion in this planning effort concluded with a summary of the Resources, Capabilities, and Needs surveys. A total of 9 Tribal Departments and 6 off-Reservation cooperators returned Resources, Capabilities, and Needs surveys.

Finally, a summary of the Wild Horse Reservoir threat from Dam Failure was extended. Past planning sessions discussed the limitations for the Tribes to respond to a dam failure and the potential damages it could entail. This session looked closely at projected Dam Failure inundation from a Wild Horse Reservoir failure as it moves down the Owyhee River through the Tribal Farms located along the river, Mountain City, and then enters the Duck Valley Indian Reservation.

This hazard and others were combined to consider potential mitigation measures aimed at protecting life and property.

The evening of June 23, the Tribes hosted a dinner for the Public Meeting of this planning effort. Many planning committee members attended as well as a good representation of the general public to learn more about this planning effort.

August 18, 2011: The draft of the Duck Valley Indian Reservation Tribal Hazard Mitigation Plan was delivered to the Planning Committee for internal review starting on August 18. At this meeting the structure of the plan was discussed as well as components of the plan developed for this release. Initial edits from the Tribal Planning Committee members were shared and discussed.

September 22, 2011: This planning committee meeting was provided for members to review the plan, discuss changes, additions, and the schedule of review for the Tribal Council and the Public. Public review was held September 16 – October 30. A planning meeting with the Shoshone-Paiute Tribal Business Council was held to discuss the progress on the plan and the progress as we advance to the final stages of implementation. The Tribal Business Council endorsed the plan and provided comments, minor revisions, and support for the implementation of the Tribal Hazards Mitigation Plan.

Table 5. Planning Committee Membership and Attendance.

Name	Position	Representing	City, State, Zip	Jan 20	Feb 17	Mar 17	May 19	June 23	Aug 18	Sept 22
Bacon, Nathan	Water & Sanitation / Fire Chief	Shoshone-Paiute Tribes	Owyhee, NV 89832	X		X	X	X	X	X

Table 5. Planning Committee Membership and Attendance.

Name	Position	Representing	City, State, Zip	Jan 20	Feb 17	Mar 17	May 19	June 23	Aug 18	Sept 22
Blossom, James	Tribal Council Member, Soil Conservation District Participant	Shoshone-Paiute Tribes	Owyhee, NV 89832	X	X	X				
Blossom, Justin	Sho-Pai Fireman	Sho-Pai Fire	Owyhee, NV 89832	X	X	X	X	X	X	X
Cleveland, Chris	Environmental Planner, Tribal Environmental Protection Program	Shoshone-Paiute Tribes	Owyhee, NV 89832	X			X	X		X
Crutcher, Shery	Director, Land/Natural Resources	Shoshone-Paiute Tribes	Owyhee, NV 89832	X		X	X			
Desmond, Jim	Owyhee County Emergency Services	Owyhee County (Idaho)	Murphy, ID 83650	X	X		X	X	X	X
Dick, Arthur	Wildlife Biologist	Sho-Pai Wildlife & Parks	Owyhee, NV 89832	X	X	X				
Dick, Carlyle	BIA Roads Dept.	BIA		X		X				
Howard, Mary	Information Technology	Shoshone-Paiute Tribes	Owyhee, NV 89832	X	X	X				
Hunter, Brent	Tribal Liaison to THMP, Fire Management Officer, TERC Chairman	Shoshone-Paiute Tribes	Owyhee, NV 89832	X	X	X	X	X	X	X
Jack, Melby	AFMO	Sho-Pai Fire	Owyhee, NV 89832	X	X	X	X	X	X	X
Jim, Patrick	Emergency Mgr. / TERO	Shoshone-Paiute Tribes	Owyhee, NV 89832	X	X	X	X			
Jones, Rozi	Property & Supply Director (Finance)	Shoshone-Paiute Tribes	Owyhee, NV 89832	X	X	X	X	X	X	X
Manning, Larry	Facility Manager	Sho-Pai Tribes OCHF	Owyhee, NV 89832	X	X	X	X	X	X	
Pete, Kenny	EMS Director	Sho-Pai Tribes EMS	Owyhee, NV 89832	X	X	X	X	X	X	X
Powers, Yvonne	Editor, Sho-Pai News	Shoshone-Paiute Tribes	Owyhee, NV 89832	X	X	X	X	X	X	X
Schlosser, Birgit	Financial Director	Kamiak Ridge, LLC	Pullman, WA 99163	X	X	X	X	X	X	X
Schlosser, William	Managing Director	Kamiak Ridge, LLC	Pullman, WA 99163	X	X	X	X	X	X	X
Shaw, Jamie	EMT	Shoshone-Paiute Tribes	Owyhee, NV 89832				X	X	X	X
Sope, Lenora	EMT	OCHF	Owyhee, NV 89832			X	X	X		X
Webb, Bill	Elko County Emergency Management	Elko County (Nevada)	Elko NV 89801	X		X		X		
Infrequent attendees to the planning sessions, and visitors.										
Complita, Gerald		All West Travel & Equipment	Elko	X						

Table 5. Planning Committee Membership and Attendance.

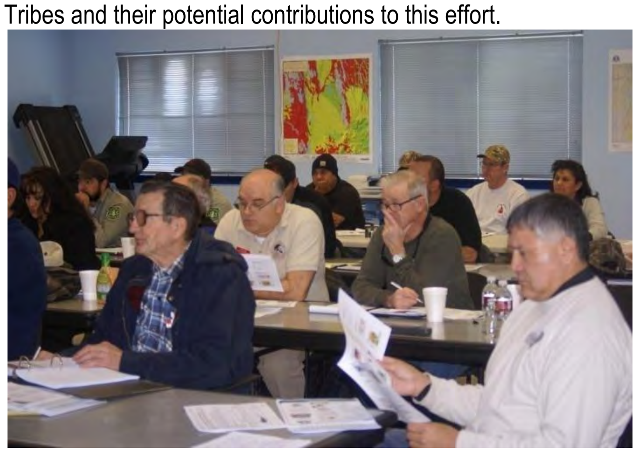
Name	Position	Representing	City, State, Zip	Jan 20	Feb 17	Mar 17	May 19	June 23	Aug 18	Sept 22
Bohl, Terry	Emergency Manager Homeland Security Director	Indian Health Board of Nevada		X						
Boleh, Brad	BLM Fire Operations Supervisor	BLM Boise District	Boise, ID 83705	X						
Cummins, Marty	BIA FAC	BIA FAC	Owyhee, NV 89832	X						
Jackson, Donna	Council Member	Sho-Pai Tribes	Owyhee, NV 89832							X
Jackson, Virginia	Community Health	OCHF	Owyhee, NV 89832			X				
Jake, Alfreida	TERC Environmental Coordinator	Elko Band TERC Environmental Coordinator	Elko NV 89801		X					
Jasmine, Jamie	NRCS District Conservationist	Natural Resources Conservation Service	Elko, NV 89801	X						
Jones, Wes	Emergency Program Manager	Sho-Ban Tribes	Fort Hall, ID 83203		X					
Lovec, Laria	Sup. Rangeland Management Specialist	Ruby Mtn/Jarbridge/Mtn City Ranger Districts, USFS	Wells NV 89835				X			
Lucas, Pat	Southwest Area Field Officer	Idaho Bureau of Homeland Security,	Boise ID 83705	X						
Manning, Winona	Finance Director	Shoshone-Paiute tribes	Owyhee, NV 89832						X	
Marotto, Regina	NIMS Project Coordinator	Indian Health Board of Nevada	Reno, NV 89502		X				X	
Moore, Bill	Coordinator	Southwest Idaho RC&D	Meridian, ID 83642-2994	X						
Murrell, Edmond	Director, Fish, Wildfire, and Parks Dept	Shoshone-Paiute Tribes	Owyhee, NV 89832					X		
Navo, Val	Fire Chief	Sho-Ban Tribes	Fort Hall, ID 83203		X					
Nino, Tina		Duck Valley Housing Authority	Owyhee, NV 89832	X						
Parks, Tracy		Raft River Electric Coop/ Mt City	Mountain City, NV 89831	X			X			
Petersen, Chuck	Range Management	NRCS Elko		X		X				
Phelps, Troy	Northeast Nevada Interagency Fire Management Program	Region 4, Humboldt-Toiyabe National Forest, Supervisor's Office	Elko, NV 89801-4938	X						
Prior, Eric	Volunteer Fire / Wildland Fire	Sho-Pai Fire	Owyhee, NV 89832	X						
Rader, Dylan	Acting Fire Management Officer	BLM: Elko District Office	Elko, NV 89801	X		X				

Table 5. Planning Committee Membership and Attendance.

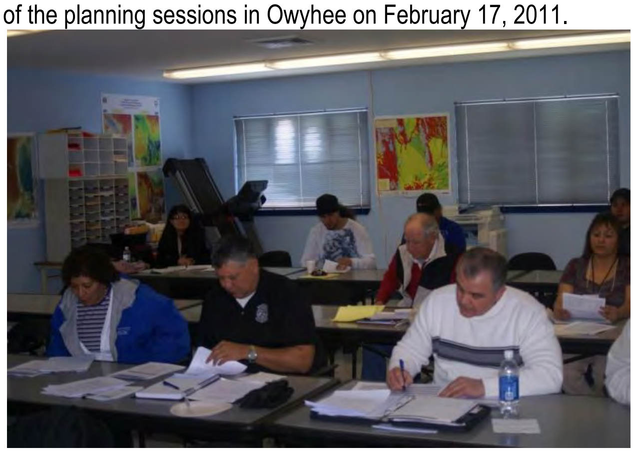
Name	Position	Representing	City, State, Zip	Jan 20	Feb 17	Mar 17	May 19	June 23	Aug 18	Sept 22
Spencer, Gregory	Eastern Nevada Agency	AFMO BLM	Elko NV 89801	X		X				
Stephensen, Mark	Mitigation Planner	Idaho Bureau of Homeland Security	Boise ID 83705				X			
Stewart, Teresa	Lab Manager	OCHF	Owyhee, NV 89832			X				

Figure 13. Selection of Planning Committee Meeting Photographs.

The Shoshone-Paiute Tribes hosted lunch for each of the planning sessions, like this one on January 20, 2011.



At the planning series kick-off meeting on January 20, 2011, participants were provided details about the FEMA planning process, past hazard mitigation planning efforts by the Sho-Pai Tribes and their potential contributions to this effort.



Guests from the Shoshone-Bannock Tribes participate in one of the planning sessions in Owyhee on February 17, 2011.

Planning committee members take advantage of time during the February 17, 2011, planning session to study hazard risk maps of the Duck Valley Indian Reservation.

Figure 13. Selection of Planning Committee Meeting Photographs.

Tribal members on the planning committee examine hazard risk maps and infrastructure maps to delineate potential mitigation measures and areas of frequent concern during natural hazard events. They marked the maps with data that was integrated into the analysis.

May 19, 2011 Planning Committee meeting spurred discussions about "what keeps people awake at night" as a theme to discuss at the public meeting.

Sho-Pai TERC Chairman, Brent Hunter with planning members at the May 19, 2011, planning session discussing wildfire topics.

Planning Committee members discuss equipment needs for response to natural hazard events.

Planning consultant, Dr. Schlosser, discusses flood risks during the June 23, 2011 planning session.

Last formal planning meeting on September 22, 2011.

Figure 13. Selection of Planning Committee Meeting Photographs.

3.7. Public Involvement

Public involvement in this planning process was important to the success of this planning effort. Public involvement included press releases, a public meeting, residential survey, and a Youth Art Contest designed to develop awareness in the schools, and within families, of natural hazard risks. A Public Meeting was held on June 23, 2011 in Owyhee, Nevada, at the Tribe's Fire Station Meeting Room. A dinner was hosted by the Tribes to encourage attendance.

3.7.1. Press Releases

An initial press release was issued in February 2011 to the Sho-Pai News (Tribal newspaper publication on the Duck Valley Indian Reservation – Figure 14) and introduced the Tribe's launch of the planning effort made possible by the FEMA funding award. Subsequent progress of the planning process was achieved mainly through the publication of press releases in the Sho-Pai News, which is the only widely distributed media source specific to the Duck Valley Indian Reservation and delivered to all Tribal members regardless of where they live (on and off Reservation).

Figure 14. Sho-Pai News Banner.

In the February 2011, a press release to Sho-Pai News announced the Youth Art Contest including guidelines for submission, an announcement of cash prizes for the selected artwork, and the contacts to make artwork submissions (Figure 16). A second press release to Sho-Pai News announced the mailings of the residential survey, its purpose, and details about the incentive for the participants to receive a free map print of Skull Creek with Na-gah superimposed over the print for respondents (Figure 19).

In May 2011, a press release was published by Sho-Pai News (Figure 22) announcing the public meetings to share information about the planning process and hazard risk profiles. The date and location of the meeting was announced as: June 23, Owyhee, at the Fire Station meeting room with a hosted dinner. Participants in the Residential Survey were given their free participant maps including the public meeting announcement flyer.

Subsequent press releases were published in Sho-Pai News and included the announcement of the public review of the Duck Valley Indian Reservation Tribal hazards Mitigation Plan, and a general interest article about the hazard risk analyses completed for the Duck Valley Indian Reservation.

Figure 15. Sho-Pai News Article announces initiation of planning efforts.

Group planning efforts to reduce impacts of natural disasters on DVIR

By Yvonne Powers

OWYHEE, Jan. 20--A meeting of tribal, federal and state employees was held at the Fire Station, a first in a series of meetings to take place on the Shoshone-Paiute Tribes' 2011 Hazard Mitigation Plan.

Brent Hunter, acting chairman of the Tribal Emergency Response Commission (TERC) and Pat Jim, emergency manager along with Bill Moore, Coordinator of the Southwest Idaho Resource Conservation & Development Council, Inc. (RC&D), and William and Birgit Schlosser of Kamiak Ridge, LLC are coordinators of the Tribal Hazard Mitigation Plan 2011--a plan that the SPT must have in place in the event of a disaster and if funds are needed.

A Hazards Mitigation Plan is a federal compliance document that cities, counties, and tribes must maintain--and renew every five years in order to be eligible for disaster funds through the Stafford Act. The TERC will revamp their 2006 plan, the last plan that was compiled, adopted by the Tribal Business Council and accepted by the Federal Emergency Management Agency (FEMA). As long as the approved Hazard Mitigation Plan is in place, tribes can submit applications for grants to fund projects for hazard mitigation identified in their plan strategy. Those identified are natural hazards, such as wildland fires, flooding, and severe weather.

Some of the goals of the latest plan include "Prioritize the protection of people, structures, infrastructure, economy, and unique ecosystems that contribute to our way of life and the sustainability of the local and regional economy," "to reduce the threats to public health and safety posed by natural hazards," and "to reduce the long-term costs of disaster recovery and disaster mitigation through intelligent and strategic mitigation policies and practices." Also on the list of goals, among others, is to educate people about the unique challenges of hazard mitigation in their daily lives.

"Since our people cannot rely on any outside agency aid when natural disasters happen, we must rely on ourselves and our determination to protect our people," says Hunter. "This All Hazards Mitigation Plan identifies areas we can work on before disaster strikes and hopefully we can lessen the effects of the disaster." He also went on to say

CONTINUED, NEXT PAGE

FEBRUARY 2011

Hazard Mitigation Plan, cont.

that the TERC will apply for funds to hire tribal members to complete these projects when the plan and funding are approved. Those projects could include emergency signage, flood zone barriers, home inspections for earthquake stability and windstorms, roadside debris catchments, embankment stabilization, response trainings, snow removal, and fire fuels reductions.

Hunter concluded, "This plan will help our reservation economy as well as keep all of us, as well as future generations, safer."

The planning committee is made up of Tribal Departments, including the Fire Department, state and county agencies, federal agencies, private industry, the power company, the school district and any public organization.

The Stafford Act governs federal response to disasters within the United States.

3.7.2. Youth Art Contest

The Duck Valley Indian Reservation Tribal Hazards Mitigation Plan Committee launched a Youth Art Contest to develop awareness in the schools, and within families, about natural hazard risks on the Duck Valley Indian Reservation. Young people were engaged in important discussions regarding the effects of natural hazards and how to mitigate the negative effects within their communities.

An article was published in the Sho-Pai News announcing the Youth Art Contest (Figure 16) as a component of the THMP.

Figure 16. Sho-Pai News article announcing the Youth Art Contest.

LOCAL

Tribal Hazard Mitigation Plan Initiates Youth Art Contest

OWYHEE, Jan. 20--The Tribal Hazards Mitigation Plan Planning Committee was formed earlier this year to collaborate in the development of the Tribal Hazards Mitigation Plan; a Federal Emergency Management Agency (FEMA) pre-disaster mitigation effort. It consists of representatives from Duck Valley Indian Reservation Tribal Departments, Tribal organizations, States and Counties, Federal agencies, and emergency responders on the Reservation.

An initial natural hazards profile was developed through scientific analyses and thoughtful discussions of the potential hazard exposures that are faced on the Duck Valley Indian Reservation. Planning sessions will include discussions led by Project Manager, Dr. Schlosser, of Kamiak Ridge, LLC, detailing flooding, wildfires, landslides, and seismic shaking hazards that are augmented by wall maps of the hazard risk exposures overlaid with the locations of structure and infrastructure on the Reservation. Planning Committee members provide valuable clarification by marking maps with additional detail, as well as participating in discussions about each of the risks. The connection between natural resources, health of the Duck Valley Indian Reservation economy, and way of life is undeniably the cornerstone of this vitally important effort.

In order to promote public awareness of the Tribal Hazard Mitigation Plan, the Tribes are sponsoring a Youth Art Contest. Children under 18 years old or still enrolled in school, and either 1) living on the Duck Valley Indian Reservation, or 2) attending school on the Duck Valley Indian Reservation are eligible to participate. All submissions should be either hand-drawn original artwork in color, on non-lined paper, or tactile artwork (sculptures, models, designs). No computer aided graphics will be accepted. Drawn artwork should measure between 5"x 5" and 8½"x11". Models and sculptures will be photographed. All artwork should incorporate the themes of natural hazard preparedness, Duck Valley Indian Reservation life, and mother Earth! Two age-groups will compete for the recognition; 12 and under, and 13 and over. The winners of the Youth Artwork Contest will not only receive cash prizes (for first, second and third in each age-group), but they will also be featured in a Sho-Pai News article, with the first place artwork featured on the cover of the Hazard Mitigation Plan. The other winners' artwork will be featured on chapter headings. Submittals should be made to Brent Hunter, Fire Management Officer and Acting TERC Chairman – Duck Valley Indian Reservation (775-757-2473), by Friday, May 13, 2011, at 4:00.

If you are interested in learning more about the Youth Art Contest or this planning effort, you are encouraged to contact either Brent Hunter or Pat Jim (775-335-5899), TERC Vice-Chair.

Prizes Awarded! The Tribal Hazards Mitigation Planning Committee will select the winners of the Youth Art Contest during the regularly scheduled planning meeting in May. The winners in each of the age categories (12 & Under and 13 & Older) are

First: $100, Second: $50, and Third: $25.

Winners will be selected based on the quality of the artwork, the incorporation of natural hazard themes into the artwork, and the featuring of the Shoshone-Paiute Tribes' way-of-life.

Posters and tri-fold handouts were used as invitations to participate in the contest and were distributed to the Combined Owyhee School in Owyhee as well as to local youth centers (Figure 17). Sho-Pai News also included invitations for youth on the Duck Valley Indian Reservation to participate. The artwork was collected through July 2011, and the winners were awarded cash prizes. The winning art work has been included in this plan as section dividers.

Figure 17. Duck Valley Indian Reservation Youth Art Contest 2011, invitation to participate poster.

Youth Art Contest! 2011

Our Mission

To make Duck Valley Indian Reservation residents, communities, and businesses less vulnerable to the negative effects of natural hazards such as:

- Wildland Fire
- Severe weather
- Flood
- Storm Water
- Landslides
- Wind Storms
- Earthquakes
- Drought

Prizes Awarded!

The Tribal Hazards Mitigation Planning Committee will select the winners of the Youth Art Contest during the regularly scheduled planning meeting in May. The winners will receive:

12 and Under	13 and older
First: $100	First: $100
Second: $50	Second: $50
Third: $25	Third: $25

Winners will be selected based on the quality of the artwork, the incorporation of natural hazard themes into the artwork, and the featuring of the Shoshone-Paiute Tribes' way-of-life.

Winters Wareagle, second place winner of Shoshone-Paiute Tribes of the Duck Valley Indian Reservation Youth Art Contest in 2004.

The Shoshone-Paiute Tribes are sponsoring a Youth Art Contest for Duck Valley Indian Reservation youth. Children under 18 years old or enrolled in school, and living on the Duck Valley Indian Reservation are eligible to participate. All submissions should be hand-drawn original artwork in color, on non-lined paper, or tactile artwork (sculptures, models, designs). No computer aided graphics will be accepted. Drawn artwork should measure between 5"x5" and 8½"x11". Models and sculptures will be photographed.

Original hand-drawn, color artwork on blank, white, non-lined paper.

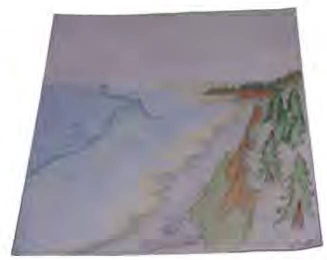
All artwork should incorporate the themes of natural hazard preparedness, Duck Valley Indian Reservation life, and mother Earth!

Submittals can be made to **Brent Hunter**, Fire Management Officer, at the Fire Station in Owyhee.

This contest ends on **Friday, May 13, 2011**, at 4:00 P.M.

Kit Julianto, winner of Shoshone-Paiute Tribes of the Duck Valley Indian Reservation Youth Art Contest in 2004.

DUCK VALLEY INDIAN RESERVATION: TRIBAL HAZARDS MITIGATION PLAN 2011



Lauren Martin, Honorable Mention in the Quinault Indian Reservation Tribal Hazards Mitigation Plan for this depiction of a tsunami wave approaching the Quinault shoreline.

Featured Artwork

The winners of the Youth Artwork Contest will not only receive cash prizes, but they will be featured in a Sho-Pai News article, and be used as artwork for the Duck Valley Indian Reservation; Tribal Hazards Mitigation Plan to be approved by the Federal Emergency Management Agency.

All submitted artwork will become the property of the Shoshone-Paiute Tribes, all rights reserved.

Thomas Seyler, first place winner of the Spokane Tribe of Indians Youth Art Contest on the Spokane Indian Reservation in 2005.

Mitigating Natural Hazards

Figure 18. March 2011 Sho-Pai News article announcing Youth Art Contest and Tribal Hazards Mitigation Planning effort.

MARCH 2011 LOCAL

All Hazards Mitigation Plan second meeting held

On February 17, the TERC convened for a repeat of the first All Hazards Mitigation Plan meeting for some neighboring tribes in Nevada and Idaho, in which representatives from the Fort Hall emergency management department and the Te-moak Tribe of Elko attended.

At the meeting participants took part in an exercise to identify potential activities within and adjacent to the Duck Valley Indian Reservation. Participants marked up the maps with potential hazards such as landslides, rockslides and flooding. PHOTO: Mary Howard of the SPT I.T. Department, Alfreda Jake, of the Te-moak Tribe of Elko, Dr. William Schlosser and EMS Director Kenny Pete. (Photo, Y. Powers.)

Youth art contest happening now!

DON'T FORGET! Our Youth Art Contest is going on now. Children under 18 years old or still enrolled in school, and either 1) living on the Duck Valley Indian Reservation, or 2) attending school on the Duck Valley Indian Reservation are eligible to participate. All submissions should be either hand-drawn original artwork in color, on non-lined paper, or tactile artwork (sculptures, models, designs). No computer aided graphics will be accepted. Drawn artwork should measure between 5"x 5" and 8½"x11". Models and sculptures will be photographed. All artwork should incorporate the themes of natural hazard preparedness, Duck Valley Indian Reservation life, and mother Earth! Two agegroups will compete for the recognition; 12 and under, and 13 and over. The winners of the Youth Artwork Contest will not only receive cash prizes (for first, second and third in each age-group), but they will also be featured in a Sho-Pai News article, with the first place artwork featured on the cover of the Hazard Mitigation Plan. The other winners' artwork will be featured on chapter headings. Submittals should be made to Brent Hunter, Fire Management Officer and Acting TERC Chairman – Duck Valley Indian Reservation (775-757-2473), by Friday, May 13, 2011, at 4:00.

If you are interested in learning more about the Youth Art Contest or this planning effort, you are encouraged to contact either Brent Hunter or Pat Jim (775-335-5899), TERC Vice-Chair.

Prizes Awarded! The Tribal Hazards Mitigation Planning Committee will select the winners of the Youth Art Contest during the regularly scheduled planning meeting in May. The winners in each of the age categories (12 & Under and 13 & Older) are

First: $100, Second: $50, and Third: $25.

Winners will be selected based on the quality of the artwork, the incorporation of natural hazard themes into the artwork, and the featuring of the Shoshone-Paiute Tribes' way-of-life.

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Table 6. Youth Art Contest Winners and Art Work.

First Place Winner	Second Place Winner	Third Place Winner
		
Justin Delaney 12 years	David Powers 6 years	Kaitlyn Teller 8 years
↑ **Winners 12 and under** ↑		

3.7.3. Residential Survey

A Residential Survey was developed for use in this planning process. The Residential Survey was intended to collect information from a wide selection of residents living on the Duck Valley Indian Reservation concerning past experiences with natural hazards, the characteristics of risk and past losses for those homes, and overall preparedness for natural hazards.

The March 2011 press release printed in the Sho-Pai News (Figure 19) gave an update on the Planning Committee's activities and asked for input from Duck Valley Indian Reservation residents by filling out a Residential Survey. Details were provided how these data would be used.

Figure 19. Sho-Pai News article requesting participation in the Residential Survey.

Shoshone-Paiute Tribes Hazards Mitigation Plan

Residential Survey

The Shoshone-Paiute Tribes are developing a Tribal Hazards Mitigation Plan to prepare against the catastrophic impacts of natural disasters. Our goal is to protect people, structures, infrastructure, the economy, and way of life on the Duck Valley Indian Reservation. Part of this effort includes the involvement of the residents of the Reservation to provide input to the planning process. Public meetings will be announced in the Sho-Pai News this spring – please come! Another effort is a public survey designed to collect valuable information about preparedness, past hazards experienced, and factors leading to your home's defensibility against natural hazards.

We are asking all residents of the Duck Valley Indian Reservation to participate in a short survey. Everyone that completes and returns a survey will receive a color aerial photography print with Na-gah (the Ram and North Star of Paiute Legend) superimposed over the North Fork of Skull Creek on the Reservation. The imagery was taken in 2010 and shows great detail.

These prints are artwork quality, suitable for framing to decorate your home or office. This print is on display at the Tribal Headquarters and at the Fire Station in Owyhee. In addition, everyone who completes and returns a survey will be entered into a raffle drawing to win a 50" color HDTV! Just return your survey to the Fire Station to get your art work print and be entered to win the HDTV.

The survey was mailed to all homes on the Duck Valley Indian Reservation on March 18, and was sent from Dr. William Schlosser at Kamiak Ridge, LLC. Kamiak Ridge has been retained by the Tribes to assist in completing this FEMA compliance document for the Tribes. When completed, return the completed survey to the staff at the Sho-Pai Fire Station. All information entered into this survey will be kept confidential and it be used to meet the Tribe's efforts in preparedness and pre-disaster mitigation work.

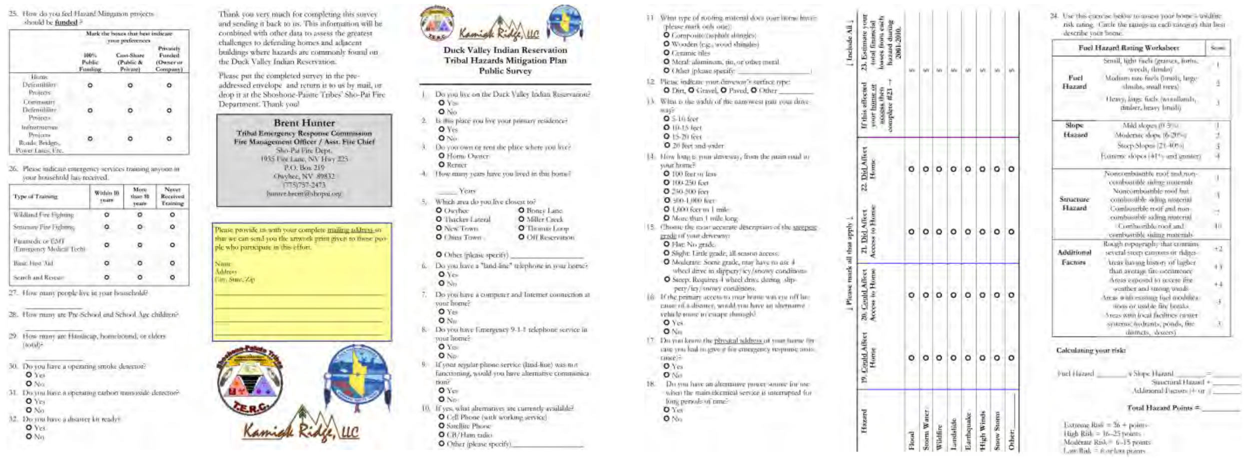
This planning effort updates the FEMA Hazard Mitigation Plan that was adopted by the Tribes in 2006. At that time, Dr. Schlosser also worked with the Tribes to complete the initial assessment. FEMA requires these plans to be updated every 5 years. When completed, this effort will make it possible for the Tribes to be awarded planning grants to fund efforts in pre-disaster mitigation work. This work benefits the Tribal membership. Please complete and return your survey now! If you have any questions, you can contact Brent Hunter, TERC Chairman, at the Fire Station by calling 775-757-2473.

All homes on the Duck Valley Indian Reservation received a residential survey. The total mailing list included 398 unique names. A total of 113 surveys were completed and returned to the TERC office and included in this summary. The overall response rate, based on the number of surveys returned, was 28%. According to the 2010 Census (Section 2.2, Demographics), the number of housing units on the Reservation is 493, with 449 occupied housing units (Table 1).

The difference in numbers represents approximately 50 homes in the Census data that is not included in the Tribal data summarizing homes. This was mitigated partially by the release of the Public Mail survey in the Sho-Pai News where potential respondents could fill out the survey from the Newspaper and return it for inclusion in the drawing and to receive their free Map Art print.

The initial mailing of the survey on March 18, 2011, included a cover letter sent from William Schlosser, Project Manager, from Kamiak Ridge. The cover letter briefly explained the project efforts and introduced a one-page, tri-fold survey asking for participation (Figure 20). A return envelope was provided.

Figure 20. Residential Survey brochure sent to all households on the Duck Valley Indian Reservation.



Approximately 1½ weeks after the launch of the initial mailing, a postcard reminder was sent to the non-respondents (April 1, 2011), again asking them to complete and return the survey for consideration. A week after the postcard reminder was sent to non-respondents, another mailing was sent (April 8, 2011) with a cover letter, replacement survey, and a replacement return envelope, urging the non-respondents to take the time to fill out the survey and return it to the Kamiak Ridge office in Pullman. This sample procedure followed the Dillman Total Design Method recommended for mail surveys (Dillman 1978).

The result of the repeated mailings, press releases, and public meetings was a total response rate of 28%, from 113 returned surveys. All responses provided the planning-effort valuable information, which is summarized here.

All respondents live on the Duck Valley Indian Reservation. Approximately 98% of respondents reported that their home on the Reservation is their primary residence, and 77% reported they own their home, while the remaining 23% rent. The tenure of living on the Reservation was variable with new residents (one year or less) to some participants reporting 60 years living on the Reservation. The average respondent reported tenure of 20 years living on the Reservation.

About 85% of the respondents indicated that they have a landline-based telephone service at their home, while about half reported they have alternate communication options at their homes – and virtually all of these homes rely on cellular telephones as their alternate device. Of those homes without a landline present in the home (16%), approximately 38% of those homes have a cellular phone as their primary communications device. Overall, cellular phone service is inconsistent on the Reservation, although cellular communications availability has increased substantially over the past half-decade. Homes located on a slight elevation relief can reach a cellular signal, such as at the Tribal Headquarters located along the state lines and the state highways. However, reception within the area of Owyhee and at the School is infrequent.

Approximately 31% of the respondents to the survey indicated a working internet communication connection at their homes and a computer. A majority of the respondents (74%) identified that they have emergency 9-1-1 service at their home.

Several respondents to the survey identified a need for the development of reliable cellular communications services within the Duck Valley Indian Reservation. This service has been identified as a need for use within all populated places of the Reservation and where agricultural work is completed.

The survey respondents indicated the type of roofing materials covering their home. Approximately 85% indicated a composite materials roof, while 6% indicated a wood roofing material. For the remaining respondents, only 5% specified metal roofing and 3% a ceramic roofing material.

From a wildfire mitigation standpoint, this is a rather good set of factors as the indicated roofing material shows only 6% of the total number of homes are covered by media ignitable by wildfire brands or embers.

The average driveway length listed by survey respondents was under 100 feet long, ranging from side-walk parking to almost 1 mile long. Approximately 40% of the driveways were listed as less than 100 feet, 25% were listed as being between 100 and 250 feet in length, 13% were reported as being between 250 feet and 500 feet long, 15% – between 500 and 1,000 feet, and approximately 7% were between 1,000 feet and one mile long.

Respondents indicated the driveway surfaces were predominately gravel (35%) and dirt (31%), with the remaining 20% bearing a paved surface. The most limiting (narrowest) driveway width indicated by respondents was 5 to 10 feet wide by 43%, 10 to 15 feet wide by 27%, 15 to 20 feet wide by 14%, and greater than 20 feet wide by 16% of the survey's respondents.

Survey respondents provided information about the steepness, or grade, of their driveways. Roughly 99% indicated a flat grade, 1% showed a slight grade, none signaled a moderate grade or a steep grade to access their homes. At the same time, almost all of the respondents to the survey indicated that they have alternative access to and from their home in the event the primary access route was cut off due to a natural hazard such as wildfire, flood, or landslide.

Survey recipients were asked to identify if their address numbers are clearly visible from the nearest public road. About 81% of respondents signified a positive response to this question. During natural hazards, power supplies are often compromised. Survey responses indicated that about 31% of residents have alternative power supplies available at their home.

Emergency services training within the household is an indicator of a family's exposure to safety issues and awareness in emergency situations. This training can include one or more family members participating in volunteer activities (such as volunteer fire fighting), from employment based training, or from other venues. Approximately 53% of the households reported at least one member of the home had attended at least one of these training opportunities (listed below) less than 10 years ago. Respondents indicated training in the following areas within the last 10 years: 21% – wildland fire, 16% – structure firefighting, 14% – paramedic or Emergency Medical Technician (EMT), 47% – basic first aid, and 11% – in search and rescue. Overall, about 24% of respondents reported at least one of these training activities for at least one member of the household during the past 10 years.

Approximately 39% of the households reported at least one member of the home had attended at least one of these training opportunities more than 10 years ago. About 20% of the respondents reported that no one in the household had attended any of these training opportunities in the past.

As discussed in subsequent sections of this plan (Chapter 4, Natural Hazards Assessment), severe weather, wildfire, and flooding risks on the Duck Valley Indian Reservation are the most widespread natural hazards experienced here. Wildfire risks are often very pronounced because of the vastness of the areas potentially impacted each summer. Homes and businesses are scattered into rural and often very remote areas. Respondents to the survey were asked to evaluate four categories of wildfire risk in the areas immediately surrounding their homes (Table 7). The right column reports the average response frequency by category, as summarized further in Table 8.

Table 7. Wildfire Fuel Hazard Rating Worksheet (Carree, Schnepf and Colt 1998).

		Rating	Results
Fuel Hazard	Small, light fuels (grasses, forbs, weeds, shrubs)	**1**	**62%**
	Medium size fuels (brush, large shrubs, small trees)	**2**	**27%**
	Heavy, large fuels (woodlands, timber, heavy brush)	**3**	**11%**
Slope Hazard	Mild slopes (0-5%)	**1**	**85%**
	Moderate slope (6-20%)	**2**	**13%**
	Steep Slopes (21-40%)	**3**	**1%**
	Extreme slopes (41% and greater)	**4**	**1%**
Structure Hazard	Noncombustible roof and noncombustible siding materials	**1**	**19%**
	Noncombustible roof and combustible siding material	**3**	**26%**
	Combustible roof and noncombustible siding material	**7**	**13%**
	Combustible roof and combustible siding materials	**10**	**43%**
Additional Factors	Rough topography that contains several steep canyons or ridges	**+2**	**Average: 0.51 pts.**
	Areas having history of higher than average fire occurrence	**+3**	
	Areas exposed to severe fire weather and strong winds	**+4**	
	Areas with existing fuel modifications or usable fire breaks	**-3**	
	Areas with local facilities (water systems, rural fire districts, dozers)	**-3**	

Fuel hazard 1.5	x Slope Hazard 1.15	=	1.72 .
Structural hazard	+		6.08 .
Additional factors	(+ or -)		0.51 .
Average Hazard Points	**=**		**8.01 .**

The overall self-evaluation performed by the homeowners places approximately 37% of the homes at low risk, 50% at a moderate risk, 12% at high risk, with 1% placed in factors leading to an assessment of to extreme risk factors to loss from wildfire (Table 8).

Table 8. Percent of respondents in each wildfire risk category as determined by the survey responses (Carree, Schnepf and Colt 1998).

01% – Extreme Risk = 26 + points
12% – High Risk = 16–25 points
50% – Moderate Risk = 7–15 points
37% – Low Risk = 6 or less points

Respondents to the survey reported the exposure of their home and access to their home by natural disasters by completing a tabular summary of these factors and the natural disasters (Table 9). The resulting summary by respondents illuminates the overall high frequency of exposure of homes and access by high and damaging winds (73% and 39% respectively), wildfire (60% and 38% respectively), and earthquakes (73% and 52% respectively) (Table 9).

In unison with these data, respondents reported disaster events that did, or could, affect their homes and access to their homes and the out-of-pocket losses caused by these natural disaster events. Approximately 9% of respondents reported that **high winds** have caused damages to their home with 14% reporting compromise to the access to their home (Table 9). When the respondent did experience a financial loss, the out-of-pocket loss averaged $1,813 (Table 10). Respondents reported approximately 15 loss events in the last 10 year period. When extrapolated from the sample size of this survey to the entire population of the households on the Reservation, the total number of losses is estimated at 54 events in the last 10 years, and a total out-of-pocket loss of approximately $97,143 for high wind damages.

Approximately 5% of respondents reported that **wildfire** has caused damages to their home with 7% reporting compromise to the access to their home (Table 9). When the respondent did experience a financial loss, the out-of-pocket loss averaged $250 per event (Table 10). Respondents reported only 2 loss events in the last 10 year period. When extrapolated from the sample size of this survey to the entire population of the households on the Reservation, the total number of losses is estimated at 7 events in the last 10 years, and a total out-of-pocket loss of approximately $1,786 for wildfire damages.

A similar assessment is completed from these data for storm water damages and flood damages. Approximately 9% of respondents reported that **stormwater accumulations** have caused damages to their home with 10% reporting compromise to the access to their home (Table 9). The results of the same assessment for **flood damage** reveals that 4% of respondents did experience losses to their homes, and 6% to their home's access. When the respondent did experience a financial loss from stormwater damages, the out-of-pocket loss averaged $7,538 per event (4 events from the sample in the last 10 years), and flooding losses averaged $20,000 per event (5 events in the last 10 years) (Table 10). When extrapolated from the sample size of this survey to the entire population of the households on the Reservation, the total number of losses is estimated at 14 stormwater loss events, and 18 flood damage events in the last 10 years. The total out-of-pocket loss is estimated at approximately $107,679 for stormwater losses and $357,143 for flooding damages, based on this sample.

Financial losses reported are residential out-of-pocket losses and not the insured losses or the financial burden caused by the natural disaster event. When damages are witnessed there may be losses borne by the homeowner in the form of loss of work, personal labor to clean-up or repair their home and personal access routes, and even personal injury. At the same time, these natural disasters may be responded to by emergency responders, emergency services organizations, and Tribal services. The losses reported in Table 9 and Table 10 include only the residential out-of-pocket losses associated with the natural disaster events. Other loss experiences on the Duck Valley Indian Reservation are summarized in Table 9 and Table 10.

Table 9. Public Survey results about hazards affecting homes and access.

Hazard	Could Affect Home	Could Affect Access	Did Affect Home	Did Affect Access
Flood	48%	49%	4%	6%
Storm Water	45%	44%	9%	10%
Wildfire	60%	38%	5%	7%
Landslide	10%	18%	2%	1%
Earthquake	73%	52%	5%	6%
High Winds	73%	39%	9%	14%
Snow Storms	67%	67%	25%	17%

Table 10. Public Survey results about hazard frequency around home.

Hazard	Did Affect Home	Number of Losses in last 10 years	Average Loss	Total Losses
Flood	4%	5	$20,000	$100,000
Storm Water	9%	4	$7,538	$30,150
Wildfire	5%	2	$250	$500
Landslide	2%	1	$50,000	$50,000
Earthquake	5%	3	$17,667	$53,000
High Winds	9%	15	$1,813	$27,200
Snow Storms	25%	9	$717	$6,450

While the comparison of these data is extremely valuable in recognizing the recent historical impact of these natural hazards, it is critical to understand that these losses are not representative of commercial business losses, Tribal, or agency losses from these hazards.

Neither are these decadal summaries of losses reflective of the expenditures in Tribal, agency, county, state, or federal dollars to mitigate these natural disasters. For instance, substantial budget amounts are expended annually by Tribal, state, and federal forest protection agencies to mitigate wildfire losses, fight wildfires, and prevent wildfire spread.

Survey respondents were asked how hazard mitigation projects should be funded in the areas surrounding homes, communities, and infrastructure such as power lines and major roads. As shown in Table 11, approximately 43% of respondents indicated a preference for public funding of home defensibility projects to reduce the exposure of individual homes to natural hazards. Conversely, about 52% of respondents indicated a public funding preference for community defensibility projects, while 29% opted for a cost-share approach. Public funding options were preferred by 64% of respondents for infrastructure hazard mitigation projects (Table 11).

Table 11. Public opinions of hazard mitigation funding preferences.

	Public Funding	Cost-Share (Public & Private)	Privately Funded (Owner or Company)
Home Defensibility Projects →	43%	28%	29%
Community Defensibility Projects →	52%	29%	20%
Infrastructure Projects Roads, Bridges, Power Lines, Etc. →	64%	16%	20%

All survey recipients were offered an incentive to participate in the project in the form of a custom made color aerial photography wall map for completing and returning the survey (Figure 3, Na-gah print provided to all Residential Survey respondents.). Respondent names were also placed in a raffle for a 50" widescreen TV raffled off during the July 4th Rodeo in Owyhee (Figure 21). The Tribal Hazards Mitigation Planning Committee extends its appreciation to all those who participated in the survey.

Figure 21. Public Mail Survey winners of the raffle for a flat screen TV: Barbara Thomas.

3.7.4. Public Meeting

The Tribal Hazards Mitigation Planning committee sponsored a public meeting in Owyhee, at the Fire Station Meeting Room on June 23, 2011. The meeting was announced in the Sho-Pai Newspaper (Figure 22). The meeting was held in the evening, starting at 6:30 PM with dinner hosted by the Tribes and lasted for approximately 1½ hours with additional time spent in discussions and interactions between the attendees and the Planning Committee members present at the meetings.

Figure 22. Sho-Pai News press release for the THMP Public Meetings.

Public Meeting and Dinner – June 23, 6:00 p.m.

The Sho-Pai Tribes are hosting a public meeting for the Tribal Hazards Mitigation Plan update on Thursday, June 23, at 6:00 to 8:30 p.m. at the Owyhee Fire Station. Dinner will be served at 6:00 and the meeting will begin at 6:30. The theme for this meeting is "what hazard situations keep you awake at night?". This meeting will discuss the profile of natural hazards affecting the Duck Valley Indian Reservation, preparedness actions, potential mitigation measures, and ideas for addressing future developments on the Reservation and on the Tribal properties adjacent to the Reservation. This interactive meeting will involve discussions, sharing of ideas, and participants identifying areas of concern for safety and security. Please join us for an evening of sharing information and discussions. If you have any questions, please contact TERC Chairman, Brent Hunter at the Owyhee Fire Station at (775) 757-2473. See you there!

The public meeting used a slide-show presentation (Figure 23) format to share with attendees information about the planning process, a summary of past disasters and the exposure of the residents on the Duck Valley Indian Reservation to these natural disasters. The discussions at each meeting centered on the most important topics for the Reservation: expansive soils, floods, forest fires, landslides, earthquakes, snow, and windstorms. One of the goals of the discussions was to identify potential mitigation measures to make it easier to deal with a disaster when it happens. Some of the ideas brought up at the meetings by the audience concerned storm water drainage, flood impacts along the Owyhee River with respect to infrastructure, wildfire mitigation measures, and disaster preparedness.

The theme of the meeting, as carried through the press releases and discussions was "What Keeps you Awake at Night?" This theme was proposed by Mark Stevensen, Idaho Bureau of Homeland Security, during one of the planning committee meetings. This theme proved to be an effective strategy to bring people to the meeting while igniting discussions about natural hazards on the Reservation.

Sho-Pai News Editor, and Planning Committee member, Yvonne Powers, sent an e-mail to a wide distribution of residents on the Duck Valley Indian Reservation:

What keeps you awake at night?

We need to hear from you! While the answer to this question may be a funny one, a serious one, or a seriously funny one—we are looking for an answer that is disaster-related. If you are kept awake by thoughts of high winds, getting snowed-in, or being flooded-out—we want to know!

Come and join us for an evening of Dr. Bill's no-nonsense hazard mitigation presentation—in other words, 'How we can make the reservation a safer place to live.' We're serving up hot dogs and hamburgers at tonight's meeting—won't you join us?

Bring the kids, bring the entire family to the HDC tonight at 6:00 p.m.! Fill out a survey and win a flat-screen TV!!

***If you cannot make tonight's meeting, would you please take the time to simply respond to this email with your answer to the question, "What keeps me awake at night?" (Snowstorm, earthquake, land slide, tornado, etc.).

Based on this e-mail a few responses were returned giving light to the questions posed. From Noelle Hanchor:

> I do not like high winds as several years ago as a child we had high winds here and the wind was so strong that a single wide trailer was literally blown over on its side. Other buildings and homes were damaged as well. I remember that my mom, aunt and I slept in the living room that night. It was pretty scary. The wind was so loud it felt as though the stove pipe would come down in the living room and it felt as though the windows would not withstand the wind. I think we all felt as though we needed to be together and of course the living room was the natural place for us all to go. Also awhile back the Owyhee River was running its banks and that was also scary. If I am correct I believe there was an elderly gentleman who had perished due to the roads being flooded.

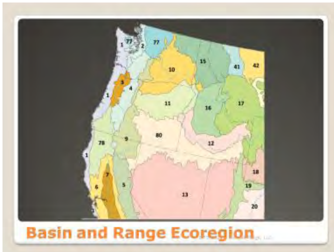
From Ann Taylor-Schoeneck, this response was sent:

> Wasn't able to attend, but my answer to this would be high winds which might cause the trees (that are huge and extremely old) to come crashing down onto my house and then I wouldn't have a place to live...that is, if I lived through it since my bedroom would be the main place they would land on. =)

Figure 23. Public Meeting slide show.

Figure 23. Public Meeting slide show.

Slide 10



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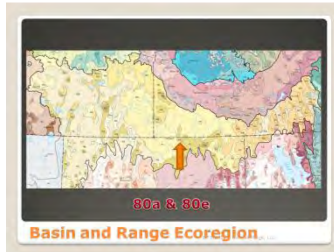

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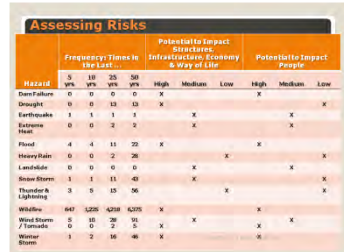

Assessing Risks

Hazard	Frequency: Times in the Last ...				Potential to Impact Structures, Infrastructure, Economy & Way of Life			Potential to Impact People		
	5 yrs	10 yrs	25 yrs	50 yrs	High	Medium	Low	High	Medium	Low
Dam Failure	0	0	0	0	X			X		
Drought	0	0	13	13	X					X
Earthquake	1	1	1	1		X			X	
Extreme Heat	0	0	2	2		X			X	
Flood	4	4	11	22	X			X		
Heavy Rain	0	0	2	28			X			X
Landslide	0	0	0	0		X			X	
Snow Storm	1	1	11	43		X				X
Thunder & Lightning	3	5	15	56			X			X
Wildfire	647	1,225	4,218	6,375	X			X		
Wind Storm / Tornado	5 0	10 0	28 2	91 5	 X	X		 X	X	
Winter Storm	1	2	16	46	X			X		

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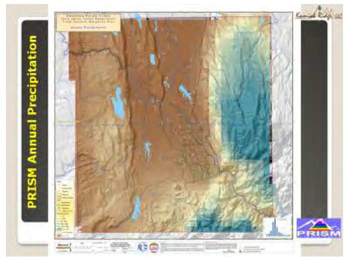

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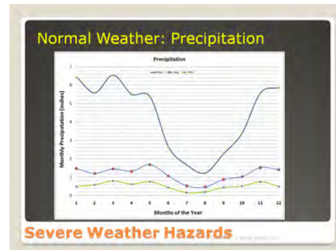

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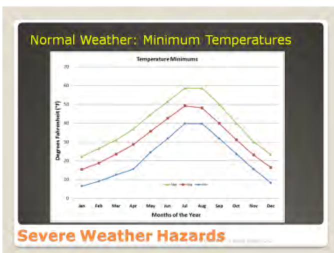

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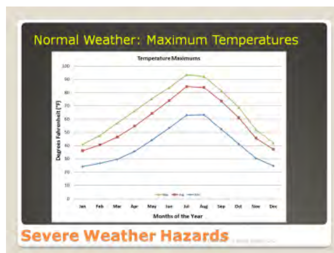

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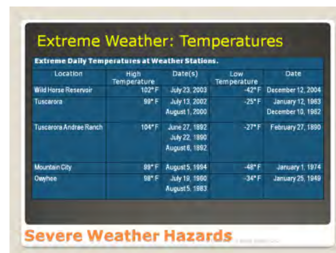

Extreme Weather: Temperatures

Extreme Daily Temperatures at Weather Stations.

Location	High Temperature	Date(s)	Low Temperature	Date
Wild Horse Reservoir	102° F	July 23, 2003	-42° F	December 12, 2004
Tuscarora	98° F	July 13, 2002 August 1, 2000	-25° F	January 12, 1963 December 10, 1962
Tuscarora Andrae Ranch	104° F	June 27, 1892 July 22, 1890 August 6, 1892	-27° F	February 27, 1890
Mountain City	99° F	August 5, 1994	-48° F	January 1, 1974
Owyhee	98° F	July 19, 1960 August 5, 1983	-34° F	January 25, 1949

Severe Weather Hazards

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Slide 21

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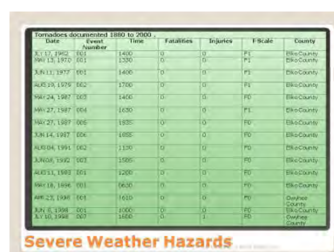
Slide 23

Slide 24



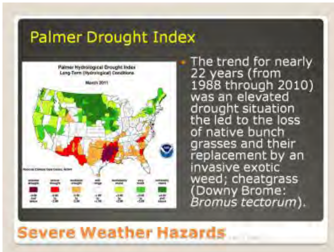
Tornadoes documented 1880 to 2000 .

Date	Event Number	Time	Fatalities	Injuries	F Scale	County
JLY 17, 1962	001	1400	0	0	F1	Elko County
MAY 13, 1970	001	1330	0	0	F1	Elko County
JUN 11, 1977	001	1400	0	0	F1	Elko County
AUG 19, 1979	002	1700	0	0	F1	Elko County
MAY 24, 1987	003	1400	0	0	F0	Elko County
MAY 27, 1987	004	1630	0	0	F1	Elko County
MAY 27, 1987	005	1835	0	0	F0	Elko County
JUN 14, 1987	006	1855	0	0	F0	Elko County
AUG 04, 1991	002	1130	0	0	F0	Elko County
JUN 08, 1992	003	1505	0	0	F0	Elko County
AUG 11, 1993	001	1200	0	0	F0	Elko County
MAY 18, 1996	001	0630	0	0	F0	Elko County
APR 23, 1998	001	1610	0	0	F0	Owyhee County
JUN 6, 1998	001	1000	0	0	F0	Elko County
JLY 10, 1998	007	1600	0	1	F0	Owyhee County

Severe Weather Hazards

Figure 23. Public Meeting slide show.

Slide 25



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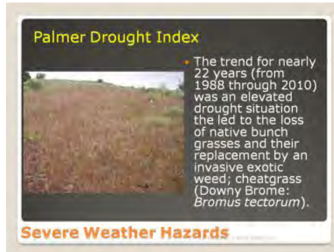

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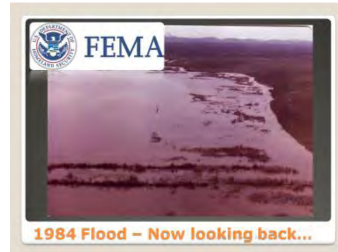

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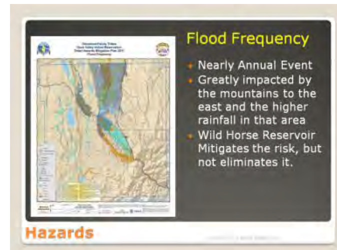

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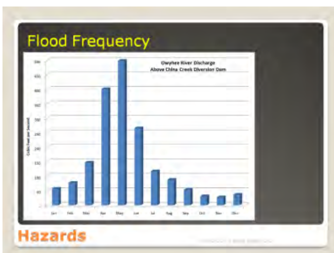

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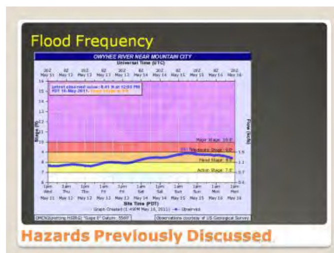

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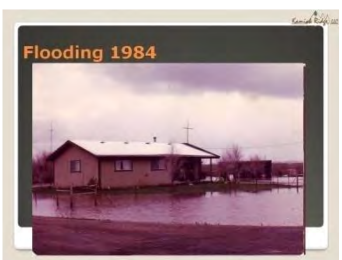

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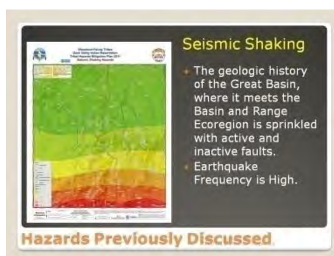

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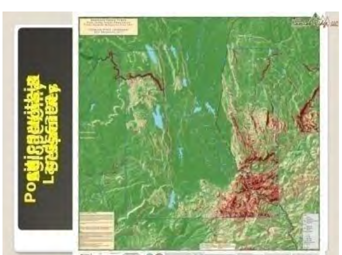

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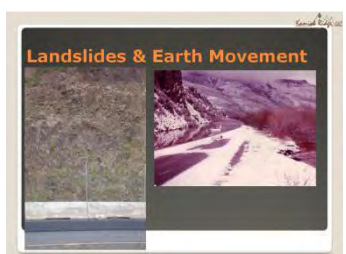

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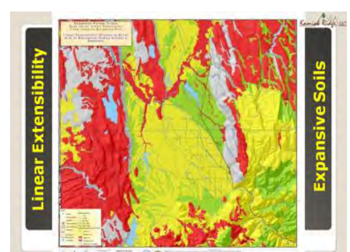

Figure 23. Public Meeting slide show.

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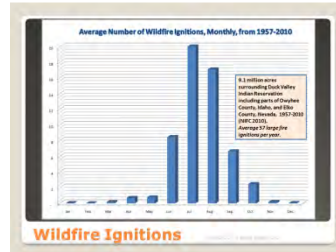

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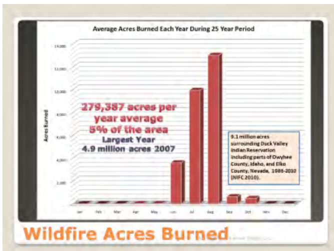

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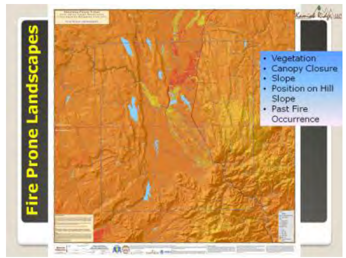

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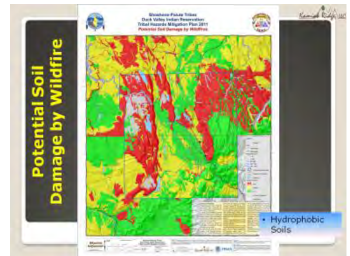

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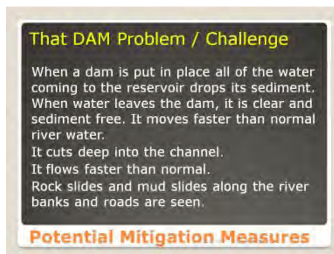

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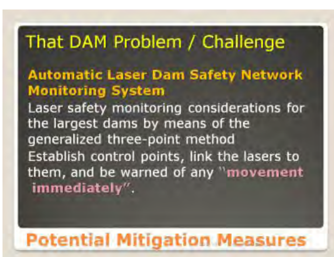

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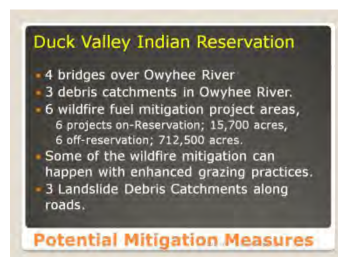

Figure 23. Public Meeting slide show.

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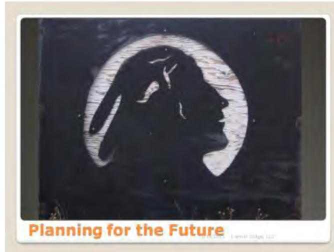


All photographs, charts, and GIS Maps were taken or derived by Kamiak Ridge, LLC, for this project.

3.7.5. Public Review

Public Review of the Duck Valley Indian Reservation Tribal Hazards Mitigation Plan was held during September – October, 2011. The Sho-Pai News newspaper announced the public review period in the September and October issues (Figure 24). The plan was offered on the Sho-Pai Tribal website for download, and interested people were encouraged to contact the Sho-Pai TERC to receive copies of the plan; 5 different locations hosted copies of the printed plan. All comments were provided before October 31, 2011, and incorporated into the final version.

Figure 24. Public Review announcement in the Sho-Pai News (October 2011).

LOCAL OCTOBER 2011

"What keeps you awake at night?"

Tribal Hazard Mitigation Plan ready for public review, comments encouraged

By Yvonne Powers

OWYHEE, Sept. 22—The goal of this plan is to one, save lives--and two, protect property, which is why this document is important to the people of the Shoshone-Paiute Tribes.

The final meeting of the Shoshone-Paiute Tribes Hazard Mitigation Plan took place this afternoon with the Tribal Emergency Response Commission (TERC) and the draft plan is ready for public review and comment. This is one of the last steps before finalization and once the plan passes review by the public, it will be presented to the Business Council. Once the Business Council approves the plan, it will then be presented to the Federal Emergency Management Agency (FEMA). The plan is then sent to FEMA for approval, and then prepared for final adoption by the Tribal Business Council. When completed, it makes it possible for the Tribes to compete for FEMA funding to reduce hazards on the Duck Valley Indian Reservation. Those hazards could include fire, flood, earthquake, and others.

As the crafting phase has come and gone, the TERC has now encountered an equally-important step: The TERC is now asking the public to take time to review the plan and comment on it. The plan itself is over 300 pages--it is a quick, easy, and friendly document to read. It is organized into chapters, each addressing a different part of the assessment; exposure to the risk, the resources available for mitigation (or lessening the effects of potential disasters), response to natural disasters and potential mitigation measures. The plan also includes history of the lands and people of Duck Valley, as well as a present-day picture. The plan has so much more--it is filled with colorful photos, maps, graphs, charts, legends, newspaper clippings and a lot more.

Dr. William Schlosser of Kamiak Ridge, LLC is the consultant to the Tribes in the planning effort. Schlosser has traveled to Duck Valley once a month since January to assist the TERC with this plan. And while the plan is a good one, Schlosser wants to make it even better--and we need the community's help in order to do that.

"Let's make this a stronger plan," says Schlosser, who is a champion for the SPT. Since November

Continued on page 3

The last meeting: Bruce McKinney, Marklin Sope, Nathan Bacon, Sam Thomas, Brent Hunter Rodney, Jim Desmond, Bryan Pete, (front row) Melby Jack, Dr. William Schlosser, Birgit Schlosser, Councilmember Donna Jackson, Rozilyn Jones, Carlyle Dick, and Chris Cleveland. (Y. Powers photo.)

Tribal Hazard Mitigation Plan, continued

2010, he along with the group's chairman Brent Hunter, has kept the TERC on task. This is the second THMP he has produced for the Shoshone-Paiute Tribes, with the Tribes' help. And soon, the SPT will be on their own as Dr. Schlosser's work here on the Hazard Mitigation Plan wraps up.

"This plan will keep the Shoshone-Paiute Tribes at the forefront of national preparedness to disasters. When implemented it can protect people, save homes and businesses, and improve the quality of life. It is up to you now to make it YOUR PLAN," Schlosser encourages.

In order to make a stronger, better plan, the community must provide input. Read this document and see your lands in a different light, look at nature in a slightly changed way, appreciate how your activities fit into the natural scheme of things. Ask yourself, "What keeps me awake at night?" If it's fire, flood, earthquake or something else, let us know. Your information can be sent to hunter.brent@shopai.org or to Dr. Schlosser at Schlosser@Resource-Analysis.com. Printed copies of the plan are available at the Tribal Council conference room, the Duck Valley Housing Authority, the Sho-Pai Fire Station and the Owyhee Community Health Facility.

Volume 19 No. 199

3.8. Shoshone-Paiute Tribal Structure

In order to formally assess and provide an opportunity for all Shoshone-Paiute Tribal Departments to participate in providing unique information for the readiness assessment of this project, a Shoshone-Paiute Tribes Readiness Survey was developed and distributed to

Shoshone-Paiute Tribes' Department Leaders. This survey provides an insight to existing preparedness, resources available for mitigation, active response, and post-disaster responses at the Department level.

The Duck Valley Indian Reservation maintains a centralized organizational framework supporting the provision of essential governmental services. The Shoshone-Paiute Tribes of Duck Valley are governed by the Business Council. The Business Council is composed of a Chairman, Vice-Chairman and five Council Members, all of whom are elected to serve three-year terms. The Business Council directs the Tribal government. The Chairman manages the operations of Tribal government. There are four divisions of tribal administration: Health & Human Services, Judicial Services, Tribal Programs and Support Services.

1. Business Council
2. Cultural Department
3. Tribal Administration
4. Fish, Wildlife, and Parks Department
5. ShoPai News
6. Fire Department
7. EPA Department
8. Natural Resources Department
9. Tribal Enrollment Department
10. Education Department
11. Water/Sanitation Department
12. Owyhee Community Health Facility
13. Recreation Department
14. IT Department
15. Human Resources Department
16. Tribal Court System
17. Stop Violence Program
18. Food Distribution Program
19. Finance Department
20. Day Care Center

The Shoshone-Paiute Tribal government operates with 20 departments and programs, each with staff and various divisions of operations. The department heads report to the Administrative Director, their responsibilities range from finance to public relations to natural resources. The direction from the Chairman and the Council is to look ahead, move ahead and create progress for the Shoshone-Paiute Tribes. Everyday Tribal government operations are headed by the Administrative Director. Together with the Tribal membership, elected leaders and the staff have set forth the goal of restoring the Tribe's self-sufficiency.

Although all of the Tribal Departments operate in unison to provide continuity of services to the Duck Valley Indian Reservation and exercise their sovereign rights of self-governance, a few of the Tribal Departments are specifically identified here for their specific relevance to this Tribal Hazard Mitigation Plan implementation and are defined within this sub-section.

3.8.1. Shoshone-Paiute Tribes Business Council

The Governing Body of the Shoshone-Paiute Tribes consists of a council known as the Business Council. The Membership of this Council consists of a Chairman and 6 Council Members duly elected to serve 3 years. A Chairman shall be elected every 3 years and 2 Council Members shall be elected each year. General Elections are held yearly in April.

The Shoshone-Paiute Tribal Business Council is the governing body responsible for setting the policies in place for the people of the Duck Valley Indian Reservation and the Tribal

Departments to use in the administration of their day-to-day operations. The Shoshone-Paiute Indians are sovereign in their lands and through the administration of their policies and governance. The Tribal Business Council sets the philosophy of mitigation and prevention, disaster preparedness, emergency response, and recovery. Through their execution of plans, policies, and governing documents, the Tribal Business Council begins the process of resilience for the people of the Duck Valley Indian Reservation.

Since 2005, the implementation of the Hazard Mitigation Plan adopted by the Tribal Business Council and approved by FEMA has met limited policy adoption by the Business Council, in part owing to the short time horizon of implementation initiated by FEMA for a 3-year term accompanied by the 3-year election horizon of Tribal Business Council members. Although a few significant policy related activities were executed by the Tribal Business Council, the full adoption of the previous plan was limited. Several projects were implemented by the Council and they resulted in significant benefits to the people of the Duck Valley Indian Reservation.

3.8.2. Tribal Administration

Tribal Administration provides a variety of government services to the people of the Duck Valley Indian Reservation.

Under the direction of the Business Council, the Mission of the Tribal Administration is to protect and preserve the Shoshone-Paiute Culture and Natural Resources, assist and encourage the economic development of the membership and the Tribe and to deliver program services to the best of our ability. It is through the Tribal Administration that many of the pre-disaster mitigation measures will be implemented. It is not directly to be implemented by the Tribal Administration Department, but through the programs and departments that the Tribal Administration oversees.

3.8.3. Property & Supply Department

The Property & Supply Department provides acquisition support and guidance for all Tribal Programs. They provide complete inventory services of all Tribally owned property (fixed assets), equipment, and supplies for all programs. They conduct asset inventory reporting for all programs. The Property & Supply Department will be the primary means of administering grant program acquisitions for disaster mitigation, prevention, preparedness, response, and recovery activities. Their efforts will insure financial management programs are administered between the Tribes and the granting agency.

3.8.4. Fish, Wildlife, and Parks Department

The Department manages three rainbow trout fisheries: Lake Billy Shaw (fly fishing), Mountain View and Sheep Creek Reservoirs. The three fisheries and a stretch of the Owyhee River are open to angling at certain times of the year. A tribal fishing permit is required in order to fish Duck Valley waters.

The Department offers guided antelope hunts to non-tribal members from July 15-October.

The Shoshone-Paiute Tribes operates and maintains several camping areas at Wild Horse Reservoir, located 30 miles south of the reservation boundary. Day use, overnight, weekly and monthly camping is available. The reservoir itself is managed by the Nevada Division of Wildlife.

3.8.5. Sho-Pai News

Sho-Pai News is the only Reservation distributed newspaper for the Duck Valley Indian Reservation. Because of funding limitations, the newspaper recently started using a $0.50 fee structure for the paper. Distribution is to all homes on the Reservation and it is the primary source for information to tribal members and residents of the area.

Sho-Pai News will be the primary means of communicating with residents on the Reservation concerning events for disaster mitigation, prevention, preparedness, response, and recovery.

3.8.6. Shoshone-Paiute Fire Department

The Sho-Pai Fire Department is dedicated to the protection of the Duck Valley Reservation and surrounding areas. They specialize in wildland and structural fire suppression as well as all-risk management which includes search and rescue, vehicle/building extrication, hazard materials response, and natural disaster events. They have 17 volunteer firefighters on call 24 hours a day and 365 days a year. The Department operates under the direction of Tribal Administration and Tribal Emergency Response Commission (TERC).

The Fire Management Officer (FMO) is housed at this facility and also sponsors (2) Type II Initial Attack Wildland Fire Crews during the summer fire season as well as (4) camp crews. Total personnel under Fire Management is 98 employees.

The Fire Department is committed to community members to be trained, equipped and ready to respond to emergency incidents. Safety is the top priority (Figure 25 & Figure 26).

Figure 25. Sho-Pai EMS, BIA Police, Sho-Pai Fire Crew, and Veterans in Owyhee.

Figure 26. Sho-Pai Fire Station in Owyhee.

In addition to being the center of operations for wildfire and structure fire responses, the fire station and the staff serve as the primary response team to all disaster mitigation, prevention, preparedness, response, and recovery efforts on the Reservation. The staff, trained in the National Wildfire Coordinating Group (NWCG) classes of preparedness for wildfires, have been operating in the NIMS compliant structure of operations since the station's inception. Many of the staff are also NIMS trained. The FMO was recently elected the Chairman of the TERC, and past coordination with this organization has historically been excellent. The TERC led the effort to prepare the Duck Valley Indian Reservation Hazard Mitigation Plan in 2006, and is leading the effort for this 2011 update.

3.8.7. Environmental Protection Department

The Shoshone-Paiute Tribal Environmental Protection Program (TEPP) manages several different programs funded through grants by U.S. EPA. The programs include: Water Quality (CWA 106), Non-Point Source (NPS), Superfund, GAP, Wetlands, Pesticides, and the Solid Waste Transfer Station and Recycling Center. The TEPP has provided oversight on the closure of 15 open dumps on the Reservation; assisted in developing and managing an award winning Integrated Municipal Solid Waste Management Program; assisted the Tribes in developing and continue to build capacity in water quality issues; Non-Point Source problems; pesticide permitting, enforcement, and worker protection; above and underground storage tank management; written ordinances specific to UST's and AST's; formed an alliance with the Bureau of Indian Affairs (BIA) to continue to work on BIA environmental issues on the Duck Valley Indian Reservation; and provides assistance with the Rio Tinto Mine mitigation, which currently sits as the number one environmental priority for the Tribes. Environmental issues are continually emerging as the TEPP builds the capacity necessary to identify these additional Tribal environmental protection needs.

The TEPP involvement in disaster mitigation, prevention, preparedness, response, and recovery efforts must be high, especially in terms of environmental planning issues related to pre-disaster mitigation measures to identify and assist in the prioritization of areas that pose a health risk to people if affected by disaster events.

3.8.8. Shoshone-Paiute Natural Resources Department

Natural resource management is a discipline in the management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations. The discipline has given rise to the notion of sustainable development, a principle which forms the basis for land management and environmental governance throughout the world. The Natural Resource Department is comprised of the following Departments: Land, Irrigation, Grazing, National Animal Identification System.

3.8.8.1. Land Allocations

The Natural Resources Department is responsible for overseeing land allocations on the Duck Valley Indian Reservation. The Tribes retain all ownership of trust properties and individual tribal members are given land allocations for homes, farming, and business use. The Department insures that Tribal Council policies are carried out in terms of structures built, competitive uses, grazing practices, and agricultural systems.

3.8.8.2. Irrigation

The new dam structure was constructed to replace an arch dam located 300 feet upstream of the new structure that experienced severe concrete deterioration due to alkali-aggregate reaction. The old dam was breached with a 6 foot diameter hole, at an invert elevation of 6,139 feet, but the rest of the concrete structure was left in place.

Figure 27. Wild Horse Dam; Duck Valley Irrigation Project Sign.

The reservoir provides water for irrigation and stock raising. There are approximately 12,800 acres of agricultural land on the Duck Valley Indian Reservation, which is located 35 miles downstream of Wild Horse Dam.

The 12,800 acre irrigation project lies at the center of the Duck Valley Indian Reservation and is separated into two district units. Duck Valley Unit and the Pleasant Valley Unit. Both irrigate lands along with Owyhee River, but are separated from each other by a basalt restriction in the river channel called the "Narrows". The Duck Valley Unit lies upstream and to the south of the Narrows; the Pleasant Valley Unit lies downstream and to the North of the Narrows.

The irrigable lands lie between 5,300 feet and 5,500 feet in elevation and the growing season is short and the winters are comparatively severe.

3.8.8.3. Grazing

The Natural Resources Department manages the lands within the Duck Valley Indian Reservation for grazing by Tribal members. The lands are assigned to members for the husbandry and management of livestock.

Ordinance of the Governing Body of the Shoshone Paiute Tribes: Ordinance Number 85-SPO-07. Be it enacted by the Business Council of the Shoshone Paiute Tribes:

> Whereas, the Business Council has determined that current proper procedures of Range Conservation and proper return from grazing privileges are pertinent to the welfare of the range and the enhancement of Tribal Government.

3.8.8.4. National Animal Identification System

The National Animal Identification System (NAIS) is a government-run program in the United States intended to extend government animal health surveillance by identifying and tracking specific animals. Administered at the federal level by the Animal and Plant Health Inspection Service, a branch of the United States Department of Agriculture, NAIS is also overseen by state animal health boards. While the federal program is voluntary, money received by some states, tribes, and non-profit entities from the USDA through cooperative agreements has been used to make parts or the entire program mandatory.

Critics claim the system will put small farmers out of business, by requiring that farmers pay the cost of registration devices of between $1 and $20 for each animal. Large, corporate factory farms which are connected to vertically integrated, birth-to-death factory systems ID and pay by the herd (and not the individual animal), while small farmers must pay it for each animal.

The Natural Resources Department's involvement in disaster mitigation, prevention, preparedness, response, and recovery efforts must be high, especially in terms of land management issues related to pre-disaster mitigation measures to identify and assist in the prioritization of areas for home site development, business building locations, land use allocation, and other issues. It is the Natural Resources Department that presents the "face of the Tribal Business Council" to Tribal members in terms of land use allocations and acceptable practices for insuring a safe and sustainable physical environment while implementing potential mitigation measures on the Reservation.

3.8.9. Water and Sanitation Department

The community water supply serving the towns of Owyhee, Newtown and Thomas Loop are under the supervision of the Shoshone-Paiute Tribes Water and Sanitation Department. Native American members of the community are primarily bi-lingual with English as the second language amongst the older generation and Shoshone or Paiute as the second language amongst the majority of the younger population.

The Duck Valley Community System is served by two separate water supplies: the Owyhee Well # 3 (feeding the town of Owyhee and along State Hwy 225 to the Rodeo Ground turn) with Owyhee Well #2 as a backup, and Newtown Well #1 and Well #3 (feeding the Newtown area, Thomas Loop and Hwy. 51) with Newtown Well #2 as backup.

Each system operates separately; however, a solenoid valve can be opened to provide water to the Newtown system from the Owyhee system.

In summary, the Owyhee system begins at the south end of Owyhee and ends at the rodeo grounds. The Newtown system begins at the rodeo grounds turn-off and ends at the Thomas Loop Sub-Division. Pumps bring the water out of the ground, which is then stored in water tanks for later distribution. Water is distributed under pressure through a distribution system network of buried pipes. Smaller pipes, called service lines, are attached to the main lines to bring water to homes. In this community system, water pressure is provided by pumping water into a storage tank at elevations that are higher than the homes. The force of gravity "pushes" the water into homes and is readily available at the tap. In the future, meters will be used to measure usage on service lines for more accurate billing.

The Water and Sanitation Department's involvement in disaster mitigation, prevention, preparedness, response, and recovery efforts must be high, especially in terms of recovery as the operations of this Department are critical to the community's recovery after a disaster event. Effective recovery begins with preparedness and mitigation.

3.8.10. Owyhee Community Health Facility

The Owyhee Community Health Facility provides health care to the Shoshone-Paiute Tribes of the Duck Valley Reservation, American Indians and Alaska Natives enrolled or a descendant of a federally recognized Tribe, and to individuals living on and near the reservation. The mission of the Owyhee Community Health Facility is to promote the highest possible health of the people of the Duck Valley Indian Reservation through a quality health care system that respects cultural values and tribal sovereignty.

Figure 28. Owyhee Community Health Facility

The Shoshone-Paiute Tribes oversee the facility with Department leadership providing the administration and operation of the facility. The facility has the vision of attaining:

1) The goal of the facility is to be a high quality Health Care system that is managed efficiently and effectively that meets the needs of the community.
2) Expanded health care services.
3) Equality of health care to all.
4) Health care educational needs would be met.
5) State of the art services for pre-hospital, hospital, and community Health Care.
6) State of the art electronic communication and information systems.

3.8.10.1. Community Health Department

The CHR/CNA's do home visits and encourage patient follow-up with the clinic. Respondents act in the capacity of advocating for the client rights, and maintaining client's confidentiality. CHR/CNA's act as a liaison in communicating between clients and health care providers. They interpret for clients in the Shoshone or Paiute languages when needed, assisting with home safety evaluations, assisting with community health promotion and disease prevention activities. CHR/CNA's provide local transportation and medication deliveries for those who do not have any other means of transportation. The Community Health Program assists with health fairs, Spay and Neuter Clinics, seasonal walking programs, and Child Car Seat training and installation. Information on disease prevention and health promotion are displayed on the bulletin board in the clinic.

3.8.10.2. Ambulatory Care Services

The facility provides the personalized care to assist with the patient’s commitment to better health. Exercise, eating right and regular visits to a physician are proven ways to help fight disease and maintain good health. Highly skilled family medicine physicians have extensive experience in the care of infants, children, adolescents, and elderly.

The facility personnel offer respectful and compassionate care in the following areas:

1) Chronic Disease Management
2) Obstetrics and Women's Health
3) Men's Health

4) Well Child Exams/Pediatric Medicine
5) School Sports Physicals
6) Pre-employment Physicals
7) Head Start Physicals
8) CDL Physicals
9) Diabetes Care
10) Minor Emergency Care
11) Orthopedics
12) Minor surgery
13) Pain Management
14) Immunization; both childhood and adult

3.8.10.3. Diabetes

The mission of the Diabetes Program for the Shoshone-Paiute Tribes of the Duck Valley Health System is to provide the highest quality of diabetes health care, services and education to the people of the service delivery area. They seek to improve the diabetic health status using techniques to identify, prevent and treat diabetic complications.

3.8.10.4. Senior Citizens Center

The Senior Center Program improves and promotes a better quality of life for the Elderly population (55 years or older) of the Duck Valley Reservation.

3.8.10.5. Behavioral Health Services

Committed to bringing forth quality, caring and professional services to the community and clients.

3.8.10.6. Health Education

The mission of the Health Education Program is to provide assistance to the Native and Non-native population in the determination and improvement of their health status incorporating cultural beliefs, practices and traditions. The program is committed to working in partnership with individuals, groups, and communities in the provision of health services. The program emphasizes wellness, and the promotion of disease prevention.

The Health Care Facility's involvement in disaster mitigation, prevention, preparedness, response, and recovery efforts must be high, especially in terms of recovery as the operations of this Department are critical to the community's recovery after a disaster event. Effective recovery begins with preparedness and mitigation.

3.8.11. Information Technology Department

The Information Technology (I.T.) Department provides support to all departments within the Shoshone-Paiute Tribes Tribal Government and the Owyhee Community Health Facility.

- Network and Computer Services
- Information Systems
- Internet Services and Support
- Geographic Information Systems (GIS)
- Telecommunications

The IT department also oversees and maintains a computer lab that is accessible to the community.

The services of IT have been integrated into all aspects of daily life on the Reservation from the office to the home. The provision of information over the internet and connection to the news of the minute, gives homes and offices rapid access to information. Many homes rely on this rapid provision of information. IT's involvement in disaster mitigation, prevention, preparedness, response, and recovery efforts must be high, especially in terms of response and recovery as the operations of this Department are essential to the community's recovery after a disaster event. Effective recovery begins with preparedness and mitigation.

3.8.12. Food Distribution Program

The Food Distribution Program on Indian Reservations (FDPIR) program is administered at the Federal level by the Food and Nutrition Service (FNS), an agency of the U.S. Department of Agriculture. FDPIR is administered locally by either Indian Tribal Organizations (ITOs) or an agency of a State government. Currently, there are approximately 243 tribes receiving benefits under the FDPIR through 98 ITOs and 5 State agencies.

USDA purchases and ships commodities to the ITOs and State agencies based on their orders from a list of available foods. These administering agencies store and distribute the food, determine applicant eligibility, and provide nutrition education to recipients. USDA provides the administering agencies with funds for program administrative costs.

FDPIR is authorized under Section 4(b) of the Food Stamp Act of 1977, and Section 4(a) of the Agriculture and Consumer Protection Act of 1973. The Personal Responsibility and Work Opportunity Reconciliation Act of 1997 reauthorize FDPIR through 2002. Federal regulations governing the program can be found at 7 CFR Parts 250, 253, and 254.

3.8.12.1. Eligibility Requirements.

Low-income American Indian and non-Indian households that reside on a Reservation, and households living in approved areas near a Reservation or in Oklahoma that contain at least one person who is a member of a Federally-recognized tribe, are eligible to participate in FDPIR.

Households are certified based on income and resource standards set by the Federal government, and must be recertified at least every 12 months. Households may not participate in FDPIR and the Supplemental Nutrition Assistance Program in the same month.

3.8.12.2. USDA Foods Available

Each month, participating households receive a food package to help them maintain a nutritionally balanced diet. Participants may select from over 70 products.

The Shoshone-Paiute Tribes' Food Distribution Program oversees the implementation of the federal program on the Duck Valley Indian Reservation. In a letter to the USDA, Food Nutrition Program on March 11, 2007, the Shoshone-Paiute Tribal Chairman, Kyle Prior, stated (Prior 2007):

> The rural and remote region where this community exists has historically been a depressed region of America. Specifically, those individuals who live below the poverty line as defined by HHS Poverty Guidelines is around 170 individuals. Nearly 100% of the children who are enrolled at Owyhee Combined Schools receive free or reduced lunches. Those children who are ages 0-21 who are enrolled in Medicaid are 451 souls, reservation wide.

In the next few years, the community is expecting to see an increase in electricity rates, estimated to be as high as 20% over the next two years. There are multiple factors that increase the need for a food distribution program. Winter months can be harsh, limiting the ability to commute to off reservation employment with the mileage at or exceeding 100 miles to the nearest town off the Reservation. Many of the tribes' traditional people who speak about the removal from aboriginal territory to the present reservation note that a significant amount of resources for subsistence was fish, deer, and elk, all of which has been impacted by hydroelectric development and overall decrease in natural populations.

In light of Emergency recovery, this Shoshone-Paiute Tribal Department would be the logical point of contact to administer the federal "Emergency Food and Shelter National Board Program" (related to the NIMS IS-420 class). This department would play an important role in the recovery of the Tribes following a disaster event that compromises food and shelter on the Reservation.

3.9. Shoshone-Paiute Tribal Operations

In order to assess the preparedness and capabilities of the Tribal Departments involved in the preparation of the Tribal Hazard Mitigation Plan, surveys were prepared. These surveys were completed and returned by a total of fourteen (14) departments (Table 12).

Table 12. Responses to Tribal Department Surveys.

Department	Number of Full-time Employees	Number of Seasonal Employees
Land/Natural Resources	5	2
Grocery Store	13	4
Sho-Pai News	2	0
Roads Management (BIA)	2	0
Water / Sanitation	2	2
Fire Station	5	17
Housing Authority	10	15
Finance Department	9	0
Property & Supply	3	0
Owyhee Community Health Clinic	64	9
Sho-Pai IT	2	0
Fish, Wildlife, Parks	6	13
Tribal Environmental Protection Program (TEPP)	4	3
Fire Department	5	55
Total	**132**	**120**

The results of the completed surveys demonstrate the differing levels of preparedness across the critical divisions of the Shoshone-Paiute Tribes, whose responsibilities encompass disaster mitigation and response. These results were used to help direct mitigation measures and to assist Tribal Departments with hazard preparedness.

Survey respondents represented 132 full-time employees and 120 seasonal employees. The Owyhee Community Health Clinic represented the most full-time employees with 64 positions. The Fire Management Program combined with the Housing Authority showed the greatest fluctuation in the number of staff with 15 full-time employees and 70 seasonal employees, combined. The average Shoshone-Paiute Tribal Department participating in this survey employed 9.4 people full-time, and 8.6 people part-time.

Training associated with a general level of preparedness for natural disasters was assessed by the respondents to the survey (Table 13). Because of the number of people involved in structure and wildfire fighting activities through the Fire Department and Fire Management Program, there are approximately 103 people possessing training in wildfire fighting and 51 people with structure firefighting training. Approximately 98 people have EMT training and 173 have basic first aid. Training in the National Incident Management System (NIMS) is provided through both the NIMS training format and NWCG and were treated equally in this survey. Approximately 34 people have at least a basic NIMS training capacity while 24 people qualify for advanced (incident command) NIMS standards. Approximately 110 people have HazMat training (Table 13).

Within these data, the representation in the various departments was summarized to present an overall distribution of people with training in these aspects of emergency response (Table 13). The six right side columns of Table 13 indicate how training is distributed. For instance, approximately 45% of the departments have no employees with wildland fire training, while 27% have all of their employees trained in wildfire response. In a similar comparison, about 64% of the Tribal Departments have no employees with NIMS training.

Table 13. General Level of Emergency Response Training by Department Staff.

Type of Training	Estimated Number with Training	Summary Based on Departmental Statistics					
		No employees	1% to 25% of employees	26% to 50% of employees	51% to 75% of employees	More than 76% of employees	All Employees
Wildland Firefighting	103	43%	29%	7%	0%	0%	21%
Structure or Rural Firefighting	51	43%	36%	7%	0%	0%	14%
EMT	98	62%	23%	15%	0%	0%	0%
Basic First Aid	173	14%	36%	0%	0%	21%	29%
NIMS (100 & 700)	34	71%	7%	14%	0%	0%	7%
NIMS Advanced	24	71%	14%	7%	7%	0%	0%
Hazardous Materials (HazMat)	110	50%	21%	7%	0%	0%	21%

Survey respondents indicated if their office headquarters has been affected in the last 10 years from a list of natural hazards (Table 14). The results of this assessment indicate that winter storms, flood, wildland fire, and earthquakes have impacted departmental operations with the highest occurrence. Winter storms were the most repeated natural disaster reported by departmental responses (43%), to impact the ability of the departments to provide services to the community.

Table 14. Respondent Assessment of Operations Exposure to Natural Hazards.

Type of Hazard	No	Yes
Flood	86%	14%
Wildland Fire	71%	29%
Earthquake	86%	14%
Landslide	100%	0%
Wind Storm/Tornado	100%	0%

Table 14. Respondent Assessment of Operations Exposure to Natural Hazards.

Type of Hazard	No	Yes
Winter Storm	57%	43%

Approximately 71% of the responding Departments reported access to a backup power generator to use for operations if the power grid fails due to a natural disaster. At the same time, approximately 50% of the respondents indicated that there is an alternative access route to their office base of operations if the main access route is compromised. Approximately 44% of the reporting Departments indicated they have the ability to operate from an alternative location. However, only 11% of the reporting Departments indicated that they have a written plan in place to operate from another location during or after a disaster event.

Approximately 93% of respondents indicated that they have alternative communications available in the case of a disaster. All departments (100%) report that employees have personal or tribal cell phones for this purpose. Other communication devices available to staff include two-way radios in common use by the fire protection and medical response employees. It is important to note that alternative communication devices such as cell phones rely on an operational electrical power grid and operational cell phone towers to be effective – both conditions that are unstable in non-emergency situations on the Duck Valley Indian Reservation.

Respondents were asked to rank the perceived relative threat posed by a variety of natural hazards (Table 15). Based on this assessment, winter storms ranked as the highest threat in the list of potential impacts (30 points where total agreement on the highest risk hazard would score 36 points). Earthquakes were ranked second overall (26 points), followed by wildfire (21 points), Wind storm / tornado (21 points), flood (19 points), and landslides (9 points) (Table 15).

Table 15. Relative Ranking of Various Hazards.

Type of Hazard	Rank	Composite Score
Winter Storm	1	30
Earthquake	2	24
Wildfire	3	23
Wind Storm/ Tornado	4	21
Flood	5	20
Landslide	6	9

Relative risk scores reported for each hazard (Table 15) were determined by assigning a point score of 6 to the highest ranked hazard, 5 to the next lowest, and so forth to the lowest ranked risk, which received a 1. All respondent scores were added together for each hazard and the risk with the highest score received the ranking as the largest comparative risk exposure.

The Natural Resources Department, Owyhee Community Health Facility, and Water and Sanitation Department indicated they have Emergency Operations Plans (EOP) in place for their departments. The remaining respondents indicated no EOP. Currently, the Shoshone-Paiute Tribes do not have a Reservation-wide or Tribal Emergency Operations Plan developed. However, the Tribes have adopted NIMS and are seeking funding to assist in the development of a Comprehensive Emergency Operations Plan.

3.10. Guidance and Integration with Tribal Planning Activities

The Duck Valley Indian Reservation Tribal Hazards Mitigation Plan update was initiated by the Shoshone-Paiute Tribal Emergency Response Commission (TERC) in 2009, with assistance by the Southwest Idaho RC&D, by the application for funding assistance from FEMA Region X.

Funding from FEMA for the preparation of the Tribal Hazards Mitigation Plan was received in 2010.

The Shoshone-Paiute tribes strive to develop practices and policies consistent with the theme of self-reliance and sovereignty, while developing relationships and coordinated approaches to hazard mitigation that build on the themes of cooperation and collaboration with neighboring jurisdictions from Counties (Owyhee and Elko), the States of Idaho and Nevada, FEMA Regions IX and X, and the organizations and agencies operating in the region (private, state, federal, and other Tribes).

3.11. Legal and Regulatory Tribal Resources Related to Hazard Mitigation

A summary of legal and regulatory resources developed and adopted by the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation is summarized in (to be updated). A further discussion of these items is presented in subsequent sections of this sub-chapter. These plans, policies, and programs provide a framework for implementing the mitigation items termed as “policy” recommendations. Many of the potential mitigation measures referenced in Table 70 will be implemented through the existing framework of plans, policies, and programs already established within the Duck Valley Indian Reservation. Through the utilization of existing Duck Valley Indian Reservation plans, policies, and programs, the implementation of the THMP will be met with high success, and both financial and administrative achievement.

As used in this context, a **“plan”** is typically a formally written document by the Shoshone-Paiute Tribes and is used to direct administrative operations with the approval and support of the Shoshone-Paiute Tribal Council. These “plans” will normally be formally adopted by the Shoshone-Paiute Tribal Council. A **“policy”**, as used in this context, is a formal code of operations administered by the Department Leadership to execute the duties assigned to the Department. “Policies” may or may not be formally adopted by Tribal Council, but are utilized on behalf of the Tribe by an authorized administrator. The third category, **“programs”**, are formal implementation strategies of the Shoshone-Paiute Tribes to enact a variety of efforts from minor activities to major undertakings. Some of the “programs” may be adopted formally by the Tribal Council, while others may not be.

Examples of these three variations of sovereign authority are seen as 1) Plan – such as this Tribal Hazards Mitigation Plan or adopting the International Building Code, 2) Policy – such as the process of sharing GIS data with cooperating parties not directly affiliated with the Tribe, and 3) Program – the implementation of a Weed Control Plan or the administration of Fire Management activities. Often, the designation of these labels is ambiguous, but their categorization into one category or another category is not critical.

3.11.1. Shoshone-Paiute Tribes Economic Development Strategic Plan

The Shoshone-Paiute Tribes Economic Development Strategic Plan (1999) is a guide that establishes goals and objectives to help the Reservation grow and develop. The Economic Development Strategic Plan includes a forecast of conditions that are anticipated to occur within a ten-year period, 1999 to 2009. The Plan proposes to expand economic development of the Duck Valley Reservation in six key comprehensive planning components.

Planning is an ongoing process. Conditions and priorities change; consequently the plan will be reviewed regularly and revised when necessary. The 6 planning components included in the Duck Valley Reservation, Shoshone-Paiute Tribes Economic Development Strategic Plan include:

1. Agriculture and Ranching
2. Gaming

3. Outdoor Recreation and Tourism
4. Downtown Revitalization
5. Community Services
6. Alternative Energy

The Economic Development Plan is founded upon explicit community values. Previous planning priorities add to the moral framework, which guided creation of the overall strategic system. Highest priority was given to programming, which will continue to strengthen the traditional culture of the Shoshone-Paiute Tribes. Sustainable development, self-sufficiency, and practical programming also are fundamental goals.

The Plan's strategy is based upon a two-point development orientation. First, Tribal resources will be enhanced to support the range of development opportunities available to the Tribes. Second, four Tribal Enterprises will be developed or enhanced. Together with private businesses, they will seek to strengthen and diversify the economy by tapping these existing resources.

A six step program will guide implementation of the Economic Development Plan:

1. Organize for implementation
2. Address existing infrastructure problems and respond to immediate needs
3. Complete strategic Tribal enterprises and private businesses
4. Expand vocational and continuing education
5. Develop strategic Tribal enterprises and private business
6. Monitor steps to adjust to change and experience

This program incorporates a series of about 50 strategic actions over a ten-year time frame. Potential resources, timing, roles, responsibilities, and other relevant implementation information is provided for each action. This Fire Management Plan will "dove-tail" with the Tribes' Economic Development Strategic Plan during its development and implementation to insure that the goals and objectives of each are integrated together. This planning effort fully adopts the goals and objectives of the Shoshone-Paiute Tribes Economic Development Strategic Plan.

Figure 29. Youth Art contest winner, David Powers, 6 years.

Chapter 4. Natural Hazards Assessment

Chapter 4 presents hazard profiles for the Duck Valley Indian Reservation as developed from the Phase I Hazard Profile completed by the Planning Committee, plus additional items identified during the planning process. Historical hazards experienced in this region are presented, including State and Presidential Hazard Declarations in the area. The extent and location of each hazard's profile is discussed. The overview of this Chapter includes:

During the first three Duck Valley Indian Reservation Tribal Hazards Mitigation Plan Committee meetings, the attendees participated in a scoping exercise to subjectively place all relevant hazards into a matrix used to compare various hazard-significance levels, based on the potential for the hazard to occur, and its capacity to negatively affect people, structures, infrastructure, environment, the economy, and the traditional way of life on the Duck Valley Indian Reservation. This exercise helped to spark discussions about relative risks and the types of impacts commonly experienced. Resources for this discussion included the tabular risk-analysis data presented in Table 19 and Table 20, augmented with the extensive personal experiences of the combined Planning Committee membership.

For the purposes of the Planning Committee discussion while creating the data found within Table 16, the relative categories of Low, Medium, and High were considered as follows:

- Probability of Occurrence
  - Low – historically, the listed hazard has been observed with a frequency of one or fewer notable events within a ten-year period. This category also includes infrequent hazard events that may occur only once a century.
  - Medium – the occurrence of the listed hazard has been observed more frequently than once in a ten year period, but less frequently than twice every five year period, on average.
  - High – the listed hazard has occurred more than twice every five years, and includes annual event hazards, and even multiple times per-year hazards. To be considered for this ranking, the hazard does not necessarily occur every year, but when considered over a five-year period, the hazard is witnessed three or more times per five-year period.
- Potential to Impact People, Structures, Infrastructure, the Economy, and Traditional Way of Life
  - Low – the occurrence of the listed hazard has low potential to negatively impact the listed resources based on the exposure to developments and population

centers, coupled with considerations for available resources to respond to these threats. The risk exposure potentially impacts no lives and less than 25 structures when it is witnessed.

- Medium – the occurrence of the listed hazard has moderate potential to negatively impact the listed resources based on the exposure to developments and population centers, coupled with considerations for available resources to respond to these threats. The risk exposure potentially impacts fewer than 5 lives or less than 50 structures when it is witnessed.
- High – the occurrence of the listed hazard has high potential to negatively impact the listed resources based on the exposure to developments and population centers, coupled with considerations for available resources to respond to these threats. The risk exposure potentially impacts more than 5 lives or more than 50 structures with each occurrence.

The findings of the Planning Committee are summarized in Table 16.

Table 16. Phase I Hazard Assessment of Duck Valley Indian Reservation.

Probability of Occurrence	Low	Medium	High
High	Thunder & Lightning	Storm Water Drought Extreme Heat	Wildland Fire
Medium	Landslides	Expansive Soils Extreme Winter Storms	Flood Windstorm / Tornado
Low		Earthquake / Seismic Shaking	Dam Failure
	Potential to Impact People, Structures, Infrastructure, the Economy, and Traditional Way of Life		

These natural hazards were further considered during interactive sessions of the planning committee to determine their observed frequency (number of events within set time periods) and differential potential to impact structures, infrastructure, economy, and way of life, and separately to threaten health and safety (Table 17).

Table 17. Hazard Profile Frequency and Severity from SHELDUS and NIFC databases.

Hazard	Frequency: Times in the Last …				Potential to Impact Structures, Infrastructure, Economy & Way of Life			Potential to Impact People		
	5 yrs.	10 yrs.	25 yrs.	50 yrs.	High	Medium	Low	High	Medium	Low
Dam Failure	0	0	0	0	X			X		
Drought	0	0	13	13	X					X
Earthquake	1	1	1	1	X			X		
Extreme Heat	0	0	2	2		X			X	
Extreme Cold						X		X		
Flood	4	4	11	22	X			X		
Heavy Rain	0	0	2	28			X			X
Landslide	0	0	0	0		X			X	
Snow Storm	1	1	11	43	X				X	
Thunder & Lightning	3	5	15	56			X			X
Wildfire	647	1,225	4,218	6,375	X			X		
Wind Storm / Tornado	5 0	10 0	28 2	91 5	X	X		X	X	
Winter Storm	1	2	16	46	X			X		

These data presented the basis for evaluation in the Duck Valley Indian Reservation Tribal Hazards Mitigation Plan with the determination that the hazards to be considered in this effort include:

1. Flood & Storm Water Drainage
2. Dam Failure
3. Wildland Fire
4. Earthquakes & Seismic Shaking Hazards
5. Landslides
6. Expansive Soils
7. Severe Weather
    1. Wind Storms & Tornadoes
    2. Winter Weather (Snow Storms & Winter Storms)
    3. Extreme Cold
    4. Extreme Heat
    5. Thunder & Lightning
    6. Windstorms

A summary of the hazards addressed (Section 3.3, State Hazard Mitigation Plans) by the State of Idaho Hazard Mitigation Plan (2010), State of Nevada Hazard Mitigation Plan (2010), past state or federal disaster declarations for the two counties where the Duck Valley Indian Reservation is located, and inclusion within this planning document are summarized in Table 18.

Table 18. Hazard Screening for the Duck Valley Indian Reservation.

Hazard Type	Hazard Identified in Idaho State HMP (2010)	Past Idaho State or Presidential Disaster Declaration	Hazard Identified in Nevada State HMP (2010)	Past Nevada State or Presidential Disaster Declaration	Hazard Profiled in this Plan
Avalanche	Yes	No	Yes	No	No
Coastal Erosion	No	No	No	No	No
Cold (Extreme)					Yes
Dam Failure	Yes	No	Yes	No	Yes
Drought	Yes	Yes	Yes	Yes	Yes
Expansive Soils & Clays	No	No	Yes	No	Yes
Flood (rains)	Yes	Yes	Yes	Yes	Yes
Hailstorm	Yes	No	Yes	No	No
Heat (Extreme)	Yes	No	Yes	No	Yes
Hurricane / Cyclone	No	No	No	No	No
Land Subsidence	No	No	Yes	No	No
Landslide	Yes	Yes	Yes	No	Yes
Seismic Shaking Hazards	Yes	No	Yes	Yes	Yes
Snow/Ice / Winter Storm	Yes	Yes	Yes	Yes	Yes

Hazard Type	Hazard Identified in Idaho State HMP (2010)	Past Idaho State or Presidential Disaster Declaration	Hazard Identified in Nevada State HMP (2010)	Past Nevada State or Presidential Disaster Declaration	Hazard Profiled in this Plan
Thunderstorms	Yes	Yes	Yes	Yes	Yes
Tornado	Yes	Yes	Yes	No	Yes
Tsunami	No	No	No	No	No
Volcano	Yes	Yes	Yes	Yes	No
Wildfire	Yes	Yes	Yes	Yes	Yes
Wind Storm	Yes	Yes	Yes	Yes	Yes

Table 18. Hazard Screening for the Duck Valley Indian Reservation.

4.1. History of Past Natural Disasters

4.1.1. Major Presidential Disaster Declarations within and Adjacent to the Duck Valley Indian Reservation

When an emergency incident exceeds the capability of the jurisdiction to adequately respond, it may require assistance from the federal government. The State's Governor can request the US President to make a major disaster declaration. While only a state Governor, or his representative, can create a state declaration of emergency or disaster to the US President, the Tribal Chairman can make a disaster or emergency declaration for the Reservation and forward that to FEMA when a formal relationship between the Tribe(s) and FEMA exists. This declaration does not make a Presidential Disaster Declaration obligatory by the US President, nor does it force the Declaration on the State(s). It does however, state the magnitude and financial impact of the disaster from the perception of the Tribe(s) to seek assistance from the state(s) and FEMA.

The Code of Federal Regulations has defined a major disaster as:

> "Any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the U.S., which in the determination of the President, causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby" (GPO 2007).

Table 19. Presidential Disaster Declarations for Disasters Located in Areas Including Elko County, Nevada, or Owyhee County Idaho.

Declaration Number	*Declared*	*State*	*Description*
19	07/14/1954	Nevada	Earthquake
36	06/21/1955	Nevada	FLOOD
48	12/24/1955	Nevada	FLOOD
55	04/21/1956	Idaho	FLOODS
63	08/31/1956	Nevada	FLOOD

Table 19. Presidential Disaster Declarations for Disasters Located in Areas Including Elko County, Nevada, or Owyhee County Idaho.

Declaration Number	*Declared*	*State*	*Description*
76	05/27/1957	Idaho	FLOOD
105	07/22/1960	Idaho	Fires
116	06/26/1961	Idaho	FLOODS
120	02/14/1962	Idaho	FLOODS
121	02/22/1962	Nevada	FLOODS
143	02/14/1963	Idaho	FLOODS
142	02/14/1963	Nevada	FLOODS
186	12/31/1964	Idaho	Heavy Rains & Flooding
3040	05/05/1977	Idaho	Drought
3041	06/11/1977	Nevada	Drought
2032	06/11/1979	Nevada	Pea Vine Peak Fire
624	05/22/1980	Idaho	VOLCANIC ERUPTION, MT. ST. HELENS
2042	08/09/1981	Nevada	Little Valley Fire
2045	07/19/1983	Nevada	Silver City Fire
694	11/18/1983	Idaho	Earthquake
697	02/16/1984	Idaho	ICE JAMS, FLOODING
2106	08/04/1994	Nevada	Crystal Fire
2183	06/24/1996	Nevada	Autumn Hills Fire
2185	08/05/1996	Nevada	Belli Ranch Fire
2188	08/13/1996	Nevada	Lee Fire
2190	08/26/1996	Nevada	Ruby Complex
2268	08/05/1999	Nevada	Osino Fire
2267	08/05/1999	Nevada	Unionville Fire
2271	08/25/1999	Nevada	Red Rock Fire
2356	01/13/2000	Nevada	Spring Creek Fire
2366	07/05/2001	Nevada	Ten Mile Fire
3202	02/17/2005	Nevada	Snow
3204	02/23/2005	Nevada	Snow
2568	07/16/2005	Nevada	Carlin Fire
2567	07/16/2005	Nevada	Contact Fire
2578	08/22/2005	Nevada	Vor-McCarty Fire

Table 19. Presidential Disaster Declarations for Disasters Located in Areas Including Elko County, Nevada, or Owyhee County Idaho.			
Declaration Number	***Declared***	***State***	***Description***
2581	08/29/2005	Nevada	Chance Fire
3244	09/13/2005	Idaho	Hurricane Katrina Evacuation
3243	09/13/2005	Nevada	Hurricane Katrina Evacuation
1629	02/03/2006	Nevada	Severe Storms and Flooding
1630	02/27/2006	Idaho	Severe Storms and Flooding
2648	06/26/2006	Nevada	Suzie Fire
2670	08/24/2006	Nevada	Mud Fire
2717	07/23/2007	Nevada	Murphy Fire Complex
2822	07/17/2009	Nevada	Red Rock Fire
2847	07/01/2010	Nevada	Cathedral Fire

4.1.2. SHELDUS Hazard Event Profile

SHELDUS (Hazards & Vulnerability Research Institute 2011) is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, wildfires, tsunami, and high winds maintained by the Hazards & Vulnerability Research Institute at the University of South Carolina. Each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that were attributed to each county. SHELDUS Hazard Profile for Elko County, Nevada, and Owyhee County, Idaho, 1960-2009 have been combined into a summary of natural disasters that either resulted in damages on the Duck Valley Indian Reservation, or adjacent to the Duck Valley Indian Reservation. The damages summarized in Table 20 do not represent damages just on the Duck Valley Indian Reservation. This summary is inclusive of the listed disasters in their effect across the region. Some of these events were also reported in Table 19. At this time, there is not a comprehensive disaster summary database created for Indian Reservations in the USA. Summaries (Table 19 and Table 20) are intended to represent the natural disasters that have generally impacted the region of the Duck Valley Indian Reservation.

Table 20. SHELDUS Hazard Profile; Owyhee County, Idaho & Elko County, Nevada. 1960-2009 (Hazards & Vulnerability Research Institute 2011).

Hazard ID	Begin	End	Hazard Type	County	ST	Injuries	Fatalities	Property Damage	Crop Damage	Remarks	Prop Damage 2010	Crop Damage 2010
9030491	10/4/2009	10/5/2009	Winter Weather	Owyhee	ID	0	0	$174	$-	Heavy Snow	$174	$-
9025801	6/25/2009	6/25/2009	Severe Storm/Thunder Storm - Wind	Elko	NV	0	0	$700	$-	Thunderstorm Wind (52EG)	$700	$-
9024393	6/6/2009	6/6/2009	Flooding	Owyhee	ID	0	1	$-	$-	Flash Flood, M?VE	$-	$-
9035048	3/29/2009	3/29/2009	Wind	Owyhee	ID	0	0	$33,333	$-	High Wind	$33,333	$-
8944310	8/25/2008	8/25/2008	Wildfire	Owyhee	ID	0	0.33	$1,666,667	$-	Wildfire, F56PH	$1,666,667	$-
8941465	7/21/2008	7/21/2008	Severe Storm/Thunder Storm - Wind	Elko	NV	0	0	$1,000	$-	Thunderstorm Wind (52EG)	$1,000	$-
8986188	2/21/2008	2/21/2008	Earthquake	Elko	NV	3	0	$1,000,000	$-	Earthquake	$1,000,000	$-
8812819	11/14/2006	11/14/2006	Wind	Elko	NV	0	0	$100,000	$-	High Wind (G72)	$107,217	$-
8820048	5/2/2006	5/5/2006	Flooding	Elko	NV	0	0	$5,000	$-	Flood	$5,361	$-
8817294	4/12/2006	4/17/2006	Flooding	Elko	NV	0	0	$20,000	$-	Flood	$21,443	$-
8817295	4/12/2006	4/16/2006	Flooding	Elko	NV	0	0	$10,000	$-	Flood	$10,722	$-
217060	5/15/2005	5/31/2005	Flooding	Elko	NV	0	0	$33,333	$-	Flood	$36,879	$-
208127	8/1/2004	8/1/2004	Severe Storm/Thunder Storm - Wind	Elko	NV	0	0	$100,000	$-	Thunderstorm Wind	$114,286	$-
170909	10/1/2002	10/2/2002	Winter Weather	Elko	NV	0	0	$5,000	$-		$5,977	$-
170908	5/20/2002	5/20/2002	Wind	Elko	NV	0	0	$1,000	$-		$1,195	$-
170907	4/14/2002	4/14/2002	Wind	Elko	NV	0	0	$1,000	$-		$1,195	$-
19328	10/10/2000	10/10/2000	Severe Storm/Thunder Storm - Wind	Elko	NV	0	0	$2,000	$-	THUNDERSTORM WIND	$2,506	$-
19306	2/14/2000	2/14/2000	Wind	Elko	NV	0	0	$400	$-	HIGH WIND	$501	$-
33154	12/13/1999	12/13/1999	Wind	Elko	NV	0	0	$750	$-	HIGH WIND	$975	$-
33145	8/4/1999	8/4/1999	Flooding	Elko	NV	0	0	$3,000	$-	FLOODS	$3,900	$-
33108	2/9/1999	2/9/1999	Wind	Elko	NV	0	0	$4,000	$-	HIGH WIND	$5,200	$-
134910	7/10/1998	7/10/1998	Tornado	Owyhee	ID	1	0	$30,000	$-		$39,493	$-
112193	4/23/1998	4/23/1998	Wind	Elko	NV	1	0	$-	$-	HIGH WIND	$-	$-
54898	7/30/1996	7/30/1996	Severe Storm/Thunder Storm	Owyhee	ID	0	0	$10,000	$-	HEAVY RAIN	$13,684	$-
54899	5/17/1996	5/20/1996	Flooding	Owyhee	ID	0	0	$5,000	$-	FLOOD	$6,842	$-
122581	8/22/1995	8/22/1995	Flooding	Elko	NV	0	0	$59	$-	FLOODS	$83	$-
122551	6/14/1995	6/16/1995	Flooding - Wind - Winter Weather	Elko	NV	0	0	$1,154	$-	HIGH WINDS, FLOODING, HEAVY SNOW	$1,622	$-
122534	6/6/1995	6/12/1995	Flooding	Elko	NV	0	0	$12,500	$-	FLOODS	$17,568	$-

Table 20. SHELDUS Hazard Profile; Owyhee County, Idaho & Elko County, Nevada. 1960-2009 (Hazards & Vulnerability Research Institute 2011).

Hazard ID	Begin	End	Hazard Type	County	ST	Injuries	Fatalities	Property Damage	Crop Damage	Remarks	Prop Damage 2010	Crop Damage 2010
137133	6/5/1995	6/5/1995	Tornado - Wind	Elko	NV	0	0	$7,500	$-	NVZ003-004-007	$10,541	$-
122522	4/12/1995	4/14/1995	Wind - Winter Weather	Elko	NV	0	0	$81,000	$-	HEAVY SNOW, HIGH WINDS	$113,838	$-
82481	12/5/1994	12/5/1994	Winter Weather	Owyhee	ID	0	0	$7,143	$-	HEAVY SNOW	$10,317	$-
82469	12/1/1994	12/1/1994	Severe Storm/Thunder Storm - Winter Weather	Owyhee	ID	0	0	$1,136	$-	HEAVY RAIN/SNOW	$1,641	$-
82429	11/1/1994	11/1/1994	Wind	Owyhee	ID	0.1	0	$5,000	$-	HIGH WINDS	$7,222	$-
74313	9/1/1993	9/30/1993	Winter Weather	Owyhee	ID	0	0	$-	$11,364	Cool and Wet Growing Season	$-	$16,883
72408	11/21/1992	11/22/1992	Winter Weather	Owyhee	ID	0	0	$2,500	$-	Heavy Snow	$3,824	$-
72367	11/9/1992	11/9/1992	Winter Weather	Owyhee	ID	0	0	$3,571	$-	Blizzard	$5,462	$-
72353	11/7/1992	11/8/1992	Winter Weather	Owyhee	ID	0	0	$3,571	$-	Heavy Snow	$5,462	$-
72230	10/1/1992	10/31/1992	Drought	Owyhee	ID	0	0	$113,636	$1,136,364	Drought	$173,796	$1,737,958
71922	9/1/1992	9/30/1992	Drought	Owyhee	ID	0	0	$-	$1,136,364	Drought	$-	$1,737,958
71436	8/24/1992	8/26/1992	Winter Weather	Owyhee	ID	0	0	$139	$13,889	Freeze	$212	$21,242
71385	8/20/1992	8/20/1992	Heat - Wind	Owyhee	ID	0	0	$26,316	$26,316	Wind, Dry Heat	$40,247	$40,247
71367	8/11/1992	8/15/1992	Lightning	Owyhee	ID	0	0	$1,136	$114	Dry Lightning	$1,738	$174
71321	8/1/1992	8/31/1992	Drought	Owyhee	ID	0	0	$-	$1,136,364	Drought	$-	$1,737,958
70762	7/1/1992	7/31/1992	Drought	Owyhee	ID	0	0	$-	$1,136,364	Drought	$-	$1,737,958
70005	6/1/1992	6/30/1992	Drought	Owyhee	ID	0	0	$-	$1,136,364	Drought	$-	$1,737,958
69570	5/1/1992	5/31/1992	Drought	Owyhee	ID	0	0	$-	$1,851,852	Drought	$-	$2,832,227
69223	4/17/1992	4/17/1992	Wind	Owyhee	ID	0	0	$11,364	$11,364	Wind	$17,380	$17,380
69172	4/9/1992	4/9/1992	Wind	Owyhee	ID	0	0	$1,724	$-	Dust Storm	$2,637	$-
69124	4/1/1992	4/30/1992	Drought	Owyhee	ID	0	0	$-	$1,851,852	Drought	$-	$2,832,227
68832	3/1/1992	3/31/1992	Drought	Owyhee	ID	0	0	$18,519	$185,185	Drought	$28,322	$283,223
68451	2/1/1992	2/29/1992	Drought	Owyhee	ID	0	0	$35,714	$35,714	Drought	$54,622	$54,622
8697601	10/15/1991	10/15/1991	Heat	Owyhee	ID	0	0	$-	$1,852	Heat	$-	$2,918
8697135	8/22/1991	8/23/1991	Lightning	Owyhee	ID	0	0	$143	$1,429	Lightning	$225	$2,251
8697098	8/1/1991	8/31/1991	Drought	Owyhee	ID	0	0	$-	$18,519	Extreme Drought	$-	$29,180
8696858	7/1/1991	7/31/1991	Drought	Owyhee	ID	0	0	$-	$18,519	Drought	$-	$29,180
8694134	3/6/1991	3/6/1991	Winter Weather	Owyhee	ID	0	0	$7,143	$-	Snow	$11,255	$-

Table 20. SHELDUS Hazard Profile; Owyhee County, Idaho & Elko County, Nevada. 1960-2009 (Hazards & Vulnerability Research Institute 2011).

Hazard ID	Begin	End	Hazard Type	County	ST	Injuries	Fatalities	Property Damage	Crop Damage	Remarks	Prop Damage 2010	Crop Damage 2010
8694123	3/4/1991	3/4/1991	Wind	Owyhee	ID	0	0	$1,852	$-	High Wind	$2,918	$-
8694093	3/3/1991	3/3/1991	Wind	Owyhee	ID	0	0	$1,136	$-	High Wind	$1,791	$-
8693122	1/14/1991	1/14/1991	Winter Weather	Owyhee	ID	0	0	$1,852	$-	Light Snow	$2,918	$-
8693098	1/12/1991	1/12/1991	Flooding	Owyhee	ID	0	0	$7,143	$-	Urban Flooding	$11,255	$-
8693091	1/10/1991	1/10/1991	Winter Weather	Owyhee	ID	0.14	0	$7,143	$-	Light Snow	$11,255	$-
8693085	1/7/1991	1/7/1991	Winter Weather	Owyhee	ID	0	0	$12,500	$-	Snow	$19,697	$-
8693080	1/1/1991	1/7/1991	Winter Weather	Owyhee	ID	0	0	$16,129	$-	Extreme Cold	$25,415	$-
8760690	12/18/1990	12/31/1990	Winter Weather	Owyhee	ID	0.68	0.02	$11,364	$113,636	Extreme Cold	$18,759	$187,590
8773106	8/20/1990	8/20/1990	Flooding	Owyhee	ID	0	0	$50,000	$5,000	Flash Flooding	$82,540	$8,254
8772825	8/8/1990	8/8/1990	Lightning	Owyhee	ID	0	0	$2,381	$238	Lightning	$3,930	$393
8757586	1/8/1990	1/8/1990	Wind	Owyhee	ID	0.03	0	$16,129	$-	High Wind	$26,626	$-
8751440	7/15/1989	7/15/1989	Lightning	Owyhee	ID	0	0	$-	$35,714	Lightning	$-	$61,905
8748822	2/6/1989	2/6/1989	Winter Weather	Elko	NV	0	0	$312,500	$-	Extreme Cold	$541,670	$-
8748522	2/4/1989	2/4/1989	Winter Weather	Owyhee	ID	0	0	$125,000	$125,000	UNUSUAL COLD SPELL	$216,668	$216,668
8691826	10/1/1988	10/31/1988	Drought	Owyhee	ID	0	0	$11,364	$11,364	Drought	$20,734	$20,734
8691145	8/1/1988	8/31/1988	Drought	Owyhee	ID	0	0	$-	$11,364	Drought	$-	$20,734
8690035	6/26/1988	6/26/1988	Hail - Wind	Owyhee	ID	0	0	$5,000	$500,000	Wind, Hail	$9,123	$912,276
8850853	6/17/1988	6/17/1988	Lightning	Elko	NV	0	1	$-	$-	Lightning	$-	$-
8687484	12/22/1987	12/22/1987	Winter Weather	Owyhee	ID	0.61	0	$1,136	$-	Heavy Snow	$2,149	$-
8685544	6/14/1987	6/14/1987	Lightning	Owyhee	ID	0	0	$50,000	$-	Lightning	$94,545	$-
8685531	6/14/1987	6/14/1987	Lightning	Owyhee	ID	0	0	$3,846	$385	Lightning	$7,273	$727
8680350	9/7/1986	9/7/1986	Severe Storm/Thunder Storm - Wind	Elko	NV	0	0	$50,000	$-	Thunderstorm Wind	$98,112	$-
8679146	7/4/1986	7/4/1986	Wind	Elko	NV	0	0	$2,941	$-	High Winds	$5,771	$-
8676138	2/17/1986	2/17/1986	Wind	Elko	NV	0	0	$500,000	$-	High Winds	$981,123	$-
8670022	4/15/1985	4/15/1985	Wind	Owyhee	ID	0	0	$12,500	$-	Wind	$25,000	$-
8735688	2/16/1982	2/16/1982	Flooding	Elko	NV	0	0	$50,000	$-	Flooding	$110,639	$-
8655534	3/29/1981	3/29/1981	Wind	Owyhee	ID	0.14	0	$35,714	$-	High Winds	$84,415	$-
128988	8/19/1979	8/19/1979	Tornado	Elko	NV	0	0	$50,000	$-	Tornado	$148,571	$-

Table 20. SHELDUS Hazard Profile; Owyhee County, Idaho & Elko County, Nevada. 1960-2009 (Hazards & Vulnerability Research Institute 2011).

Hazard ID	Begin	End	Hazard Type	County	ST	Injuries	Fatalities	Property Damage	Crop Damage	Remarks	Prop Damage 2010	Crop Damage 2010
9052684	8/14/1979	8/14/1979	Hail - Severe Storm/Thunder Storm	Owyhee	ID	0	0	$-	$500	Hail, Rain	$-	$1,486
9052502	7/22/1979	7/22/1979	Severe Storm/Thunder Storm	Elko	NV	0	0	$5,000	$-	Thunderstorm	$14,857	$-
9051276	5/25/1979	5/25/1979	Severe Storm/Thunder Storm	Elko	NV	0	0	$500	$-	Thunderstorm	$1,486	$-
8705727	2/1/1979	2/13/1979	Winter Weather	Owyhee	ID	0	0	$1,136	$-	Freeze, Snow, and Wind	$3,377	$-
8710593	1/11/1979	1/11/1979	Winter Weather	Elko	NV	0	0	$4,545	$-	warm winter storms	$13,506	$-
8705728	1/1/1979	1/31/1979	Winter Weather	Owyhee	ID	0	0	$11,364	$-	Extreme Cold	$33,766	$-
9043369	12/26/1978	12/31/1978	Wind - Winter Weather	Owyhee	ID	0	0	$111	$-	snow, wind, extreme cold	$361	$-
8652310	7/28/1978	7/28/1978	Hail	Owyhee	ID	0	0	$50	$50,000	Hail	$163	$162,501
9047807	7/28/1978	7/28/1978	Severe Storm/Thunder Storm	Elko	NV	0	0	$5,000	$-	Thunderstorm	$16,250	$-
9047809	7/28/1978	7/28/1978	Severe Storm/Thunder Storm	Elko	NV	0	0	$500	$-	Thunderstorm	$1,625	$-
9044572	4/16/1978	4/16/1978	Wind	Elko	NV	0	0	$5,000	$-	High Wind	$16,250	$-
9037530	11/18/1977	11/18/1977	Wind	Elko	NV	0	0	$-	$5,000	High Wind	$-	$17,931
8645314	8/20/1977	8/20/1977	Severe Storm/Thunder Storm	Elko	NV	0	0	$50,000	$-	Thunderstorm	$179,308	$-
8645359	7/3/1977	7/3/1977	Hail - Severe Storm/Thunder Storm	Owyhee	ID	0	0	$500	$50,000	Hail, Rain	$1,793	$179,308
9043531	7/3/1977	7/3/1977	Hail - Severe Storm/Thunder Storm	Owyhee	ID	0	0	$500	$5,000	Hail and rain	$1,793	$17,931
8643468	6/13/1977	6/13/1977	Hail	Owyhee	ID	0	0	$-	$25,000	Hail	$-	$89,654
9043581	6/11/1977	6/11/1977	Flooding - Hail	Owyhee	ID	0	0	$5,000	$-	Flash Flooding and Hail	$17,931	$-
9043832	6/11/1977	6/11/1977	Tornado	Elko	NV	0	0	$5,000	$-	Tornado	$17,931	$-
9043831	6/10/1977	6/10/1977	Severe Storm/Thunder Storm	Elko	NV	0	0	$5,000	$-	Heavy rain	$17,931	$-
8641268	3/27/1977	3/27/1977	Wind	Owyhee	ID	0	0	$1,852	$-	Wind	$6,641	$-
8641912	3/27/1977	3/27/1977	Wind	Elko	NV	5	0	$16,667	$16,667	Wind	$59,769	$59,769
9020867	8/2/1976	8/2/1976	Flooding	Owyhee	ID	0	0	$500	$-	Flash Flooding	$1,926	$-
8636579	6/26/1976	6/26/1976	Winter Weather	Owyhee	ID	0	0	$-	$18,519	Frost	$-	$71,329
9015609	5/13/1976	5/13/1976	Wind	Owyhee	ID	0	0	$5,000	$-	Funnel Cloud	$19,259	$-
8634945	3/22/1976	3/22/1976	Wind	Owyhee	ID	0	0	$10,000	$-	Windstorm	$38,518	$-
8634316	2/16/1976	2/17/1976	Wind - Winter Weather	Owyhee	ID	0	0	$1,136	$-	Snow and Wind	$4,377	$-
9013636	12/6/1975	12/26/1975	Fog - Winter Weather	Owyhee	ID	0	0	$50	$-	Fog, ice	$200	$-
9012776	11/30/1975	11/30/1975	Winter Weather	Owyhee	ID	0	0	$114	$-	Snowstorm	$455	$-

Table 20. SHELDUS Hazard Profile; Owyhee County, Idaho & Elko County, Nevada. 1960-2009 (Hazards & Vulnerability Research Institute 2011).

Hazard ID	Begin	End	Hazard Type	County	ST	Injuries	Fatalities	Property Damage	Crop Damage	Remarks	Prop Damage 2010	Crop Damage 2010
9012732	11/26/1975	11/27/1975	Winter Weather	Owyhee	ID	0	0	$11	$-	Snowstorm	$45	$-
8729247	11/10/1975	11/10/1975	Wind - Winter Weather	Owyhee	ID	0	0	$1,136	$-	Wind, SNOW	$4,545	$-
9012579	10/26/1975	10/26/1975	Wind	Elko	NV	0	0	$-	$500	Wind storm	$-	$2,000
9012489	10/25/1975	10/25/1975	Winter Weather	Owyhee	ID	0	0	$5	$-	Snow	$20	$-
9011147	8/13/1975	8/13/1975	Lightning - Wind	Owyhee	ID	0	0	$500	$-	Lightning, wind	$2,000	$-
8727179	7/29/1975	7/29/1975	Lightning - Severe Storm/Thunder Storm - Wind	Owyhee	ID	0	0	$1,852	$1,852	Wind, Lightning, rain	$7,407	$7,407
9010126	7/14/1975	7/14/1975	Hail - Lightning - Severe Storm/Thunder Storm - Wind	Owyhee	ID	0	0	$11	$114	hail, wind, rain, lightning	$45	$455
9010085	7/12/1975	7/12/1975	Hail - Lightning - Severe Storm/Thunder Storm - Wind	Owyhee	ID	0.1	0	$500	$50	wind, rain, hail, and lightning	$2,000	$200
8727310	7/12/1975	7/12/1975	Flooding	Elko	NV	0	0	$50,000	$-	FLASH FLOOD	$200,000	$-
9010073	7/6/1975	7/6/1975	Lightning - Wind	Owyhee	ID	0.07	0	$357	$-	Lightning, wind	$1,429	$-
9009895	7/5/1975	7/5/1975	Lightning	Owyhee	ID	0	0	$500	$-	lightning	$2,000	$-
9011628	6/23/1975	6/23/1975	Hail - Lightning - Severe Storm/Thunder Storm - Wind	Owyhee	ID	0	0	$111	$11	Electrical storm, wind, rain, hail	$444	$44
8726007	6/2/1975	6/2/1975	Hail - Lightning - Severe Storm/Thunder Storm - Wind	Owyhee	ID	0	0	$3,571	$4	Electrical storm, wind, rain, hail	$14,286	$14
9015511	6/2/1975	6/2/1975	Hail - Lightning - Severe Storm/Thunder Storm - Wind	Owyhee	ID	0	0	$111	$11	Electrical storm, wind, rain, hail	$444	$44
8989226	5/25/1975	5/25/1975	Winter Weather	Owyhee	ID	0	0	$-	$185	Frost	$-	$741
8989199	5/24/1975	5/24/1975	Wind	Owyhee	ID	0	0	$185	$-	Wind, dust	$741	$-
9008417	3/25/1975	3/27/1975	Wind - Winter Weather	Owyhee	ID	0	0	$200	$20	Wind, heavy snow	$800	$80
8841898	2/9/1975	2/13/1975	Winter Weather	Owyhee	ID	0	0	$114	$-	heavy snow	$455	$-
8975358	2/4/1975	2/6/1975	Wind - Winter Weather	Owyhee	ID	0	0	$111	$-	wind, heavy snow	$444	$-
8726637	1/7/1975	1/10/1975	Severe Storm/Thunder Storm - Winter Weather	Owyhee	ID	0	0.02	$1,136	$-	Heavy Rain, Snow	$4,545	$-
9005794	3/30/1974	3/30/1974	Wind	Owyhee	ID	1	0	$-	$-	Wind	$-	$-
8992862	11/1/1973	11/30/1973	Severe Storm/Thunder Storm - Wind - Winter Weather	Owyhee	ID	0.02	0	$111	$-	Snow, Rain, Wind	$550	$-
8624396	8/15/1973	8/15/1973	Severe Storm/Thunder Storm	Elko	NV	0	0	$29,412	$-	THUNDERSTORMS	$145,661	$-
8987222	8/13/1973	8/25/1973	Lightning - Wind	Owyhee	ID	0	0	$-	$111	Dry Lightning, Wind	$-	$550
8972422	6/22/1973	6/23/1973	Lightning - Wind	Owyhee	ID	0	0	$161	$-	Wind, lightning	$799	$-
9000596	12/6/1972	12/8/1972	Winter Weather	Owyhee	ID	0	0	$111	$-	Freeze	$578	$-
9000552	12/2/1972	12/3/1972	Winter Weather	Owyhee	ID	0	0	$16	$-	Snow	$81	$-
8998457	8/9/1972	8/9/1972	Lightning - Wind	Owyhee	ID	0	0	$167	$-	Wind, lightning	$867	$-

Table 20. SHELDUS Hazard Profile; Owyhee County, Idaho & Elko County, Nevada. 1960-2009 (Hazards & Vulnerability Research Institute 2011).

Hazard ID	Begin	End	Hazard Type	County	ST	Injuries	Fatalities	Property Damage	Crop Damage	Remarks	Prop Damage 2010	Crop Damage 2010
8995574	6/9/1972	6/9/1972	Wind	Owyhee	ID	0	0	$500	$50	Wind	$2,600	$260
8611214	4/17/1972	4/17/1972	Winter Weather	Owyhee	ID	0	0	$-	$3,125	FREEZE	$-	$16,250
8966102	3/25/1972	3/31/1972	Winter Weather	Owyhee	ID	0	0	$-	$50,000	Freeze	$-	$259,997
8965022	2/22/1972	2/22/1972	Wind	Owyhee	ID	0	0	$500	$-	Wind	$2,600	$-
8611213	1/9/1972	1/12/1972	Wind - Winter Weather	Owyhee	ID	0.07	0	$113,636	$-	WIND AND SNOW	$590,902	$-
8966568	12/13/1971	12/13/1971	Winter Weather	Owyhee	ID	0	0	$50	$-	Snow	$260	$-
8966563	12/8/1971	12/9/1971	Wind - Winter Weather	Owyhee	ID	0	0	$17	$-	Wind and Snow	$90	$-
8966045	12/5/1971	12/6/1971	Wind - Winter Weather	Owyhee	ID	0.4	0	$167	$-	Wind and snow	$867	$-
9015411	11/29/1971	11/29/1971	Winter Weather	Owyhee	ID	0.43	0	$-	$-	Snow	$-	$-
8966575	10/29/1971	10/29/1971	Winter Weather	Owyhee	ID	0.3	0	$-	$-	Snow	$-	$-
8964614	10/27/1971	10/27/1971	Winter Weather	Owyhee	ID	0.07	0	$18	$-	Snow	$93	$-
8964574	10/2/1971	10/2/1971	Lightning	Owyhee	ID	0	0	$500	$-	Lightning	$2,600	$-
8963098	8/7/1971	8/7/1971	Flooding	Owyhee	ID	0	0	$5,000	$-	Flash Flood	$26,000	$-
9002759	12/2/1970	12/2/1970	Winter Weather	Elko	NV	0.63	0	$-	$-	Snowstorm	$-	$-
8994899	11/30/1970	11/30/1970	Wind	Owyhee	ID	0	0	$200	$-	Strong winds	$1,095	$-
8964220	8/30/1970	8/30/1970	Severe Storm/Thunder Storm	Owyhee	ID	0	0	$417	$42	Thunderstorm	$2,281	$228
8592992	8/27/1970	8/27/1970	Flooding	Elko	NV	0	0	$50,000	$-	FLOOD	$273,688	$-
8589907	8/1/1970	8/1/1970	Lightning	Owyhee	ID	0	0	$10,000	$-	LIGHTNING	$54,738	$-
8589906	6/26/1970	6/27/1970	Hail - Wind	Owyhee	ID	0.34	0.21	$17,241	$1,724	SEVERE WIND AND HAIL	$94,375	$9,438
8993356	6/21/1970	6/21/1970	Severe Storm/Thunder Storm - Wind	Owyhee	ID	0	0	$250	$25	Thunderstorm, wind	$1,368	$137
8955825	5/17/1970	5/17/1970	Lightning - Severe Storm/Thunder Storm	Owyhee	ID	1	0	$500	$500	Thunderstorm, electrical, rain	$2,737	$2,737
8955819	5/4/1970	5/4/1970	Wind	Owyhee	ID	0	0	$200	$2	wind	$1,095	$11
8950389	4/13/1970	4/14/1970	Severe Storm/Thunder Storm - Wind - Winter Weather	Owyhee	ID	0	0	$192	$-	Wind, rain and snow	$1,053	$-
8950306	4/13/1970	4/14/1970	Severe Storm/Thunder Storm - Wind - Winter Weather	Owyhee	ID	0	0	$185	$-	Wind, rain and snow	$1,014	$-
8949737	3/24/1970	3/24/1970	Wind	Owyhee	ID	0	0	$263	$-	Wind	$1,440	$-
8921966	3/22/1969	3/23/1969	Wind	Owyhee	ID	0	0	$111	$-	Wind	$642	$-
8581818	1/26/1969	1/26/1969	Winter Weather	Owyhee	ID	0	0	$11,628	$-	SNOW STORM	$67,182	$-
8581817	1/6/1969	1/7/1969	Winter Weather	Owyhee	ID	0	0	$11,628	$-	SNOW STORM	$67,182	$-

Table 20. SHELDUS Hazard Profile; Owyhee County, Idaho & Elko County, Nevada. 1960-2009 (Hazards & Vulnerability Research Institute 2011).

Hazard ID	Begin	End	Hazard Type	County	ST	Injuries	Fatalities	Property Damage	Crop Damage	Remarks	Prop Damage 2010	Crop Damage 2010
8576243	8/11/1968	8/11/1968	Flooding - Severe Storm/Thunder Storm	Elko	NV	2	0	$500,000	$-	Heavy rain and flooding	$3,058,852	$-
8572668	8/10/1968	8/23/1968	Severe Storm/Thunder Storm	Owyhee	ID	0	0	$-	$11,364	Rain	$-	$69,519
8572667	7/19/1968	7/20/1968	Wind	Owyhee	ID	0	0	$1,136	$114	Wind	$6,952	$695
8909440	12/4/1966	12/5/1966	Wind	Owyhee	ID	0	0	$172	$-	Wind	$1,121	$-
8907002	8/25/1966	8/26/1966	Wind	Owyhee	ID	0	0	$111	$111	Wind	$722	$722
8893003	11/23/1965	11/24/1965	Winter Weather	Elko	NV	0	0	$5,000	$500	Heavy wet snow	$34,667	$3,467
8886221	8/22/1965	8/22/1965	Hail - Severe Storm/Thunder Storm - Wind	Owyhee	ID	0	0	$-	$167	Hail, wind, and rain	$-	$1,156
8886924	8/18/1965	8/18/1965	Flooding - Severe Storm/Thunder Storm	Elko	NV	0	0	$5,000	$500	heavy rain and flooding	$34,667	$3,467
8886922	8/14/1965	8/14/1965	Flooding - Severe Storm/Thunder Storm	Elko	NV	0	0	$5,000	$500	Heavy thunderstorms and flash floods	$34,667	$3,467
8885122	8/2/1965	8/2/1965	Hail - Severe Storm/Thunder Storm - Wind	Owyhee	ID	0	0	$111	$111	Hail, wind and rain	$770	$770
8883927	7/31/1965	7/31/1965	Flooding - Severe Storm/Thunder Storm	Elko	NV	0	0	$250	$2,500	Heavy rain and flash floods	$1,733	$17,333
8882449	7/26/1965	7/26/1965	Lightning - Wind	Owyhee	ID	0	0	$111	$-	Wind, lightning	$770	$-
8554983	7/8/1965	7/8/1965	Hail - Severe Storm/Thunder Storm	Owyhee	ID	0	0	$-	$1,136	HAIL, RAIN	$-	$7,879
8547697	12/22/1964	12/23/1964	Wind	Elko	NV	4.5	0	$25,000	$-	WIND STORM	$173,334	$-
8990772	12/20/1964	12/24/1964	Severe Storm/Thunder Storm - Wind - Winter Weather	Owyhee	ID	0	0	$111,111	$-	Snow, rain, and wind	$770,374	$-
8990090	7/29/1964	7/29/1964	Wind	Owyhee	ID	0.17	0	$-	$-	Wind	$-	$-
8988952	3/11/1964	3/13/1964	Wind - Winter Weather	Owyhee	ID	0.16	0	$-	$-	Snow and wind	$-	$-
8988872	1/1/1964	1/31/1964	Wind - Winter Weather	Owyhee	ID	0.22	0	$111	$-	Snow, wind	$770	$-
8990051	12/1/1963	12/31/1963	Fog - Winter Weather	Owyhee	ID	0.27	0	$111	$-	Snow, ice and fog	$770	$-
8901429	11/6/1963	11/6/1963	Wind - Winter Weather	Owyhee	ID	0	0	$172	$-	Wind, snow	$1,195	$-
8901098	10/11/1963	10/12/1963	Winter Weather	Elko	NV	0	0	$1,667	$-	Heavy snow	$11,556	$-
8899997	8/9/1963	8/9/1963	Severe Storm/Thunder Storm	Owyhee	ID	0	0	$172	$-	Thunderstorms	$1,195	$-
8895535	4/14/1963	4/14/1963	Wind	Owyhee	ID	0.04	0	$111	$-	Wind	$770	$-
8894970	2/1/1963	2/1/1963	Wind	Owyhee	ID	0	0	$172	$-	Wind	$1,195	$-
8982179	1/1/1963	1/31/1963	Winter Weather	Owyhee	ID	0.44	0	$-	$-	Snow and Ice	$-	$-
8863010	12/16/1962	12/21/1962	Fog - Winter Weather	Owyhee	ID	0.16	0	$-	$-	Fog, rime ice	$-	$-
8527216	4/19/1962	4/20/1962	Wind	Owyhee	ID	0.39	0	$114	$114	WIND AND DUST	$788	$788
8890944	4/6/1962	4/7/1962	Wind	Owyhee	ID	0	0	$111	$-	Wind	$770	$-

Table 20. SHELDUS Hazard Profile; Owyhee County, Idaho & Elko County, Nevada. 1960-2009 (Hazards & Vulnerability Research Institute 2011).

Hazard ID	Begin	End	Hazard Type	County	ST	Injuries	Fatalities	Property Damage	Crop Damage	Remarks	Prop Damage 2010	Crop Damage 2010
8888995	1/19/1962	1/21/1962	Winter Weather	Owyhee	ID	0.03	0	$-	$-	Heavy Snow	$-	$-
8519266	11/16/1961	11/16/1961	Winter Weather	Owyhee	ID	0	0	$-	$277,778	DEEP SOIL FREEZE	$-	$2,063,421
8973152	5/31/1961	5/31/1961	Hail	Elko	NV	0	0	$50	$-	Hail	$371	$-
8882757	4/12/1961	4/13/1961	Wind	Owyhee	ID	0.07	0	$114	$-	Wind	$844	$-
8513993	9/3/1960	9/4/1960	Lightning - Wind	Owyhee	ID	0.05	0	$1,136	$-	WINDSTORM AND LIGHTNING	$8,441	$-
8879324	8/21/1960	8/21/1960	Wind	Owyhee	ID	0	0	$172	$-	Wind	$1,281	$-
8877916	7/30/1960	7/30/1960	Severe Storm/Thunder Storm - Wind	Owyhee	ID	0	0	$2,500	$-	Wind and Rain	$18,571	$-
8516226	7/30/1960	7/30/1960	Severe Storm/Thunder Storm - Wind	Elko	NV	0	0	$29	$29	WIND, RAIN	$218	$218
8518059	5/19/1960	5/22/1960	Winter Weather	Owyhee	ID	0	0	$-	$100,000	KILLING FREEZE	$-	$742,832

Using the summaries, presented in Table 20, several observations concerning the frequency and financial magnitude of natural hazards within and surrounding the Duck Valley Indian Reservation can be made. Summaries for wildland fire are not well represented in the SHELDUS database, however, these events are summarized by the National Interagency Fire Center based in Boise, Idaho (NIFC 2011). In terms of frequency of large-scale disaster events, **wildland fire** leading to disaster events occurs with the highest frequency in the region. The factors of wildfire ignitions (natural and man caused) and the impact of acres burned will be addressed in Section 4.5). This hazard, like many, is influenced by multiple factors leading to disaster events, including the combination of drought, extreme heat, lightning, wind storms, tornadoes, and the presence of people and infrastructure within the Wildland-Urban Interface (WUI). These factors will be discussed in more detail within the sections of this document concerning each hazard.

4.2. The Northern Basin and Range Characteristics

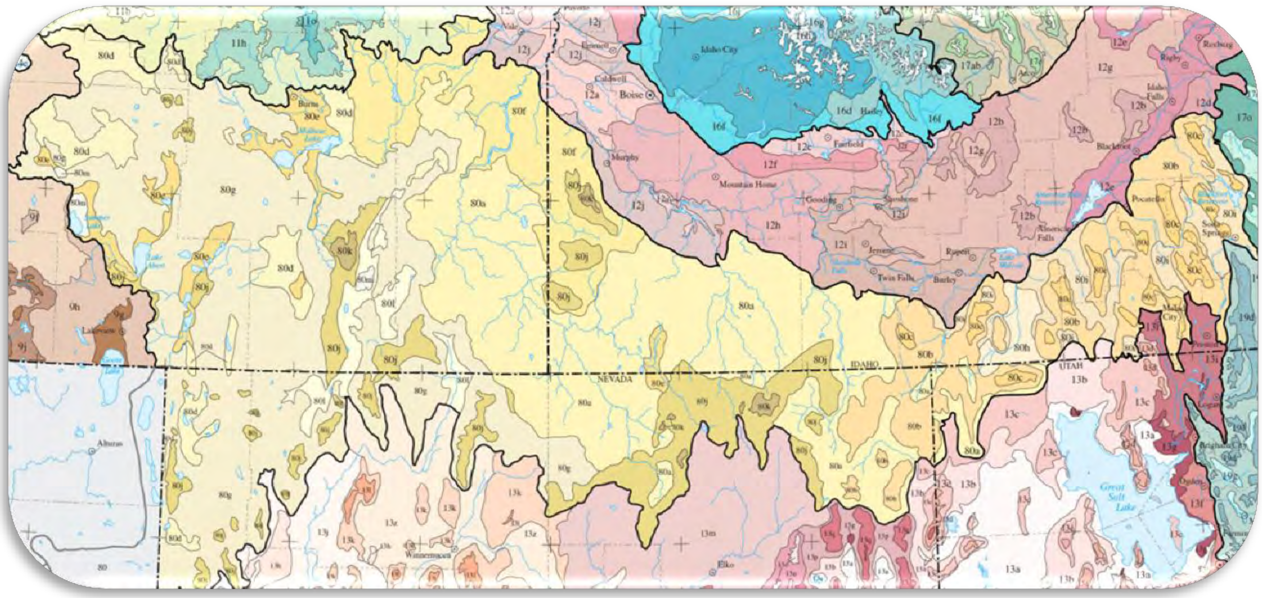
The Northern Basin and Range ecoregion is a Level III ecoregion designated by the United States Environmental Protection Agency (EPA) in the U.S. states of Oregon, Idaho, Nevada, Utah, and California (Region #80 in Figure 30). It contains dissected lava plains, rolling hills, alluvial fans, valleys, and scattered mountain ranges in the northern part of the Great Basin. Although arid, the ecoregion is higher and cooler than the Snake River Plain to the north (#12 in Figure 30) and has more available moisture and a cooler climate than the Central Basin and Range to the south (#13 in Figure 30). Its southern boundary is determined by the highest shoreline of Pleistocene Lake Bonneville, which once inundated the Central Basin and Range (Thorson, Bryce and Lammers 2011).

4.2.1. High Desert Wetlands (80e)

The nearly level Northern Basin and Range, High Desert Wetlands ecoregion consists of high desert lakes and surrounding wetlands that provide critical habitat for nesting and migratory birds and associated upland birds and mammals. Elevation varies from 4,000 to 5,200 feet. The fine-textured soils are poorly drained, and basins collect water seasonally. Although water levels fluctuate from year to year, lakes and wetlands in this region hold water more consistently than on the coarser, better drained soils of the Pluvial Lake Basins. Sedges, rushes, black greasewood, tufted hairgrass, mat muhly, meadow barley, creeping wildrye, and Nevada bluegrass occur in wetter areas. Drier areas support basin big sagebrush, Wyoming big sagebrush, silver sagebrush, bluebunch wheatgrass, basin wildrye, Idaho fescue, Thurber's needlegrass, and cheatgrass. The region covers 1,651 square miles in Oregon, including the Malheur National Wildlife Refuge and land surrounding Malheur Lake, Paulina Marsh, Summer Lake, Lake Abert, and the Warner Lakes. It also includes 105 square miles in Idaho and 56 square miles in Nevada, on and around the Duck Valley Indian Reservation (Thorson, Bryce and Lammers 2011).

The valleys support sagebrush steppe or saltbush vegetation. Mollisol soils are common, in contrast to the aridisols of the Central Basin. Juniper-dominated woodland occurs on rugged, stony uplands. The mountain ranges are covered in mountain sagebrush, Idaho fescue, Douglas-fir, subalpine forests, or aspen. Today, most of the region is used for livestock grazing. Dryland and irrigated cropland are found in some areas, but in general the soils are less suitable for agriculture than those in the Columbia Plateau and the Snake River Plain ecoregions. Most public lands in the region are managed by the Bureau of Land Management (Thorson, Bryce and Lammers 2011).

Figure 30. Level IV ecoregions in the Northern Basin and Range ecoregion (EPA 2008).



4.2.2. Dissected High Lava Plateau (80a)

Dissected High Lava Plateau ecoregion is a broad to gently rolling basalt plateau cut by deep, sheer-walled canyons, with perennial and intermittent streams draining to the Snake River. Elevation varies from 4,000 to 7,300 feet. The region is less wooded, lower, and more arid than neighboring subregions in the Northern Basin and Range. It differs from sagebrush-dominated regions in the Central Basin and Range in having higher precipitation and colder winters. Potential natural vegetation is mostly sagebrush steppe; Wyoming big sagebrush and black sagebrush are abundant, as well as Douglas rabbitbrush, Idaho fescue, bluebunch wheatgrass, western wheatgrass, Thurber's needlegrass, bottlebrush squirreltail, Great Basin wildrye, Sandberg's bluegrass, Indian ricegrass, and cheatgrass. Juniper-pinyon woodlands grow on rocky and gravelly uplands. Understory species are denser and biological soil crusts tend to be more extensive and in better condition than at similar elevations in the Central Basin and Range (Thorson, Bryce and Lammers 2011).

Cheatgrass has replaced depleted bunchgrasses in overgrazed areas and in response to prolonged drought conditions. One of the largest Northern Basin and Range subregions, the Dissected High Lava Plateau covers 5,364 square miles in Idaho, 3,984 square miles in Oregon, 3,537 square miles in Nevada, and 412 square miles in Utah, including much of the Owyhee Desert. It is primarily used for rangeland and wildlife habitat. Much of the peripheral areas of the Duck Valley Indian Reservation, and adjacent areas are defined as Dissected High Lava Plateau.

4.2.3. Great Basin

The Great Basin encompasses the area between the Wasatch Range, Utah, and the Sierra Nevada range, California, and covers the western half of Utah and almost all of Nevada from about 65 miles north of Las Vegas northward (Figure 31) (Wagner and Baron 1999). Located north of this Great Basin is the Northern Basin and Range, High Desert Wetlands ecoregion.

The Great Basin is the largest area of contiguous endorheic watersheds (closed drainage basin that retains water and allows no outflow to other bodies of water such as rivers or oceans – water loss is completely from evaporation and sub-surface flow) in North America and is noted for its arid conditions and Basin and Range topography that varies from the North American low point at Badwater Basin (282 ft. below sea level) to the highest point of the contiguous United States, Mount Whitney (14,505 feet) less than 100 miles apart. The region spans several physical geography (physiographic) divisions, biomes/ecoregions, and deserts, and, is the ancestral homeland of the Great Basin tribes.

The Great Basin includes the topography that southwestern initiated weather systems pass over on their path to the Duck Valley Indian Reservation.

Figure 31. Map showing the Great Basin drainage basin as defined hydrologically (Kmusser 2010).

4.2.4. Legends

Many of the sub-sections to this chapter begin by sharing native folklore tales to explain the natural disasters observed over the centuries of oral tradition. These legends are not intended to explain what we today understand to be weather pattern changes or seismic stability. These legends demonstrate that the native cultures of the Northern Basin and Range and Great Basin have dealt with the negative effects of natural disasters for the extent of human history within this continent. Historical responses to natural disasters are as important to dealing with them today as they were in the past.

Windstorms and flood references are common in Native oral traditions within the Northern Basin and Range and Great Basin. Some of these stories are literal, and clearly refer to recent historical happenings. Other stories, such as those that refer to earthquake effects, are often expressed metaphorically.

4.2.4.1. Brother Turtle The Rock Animal

An American Indian Legend - Nation Unknown, believed to be Great Basin in Origin

> *Long ago giants ruled the land and sea. They feared no element or spirit. They felt nothing could hurt or destroy them. Then one day the giants claimed to be more powerful, beautiful, and sacred than all the elements.*
>
> *This made the elements of Sky, Water, Land, and all their relatives very mad. So brother Cloud covered the land and sea for a long time shooing the sun away.*
>
> *Many of the giants died, but a few lived through the dark days. When Sun returned and learned what the giants had done, he became very upset. Instead of warming the lands and seas of Mother Earth, he started to bake all things. His heat shrank and changed the color and the nature of all living things on Earth. His fierce heat even turn some of the giants into pools of a black liquid.*
>
> *Two elements, Rocks and Sand, did not agree with the Sun's actions. They covered the animals of the sea and land. Many animals did not trust Rocks and left their safe covering. One animal, Turtle, became angry at Sun's behavior and of having to hide all the time. He stuck out his head, arms, and legs and tail to confront Sun.*
>
> *One Rock decided to help Turtle. He covered what he could of Turtle to protect him from Sun's heat. Turtle asked Sun, "Why don't you stop your action before you destroyed all the creatures of Mother Earth?" Hearing this made Sun even madder. He made the land ever hotter and started to boil all the water. Turtle hid behind Rock, but his face, hands, and legs were scalded by Sun's heat. "See how brave Turtle was," said Brother Rock. Another Rock told turtle to turn around. Then he jumped onto turtle's back, just as Sun came as close as he could to Turtle. Turtle pulled in his exposed parts as he heard Rock crack and split, time and time again. The sound made the other animals begin to cry out for help from Mother Earth.*
>
> *Seeing her creatures being destroyed, Mother Earth called upon all her energy to save them. She moved ice over them to cool them. This made Sun beat down on her even harder.*
>
> *Turtle refused to give up. He stood up to the Sun, protected by the two rocks. The battle between Sun and Earth went on for a long time. The rest of the creatures ran and hid where they could, but the heat burnt their skin and on some, fried off their legs. When Mother Earth covered the land with ice and Sun melted it, they learned how to hold their breath to live underwater. All the creatures felt sorry for their hero Turtle, but none went to join him.*
>
> *The noise woke up the Great Spirit. Sun's anger and foolish acts saddened him. With one thought the Great Spirit flung Sun across space, far away from mother Earth and her creatures. Sun begged the Great Spirit not to hurt him. He told him that he was sorry for what he had done.*

Suddenly Sun stopped flying in space. He heard the Great Spirit speak. "From this day on, Sun may not move as he wants. He will only be allowed to have Mother Earth circle around him at a safe distance. She may come as close as she feels it is necessary to keep her elements and creatures alive.

The Great Spirit looked down at Mother Earth and said, "Sun is sorry, and your animals will live as they learned, fearing neither water or land. Both shall be their home."

Then a voice yelled out, "What about me?" "Who speaks", said the Great Spirit. "It is I, Turtle. I have a rock melted to my back and cannot move." "I release you, but Rock will remain with you forever. As a rock animal you will remind all the creatures of this day and how you saved the Earth. Although you have a rock stuck to your back and you can only move slowly, I grant you long life. The rest of the creatures will live fast and short lives, but you will live long and grow wise".

Turtle, burnt and scaled from the battle, was teased and laughed at by the other animals. They quickly forgot what he had done for them. Yet, turtle never got angry at them. He merely reminded them of how great it was to be alive. After many, many years, most of the animals who lived through the battle between Sun and Earth died. Yet Turtle lived on.

Some say Turtle live forever. His children say he carries Mother Earth on his back through space as a reward for his courage and kindness. Even today the turtle lives a long and slow paced life. His shell shows us the hurt that hate causes. The weight of it shows how deep and heavy war scars those that live through it. It reminds us how long it takes to rebuild, forgive, forget and learn to love again.

Do you stand tall against all? Or do you forget the lessons learned and run fast and make fun of those who take their time to complete a task with kindness and care?

You may do as you wish, but the turtle people will outlive you.

4.3. Global Climate Change

This section begins with a cursory review of historical changes to the climate, and recent impacts from those changes, then transitions into a look of the future potential impacts.

About 10,000 to 12,000 years ago, vast continental glaciers were in retreat (Figure 32), leaving behind rounded valley walls and marshy meadows. There were no dense forests or expansive meadows during the glaciation – all surface vegetation was scraped off by the advancing glaciers. At the terminal edges of the glaciers, and throughout the glacial retreat, elk, bison, wolves and mammoths roamed the newly exposed land, and humans roamed with them (Schirber 2011). Most speculations about the glacial retreat beginning about 12,000 years ago designate this period as the time when humans began to permanently populate this region.

Figure 32. North American glaciers just over 12,000 years ago. During the Pleistocene, repeated glaciations occurred (Blakey 2011).

4.3.1. Glacial Phenomena in Nevada

John Muir (1838-1914), the founder of The Sierra Club, was a Scottish-born American naturalist who travelled extensively throughout North and South America. On one of his well-known journeys, he studied the Great Basin and recorded his 'glacial observations' in ON THE EDGE (Miller 1952).

By John Muir

> The monuments of the Ice Age in the Great Basin have been greatly obscured and broken, many of the more ancient of them having perished altogether, leaving scarce a mark, however faint, of their existence -- a condition of things due not alone to the long-continued action of post-glacial agents, but also in great part to the perishable character of the rocks of which they were made. The bottoms of the main valleys, once grooved and polished like the glacier pavements of the Sierra, lie buried beneath sediments and detritus derived from the adjacent mountains, and now form the arid sage plains; characteristic U-shaped canyons have become V-shaped by the deepening of their bottoms and straightening of their sides, and decaying glacier headlands have been undermined and thrown down in loose taluses, while most of the moraines and striae and scratches have been blurred or weathered away. Nevertheless, enough remains of the more recent and the more enduring phenomena to cast a good light well back upon the conditions of the ancient ice sheet that covered this interesting region, and upon the system of distinct glaciers that loaded the tops of the mountains and filled the canyons long after the ice sheet had been broken up.

First, at the beginning of the glacial period the region now known as the Great Basin was an elevated tableland, not furrowed as at present with mountains and valleys, but comparatively bald and featureless.

Second, this tableland, bounded on the east and west by lofty mountain ranges, but comparatively open on the north and south, was loaded with ice, which was discharged to the ocean northward and southward, and in its flow brought most, if not all, the present interior ranges and valleys into relief by erosion.

Third, as the glacial winter drew near its close the ice vanished from the lower portions of the basin, which then became lakes, into which separate glaciers descended from the mountains. Then these mountain glaciers vanished in turn, after sculpturing the ranges into their present condition.

Fourth, the few immense lakes extending over the lowlands, in the midst of which many of the interior ranges stood as islands, became shallow as the ice vanished from the mountains, and separated into many distinct lakes, whose waters no longer reached the ocean. Most of these have disappeared by the filling of their basins with detritus from the mountains, and now form sage plains and "alkali flats."

The transition from one to the other of these various conditions was gradual and orderly: first, a nearly simple tableland; then a grand mer de glace shedding its crawling silver currents to the sea, and becoming gradually more wrinkled as unequal erosion roughened its bed, and brought the highest peaks and ridges above the surface; then a land of lakes, an almost continuous sheet of water stretching from the Sierra to the Wahsatch, adorned with innumerable island mountains; then a slow desiccation and decay to present conditions of sage and sand.

4.3.2. Global Warming or Climate Change?

The media often uses the term global warming when talking about changes to the global climate. The phrase ‘climate change’, however, actually encompasses the more intricate set of changes that scientists are projecting. For example, the world is not expected to warm uniformly and some areas actually could become cooler as other parts of the Earth warm. Although more rain and snowfall are expected as the globe warms, some areas will become drier at the same time that other areas become wetter. The phrase climate change is, therefore, a more accurate way to describe projected changes to the global environment.

4.3.3. Historical Climate Trends

The concentrations of greenhouse gases in the atmosphere have been increasing since the beginning of the Industrial Revolution in the mid-1800s, so it is reasonable to ask whether the predicted climate effects of that increase have begun to appear during the last 150 years. Over much of the US, dependable weather records do not go back much before the turn of the 20th century. There are enough data, however, for scientists to conduct analyses of climate trends over the past 100 years.

In the Northern Basin and Range ecoregion and Great Basin region, average annual temperatures have risen about 1°F during the 20th century in the northwestern two-thirds of the region, but have not increased significantly in the southeastern third (i.e. Colorado and New Mexico). The lowest nighttime temperatures have increased more than the highest daytime temperatures, consistent with projections by climate models. Average yearly precipitation has increased from about 5 to 20% during the 20th century, again mostly in the northwestern two-thirds of the region. There has been no significant increase in precipitation in the southeastern one-third of the region (Wagner and Baron 1999). These changes are in the general direction of those projected by the computer models.

4.3.3.1. El Niño Southern Oscillation (ENSO)

El Niño events occur when the trade winds that normally blow from east to west over the tropical Pacific Ocean diminish and the waters of the central and eastern tropical Pacific become warmer than normal (Redmond 1999). The ENSO cycle, with the peak event normally about one-year in length, is a continuously changing pattern of ocean-atmosphere behavior. It often causes rainfall patterns and amounts to change in various locations around the globe.

For example, El Niño winters tend to be drier than normal (including reduced snowpack) in the Pacific Northwest and wetter than normal north of the Pacific Northwest and across the southwestern US including the southern portion of the Northern Basin and Range ecoregion and Great Basin region. In contrast, the La Niña phase of ENSO tends to bring winters that are cooler and wetter than normal in the Pacific Northwest and the northern two thirds of the Northern Basin and Range ecoregion and Great Basin region. Historically ENSO events have occurred approximately every 2-7 years (Redmond 1999).

4.3.3.2. Pacific Decadal Oscillation (PDO)

The Pacific Decadal Oscillation (PDO) is a recently identified pattern of longer-term variability, described by changes in Pacific sea-surface temperature north of the equator (20 degrees latitude). Like the warm El Niño phase of ENSO, the warm or positive phase of PDO warms the Pacific near the equator and cools it at northern mid-latitudes. But unlike ENSO, PDO's effects are stronger in the central and northern Pacific than near the equator, and its irregular period is several decades, tending to stay in one phase or the other for 20 to 30 years at a time (Redmond 1999).

For example, the PDO was in its cool, or negative phase from the first sea-surface temperature records in 1900 (and possibly before) until 1925, then in warm or positive phase until 1945, cool phase again until 1977, and then a warm phase. The warm phase of PDO, like El Niño, brings warmer winter temperatures over western North America and warmer ocean temperatures along the coast. Because the storm track splits and carries the storms to the north and south of the Pacific Northwest, the winters tend to be drier than normal (including less snowpack) and wetter than normal north of the Pacific Northwest and across the southwestern US including the southern portion of the Northern Basin and Range ecoregion and Great Basin region.

In contrast, years during the cool phase of PDO are like the cool La Niña phase of ENSO, tending to bring winters that are cooler and wetter than normal in the Pacific Northwest and the Northern Basin and Range ecoregion. Because the PDO and the ENSO phenomena are on different time scales, they are sometimes in complimentary phases making the impacts greater and sometimes they are in opposite phases so that the effect on temperature and precipitation is cancelled out (Klopatek 1999).

4.3.4. Possible Future Climates

Because the atmospheric concentrations of greenhouse gases are increasing, and are expected to increase substantially by the year 2100 over the pre-industrial levels, the patterns of climate change in the 21st century are likely to be different from those of the 20th century (Redmond 1999).

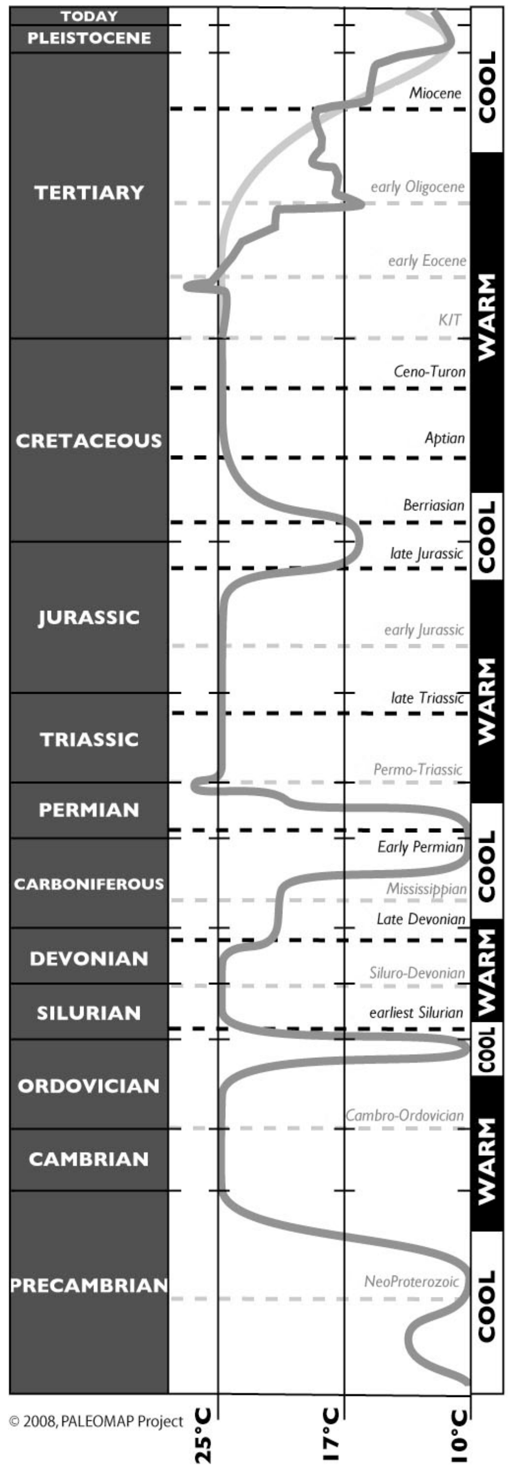
Human occupation of the Northern Basin and Range ecoregion and Great Basin region seems to follow environmental changes of the last 15,000 years. The terminal edges of glaciers meandered through most of what is now the Northern Basin and Range ecoregion (Figure 30). They receded and left behind rivers and valleys that people likely followed in pursuit of ice-age mammals such as the mammoth and the giant bison.

The first people arrived in this region sometime before 11,000 years ago. Archeologists have found physical evidence of their presence such as distinctive stone tools and projectile points.

As the climate became warmer and drier, the animals, vegetation and human lifestyles also changed. Large ice-age megafauna animals that were adapted to cold and wet conditions became extinct. People, who could no longer rely on large mammals for food, depended on smaller animals, such as deer, moose, and elk. Plants such as camas, bitterroot, huckleberries, and serviceberries also became important food staples.

Global climate is highly variable, and currently it is in a cycle of warming because we are still leaving the last ice age (Figure 33) and because globally, humans are adding greenhouse gases to the atmosphere (Scotese 2002). This cycle of global climate change holds the potential to disproportionately impact agrarian and coastal populations.

Figure 33. During the last 2 billion years the Earth's climate has alternated between a frigid "Ice House", like today's world, and a steaming "Hot House", like the world of the dinosaurs (Scotese 2002).



By about 3,000 years ago, as the aboriginal human population increased within the North American Continent, early inhabitants shifted their habitation focus to lowland rivers and lakes. Fishing, gathering, and hunting land mammals formed the foundation of a rich and complex culture (NPS 2011).

Understanding synoptic-scale weather patterns across large landscapes, or mesoscale responses within watersheds, to climate change is quite underdeveloped (Scotese 2002, Wagner and Baron 1999). This is partly because the time scales of concern are short (annual to centennial) and fall between the small scales addressed by most numerical models and the large sales described in the conceptual models of geomorphologists (Figure 33). An additional problem is that the type of models often used to bridge this gap are based on the extrapolation of historic behavior and is not precise as the climates change (Redmond 1999).

Climate Change is not here considered a natural disaster, but instead it is considered a natural part of the global climate cycle of change that took a turn nearly 12,000 years ago when the glaciers began their retreat. These glacial retreats opened up lands held in the lock of glacial ice to make available fertile soils for meadows, rangelands, forestlands, lakes and valleys. This cycle of change from the last "hot peak" of the Tertiary period to the "cold gorge" of the Pleistoncene period took nearly 50.7 million years to complete (22.0 million years during the Eocene Epoch, 11.0 million years during the Oligocene Epoch, and 17.7 million years of the Miocena Epoch) (Figure 33).

Are anthropogenic carbon emissions increasing the rate of global climate change? The answers to that question are debated by many scientists around the globe. The speed of changes introduced by climate change and the extremes of that change (hotter and colder, wetter and drier) must be viewed in the long-term synoptic scale looking forward to the coming centuries and millennia, while practitioners are by necessity, focused on the mesoscale profile of the coming months, years, and possibly decades (Adams 1997).

In general, the largest impact expected in this short-term (mesoscale) outlook for the Great Basin, is to a trend of global warming that can bring with it warmer temperatures during all months of the year, accompanied by wetter seasons.

Climate change and vegetative responses to those changes are interrelated processes, both of which take place on a global scale (IPCC 2001). Global warming is projected to have significant impacts on conditions affecting vegetative processes (including agriculture), through changes in temperature, atmospheric carbon dioxide content, increased glacial run-off, amplified precipitation, and the interaction of these elements. The overall effect of climate change on vegetative productivity generally, and agriculture specifically, will depend on the balance of these effects.

4.3.4.1. Water Resources

The climate of the Northern Basin and Range ecoregion and Great Basin region is arid (dry) to semi-arid. Water is a limited resource and the water limitation is a major reason why the region's population did not originally increase in the same manner as in the eastern two-thirds of the Nation (Strzepek 1999). Water is essential to all aspects of life in the Northern Basin and Range ecoregion. While agriculture is the biggest user, consuming about 80% of the total available water, urban, industrial, recreational, and historic Native American rights are intensifying competition for this limited and already totally appropriated resource (i.e., all available water is already allocated to some use).

The snowpacks of the region's mountain ranges are the sources of many of our Nation's rivers, including the Missouri, Yellowstone, Platte, Arkansas, Rio Grande, Colorado, and Snake. Rocky Mountain waters flow into the Mississippi and Columbia River systems, and subsequently into the Pacific Ocean, the Gulf of Mexico, and the Gulf of California (Chaplin 1999). Thus the Great Basin contributes to the water needs of municipalities outside the region.

4.3.4.2. Environmental Impacts

About 85% of the water used by the population of the Northern Basin and Range ecoregion is derived from surface water, namely streams. Approximately three-fourths of the region's stream-flow comes from melt and run-off of the yearly snowpacks on its mountain ranges (Chaplin 1999). Thus, the effects of climate change on the availability of water resources needed to supply the region's human requirements depend importantly on future trends in total precipitation, its seasonal timing (winter or summer), and its state (rain or snow), which is controlled by atmospheric temperature.

Some scientists are projecting major increases in precipitation in the region by the end of the 21st century (Redmond 1999). The largest increase is projected to occur in winter. At first glance, this would seem to imply increased snowpacks and greater water availability. The increased precipitation of the 20th century does appear to be reflected in increased flow of streams in the region and rising groundwater tables in northeastern Nevada (Wagner and Baron 1999).

However, what is likely to happen to snowpacks and seasonal stream-flow patterns is not entirely clear. Warmer temperatures could cause rainfall to change to snow later in the fall, and make spring snowmelt earlier. Along with snowpack retreating to increasingly higher elevations, the overall result could be reduced snowpacks, increased winter stream-flow, lower and earlier spring run-off, and longer summer and fall low flows (IPCC 2001).

One still undetermined factor in the water-resources equation is evapotranspiration (loss of water by the soil and by plants). This would likely increase with rising temperatures and offset to some degree the gain from increased precipitation (Riebsame 1997).

It may turn out that precipitation will actually decrease in the region, and there will be increasing competition for already limited water supplies and all water-using sectors will come under increasing stress; some will surely be seriously affected.

4.3.4.3. Social Impacts

The relative scarcity and the variability in time and space of water resources in the Intermountain West were smoothed out in the early 20th century by an extensive engineering infrastructure that impounded and distributed water to what was then a small population. Nearly all major western streams have been dammed (such as the Owyhee River at Wild Horse Reservoir), many of them numerous times (continuing downstream from Wild Horse Reservoir to the Snake River and Columbia River exiting at the Pacific Ocean crossing 10 dams). A legal and administrative infrastructure established the legal and regulatory ways those water resources were allocated to the growing population. Because the western American culture was largely rural in the early decades of the century, traditions and policies were established to allocate most (about 80%) of the water to agriculture, even though crop production is small and marginal compared with the Midwest and other highly productive regions in the US. Damming of the rivers also expatriated many anadromous fish species because of blocked migratory passage.

4.3.4.4. Economic Impacts

An increase in extreme weather events, which could accompany climate change, would create economic challenges (Wagner and Baron 1999). For instance, an increase in the frequency of intense storms, and resulting flooding, could wreak major damage on this region's water-delivery systems, homes and other buildings, and the agriculture industry. In contrast, increased frequency of drought during vulnerable times of the growing season would seriously compromise the region's crops (Strzepek 1999). Should this occur, a likely result would be the reduction of irrigated acreage, an economic concern for the Shoshone-Paiute Tribes' agriculture industry which is more prone to drought stress.

4.3.4.5. Addressing Potential Impacts on Water Resources

Several strategies are available if climate change causes significant impacts to water resources of the Northern Basin and Range ecoregion and Great Basin region (Wagner and Baron 1999). These strategies include efforts to:

- Better adapt water-management options to address the needs of multiple users and to develop strategies to encourage optimal use of existing water supplies of differing qualities (for example, delivery of non-potable supplies, such as reclaimed water, for irrigation).
- Apply available technologies that are designed to increase water-use efficiency to all uses, including areas that remain in irrigated agriculture. And/or shift to regionally sustainable agricultural practices and reduce irrigated acreage.
- Adopt agricultural and land-management practices that better retain soil-moisture.
- Identify innovative methods of increasing water storage and storage techniques such as groundwater storage reservoirs.
- Improve flexibility in future water management to account for potential changes in timing and variability.
- Price water to more accurately reflect real costs.

The "use it or lose it" tradition can encourage water wastage. The tradition of agriculture being "the highest and best use" needs to be re-evaluated in the light of changing western culture -- including rural-to-urban population shifts and the variety of costs attached to water.

4.4. Weather Features of the Region

The climate varies across this extensive and topographically complex region. Its topography is bounded on the east and west by major mountain chains rising to between 12,000 and 14,000 feet at their highest points. The Duck Valley Indian Reservation of the Northern Basin and Range ecoregion and Great Basin region is dotted with a washboard pattern of lesser ranges and intervening dry valleys, making what the geologists call the Basin-and-Range Province (Wagner and Baron 1999).

In the West, precipitation increases and temperature decreases with increasing elevation. These variations are quite large; for example, precipitation in the Basin-and-Range Province region varies from as low as 2 inches per year up to 100 inches per year (PRISM Climate Group 2004). The region's mountains force much of the atmosphere's moisture out as precipitation, primarily as snow on the mountains thereby drying the air and creating an arid climate in the valleys. The mountain snow supports a lucrative skiing and tourism economy in the winter. Spring runoff provides the needed water for tribal irrigation use, industry needs, and power generation, and a rapidly growing urban population cloistered in the lower elevations (Chaplin 1999).

4.4.1. Weather and Climate

Distinguishing clearly between the terms weather and climate is important to understanding how to interpret the results of this section. Weather is the hour-to-hour and day-to-day state of the atmosphere: whether, at a particular time, it is rainy or sunny, warm or cold, windy or calm. Climate is the average weather over time: a locale's typical weather patterns, including frequency and intensity of storms, cold outbreaks, and heat waves.

Just as the weather varies naturally, the climate varies naturally in response to such factors as sunspots, volcanic eruptions, and atmosphere-ocean interactions (e.g., El Niño events). Climate change is a shift in the climate that lasts a few decades or more. Human activities in the last two centuries have become important drivers of climatic change.

Thunderstorms in this region are intermittent and occasionally produce severe localized flooding and debris flow events (slope failures). Thunderstorms occur from time to time in the landforms surrounding and within the Duck Valley Indian Reservation. Rarely, slow-moving thunderstorms, forced by terrain features, allow large amounts of water to accumulate in one area. Narrow valleys or watersheds where rain can be concentrated, are also contributors to flash-flooding events (Mass 2008).

4.4.2. Geologic Setting

The Owyhee uplands lie at the joining of the Northern Basin and Range ecoregion and Great Basin region. This region is a flat deeply dissected plateau with little interior drainage where fault-block topography is less pronounced. The drainage basin of the Owyhee River drains the uplands. Originating in Nevada, the Owyhee River flows northwesterly through the Duck Valley Indian Reservation, Idaho, and Oregon to join the Snake River near Adrian, Oregon. In spite of low rainfall in the area, steep gradients give the river and its tributaries well-defined drainage patterns and deep canyons. Cutting through the uplands over 6,000 feet above sea level, the river drops to approximately 2,000 feet where it joins the Snake River. Small streams flowing in from the hills are largely intermittent.

The geological background of this province is based in volcanic activity which started in the Miocene. There are deep volcanic deposits of basalts, tuffs and tuffaceous sediments (Shock, et al. 2011). While basalt is prevalent, other features include rhyolite, diatomaceous deposits, new sedimentary deposits and new surface lava. The episodes of deposition affecting the Owyhee uplands include the Owyhee Basalts that erupted onto the plateau 13-12 million years ago and the ash-flow tufts from the Steens mountains around the same time. In a few areas there has been relatively recent volcanism.

4.4.2.1. Legend: Rabbit and the Sun

Within the previous section of this Tribal Hazards Mitigation Plan (Section 4.3, Global Climate Change) discussion was given to the importance of Legends of the *Newe and Numa* people. Many of the legends of the *Newe and Numa People* were focused on the events of the weather and strived to explain the origins and the source of current patterns.

A Newe legend of the hot sun (A. Smith 1993):

> *Once there was a rabbit with only three legs. So he made a wooden leg for himself and was able to move fast. At that time the Sun was very hot. Rabbit said to himself, "I will go and see what makes the Sun so hot."*
>
> *As he hopped off toward Sun, he found it getting hotter every day. "The only thing on earth that doesn't burn," said Rabbit, "is cactus."*
>
> *So he made a house of cactus and stayed in it during the day. He traveled at night. When he came closer to Sun, he arose early one morning and ran toward the place where it should come up. When he saw the ground boiling, he knew that Sun was ready to come up. Rabbit stopped, sat down, and took out his bow and arrows.*

When Sun was about halfway out of the earth, Rabbit shot at it. His first arrow hit the heart and killed Sun. Rabbit stood over it and began to cry. "The white part of your eye will be clouds." And it was.

"The black part of your eye will be the sky."

And it was.

Your kidney will be a star, your liver the moon, and your heart the dark."

And they were.

Then rabbit said to Sun, "You will never be too hot again, for now you are only a big star."

Sun has never been too hot since then. Ever since that day, rabbits have brown spots behind their ears and on their legs. There Rabbit's fur was scorched during his journey, long, long, long ago, to see why the sun was so hot.

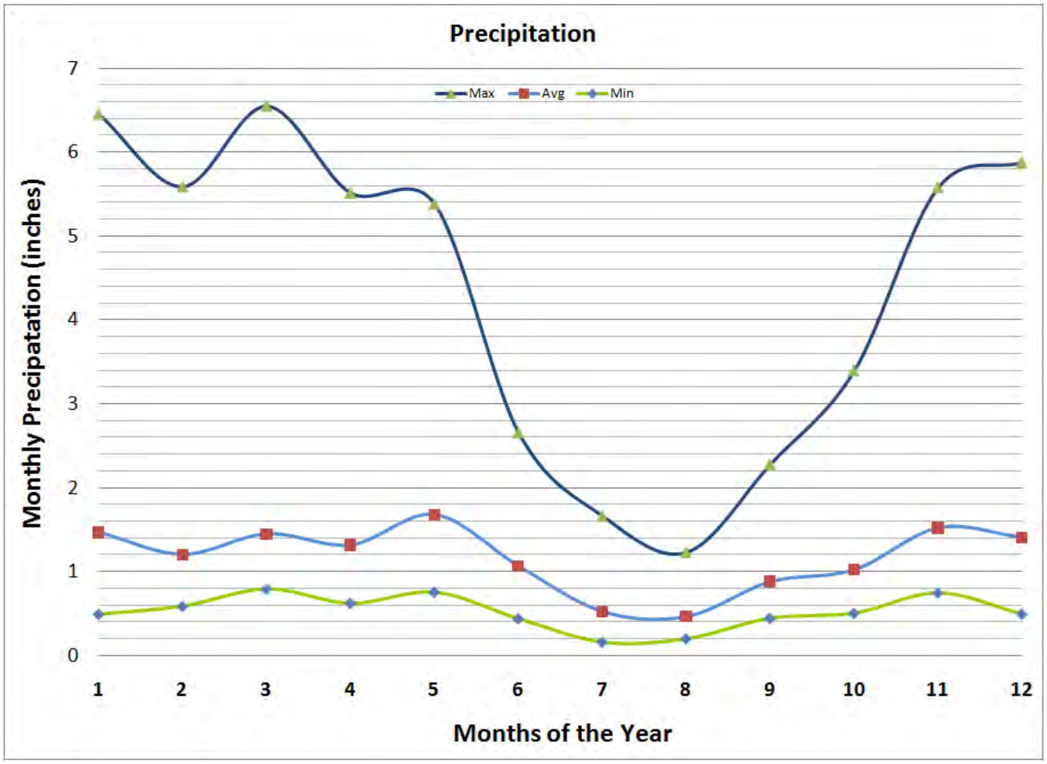
4.4.3. Characterizing Normal Weather

There is a high degree of weather variability within the joining of landforms of the Northern Basin and Range ecoregion and Great Basin region where the Duck Valley Indian Reservation is located. Gradual rises separate the Owyhee River subbasin from the Humboldt River basin to the south and from the Bruneau River Basin to the northeast. To the northwest, Juniper Mountain separates the subbasin from the subbasins of the Middle Fork and North Fork of the Owyhee River. Stream networks that traverse the Duck Valley Indian Reservation are fed by a combination of foothill and mountain ridgeline sources (Shock, et al. 2011).

4.4.3.1. Precipitation

Precipitation is highly variable and show tendencies of increasing precipitation amounts with increasing elevation. Annual precipitation ranges from a low of only 6.2" per year to a high of 52.2" within the area including and immediately adjacent to the Duck Valley Indian Reservation (Table 21, Figure 34) (PRISM Climate Group 2004).

Figure 34. Average Monthly Precipitation of the Duck Valley Indian Reservation and area surrounding the Reservation within the Great Basin.



Because of the influences of the high mountain deserts, the deep canyons, and the towering peaks within the Northern Basin and Range ecoregion and Great Basin region, the temperatures are generally moderated while the precipitation is highly variable – with the mountain peaks getting most of the high precipitation levels (Figure 34, Table 21).

Table 21. Average Monthly Precipitation on the Duck Valley Indian Reservation (PRISM Climate Group 2004).

Month	Average Monthly Precipitation (inches)	Percent of Total	Areas of Lowest Precipitation	Areas of Highest Precipitation
Jan	1.46	10%	0.49	6.45
Feb	1.20	9%	0.59	5.59
Mar	1.45	10%	0.79	6.55
Apr	1.31	9%	0.62	5.51
May	1.67	12%	0.75	5.38
Jun	1.06	8%	0.44	2.66
Jul	0.52	4%	0.15	1.66
Aug	0.46	3%	0.20	1.23
Sep	0.88	6%	0.44	2.28
Oct	1.02	7%	0.50	3.39
Nov	1.52	11%	0.74	5.58
Dec	1.40	10%	0.49	5.88
Total	**13.97**		**6.20**	**52.16**

4.4.3.2. Temperature

Temperatures commonly observed in this region witnesses monthly averages below 10° F from December through February (Table 22, Figure 35). Conversely, average high temperatures exceed 90° F during the months of July and August (Figure 36). Average high temperatures within the region are generally between 36° F (January) and 84° F (July) giving this region a comfortable living range of high temperatures (Figure 36). Average daily low temperatures area generally above 40° F from June through September (PRISM Climate Group 2004).

Figure 35. Average Monthly Low temperatures of the Duck Valley Indian Reservation and area surrounding the Reservation within the Great Basin.

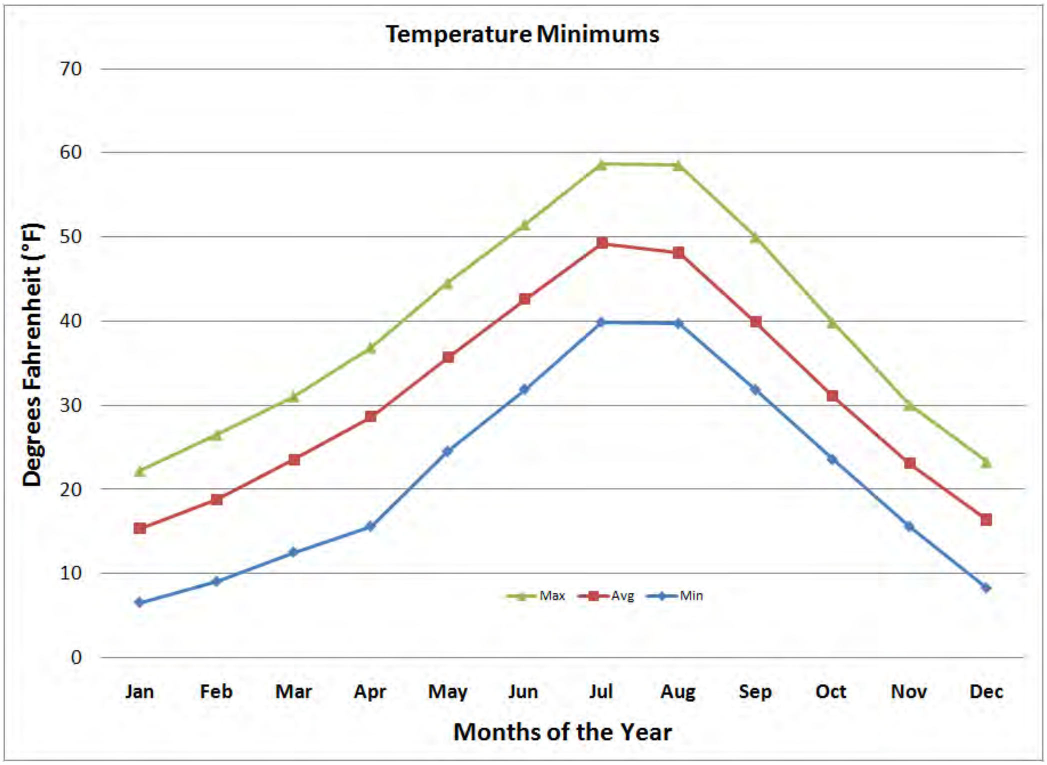
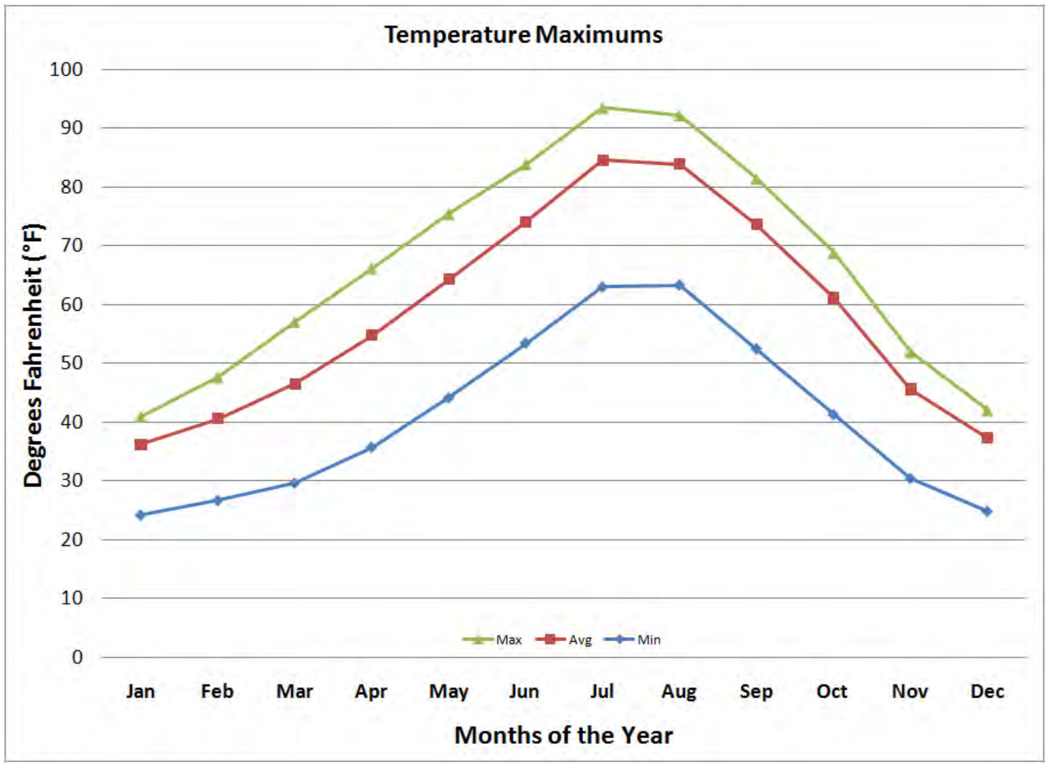


Figure 36. Average Monthly High temperatures of the Duck Valley Indian Reservation and area surrounding the Reservation within the Great Basin.



Monthly extreme temperature variations demonstrate how the differences from the highest average monthly temperature in a selected month (e.g., July) may differ from the lowest average monthly temperature from the same month by as much as 53° F (Table 22). At the other extreme, when considering the lowest of the daily average high temperatures in January (24.2° F), and the highest of the daily low temperatures (22.2° F) the difference is only 2° F (Table 22).

Table 22. Variations in Monthly Temperature Extremes within the Duck Valley Indian Reservation (PRISM Climate Group 2004).

	Lowest Monthly Temperature Extremes (° F)			Highest Monthly Temperature Extremes (° F)		
Month	Minimum	Average	Maximum	Minimum	Average	Highest
Jan	6.5	15.4	22.2	24.2	36.2	40.9
Feb	9.0	18.8	26.5	26.7	40.6	47.7
Mar	12.5	23.5	31.1	29.6	46.5	57.1
Apr	15.6	28.7	36.9	35.7	54.8	66.2
May	24.5	35.7	44.5	44.1	64.3	75.4
Jun	31.9	42.6	51.5	53.4	74.1	83.8
Jul	39.9	49.2	58.7	63.0	84.6	93.4
Aug	39.7	48.1	58.6	63.3	83.9	92.2
Sep	31.9	39.9	50.0	52.4	73.6	81.4
Oct	23.5	31.1	39.9	41.3	61.1	68.8
Nov	15.6	23.1	30.1	30.4	45.6	51.9
Dec	8.3	16.4	23.3	24.8	37.3	42.0

These characteristics define the local temperate and precipitation ecotype known to this region that combines moderated temperatures (few extreme lows and few extreme highs) with infrequent and moderate amounts of rainfall delivered most months of the year.

Clouds and precipitation are greatly enhanced when air is forced to ascend the windward slopes of mountain barriers. Most major Northern Basin and Range ecoregion flooding events start with an extensive region of light-to-moderate precipitation linked to a strong Pacific low-pressure system and its associated fronts. This precipitation is then greatly increased, sometimes by factors of two-to-five times, as air ascends the mountains, both from the Columbia River system and the Humboldt River basin (Mass 2008). When moisture-laden storms move into the Northern Basin and Range ecoregion they are forced up mountains, where precipitation often is dropped in the process, it results in a storm system composed of rain clouds that will rotate northeastward if they came from the south (Humboldt River), and southeastward if they came from the north (Snake River), while over the region of the Duck Valley Indian Reservation. As the front moves into the region, the topographic uplift causes the dropping of often significant amounts of precipitation to the Jarbridge Peaks (east of Duck Valley). Frequently, these storms in the spring and fall are delivered in combination with high winds, hail, thunder, and lightning.

Numerical data for this report concerning monthly weather trends within the Duck Valley Indian Reservation were created using the PRISM (Parameter-elevation Regressions on Independent Slopes Model) climate mapping system, developed by Dr. Christopher Daly, PRISM Climate Group director at Oregon State University. PRISM is a unique knowledge-based system that uses point measurements of precipitation, temperature, and other climatic factors to produce continuous, digital-grid estimates of monthly, yearly, and event-based climatic parameters. Continuously updated, this unique analytical tool incorporates point data, digital elevation models, and expert knowledge of complex climatic extremes, including rain shadows, coastal effects, and temperature inversions. PRISM data sets are recognized world-wide as high-quality spatial climate data sets. PRISM is the USDA's official climatological data source (PRISM Climate Group 2004).

PRISM is an analytical model that uses point data and an underlying grid such as a digital elevation model (DEM) and a 30-year climatological average (e.g. 1971-2010 average) to generate gridded estimates of monthly and annual precipitation and temperature (as well as other climatic parameters). PRISM is well suited to regions with mountainous terrain, because it incorporates a conceptual framework that addresses the spatial scale and pattern of orographic processes. Grids evaluated for this report have been modeled on a monthly basis (PRISM Climate Group 2004).

4.4.4. Characterizing Extreme Weather

The Northern Basin and Range ecoregion is essentially a large topographic bowl circumvented to the south by the Great Basin region. Most of the upper Owyhee River basin has an average annual precipitation less than 15 inches per year (6.2” on the high mountain desert and 52.2” along the forested peaks - Table 21). This high mountain desert is classified as semi-arid. Since the winter temperatures in this semi-arid desert section drop as low as they do and there are stark temperature differences from season to season, the area is also classified as a cold-winter desert (Shock, et al. 2011). The majority of the upper Owyhee subbasin is a semi-arid, cold-winter desert.

Extremes of temperature within the region give evidence of the extreme variation from monthly averages, to the highest and lowest temperatures observed in preserved records (Table 23). The most extreme temperature variations have been witnessed in Mountain City, Nevada, just 13 miles southeast of Owyhee, Nevada, and 2 miles from the exterior boundary of the Duck

Valley Indian Reservation, where a 99° F high was recorded in August 1994, and a low of -48° F was recorded in January 1974 (Table 23).

Table 23. Extreme Daily Temperatures at Weather Stations near the Duck Valley Indian Reservation.

Location	High Temperature	Date(s)	Low Temperature	Date
Wild Horse Reservoir	102° F	July 23, 2003	-42° F	December 12, 2004
Tuscarora	99° F	July 13, 2002 August 1, 2000	-25° F	January 12, 1963 December 10, 1962
Tuscarora Andrae Ranch	104° F	June 27, 1892 July 22, 1890 August 6, 1892	-27° F	February 27, 1890
Mountain City	99° F	August 5, 1994	-48° F	January 1, 1974
Owyhee	98° F	July 19, 1960 August 5, 1983	-34° F	January 25, 1949

A storm warning generally refers to an advisory issued by an official meteorological department to warn citizens of approaching dangerous weather. A storm watch, on the other hand, typically refers to an advisory issued to indicate that conditions are favorable for the development of dangerous weather patterns, although the dangerous weather conditions themselves are not currently present.

In the United States, storm warnings and watches are issued by the National Weather Service (NWS), which is itself a branch of the National Oceanic and Atmospheric Administration. The NWS defines a watch as "the risk of a hazardous weather or hydrologic event [increasing] significantly, but its occurrence, location, and/or timing is still uncertain" and a warning as "hazardous weather or hydrologic event [that] is occurring, is imminent, or has a very high probability of occurring" (NWS 2011). Additionally, the NWS breaks down storm warnings and watches based upon the specific type of hazardous weather. These warnings and watches include, but are not limited to, hurricanes, tornadoes, and severe thunderstorms. The term "storm warning" is also used by the NWS to warn of high wind conditions sustained at 58 to 73 mph not associated with tropical cyclones (Table 24) (NWS 2011).

Table 24. Severe weather terminology in the United States (NWS 2011).

Event	Hazard	Types of Warnings	Potential Risk at Duck Valley?
Severe Storms	Thunderstorm	Watch ● PDS Watch ● Warning	Yes
	Flood	Flood Warning ● Flash Flood Watch ● PDS Watch ● Flash Flood Warning ● Urban and Small Stream Flood Advisory	Yes
	Tornado	Watch ● PDS watch ● Warning ● Emergency	Yes
Winter Weather	Advisories	Winter Weather Advisory	Yes
	Winter storm	Watch ● Warning	Yes
	Blizzard	Advisory ● Watch ● Warning	Yes
	Heavy snow	Warning	Yes
	Lake-effect snow	Advisory ● Watch ● Warning	No
	Ice	Freezing Rain Advisory ● Ice Storm Warning	Yes
Tropical Cyclones	Tropical storms	Watch ● Warning	No
	Hurricanes	Watch ● Warning	No

Table 24. Severe weather terminology in the United States (NWS 2011).

Event	Hazard	Types of Warnings	Potential Risk at Duck Valley?
Wind	Inland Advisories	Watch ● Inland Tropical Storm Warning ● Inland Hurricane Watch ● Inland Hurricane Warning	No, but possible for Inland Tropical Storm Warnings
	Gale warning ● Small craft Advisory ● Extreme Wind Warning ● High Wind Warning ● Lake Wind Advisory		No
Other	Special weather statement ● Significant Weather Advisory ● Fire Weather Watch ● Red flag warning ● Fire Warning ● Hazardous Weather Outlook		Yes
	Particularly Dangerous Situation (PDS)		

A particularly dangerous situation (PDS) is a type of enhanced wording first used by the National Weather Service's Storm Prediction Center in Norman, Oklahoma, on certain severe weather watches. It is issued at the discretion of the forecaster composing the watch and implies that there is an enhanced risk of very severe and life-threatening weather, usually a major tornado outbreak or (much less often) a long-lived, extreme derecho event (see Section 4.4.4.2, Severe Thunderstorms). On April 24, 2011, the National Weather Service's Memphis local office issued the first PDS Flash Flood Watch to highlight the threat for widespread, significant, and potentially life-threatening flash flooding due to repeated rounds of severe thunderstorms (NWS 2011).

PDS tornado watches are issued when there is a greater risk of multiple strong, violent or extremely violent tornadoes in the watch area, in addition to significant wind and hail damage. While there is no hard criteria for a PDS watch to be issued, they are usually issued when the potential exists for a major tornado outbreak. They represent about 90% of PDS watches issued (Dean 2006).

PDS severe thunderstorm watches are issued when there is a greater risk of severe wind damage capable of major structural damage (in addition to large hail and perhaps a few isolated tornadoes), usually due to a strong and persistent derecho. They are very rare (an average of only two each year) as the tornado risk has to remain low enough to only warrant a severe thunderstorm watch (a tornado watch - generally not PDS - would be issued if the tornado risk is significant alongside the extreme wind threat) (Dean 2006).

PDS flash flood watches are issued when there is a greater risk of widespread, potentially life-threatening flash flooding. These watches are issued by the local forecast offices, not the Storm Prediction Center. These PDS warnings are possible surrounding the Duck Valley Indian Reservation.

4.4.4.1. Heavy Snowfall

During the winter, cold air is often stagnated within this large highland basin for prolonged periods of time. Conditions leading to an inversion are common in this region during the winter with warmer air trapped above a layer of cold air at the surface.

Weather hazards in this area include the snowfall and subzero temperatures mentioned above. Winter storm winds in excess of 55 mph sustained with gusts over 70 mph occur about once or twice per year with more powerful storms less frequent. Normal rain and snow amounts are considered beneficial for the most part, although excessive heavy rain resulting in localized and more widespread flooding is possible (Adams 1997).

Prolonged heavy snow can cause interruptions to commerce and over a season can result in a heavy snow pack and the possibility of spring snow melt flooding. Heavy rain-on-snow, coupled with antecedent sub-freezing temperatures and a rapid warm up can result in serious flooding.

The Elko, Nevada, Weather Office was covered in snow after a record setting snowfall dropped nearly 22 inches in a 24 hour period. This heavy snowfall occurred on January 24-25, 1996 (Figure 37). These events exemplify the occurrence of high energy storms that transcend the warm and wet oceanic climate to be pushed up along a steep gradient to the Northern Basin and Range ecoregion and Great Basin region interface.

Figure 37. Record snowfall in Elko, Nevada, on January 24-25, 1996 (NOAA 2011).

4.4.4.2. Severe Thunderstorms

4.4.4.2.1. Legend: Grandfather the Thunder

An American Indian Legend - Lenapé Nation

Muxumsa Pethakowe, our Grandfather the Thunder, was father of the first people, and the Moon was the first mother. But Maxa'xâk, the evil horned serpent, destroyed the Water Keeper Spirit and loosed the waters upon the Earth and the first people were no more. Since then, the Thunderers, Pethakowe'jàk, have always been on the lookout for Maxa'xâk and other such evil water monsters, and when one appears, the Thunderers shoot their crooked, fiery lightening arrows at them, hoping to avenge the deaths of the first people and to make sure that none of the evil shall ever disturb the harmony upon the Earth or cause harm to our Lenape'wàk.

Long ago, there was a time when Grandfather Thunder was forgotten among our people, unlike Grandmother Moon who has always been remembered and honored by us. He became bitter and despondent over our neglect and forgetfulness of him, and in his anger he came from his home in the west, calling out in a voice that shook the heavens and the Earth. Hidden in clouds, he crossed right over the homes and villages of our people. In his fury he shot lightening arrows at the Earth, killing people, burning houses and shattering trees, and the clouds cried their tears of sorrow upon the Earth. Luckily, he never stayed in one place too long, and usually was seen traveling towards the east.

At first he would come alone, but after a while his many children came with him, and they frequently brought fear into the hearts of our Lenapé people. Some *would come from a cave under the falls know today as Niagara and others came from the mountains where they often made their homes.*

At the sight of dark clouds and lightening, and at the sound of the thunder, being the roar of the wings of the Thunderers and the shaking of their rattles filled with bones, which shook the sky, our people became most fearful.

Nanapush finally saw that we, his grandchildren, were in distress and so he came to help us saying, "You have hurt and insulted your Grandfather Thunder through a lack of respect and thought for him. Grandfathers need to be remembered and honored too, for they also, like grandmothers, have shared in the gift of life and in helping their grandchildren into the future. So, when you first hear Grandfather Thunder in the spring, telling you that winter has ended and that life is again coming to the Earth, burn tobacco and greet your grandfather with prayers.

Whenever you hear his voice, do this and you will gain his protection and lightening will not strike you. Grandfather Thunder has charge of the rains that water the Earth and make your crops grow. With the proper respect, he will be thankful, bringing blessings to you, and protect you from the horned snakes and water monsters, and he will come to bring you warnings!"

From that time to this our Grandfather Thunder and our Lenapé people have always been close. We listened to our wise Grandfather Nanapush, and we have always shown respect to Old Thunder and love him dearly, and we always give thanks for his many gifts to all land and life upon Mother Earth

4.4.4.2.2. Events

The Duck Valley Indian Reservation region has a long history of periodic, but infrequent, severe weather events impacting the economy and lives of the region. These events often come as storms that bring high winds, and are even combined with hail, snow, or freezing rain. Sometimes, the hardest hitting and largest impact storms are short bursts of a leading front moving into the confluence of the two ecoregion provinces where terminal foothills begin to lift the front causing precipitation to fall and the winds to swirl (Mass 2008).

Severe thunderstorms are common with the greatest hazard considered to be wildfire during the dry summer months. Heavy rain from thunderstorms can cause localized flooding and difficult driving conditions, while true "gully washing" flash flooding from thunderstorm rain alone is very rare. Small soft hail is a frequent occurrence in the spring and early summer, but is not usually considered a hazard. Larger, more damaging hail can affect the area, but on an infrequent basis. Damaging tornadoes are also very rare, although high winds are seen as frequently as annually to once every 5 years (Figure 38, Figure 39). Red-flag fire conditions occur annually when low humidity and high wind combine leading to dry conditions. If preceded by a significant number of starts from lightning, the wildfire situation can be very hazardous and very difficult to contain.

It is expected that these extreme events will continue at this historic frequency into the future, with events recorded as frequently as annually.

Figure 38. Severe winds (86 MPH) uprooted trees and caused damage during a thunderstorm. The storm occurred July 10, 1995 near Elko, Nevada (NOAA 2011).

A derecho (from Spanish: "derecho" meaning "straight") is a widespread and long-lived, violent convectively induced straight-line windstorm that is associated with a fast-moving band of severe thunderstorms in the form of a squall line usually taking the form of a bow echo (Figure 39). Derechos blow in the direction of movement of their associated storms, similar to a gust front, except that the wind is sustained and generally increases in strength behind the "gust" front. A warm weather phenomenon, derechos occur mostly in summer, especially June and July in the Northern Hemisphere. They can occur at any time of the year and occur as frequently at night as in the daylight hours (Coniglio and Stensrud 2004).

Figure 39. A shelf cloud (derecho) from a severe thunderstorm bears down on Elko (NOAA 2011).

4.4.4.3. Tornadoes

Tornadoes within the Northern Basin and Range ecoregion and Great Basin are rare compared with frequency in some other North American locations. Historically, tornadoes are seen generally between April and August, when the atmosphere is most unstable (Table 26). It takes considerable time for the atmosphere to heat up after being chilled all winter, although the land surface is warmed rapidly by the powerful springtime sun. With cool temperatures aloft and warm temperatures near the surface, temperatures decrease rapidly with height: the necessary condition for tornado events. Tornado activity may continue into the summer because the lower atmosphere gets very warm due to a lack of ocean influence. Summertime tornado activity could be enhanced over the eastern side of the region due to the subtropical moisture that streams eastward out of the Gulf of California into the interior region from late June into early September (Mass 2008).

The Fujita scale (F-Scale), or Fujita-Pearson scale, is a scale for rating tornado intensity, based on the damage tornadoes inflict on human-built structures and vegetation (NOAA 2009). The official Fujita scale category is determined by meteorologists (and engineers) after a ground and/or aerial damage survey; and depending on the circumstances, ground-swirl patterns (cycloidal marks), radar tracking, eyewitness testimonies, media reports and damage imagery, as well as photogrammetry/videogrammetry if motion picture recording is available (TTP 2011).

Table 25. Fujita Scale (F-Scale) Number Intensity Phrase Wind Speed Type of Damage Done (Fujita 1971).

SCALE	*WIND ESTIMATE *** (MPH)*	*TYPICAL DAMAGE*
F0	*< 73*	***Light damage**. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.*
F1	*73-112*	***Moderate damage**. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.*
F2	*113-157*	***Considerable damage**. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.*
F3	*158-206*	***Severe damage**. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.*
F4	*207-260*	***Devastating damage**. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.*
F5	*261-318*	***Incredible damage**. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.*

A key point to remember is about the rating scale is that the size of a tornado is not necessarily an indication of its intensity. Large tornadoes can be weak, and small tornadoes can be violent. Another consideration is the stage in the life cycle of the tornado. A "small" tornado may have been larger, and is at the "shrinking" stage of its life cycle (TTP 2011). The Fujita Scale is based on damage, not the appearance of the funnel. Storm spotters, storm chasers and other weather observers often try to estimate the intensity of a tornado when they are in the field, basing their judgment on the rotational speed and amount of debris being generated as well as the width (NOAA 2009). However, the official estimate is made after the tornado has passed. Personnel from the National Weather Service office that issued the warning survey the site to determine the F-Scale rating. Aerial surveys are occasionally done after violent tornadoes to determine the exact damage track. Insurance companies may also call in wind engineers to do their own evaluations, but the official rating is set by the National Weather Service. A few of the things they all look for are:

- attachment of the walls and floor to the foundation of the building
- attachment of the roof to the rafters and walls
- whether or not there are steel reinforcing rods in concrete or cinder block walls
- whether there is mortar between the cinder blocks

The frequency of recorded tornado events within the counties where the Duck Valley Indian Reservation is located, is highly variable with as many as four events within a single year (1987) to only one event (1970) recorded between 1962 and 1977 (Table 26). A total of 15 tornado events were recorded between 1962 and 2010, in this dataset (TTP 2011).

An illustrative example can be seen from the results of a manufactured home that was flipped over by an F0 tornado at Oreana in north-central Owyhee County on April 23, 1998 (Table 26): by definition it should have been rated an F1 tornado (Table 25).

Table 26. Tornadoes documented 1880 to 2000 (TTP 2011).

Date	Event Number	Time	Fatalities	Injuries	F Scale	County
JLY 17, 1962	001	1400	0	0	F1	Elko County
MAY 13, 1970	001	1330	0	0	F1	Elko County
JUN 11, 1977	001	1400	0	0	F1	Elko County
AUG 19, 1979	002	1700	0	0	F1	Elko County
MAY 24, 1987	003	1400	0	0	F0	Elko County
MAY 27, 1987	004	1630	0	0	F1	Elko County
MAY 27, 1987	005	1835	0	0	F0	Elko County
JUN 14, 1987	006	1855	0	0	F0	Elko County
AUG 04, 1991	002	1130	0	0	F0	Elko County
JUN 08, 1992	003	1505	0	0	F0	Elko County
AUG 11, 1993	001	1200	0	0	F0	Elko County
MAY 16, 1996	001	0630	0	0	F0	Elko County
APR 23, 1998	001	1610	0	0	F0	Owyhee County
JUN 8, 1998	001	1000	0	0	F0	Elko County
JLY 10, 1998	007	1600	0	1	F0	Owyhee County

4.4.4.4. High Winds

High winds come up in the morning and evening across the plateau regions of the Owyhee uplands. These winds, anabatic and katabatic, are driven by gravity and the heating and cooling associated with morning and evening, respectively (Shock, et al. 2011).

An anabatic wind, is a wind that blows up a steep slope or mountain side, driven by heating of the slope through insulation (RNMI 2000). It is also known as an upslope flow. These winds typically occur during the daytime in calm sunny weather. A hill or mountain top will be warmed by the Sun which in turn heats the air just above it. Air at a similar altitude over an adjacent valley or plain does not get warmed so much because of the greater distance to the ground below it. The effect may be enhanced if the lower lying ground is shaded by the mountain and so receives less heat.

The air over the hilltop gets warmer than the air at a similar altitude around it and will rise through convection. This creates a lower pressure region into which the air at the bottom of the slope flows, causing the wind. It is common for the air rising from the tops of large mountains to reach a height where it cools adiabatically to below its dew point and forms cumulus clouds. These can then produce rain or even thunderstorms (RNMI 2000).

Conversely, Katabatic winds are down-slope winds, frequently produced at night by the opposite effect, the air near to the ground losing heat to it faster than air at a similar altitude over adjacent low-lying land. A katabatic wind, is the technical name for a drainage wind, a wind that carries high density air from a higher elevation down a slope under the force of gravity. Such winds are sometimes also called fall winds. Katabatic winds can rush down elevated slopes at hurricane speeds, but most are not that intense and many are on the order of 10 knots or less.

Not all downslope winds are katabatic. For instance, winds such as the Foehn, Chinook or Bergwind, are rain shadow winds where air driven upslope on the windward side of a mountain range drops its moisture and descends leeward drier and warmer. Examples of true katabatic winds include the Santa Ana Winds in southern California (Mass 2008).

The interface of the Northern Basin and Range ecoregion and Great Basin region creates circumstances that can, and often do, lead to these high wind conditions (Figure 39). Often, the formation of these events happens over unpopulated places where weather tracking efforts are not well developed. The arrival of these winds at the Duck Valley Indian Reservation can break trees near homes and over power lines. A long history of high wind damages (Table 20) has been recorded within this region from 1960 to present time. While winds have been cited in the disaster records as singular events, they are also often combined with other hazards such as severe winter weather, heat, lightning, or thunder storms.

4.4.4.4.1. Legend: When Bear Stole the Chinook

A Siksika Nation Tale retold by: Harriet Peck Taylor

> *The north wind blew in hard and cold that long-ago winter. There were many blizzards, and the land was frozen under ice and snow. It seemed that the warm wind called the Chinook would never come. The deep snows made it hard to find wood for fires, and there was very little for the Siksika people and the animals to eat.*
>
> *Each sunrise, the Old Ones would look for signs that the Chinook was coming. The Chinook would blow in if the skies were clear and blue. But each day was as gloomy as the next, with fog and clouds covering the mountain peaks.*
>
> *Among the Siksika was a boy with no mother or father. He lived in the poorest of lodges, and his closest companions were the birds and animals. He spoke with them and shared with them whatever food he had.*
>
> *One day he decided to call his friends together for a council. Owl and Coyote came. Weasel, Prairie Chicken, and Magpie were there, too. The boy turned to Magpie, a busybody who always flew here and there, learning everyone else's business. "Do you know where the Chinook has gone?" he asked.*
>
> *Magpie answered, "I don't, but my relatives who live in the mountains might know something. I'll go pay them a visit."*
>
> *The next day he returned and said, "My relatives know a huge Bear who has his den high in the mountains. He has stolen the Chinook so that he may keep warm all through the winter."*
>
> *The friends held another council that evening. They decided to make the long journey to the great Bear's den to try to bring back the Chinook. They left early in the morning, carrying with them dried meat and berries and the boy's stone pipe.*
>
> *Magpie knew the way and led them up the steep mountain. Higher and higher they climbed, over icy ridges and through snow-covered forests. The wild north wind picked up the snow and threw it in their faces, but still they struggled on. At night they found shelter in caves, huddling together under a buffalo robe for warmth.*

At last Magpie announced. "We're near the den of the great Bear. We must go slowly and sneak up on him." Creeping quietly, they heard a frightening sound. "Grrr!" Bear growled. "Who's there?" Because of Owl's keen eyesight, the boy sent him to peek through the smoke hole in Bear's den. Owl's job was to see if he could find the Chinook. But Bear was on his guard and heard Owl. When Owl poked his head through the hole. Bear grabbed a stick and knocked him in the eyes. That is why, to this day, owls have circles around their eyes. "Oow! Oow!" cried Owl as he flew back.

Coyote bragged, "I'm not afraid of that old Bear, I'll go look." Once again, Bear was waiting. He reached out to grab Coyote with one of his huge paws. Trembling with fright, Coyote dashed back to tell his friends what had happened. "What will we do?" Prairie Chicken asked. Magpie said. "Weasel, why don't you sneak up to the den? Bear won't see you in your winter-white coat."

Weasel crept up to the den. When Bear saw the white fur, he thought snow was falling through his smoke hole, so Weasel was able to get a good look inside. Weasel returned and whispered. "I have found the Chinook. Bear keeps it in a buffalo-hide bag in the far corner of his den. Bear looks huge and fierce! How will we ever get it?"

Suddenly the boy had an idea. "I'll blow smoke from my pipe into his den. When it starts to fill with smoke, Bear will become sleepy." The boy got out his pipe and filled it with tobacco. Then he climbed up to the smoke hole and puffed and puffed and puffed. Soon thick white clouds filled the den.

Bear's eyes became heavy and he yawned: "Aahhh." Pretty soon, the great Bear's snoring was so loud that even the ground rumbled. Coyote crawled silently past Bear and grabbed the buffalo-hide bag that held the Chinook. Carefully, he dragged it outside, where they saw that it was tied with heavy leather thongs.

Prairie Chicken stepped up and said, "Let me see if I can cut the thongs with my beak." She pecked hard and fast at the leather straps until they snapped and the bag fell open. The Chinook rushed out with a loud whoooosh!

Bear heard the noise and came thundering out of his den. The boy and his friends ran like the wind, with Bear's sharp teeth snapping at their heels. They raced along the icy ridge and across a frozen river.

When Bear got to the riverbank, the ice was already melting. He knew it would not hold his weight, so he growled and paced while Coyote, Magpie, Prairie Chicken, Weasel, Owl, and the boy escaped safely down the mountain.

When the boy returned to his village, the people came out of their lodges. The boy pointed to the clearing sky. Then the wonderful warm wind blew off the peak and down into the valley, and from there it spread to the far corners of the earth. Everywhere snow and ice melted and the rivers broke up and tumbled down the hillsides. The people, animals, and birds danced and gave thanks under the bright blue sky.

Bear has never again been allowed to steal the Chinook. Since he cannot stand the cold, from that time on he has slept all winter long. And that is why bears *never leave their dens until the warm wind called the Chinook returns, brining spring to the land.*

4.4.4.5. Drought

A drought is an extended period of months or years when a region notes a deficiency in its water supply. Generally, this occurs when a region receives consistently below average precipitation. It can have a substantial impact on the ecosystem and agriculture of the affected region. Although droughts can persist for several years, even a short, intense drought can cause significant damage (Australian Government 2011) and harm the local economy.

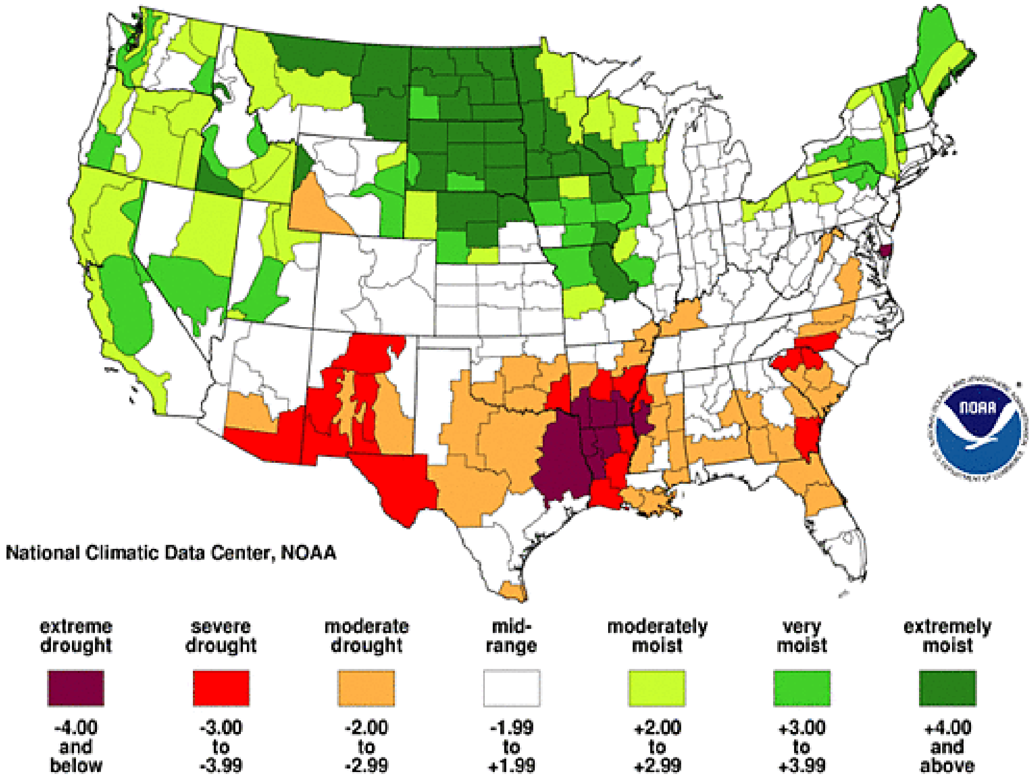
This global phenomenon has a widespread impact on agriculture. The United Nations estimates that an area of fertile soil the size of Ukraine is lost every year because of drought, deforestation, and climate instability (FAO 2011). Lengthy periods of drought have long been a key trigger for mass migration and played a key role in a number of ongoing migrations and other humanitarian crises.

4.4.4.5.1. Palmer Drought Index

The Palmer drought indices (Palmer 1965) measure the balance between moisture demand (evapotranspiration driven by temperature) and moisture supply (precipitation). The Palmer Z Index depicts moisture conditions for the current month, while the Palmer Hydrological Drought Index (PHDI) and Palmer Drought Severity Index (PDSI) depict the current month's cumulative moisture conditions integrated over the last several months. As seen on the Palmer Z Index map (Figure 40), low precipitation resulted in dry conditions in March 2011 for a band stretching from the Four Corners region to the Arklatex (where Arkansas, Louisiana, Texas, and Oklahoma intersect), with an additional area of dryness in the High Plains of Colorado.

Wet conditions as of March 2011 are evident across much of the Pacific Coast states, from Central California northward, in the Great Basin, Northern Plains, the Appalachians, and Northeast. Near-normal conditions occurred across much of the Central Mississippi and Ohio Valleys. Long-term drought remains entrenched in the Lower Mississippi Valley, southern Rockies and parts of the Southern Atlantic Coast (Figure 40). Within the region surrounding the Duck Valley Indian Reservation precipitation was unusually high as the PHDI increased to above average levels in the Columbia River basin of Idaho and was moderately moist in the northern reaches of the Great Basin (Figure 40). These conditions have been in a series of wetting for the past 2 years and may signal the end to the prolonged drought conditions that have persisted in this area for the last 2 decades.

Figure 40. Palmer Hydrological Drought Index (Long-Term) as of March 2011 (NCDC 2011).



The Standardized Precipitation Index (SPI) measures moisture supply. The SPI maps here show the spatial extent of anomalously wet and dry areas at time scales ranging from 1 month to 24 months. The shorter-term maps (i.e., those sensitive on the one- to three-month timescale) confirm the general patterns described by the Palmer Z index and March precipitation statistics (Figure 40). On longer timescales, the last six months have been quite wet across much of the Northern Basin and Range ecoregion and Great Basin region.

In 1965, W.C. Palmer developed an index to measure the departure of the moisture supply (Palmer 1965). Palmer based his index on the supply-and-demand concept of the water balance equation, taking into account more than just the precipitation deficit at specific locations. The objective of the Palmer Drought Severity Index (PDSI), as this index is now called, was to provide measurements of moisture conditions that were standardized so that comparisons using the index could be made between locations and between months.

The PDSI is a meteorological drought index, and it responds to weather conditions that have been abnormally dry or abnormally wet. When conditions change from dry to normal or wet, for example, the drought measured by the PDSI ends without taking into account streamflow, lake and reservoir levels, and other longer-term hydrologic impacts. The PDSI is calculated based on precipitation and temperature data, as well as the local Available Water Content (AWC) of the soil. From the inputs, all the basic terms of the water balance equation can be determined, including evapotranspiration, soil recharge, runoff, and moisture loss from the surface layer. Human impacts on the water balance, such as irrigation, are not considered. Complete descriptions of the equations can be found in the original study by Palmer (1965).

Several states, including New York, Colorado, Idaho, and Utah, use the Palmer Index as one part of their drought monitoring systems.

The Northern Basin and Range ecoregion and Great Basin are experiencing a wetter than recently experienced weather patterns. The trend for nearly 22 years (from 1988 through 2010 - Table 20) was an elevated drought situation the led to the loss of native bunch grasses and their replacement by an invasive exotic weed; cheatgrass (Downy Brome: *Bromus tectorum*). Cheat grass can thrive in the drought conditions present within the region during the past two decades (Figure 41) and it does not have the same nutritive qualities for wildlife and livestock as does native grasses. However, cheat grass seeds are a critical portion of the diet of the Chukar and Grey Partridge which have been introduced to the US.

Cheatgrass dries sooner in the summer season than other species in the region. When this happens, the biomass of the plant becomes susceptible to wildfire risks (Ziska, Reeves and Blank 2005). The region receives hot temperatures, low moisture, and high winds that when combined with an ignition source can lead to rapidly moving wildfires (range fires). Cheatgrass range fires have been a substantial challenge for the fire fighters of the region.

The current wetting trend does not ensure the repatriation of native grasses over cheatgrass, but it does make the conversion from the invasive species to the native grasses possible.

Figure 41. Downy Brome infested rangeland: photo taken in Northern Nevada, June 2005 (Toiyabe 2005).

4.4.5. Probability of Future Events

When considering the influence of global climate changes on the occurrence and behavior of natural disaster events, severe weather appears to be most vulnerable to changes in periodicity and destructive force. Anecdotal reports in the national media, scientific journals, and observations of events, have described increasing rainfall, warming temperatures even at higher elevations, and increased energy delivered by storms. At the same time, human habitation has expanded its reach into areas previously not suited for permanent homes, businesses, or infrastructure. The combined effect of the spread of human developments with increased storm force can lead to frequent (multiple times each year) destructive force events.

Severe weather is a driving force of energy for most natural event hazards such as wildfire and flooding. These disaster events will be discussed in further detail in subsequent sections of this document.

Predicting future severe weather events presents the same nature of predicting the weather next week, or next month. In general terms, the observer would expect that the future nature of severe weather events within the Duck Valley Indian Reservation would be similar to the histories documented in this planning document that illustrate extreme weather fluctuations, from occasional extreme warmth in the winter, too cold in the summer. And conversely colder temperatures in the winter, and higher temperatures in the summer months. The addition or decrease of precipitation in unison with these temperature changes may cause heavier flooding and heavier snow damages (lower winter temperatures with high precipitation) or increased wildfire risks (hotter summer temperatures with lower precipitation).

Generalizations about this extreme weather changes cannot be articulated as predictably as some of the other natural hazards, but conceptually it can be articulated as being responsive to the impacts of global climate change (Section 4.3, Global Climate Change). The changes to weather patterns have been observed during the past century. Unfortunately, that period of time limits our ability to make meaningful predictions about the ebb and flow of weather pattern changes. It is expected that new extremes will be witnessed during the next 50 to 100 years for all measurements of severity (e.g., wind speed and duration, rainfall daily extremes, drought intensity, river flow minimums and maximums, new high temperatures and new low temperatures).

The current climate of the Northern Basin and Range ecoregion and Great Basin varies widely by season and location. As a region that encompasses nature's extremes, much of the area consists of ecological boundaries, ranging from hot, dry lands that push the limits for sustaining life, to alpine areas perched on the region's high mountains. At present, much of this region is semi-arid and subject to variable precipitation that can result in drought and floods.

Given the region's normal conditions and the projected climate changes that could occur, extreme weather events could be of acute concern. Although there are limitations in using global and regional climate models to project future patterns of extreme events, some historical records, observations, and model simulations suggest that such events could increase in frequency and/or intensity. Changes in extreme events that could be of special importance in this region include increased occurrence of lightning-induced fires, increased duration of drought conditions, and floods caused by precipitation increases and inability of the western hydrologic network to accommodate expanded run-off.

Much of both the Northern Basin and Range ecoregion and the Great Basin are characterized by especially low levels of soil moisture and relative humidity. Changes in the climate of such semi-arid regions that would promote higher temperatures, increased evapotranspiration (loss of water by the soil and by plants), decreased precipitation, or increased variations in precipitation could result in prolonging the droughts that do occur, and/or increasing the frequency of drought occurrence (Shock, et al. 2011). The extreme heat waves associated with drought can have devastating effects on all life forms. Drought and heat can cause waterways to warm or evaporate and affect the fish and wildlife dependent on those habitats (Strzepek 1999). Heat and drought can increase community demands for water (at a time when there is less) (Wagner and Baron 1999).

4.4.6. Potential Mitigation Measures

Because the intersection of the Northern Basin and Range ecoregion and the Great Basin is typified by extremes, in some ways, the ecosystems are already resilient to extreme events. However, climate change is likely to increase the frequency and intensity of some types of extremes, while alleviating others. Resilient human habitations and life styles are a necessary component to mitigation against the potential changes to the climates of the region. Strategies that seek to increase the resiliency of both the built environment and the natural environment to extreme events could include efforts to:

- Keep vulnerable land-uses out of flood and fire-prone areas.
- Design buildings so they can be heated or cooled more efficiently and so they retain that heating/cooling more effectively.
- Organize social services to provide relief to vulnerable populations unable to afford protection from extreme events.
- Plan developments that make use of historical climate records as well as long-term climate forecasts, and factor climate information into policy and infrastructure decisions.
- Support research for distributed and alternative energy sources and policies to encourage use of distributed and alternative energy products and energy-conservation practices since traditional sources and transmission systems may be vulnerable to increases in extreme events.
- Intensify the focus on long-term sustainability and resiliency-building in all uses of the natural and the built environment.

Climate change could present an array of benefits as well as challenges to the Northern Basin and Range ecoregion and Great Basin region. Possible climate-changes could reduce stresses on this region's water resources, agriculture, and ranching. Climate changes could have mixed effects on outdoor recreation. But climate changes are likely to fundamentally alter natural ecosystems. An intensification of extreme events – especially forest and range fires, drought, and floods – are likely to accompany changes in climate, thus altering the region.

Although we should be careful when extrapolating results from climate models, especially because they still exhibit a wide range of estimates at the regional scale, these tools are valuable in generating reasonable projections of climate change and related impacts. As such, the projections conveyed in this analysis can be used to consider strategies that might be needed to better insulate this region from the adverse consequences of climate change.

Ice on power lines can cause power-line and telephone-line breakage leading to a disruption of communications and power for prolonged periods of time. Repairs to the system are often complicated because utility company repairmen must navigate stormy conditions while attempting to restore normal operations. Ice on area roadways can cause accidents and pose a hazard to both motorists and pedestrians.

Heavy snows can immobilize the Duck Valley Indian Reservation, isolate rural farms and homes, and cause the death of exposed animals. Heavy snowfall can clog roadways, immobilize transportation assets, and disrupt emergency and medical services. Roof-top snow accumulation can cause the collapse of buildings and death or injury to its inhabitants

The impact of prolonged winter storms on the local economy can be pronounced. The cost of snow plowing, de-icing, and overtime pay, can severely impact limited budgets. Disruption of transportation resources can impede the flow of food and supplies, and slow the economy.

Winter storms cause multiple fatalities each year resulting from vehicular accidents on icy or snow-clogged roads. Some people may die of heart attacks due to overexertion while shoveling heavy, wet snow. Each year, fatalities result from fires or carbon monoxide poisoning due to the use of alternative heating methods during storm-caused power outages. In more rare cases, individuals die of hypothermia from prolonged exposure to cold.

In light of high-wind warnings that have hit the Duck Valley Indian Reservation, it is recommended to initiate the service of incorporating high-wind warnings to the operation of the Tribal Emergency Operations Center (EOC). In the same lines of thinking, it is strongly urged that the Shoshone-Paiute Tribes prepare an Emergency Operations Plan (EOP) with an EOC detailed. These services would include those presented in the following sub-sections.

Additional action items related specifically to severe weather include:

- Continue participation in the StormReady Program and facilitate the placement of a NOAA weather radio tower on the Reservation,
- Inspect both public and private buildings for snow-loading capacity (every 10 years),
- Inspect roofing material stability on public and private buildings to sustain high straight-line winds without displacement,
- Integrate severe weather pre-construction mitigation capabilities (roofing fasteners, snow-load capability, and related items) into Tribal building-code requirements,
- Continue to use the Tribal Radio Station as a public services radio station for residents and visitors to the Duck Valley Indian Reservation that can be activated during emergency situations,
- Purchase and strategically install back-up generators for use during emergencies.

4.5. Floods

Flooding and storm water accumulation is most widespread along the edges of rivers and lakes. Flooding can impact any area where water accumulates on the surface and reaches a structure, road surface, or sensitive vegetative area.

4.5.1. Understanding Water Related Damages

Flooding is a natural process that occurs when water leaves river channels, lakes, ponds, and other water bodies where water is normally confined and expected to stay. It is also a serious and costly natural hazard affecting all of the Northern Basin and Range ecoregion and Great Basin when it occurs around buildings and infrastructure. Floods damage roads, farmlands, and structures, often disrupting lives and businesses. Flood-related disasters occur when property and lives are impacted by the flooding water. An understanding of the role of weather, runoff, landscape, and human developments in the floodplain is therefore the key to understanding and controlling flood-related disasters.

Natural flood events on the Duck Valley Indian Reservation are grouped into five general categories:

1. **Riverine Flooding:** a rise in the volume of a stream until that stream exceeds its normal channel and spills onto adjacent lands.
    a. **Slow kinds:** Runoff from sustained rainfall or rapid snowmelt exceeding the capacity of a river's bank-full width. Causes include heavy rains from monsoons, hurricanes and tropical depressions, warm winds and, more commonly on the Duck Valley Indian Reservation, warm rainfall landing on a deep and frozen snow pack (rain-on-snow events) in the highlands surrounding the Reservation – especially within the Owyhee River watershed.
    b. **Fast kinds:** Runoff causes a flash flood as a result of an intense and often prolonged thunderstorm or a rain-on-snow event coupled with high rainfall in lower altitudes of the Reservation.
2. **Flash Flooding:** Flash flooding results from high water velocity in a small area but may recede relatively quickly. These floods are generally fed by low-order streams and occur in headwater areas. Streams prone to flash flooding (such as Blue Creek on the north

side of the Reservation) do not possess the expansive floodwater storage area that higher-order streams typically possess. Flood storage areas are identified by wide and flat valley bottoms where flood waters decrease flow velocity, drop sediment load, and then re-enter the main stream channel. Low-order streams are typically confined to steep “V” shape valley bottom lands where channel widening does not occur. The only path for water to follow is the main stream channel where volume increases with heavy rain and snowmelt, causing water velocity to increase accordingly. Flash flooding is the combination of high water volume with high water velocity. When a topographic widening of the valley is found, a flash flood can be the result. The joining of two or more low-order streams into a floodplain, or a floodplain with high-order streams can accelerate into a riverine flood type, often of the “fast kind”.

3. **Ice/Debris Jam Flooding:** Floating debris or ice accumulates at a natural or man-made obstruction in rivers and restricts the flow of water, causing it to leave the bank-full width of the river and spill onto the floodplain and beyond. This flood type is common along the Owyhee River in response to the steep canyon walls geographically arranged north-south to receive little or no water-melting sunlight as the valley drops elevation on its approach to the Duck Valley Indian Reservation – the steep hillsides adjacent to the river limit the amount of sunlight that would provide solar radiation to melt the ice. This natural ice dam situation can occur within the Owyhee River (Figure 42) and in many of the other streams on the Reservation, but their occurrence along these other rivers is rare. Road crossings on the Reservation and low-profile bridges can exacerbate the problem by causing significant stream obstructions and river-bank erosion. When this is witnessed, flooding around the ice-dam impacted areas can flood homes, roads, and significant infrastructure.

4. **Mud Floods or Muddy Floods:** These flood types result from super-saturated soils on moderate to steep slopes that are generally destabilized by types of development (road building, structure construction) or other disturbance (landslides, or drastic changes in vegetation cover). The flow of these super-saturated soils can follow the same path as water down ravines, and in the process displace flood zones with heavy concentrations of mud and debris. They can occur on harvested forestlands and disturbed rangelands (Figure 43), and in high-impact housing developments. Muddy floods are a hillside process and not the same as mudflows, which are a mass-wasting process discussed in the Landslides Section (Section 4.7) of this document. Muddy floods primarily lead to damage of road infrastructure (leaving a mud blanket or clogging sewage networks) and property (Figure 45).

5. **Catastrophic Flooding:** These floods are caused by a significant and unexpected event such as a dam breakage or levee failure. Sometimes these floods are triggered by other natural or man-caused hazards such as an earthquake, landslide, volcanic eruption, or dam failure. They are caused when the Wild Horse Reservoir is breached by rapid snowmelt volumes to release water on a saturated Owyhee River channel. Flood waters exceed the capacity of the river to convey that water through the network, causing extreme flooding to occur on the Duck Valley Indian Reservation where the channel grade moderates (Figure 46).

Figure 42. Ice Jam flooding along Owyhee River on January 17, 2011.

Figure 43. Area where prescribed burning in 2009 reduced wildfire risk, but January 17, 2011, experienced muddy flood water accumulations.

Figure 44. 5/14/1984, Lower Duck Valley -- Owyhee River Channel -- looking northeast where muddy floods destabilized the bridge crossing. Note debris on bridge surface.

Figure 45. 5/15/1984, National Guard Bridge, Owyhee River. Approach was cut on near side to relieve water flow pressures.

Figure 46. 5/14/1984, East Fork of Owyhee River looking north towards Blue Creek.

Figure 47. April 18 & 19, 2011, Sheep Creek Road washout and road closure.

Flood damages are assessed in three related categories:

1. **Primary Effects:**
    a. Physical damage: These damages include harm to buildings, bridges, cars, sewer systems, roadways, canals, and any other type of structures,

b. Casualties: Described as the number of people and livestock that die due to drowning, leading to epidemics and diseases.

2. **Secondary Effects:**

   a. Water supplies: Can lead to the contamination of water. Clean drinking water becomes scarce.

   b. Diseases: Unhygienic conditions are present. Spread of water-borne diseases occurs.

   c. Crops and food supplies: Shortage of food crops can be caused due to loss of an entire harvest.

   d. Trees: Tree species not tolerant to prolonged subsurface water saturation can die from suffocation.

3. **Tertiary and Other Long-Term Effects:**

   a. Economic: Economic hardship due to a temporary decline in tourism, rebuilding costs, and food shortage leading to price increase.

The most commonly observed flood type on the Duck Valley Indian Reservation is a Riverine Flood. A “base flood” is the magnitude of a flood having a one-percent chance of being equaled or exceeded in any given year. Although unlikely, “base floods” can occur in any year, even successive ones. This magnitude is also referred to as the “100-year Flood” or “Regulatory Flood” by state government (IBHS 2008).

Both the Ice-jam flood and the muddy floods are seen on the Duck Valley Indian Reservation, although their genesis is often from the Riverine Flood type. Often the Catastrophic flood is also derived from the Riverine Flood type although components of the muddy flood and ice jam flood may combine to cause catastrophic flood damages.

The low-relief areas adjacent to the channel that normally carries water, are collectively referred to as the floodplain. In practical terms, the floodplain is the area that is inundated by floodwaters. In regulatory terms, the floodplain is the area that is under the control of floodplain regulations and programs (such as FEMA’s National Flood Insurance Program, which publishes the Federal Insurance Rate Maps, or FIRM maps). Idaho State Code (IBHS 2008) defines the floodplain as:

> *“That land that has been or may be covered by floodwaters, or is surrounded by floodwater and inaccessible, during the occurrence of the regulatory flood.”*

Figure 48. Wild Horse Reservoir on the Owyhee River, upstream of Duck Valley.

4.5.2. Floodplain on the Duck Valley Indian Reservation

The Shoshone-Paiute Tribes of the Duck Valley Indian Reservation have not entered into the National Flood Insurance Program (NFIP) with FEMA and therefore no Flood Insurance Rate Maps (FIRM) have been generated for the Reservation. Two efforts have been made to map flood prone areas on the Reservation; one by the BIA, and the other by the Bureau of Reclamation (BOR).

The efforts by the BIA concentrated on the Blue Creek drainage drawing off areas north of the Reservation in Idaho and into the Owyhee River, northwest of Owyhee (Figure 49). The BOR efforts were to model Wild Horse Reservoir Dam failure and spillway overflow (Figure 50). This effort focused on the Owyhee River from the dam and onto the Reservation to the confluence with Blue Creek. The two flood zones converge at the Blue Creek and Owyhee River confluence (Figure 51).

Maps of predicted flood risks are presented on large-scale and small-scale wall maps and have been used for planning purposes and public display at meetings. Both of these flood zone estimations have been made for the 1% chance of occurrence on an annual basis (the so-called 100-year flood zone). Neither estimate replaces the FEMA identified FRIM designation of the flood zone, nor do they qualify the Shoshone-Paiute Tribes for NFIP entry.

Figure 49. Potential Flood-Impact Areas of the Duck Valley Indian Reservation: Blue Creek Drainage.

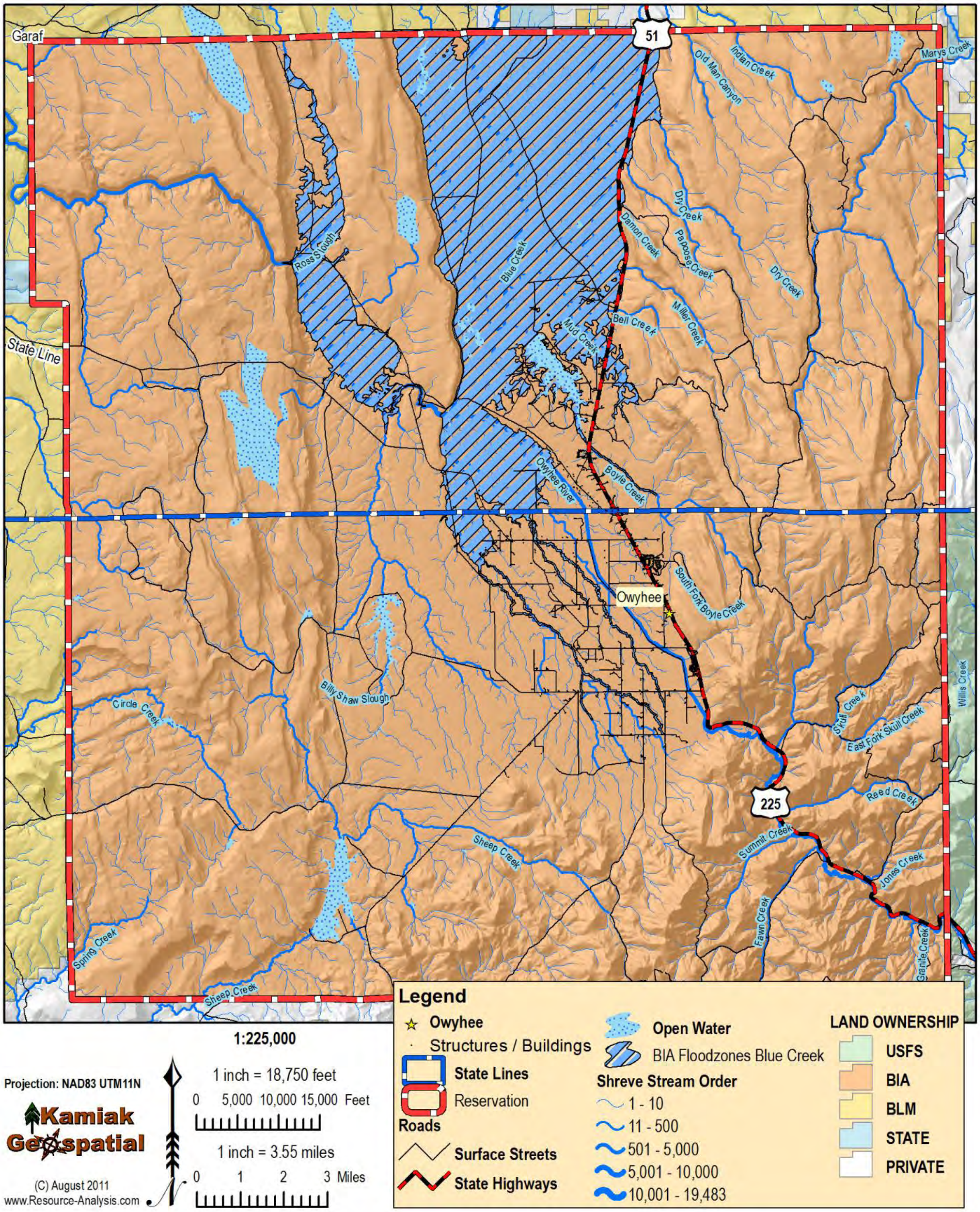


Figure 50. Potential Flood-Impact Areas of the Duck Valley Indian Reservation: Wild Horse Dam Failure and Spillway Overflow.

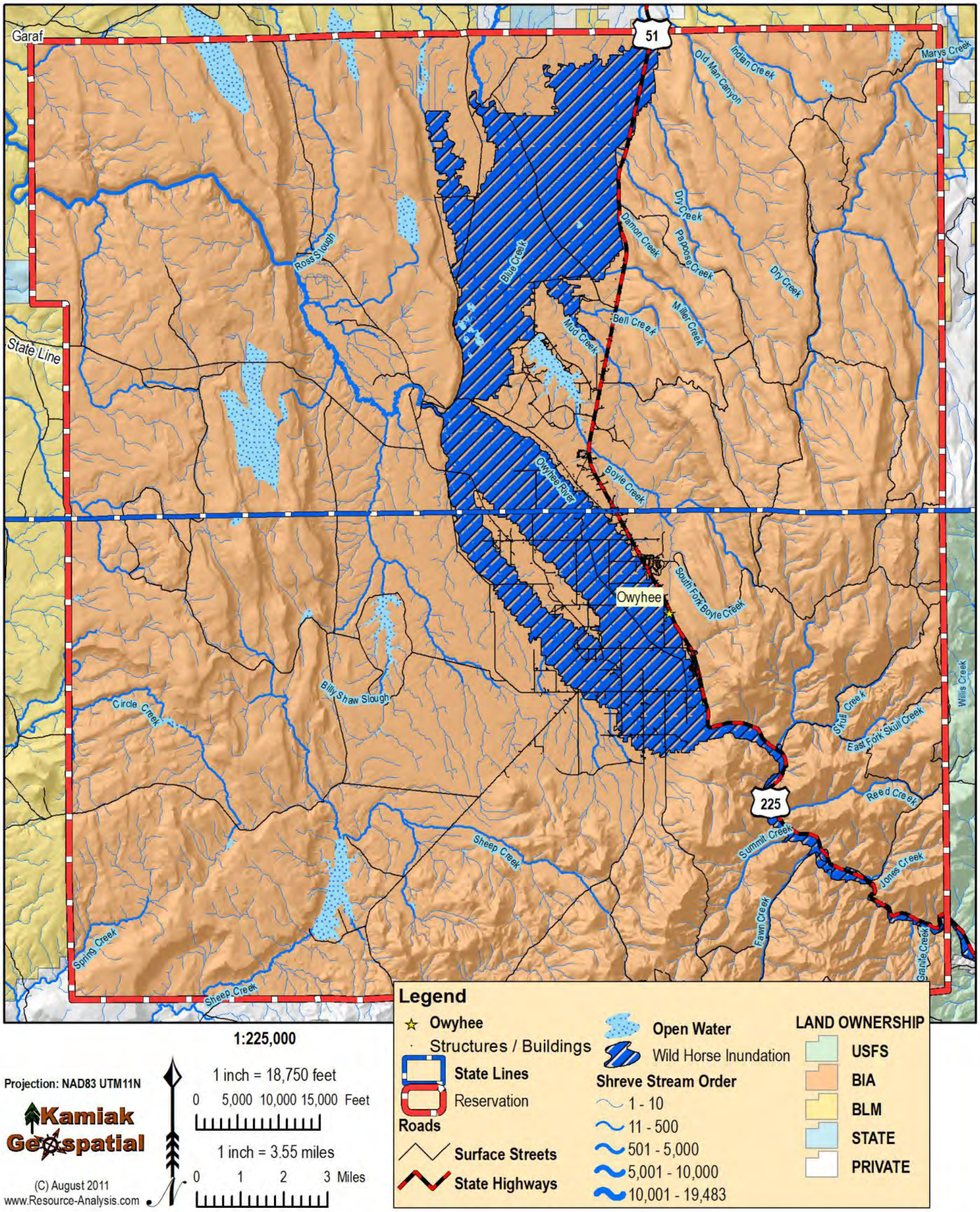
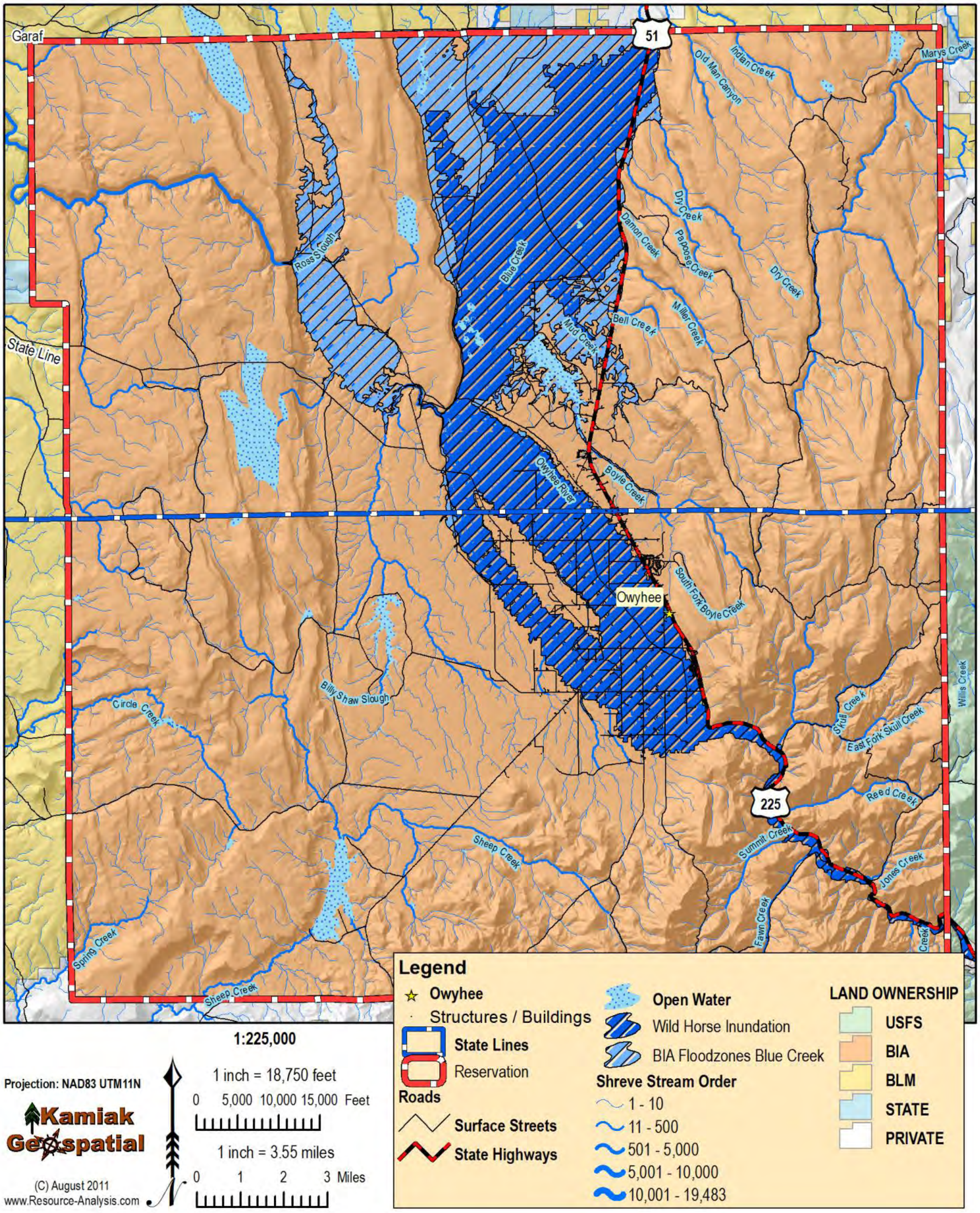


Figure 51. Potential Flood-Impact Areas of the Duck Valley Indian Reservation: Combination of Blue Creek Drainage and Owyhee River inundation.



4.5.3. Weather

Winter and spring weather conditions are the main driving force in determining where and when base floods will occur. The type of precipitation that a winter storm produces is dependent on the vertical temperature profile of the atmosphere over a given area. The Northern Basin and Range ecoregion and Great Basin experiences riverine flooding from two distinct types of meteorological events:

- spring runoff and
- winter rain/snowmelt events.

The major source of flood waters in the Northern Basin and Range ecoregion and Great Basin is normal spring snow melt. As spring melt is a “natural” condition, the stream channel is defined by the features established during the average spring high flow (bank-full width). Small flow peaks exceeding this level and the stream’s occupation of the floodplain are common events.

Unusually heavy snow packs or unusual spring temperature regimes (e.g., prolonged warmth) may result in the generation of runoff volumes significantly greater than can be conveyed by the confines of the stream and river channels. Such floods are often the ones that lead to widespread damage and disasters. Floods caused by spring snow melt tend to last for a period of several days to several weeks, longer than the floods caused by other meteorological events.

Floods that result from rainfall on frozen ground in the winter, or rainfall associated with a warm, regional frontal system that rapidly melts snow at low and intermediate altitudes (rain-on-snow), can be the most severe. Both of these situations quickly introduce large quantities of water into the stream channel system, easily overloading its capacity.

These situations are also amplified by ice-jam flooding events common to the Owyhee River. This river drainage is especially problematic because it is directionally aligned north to south with steep banks rising over a thousand feet on both sides. The topography eliminates solar radiation to the valley bottom during the winter, leading to accumulations of river ice. Melting waters in the Wild Horse Reservoir released in high flow events, allows the heightened water temperature to mix with ice in the lower river causing ice debris to break loose in the channel and create ice jams.

On smaller drainages, such as Blue Creek, the most severe floods are usually a result of rainfall on frozen ground but moderate quantities of warm rainfall on a snow pack, especially for one or more days, can also result in rapid runoff and flooding in streams and small rivers. Although meteorological conditions favorable for short-duration warm rainfall are common, conditions for long-duration warm rainfall are relatively rare. Occasionally, however, the polar front becomes situated along a line from Hawaii through Oregon and warm, moist, unstable air moves into the region. Most winter floods develop under these conditions, as has been the case with several floods of in Idaho (Idaho BHS 2010) and Nevada (Nevada DPS 2010).

In general, the meteorological factors leading to flooding are well understood. They are also out of human control, so flood mitigation must address the other contributing factors leading to losses.

4.5.4. Topography and Geographic Influences

The nature and extent of a flood event is the result of the hydrologic response of the landscape. Factors that affect this hydrologic response include soil texture and permeability, land cover and vegetation, land use, and land management practices. Precipitation and snowmelt, known collectively as runoff, follow one of three paths, or a combination of these paths, from the point of origin to a stream or depression: overland flow, shallow subsurface flow, or deep subsurface (“ground water”) flow. Each of these paths delivers water in differing quantities and rates. The character of the landscape will influence the relative allocation of the runoff and will, accordingly, affect the hydrologic response.

Unlike precipitation and ice formation, steps can be taken to mitigate flooding through manipulation or maintenance of the floodplain. Insufficient natural water-storage capacity and changes to the floodplain landscape can be offset through water storage and conveyance systems that run the gamut from highly engineered structures to constructed wetlands.

Careful planning of land use can build on the natural strengths of the hydrologic response. Re-vegetation of burned slopes diverts overland flow (fast and flood producing) to subsurface flow (slower and flood moderating). Details on rehabilitating burned areas to reduce flash floods, debris flows, and landslides can be found in the Landslide section of this document (Section 4.7).

The amount, location, and timing of water reaching a drainage channel – from natural precipitation and controlled or uncontrolled reservoir releases – determines the flow at downstream locations. Some precipitation evaporates, some slowly percolates through soil, some may be temporarily sequestered as snow or ice, and some may produce rapid runoff from surfaces including rock, pavement, roofs, and saturated, or frozen ground. The fraction of incident precipitation promptly reaching a drainage channel has been observed from nil, for light rain on dry, level ground, to as high as 170 percent for warm rain on accumulated snow (Babbitt and Doland 1949).

One major and one minor stream system within the Duck Valley Indian Reservation are the Owyhee River (major), and Blue Creek system (minor). The Owyhee River system drains lands to the south all the way to the crest of the Jarbridge Mountains (Nevada). Blue Creek drains the uplands within Owyhee County (Idaho) of the northern extent of the Duck Valley Indian Reservation. All surface water crossing the Duck Valley Indian Reservation enters the Owyhee River on its way to the Snake River, then the Columbia River.

4.5.5. Historic Flood Occurrence

The Duck Valley Indian Reservation has experienced a long history of high-magnitude floods, typically recorded as “100-year” flood events. The diverse landscape and weather patterns within the Northern Basin and Range ecoregion and Great Basin are the triggers for those high-magnitude floods. Rain-on-snow events and above-normal spring high temperatures are typical antecedents to spring floods. The combination of these two factors can be devastating and can cause extraordinary flooding events. When coupled with ice-jam flooding along the Owyhee River, the combination of flood-event impacts can be unpredictable and disastrous.

Major flooding typically occurs during late-winter and spring seasons and is often triggered by rain-on-snow events. The conditions of an annual winter snow pack with an inversion weather system that brings above-freezing temperature rains to the headwaters of the area lead to the highest stream water flows. These conditions can turn a normal-level water flow in rivers to extreme-flow surges within five days that remain above flood stage for as long as two weeks.

Normal-flow exacerbation of the water transport system in the region’s rivers is caused by infrastructure development in the form of bridges and the construction of roads beside rivers during the past 100 years. The case of infrastructure developments on the Duck Valley Indian Reservation in the form of bridges and roads beside rivers has caused a definable complication to the normal flow of water in the region’s streams and rivers. Examples of this have been seen along the Owyhee River as bridges have been overtopped or became part of debris dams during high-water events.

A cursory look through the events detailed in Table 20, reveals that many were related to flooding (Figure 52). The following discussion looks at some of the recent and more historical flood events impacting the Duck Valley Indian Reservation.

Figure 52. The 1952 flood of the Owyhee River in Duck Valley; Montey Manning collection (McKinney 1983).

4.5.5.1. Flood Profile

The Owyhee River is the only drainage network flowing through the Duck Valley Indian Reservation with USGS monitoring station. The station is located above the China Town Diversion Dam near Owyhee, Nevada (on the Reservation).

- Owyhee River
- Elko County, Nevada / Duck Valley Indian Reservation
- Hydrologic Unit Code 17050104
- Latitude 41°55'15.99", Longitude 116°04'10.41" NAD83
- Drainage area 458 square miles
- Gage datum 5,425.00 feet above NGVD29
  (USGS 2011)

Flood stage at this station is 8.0 feet. Data are available from 1939 through 1984, although data are continuously monitored. Stream flow data for the Owyhee River at the China Town Diversion Dam reveals the flood stage on this river was observed for high annual flow amounts during 23 years in the 45 year period between 1939 and 1984 (Figure 53, Table 27).

Figure 53. USGS Owyhee River velocity at the China Town Diversion Dam.

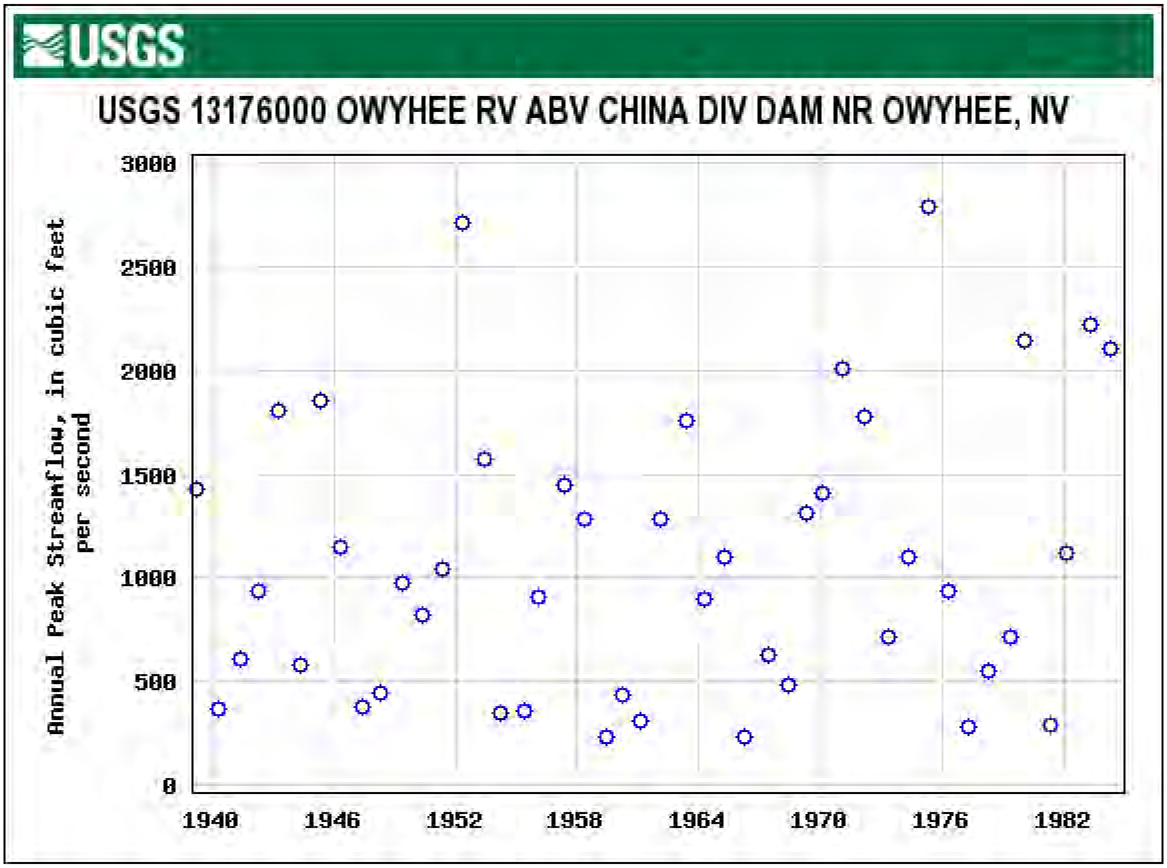


Table 27. USGS Owyhee River stream flow annual maximum heights 1939-1984 at China Town.

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)	Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1939	Mar. 25, 1939		14,306	1962	Feb. 12, 1962	8.83	12,806
1940	Mar. 27, 1940	4.14	3656	1963	Jun. 05, 1963	9.61	17,606
1941	11-May-41	5.9	6106	1964	Apr. 01, 1964	7.95	9006
1942	Apr. 14, 1942	7.62	9346	1965	Apr. 22, 1965	8.51	11,006
1943	Apr. 09, 1943	9.12	18,006	1966	Apr. 02, 1966	4.2	2306
1944	9-May-44	5.72	5846	1967	23-May-67	7.09	6286
1945	6-May-45	9.18	18,506	1968	Jun. 06, 1968	6.4	4836
1946	Apr. 20, 1946	8.34	11,506	1969	Apr. 06, 1969	9.11	13,106
1947	9-May-47	4.61	3826	1970	Jan. 23, 1970	9.24	14,106
1948	Apr. 22, 1948	5.22	4496	1971	Jan. 18, 1971	10.01	20,106
1949	18-May-49	7.86	9786	1972	Mar. 03, 1972	9.72	17,706
1950	17-May-50	7.27	8226	1973	Apr. 30, 1973	7.63	7186
1951	Apr. 19, 1951	8.15	10,406	1974	Apr. 25, 1974	8.72	11,006
1952	3-May-52	10.07	27,106	1975	18-May-75	10.84	27,906

Table 27. USGS Owyhee River stream flow annual maximum heights 1939-1984 at China Town.

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)	Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1953	Jun. 02, 1953	9.13	15,706	1976	6-May-76	8.49	9346
1954	Mar. 09, 1954	4.85	3506	1977	Apr. 08, 1977	4.54	2786
1955	9-May-55	4.98	3566	1978	Apr. 27, 1978	6.51	5476
1956	Jan. 16, 1956	8.09	9046	1979	17-May-79	7.89	7186
1957	19-May-57	9.34	14,506	1980	Jan. 14, 1980	10.17	21,406
1958	12-May-58	8.85	12,806	1981	25-May-81	4.61	2896
1959	27-May-59	4.1	2356	1982	Feb. 17, 1982	8.77	11,206
1960	Apr. 07, 1960	6.07	4376	1983	Apr. 25, 1983	10.14	22,206
1961	Feb. 10, 1961	4.95	3066	1984	Apr. 17, 1984	10.23	21,006

Flood stage is seen for heights over 8.0 feet and are shaded green here (USGS 2011)**.**

Gold Creek station is located slightly below Wild Horse Dam on the Owyhee River. The USGS does not publish a flood height for this station. Correlation between annual maximum flows at China Town (Table 27) and Gold Creek (Table 28) do not correspond for each date where each station experienced a high flow rate. Some tributaries influence the flow levels at China Town Diversion Dam but not Gold Creek below the dam. These data do, however, provide insightful evidence of high fluctuations in river flow volumes, despite the presence of a flow controlling dam (Wild Horse).

Table 28. USGS Owyhee River stream flow annual maximum heights 1916-2010 at Gold Creek.

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)	Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1916	Apr. 11, 1916	7.7	970	1969	Apr. 29, 1969	5.33	417
1917	14-May-17	8.5	1,380	1970	Aug. 12, 1970	3.62	144
1918	Apr. 11, 1918	4.0	260	1971	12-May-71	4.31	262
1920	Apr. 30, 1920	6	623	1972	Apr. 08, 1972	2.98	352
1921	Apr. 22, 1921	6.8	828	1973	6-May-73	2.61	210
1922	5-May-22	10.1	1,810	1974	Apr. 21, 1974	3.45	565
1923	Apr. 17, 1923	3.91	282	1975	20-May-75	4.35	945
1924	Apr. 10, 1924	5.82	670	1976	Jun. 22, 1976	2.38	194
1925	Apr. 12, 1925	6.73	860	1977	8-May-77	2.26	177
1937	Apr. 15, 1937	3.80	267	1978	Jun. 29, 1978	2.43	220
1938	Apr. 19, 1938	4.92	553	1979	Jul. 20, 1979	2.69	282
1939	Mar. 23, 1939	5.44	705	1980	Jun. 05, 1980	2.66	252
1940	30-May-40	3.24	167	1981	Sep. 30, 1981	2.69	244
1941	Jun. 24, 1941	2.84	111	1982	19-May-82	2.63	2406
1942	Apr. 18, 1942	4.23	335	1983	Apr. 25, 1983	5.45	1,700
1943	Apr. 05, 1943	6.62	980	1984	14-May-84	5.2	159
1944	Jul. 04, 1944	3.13	142	1985	Jun. 23, 1985	2.29	297
1945	6-May-45	5.09	572	1986	Apr. 15, 1986	2.42	357

Table 28. USGS Owyhee River stream flow annual maximum heights 1916-2010 at Gold Creek.

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)	Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1946	Apr. 20, 1946	4.76	500	1987	12-May-87	1.89	153
1947	Jun. 25, 1947	3.14	144	1988	Jul. 13, 1988	1.83	135
1948	Jun. 25, 1948	3.28	172	1989	Jun. 15, 1989	1.96	169
1949	Jun. 30, 1949	3.47	202	1990	Jul. 16, 1990	1.99	154
1950	Apr. 29, 1950	3.61	243	1991	Jul. 08, 1991	1.82	122
1951	Apr. 19, 1951	4.12	353	1992	Jun. 05, 1992	1.49	87
1952	Apr. 29, 1952	6.7	1,210	1993	Sep. 30, 1993	1.73	109
1953	Jun. 01, 1953	4.6	464	1994	Jul. 04, 1994	1.86	140
1954	15-May-54	3.34	182	1995	Aug. 10, 1995	1.59	100
1955	Jul. 07, 1955	3.1	134	1996	19-May-96	1.95	156
1956	Jun. 28, 1956	3.1	136	1997	2-May-97	2.82	334
1957	20-May-57	4.15	352	1998	17-May-98	2.63	264
1958	Apr. 23, 1958	4.92	552	1999	Jun. 04, 1999	2.12	163
1959	5-May-59		111	2000	Jun. 28, 2000	2.21	175
1960	Jun. 17, 1960		120	2001	Jun. 02, 2001		200
1961	Jun. 17, 1961		109	2002	Jun. 18, 2002	2.26	1666
1962	Apr. 20, 1962	3.95	318	2003	Jun. 18, 2003	2.14	1516
1963	Jun. 15, 1963	3.27	188	2004	Jun. 20, 2004	1.93	1196
1964	Jul. 10, 1964	4.5	461	2005	Sep. 02, 2005	1.85	1146
1965	24-May-65	3.07	156	2006	Apr. 25, 2006	4.31	9976
1966	21-May-66	3.12	145	2007	Jun. 13, 2007	2.17	1686
1967	Jul. 28, 1967	3.04	134	2008	Jul. 17, 2008	2.06	1496
1968	13-May-68	3.27	88	2009	Aug. 02, 2009	1.94	1286
				2010	Jul. 20, 2010	2.06	142

The extensive history of data (100 years) for the Owyhee River at Gold Creek provides evidence of extremely high water volumes along the Owyhee River (Figure 54, Figure 56) intermixed with moderated flow amounts. When observed on the shorter time-scale (Figure 55), the observer can see evidence of rapid flow rate increases and moderate returns to normal flow amounts. In the May 2011 example provided in Figure 55, the rate of increase to its peak took only five days, while the moderation of the flow took nearly two months to return to normal flow levels. These characteristics can be observed when a rapid warming occurs to melt mountain snowpacks and is accompanied by rain-on-snow events, such as was observed in the spring 2011.

Average (1911-2010) annual river flow amounts (Figure 57) show the trend of flows that increase dramatically in April, peak in May, and then continue through August. Part of the flow characteristics over Wild Horse Dam is a need to maintain irrigation waters into the summer growing season in Duck Valley.

Figure 54. Daily Mean Discharge on Owyhee River at Gold Creek 1911-2010.

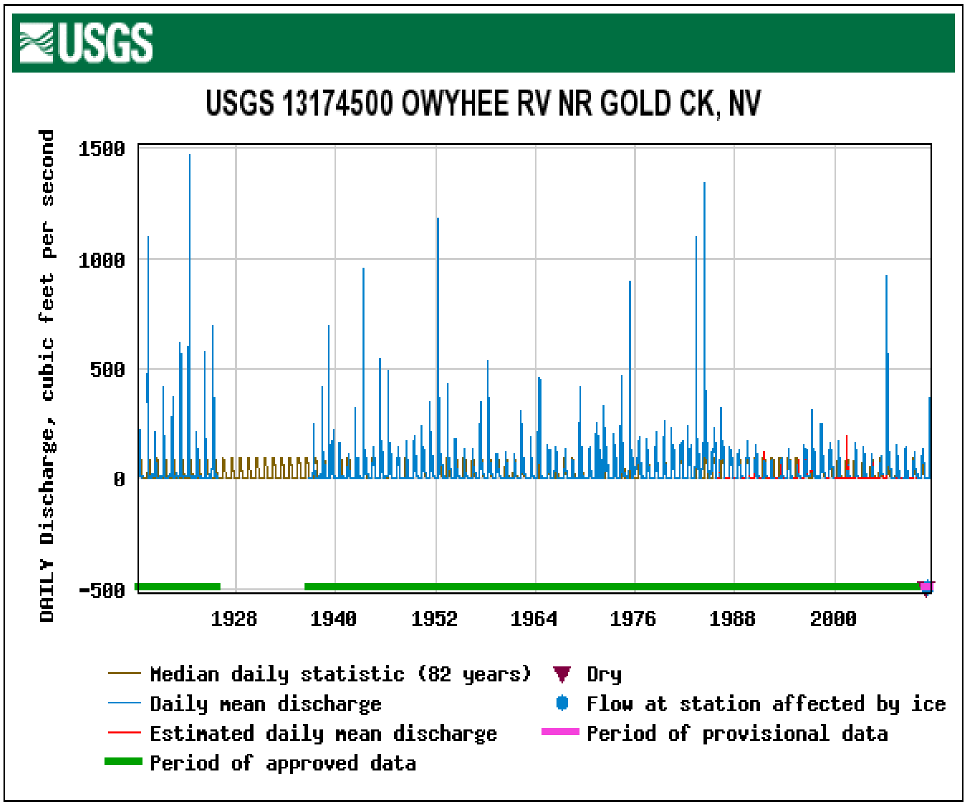


Figure 55. Daily Mean Discharge on Owyhee River at Gold Creek 4/23/2011-8/13/2011.

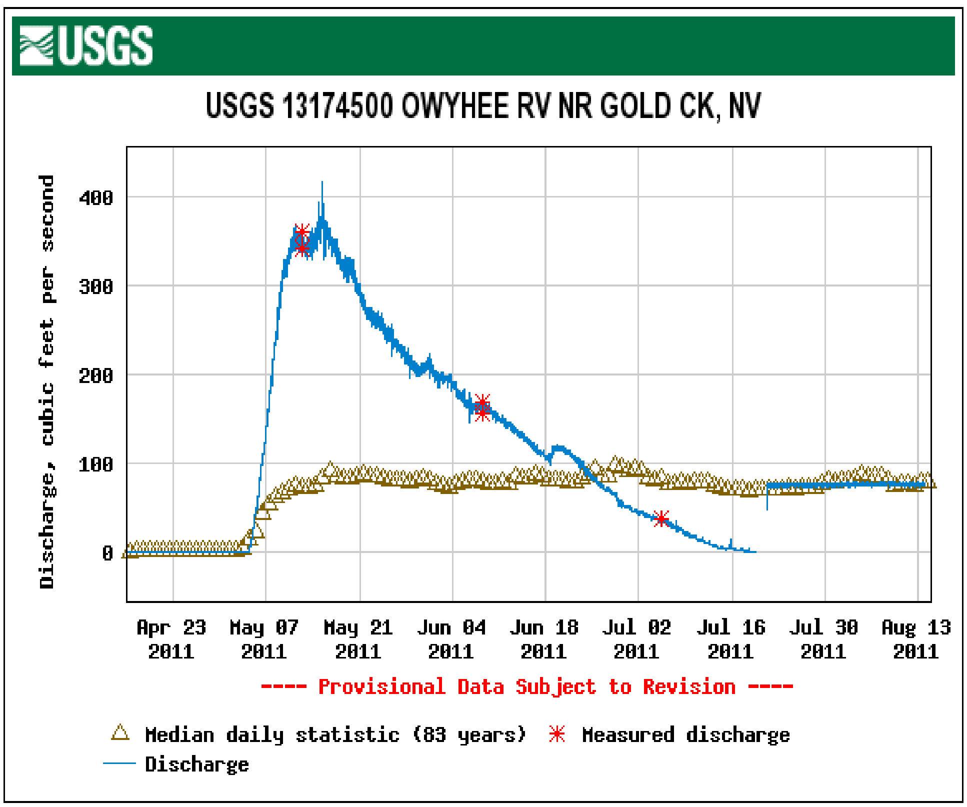


Figure 56. Average Monthly Owyhee River Discharge below the Wild Horse Dam (1916-2010).

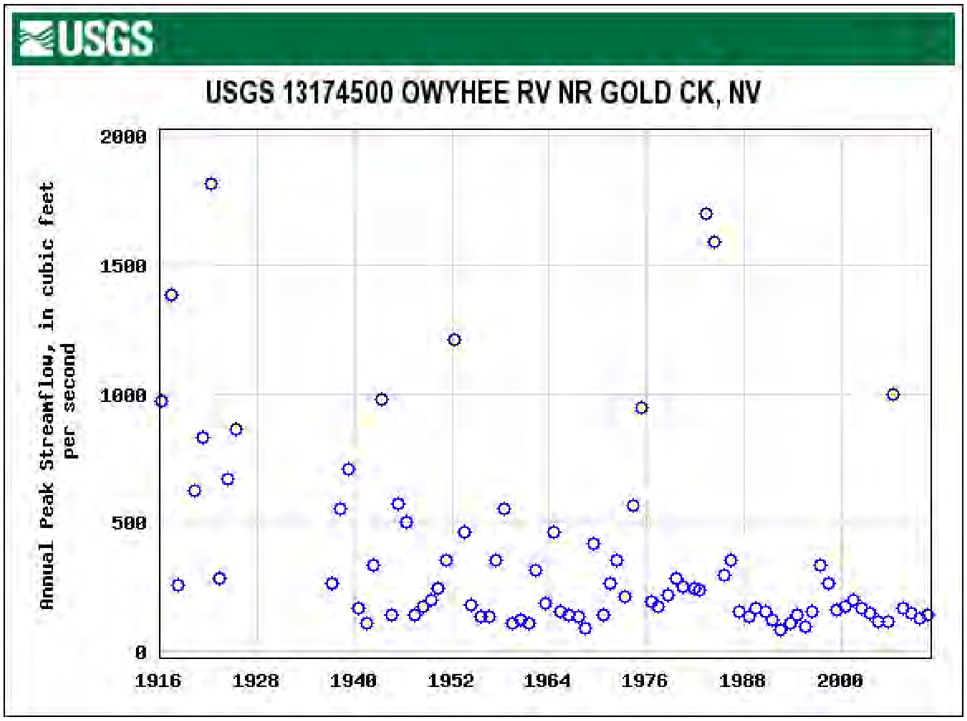
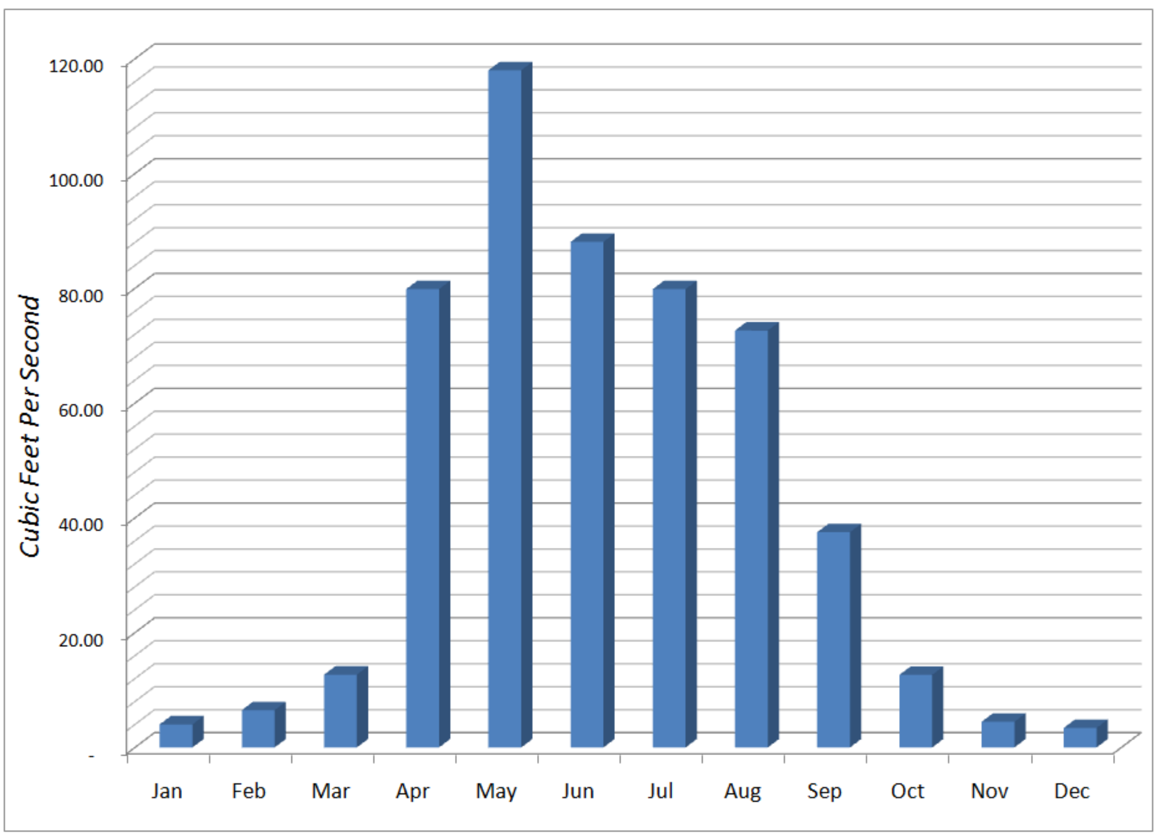


Figure 57. Owyhee River Average Monthly flow at Gold Creek 1911-2010.



4.5.5.2. Flood Incident Summary-May 12-19, 1984

Continuous rainfall and warm temperatures the week leading up to May 12, 1984, contributed to the Duck Valley Flood of 1984. Wild Horse Reservoir sits high in the high mountain plateau of the Owyhee River Canyon and was constructed in 1937 and rebuilt in a new location in 1969. The Wild Horse Reservoir flows the Owyhee River with numerous amounts of tributaries flowing into the river through the canyon and the reservation. On the morning of May 12, 1984 the water was approximately 2.5 feet over the spillway of the dam releasing 1,500 cubic feet per second of water into the Owyhee River. The flood-swollen river had blocked the highway at the entrance into the Duck Valley Indian Reservation and the Nevada Highway Patrol had closed the entire route indefinitely. The community of Mountain City was being threatened by high flood waters on the river side of town and the highway through the canyon was being threatened by falling rocks.

On the day of May 16, 1984, an elderly transient was discovered after he was traveling south from Idaho when he came to an area on the Reservation where the water was flowing over the roadway. He drove into the northbound lane to avoid water when he overcorrected and his wheels ran off the asphalt and were stuck in the soft mud. The cold runoff flooded throughout the car, as the transient, who carried a walker with him, could not get out of his car and died of exposure from the frigid temperature of the water. Emergency managers could not pinpoint the exact amount of time he had been in his car as the highway had been closed since the previous Friday. The man’s family had submitted a missing persons report the day before in Idaho.

The community of Owyhee and the surrounding scattered home sites alongside the river had been extremely vulnerable to the flood. Three bridges the community uses for transportation infrastructure were threatened and closed due to the high water torrent and debris blockage. The mighty, gushing flow of the river had caused the embankment to erode away the dirt road alongside the river. The Mountain View Reservoir had crested to maximum capacity of its earthen dam’s structural limits. All of the Blue Creek area was flooded as the mouth of the Owyhee Canyon was at its highest choking point flowing northwesterly. The water finally receded after seven days of high rainfall and snowmelt as water levels returned to normal.

Reservation Summary-Unknown

Elko Daily Free Press

4.5.5.3. Spillway Overflow May 11, 2006

Flood Warnings: May 11, 2006

FLOOD STATEMENT

NATIONAL WEATHER SERVICE ELKO, NV

1120 AM PDT THU MAY 11 2006

...FLOOD WARNINGS IN EFFECT FOR ALL RIVERS AND STREAMS IN ELKO...NORTHERN LANDER...NORTHERN EUREKA...AND HUMBOLDT COUNTIES...

...MINOR FLOODING IS OCCURRING ON THE HUMBOLDT RIVER FROM BATTLE MOUNTAIN THROUGH WINNEMUCCA...ALONG THE BRUNEAU RIVER...AND ALONG THE LOWER REACH OF THE MARYS RIVER...

...WILDHORSE RESERVOIR IS ABOVE THE SPILLWAY...

RUNOFF FROM SNOWMELT IS CAUSING HIGH FLOWS ALONG MANY AREA RIVERS AND STREAMS. MINOR TO MODERATE FLOODING IS EXPECTED TO CONTINUE THROUGH THIS WEEK. WARMER TEMPERATURES THIS WEEK WILL INCREASE SNOW MELT AT

HIGHER ELEVATIONS...RESULTING IN ADDITIONAL RISE...ESPECIALLY IN SMALLER RIVERS AND STREAMS ACROSS NORTHERN NEVADA.

WILDHORSE RESERVOIR...ON THE OWYHEE RIVER...IS AT CAPACITY. WATER IS FLOWING OVER THE SPILLWAY INTO THE OWYHEE RIVER.

AT 11 AM...WILDHORSE RESERVOIR WAS AT 6206.4 FEET. THE HEIGHT OF THE SPILLWAY IS 6205.0 FEET. WATER IS FLOWING OVER THE SPILLWAY INTO THE OWYHEE RIVER.

AT 11 AM...THE OWYHEE RIVER AT MOUNTAIN CITY WAS 7.2 FEET. FLOOD STAGE IS 8.0 FEET. NO FLOODING IS OCCURRING. THE RIVER IS EXPECTED TO REMAIN NEAR THIS LEVEL THROUGH SUNDAY.

DO NOT DRIVE CARS THROUGH FLOODED AREAS. STAY TUNED TO DEVELOPMENTS BY LISTENING TO NOAA WEATHER RADIO.

4.5.5.4. Floods of April & May 2011

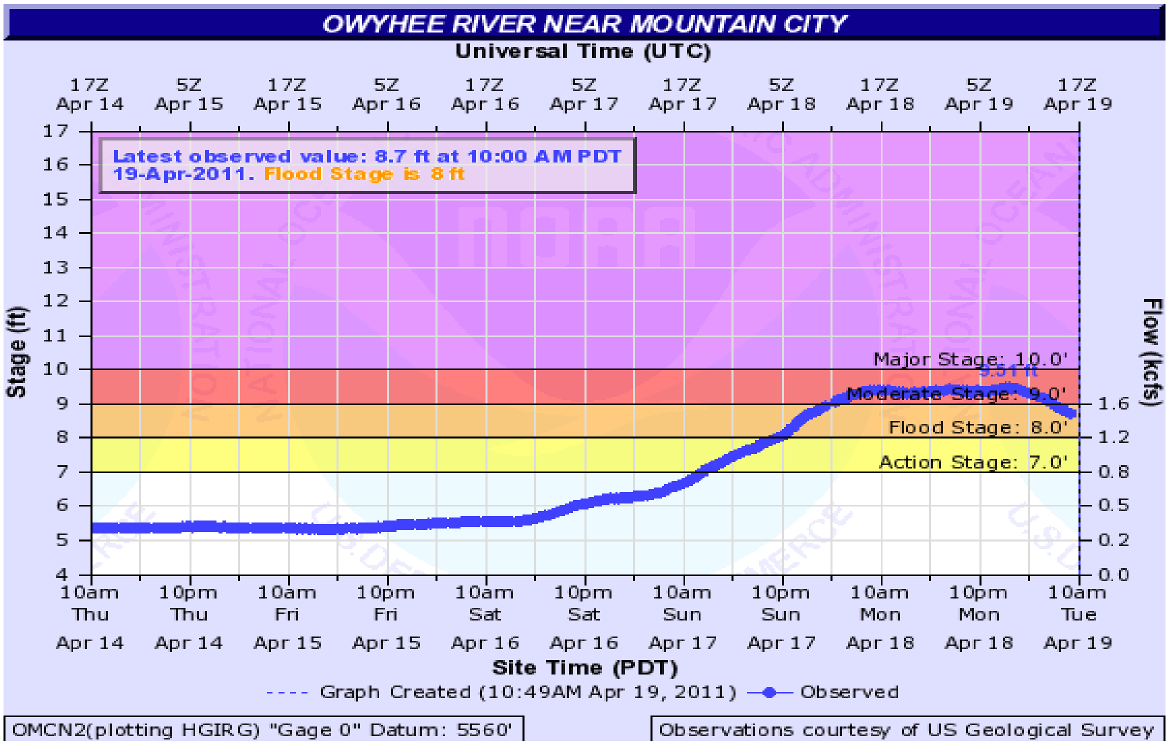
The National Weather Service issued flood warnings to people within the area of Elko, Nevada, concerning flood conditions within the drainages of Mary's River near Charleston, Bruneau River near Rawlins, Owyhee River at Mountain City, and Martin Creek near Paradise Valley. Sho-Pai News (Figure 64) reported on the situation on the Duck Valley Indian Reservation recognizing that the flood stage of the Owyhee River occurs with flows over 8 feet, and that on May 16th the flow was 8.60 feet and decreasing. The NWS reported on May 15th, a flow level of 8.91 feet (Figure 65).

By May 19th, substantial amounts of debris had accumulated along the China Town Diversion Dam (Figure 66). The accumulation of river delivered debris on the Reservation was seen at bridge crossings and irrigation channels fed by the Owyhee River.

The National Weather Service in Elko, Nevada issued several flood advisories and warnings for Northern Elko County in the spring of 2011. On April 17, at about 1:00 in the afternoon, the Owyhee river gauge station near Mountain City reported a reading of 7 feet (Figure 58). This prompted the National Weather Service to post a flood advisory. This was later upgraded to a flood warning for the East Fork of the Owyhee river. This flooding was the result of large amounts of rain on a heavy snow pack in the mountains. At the time of this event the Wild Horse dam was not releasing any water into the river. The Remote Automated Weather System (RAWS) on the Duck Valley Reservation recorded a precipitation reading of 1.15 inches on April 17 and April 18.

Over an 18 hour period the river continued to rise from 0.8 KCFS to 1.8 KCFS (Figure 58).

Figure 58. USGS river flow graph for Owyhee River in April 2011.



On the Duck Valley Reservation, the flooding was causing road and river embankment erosion. Nevada State Highway 225 from Owyhee to Mountain City was very close to being impassable (Figure 59). The Boney lane bridge was a couple feet from cresting (Figure 60). Two access roads to an area known as Pleasant Valley were closed because of the high river flow (Figure 61). There was flooding of low lying hay fields and pastures.

Figure 59. Nevada State Highway 225 adjacent to the Owyhee River as flood waters rose.

Figure 60. Boney lane bridge only a couple feet from being crested by the Owyhee River in April 2011.

Owyhee River eventually dropped out of the moderate stage a couple days later but continued to flow above 'action stage'. As the spring progressed into May the Owyhee river continued fluctuate on the flood scale. Then on May 11, 2011 the Wild Horse reservoir began to dump excess runoff over the spill way. This caused the river to flow at a higher consistent rate over a longer period of time (Figure 61 - Figure 66).

Figure 61. Flooding and high water road closures on the Duck Valley Reservation in April, 2011.

Figure 62. High water threatens River Road (April 18 & 19, 2011).

Figure 63. High waters close Pleasant Valley Road (April 18 & 19, 2011).

Figure 64. Sho-Pai News article conveying flood status on Owyhee River in May 2011.

4 Sho-Pai News LOCAL JUNE 2011

Owyhee River running high and fast

Members of the fire department assess the river situation and check roads for possible flooding. This photo was taken along River Road. The road is currently closed to traffic. (Submitted photo.)

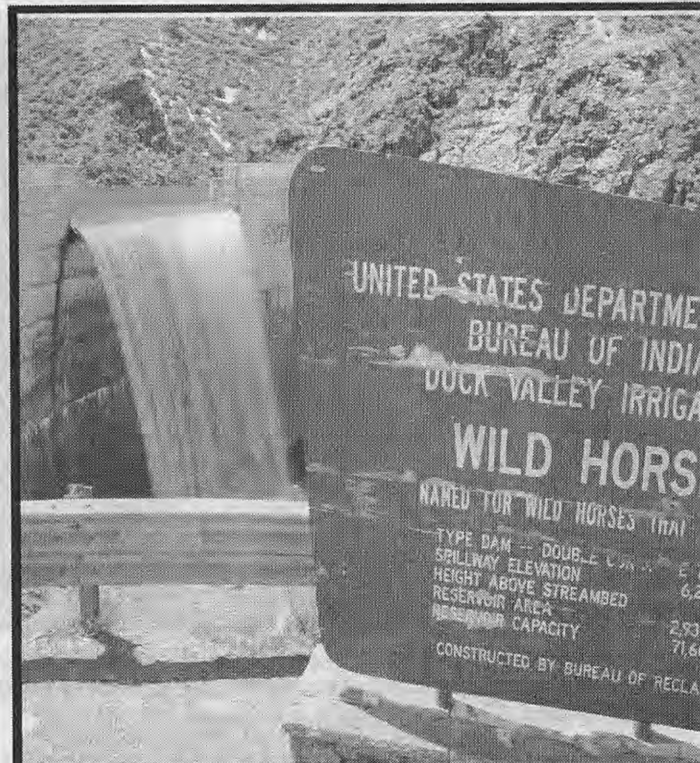
By DeMetria Sam

After days of heavy rain and snow, the Owyhee River and small streams on the Duck Valley Indian Reservation had risen and some were flooding.

The National Weather Service states the official flood level is 8 feet. But, on the morning of May 16, 2011, Fire Management Officer, Brent Hunter had reported the Owyhee River to be 8.60 feet at the south gate monitor.

"The only real threat at this point would be a NV State 225 road closure but that will be a NDOT call although I don't think it's even over the road," stated Hunter via an email transmission. According to Hunter, forecasts say it should be at its highest today and tomorrow but will be of decreased levels after that. An advisory not to take River Road, River Road crossings, or Pleasant Valley Bridge was recommended at this time.

Fortunately, with the weather turn around—Hunter reports later the same day that the level had decreased to 8.46. The Sho-Pai Fire Department will continue to monitor.



Water started spilling over Wildhorse Dam in early May--the last time it reached this level was five years ago. This photo was taken by DeMetria Sam on May 6.

CenturyLink offers telephone assistance to individuals living on Tribal Lands

Figure 65. USGS river flow graph for Owyhee River in May 2011.

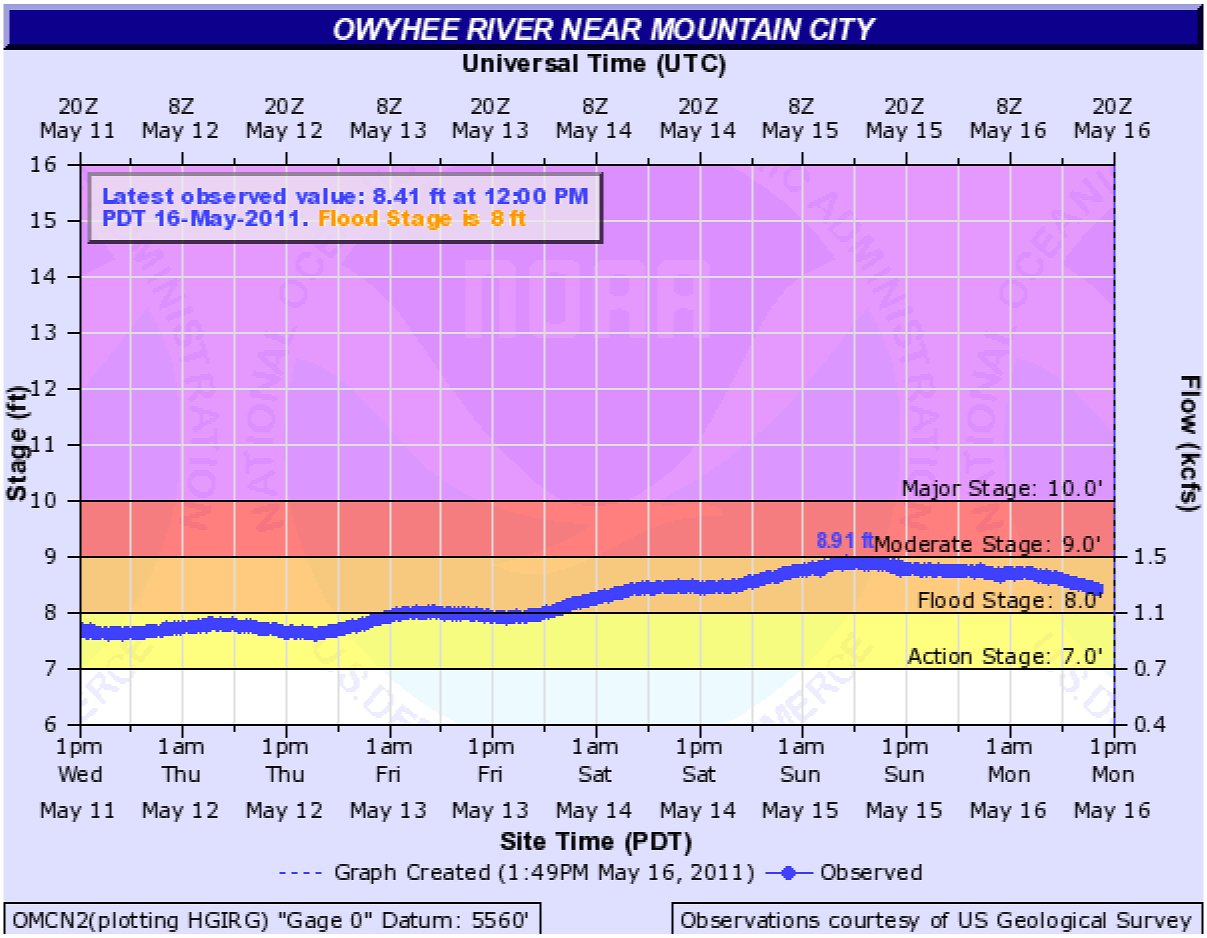


Figure 66. May 19, 2011, debris flow over the China Town Diversion Dam

The Shoshone-Paiute Tribes have held an annual rodeo at the campgrounds located west of Nevada State Highway 225 and the Newtown sub-division. This area has long supported the rodeo grounds, but has been wetted by recent, late season flows from the Owyhee River (Figure 67).

Figure 67. Sho-Pai 4th of July Powwow Arbor closed due to flooding, seeking ideas for venue move.

5 Sho-Pai News

Move the July 4th campgrounds? *You can help make this decision*

FLOODED OUT CAMPGROUNDS: The campgrounds where the annual Fourth of July Celebration has taken place every year for decades was flooded and remain closed this year. Festivities were moved to the HDC in Owyhee, with food, jewelry, and other vendors set up on the street close to the gym. A survey is now out to determine where tribal and community members would like to see a new arbor built. (D. Sam photo.)

By DeMetria Sam

OWYHEE--The Volunteer Celebrations Committee held a meeting with those who helped coordinate events during the Fourth of July Celebration on Monday, July 25, 2011 where thoughts, reviews, and suggestions were made in a variety to improve the celebration in the years to come.

There were both pros and cons, but one topic was discussed meticulously as the Tribe is looking to build a new powwow arbor--however the location of a new arbor is at question.

A public survey to the community was released on Monday, August 1, 2011. Residents received the surveys in their post office box on August 2.

Each survey requests for a name, so the survey will not be duplicated and asks four critical questions that needs significant response from the people.

"I understand the concern about the campgrounds not being open this year, but due to the rain and the amount of water there—it was a safety hazard," said Dennis Smith, Vice-Chairman of the Business Council and Celebration Committee Member.

According to the public survey, the high water table at the old campground will continue to be a problem for years to come. Even if the irrigation water was re-routed, the spring storm waters will continue to flood the area.

"Before we move, we thought we better get thoughts from the people. And if they say yes, let's move it—then we will," Smith finished.

So, will the membership decide to put it south of the rodeo grounds, Tag Harney Park or will they decide that having the powwow at the HDC is more beneficial.

Also the survey asks for recommendations for the old camp grounds, and if the Powwow and Rodeo should be held at different times of the day or at the same time, as it has in the past. Let your voice be heard, fill out the survey and return to Terri Cota at the Resource Building by August 31, 2011.

The 4th of July celebration in 2011 was moved because of excessive surface water at the Rodeo Grounds where people would park vehicles while attending the celebration (Figure 68, Figure 69). Between the Powwow Arbor and Nevada State Highway 225 is an irrigation diversion ditch originating from the Owyhee River to supply irrigation water to agricultural fields north of the area. The entire area is exposed to high water flows and accumulation. The situation in 2011 caused a series of high water flows that led to the closure of the site in July. The rodeo Grounds Arbor is within the flood inundation zone from the Owyhee River (Figure 69). The Tribes are currently seeking ideas from residents for the placement of the rodeo grounds on the Reservation.

Figure 68. Rodeo Grounds historic and current location.

Figure 69. Powwow Arbor showing Wild Horse Flood Inundation Zone.

4.5.6. Wild Horse Reservoir

In 1937, Wild Horse Reservoir was constructed covering what was once Owyhee Meadows. The reservoir was named after the wild horses that roamed abundantly in the area. Ranching has restricted the horse's movement but they can still be found on the Owyhee Desert west of Wild Horse.

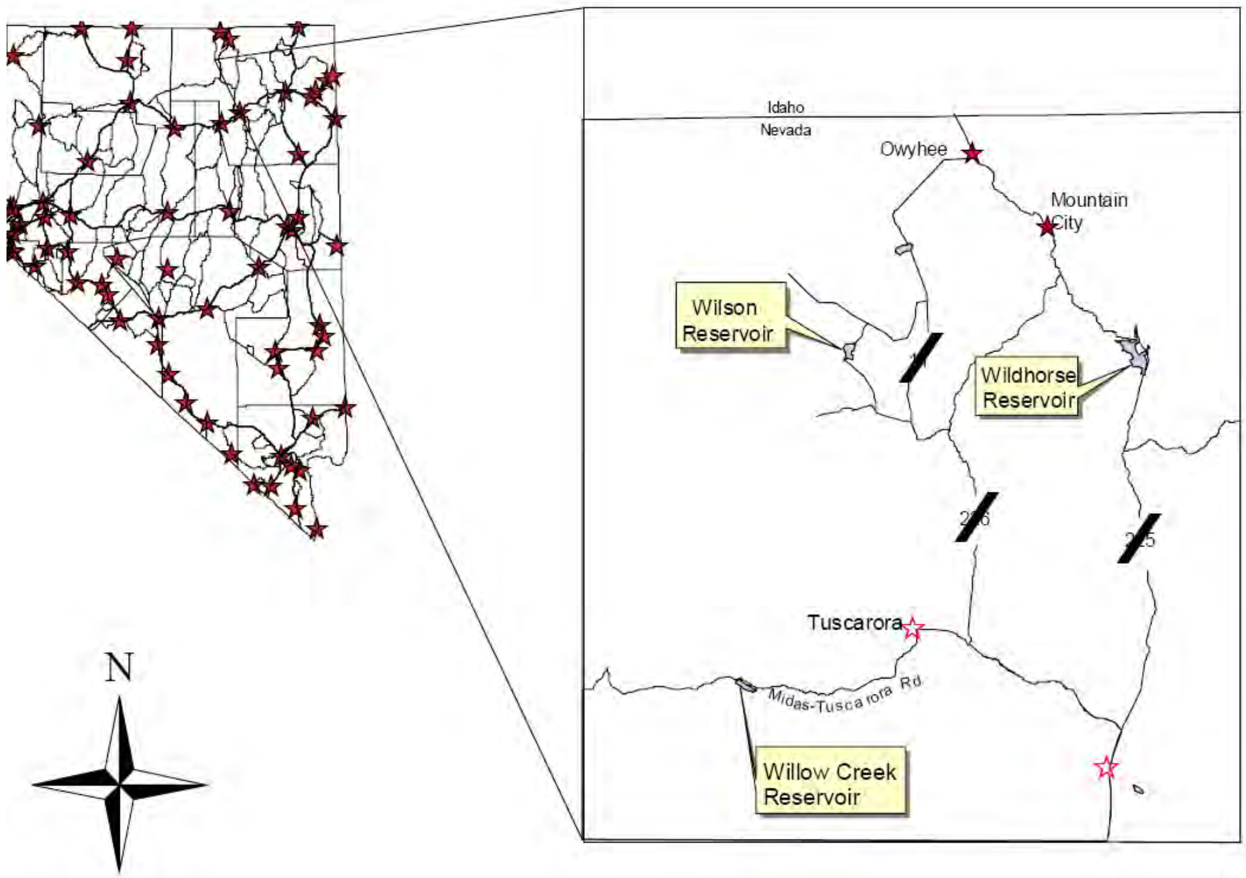
The stored irrigation water is for agriculture in the Duck Valley Indian Reservation. The original dam was found to be weak and a new one was constructed in 1969 (Figure 71). This doubled the size of the reservoir. When full, the reservoir has a surface area of 2,830 acres and holds 73,500 acre feet of water, has a maximum depth of 70 feet, an average depth of 40 feet. The spillway elevation is 6,205 feet above sea level.

The countryside around Wild Horse Reservoir is a treeless high and cold desert. The Flora and fauna is typical of the Great Basin. Big sage dominates the landscape with patches of quaking aspen trees in the hills. Subalpine habitat can be found in higher elevations. The later parts of May through June, brings beautiful wild flowers backed by towering snowcapped peaks. Many of them over 8,000 feet.

Although Wild Horse Reservoir was built for irrigation purposes on the Duck Valley, its role as a flood mitigation dam is significant. Although past flood records are scarce, anecdotal evidence and stories from the elders in Owyhee, tell of frequent floods in Duck Valley, and perpetual flood reconstruction of roads, bridges, and structures. The Duck valley Indian Reservation controls the water flow from the Wild Horse Reservoir. Spring runoff frequently breaches the dam causing flood waters to climb in the valley. However, flood mitigation through control of water levels has been mostly within the control of the Shoshone-Paiute Tribes.

While flood mitigation is partially provided by the Dam, it also presents the risk of a flood inundation in the event of a dam failure. This topic will be discussed in a subsequent sub-chapter.

Figure 70. Area map of Wild Horse Reservoir.



Wild Horse Dam Statistics:

General

- Region..Pacific Northwest
- State...Nevada
- County ....Elko
- Project ....Duck Valley Irrigation Project - BIA
- Dam type ....Concrete thin arch
- Location ....69 miles north of Elko, NV
- Watercourse ....East Fork of Owyhee River
- Reservoir ....Wild Horse
- Original construction 1967-1969
- National ID Number NV10119

Hydraulics

- Top of Active Conservation ....6205 ft.
- Top of Dead ....6140 ft.
- Streambed at Dam Axis .... 6122 ft.
- Lowest Point of Foundation ....6102 ft.
- Total Storage to El. 6205.0 ....71,661 ac-ft.
- Active Storage ....71,500 ac-ft.

- Dead Storage ....20 ac-ft.
- Service spillway Capacity at El. 6212 ....4,900 cfs
- Outlet works Capacity at El. 6212 ....705 cfs

Dimensions

- Crest Elevation ....6212.0 ft.
- Top of Parapet Elevation ....6216.0 ft.
- Structural Height ....110 ft.
- Hydraulic Height ....83 ft.
- Crest Length ....435.0 ft.
- Crest Width ....5 ft.
- Base Width ....12.4 ft.
- Volume of Concrete ....12,135 cu yd.

Hydrology

- Drainage area ....209 sq. mi
- PMF** ....1984 winter rain-on-snow
- Volume ....30,000 acre-feet over five days
- Peak inflow ....15,600 cfs
- Maximum water surface ....6210.5 ft.

**Probable maximum flood (PMF) (maximum probable flood, MPF). The largest flood that may reasonably be expected to occur at a given point on a stream from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible on a particular watershed. This term identifies estimates of hypothetical flood characteristics (peak discharge, volume, and hydrograph shape) that are considered to be the most severe "reasonably possible" at a particular location, based on relatively comprehensive hydrometeorological analyses of critical runoff-producing precipitation (and snowmelt, if pertinent) and hydrologic factors favorable for maximum flood runoff. The maximum runoff condition resulting from the most severe combination of hydrologic and meteorologic conditions that are considered reasonably possible for the drainage basin under study.

Figure 71. Wild Horse Dam on the Owyhee River showing first dam and replacement dam.

4.5.7. Resources at Risk

Floods generally come with warnings and flood waters rarely go where they are totally unexpected based on expert predictions. Those warnings are not always heeded, though, and despite the predictability, flood damage continues.

The failure to recognize or acknowledge the extent of the natural hydrologic forces in an area has led to development and occupation of areas that can clearly be expected to flood on a regular basis or even an infrequent basis. Despite this, communities are often surprised when the stream leaves its channel to occupy its floodplain. A past reliance on structural means to control floodwaters and "reclaim" portions of the floodplain has also contributed to inappropriate development and continued flood-related damages.

Unlike the weather and the landscape, this flood-contributing factor can be controlled. Development and occupation of the floodplain places individuals and property at risk. Such use can also increase the probability and severity of flood events (and consequent damage) downstream by reducing the water-storage capacity of the floodplain, or by pushing the water further from the channel or in larger quantities downstream.

Section 2.6 (Structure Assessment & Values), has provided details on a database of structure values within the Duck Valley Indian Reservation. This database, with spatial reference, provided the assessment of determining the risk exposure on the Duck Valley Indian Reservation. The analysis procedure began by selecting all structures (embedded with value) within each of the two derived flood zones (BIA & BOR).

The actual location of each structure has been used to determine physical location within the two estimated flood zones (Table 29). According to the analysis, out of the 588 structures on the Duck Valley Indian Reservation there are approximately 164 structures in the flood zone.

Approximately 83% of the structures in the flood zone are used for residential purposes and house approximately 136 people (souls). These residential use values are estimates and based on informed approximations of the current (2011) occupation. The value of structures in the flood zone exceed $14.3 million, or 21% of the total estimated value of all structures on the Reservation (Table 29).

Table 29. Building use and location relative to flood zone, with number of 'souls' and value.

Structure Type	Total Number of Structures	Souls Living in Structures	Total Value	Total Number of Structures in Flood Zones	Souls Living in Structures in Flood Zone	Value in Flood Zones
BIA (all uses)	7	0	$1,250,000	2	N/A	$150,000
Churches	6	0	$2,220,000	0	N/A	0
Commercial	24	0	$5,509,500	4	N/A	$950,000
Hospital	3	0	$ 5,509,196	0	N/A	0
Residential (including abandoned)	498	1,036	$47,602,361	136	226	$10,546,176
School (all uses)	13	0	$3,875,000	8	N/A	$1,675,000
Sho-Pai Tribes (all uses)	37	0	$5,250,050	14	N/A	$1,005,550
Total	**588**	**1,036**	**$71,216,107**	**164**	**226**	**$14,326,726**

4.5.8. Probability of Future Events

Duck Valley Indian Reservation has a high probability of future flooding events with occurrence expected to be seen as frequently as multiple times each year, and no less frequent than once every five years. Historical information from the USGS monitoring water flow at the China Town Diversion Dam, shows that the river entered flood stages during 23 years out of 45 years. These data show only the yearly maximum flow levels and not the peak flows when they occur multiple times in a given year (Figure 53, Table 27). This frequency shows a flood occurrence on the Duck Valley Indian Reservation once every two years. Historical data (Table 27) indicates that the longest period without flooding was 5 years (1947-1951), with several examples of 4 year periods without flood flow levels. Conversely, there were several consecutive years with annual flow rates exceeding flood stage events (1969-1972) on the Owyhee River.

Flood frequency on other river networks on the Duck Valley Indian Reservation have been recorded in conceptual models of personal accounts, news reports of the region, and physical evidence of past flooding. Although illustrative, these accounts fail to apply uniform measures of flood intensity (depth), duration (days), or location (watersheds affected).

These accounts serve to quantify the high frequency of flood related events (1 every 2-5 years). It is likely that this frequency will continue into the future even with significant changes to the global climate weather patterns discussed here. Although frequency may remain relatively consistent, the intensity of flooding events may change. The only sure way of limiting the exposure of residents to these extreme flood events is to locate homes, businesses, and infrastructure outside of the maximum floodplain extent to avoid these catastrophic events.

Although the semi-arid character of the Northern Basin and Range ecoregion and Great Basin region first brings to mind the prospects for drought, projections of climate models also indicate the potential for sharp increases in precipitation over the 21st century. The weather records indicate that such precipitation increases over much of the region started during the 20^{th} century. Also, those records not only show increases in the yearly averages of precipitation, but also increased variability between years which is an indication of more extreme precipitation events. This trend toward increased variability also raises the concern of more-frequent flooding for the future, a risk that is emphasized by the fact that most human settlements in the Duck Valley originally were established along streams and in riparian zones (i.e., on the banks of natural waterways). Today, much of the expansion of these settlements continues to occur in and near riparian zones where building sites are aesthetically pleasing.

Flooding occurs under two sets of circumstances in the Northern Basin and Range ecoregion and Great Basin. Over most of the region, floods tend to occur in springs following exceptionally high winter snowfalls and snowpack, especially during early, warm springs that are accompanied by heavy, warm rainfall. The Teton River dam in southern Idaho failed on June 5, 1976, under such conditions and flooded several small Idaho towns. Water also flowed down the sandbagged, downtown main streets of Salt Lake City in the spring of 1984 following a record winter snowfall and overflow of City Creek, which carried the melt-water out of the Wasatch Mountains.

Flooding also occurs in the southern portion of the Northern Basin and Range ecoregion and Great Basin in late summer during the monsoon. Rainstorms during these events can be sudden, intense, and localized. For example, in July 1999, three inches of rain fell in Las Vegas in just two hours -- that is three-quarters of the rain Las Vegas normally receives in an entire year. The flash floods that resulted caused at least two deaths and some property damage. Some infrastructure damage was avoided due to a partially completed flood-control program.

How the probability of flooding in the Northern Basin and Range ecoregion and Great Basin will be affected by the projected changes in climate is not clear at this point in time. Precipitation in fall and early winter falling as rain rather than snow would allow that moisture to run-off in winter rather than contributing to the snowpack and spring run-off. Earlier spring warm-up would convert precipitation that would normally fall as snow to rain further limiting snowpack. The snowpack would be reduced further by occurring higher up the mountains. The net effect of these factors would be reduced snowpacks, higher fall and winter stream flows, and lower spring run-off peaks than are now the case.

However, if precipitation should double with the major increase occurring in winter, which is likely an extreme of the projected changes, this could lead to increased snowpacks despite shorter seasons and higher temperatures. Such conditions would result in the snowpack occurring higher in the mountains, and would maintain or even increase risk of springtime flooding. Careful hydrologic (water cycle) modeling is needed to better understand this issue.

Failure of the Wild Horse Dam is a possibility that must be considered. The Duck Valley Indian Reservation is the first location downstream of the Dam, where the floodplain becomes wide and expansive. Based on BOR estimates of flood inundation (Table 29), the exposure of homes and businesses to Wild Horse Dam failure on the Reservation is high (588 structures with 1,036 people living in them). Currently, the only warning system to the residents of the Reservation is the river flow rate, but not Dam Failure as evidenced by cracks and Dam-structure movement. This is one of the potential mitigation measures identified in this plan's recommended actions (Chapter 7).

4.5.9. FEMA Programs Concerning Floods

As of the preparation of this Tribal Hazards Mitigation Plan, the Duck Valley Indian Reservation is not a participant in any of the flood-mitigation programs of FEMA.

The National Flood Insurance Program (NFIP) was created by the Congress of the United States in 1968 through the National Flood Insurance Act of 1968 (P.L. 90-448). The NFIP enables property owners in participating communities to purchase insurance protection from the government against losses from flooding. This insurance is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP would be based on an agreement between Tribes and the federal government and states that if the Tribes will adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas (SFHA), the federal government will make flood insurance available within the community as a financial protection against flood losses. The SFHAs and other risk premium zones applicable to each participating community are depicted on FIRM. The Mitigation Division within the Federal Emergency Management Agency manages the NFIP and oversees the floodplain management and mapping components of the Program.

The intent of the act was to reduce future flood damage through community floodplain management ordinances and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection. The NFIP is meant to be self-supporting, though in 2004 Congress found that repetitive-loss properties cost the taxpayer about $200 million annually. Congress originally intended that operating expenses and flood-insurance claims be paid for through the premiums collected for flood-insurance policies. NFIP borrows from the U.S. Treasury for times when losses are heavy, and these loans are paid back with interest.

The program was first amended by the Flood Disaster Protection Act of 1973, which made the purchase of flood insurance mandatory for the protection of property within SFHAs. In 1982, the Act was amended by the Coastal Barrier Resources Act (CBRA). The CBRA enacted a set of maps depicting the John H. Chafee Coastal Barrier Resources System in which federal flood insurance is unavailable for new or significantly improved structures. The program was further amended by the Flood Insurance Reform Act of 2004, with the goal of reducing "losses to properties for which repetitive flood insurance claim payments have been made."

In order for the Duck Valley Indian Reservation to enter the NFIP, discussions between the Tribes and FEMA Region X and/or Region IX representatives must reach agreement on the implementation of policies, laws, and programs to be carried out by the Shoshone-Paiute Tribes to protect the structures and infrastructure located in the floodplain. At the same time, FEMA may launch additional floodplain mapping of the Duck Valley Indian Reservation to consistently define the floodplain.

While these programs are set in place, initial mapping of projected flood-impact areas completed by the BIA and BOR have been completed and can serve the Duck Valley Indian Reservation to establish floodplain protection areas. These projected flood impact areas would be replaced by FEMA-established FIRM maps if they are created, in case the Shoshone-Paiute Tribes chooses to enter the NFIP.

4.5.10. Repetitive Loss

The primary objective of the Repetitive Loss Properties Strategy is to eliminate or reduce the damage to property and the disruption of life caused by repeated damages of the same properties. Although mostly recognized within the flood-risk category of losses, the repetitive loss category can be applied to properties that meet the following conditions:

- Four or more paid flood losses (by FEMA) of more than $1,000 each; or
- Two paid flood losses (by FEMA) within a 10-year period that, in the aggregate, equal or exceed the current value of the insured property; or
- Three or more paid losses (by FEMA) that, in the aggregate, equal or exceed the current value of the insured property.

Although there are no formally entered repetitive loss properties within the Duck Valley Indian Reservation, that lack of classification is completely attributable to the lack of participation in insurance coverage offered by FEMA for homeowners. Flood loss damages to property on the Duck Valley Indian Reservation are a frequent event that can be witnessed annually. The Shoshone-Paiute Tribes are currently not a participant in the National Flood Insurance Program.

4.5.11. Potential Mitigation Measures

In many western countries, rivers prone to floods are often carefully managed. Water management structures such as levees, reservoirs, and weirs have been used to prevent rivers from bursting over their banks. However, these structures only influence flood properties and do not alter the actual floodplain. The floodplain is a natural storage area used by the river to store the high-water levels as it drains downstream. When a levee is placed along a river, the effect is to remove this temporary storage area and displace the needed storage to other stream storage areas immediately upstream (backflow) and adjacent to the levee protected area, and eventually downstream of the protected area. These displacements often mean increased flooding impacts in areas other than those protected by the levee.

Flood mitigation measures for residential homes on the Duck Valley Indian Reservation should begin with a policy to eliminate new home construction in the flood zone. The homes which are currently in the flood zone (136 structures) can be elevated on a cement foundation / basement or otherwise modified to make flood damage less likely. The feasibility of such adjustments would need to be decided based on home value, resident wishes, and other factors.

Access on the reservation is severely compromised during major flood events. Infrastructure hardening is one way to improve the resilience of roads, bridges and culverts during flood events. The desire would be to make improvements to these infrastructure components. Specific projects related to flood damage are summarized below (Table 30).

Table 30. Mitigation measures recommended for flood and landslide.

Item	Number Recommended	Treatment for which Hazard
Area Treatments		
Elevate Road Surface (flood over road)	4	Flood
Embankment Stabilization Road/Stream	6	Flood & Landslide
Point Treatments		
Culvert Replacement / Enlargement	13	Flood
Debris Catchment in River	3	Flood
Install Bridge	5	Flood
Raise Bridge	1	Flood
Structure Treatments		
Residential	136	Flood
Sho-Pai Tribes	14	Flood
Schools	8	Flood
Commercial	4	Flood
International Building Code Enforcement		Flood

The debris catchments (Table 30) refer to structures placed in the stream channels upstream of structures including the China Town Diversion Dam (Figure 76), and bridge crossings over the Owyhee River (Figure 77, Figure 78). The objective of installing these debris catchments is to prevent future debris damage to bridges and abutments by intercepting debris, and by minimizing the amount of debris catching on the structural elements of the bridge. Many times, high water events are accompanied by large organic debris being ripped from the stream banks and swept downstream. These root wads, small trees and bushes generally pile up against the downstream obstructions causing exacerbated problems of water backing up, washing out the in-stream structures, and other associated problems. The situations depicted in Figure 44 and Figure 45, and the debris on the China Town Diversion Dam in Figure 66 are examples of debris damage.

The 3 debris catchments referenced in Table 30 would be placed some distance upstream of the diversion dam, bridge, or culvert and be accessible by a front end loader or other machinery which could clean out the catchment as it is filled with debris. These structures have been recommended in the locations where debris has been a problem in the past and would reduce future washouts and failures of the structures they are intended to protect.

In other cases, crossings of the Owyhee River are either low-profile crossings, or simply non-existent. These “splash crossings” of the Owyhee River are problematic, especially in snow or icy conditions. During high water events they are completely impassable. A total of five new bridges are proposed crossing the Owyhee River (Figure 79 - Figure 82).

International Building Codes, or more stringent local building codes, provide basic guidelines to communities on how to regulate development. When the Tribal Housing participates in building to these codes it enables property owners on the Reservation to insure against flood losses. By employing wise floodplain management, the Reservation can protect its citizens against much of the devastating emotional and financial loss resulting from flood disasters. Careful local management of development in the floodplains results in construction practices that can reduce flood losses and the high costs associated with flood disasters to all levels of government.

Figure 72. River Road improvements against flood damages (as shown in Figure 64).

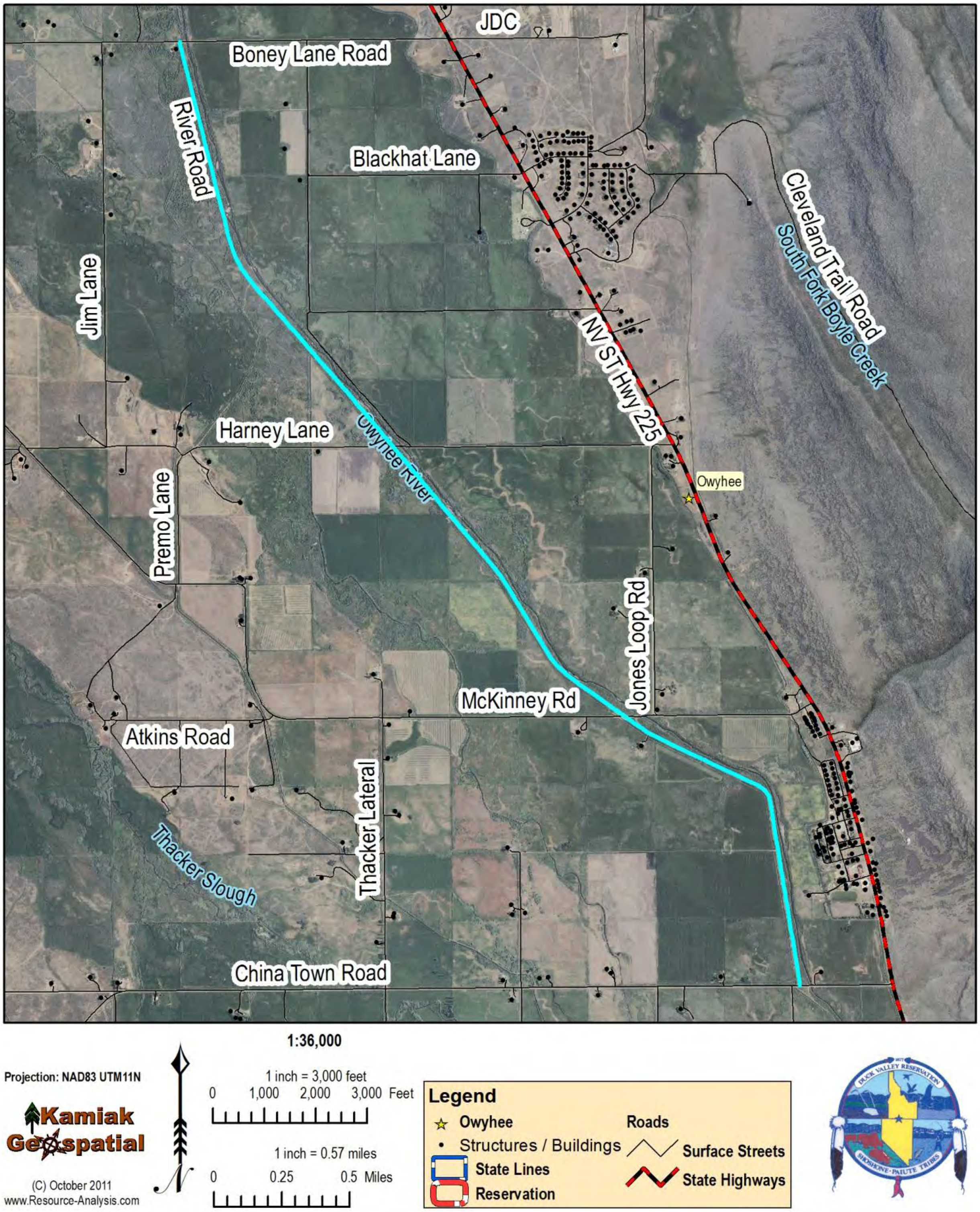


Figure 73. Sheep Creek Road improvements against flood damage.

Figure 74. Blue Creek / Owyhee River widening & Hydrologic flow improvement: 2.13 miles.

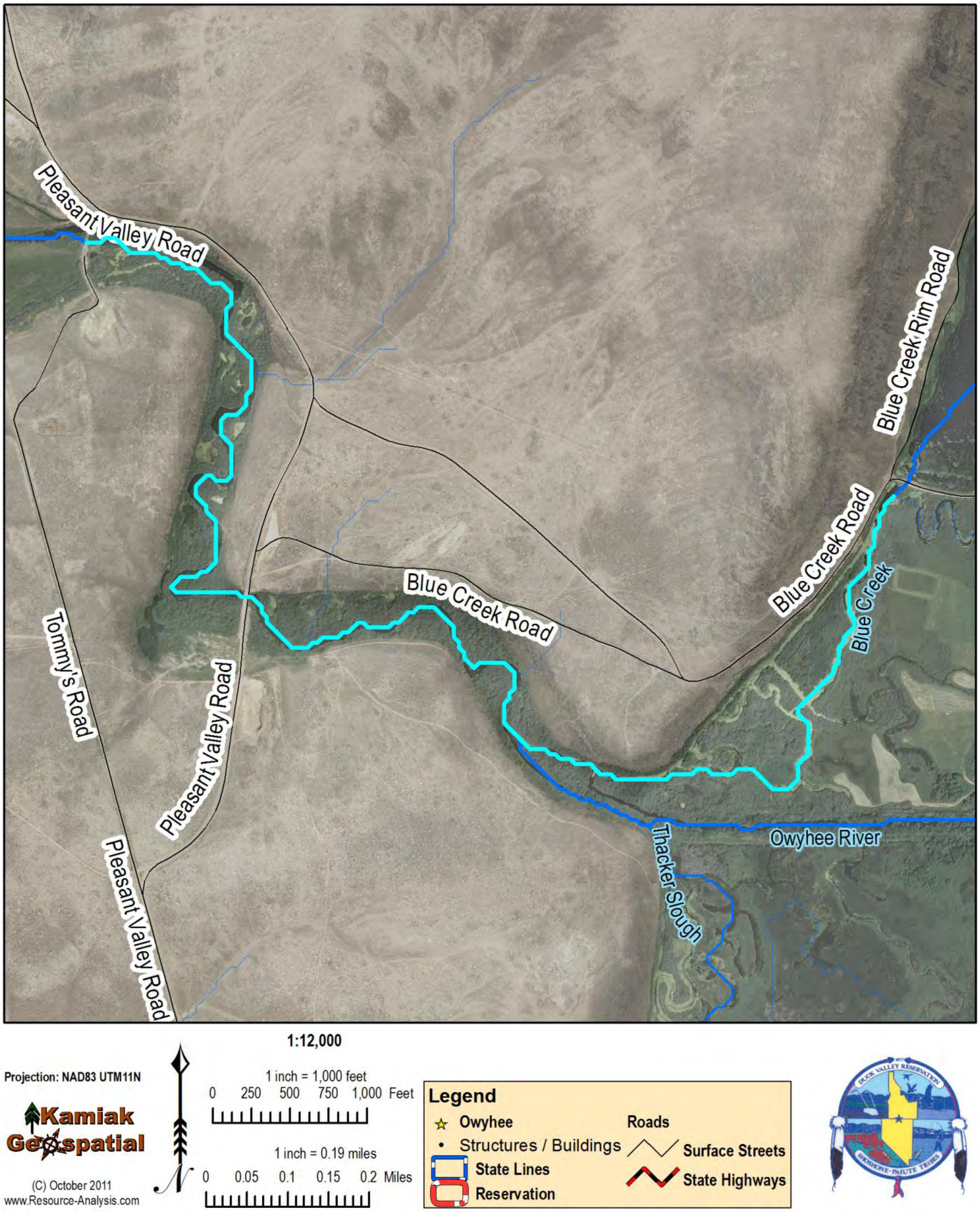


Figure 75. Pleasant valley Road improvements: river approach to bridge.

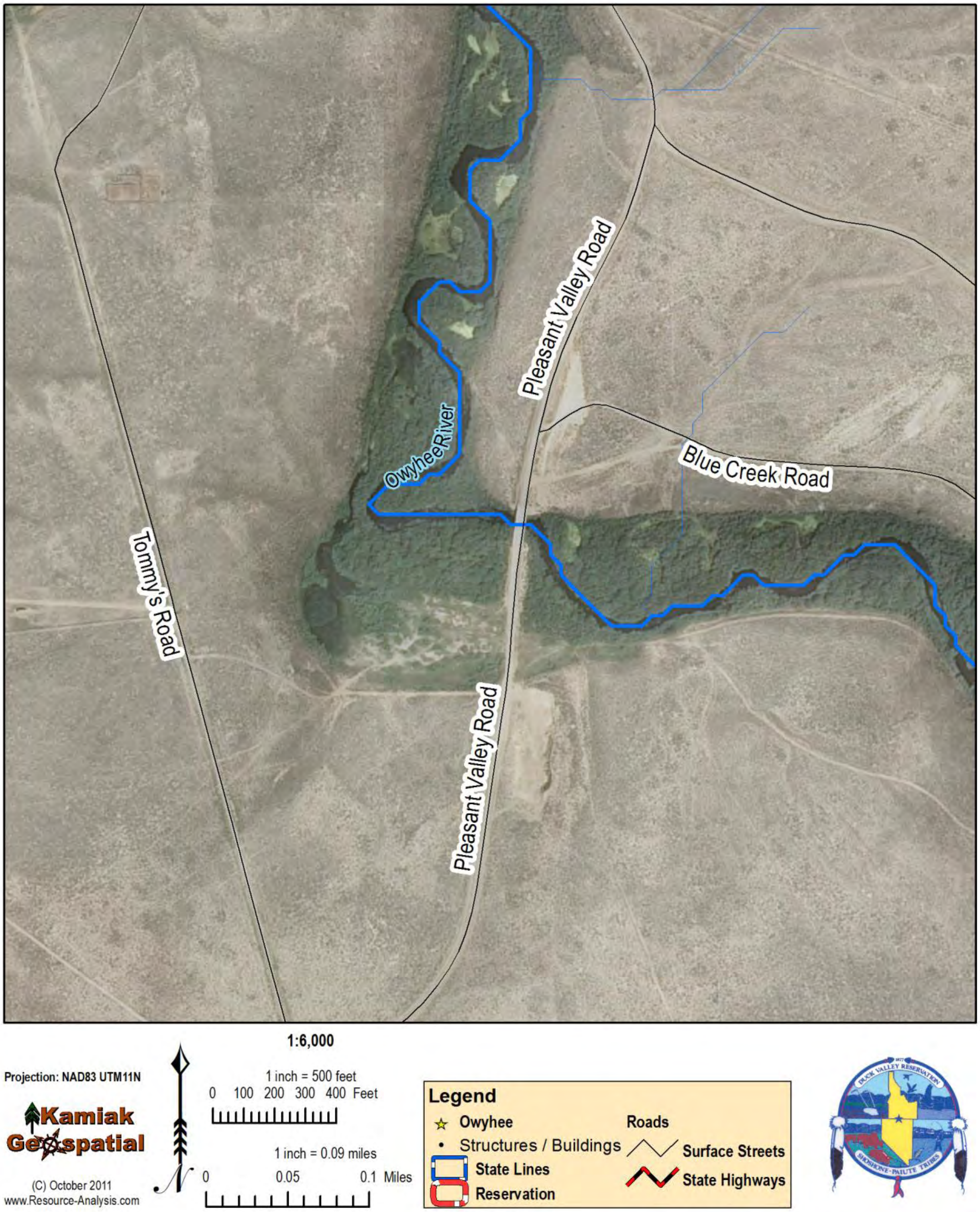


Figure 76. Proposed Debris Catchment at China Town Diversion Dam on Owyhee River.

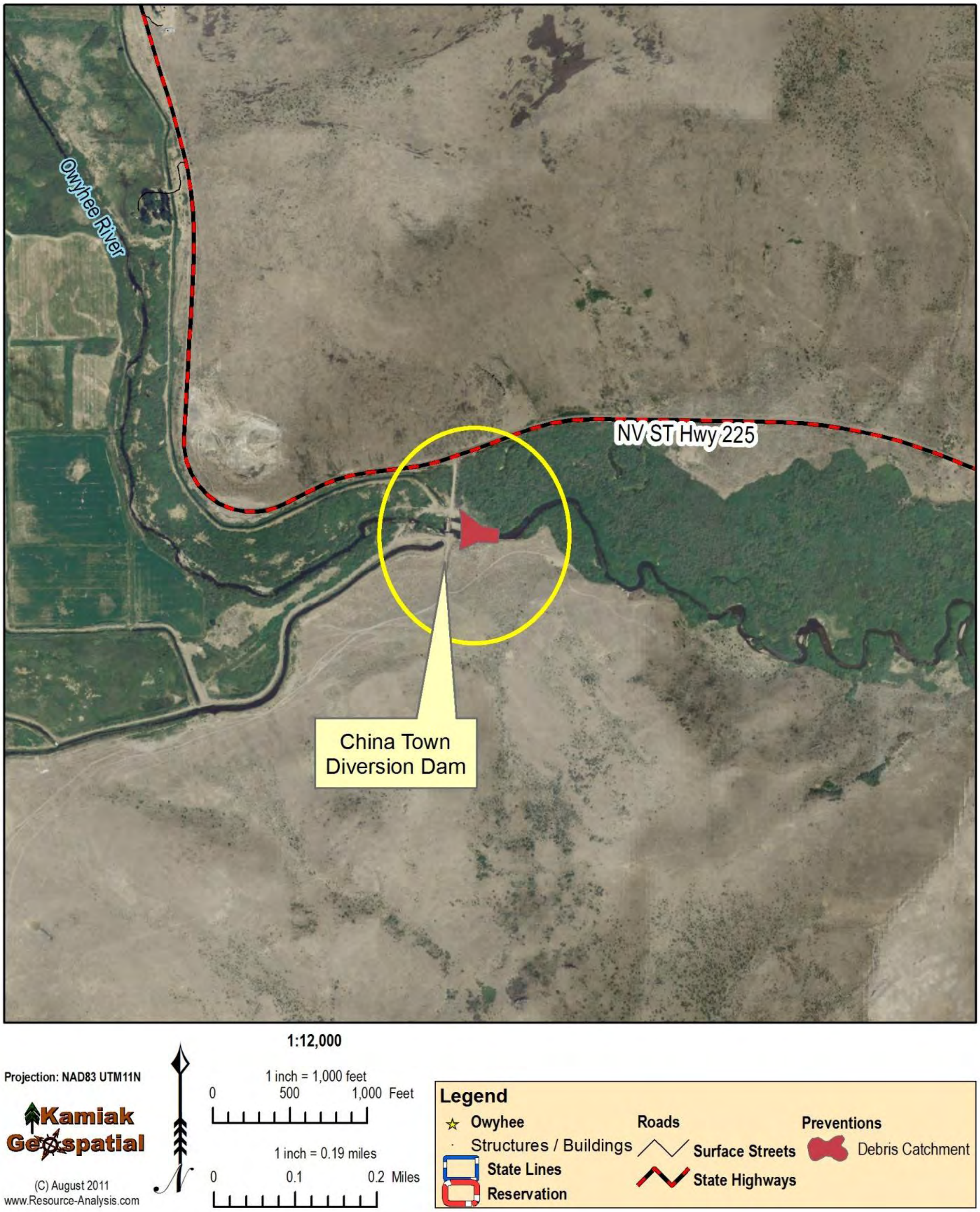


Figure 77. Proposed Debris Catchment between Fawn Creek Road & Jones Flat on Owyhee River.

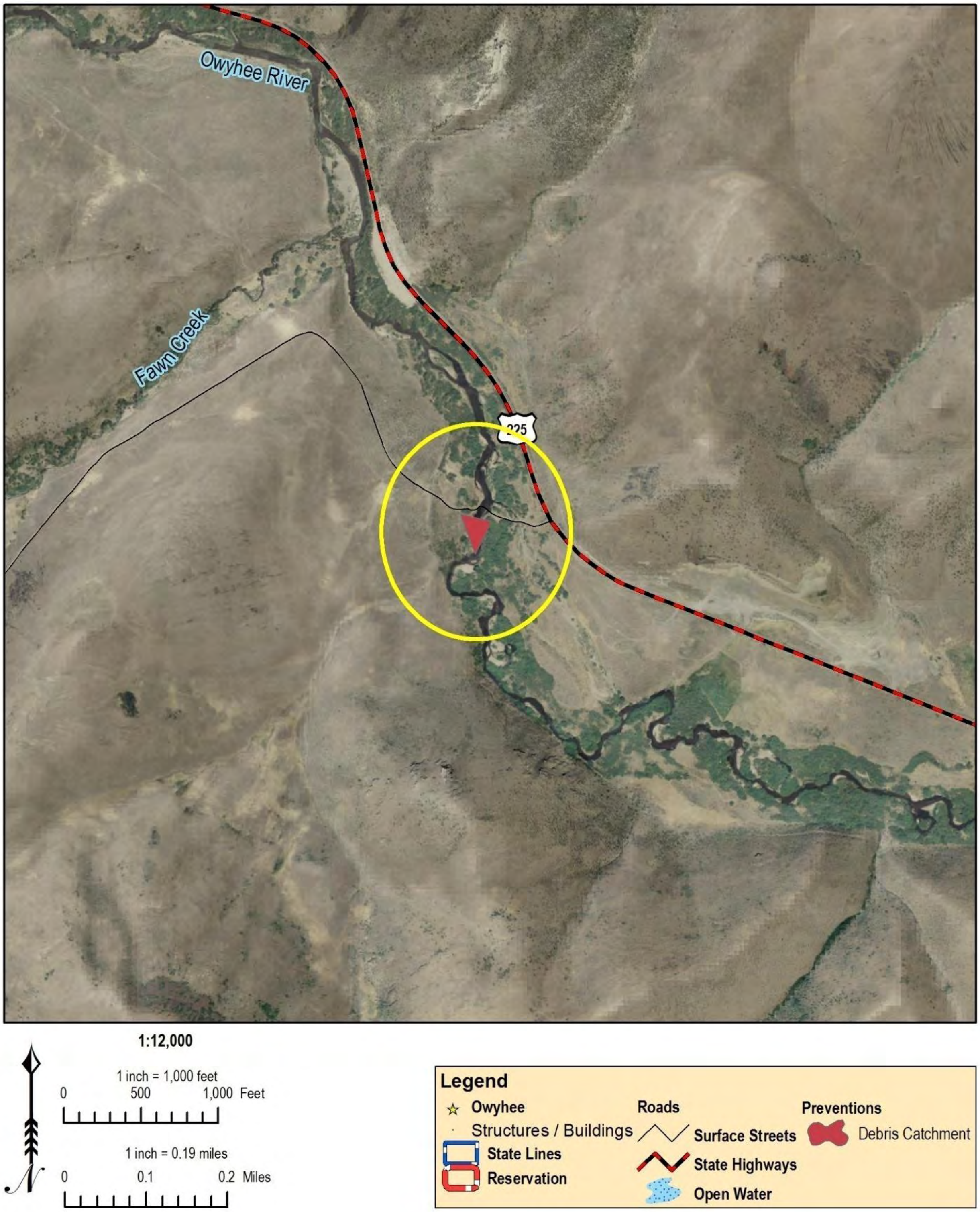


Figure 78. Proposed Debris Catchment between Granite Creek and Grasshopper Gulch on Owyhee River.

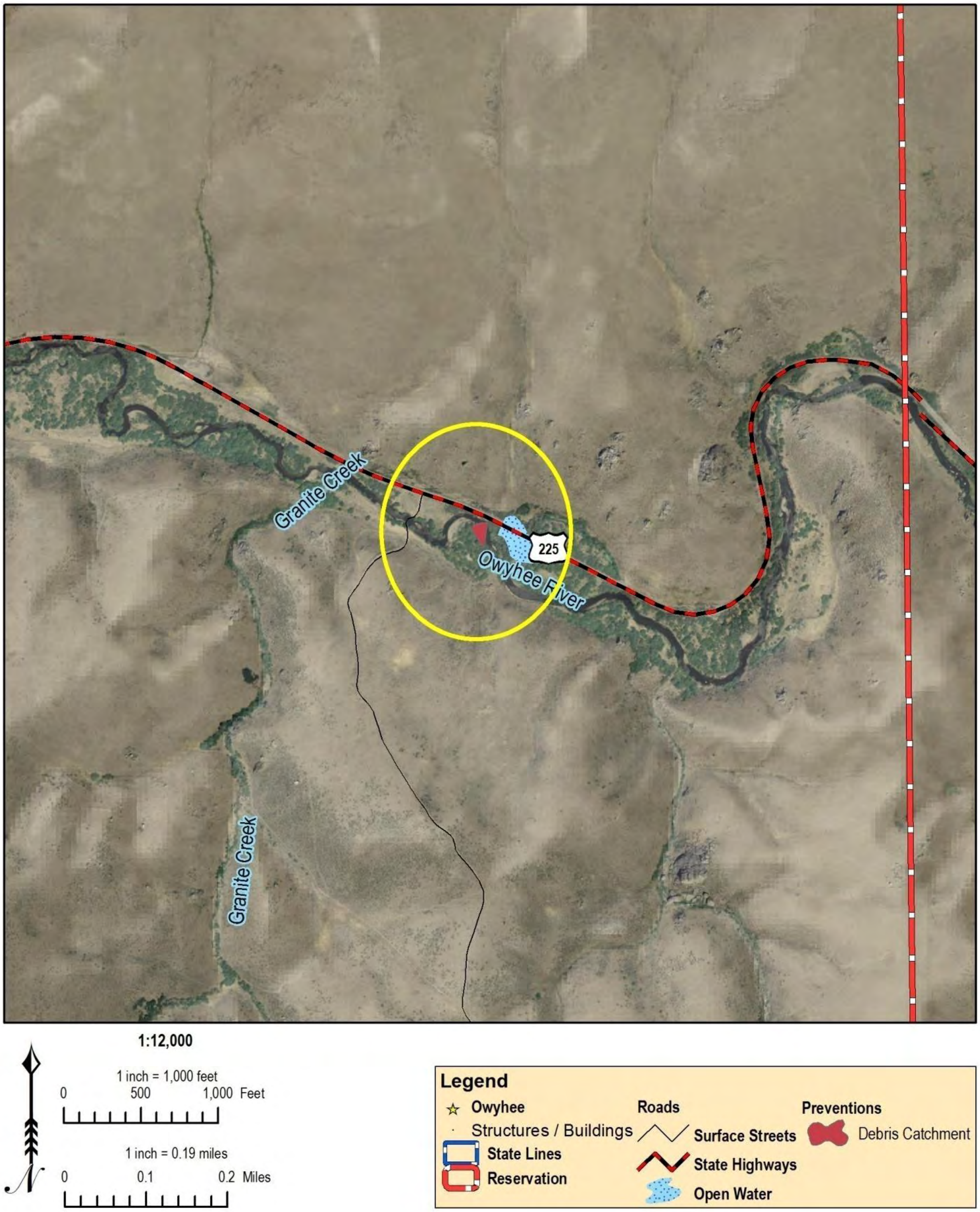


Figure 79. Bridge Crossing of Owyhee River at China Town Road and McKinney Road.

Figure 80. Bridge Crossing of Owyhee River at McKinney Road and Harney Lane.

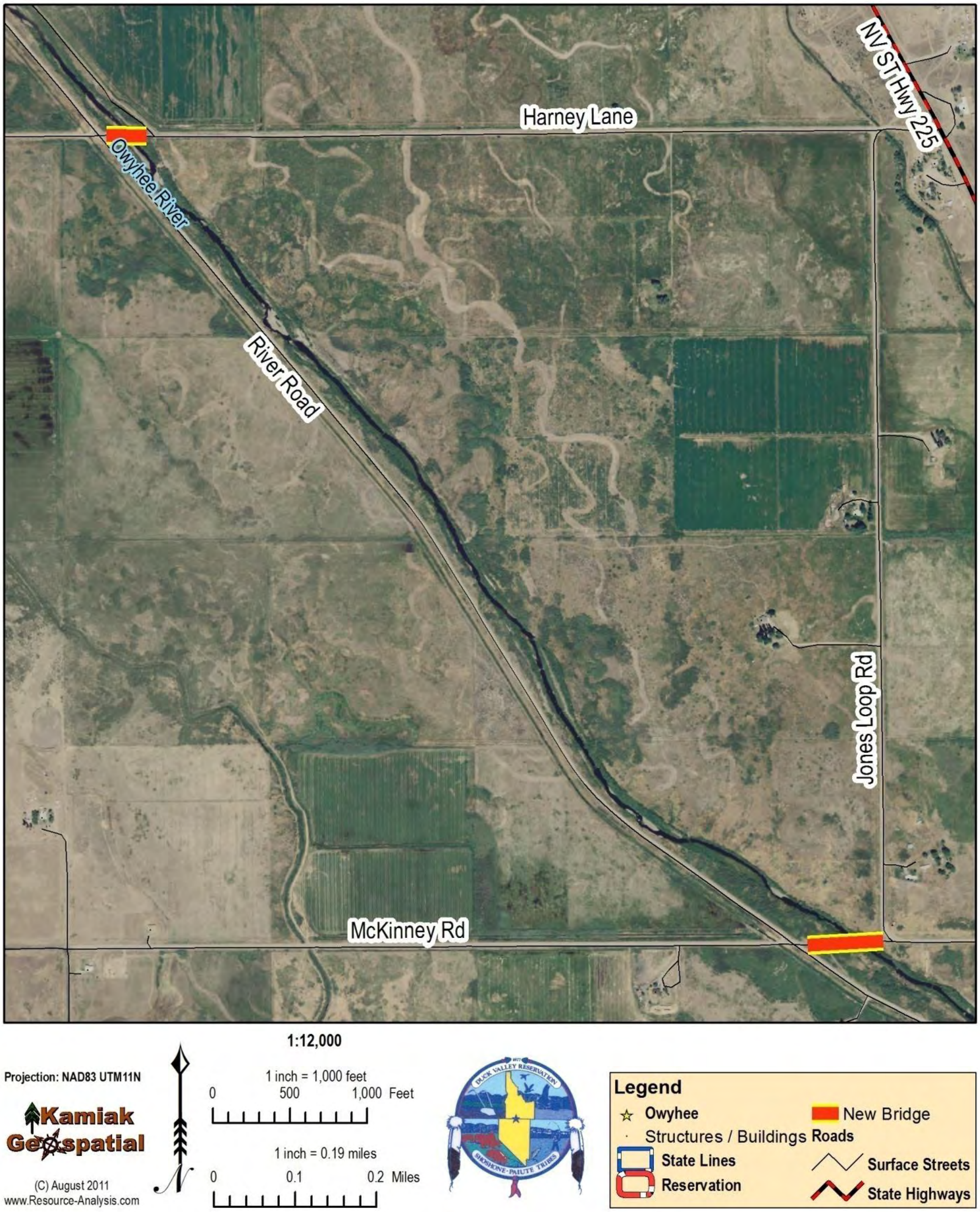


Figure 81. Bridge Crossing of Owyhee River at Boney Lane.

Figure 82. Bridge Crossing of Owyhee River at National Guard Road.

4.5.11.1. Wild Horse Dam Mitigation Measures

Wild Horse Dam, constructed in 1969, is also located near the northern terminus of the Eastern Independence Mountains fault zone. Dam Failure will lead to rapid and intense flood inundation of the Duck Valley Indian Reservation. However, the mitigation of this risk is addressed with the section of this document concerning seismic shaking hazards and fault line geology (Section 4.6.9.2). This risk can only be mitigated through the multi-hazard consideration of this profile.

4.5.11.2. Post Flood Safety

Cleanup activities following floods often pose hazards to workers and volunteers involved in the effort. Potential dangers include electrical hazards, carbon monoxide exposure, musculoskeletal hazards, heat or cold stress, motor vehicle-related dangers, fire, drowning, and exposure to hazardous materials, or contaminated soils and sediment. Because flooded sites are unstable, cleanup workers might encounter sharp, jagged debris, biological hazards in the floodwater, exposed electrical lines, blood or other body fluids, animal, and human remains.

A flood-response plan has not been adopted by the Shoshone-Paiute Tribes for specifically dealing with flood activities on the Duck Valley Indian Reservation. This plan should be developed in continuation of this planning effort.

4.5.11.3. Benefits of Flooding

There are many disruptive effects of flooding on human settlements, infrastructure, and economic activities. However, flooding can bring benefits, such as making soil more fertile by providing nutrients in which it is deficient. Periodic flooding was essential to the productivity of lands for the Tribes of the region, who have relied, and still rely, on a productive river ecosystem for food supplies, productive agriculture, and ranching activities.

4.5.11.4. Considerations Concerning Flood Policy

The stabilization of the floodplains of the Duck Valley Indian Reservation is essential to the functioning of the Duck Valley Indian Reservation in terms of the economy (especially related to agriculture and ranching), the home sites located adjacent to, and within the floodplains, and the infrastructure that provides water, sewer, power, and critical linkages between the community and to resources located outside the Reservation. This stabilization of the floodplains begins with an assessment of the current functioning of the hydrological network.

As previously discussed, the NFIP is a Federal Program that helps communities reduce flood risks and enables property owners and renters to buy flood insurance. Although the NFIP offers flood insurance to homeowners and renters, this insurance coverage does not reduce the occurrence of flooding. At this time, Reservation-wide FIRM maps of the Duck Valley Indian Reservation have not been developed. Discussions are on-going within the Shoshone-Paiute Tribes to consider the entry of the Tribes to the NFIP.

The Shoshone-Paiute Tribes may decide to participate in the NFIP while enacting and enforcing measures to reduce future flood risks. At a minimum, these regulations govern construction in the SFHAs shown on the FIRM maps. In the interim period, while the FEMA-approved FIRM maps are not available, those areas shown on the BIA and BOR flood zones can be used on the Duck Valley Indian Reservation for internal policy development and implementation. Participation by homeowners in the FEMA insurance program is optional. If FIRM maps are subsequently developed by FEMA on the Duck Valley Indian Reservation, then the use of the FEMA-approved FIRM maps can be adopted. In addition, many mortgage companies require NFIP coverage for homes in the SFHA when purchased through a mortgage loan.

These NFIP management regulations apply to new construction and substantial improvements to structures in the flood zone. The Shoshone-Paiute Tribes can consider implementing these measures while using the BIA and BOR flood zones to be updated when FEMA-derived NFIP maps are finalized. Structural improvements that lead to improved protection during flood events include a variety of techniques to elevate structures, so the ground floor is above the base-flood elevation (so called flood proofing). Small-scale levee construction is not a recognized flood mitigation technique for the NFIP program. Other potential mitigation measures are effective at reducing the negative impacts caused by flooding.

Floodplain Ordinances should be considered and enacted within Duck Valley Indian Reservation by the Shoshone-Paiute Tribes. It is recommended that these ordinances define a substantial improvement as “any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the ‘start of construction’ of the improvement.” These ordinances should require all new construction or substantial improvements be made using methods and practices that minimize flood damage to the structure while not negatively impacting the floodplain where the structure is located.

4.6. Earthquakes

In all parts of the Northern Basin and Range ecoregion and Great Basin, the historical record of seismicity reveals at least a moderate threat from earthquakes. Both the Idaho Geological Survey (IGS) and the Nevada Bureau of Mines and Geology (NBMG) addresses earthquake concerns by studying faults and seismic activity, and by promoting earthquake education programs. They both work closely with other agencies in planning state and regional earthquake policy and response, and participates in regional organizations such as the Western States Seismic Policy Council (WSSPC).

4.6.1. Geological Setting

Geological and seismological studies show that earthquakes are likely to happen in any of several active zones in the Northern Basin and Range ecoregion and Great Basin. Idaho has experienced two substantial earthquakes in the last fifty years—the 1959 Hebgen Lake earthquake (Magnitude 7.5) and the 1983 Borah Peak earthquake (Magnitude 7.3). Both tremors caused fatalities and millions of dollars in damage. In Nevada, the seismic activity has been more pronounced with the 2008 Wells, Nevada, Magnitude 6 Earthquake. It was the largest earthquake to occur in the Basin and Range Province in the last 15 years and the largest event in Nevada in the last 42 years. Wells is only 100 miles southeast of Owyhee, Nevada.

The crust or surface of our planet is broken into large, irregularly shaped pieces called plates. The plates tend to pull apart or push together slowly, but with great force. Stresses build along edges of the plates until part of the crust suddenly gives way in a violent movement. This shaking of the crust is called an earthquake.

The crust breaks along uneven lines called faults. Geologists locate these faults and determine which are active and inactive. This helps identify where the greatest earthquake potential exists. Many faults mapped by geologists are inactive and have little earthquake-induced risk potential; others are active and have a higher earthquake-induced risk potential.

When the crust moves abruptly, the sudden release of stored force in the crust sends waves of energy radiating outward from the fault. Internal waves quickly form surface waves, and these surface waves cause the ground to shake. Buildings may sway, tilt, or collapse as the surface waves pass. Fault-line information used in this report was adopted from research completed by the IGS, a research agency of the University of Idaho (Breckenridge, et al. 2003), and the Nevada Bureau of Mines and Geology (NBMG 2011).

The constant interaction of crustal plates in western North America creates severe earthquakes. The Northern Basin and Range ecoregion and Great Basin is situated where the Basin and Range and Rocky Mountain geomorphic provinces meet. Most of the Northern Basin and Range ecoregion and Great Basin has undergone the effects of tremendous crustal stretching.

Earthquakes from the crustal movements in the adjoining states of Utah, and California can also cause severe ground shaking in the Northern Basin and Range ecoregion and Great Basin. Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated sediment and other unstable soil, as well as trailers and homes not tied to their foundations, are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths, injuries, and extensive property damage.

Aftershocks are smaller earthquakes that follow the main shock and can cause further damage to weakened buildings. Aftershocks can occur in the first hours, days, weeks, or even months after the quake. Some earthquakes are actually foreshocks, and a larger earthquake might subsequently occur.

Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related injuries result from collapsing walls, flying glass, and falling objects as a result of the ground shaking, or people trying to move more than a few feet during the shaking (NBMG 2011).

4.6.2. Measuring an Earthquake

Earthquakes are measured in two ways. One determines the power; the other describes the physical effects. Magnitude is calculated by seismologists from the relative size of seismograph tracings. This measurement has been named the Richter scale, a logarithmic-numerical gauge of earthquake energy ranging from 1.0 (very weak) to 9.0 (very strong). A Richter scale earthquake of 5.0 is ten times stronger than a 4.0 earthquake. The Richter scale is most useful to scientists who compare the power in earthquakes. Magnitude is less useful to disaster planners and citizens, because power does not describe and classify the damage an earthquake can cause. The damage we see from earthquake shaking is due to several factors including distance from the epicenter and local rock types. Intensity defines a more useful measure of earthquake shaking for any one location. It is represented by the modified Mercalli scale (Table 31). On the Mercalli scale, a value of I is the least intense motion and XII is the greatest ground shaking. Unlike magnitude, intensity can vary from place to place. In addition, intensity is not measured by machines. It is evaluated and categorized from people's reactions to events and the visible damage to man-made structures. Intensity is more useful to planners and communities because it can by reasonably used to predict the effects of violent shaking for a local area.

Table 31. Modified Mercalli Earthquake Intensity Scale (Breckenridge, et al. 2003).

Intensity	Description
I.	Only instruments detect the earthquake
II.	A few people notice the shaking
III.	Many people indoors feel the shaking. Hanging objects swing.
IV.	People outdoors may feel ground shaking. Dishes, windows, and doors rattle.
V.	Sleeping people are awakened. Doors swing, objects fall from shelves.
VI.	People have trouble walking. Damage is slight in poorly built buildings.
VII.	People have difficulty standing. Damage is considerable in poorly built buildings.
VIII.	Drivers have trouble steering. Poorly built structures suffer severe damage, chimneys may fall.
IX.	Well-built buildings suffer considerable damage. Some underground pipes are broken.
X.	Most buildings are destroyed. Dams are seriously damaged. Large landslides occur.
XI.	Structures collapse. Underground utilities are destroyed.
XII.	Almost everything is destroyed. Objects are thrown into the air.

4.6.3. Owyhee Basin Geology

The diverse geology of the Northern Basin and Range ecoregion and Great Basin is manifested by the rolling Palouse prairie on the west side, and foothills and steep forested mountains on the east side. The mountains are underlain by the Mesoproterozoic Belt Supergroup, with the Emerald Creek mining district, in the extreme southeastern corner of the Reservation south of Santa, situated in metamorphic rocks of the middle-Belt Wallace Formation. Miocene Columbia River basalts cover the low farming country in the north eastern part of the Reservation and along the eastern side of the Reservation. In addition to these consolidated sediments, there are a few terrace gravels of Tertiary age and the larger stream valleys contain some recent alluvium (Wagner 1949). Lacustrine and river sediments accumulated in valleys that had been dammed up by basalt lava flows. The world famous Clarkia fossil locality formed this way. The St. Joe fault, an Eocene feature related to continental extension and development of metamorphic core complexes, runs eastward through the northeast corner of the Reservation.

The geologic structure of Duck Valley Indian Reservation consists of four main types including 1) metamorphic structures, 2) basalt structures, 3) alluvial floodplain deposits, and 4) windblown fine silt and sand deposits. Metamorphic structures consist of many formations scattered across the region, mainly on the central and eastern side of the Reservation. These formations form the topographic relief seen in the relatively high elevations along the eastern side and northeastern reaches of the Reservation.

Granitic bedrocks are found across the Duck Valley Indian Reservation except in the highest elevations that are dominated by the aforementioned metamorphic structures. These granitic formations are estimated to have been formed during the Mesozoic to early Tertiary period (about 60-65 million years ago).

Alluvial deposits can be identified on all of the major and minor river systems on the Duck Valley Indian Reservation. Silt, sand, river gravel, and even peat make up this hydraulically transported alluvium. This material is common in the major river valleys where human developments have been concentrated, especially along the St. Joe River system.

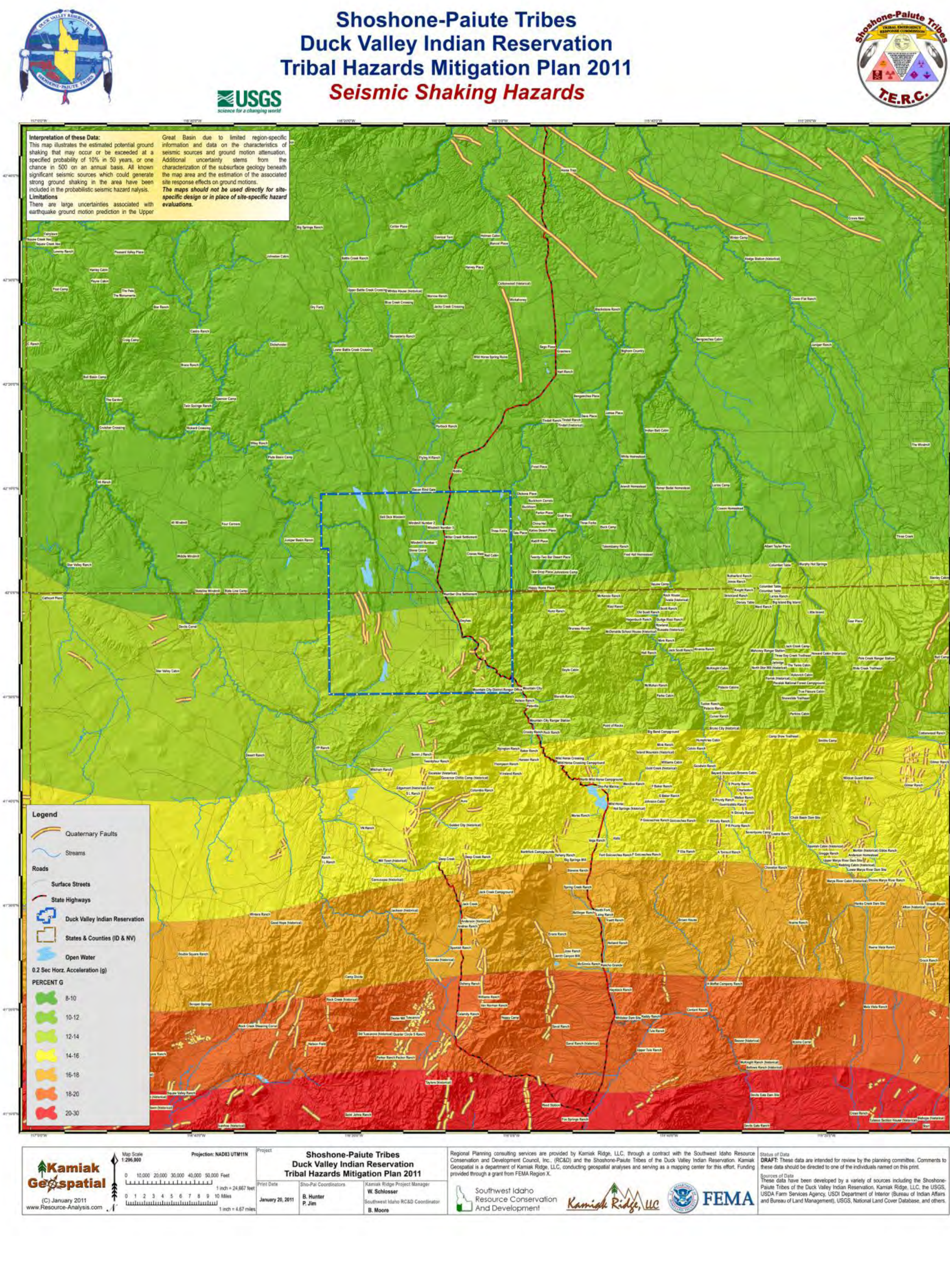
Windblown loess deposits are observed along the western side of the Duck Valley Indian Reservation and make up a part of the Palouse Hills soil complex. These highly fertile soils are sometimes very deep and often located on moderate slopes where farming activities are successful.

4.6.4. Seismic Shaking Hazards

The USGS has gathered data and produced maps of the nation, depicting earthquake shaking hazards (Figure 83). This information is essential for creating and updating seismic design provisions of building codes. The USGS Shaking Hazard maps for the United States are based on current information about the rate at which earthquakes occur in different areas and on how far strong shaking extends from quake sources. These analyses estimate the level of horizontal shaking that have a 1 in 10 chance of being exceeded in a 50-year period. Shaking is expressed as a percentage of "g" (g is the acceleration of a falling object due to gravity). This analysis is based on seismic activity and fault-slip rates and takes into account the frequency of occurrence of earthquakes of various magnitudes. Locally, risk may be greater than that shown, because site geology may amplify ground motions.

Studies of ground shaking during previous earthquakes have led to better interpretations of the seismic threat to buildings. In areas of severe seismic shaking hazard, older buildings are especially vulnerable to damage. Older buildings are at risk even if their foundations are on solid bedrock, but are at greater risk if their foundations are not stable. Areas with high seismic shaking hazard can experience earthquakes with high intensity where weaker soils exist. Most populated areas on the Duck Valley Indian Reservation are located on or near alluvial deposits that provide poorer building site conditions during earthquakes. Older buildings may suffer damage even in areas of moderate ground shaking hazards (Breckenridge, et al. 2003, NBMG 2011).

Figure 83. Seismic Shaking Hazards of the region.



4.6.5. Earthquake Profile

Many populated places in the Northern Basin and Range ecoregion and Great Basin are at risk to earthquakes, even small ones, because they were built on unconsolidated sediments that move easily in response to seismic waves. Seismic waves are the form of energy that ripples through Earth when an earthquake occurs. When seismic waves propagate through unconsolidated sediments, the sediments re-organize and move chaotically (like shaking a bowl of marbles). The danger is really two-fold because population centers often contain structures built near rivers below the foothills and mountains, that were then expanded into the foothills with new structures. Mountain foothills contain erosional remnants called alluvial fans. The alluvial fans may either slide down into the valley or simply shake about, creating new topography due to internal settling. Structures on the Duck Valley Indian Reservation are located mostly along the bottoms of the river valleys where the alluvial fans are terminated – there are no structures used for habitation within the foothills of the Reservation.

All Duck Valley developments have been built within close proximity to river drainages, often placing the structures at risk to flooding. These zones typically are also found on unconsolidated sediments. The overwhelming majority of structures on the Duck Valley Indian Reservation are located on unconsolidated sediments that respond poorly to seismic shaking.

Ground motion is the shaking of the ground that causes buildings to vibrate. Large structures such as office buildings, dams, and bridges may collapse. Broken gas lines and fallen electrical wires may cause fires, while broken water lines can hinder the capability of controlling fires. Landslides can also be caused by earthquakes.

Geological and seismological studies in combination with local fault lines indicate that earthquakes are likely to occur within the Duck Valley Indian Reservation.

The 1991 Uniform Building Code (UBC), a nationwide industry standard, sets construction standards for different seismic zones in the nation. UBC seismic zone rankings for Idaho and Nevada are among the highest in the nation. When buildings are built to these standards they have a better chance of withstanding earthquakes. In 2002 the International Building Code (IBC) adopted the 1991 UBC earthquake standards. The Duck Valley Indian Reservation operates with compliance to the 2006 International Building Code and the 2006 International Residential Code. Given the Reservation's risk level, this is adequate caution for all new construction.

The 2006 International Building Code provides an assessment that the area is in a site class 2-B, possessing a 17%-33% chance of experiencing a horizontal spectral response acceleration for 0.2 second period with a 2% probability of exceeding the norm in 50 years (Petersen, et al. 2008).

More challenging for Duck Valley Indian Reservation residents is dealing with older structures that were built prior to development of the new standards and are not in compliance. There are two main risk categories on the Duck Valley Indian Reservation; 1) unreinforced masonry structures, and 2) brick or masonry chimneys on otherwise stable wood-frame structures. The risks presented by these two categories of construction will be discussed in greater detail in subsequent sections of this plan.

4.6.5.1. Past Earthquake Events

In Nevada a number of the larger shocks have produced some spectacular examples of surface faulting; these include shocks at Pleasant Valley (1915), Cedar Mountain (1932), Excelsior Mountain (1934), Rainbow Mountain (1954), and Fairview Peak - Dixie Valley (1954). Although these events are classified as major earthquakes in terms of magnitude, no fatalities were reported and building damage was minimal because of the sparse population of the epicentral areas.

On March 28, 1975, and earthquake hit Oneida County, Idaho, causing a reported $1.0 million in damage. In nearby Custer County, Idaho, on October 28, 1983, another earthquake hit causing 3 injuries and 2 deaths and a reported $12.5 million in property damages (Hazards & Vulnerability Research Institute 2011). Both of these quakes were felt on the DVIR, but neither caused any damages.

The earliest reported earthquake in Nevada occurred in 1851. A newspaper article in 1865 cited reports of an earthquake 13 years earlier near Pyramid Lake. The account stated that great cracks opened from which water spouted 100 feet high. Large landslides were also reported.

On October 2, 1915, three strong earthquakes within about 7 hours disturbed a large part of northern Nevada. The third tremor had an estimated magnitude of 7.75. It destroyed or seriously damaged many adobe houses in Pleasant Valley. Most of the damage was confined to the towns of Kennedy, Lovelock, and Winnumucca. The earthquake was felt over a very wide area - from Baker, Oregon, to San Diego, California, and from the Pacific coast to beyond Salt Lake City, Utah; an area of about 1,295,000 square kilometers. A scarp 1.5 to 4.5 meters high and 35 kilometers long, was formed parallel to the base of the Sonoma Mountains. About 100 aftershocks followed the main earthquake.

An earthquake of magnitude 7.3 originated in west-central Nevada on December 20, 1932. The epicentral area, near Cedar Mountain, was almost uninhabited. Two cabins, one of stone, and the other of adobe, were destroyed, and mining property was damaged. Many chimneys were thrown down at Mina and Luning. At Hawthorne, the shock cracked and threw down chimneys. Extensive and complicated faulting occurred northeast of Mina, over an area of about 60 kilometers long and 6 to 14 kilometers wide in the valley between the Cedar and Pilot Mountains. The total felt area was approximately the same as that of the 1915 shock.

About a year later, on January 30, 1934, a magnitude 6.5 earthquake which centered in the Excelsior Mountains area about 80 kilometers west of the 1932 zone, again caused some damage at Mina. The collapse of some adobe buildings at Marietta was also reported. Several foreshocks were noted; the strongest had a magnitude of 5.5 and occurred about an hour before the main earthquake. Slight damage at Mina resulted from this foreshock. A small fault scarp 12.5 centimeters high and about 1,500 meters long was formed on the south slope of the Excelsior Mountains. The earthquake was felt widely over Nevada and in parts of California and Utah, an area of about 285,000 square kilometers.

The Wells, Nevada, earthquake occurred at 6:16 a.m. PST on February 21, 2008, in northeastern Nevada, a region that had not had many earthquakes historically and lacked permanent seismometers to record events. The earthquake had a moment magnitude of 6.0, an epicenter about 9 km (6 mi) northeast of the City of Wells, and ruptured in the subsurface to within a few kilometers of the community. After a universally heard large ―bang‖ sound, Wells residents rode out the earthquake for as long as 40 seconds. Some stayed in bed, some sat or stood in place, some scrambled for their lives and ran out of their residences, and some protected possessions (such as one resident who reported steadying his giant flat-screen television). At the early morning hour of the event, nobody was in harm's way along the sidewalks of the historical district, and fortunately there were no deaths and only three minor injuries from the earthquake. The strong shaking caused at least minor damage to over 40 commercial and government buildings, roughly half the non-residential buildings in Wells, and major damage to 17 buildings (Figure 84). There was damage to over 60 chimneys in Wells, which was 10% to 15% of all the chimneys in town, and there was widespread nonstructural damage that included cracked interior drywall and windows, and fallen and damaged pictures, televisions, fish tanks, and dishes, in Wells and surrounding areas (dePolo 2011).

Figure 84. Unreinforced masonry building in Wells, Nevada after M8.0 earthquake in 2008.

Although this epicenter was located 100 miles southeast of Owyhee, the tremor was felt here. The cost of the earthquake, including the emergency response, damage losses, and reconstruction, was over $10.5 million. For some folks in Wells, the impact of the earthquake was the effort involved in cleaning up the home and work place and lending a helping hand to others. They lost some items and had cracks in the interior drywalls of their houses. A few others, however, lost their homes and had to deal with living in hotels and a very uncertain future. And, as can happen from earthquakes, a couple of people had complete changes in their livelihoods. In the moments, hours, days, weeks, and months thereafter, people worked tirelessly to respond to the emergency and recover from the earthquake. The community returned to a certain sense of normalcy within about year, was largely recovered within about three years, and has steadily tried to resolve outstanding damage (dePolo 2011).

4.6.6. Fault Lines

In geology, a fault is a planar fracture or discontinuity in a volume of rock, across which there has been significant displacement. Large faults within the Earth's crust result from the action of tectonic forces. Energy release associated with rapid movement on active faults is the cause of most earthquakes. A fault line is the surface trace of a fault, the line of intersection between the fault plane and the Earth's surface (Tingley and Pizarro 2000).

Since faults do not usually consist of a single, clean fracture, geologists use the term ‘fault zone’ when referring to the zone of complex deformation associated with the fault plane. Across the Duck Valley Indian Reservation there are approximately 3 individual fault line structures (fault zones), all aged 1.6 million years and younger (Figure 93) (Haller, Dart and Rhea 2004).

The two sides of a non-vertical fault are known as the hanging wall and footwall. By definition, the hanging wall occurs above the fault and the footwall occurs below the fault (USGS 2000). Most of the seismic activity takes place where two or more plates meet. Plates may collide, pull apart, or scrape past each other. Because of friction and the rigidity of the rock, the rocks cannot simply glide or flow past each other. Rather, stress builds up in rocks and when it reaches a level that exceeds the strain threshold, the accumulated potential energy is released as strain, which is focused into a plane along which relative motion is accommodated; the fault (Tingley and Pizarro 2000).

All the stress and strain produced by moving plates builds up in the Earth’s rocky crust until it cannot store the contained energy any more. Suddenly, the rock breaks and the two blocks move in opposite directions along a more or less planar fracture surface called a fault.

The sudden movement generates an earthquake at a point called the focus. The energy from the earthquake spreads out as seismic waves in all directions. The epicenter of the earthquake is the location where seismic waves reach the surface directly above the focus (USGS 2000).

4.6.6.1. Normal Fault

Faults are classified by how the two rocky blocks on either side of a fault move relative to each other. A normal fault drops rock on one side of the fault down relative to the other side (Figure 85).

4.6.6.2. Reverse Fault

Along a reverse fault one rocky block is pushed up relative to rock on the other side (Figure 86).

4.6.6.3. Strike-slip fault

Strike-slip faults have a different type of movement than normal and reverse faults (Figure 87). The blocks that move on either side of a reverse or normal fault slide up or down along a dipping fault surface. The rocky blocks on either side of strike-slip faults scrape along side-by-side. The movement is horizontal and the rock layers beneath the surface are not moved up or down on either side of the fault.

Pure strike-slip faults do not produce fault scarps. There are other changes in the landscape that signal strike-slip faulting. Where the two massive blocks on either side of a strike-slip fault grind against each other, rock is weakened. Streams flowing across strike-slip faults are often diverted to flow along this weakened zone.

4.6.6.4. Real-life

In "real-life" faulting is not always exposed by such a simple pictures (Figure 85, Figure 86, Figure 87). Usually faults do not have purely up-and-down or side-by-side movement as described here. It is much more common to have some combination of fault movements occurring together. For example, along California's famous San Andreas strike-slip fault system, about 95% of the movement is strike-slip, but about 5% of the movement is reverse faulting in some areas (USGS 2000).

Figure 85. Normal Fault.

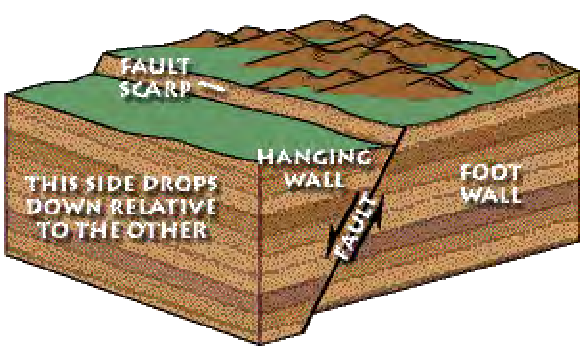


Figure 86. Reverse Fault.

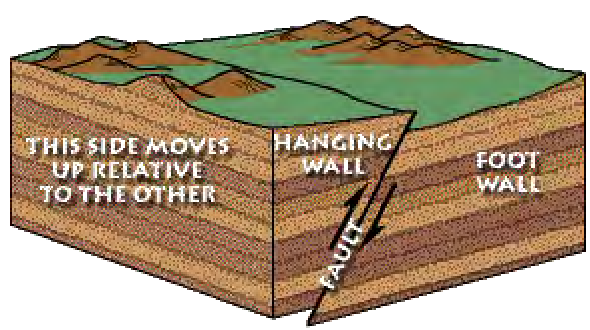


Figure 87. Strike-slip Fault

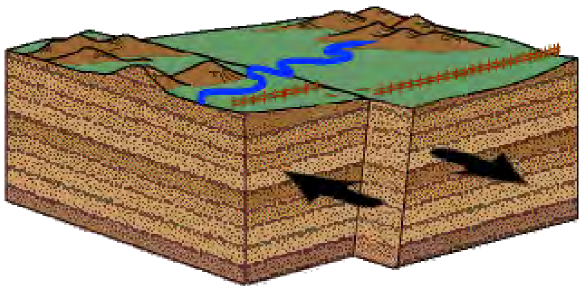


Figure 85, Figure 86, Figure 87 are all contributed by USGS (2000).

Within the Duck Valley Indian Reservation, the fault lines present are all categorized as "Normal Faults". These normal faults occur in places where the outer shell of the Earth's crust is being stretched. Normal faults can show different geometries. In some situations the faults can become gently dipping at depth so that they have a spoon (or listric) shape. Other normal faults are found in batches, dipping in the same direction, with rotated fault blocks between. These are termed domino faults and can be seen along the southern edges of the Duck Valley Indian Reservation (Figure 93).

Adams, K.D., and Sawyer, T.L., compilers, 1999, Fault number 1549, Unnamed fault zone south of Owyhee, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults, accessed 08/14/2011 05:15 PM. Partial Report for Unnamed fault zone south of Owyhee (Class A) No. 1549 (southwestern side of the Reservation (Figure 93)).

These short distributed intermontane faults in the northern Bull Run Mountains bound northwest front of Siciegottit peak, cross ridges east of Cavanaugh Spring and the canyon of the Owyhee River, and are scattered near range front west of Ungina Wongo peak. These northwest- through northeast-striking faults offset Quaternary colluvium and landslide deposits and juxtapose Quaternary colluvium against Tertiary and older rocks. Faults are expressed as minor topographic breaks, aligned drainages, saddles, and side hill benches. Detailed geologic mapping of the region is the source of data. Trench investigations and detailed studies of scarp morphology have not been completed. These short distributed intermontane faults in the northern Bull Run Mountains bound northwest front of Siciegottit peak, cross ridges east of Cavanaugh Spring and the canyon of the Owyhee River, and are scattered near range front west of Ungina Wongo peak.

The sense of the movements are classified as "Normal" (Figure 85). Faults appear to be expressed as minor topographic breaks, aligned drainages, saddles, and side hill benches. Quaternary; Tertiary. These faults offset Quaternary colluvium and landslide deposits and juxtapose Quaternary colluvium against Tertiary and older bedrock.

Sawyer, T.L., and Adams, K.D., compilers, 1999, Fault number 1547, Unnamed faults in eastern YP Desert, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults, accessed 08/14/2011 05:27 PM. Partial Report for Unnamed faults in eastern YP Desert (Class A) No. 1547. (southeastern side of the Reservation (Figure 93)).

These faults are part of a distributed zone of possibly related intra-plateau Tertiary faults that crosses the eastern YP Desert. Although most of the faults in the zone displace only Tertiary basalt and associated sediments, the faults shown here have the most notable topographic expression. Reconnaissance photogeologic mapping of the faults is the source of data. Trench investigations and detailed studies of scarp morphology have not been completed. These faults are part of a distributed zone of possibly related intra-plateau Tertiary faults that crosses the eastern YP Desert. The Tertiary faults form a distinctive orthogonal pattern in a Tertiary rhyolitic or dacitic flow or dome (Coats, 1987 #2861; Dohrenwend and Moring, 1991 #284). No published mapping indicates the Quaternary faults extend into Idaho.

The sense of the movements are classified as “Normal” (Figure 85). Abrupt and well-defined fault scarps juxtapose Quaternary alluvium against bedrock.

4.6.7. Brick and Mortar vs. Seismic Shaking

4.6.7.1. Unreinforced Masonry Buildings

Masonry boasts a remarkable compressive strength (vertical loads) but is much lower in tensile strength (twisting or stretching), unless reinforced. The tensile strength of masonry walls can be increased by thickening the wall, or by building masonry "piers" (vertical columns or ribs) at intervals. Where practical, steel reinforcement also can be introduced vertically and/or horizontally to greatly increase tensile strength, though this is most commonly done with poured walls.

Early 20th century masonry construction techniques did not use the technology of reinforcement as is used today in new construction. Unreinforced masonry buildings are a type of structure where load-bearing walls, non-load-bearing walls, or other structures such as chimneys are made of brick, cinderblock, tiles, adobe, or other masonry material that is not braced by reinforcing beams (CSSC 2005). The term is used as a classification of certain structures for earthquake safety purposes, and is subject to some variation from place to place (ABAG 2003).

Unreinforced masonry buildings on the Duck Valley Indian Reservation were constructed in an era when reinforcing was generally not used. Anchorage to floor and roof was generally missing and the use of low-strength lime mortar surrounding river rock was common (Figure 88). Construction of reinforced masonry became common sometime between 1933 and 1955, depending on local codes and stringency of code enforcement (Figure 89). Current efforts on the Duck Valley Indian Reservation include new reinforced masonry construction alongside unreinforced masonry buildings (Figure 90).

Figure 88. Early era stone and masonry building in Owyhee, serving as Tribal Court.

Figure 89. Reinforced masonry construction of Owyhee Community Health Care Facility.

Figure 90. (Left) Unreinforced masonry building in background, with new masonry construction in the foreground. (Right) slate rock with low-strength lime mortar – building currently vacant.

Unreinforced masonry structures are vulnerable to collapse in an earthquake. One problem is that most mortar used to hold bricks together is not strong enough (CSSC 2005). Additionally, masonry elements may "peel" from the building and fall onto occupants in the building or pedestrians outside (Perkins 2004).

Building retrofits are relatively expensive, and may include tying building walls to the foundation, tying building elements (such as roof and walls) to each other, so the building moves as a single unit rather than creating internal shear during an earthquake, attaching walls more securely to underlying supports so they do not buckle and collapse, and bracing or removing parapets and other unsecured decorative elements (Perkins 2004, CSSC 2005). Retrofits are generally intended to prevent injury and death to people, not to preserve the building itself (Perkins 2004).

Earthquake damage to unreinforced masonry structures can be severe and hazardous (Figure 84). The lack of reinforcement coupled with poor mortar and inadequate roof-to-wall ties can result in substantial damage to the building as a whole as well as to specific sections of it. Severely cracked or leaning walls are some of the most common earthquake damages. Also hazardous, but slightly less noticeable, is the damage that may occur between the walls, and roof and floor diaphragms. Separation between the framing and the walls can jeopardize the vertical support of roof and floor systems, which could lead to the collapse of the structure (ABAG 2003).

Although the Duck Valley Indian Reservation contains many buildings constructed from masonry materials that may or may not have been reinforced during or after initial construction.

Most remain from an era that used materials and construction techniques that place them at extremely high risk to seismic shaking hazard destruction.

4.6.7.2. Brick Chimneys

Most homes on the Duck Valley Indian Reservation are built with wood-frame construction techniques (Table 32). These homes and businesses are typically considered resistant to seismic shaking hazards. However, many of these homes have incorporated a brick chimney appendage. Chimneys placed internally to the frame of the home are considered more resistant to loss from shaking hazards. Those that append the chimney to the side of the structure or extend more than 4 feet above the supporting wall (Figure 90, Figure 91) are more at risk to falling bricks from earthquake-induced shaking.

Figure 91. Notable unreinforced brick chimney at the Owyhee School building.

Table 32. Heating sources and construction materials on the Duck Valley Indian Reservation.

Heating	Count	Construction	Count
Includes Wood Stove	433	Unknown or Unclear	29
Propane	41	Brick & Concrete Block (unreinforced)	22
Unknown	70	Metal Frame	5
Fuel Oil	5	Mobile Home	24
Electric	39	Pole	2
	0	Stone	16
	0	Wood Frame	490
Total	**588**	**Total**	**588**

When coupled with fault lines across the region and the periodic earthquakes in the area, much of the Duck Valley Indian Reservation is at risk to shaking losses. These losses could be greatly mitigated by reinforcing the 22 unreinforced buildings that lack reinforcement (Table 32). The goal of reinforcement is not to save the buildings, but to reduce the risk of damaging people in the structure and next to it when a shaking disaster strikes (ABAG 2003).

How to Identify unreinforced masonry buildings (CSSC 2005)**:**

- Bricks or stone can be seen from the outside (unless the walls are covered with stucco).
- Brick walls have "header courses" of bricks turned endways every five or six rows.
- Structure is brick or masonry and is known to be built before 1933.

If visual inspection cannot determine these components from the outside, investigations behind electrical cover plates and electrical outlet boxes on an outside wall may reveal brick or other masonry materials. If the wall is concrete or concrete block, it is very difficult to find out if reinforcing steel was added during construction.

Other sources of verification:

- Look for copies of the structural plans, which may be on file with the Building Department, or
- Consult a licensed engineer to make the determination.

Suggestions:

- It is very expensive to shore up a house, remove damaged walls, and put in new walls.
- Consult a licensed architect or engineer to fix this problem.
- Another solution might involve
    - Tying the walls to the floor and roof.
    - Installing a steel frame and bolting the wall to it.

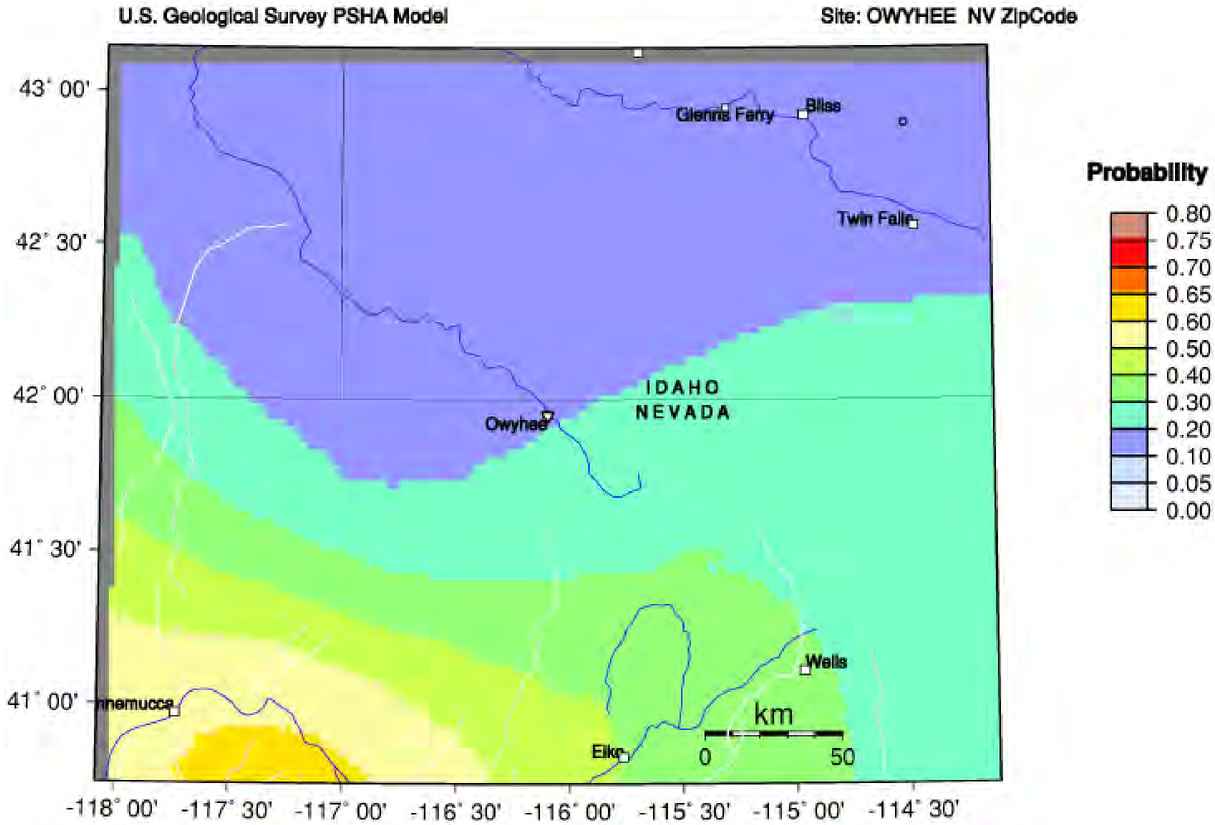
4.6.8. Probability of Future Events

Although the Reservation is located in two of the most seismically active states in the lower 48, it is located in the least seismically active areas in both Nevada and Idaho. This does not mean that earthquakes in adjacent areas of Idaho or Nevada will not be felt or have impacts on the Reservation.

Studies of ground shaking in Idaho and Nevada during previous earthquakes have led to better interpretations of the seismic threat to buildings. In areas of severe seismic shaking hazard, older buildings are especially vulnerable to damage. Older buildings are at risk even if their foundations are on solid bedrock. Areas shown on the map with high seismic shaking hazard (Figure 92) can experience earthquakes with intensity VII where weaker soils exist. Most of the DVIR are located on or near alluvial deposits which provide poorer building site conditions during earthquakes. Older buildings may suffer damage even in areas of moderate ground shaking hazards.

As seen in Figure 92, the probability for the DVIR to experiences a magnitude 5 or higher earthquake in the next 50 years is approximately 20%-30%.

Figure 92. Probability of earthquake with an M ≥ 5.0 within 50 years and 50 km.



It is difficult to estimate potential losses on the DVIR because of the low periodicity of earthquakes and unknown building factors such as year of construction and building materials. Anecdotal evidence suggests that the potential losses would be minimal because of the high percentage of structures which are relatively new wooden frame construction (ex., Tribal Headquarters, Parks and Recreation building, homes - Table 32). Key infrastructure buildings such as the hospital and the school are multi-story buildings with a component of masonry used in construction, however these are all 'recent' construction integrating reinforcement techniques.

We have estimated losses based on an earthquake of magnitude 5.0, with a probability of 25% (Figure 7.4), occurring within 50 km of the DVIR.

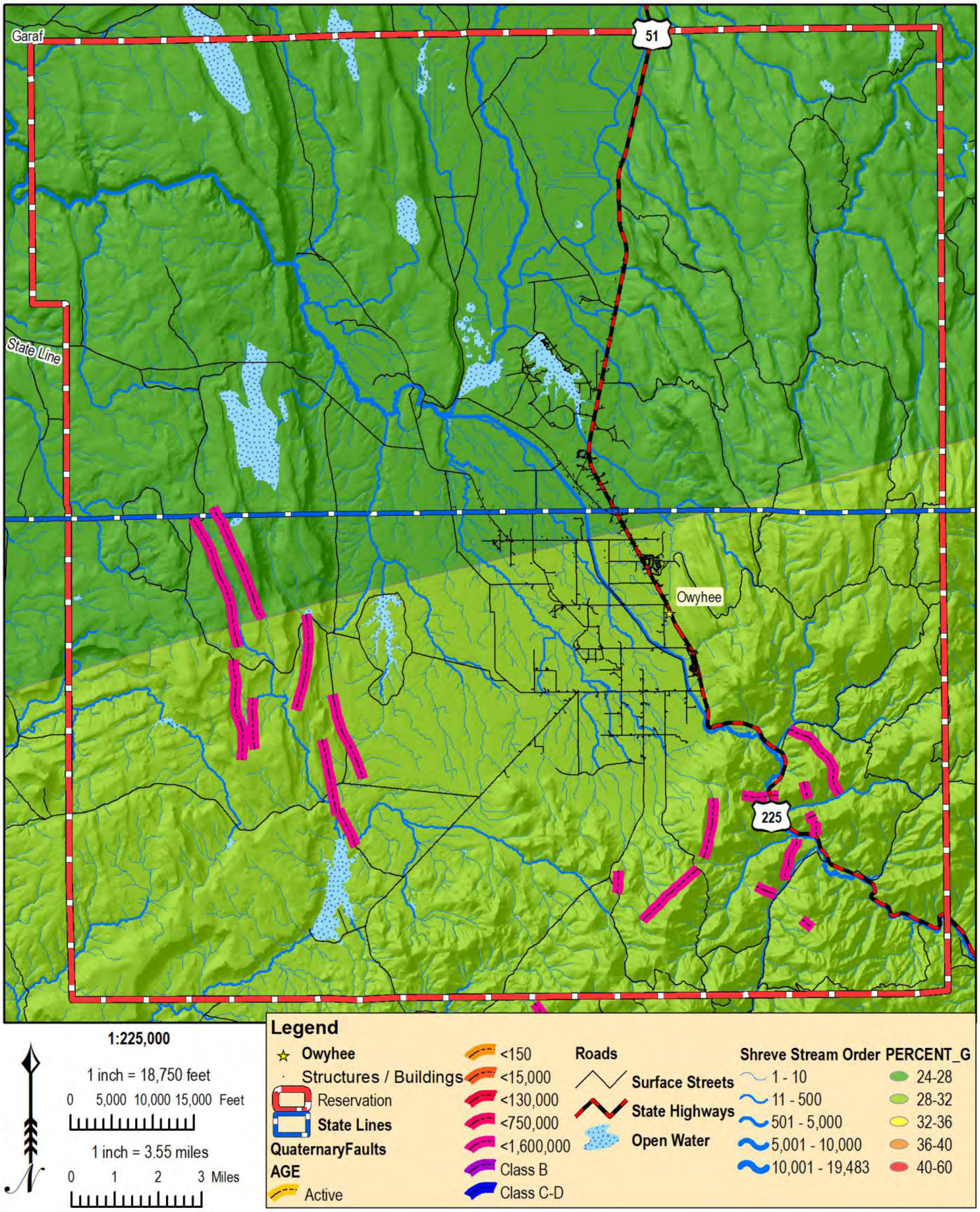
The Duck Valley Indian Reservation has a moderate probability of future earthquake events with those events expected to be seen as infrequently as once every 25 years and with Mercalli magnitudes of IV to VII (Table 31). Although the frequency and the intensity of expected earthquakes is low, the potential for a significant event is real, as indicated by other historical events within the "geologic neighborhood" (ex., Wells, Nevada, M8.0 earthquake in 2008).

4.6.9. Resources at Risk

4.6.9.1. Reservation Resources

The exposure of resources on the Duck Valley Indian Reservation to earthquake damage is not localized to small areas. Literally, all of the Duck Valley Indian Reservation is exposed to losses potentially resulting from seismic shaking hazards and fault line tremors. Analysts have estimated that the seismic shaking hazards for the northern half of the Reservation is in the range of moderate risk (24-28% G), and the southern half is slightly higher risk (28-32% G) (Figure 93).

Figure 93. Fault lines and Seismic Shaking Hazards of the Duck Valley Indian Reservation.



While all structures are potentially at risk to damage from earthquakes on the Duck Valley Indian Reservation, a special category of structures are at increased risk. These are the previously discussed brick and masonry buildings and chimney structures found throughout the Duck Valley Indian Reservation.

In most communities, wood-frame construction dominates the architectural scene. These structures are generally considered at lower risk to earthquake damage. A complete structure level inventory of masonry building construction date, reinforcement condition, or chimney stability has not been completed. A recommendation of this planning effort is to begin the process at the Tribal level to address risk exposure. As these inventories are created, increasing the structural integrity of external wall chimneys by reinforcement can begin.

The value of resources at risk to earthquake losses are partially explained by the seismic shaking hazard risks on the Duck Valley Indian Reservation. There are only two risk categories (24-28% G and 28-32% G) (Figure 93) found within the Reservation (Figure 93).

4.6.9.2. Wild Horse Reservoir Risk

Transecting the reservoir is the Eastern Independence Mountains fault zone (Class A) No. 1556 (Figure 94). This is a long discontinuous, down-to-the-east normal fault bounding east front of the Independence Mountains and Lone Mountain to Singletree Creek. This major range-bounding fault places Quaternary alluvium against bedrock, and form scarps and lineaments on Quaternary alluvium adjacent to the range front. Reconnaissance photogeologic mapping of fault-related features is the source of data. Trench investigations and studies of scarp morphology have not been conducted along the fault (Oswald and Sawyer 1998).

Age of faulted surficial deposits is considered to be middle to early Pleistocene; Quaternary. The fault displaces alluvium interpreted from photogeologic mapping to be Quaternary in age. Slemmons (1964, unpublished Wells 1° X 2° sheet) reported a fault in late Pleistocene piedmont-slope deposits based on photogeologic mapping. This fault zone was not identified when the Dam was placed in neither 1937 nor 1969.

When combined, the risk profile of the seismic shaking hazards in the region (Figure 83), and the presence of active fault lines near the Dam (Figure 94), gives concern to the residential properties downstream of the Dam located along Nevada Highway 225, through Mountain City and the Duck Valley Indian Reservation (Figure 95).

The Shoshone-Paiute Tribes are responsible for water releases from the Dam and for monitoring the stability of the structure. There is not an automated system to warn the Tribes of eminent failure, such as an earthquake or tremor that causes a crack in the Dam structure. Oral reports from the Tribal member responsible for Dam management, confirmed that requests have been forwarded to Mountain Home Air Force Base, located 100 miles north of Owyhee, to arrange a “fly by” to observe if any visual cracks in the dam are seen.

These circumstantial situations have led to the recommendation for the Tribes to install an Automatic Laser Dam Safety Network Monitoring System on the Wild Horse Dam (Figure 96). Laser safety monitoring considerations for the largest dams in the world are provided by means of the generalized three-point method provided by a series of lasers located on the Dam and pointed to fixed locations on the surrounding hillsides. This system establishes control points by linking the lasers to both the Dam and the fixed location. When the line-of-sight is broken because of movement, a warning is sent via radio (solar powered) to a monitoring station. This alerts the station of a possible Dam failure in progress. Evacuation can be initiated immediately while the situation is confirmed. These services will benefit both the residents of Duck Valley and Mountain City, Nevada.

Figure 94. Fault Lines surrounding Wild Horse Dam.

Red Arrow shows location of Wild Horse Dam, orange lines are fault lines, red line is NV Hwy 225.

Figure 95. Flood inundation from Wild Horse Dam, through Tribal Ranch Properties (Fee Simple and shown in yellow), along Owyhee River.

Figure 96. Automatic Laser Dam Safety Network Monitoring System.

Wild Horse Reservoir
First Constructed 1937, new spillway built 1969

4.6.10. Loss Methodology

To calculate the potential damage that would occur to structures on tribal property, the building type, structure value, and content value of buildings on the Duck Valley Indian Reservation were obtained from Tribal records. A damage ratio was assigned to each category of structure (single story residential, multiple-story residential, hospital, school, office building, retail building, etc.). Content losses were estimated at ½ of the building losses. Operating costs and net revenue values derived from the loss of operations at each structure were not estimated, thus the resulting estimates most likely underestimate the actual losses the Duck Valley Indian Reservation would experience given the hazard event. However this is consistent with the potential for departments of the Shoshone-Paiute Tribes to operate from alternative locations as evidenced in the survey of Department Managers.

4.6.11. Loss Estimates

The total value of structures on the Duck Valley Indian Reservation is approximately $71,301,107. Loss estimates were based on the type of structure and are summarized in Table 33. These estimates were based on construction type and building characteristics in a magnitude 5.0 earthquake and are estimated at $5.9 million.

Table 33. Earthquake loss ratios for structures and contents, based on structure type.

Structure Type	Damage Ratio to Structure	Damage Ratio to Contents	Count	Total Structure Value	Loss Estimate
Pump House	1.0%	0.5%	7	$514,050	$7,711
Mobile home	10.0%	5.0%	30	$2,354,686	$353,203
Shed/Shop	2.0%	1.0%	10	$959,204	$28,776
Silo	1.0%	0.5%	1	$84,000	$1,260
Single story	5.0%	2.5%	485	$51,358,029	$3,851,852
Two Story	8.0%	4.0%	30	$11,832,638	$1,419,917
Other	4.0%	2.0%	25	$4,198,500	$251,910
Total / Average	**4.43%**	**2.21%**	**588**	**$71,301,107**	**$5,914,629**

The weighted average damage to these structures and contents were estimated at 8.0% of value as a result of a magnitude 5.0 earthquake, occurring within 50 km of Duck Valley Indian Reservation. Total contents value was estimated at $35.7 million and the average damage to contents was estimated at 2.21%, and yields a loss estimate of $985,771.

Public health and safety, environmental, and economic effects would also result from potential electrical power line, water and sewer pipeline failures. Overhead power lines both in the Duck Valley Indian Reservation and on the main high tension power lines supplying the Reservation, could arc against each other causing power interruption. Downed power lines could result in wildfires, injury to people and motorists, and result in prolonged outages, especially when considered in light of the extreme remoteness of the region to the larger population centers of Idaho (Boise, Caldwell, Twin Falls), and Nevada (Elko, Reno, Las Vegas). Outages would not only impact homes and businesses, but also critical services such as the hospital, Tribal Council, fire and police. Fortunately these critical departments have power generators available as a backup to operations. Electrical loss would also impact the ability of the Tribe to pump water and process waste water.

In the event of a large earthquake, the Shoshone-Paiute Tribes could suffer economic losses from regional damages. Road transportation to Mountain Home, Idaho, and Elko, Nevada, could be compromised. Transportation losses could be in the form of earthquake induced landslides covering roads, liquefaction of riverside abutments holding bridges, and even the failure of the Wild Horse Reservoir leading to flood inundation.

Impacts to the growing recreation business on the Duck Valley Indian Reservation would be negatively impacted as well. Recreation on the Duck Valley Indian Reservation is based mainly on fishing and camping in the Duck Valley.

4.6.12. Potential Mitigation Activities

Seismic retrofitting is the modification of existing structures to make them more resistant to seismic activity, ground motion, or soil failure due to earthquakes. With better understanding of seismic demand on structures and with recent experiences with large earthquakes near urban centers, the need of seismic retrofitting is well acknowledged. Prior to the introduction of modern seismic codes in the U.S. during the late 1960s, many structures were designed without adequate detailing and reinforcement for seismic protection (Scotese 2002). This is generally the case in much of the Northern Basin and Range ecoregion and Great Basin and specifically on the Duck Valley Indian Reservation. In view of the imminent problem, various research studies have been carried out worldwide. Furthermore, state-of-the-art technical guidelines for seismic assessment, retrofit and rehabilitation have been published (FEMA 2009).

Retrofit techniques are applicable for other natural hazards such as tornadoes, and severe winds from thunderstorms. While the current practice of seismic retrofitting is concerned with structural improvements to reduce the seismic hazard of using the structures, it is essential to reduce the hazards and losses from non-structural elements as well (FEMA 2009). Methods of reducing hazards within schools, hospitals, homes, office buildings, and other commercial buildings, and general disaster preparation are found in related articles on household seismic safety published by FEMA (FEMA 2011). It is important to keep in mind that there is no such thing as an earthquake-proof structure, although seismic performance can be greatly enhanced through proper initial design or subsequent modifications (FEMA 2009).

A Shoshone-Paiute Tribes' Comprehensive Building Plan and strategy for preparing for earthquakes should include (FEMA 2009):

- Assessment of seismic hazards to quantify and understand the threat;
- Adoption and enforcement of seismic building code provisions especially in reference to chimneys and brick or masonry buildings, including pre-existing structures;
- Implementation of land use and development policy to reduce exposure to earthquake hazards;
- Implementation of retrofit, redevelopment, and abatement programs to strengthen existing structures, especially the unreinforced masonry buildings;
- Implementation of reinforcement to extended brick and masonry chimney structures prone to collapse during seismic events;
- Support of ongoing public-education efforts to raise awareness and build support; and
- Development and continuation of collaborative public/private partnerships to build a prepared and resilient community.

The Sho-Pai News, as local media, can raise awareness about earthquakes by providing important information to the community. Here are some suggestions (FEMA 2009):

- Publish a special section in Sho-Pai News with emergency information on earthquakes. Localize the information by printing the phone numbers of local emergency services offices, the American Red Cross, and hospitals.
- Conduct a month-long series on locating earthquake hazards in the home.
- Work with local emergency services and American Red Cross officials to prepare special reports for people with mobility impairments on what to do during an earthquake.
- Provide tips on conducting earthquake drills in the home, schools, and public buildings.
- Interview representatives of the gas, electric, and water companies about shutting off utilities.

4.6.12.1. Unreinforced Masonry Chimney Reinforcement

Unreinforced Masonry (URM) chimneys are extremely vulnerable to earthquake damage; their behavior has long been used as an indicator of seismic intensity as in the Modified Mercalli Intensity (MMI) scale. Unreinforced masonry chimneys may crack, spall, separate from the structure, or collapse. They may fall through the roof structure and injure occupants or fall to the ground hurting people. Chimneys may suffer damage even at relatively low levels of ground shaking.

FEMA has offered several considerations when addressing the case of unreinforced chimney structures (FEMA 2011):

- The most reliable mitigation measure is to remove a URM chimney and replace it with a metal flue inside a framed enclosure or to remove the chimney and firebox entirely.

- If the chimney is not being used, reducing its height to not more than 1 to 2 feet above the roofline will limit the potential for damage.
- Chimney and roof configurations vary widely. If a URM chimney is to be braced in place, an engineered design is needed to account for specific as-built construction details.
- To protect against a chimney falling in toward the roof and posing a safety hazard below, the roof can be locally strengthened with plywood.
- Large historically important chimneys need special consideration; these could be reinforced using a “center core” technology to improve their performance; this method involves core drilling the masonry and filling the cores with reinforcing and grout.
- Fire code requirements and local ordinances must be considered when considering strategies for reducing the risk of unreinforced masonry chimneys.
- The City of Seattle developed guidelines for Alteration and Repair of Unreinforced Masonry Chimneys following the 2001 Nisqually Earthquake (City of Seattle 2004).

The utility of reinforcing URM Chimneys is not necessarily to preserve the chimney structure, but to prevent injury to people located adjacent to the building when an earthquake happens. Falling debris from the structure can harm, or kill, people below when it drops. The design of URM Chimney enhancements has been proposed and developed within areas that experience frequent earthquakes (e.g., California San Andreas Faults), or notable earthquake events (e.g., Seattle’s Nisqually Earthquake 2001).

The design most applicable to the Duck Valley Indian Reservation is to reinforce chimney structures by attaching an external frame to the chimney with vertical angle iron supports held in place with horizontal frames placed between the roof and the top of the chimney (Figure 97). These frames are then braced to the structure’s frame (Figure 98). This design will not prevent damage to the chimney during an earthquake, but it could reduce the potential for damage to the building and to people or resources on the ground and adjacent to the structure because of a seismic event.

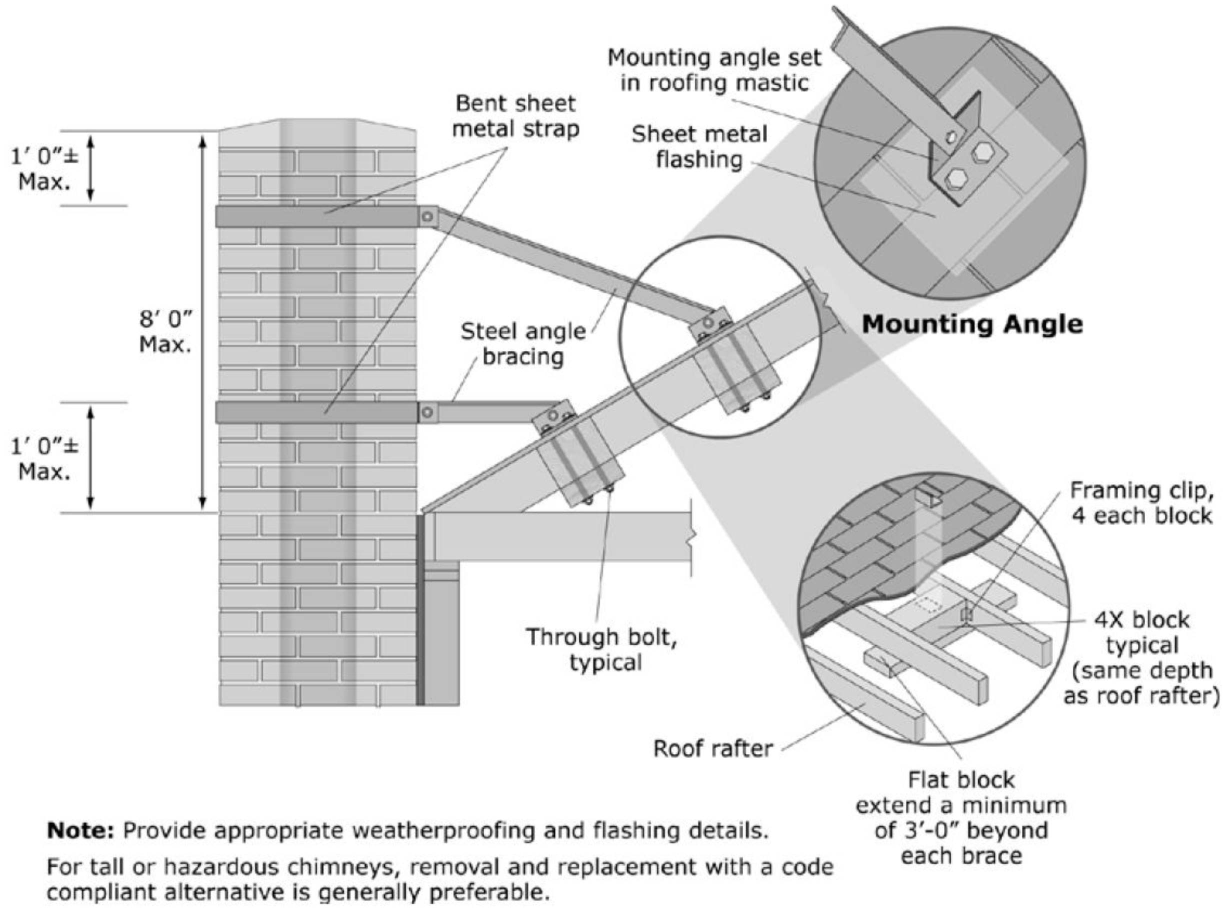
Figure 97. The reinforcement of URM chimney structure (FEMA 2011).

When considering seismic stability where URM building techniques have been implemented, it is advisable to give serious consideration to the current utility of the URM chimney structure. If the chimney is no longer used for smoke management from wood burning, then removal of the chimney should be seriously considered. If the chimney is used, but it extends more than about 3 feet above the roof line, then consider chimney reinforcement, bracing, removal, or replacement with a factory-built chimney structure (using metal structure design instead of masonry).

Chimneys may be used for venting more than one appliance. For example, the same chimney may vent both a gas water heater and a fireplace. Before capping or removing a chimney, it is important to verify that it is not needed to vent any other appliance.

The City of Seattle (2004) developed a Director's Rule (5-2004) in response to damages in Western Washington during the Nisqually earthquake of 2001. The region experienced extended amount of damage because of URM chimney failure. Those design specifications provide cautions, insights, and design standards that can be applied to structures on the Duck Valley Indian Reservation. Those guilds and designs are recommended for the Shoshone-Paiute Tribes to adopt and implement on the Duck Valley Indian Reservation.

Figure 98. Mitigation Measures Design As-Built for URM Chimney Structure (FEMA 2011).



4.7. Landslides & Mass Wasting

A landslide is a geological phenomenon that includes a wide range of ground movement such as rock falls, deep failure of slopes, and shallow debris flows. Although the action of gravity is the primary driving force for a landslide to occur, there are other contributing factors affecting the original slope stability. Typically, pre-conditional factors build up specific sub-surface conditions that make a slope prone to failure, although the actual landslide often requires a trigger before being released. Landslide is a general term for a wide variety of down slope movements of earth materials that result in the perceptible downward and outward movement of soil, rock, and vegetation under the influence of gravity. The materials may move by falling, toppling, sliding, spreading, or flowing. Some landslides are rapid, occurring in seconds, whereas others may take hours, weeks, or even longer to develop. Although landslides usually occur on steep slopes, they also can occur in areas of low relief. Landslides can occur as ground failure of river bluffs, cut and-fill failures that may accompany highway and building excavations, collapse of mine-waste piles, and slope failures associated with quarries and open-pit mines.

The term “landslide” covers a variety of processes and landforms known as rockslide, rock fall, debris flow, liquefaction, slump, earthflow, and mudflow. The IGS, a research agency of the University of Idaho (Breckenridge, et al. 2003), and the Nevada Bureau of Mines and Geology (NBMG 2011) have identified and plotted over 7,300 landslides for the USGS's national landslide appraisal. Landslides are a recurrent menace to waterways and highways and a threat to homes, schools, businesses, and other facilities.

Landslides may be triggered by other natural hazards such as earthquakes and floods. Weather and climate factors, such as melting snow and rain, that increase the water content of earth materials may fuel slope instability. The activities of urban and rural living with excavations, roads, drainage ways, landscape watering, logging, and agricultural irrigation may also disturb the stability of landforms. Late spring and early summer is slide season, particularly after days and weeks of greater than normal precipitation.

Landslide damages can be costly. The entire Northern Basin and Range ecoregion and Great Basin faces the challenge of maintaining major travel routes. Redirecting local and through traffic around a landslide is not an option in many places. Alternative routes often do not exist, and detours in steep terrain are difficult or impossible to construct. The unimpeded movement over roads—whether for commerce, public utilities, school, emergencies, police, recreation, or tourism—is essential to a normally functioning society. The disruption and dislocation caused by landslides can quickly jeopardize that freedom and vital services.

Landslides can be triggered by natural changes in the environment or by human activities. Inherent weaknesses in the rock or soil often combine with one or more triggering events, such as heavy rain, snowmelt, or changes in ground water level. Late spring-early summer is slide season, particularly after days and weeks of greater than normal precipitation. Long-term climate change may result in an increase in precipitation and ground saturation and a rise in ground-water level, reducing the shear strength and increasing the weight of the soil.

Stream and riverbank erosion, road building or other excavation can remove the toe or lateral slope can exacerbate landslides. Seismic or volcanic activity often triggers landslides as well. Urban and rural living with excavations, roads, drainage ways, landscape watering, logging, and agricultural irrigation may also disturb the solidity of landforms, triggering landslides. In general, any land use changes that affect drainage patterns or that increase erosion or change ground-water levels can augment the potential for landslide activity.

Landslides are a recurrent menace to waterways and highways and a threat to homes, schools, businesses, and other facilities. The unimpeded movement over roads—whether for commerce, public utilities, school, emergencies, police, recreation, or tourism—is essential to a normally functioning of the Reservation. The steep canyon walls located along the Owyhee River in the southern end of the Reservation pose the most landslide prone area on the Reservation. The main north south highway (NV 255) runs through this canyon and is continually affected by rock fall and small landslides which interrupts traffic flow.

Due to the location of most housing, offices, schools and other resources in the valley, little infrastructure other than the main highway, is affected by landslides on the Reservation.

There have been no reports of destructive landslide events in Owyhee or Elko Counties, no Presidential Disasters of landslide in the area, nor anecdotal information leading to large mass wasting events on the Duck Valley Reservation in recent memory. However, reports of rock slides terminating along Nevada State Highway 225 are an annual occurrence hindering traffic movement. Most of the landslides on the Duck Valley Indian Reservation recalled in memory by local residents and the Planning Committee members have occurred along County or Forest Service roads and may in some cases be a result of road construction or maintenance activities. A few re-occurring slide areas cause damage to the paved road surface and require cleanup of slide debris on a fairly regular basis – even annually or twice every three years (especially State Highway 225).

There are no SHIELDUS events of landslides recorded for either Elko County, Nevada, or Owyhee County, Idaho. Although SHIELDUS tracks the existence of landslides, none have been reported for this geographical area.

4.7.1. Incident Summary-May 15, 1972

During the morning of May 15, 1972 there was unusually high precipitation (rainfall) accompanied by warm, humid temperatures. This weather melted a high winter snowpack in the Cavanaugh Springs drainage on the southeastern portion of the reservation along Highway 225. The conditions resulted in a mudslide event that brought down several thousand tons of mud that covered the highway for 80 yards wide and 100 yards long that eventually hit the banks of the Owyhee River (Figure 99). This event caused highway closure for approximately two days, as residents had no access route into Elko, Nevada. The Nevada Dept. Of Transportation started highway clearing on the south end of the slide as Bureau Of Indian Affairs Road Maintenance crews started work on the north on the morning of May 16, 1972. The closure caused severe traffic back-up as transients were re-routed back through Twin Falls, Idaho, Wendover, NV and eventually into Elko. All traffic traveling north was re-routed through Wells, NV. All medical patient runs to Elko were sent towards Idaho and the school bus routes cancelled. The indirect cost of the event cannot be accurately summarized due to many factors involved. It was fortunate that there had been no vehicles in the area at the time as there were no injuries or casualties. Tribal members that bought groceries, gas other goods at the Golden Rule store in Mt. City had to travel to Mtn. Home, Idaho, 100 miles north for food.

Reservation Summary: $25,000 loss.

Figure 99. Past mudslides on the Duck Valley Indian Reservation (1972).

4.7.2. Types of Landslides

4.7.2.1. Debris flow

Slope material that becomes saturated with water may develop into a debris flow or mud flow. The resulting slurry of rock and mud may pick up trees, houses, and cars, blocking bridges and tributaries, and causing flooding along its path. Debris flow is often mistaken for flash flood, but they are entirely different processes.

Muddy-debris flows in alpine areas cause severe damage to structures and infrastructure and often claim human lives. Muddy-debris flows can start as a result of slope-related factors, and shallow landslides can dam streambeds, resulting in temporary water blockage. As the impoundments fail, a "domino effect" may be created, with a remarkable growth in the volume of the flowing mass as it takes up the debris in the stream channel. The solid-liquid mixture can reach densities of up to 3,350 pounds per cubic yard and velocities of up to 46 feet per second (Luino 2004, Arattano and Marchi 2005).

These processes normally cause the first severe road interruptions, due not only to deposits accumulated on the road, but in some cases to the complete removal of bridges, roadways, or railways crossing the stream channel. Damage usually derives from a common underestimation of mud-debris flows. In high-elevation valleys, for example, bridges are frequently destroyed by the impact force of the flow because their span is generally calculated to accommodate water discharge, not high energy debris flows.

4.7.2.2. Earth flow

Earthflows are downslope, viscous flows of saturated, fine-grained materials, which move at any speed from slow to fast. Typically, they can move at speeds from 500 feet per hour to 15 miles per hour. Though these are a lot like mudflows, overall they are slower moving and are covered with solid material carried along by flow from within. Clay, fine sand and silt, and fine-grained, pyroclastic material are all susceptible to earthflows. The velocity of the earthflow is all dependent on how much water is contained in the flow itself. The greater the water content in the flow, the higher the velocity will be (Arattano and Marchi 2005).

These flows usually begin when the pore pressures in a fine-grained mass increase until enough of the weight of the material is supported by pore water to significantly decrease the internal shear strength of the material. This thereby creates a bulging lobe that advances with a slow, rolling motion. As these lobes spread out, drainage of the mass increases and the margins dry out, thereby lowering the overall velocity of the flow. This process causes the flow to thicken. The bulbous variety of earthflows is not that spectacular, but they are much more common than their rapid counterparts. This variety develops a sag at its head and is usually derived from slumping at the source.

Earthflows on the Duck Valley Indian Reservation can occur during periods of high precipitation, which saturates the ground and adds water content to the slope. Fissures that develop during the movement of clay-like material allow the intrusion of water into the earthflows. Water then increases the pore-water pressure and reduces the shearing strength of the material (Easterbrook 1999).

4.7.2.3. Debris avalanche and debris slide

A debris avalanche is a type of slide characterized by the chaotic movement of rocks, soil, and debris mixed with water or ice (or both). They are usually triggered by the saturation of thickly vegetated slopes, resulting in an incoherent mixture of broken timber, smaller vegetation and other debris (Easterbrook 1999). Debris avalanches differ from debris slides because their movement is much more rapid. This is usually a result of lower cohesion or higher water content and generally steeper slopes.

Debris slides generally begin with large blocks that slump at the head of the slide and then break apart as they move towards the toe. This process is much slower than that of a debris avalanche. In a debris avalanche this progressive failure is very rapid and the entire mass seems to somewhat liquefy as it moves down the slope. This is caused by the combination of the excessive saturation of the material, and very steep slopes. As the mass moves down the slope it generally follows stream channels, leaving behind a V-shaped scar that spreads out downhill. This differs from the more U-shaped scar of a slump. Debris avalanches can also travel well past the foot of the slope due to their tremendous speed (Schuster and Krizek 1978).

4.7.2.4. Sturzstrom

A sturzstrom is a rare, poorly understood type of landslide, typically with a long run-out. Often very large, these slides are unusually mobile, flowing very far over a low angle, flat, or even slightly uphill terrain. They are suspected of "riding" on a blanket of pressurized air, thus reducing friction with the underlying surface.

4.7.2.5. Shallow landslide

A shallow landslide is common where the sliding surface is located within the soil mantle or on weathered bedrock (typically to a depth from a few feet to many yards). They usually include debris slides, debris flow, and failures of road-cut slopes. Landslides occurring as single large blocks of rock moving slowly down slope are sometimes called block glides.

Shallow landslides can often happen in areas that have slopes with highly permeable soils on top of low-permeability bottom soils or hardpan. The low-permeability bottom soils trap the water in the shallower, highly permeable soils, creating high water pressure in the top soils. As the top soils are filled with water and become heavy, slopes can become very unstable and material will slide over the low permeability bottom soils. This can happen within the Duck Valley Indian Reservation where a slope with silt and sand as its top soil sits on top of bedrock. During an intense rainstorm, the bedrock will keep the rain trapped in the top soils of silt and sand. As the topsoil becomes saturated and heavy, it can start to slide over the bedrock and become a shallow landslide.

4.7.2.6. Deep-seated landslide

In deep-seated landslides the sliding surface is mostly deeply located below the maximum rooting depth of trees (typically to depths greater than 30 feet). Deep-seated landslides usually involve deep regolith, weathered rock, and/or bedrock and include large scale slope failure associated with translational, rotational, or complex movement.

4.7.3. Duck Valley Indian Reservation Landslide Prone Landscapes

All of these landslide types can occur on the Duck Valley Indian Reservation, although the sturzstrom variant is highly unlikely. The materials may move by falling, toppling, sliding, spreading, or flowing. Some landslides are rapid, occurring in seconds, whereas others may take hours, weeks, or even longer to develop. Although landslides usually occur on steep slopes, they also can occur in areas of low relief. Landslides can occur as ground failure of river bluffs, cut-and-fill failures that may accompany road construction and building excavations, collapse of mine-waste piles, and slope failures associated with quarries and open-pit mines.

The primary factors that increase landslide risk on the Duck Valley Indian Reservation are slope and certain soil characteristics. In general, the potential for landslide occurrence intensifies as slope increases on all soil types and across a wide range of geological formations.

Soil factors that increase the potential for landslide are soils developed from parent materials high in schist and granite, and soils that are less permeable, containing a resistive or hardpan layer. These soils tend to exhibit higher landslide potential under saturated conditions than do well-drained soils. To identify the high-risk soils on the Duck Valley Indian Reservation, the USDA Natural Resources Conservation Service (NRCS) State Soils Geographic Database (STATSGO) layers were used to identify the location and characteristics of all soils on the Reservation. This involved assembling together the datasets for the Duck Valley Indian Reservation (ID677), the Owyhee County (ID675) database, and Elko County databases (NV766, NV612, and NV621). The specific characteristics of each major soil type within each dataset were reviewed for all of the Duck Valley Indian Reservation.

Soils with very low permeability that characteristically have developed a hardpan layer or have developed from schist and granite parent material were selected as soils with potentially high landslide risk potential. High-risk soils magnify the effect of slope on landslide potential. Soils identified as having high potential landslide risk are further identified with increasing slopes corresponding to increasing landslide risk.

These factors were combined with vegetation characteristics (type of land cover) and canopy cover (vegetation density). Through this analysis, it was determined that while an evergreen forest is a relatively stable site against landslides, it is less stable when on steep slopes, and even more unstable where all vegetation has been removed (from logging, heavy grazing, or a wildfire, for example).

The features of the local topography are important to consider in terms of the potential to move under landslide forces. The top of an otherwise stable ridgeline is considered less prone to move than a similar combination of factors located lower on the hillside, or even near the bottom of the slope. In order to accommodate these factors, the amount of land surface located uphill of each site was factored into the risk profile for potential landslide occurrence.

To portray areas of probable landslide risk due to elevation, slope, vegetative cover, canopy coverage, and position on the hillside, data for these factors were combined into one predictive model called Landslide Prone Landscapes. This model shows the relative landslide risk on the Duck Valley Indian Reservation; it is based on the technique developed by Schlosser (2003) and enhanced by Schlosser (2009). A Landslide Prone Landscapes assessment was completed for this Duck Valley Indian Reservation Tribal Hazards Mitigation Plan analysis (Figure 100).

Because of the presence of active fault lines in the region, and the tendency of these soils to respond to seismic shaking events, the Landslide Prone Landscapes estimate was enhanced to include a factor of seismicity. Specifically, the risk of soils to landslides was increased where active faults were located to the extent that soils are expected to react to forceful shaking.

From the Landslide Prone Landscape profile produced, it is possible to depict areas of risk and their proximity to development and human activity. With additional field reconnaissance, the areas of high risk were further defined by overlaying additional data points identifying actual slide locations (although these data were relatively limited), thus improving the resolution by specifically identifying the highest-risk areas. This method of analysis builds on a method developed by the Clearwater National Forest in north-central Idaho (McClelland, et al. 1997).

A risk-rating score of zero represents no relative risk and a score of one hundred is considered extreme risk. In practice, very few areas of the highest risk category (100) are found. This rating scale should be considered as nominal data, producing values that can be ordered sequentially, but the actual values are not multiplicative. This means that a site ranking 20 on this scale is not "twice as risky" as a site ranking 10. The scale provides relative comparisons between sites.

The analysis of all areas on the Duck Valley Indian Reservation reveals that a significant area of land is not subject to landslide risks without substantial surface disturbances. While these findings would seem to indicate that there is little or no risk of landslide on the Duck Valley Indian Reservation, that would be an incorrect interpretation. This assessment concludes that most slopes are relatively stable until they are disturbed by some activity. These activities could include road building, development, settlement, or mass vegetation characteristic changes. These activities may also involve a combination of several forces such as wildfire followed by heavy rains, or other natural disasters on steep slopes. Once disrupted, sites can become unstable with little or no warning.

The risk ratings show that there are no structures directly at risk from landslides (Figure 100, Figure 101, Figure 102). There are, based on the observations of these figures, substantial risks for infrastructure compromise, especially along Nevada State Highway 225 (Figure 101).

Figure 100. Landslide Prone Landscapes predicted on the Duck Valley Indian Reservation.

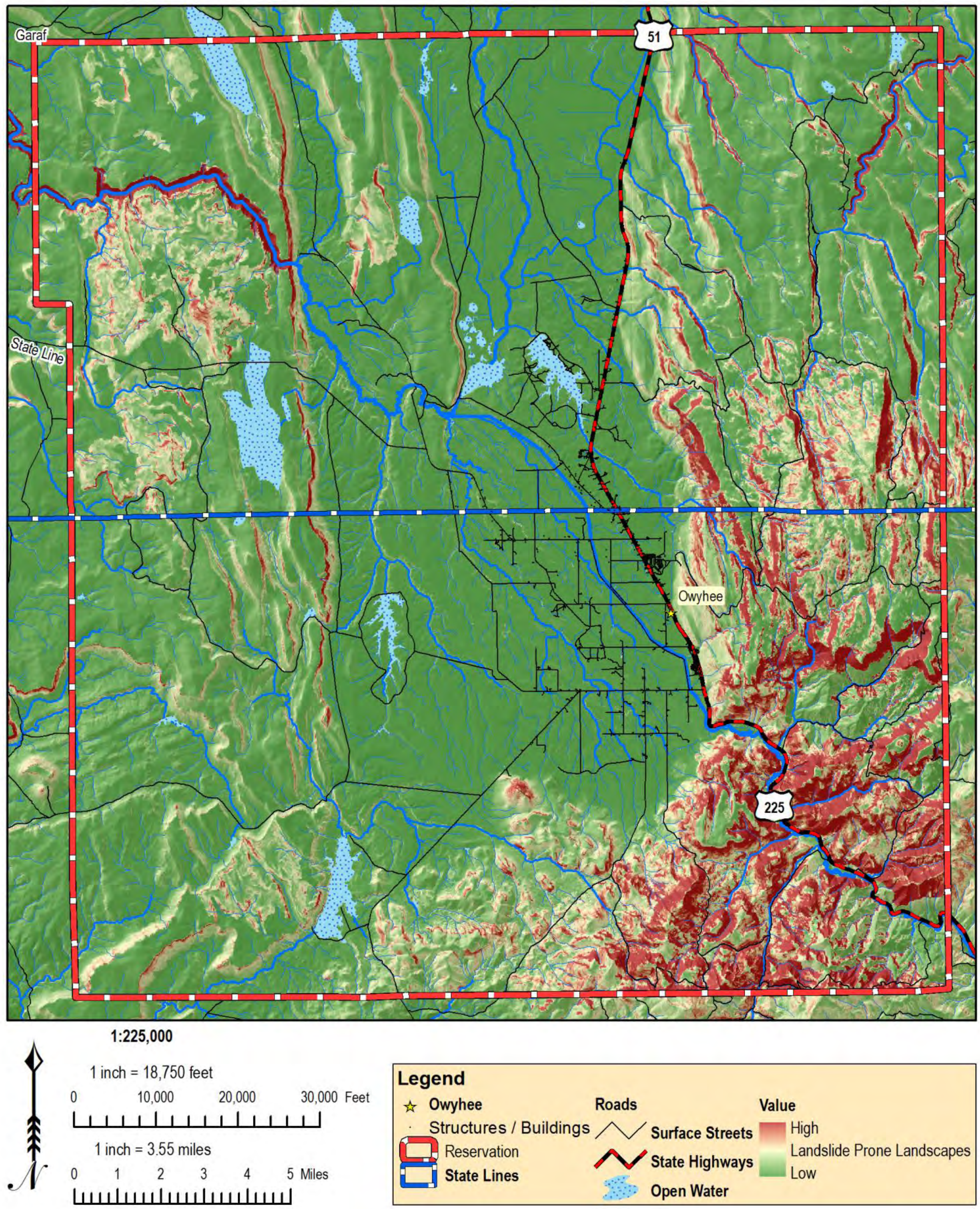


Figure 101. Landslide Prone Landscapes predicted near State Highway 225 (SE DVIR).

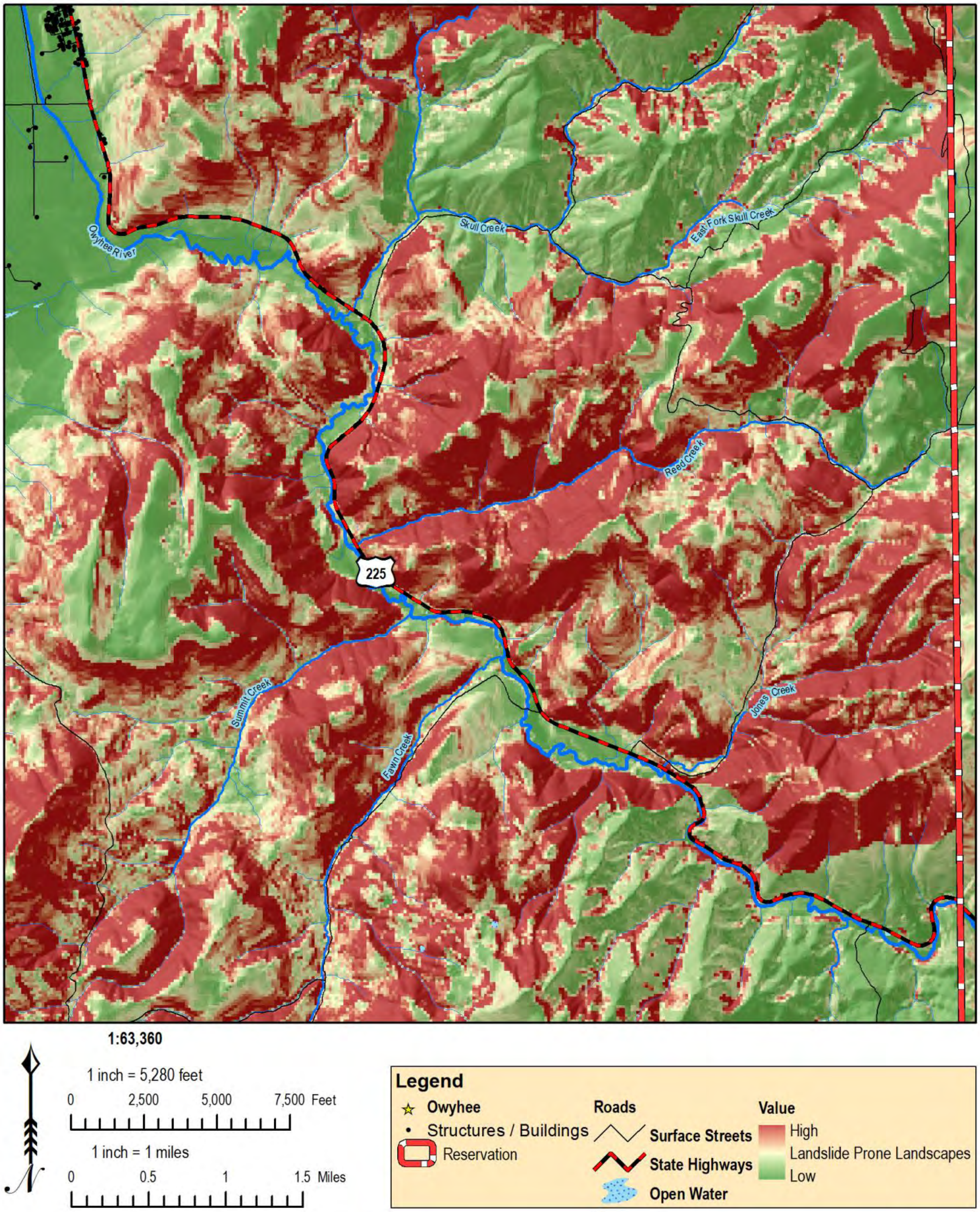
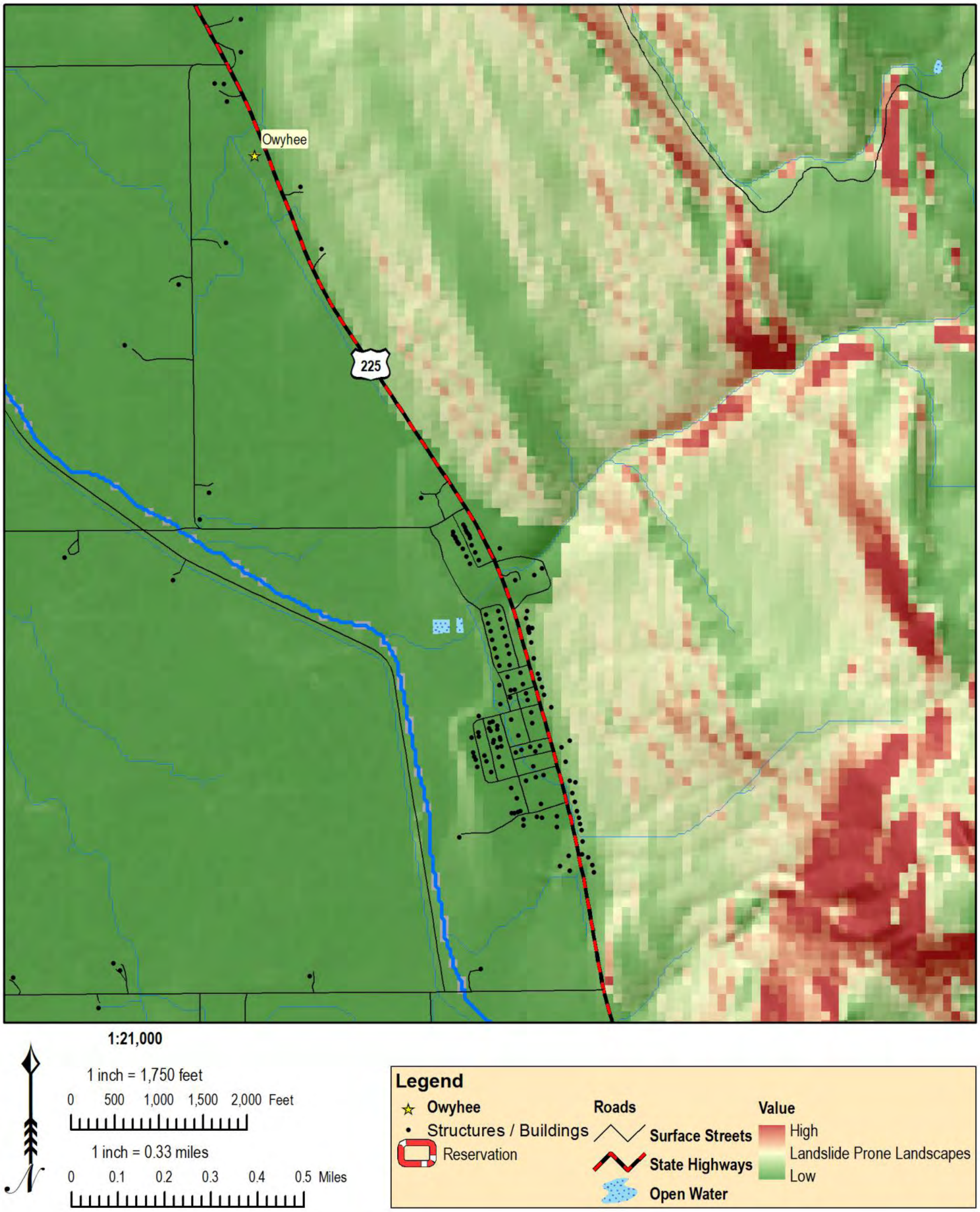


Figure 102. Landslide Prone Landscapes predicted near main Owyhee Village and State Highway 225.



Landslides may occur on slopes steepened during construction, or on natural ground never disturbed. However, most slides occur in areas that have had sliding in the past. All landslides are initiated by factors such as weaknesses in the rock and soil, earthquake activity, the occurrence of heavy snow or rainfall, or construction activity that changes a critical factor involved with maintaining stability of the soil or geology of the area. A prime example of this includes previously stable slopes where home construction utilizing independent septic systems are added. The increased moisture in the ground, when coupled with an impermeable layer below the septic systems, leads to surface-soil movements and mass wasting.

Stream and riverbank erosion, road building, or other excavation can remove the toe or lateral slope and exacerbate landslides. Seismic or volcanic activity often triggers landslides as well. Urban and rural developments with excavations, roads, drainage ways, landscape watering, logging, and agricultural irrigation may also disturb the solidity of landforms, triggering landslides. In general, land use changes that affect drainage patterns, increases erosion, or changes ground water levels can augment the potential for landslide activity.

Landslides are a recurrent menace to waterways and highways and a threat to homes, schools, businesses, and other facilities. The unimpeded movement over roads—whether for commerce, public utilities, school, emergencies, police, recreation, or tourism—is essential to a normally functioning landscape. The steep walls of the Reservation's roads along the Owyhee River drainage poses special problems. The disruption and dislocation of this, or any other routes, caused by landslides and rock fall can quickly jeopardize travel and vital services.

4.7.4. Probability of Future Events

In order to put these Landslide Prone Landscape numbers in terms of probability of occurrence, the Landslide Prone Landscapes rating score can be modified to represent a probability of a landslide event occurring during a given period of time. The lower the Landslide Prone Landscapes rating score, the lower the probability of witnessing a landslide event in that area. Directly, the Landslide Prone Landscapes rating score can be converted to a probability by stating the relative score as a probability of occurrence within a 50-year period. Using the conversion defined by the Extreme Value Theory (Castillo 1988), the 50-year landslide probability event would be stated as the Landslide Prone Landscapes rating score converted to a percent. Thus, a Landslide Prone Landscapes rating score of 25 represents a 25% probability of witnessing a 50-year landslide event. This conversion is intended for illustrative purposes only and the actual probability of occurrence on a particular site may differ from these estimates.

The probability of landslide events within the Duck Valley Indian Reservation is moderate-to-high in places, low in others, and is greatly dependent on topography, soils, hydrologic functioning, and human-induced land use changes. This places specific points within the Duck Valley Indian Reservation likely to experience damages due to landslides. Other locations, where topography is moderate and surface resources are maintained at stable conditions (native vegetation, sufficient drainage, etc.), landslides are not expected to occur.

Ordinarily, the Duck Valley Indian Reservation is expected to experience landslide events curtailing transportation networks, or blocking streams in a moderate frequency (occurrence about once every 5 to 25 years).

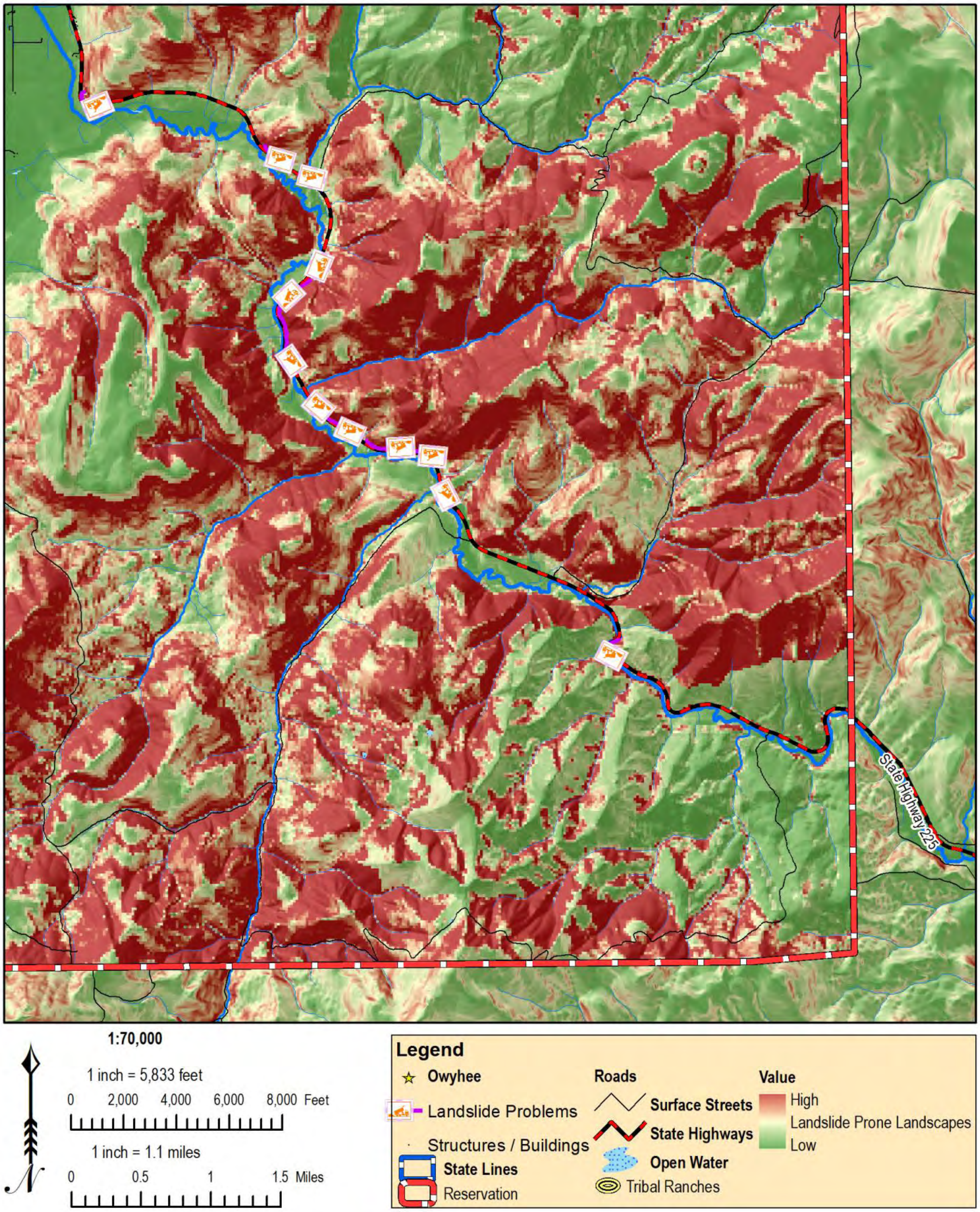
Further extrapolation of these data can be made in order to better understand the probability of future landslide events on the Duck Valley Indian Reservation. If the site is left undisturbed, the risk of future landslide events for each area evaluated can be estimated as the risk-rating score expressed in a percent (rating score of 15, expressed as 15%). This modified score can then be treated as an expression of the likelihood of that area experiencing a landslide event within the next 50-year period. Of course, certain areas that become modified for developments or road building may experience increased landslide periodicity in response to the modification. Off-site modifications, such as developments, logging, heavy grazing, or wildfires can also modify this risk-rating scale to cause increased landslide occurrence downslope of the activity. In the same light, mitigation measures can be expected to decrease the likelihood of continued landslide events. This expression of potential probability of occurrence is based on anecdotal information and should be used for general reference only. A comprehensive landslide database should be created and maintained on the Duck Valley Indian Reservation, to better understand the conditions leading to major mass wasting events.

4.7.5. Resources at Risk

While a large area of the Duck Valley Indian Reservation is at high risk to landslides (Figure 100, Figure 101, Figure 102), most of this area covers the large expansive wildlands of the Duck Valley Indian Reservation. Home and business development on the Reservation has been exclusively on lands not at risk to landslides. An analysis of the structures most at-risk to landslides rated fewer than 5 points on the 100-point scale. Even when extending the ‘reach’ of the landslide by one or two hundred feet, the analysis points to structures placed at extremely safe locations from landslides.

Infrastructure components, such as Nevada State Highway 225, are at risk. Nevada State Highway 225 is 14.7 miles long within the Duck Valley Indian Reservation. Approximately 23 locations have been identified by Planning Committee members and others as areas with past landslide complications caused by the factors discussed in this report.

Figure 103. Landslide Prone Landscapes and historical problem areas along State Hwy 225.



The reader will note a significant change in the risk category given to lands on the Reservation compared to those south and east of it. Those areas within the Humboldt-Toiyabe National Forest do not have a completed soil survey. Therefore those data were not available for characterizing Landslide Prone Landscapes in those areas.

4.7.6. General Landslide Hazards Mitigation Strategies

A number of techniques and practices are available to reduce and cope with losses from landslide hazards. Careful land development can reduce losses by avoiding the hazards or by reducing the damage potential. Following a number of approaches used individually or in combination to mitigate or eliminate losses can reduce landslide risk.

4.7.6.1. Establish a Reservation Landslide Hazard Identification Program

The Duck Valley Indian Reservation should embark on a program to document all landslides, bank failures, "washouts", and man-made embankment failures. Each failure should be located on a map with notations about time of failure, repair (if made), and descriptions of the damaged area. Entering this mapping data into the Tribe's Geospatial Data Library of disaster related information would aid future disaster assessments. These records would be instrumental to further develop the predictive power of the Landslides Prone Landscape assessment on the Duck Valley Indian Reservation and the region.

4.7.6.2. Restrict Development on Landslide Prone Landscapes

Land-use planning is one of the most effective and economical ways to reduce landslide losses by avoiding the hazard and minimizing the risk. This is accomplished by removing or converting existing development or discouraging or regulating new development in unstable areas. Buildings should be located away from known landslides, debris flows, steep slopes, streams and rivers, intermittent stream channels, and the mouths of mountain channels. On the Duck Valley Indian Reservation, restrictions on land use should be considered for implementation by the Tribe in order to help avoid and minimize these risks.

4.7.6.3. Standardize Codes for Excavation, Construction, and Grading

Excavation, construction, and grading codes have been developed for construction in landslide-prone areas; however, there is no nationwide standardization. Instead, Tribal governments apply design construction criteria that fit their specific needs. The Federal Government has developed codes for use on Federal projects. Federal standards for excavation and grading often are used by other organizations in both the public and private sectors.

4.7.6.4. Protect Existing Development

Control of surface-water and ground-water drainage is the most widely used and generally the most successful slope-stabilization method. Stability of a slope can be increased by removing all or part of a landslide mass or by adding earth buttresses placed at the toes of potential slope failures. Retaining walls, piles, caissons, or rock anchors are commonly used to prevent or control slope movement. In most cases, combinations of these measures are most effective.

4.7.6.5. Post Warnings and Educate the Public about Areas to Avoid

Warnings against hazard areas may include the identification of, and posted signs at, the following locations: (a) existing / old landslides, (b) on or at the base of slopes, (c) in or at the base of a minor drainage hollow, (d) at the base or top of an old fill or steep cut slope, and (e) on developed hillsides where leach field septic systems are used. In addition to identifying these at-risk landscapes, it will also serve to begin an educational dialog with landowners on the Duck Valley Indian Reservation, enlightening residents and visitors to the risks associated with landslides.

4.7.6.6. Utilize Monitoring and Warning Systems

Monitoring and warning systems are utilized to protect lives and property, not to prevent landslides. However, these systems often provide warning of slope movement in time to allow the construction of physical measures that will reduce the immediate or long-term hazard. Site-specific monitoring techniques include field observation and the use of various ground-motion instruments, trip wires, radar, laser beams, and vibration meters. Data from these devices can be sent via telemetry for real-time warning. Development of regional real-time landslide warning systems is one of the more significant areas of landslide research (Fragaszy 2002).

4.7.6.7. Public Education

Residents can increase their personal awareness by becoming familiar with the land around their home and community. People can learn about slopes where landslides or debris flows have occurred in the past or are likely to occur in the future. These activities are especially useful for areas where existing structures and improvements are in locations with high risk Landslide Prone Landscape rating scores.

Educate the public about telltale signs that a landslide is imminent so that personal safety measures may be taken. Some of these signs include:

- Springs, seeps, or saturated ground in areas that have not typically been wet before.
- New cracks or unusual bulges in the ground, street pavements, or sidewalks.
- Soil moving away from foundations, and ancillary structures such as deck-sand patios tilting and/or moving relative to the house.
- Sticking doors and windows, and visible open spaces indicating jams and frames out of plumb.
- Broken water lines and other underground utilities.
- Leaning telephone poles, trees, retaining walls or fences.
- Sunken or dropped-down roadbeds.
- Rapid increase in a stream or creek water levels, possibly accompanied by increased turbidity (soil content).
- Sudden decrease in creek water levels even though rain is still falling or just recently stopped.

Residents or Tribal representatives who live and work in landslide-prone areas should follow these recommendations prior to a storm event:

- Watch the patterns of stormwater drainage on slopes and note places where runoff water converges, increasing flow over soil-covered slopes. Watch the hillsides around your home and community for any signs of land movement, such as small landslides or debris flows or progressively tilting trees.
- Develop emergency response and evacuation plans for individual communities and for travel routes. Individual homeowners and business owners should be encouraged to develop their own evacuation plan.

4.7.6.8. Road Damage Mitigation Activities

Mitigation measures (Table 34) include a number of landslide related treatments. All of the landslide related treatments are recommended for Nevada State Highway 225 from Owyhee to

Mountain City, Nevada. This highway has been damaged from roadside slides, washouts, and other failures related to slides (Figure 103).

Table 34. Mitigation measures recommended for landslide adjacent to State Highway 225.

Item	Number Recommended	Treatment for which Hazard
Area Treatments		
Roadside Debris Catchment (Figure 104)	7	Landslide
Embankment Stabilization Road/Stream	5	Flood & Landslide
Improve Ditching	1	Landslide

In general, Highway 225 requires a major renovation of maintenance in respect to how the highway is maintained. Nearly all of the in-slope ditches of this corridor are closed with sediment and have not been cleaned in recent history. This has caused water which is normally meant for ditch-to-culvert disposal to flow over the road. All of the ditches need cleaned with a backhoe and maintained on a frequent basis. This is the responsibility of the State of Nevada Highway Department.

Spring time freeze-thaw in the rocky slopes overhanging the highway release rocks which are rather small to relatively large (1 foot diameter) to fall on to the highway. These rocks are often at turns in the highway where motorists cannot see the road hazard, hit the rocks, and damage their vehicle. This is a common event on this highway. Roadside debris catchments (Figure 104) be installed on 7 locations along the highway. These catchments would intercept falling rocks and other debris and prevent the road hazards seen today.

Figure 104. Roadside debris catchment examples, recommended structures for Hwy 225.

4.8. Expansive Soils and Expansive Clays

Expansive soils and expansive clays are substrates that are subject to large-scale settlement or expansion when wetted or partially dried (Bekey 1989). Expansive soils contain minerals such as smectite clays that are capable of absorbing water. When these soils absorb water they increase volume. The more water these soils absorb the more their volume increases. Expansions of ten percent or more are not uncommon. This change in volume can exert enough force on a building or other structure resting on top of them to cause damage (GES 2010).

Expansive soils such as clay, claystone, and shale can "swell" in volume when wetted and then shrink when dried (Bekey 1989). This volumetric expansion and contraction can cause houses and other structures to heave, settle, and shift unevenly, resulting in damage that is sometimes severe (PCI 2010). Cracks in building foundations, along floors and within basement walls are typical types of damage done by these swelling soils. Damage to the upper floors of the building can occur when motion in the structure is significant (GES 2010).

Expansive soils will also shrink when they dry out (Bekey 1989). This shrinkage can remove support from buildings or other structures and result in damaging subsidence. Fissures in the soil caused from differential expansion and contraction can also develop. These fissures can facilitate the deep penetration of water when moist conditions or runoff occurs. This produces a cycle of shrinkage and swelling that places repetitive stress on structures (PCI 2010).

When expansive soils are present they will generally not cause a problem if their water content remains constant. The situation where greatest damage occurs is when there are significant or repeated moisture content changes.

Homeowners have literally lost their homes due to extensive damage and the high costs of repair. In some cases, class-action lawsuits have been brought against builders and developers for failure to follow the recommendations of soils engineers, or for failure to properly disclose the potential risks associated with purchasing a home built on expansive soil (PCI 2010), and from buyer and seller ignorance about the potential risks.

4.8.1. Extent of the Risk

Expansive soils are present throughout the world and are known in every US state. Every year they cause billions of dollars in damage. The American Society of Civil Engineers estimates that ¼ of all homes in the United States have some damage caused by expansive soils (Snethen 1980). In a typical year in the United States they cause a greater financial loss to property owners than earthquakes, floods, hurricanes and tornadoes combined (GES 2010).

Even though expansive soils cause enormous amounts of damage, most people have never heard of them. This is because their damage is done slowly and not generally attributed to a specific event. The damage done by expansive soils is often attributed to poor construction practices or a misconception that all buildings experience this type of damage as they age (GES 2010).

The Northern Basin and Range ecoregion and Great Basin is at variable levels of risk to factors leading to damages from expansive soils and expansive clays (Bekey 1989). Although clay content in the soil is a major contributing factor to expansive soil reactions, the content of Loess Soils is equally problematic. Site inspections of houses, roads, and other infrastructure components reveals potential signs of prolonged damages consistent with expansive soils and expansive clays (cracked foundations, uneven road surfaces).

Figure 105. Swell Potential of Reactive Clay Soils in the USA (PCI 2010), reproduced using (USGS 1989) data.

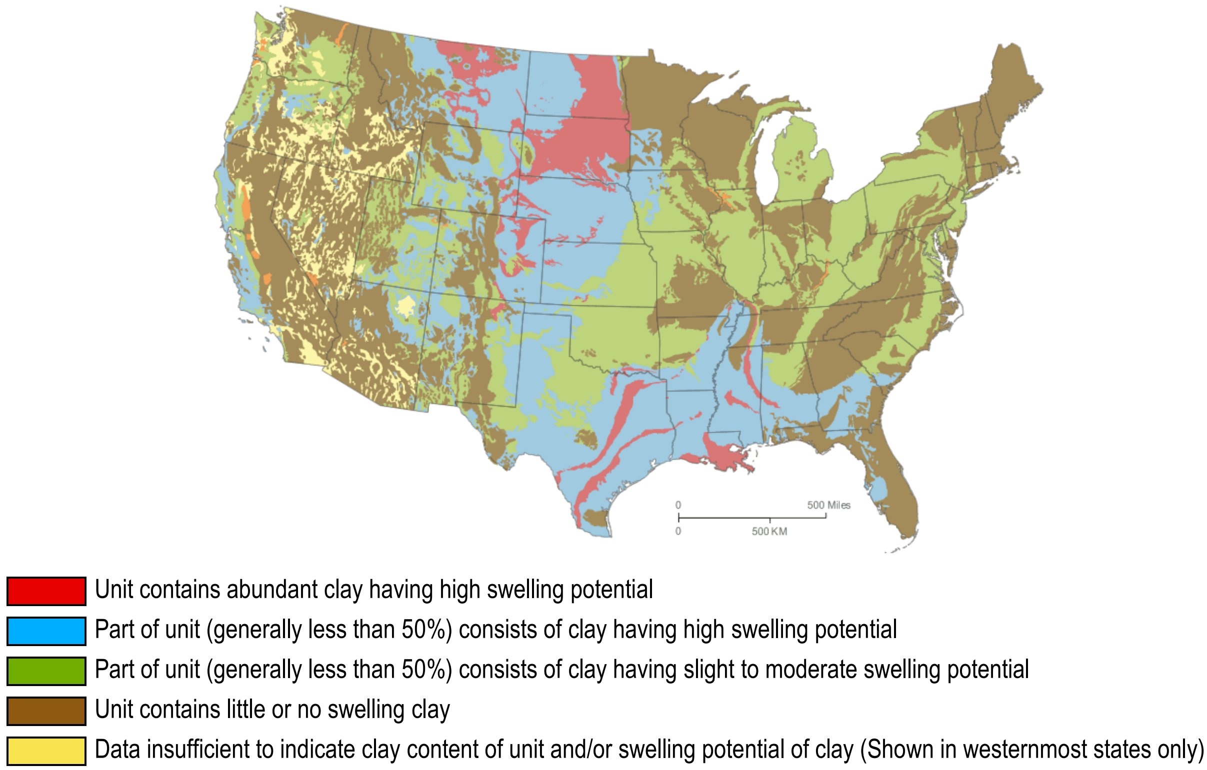


Figure 105 shows the geographic distribution of soils that are known to have expandable characteristics with clay minerals that can cause damage to foundations and structures. It also includes soils that have a clay mineral composition which can potentially cause damage. Soils are composed of a variety of materials, most of which do not expand in the presence of moisture. However, a number of clay minerals are expansive. These include: smectite, bentonite, montmorillonite, beidellite, vermiculite, attapulgite, nontronite, illite and chlorite. There are also some sulfate salts that will expand with changes in temperature and moisture. When a soil contains a large amount of expansive minerals it has the potential of significant expansion. When the soil contains very little expansive minerals it has little expansive potential (PCI 2010).

Bekey (1989) reported four general soil types, beyond just the clay influenced types, that are most prone to expansive soils characteristics:

1. Loess – aeolian sediment formed by the accumulation of wind-blown silt, typically in the 20–50 micrometre size range, and lesser and variable amounts of sand and clay that are loosely cemented by calcium carbonate. It is usually homogeneous and highly porous and is traversed by vertical capillaries that permit the sediment to fracture and form vertical bluffs.
2. Peat – Peat is an accumulation of partially decayed vegetation matter or histosol. Peat forms in wetland bogs, moors, muskegs, pocosins, mires, and peat swamp forests. Because of the physical properties of peat, any compression loading on peat results in settlement at the surface. In normal events, roughly half of the settlement occurs within 6 months to 2 years following construction. The balance of the settlement compaction can take an additional 20 years to be fully seen. Unfortunately, the rate of settlement is not consistent as expansion and contraction will neither be equal nor constant. A common technique used to manage construction of roads and structures on the top of peat

materials has been to overtop the material with a fill dirt. When this has been applied, the high organic matter of the peat is trapped under the less permeable layer leading, in many cases, to a bearing capacity failure. Other attempts have combined peat capping with an overtopping layer of rock. Many of these approaches have been met with variable levels of success. Construction within or adjacent to many of lowlands face challenges of peat-related expansive soils.

3. Hydrocompaction – Hydrocompaction occurs when a dry, underconsolidated silty and clayey soil, in an arid or semiarid environment, loses strength on wetting and, as a result, settles or collapses. These soil types (silty and clayey soil) are common on the Duck Valley Indian Reservation, and the physical conditions of arid or semiarid are common as well.
4. Expansive Clay Soils – Expansive clay soils develop at the top of deeply weathered rocks composed on illite and montmorillonite clays. These clay types are common where volcanic ash and feldspar-rich parent materials are seen. Although these conditions are witnessed across the region, the past glaciation (Section 4.3) has transported most of the potentially expansive weathered soil away from its point of origin. Unfortunately, the glaciation that removed the top layer of materials, deposited those sediments at the termination of the glacier and then along the retreat path as it moved up in elevation during its melt. This has left scattered deposits that may hold pockets of expansive clays, especially near (but not necessarily adjacent to) glacier-formed river systems such as the Owyhee River.

4.8.2. Linear Extensibility / Expansive Soils

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change (NRCS 2010).

For each soil layer, the linear extensibility attribute is recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this analysis the "most restrictive" element has been selected for each soil type.

Several soil surveys have been combined for this analysis (Figure 106, Figure 107), including Duck Valley Indian Reservation (ID677), the Owyhee County (ID675) database, and Elko County databases (NV766, NV612, and NV621). The most relevant and applicable for the Duck Valley Indian Reservation is Soil Survey ID677. All surrounding Soil Survey data from Owyhee County and Elko County were combined for display purposes. Edge matching of these analyses reveals several discontinuities in the risk projection (Figure 106, Figure 107). These "abrupt changes" in the risk profile are a result of differing ages of the surveys. Those areas within the Humboldt-Toiyabe National Forest do not have a completed soil survey and were not analyzed for this report (south and east of the Reservation).

NRCS soil-survey data has been used to determine the extent of expansive soils and expansive clays within the Duck Valley Indian Reservation (Figure 106, Figure 107). Rating class terms in this analysis indicate the extent to which the soils are limited by expansive soils and expansive clays that affect building site development.

Two different analyses of exposure to risk have been derived for this effort. The first determines suitability for **‘homes without basement, and light commercial’** structures. This is accomplished by analyzing the soil characteristics from a depth of 10 inches to 40 inches

(Figure 106). Each soil type characteristic is evaluated for linear extensibility and given a rating scale from zero (0) to thirty (30).

The second analysis determines suitability for **'homes with a basement, and heavy commercial'** structures. This is accomplished by analyzing the soil characteristics from a depth of 10 inches to 60 inches (Figure 107). Each soil type characteristic is evaluated for linear extensibility and given a rating scale from zero (0) to thirty (30).

A cursory review of Figure 106 and Figure 107 allows the reader to observe the elevated risks (colored red) on the west side of the Reservation where homes do not currently exist, and the moderate risks (colored yellow) located west of the community center and in the Owyhee River flood plain. Additional risks are observed on both sides of Idaho State Highway 51 in the northern reach of the Reservation where clay content is extensive near the surface, and linear extensibility is extreme.

The expansive soils and expansive clays limitations can be overcome or minimized by special planning, design, and installation. Fair performance and moderate maintenance can be expected where appropriate actions are taken and where risks are lower.

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet.

The ratings used here for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (expansive soils potential), and compressibility. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper.

In response to sites with expansive soils, stabilization efforts have included the complete removal attempts of the problem materials, or isolation of the expansive soils by an adequate cap of non-expansive, relatively impervious fill material (Bekey 1989). Where the construction project involves hillsides or the edges of cliffs (such as along the rocky shores of the Owyhee River), a combination of partial material removal and the installation of a buttress fill have been used to limit potential sliding of the structure (Bekey 1989). These efforts around the globe have been met with variable levels of success and some notable failures.

Figure 106. Linear Extensibility Percent (Expansive Soils) for Homes without a Basement and Light Commercial Structures (soil depths 10" to 40").

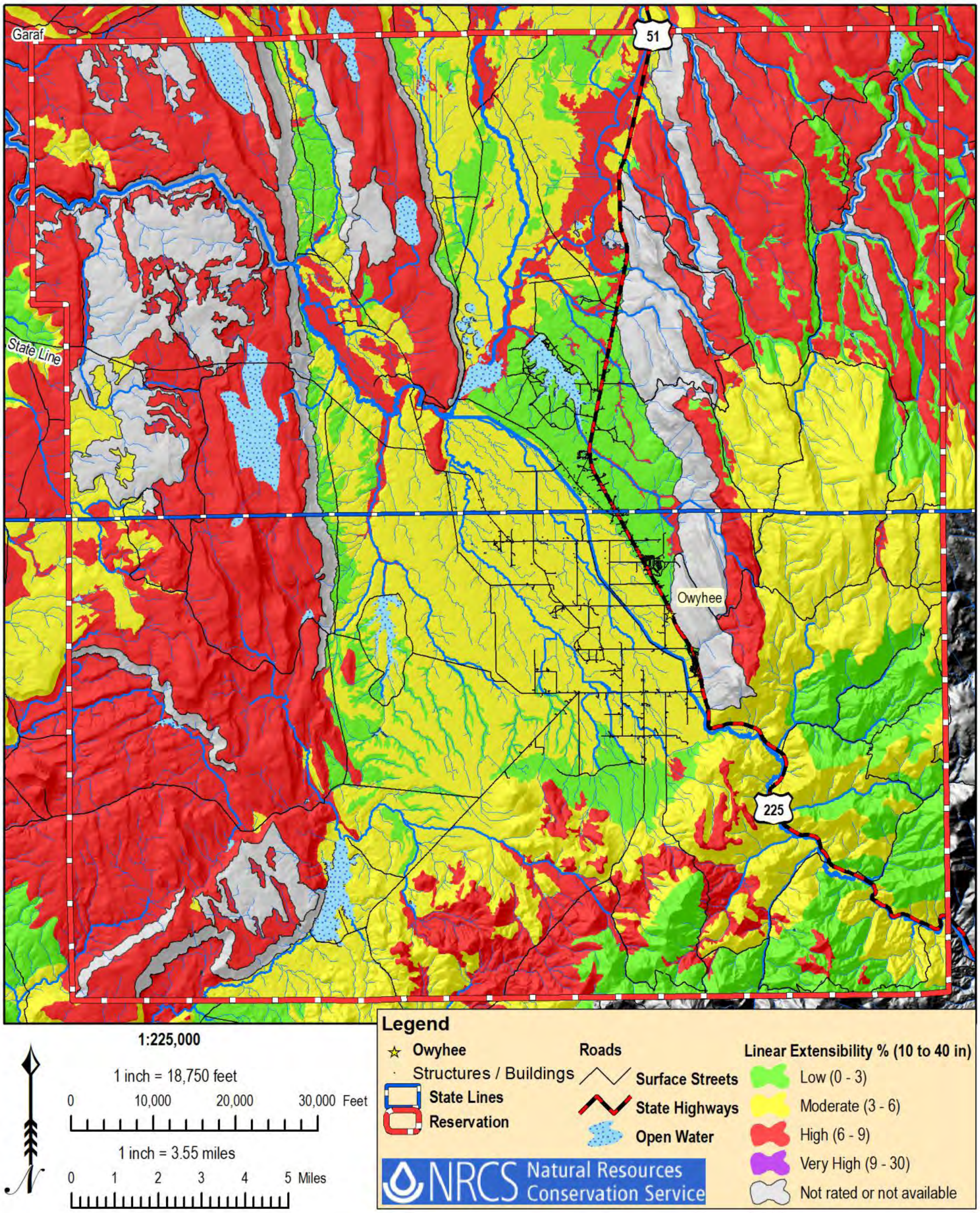
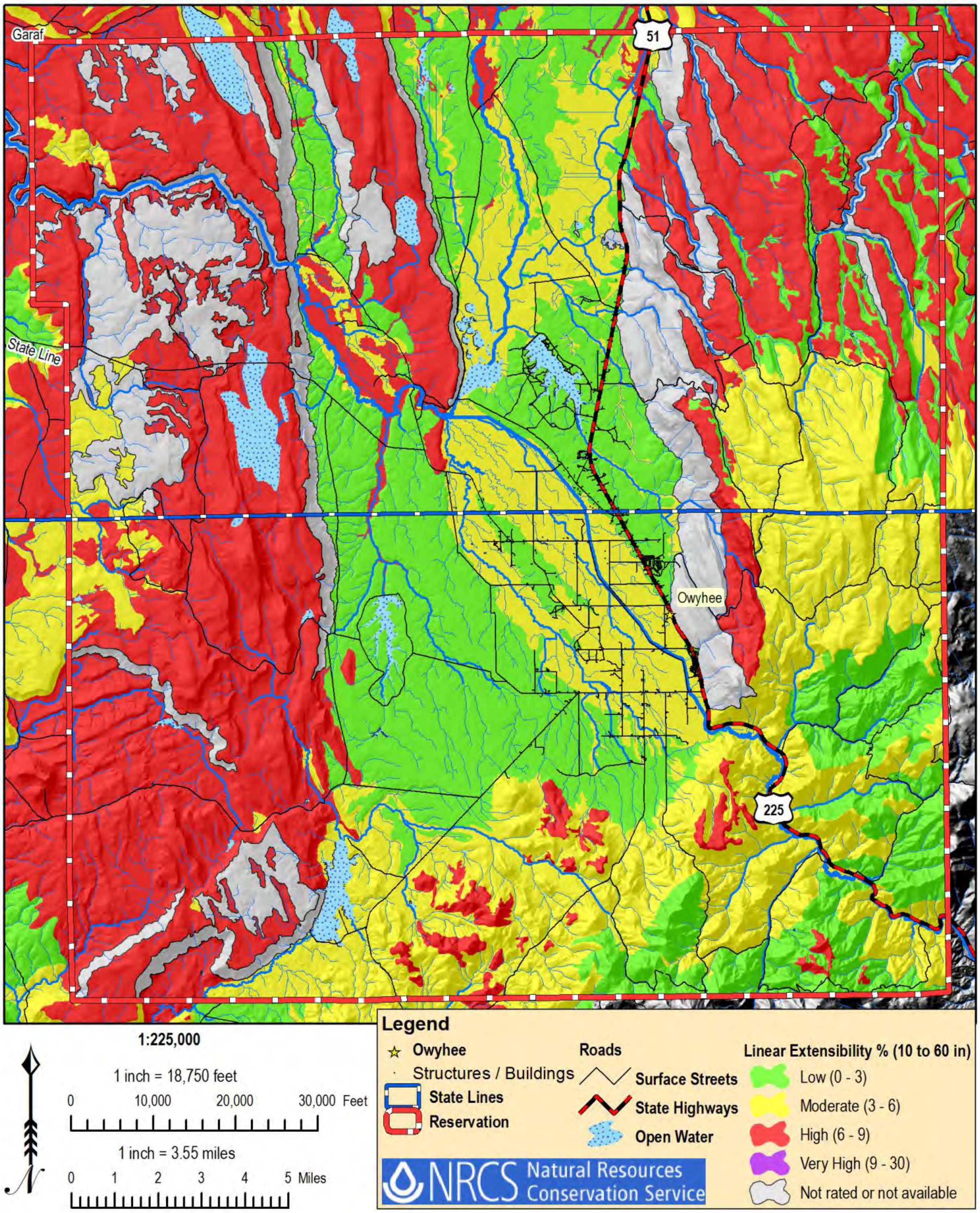


Figure 107. Linear Extensibility Percent (Expansive Soils) for Homes with a Basement and Heavy Commercial Structures (soil depths 10" to 60").



4.8.3. Resources at Risk

Using the approach implemented for assessing risk exposure from other natural hazards on the Duck Valley Indian Reservation, the value of resources at risk to expansive soils and expansive clays has been completed. The linear extensibility risk-rating score was assigned to each structure on the Duck Valley Indian Reservation. The individual structure values, by structure type, were then summed together in these groups to reveal structural values that are at risk to expansive soils.

On the Duck Valley Indian Reservation there are only two structures that would qualify for “Homes with a Basement and Heavy Commercial Structures”; the High School, and the Owyhee Community Health Facility. These are both modern construction of masonry structures with foundations. All other structures are residential of two or fewer floors, some are mobile homes. These structures are all within the “Homes without a Basement and Light Commercial Structures” category (Table 35). The hospital is located on a low risk (0-3) category Linear Extensibility Site. The High School is located on a moderate risk (3-6) Linear Extensibility site, west of Nevada State Highway 225.

For the purposes of future construction and remodeling considerations, all structures have been evaluated for the potential to be considered under the both the lower risk (Homes without a Basement and Light Commercial Structures) and the higher risk category (Homes with a Basement and Heavy Commercial Structures). The reader should note that structures, except mentioned above, are located on the lower risk sites.

Based on this assessment (Table 35), virtually all structures are considered under the Linear Extensibility 10”-40” criteria. Almost half of all structures (285) are found on the lowest risk categories (Low 0-3) representing a value of $32.5 million. The remaining 303 structures are located on moderate risk sites (3-6) and represent approximately $32.7 million. Although there are sites on the Duck Valley Indian Reservation that are considered high risk to loss from Expansive Soils (6-9), there are currently no structures placed on these sites.

Table 35. Existing Structures and Linear Extensibility Risk Exposure.

Structure Type	Linear Extensibility 10”-40” — Homes without a Basement and Light Commercial Structures					Linear Extensibility 10”-60” — Homes with a Basement and Heavy Commercial Structures				
	Low 0-3	Value	Moderate 3-6	Value	High 6-9	Low 0-3	Value	Moderate 3-6	Value	High 6-9
Mobile home	15	$1,327,050	15	$1,027,636	0	20	$1,492,643	10	$862,043	0
Pump House	2	$89,000	5	$425,050	0	3	$164,000	4	$350,050	0
Shed/Shop	2	$175,000	8	$870,000	0	2	$175,000	8	$870,000	0
Silo	0	$-	1	$84,000	0	0	$-	1	$84,000	0
Single story	240	$26,115,882	245	$25,340,207	0	311	$33,114,818	174	$18,341,271	0
Two Story	16	$4,786,000	14	$2,303,586	0	17	$4,966,000	13	$2,123,586	0
Other	10	$1,581,500	15	$2,617,000	0	13	$1,910,500	12	$2,288,000	0
Totals	**285**	**$32,483,382**	**303**	**$32,667,479**	**0**	**366**	**$39,991,318**	**222**	**$24,918,950**	**0**

Sites across the entire Reservation have been assessed (as the lands surrounding the Reservation have been) for Linear Extensibility considerations (Table 36). This analysis reveals that there are only about 45,000 acres of land suited to only moderate considerations for homes without a basement and light commercial structures on the Reservation, and 100,000 acres suited to this construction with moderate considerations when building these structures. However, all buildings on the Reservation have been placed on these sites to-date. Sites with higher risk ratings total almost 108,000 acres (high risk 6-9), and should be avoided when possible. These sites would require substantial construction modifications to ensure longevity.

Table 36. Acres of land rated in Linear Extensibility risk zones.

Linear Extensibility	Linear Extensibility 10"-40" Homes without a Basement and Light Commercial Structures	Linear Extensibility 10"-60" Homes with a Basement and Heavy Commercial Structures
Low (0-3)	45,153.6	71,863.1
Moderate (3-6)	97,686.6	83,206.1
High (6-9)	107,908.2	95,679.1
Very High (9-30)	0	0
Undetermined or Unavailable	38,306.7	38,306.7
Total	**289,055**	**289,055**

The determination of absolute risk of existing structures to expansive soils and clays within the Duck Valley Indian Reservation is difficult to ascertain. Although structures may have been built where linear extensibility percent ratings are low, construction techniques to deal with the problem before beginning construction may, or may not, have taken place. It is possible to build large structures where linear extensibility percent ratings are high, while still enjoying decades (even more than a century) of life for the structure. Conversely, it is possible to build structures on low-risk rated expansive soil sites, but exacerbate problems by artificially modifying the soil moisture regime (e.g., by draining rain gutters directly onto the soils at the base of the foundation).

It is advisable that all new construction on the Duck Valley Indian Reservation incorporate expansive soils building techniques while selecting building sites, and determining building architecture characteristics suitable to the sites selected.

4.8.4. Probability of Future Events

Expansive soils represent a physical property of soils that is not dependent on outside factors to realize risks (such as an earthquake or flood). When the at-risk soil components are exposed to compression, wetting and drying, the damages to the structure placed on top of those soils can be realized. If recommended building techniques are not employed during initial construction, then damages are frequently seen. The "laissez-faire builder" may desire to "take a chance" with this disaster not affecting the house built on expansive soils, but if those actions lead to the conditions needed for damage, then the probability of damage is nearly 100% chance of failure within a 25 year period.

4.8.5. Dealing with Damages

Geotechnical engineering and structural engineering have come a long way in the last 20 years, and specific foundation systems have been devised to help counteract some of the problems for buildings inherent with expansive soils. However, the risk of damage to homes can be minimized but cannot always be eliminated (PCI 2010). Because the damages from expansive soils are variable, and often are difficult to visually confirm by the untrained eye, professional inspections of existing structures and of potential building sites is strongly recommended throughout the Duck Valley Indian Reservation where risk ratings are moderate or higher.

It is possible to build successfully and safely on expansive soils if stable moisture content can be maintained or if the building can be insulated from any soil-volume change that occurs. The recommended procedures are as follows (GES 2010):

- Professional geotechnical engineering testing to identify any problems,
- Design to minimize moisture-content changes and insulate from soil-volume changes,

- Build in a way that will not change the conditions of the soil,
- Maintain a constant moisture environment after construction,
- Ensure adequate surface-water drainage around building sites and off the site,
- Avoid construction on expansive soils and expansive clays.

Expansive soil conditions are made worse if water collects around a building's foundation. Rainfall and surface-water drainage should run off the property to mitigate the worsening soil condition. Rain gutters and downspouts should direct water away from the structure, discharging it no closer than 3 feet from the foundation (PCI 2010). This drainage should also be conscious of the neighboring structures so that surface water drainage from one building is not diverted into another structure. Well-designed communities will facilitate this stormwater and surface-water drainage to avoid diversions into other structures and into at-risk infrastructure.

4.9. Wildland Fire

4.9.1. Tribal Legends

Several native legends explain the introduction of fire to the people. Coyote holds a prominent role in the acquisition of fire and instructing the people how to use it.

4.9.1.1. The Theft of Fire – *a Numa Legend*

One winter evening Coyote noticed a fire far down the mountain. He asked his powers, "Who owns that fire?" To him they answered, "Some other people own it. Crane is their chief. Go down and get their fire for yourself."

Coyote did not tell anyone that night. After he woke up the next morning, he painted all his body and then talked to his people. "I saw something strange last night-a fire down the mountain. Shall we go and get it?"

All his people held a council and debated whether or not they should go. Mice, Rats, and all the other men decided to go, but the women stayed at home. Coyote and his men went down toward the fire, the first they had ever seen.

When they reached the people who had the fire, Crane told them to receive their guests hospitably. After a feast, the Coyote people gambled, and the Crane people held a nuakin dance. The purpose of the nuakin dance was to make sure that they would have a big supply of food, especially of salmon and berries.

Crane told the Coyote people to go on enjoying themselves at gambling and later to come to the nuakin. When Coyote joined the dance, he wore a headdress that reached to the ground. The old women said to him, "You are not watching your headdress. See-you are dragging it along the ground and are burning its edges in the fire."

But Coyote was doing what he intended to do. When the women were not watching him, he spread the fire. Toward morning he summoned a council of his people. "As soon as we can get their food and their fire," said Coyote, "we shall all run away."

Crane's people kept all their food in a large bag high up in a tree, and Crane kept the fire in his own lodge. Just before dawn there was another dance. While it was going on, Coyote danced around the lodge until his headdress caught fire. He seized the fire, hid it under his blanket, and sneaked out of the lodge.

Jack Rabbit had already been told to play his flute outside the houses of the Crane people, so that all of them would fall asleep. As he went around from lodge to lodge, playing, they listened and soon were sleeping. Then the Coyote people tried to steal the food. Coyote jumped and jumped, but could not reach the bag of food. All of his followers jumped and jumped, one after the other, but no one could jump high enough. At last the woodpeckers were asked to fly up, put their bills together, and pierce the bag. When they did, the food fell through the hole-pine nut food. Coyote and his people ate some, and then ran away with the rest of it and with the fire.

In the morning, when the Crane people got up, they could not start a fire. Then they looked for their food bag and found it empty.

“Where are those visitors?” they asked.

“They are all gone,” said Crane. “Let us run after them and get our food and our fire.”

They started at once and kept running until they saw Coyote and his people. Coyote was in war dress, the last in line and nearest the enemy. They shot at him but could not kill him. They kept shooting at him until they shot off all his hair. By that time Coyote was so tired he had to stop running. At first he did not know what to do, but when he came to an old track, he hid himself in it.

Twice he hid from the Crane people, but each time they found him and threw rocks at him. When he was too exhausted to run again, he gave the food and the fire to his people in front of him. The enemy overtook him and killed him. After skinning him, they looked over all his body, but could not find the food or the fire.

Crane and his people ran on after the Coyote people and killed them, one by one. Only three escaped. Jack Rabbit jumped aside and hid in a hole. Rock Squirrel, carrying the fire, and Hai, carrying the food, were stoned by the enemy pursuing them. Hai was a black bird. When the Crane people almost caught Hai, he wished that his leg would rot. One leg did rot, and he put the food inside it. Then he fell down exhausted.

Crane said to the black bird, “You are a great chief,” and then kicked him. When Hai screeched, his leg with the food in it fell off, and ran away by itself. But Crane and his followers did not notice, so busy were they searching Hai, cutting him up, and looking for the food and the fire. When they found that one leg was missing, they looked for it, saw its track, and followed it.

Hai made another wish: he wished that rain and snow would fall behind his leg. When rain and snow covered the footprints, the Crane people had a council.

“There is no use following the leg up the mountains,” they said. “It is too far away. Let us go after Rock Squirrel, who must have the fire.”

Hai’s leg went westward, scattering pine nuts all the way. That is why the people living there have pine nuts now. When the Crane people got near Rock Squirrel, he hid the fire by his breast. That is why he has a spot there now, as if he had been burnt. Several times they nearly caught him. At last he jumped down from a steep cliff and threw his fire sticks all over the mountains. He said to the fire, “Everybody is going to use you hereafter. Go and burn everywhere.”

That is how the Shoshoni people got fire.

When Crane came to the cliff and saw the fire burning everywhere, he was too tired to do anything more. So he said to his people, “I give up the chase. I am going down to the river.”

Then he turned into the bird that he is now and went to the river, where he belonged.

Jack Rabbit came out of the hole he had hidden in, found Coyote’s body, and hit it with his whistle. Coyote woke up and asked, “Why did you wake me up? I was having a nice dream.”

Jack Rabbit went around and hit every one of the Coyote people with his whistle. He brought all of them back to life.

4.9.2. Wildfires

A wildfire, also known as a wildland fire, forest fire, brush fire, or vegetation fire, is an uncontrolled fire often occurring in wildland areas, but also with the potential to consume houses and agricultural resources. Common causes are numerous and can include lightning, human carelessness, slash-and-burn farming, arson, volcanic activity, pyroclastic clouds, and underground coal fire. Heat waves, droughts, and cyclical climate changes such as El Niño can also dramatically increase the risk of wildfires (NWCG 1998).

Wildfires are common in climates that are sufficiently moist to allow the growth of vegetation but feature extended dry, hot periods, such as can be found in most of the Northern Basin and Range ecoregion and Great Basin in late summer months. Wildfires can be particularly intense during days of strong winds and periods of drought. Fire prevalence is also high during the summer and autumn months, when fallen branches, leaves, grasses, and scrub dry out and become more flammable (NWCG 1998).

Wildfires are considered a natural part of the ecosystem of numerous forestlands and rangelands, where some plants have evolved to tolerate fires through a variety of strategies such as fire-resistant seeds and reserve shoots that sprout after a fire (Agee 1998, Agee 1993). Smoke, charred wood, and heat are common fire cues that stimulate the germination of seeds (Agee 1998). Exposure to smoke from burning plants can even promote germination in some types of plants (Barrett 1979).

Natural fire ignition from lightning, as well as human carelessness or arson, are the two main causes for most wildfires in the Northern Basin and Range ecoregion and Great Basin. These fires threaten homes located within the Wildland-Urban Interface (WUI), a zone of transition between developed areas and undeveloped wildland. However, structure fires can also threaten wildlands when these homes are located without a vegetation buffer, allowing the structure fire to spread to forestland or rangeland vegetation, then back to other homes in the area.

4.9.3. Wildfire Threats on the Duck Valley Indian Reservation

Fires can be categorized by their fuel type as follows:

- **Smoldering:** involves the slow combustion of surface fuels without generating flame, spreading slowly and steadily.
- **Crawling:** surface fires that consume low-lying vegetation such as grass, leaf litter, and debris.
- **Ladder:** fires that consume material between low-level vegetation and tree canopies, such as small trees, low branches, vines, and invasive plants.
- **Crown:** fires that consume low-level surface fuels, transition to ladder fuels, and also consume suspended materials at the canopy level. These fires can spread at an incredible pace through the top of a forest canopy, burning entire trees in groups, and can be extremely dangerous (sometimes called a Firestorm).

Smoldering fires involve the slow combustion of surface fuels without generating flame, while spreading slowly and steadily. They can linger for days or weeks after flaming has ceased, resulting in potential large quantities of fuel consumed. They heat the duff and mineral layers, affecting the roots, seeds, and plant stems in the ground. These are most common in peat bogs, but not exclusive to that vegetation.

Wildfires may spread by jumping or spotting, as burning materials are carried by wind or firestorm conditions. Burning materials can jump over roads, rivers, or even firebreaks and start distant fires. The powerful updraft caused by a large wildfire will draw in air from the surrounding area. These self-generated winds can also lead to the phenomenon known as a firestorm.

4.9.4. History

Wildland fire management in the West over the past hundred years has created a modified role for wildland fire. Because of a national awareness of wildfire impacts, forest managers increased protective measures to stop wildfires as soon as they are discovered.

Indigenous wildland fires of this region were allowed to burn unchecked with a fire-return interval ranging from as few as five years to as many as a couple hundred years between fire events (Brown 1995, IFPC 2005). In those locations where fires were a frequent “visitor”, the fire intensity was commonly low, and supported by surface fuels such as grasses, rangeland and forest litter and debris. Occasionally, the fires would torch into single trees (via ladder fuels) or small groups of trees, but rarely were they sustained in the tree crowns (crown fire). Fire intensities created a mosaic of burned and un-burned areas located relatively close to each other.

In less frequent fire-return interval sites, the natural-condition wildfires would burn with more intensity but a lower periodicity. The forest and rangeland species occupying these sites would often be tolerant of some level of fire activity and sometimes regenerated by fire activity (such as ponderosa pine or chaparral). These sites experienced wide-scale fires on a return interval of 60 to 120 years between wildfire events.

Other sites witnessed fire reoccurrence very infrequently (as much as 200 years between fire returns), where trees and other vegetation would thrive in the inter-fire period only to be destroyed by the next large event, commonly called a “Stand Replacing Fire” (Brown 1995).

Prior to about 1920, the lack of a well-developed road system in most of this region hindered fire protection services from accessing fires, while they were still small enough to logistically control with hand tools. As the road system of the region was developed through increased timber harvesting activities, fire-response time was greatly aided. After World War II, wildland firefighting agencies added two more features to their anti-incendiary tool-belt: air attack and smoke jumpers.

Both of these tools increased the effectiveness of the wildland firefighters, mainly employed by the Shoshone-Paiute Tribes, USFS, State Natural Resources or Lands Departments, forest products companies, and others, to control fires while still small. Fire-suppression efforts were so successful that the number of acres burning annually in the region became only a small fraction of the region’s historical average.

A parallel sequence of events occurred with this scenario. Technology to track lightning strikes as they occur improved critical quick response time in North America in the late 1960s (Brookhouse 1999). Lightning detection systems are able to record various characteristics of lightning strikes, including the type of strike (cloud-to-ground, cloud-to-cloud), polarity, intensity, and approximate location of the discharge. Each lightning strike emanates a radio signal that has a unique signature. USFS and BLM research has been instrumental in establishing lightning detection systems all across the region and all of the United States. The first lightning detectors in this region came into operation in 1968, with the location of ground strikes plotted manually. This manual form of triangulation was replaced by linking detectors to computers. This system is called “Automated Lightning Detection System” (ALDS).

This synergistic combination of resources and technology greatly reduced the average wildland fire size and therefore reduced risks to both the ecosystem and the rural and urban populations living in or near forestlands (such as the Duck Valley Indian Reservation).

This break in the natural fire cycle introduced by large-scale and effective firefighting led to the accumulation of natural fuels on sites, where fire previously had re-occurred on a semipredictable cycle. Other disruptions to the natural fire cycle included the introduction of exotic plants, such as cheatgrass.

While wildland fire spread in the region has been drastically reduced, debris and normal vegetative fuels continue to accumulate in the forest and rangelands. When fire does occur, it can burn hotter and longer than it did historically. These "out-of-natural historic range of variability" fires are witnessed each summer across the nation.

With extensive urbanization of rangelands and forestlands, these fires often involve destruction of homes located in the WUI. On many occasions, wildfires have caused large-scale damage to private and public property, destroying many homes and causing deaths, particularly when they have reached urban fringe communities (Figure 10).

4.9.5. Wildland Fire History

Throughout the Northern Basin and Range ecoregion and Great Basin, wildfires have been observed on a continuous and frequent cycle in all forested and rangeland ecosystems. Many homes have been built within the WUI, leading to losses of private and public structures from wildfires. The reverse is also true, as homes have ignited and then spread to surrounding rangelands and forestlands, causing the loss of adjacent homes and natural ecosystems.

Fire was once an integral function of the majority of ecosystems in Northern Basin and Range ecoregion and Great Basin. The seasonal cycling of fire across the landscape was as regular as the July, August, and September lightning storms plying across the canyons and mountains. Depending on the plant community composition, structural configuration, and buildup of plant biomass, fire resulted from ignitions with varying intensities and extent across the landscape. Shorter return intervals between fire events often resulted in less dramatic changes in plant composition (Johnson, et al. 1994). The fires burned from 1 to 47 years apart, with most at 5- to 20-year intervals (Barrett 1979). With infrequent return intervals, plant communities tended to burn more severely and be replaced by vegetation different in composition, structure, and age (Johnson, et al. 1994). Native plant communities in this region developed under the influence of fire, and adaptations to fire are evident at the species, community, and ecosystem levels. Fire history data (from fire scars and charcoal deposits) suggest fire has played an important role in shaping the vegetation in the Northern Basin and Range ecoregion and Great Basin for thousands of years (Agee 1993).

Detailed records of fire ignition and extent have been compiled by the Bureau of Land Management, the US Forest Service, and states, in addition to data collected by the Sho-Pai Fire Station in Owyhee. Using this data on past fire extents and fire ignition data, the occurrence of wildland fires in the region of Duck Valley Reservation have been evaluated.

The area of analysis was extended beyond the borders of the Reservation to approximately 9.2 million acres, reaching to the north to almost the Snake River and to the south to Elko. From 1985 through 2010 (25 years - Table 17), the number of wildfire ignitions in and near the Duck Valley Indian Reservation has totaled 4,218 ignitions and averaged almost 170 ignitions per year (fires growing larger than 1 acre). Those fires have ignited approximately 4,000 acres annually.

The Fire Management Program of the Shoshone-Paiute Tribes is responsible for wildfire and structure fire protection on the Reservation. The Tribes cooperate with the states of Idaho and Nevada, the Bureau of Land Management, and the US Forest Service in wildfire response. Sho-Pai Fire responds to wildfires nationally as requested and is dispatched by the BIA.

Since 1985, it would appear that roughly 22% of all fires in the Reservation have been ignited by nature, while the remaining 78%, on average have been human caused (Table 37). This is a high proportion of human caused fires as compared to the Idaho and Nevada averages, which generally account for only 25-40% caused by humans. Fires started from Debris Burning would seem to be the biggest "culprit" for these ignitions that grew into wildfires.

Table 37. Wildfire Ignitions by Cause, in and near the Duck Valley Reservation.

		1985-2010	
Cause	**Cause Code**	**Occurrence**	**Percent**
Lightning	1	941	22%
Campfire	2	46	1%
Smoking	3	304	7%
Debris Burning	4	1,704	40%
Arson	5	224	5%
Equipment Use	6	160	4%
Railroad	7	17	0%
Children	8	367	9%
Miscellaneous	9	460	11%
Total		**4,218**	

4.9.6. Analysis Tools to Assess Wildfire Risk Exposure

Analysis tools to assess the risk exposure to wildland fires on the Duck Valley Indian Reservation are numerous. Each analysis tool has specific applications to unique needs and can be considered in light of the site being addressed; none of them will replace professional expertise of fire behavior analysts on the ground. These techniques are presented for consideration of the risk exposure to Duck Valley Indian Reservation residents. Wildland fire is arguably one of the most widespread hazards affecting the Duck Valley Indian Reservation.

4.9.6.1. Mean Fire Return Interval

Broad-scale alterations of historical fire regimes and vegetation dynamics have occurred in many landscapes in the U.S. through the combined influence of land management practices, fire exclusion, ungulate herbivory, insect and disease outbreaks, climate change, and invasion of non-native plant species. The LANDFIRE Project (LANDFIRE 2007) produces maps of simulated historical fire regimes and vegetation conditions using the LANDSUM landscape succession and disturbance dynamics model. The LANDFIRE Project also produces maps of current vegetation and measurements of current vegetation departure from simulated historical reference conditions. These maps support fire and landscape management planning outlined in the goals of the National Fire Plan, Federal Wildland Fire Management Policy, and the Healthy Forests Restoration Act.

The Simulated Historical Mean Fire Return Interval data layer (LANDFIRE MFRI 2006) quantifies the average number of years between fires under the presumed historical fire regime. This data layer is derived from vegetation and disturbance dynamics simulations using LANDSUM (Keane, Parsons and Hessburg 2002, Keane, Holsinger and Pratt 2006, Pratt, Holsinger and Keane 2006). LANDSUM simulates fire dynamics as a function of vegetation dynamics, topography, and spatial context in addition to variability introduced by dynamic wind direction and speed, frequency of extremely dry years, and landscape-level fire-size characteristics. This layer is intended to describe one component of simulated historical fire regime characteristics in the context of the broader historical time period represented by the LANDFIRE Biophysical Settings layer and LANDFIRE Biophysical Settings Model Documentation.

Mean fire return interval is calculated from the simulation length divided by the number of fires that were measured on each pixel. The simulations used to produce this layer were 10,000 years in duration to observe the most complete representation of the fire regime characteristics within spatially complex landscapes, given computational limitations. However, it is important to note that these simulations are not intended to accurately represent the last 10,000 years of measurable history, which includes spatially and temporally dynamic factors such as climate change, vegetation species dispersal, and anthropogenic influences on vegetation and fire characteristics.

Simulated historical mean fire return intervals were classified into 22 categories of varying temporal length to preserve finer detail for more frequently burned areas and less detail for rarely burned areas. Additional data layer values were included to represent Water, Snow / Ice, Barren land, and Sparsely Vegetated areas. Vegetated areas that never burned during the simulations were included in the category "Indeterminate Fire Regime Characteristics"; these vegetation types either had no defined fire behavior or had extremely low probabilities of fire ignition (Keane, Parsons and Hessburg 2002).

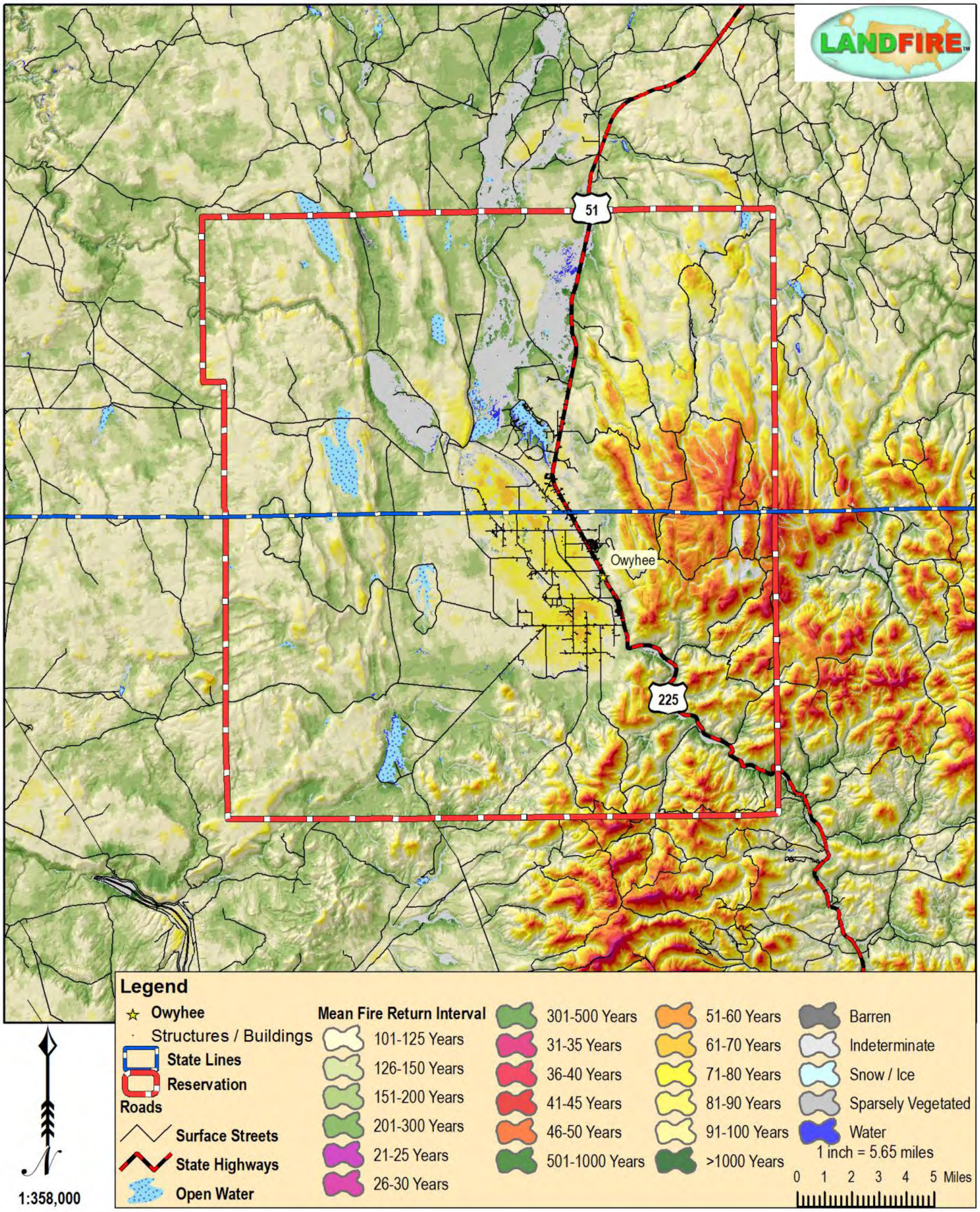
The results of the Mean Fire Return Interval analysis on the Duck Valley Indian Reservation (Table 38) reveals that about 60% of the land area on the Duck Valley Indian Reservation is subject to a return interval of 100 – 200 years, while the rest of the land area is exposed to mean fire return intervals less than this down to about a 45 year return interval. The data are extremely variable, with the largest land area category, representing 28% of the total land area (81,100 acres), situated in the mean fire return interval of 101-125 years. These data indicate that the role of wildland fire is highly variable and operating on temporal scales exceeding most planning efforts.

The spatial distribution of these data is shown in Figure 108. An investigative study of these maps demonstrates the variability and distribution of this analysis component to understanding the role of wildland fire in this region.

Table 38. Mean Fire Return Intervals on the Duck Valley Indian Reservation.

Mean Fire Return Interval		Acres	Percent of Total Area
26-30 Years		0.67	0.0%
31-35 Years		134.55	0.0%
36-40 Years		791.50	0.3%
41-45 Years		2,382.96	0.8%
46-50 Years		4,056.04	1.4%
51-60 Years		11,337.02	3.9%
61-70 Years		11,804.05	4.1%
71-80 Years		13,680.17	4.7%
81-90 Years		17,929.47	6.2%
91-100 Years		20,336.67	7.0%
101-125 Years		81,100.06	28.0%
126-150 Years		57,307.37	19.8%
151-200 Years		35,191.32	12.2%
201-300 Years		6,465.69	2.2%
301-500 Years		1,530.52	0.5%
501-1000 Years		311.13	0.1%
>1000 Years		190.81	0.1%
Water		2,415.21	0.8%
Barren		296.23	0.1%
Indeterminate Fire Regime Characteristics		22,265.28	7.7%
(LANDFIRE 2007)	**Total**	**289,526.72**	

Figure 108. Mean Fire Return Interval (LANDFIRE MFRI 2006) for the Duck Valley Indian Reservation.



4.9.6.2. Fire Prone Landscapes

Schlosser (2002), developed a methodology to assess the location of fire prone landscapes on forested and non-forested ecosystems in the western US. This assessment technique has been completed for tribal- and county-level fire mitigation plans and FEMA hazard mitigation plans, for Bureau of Indian Affairs and BLM Fire Management Plans and Environmental Assessments on over 67 project areas in Idaho, Montana, Nevada, Oregon, and Washington to determine fire prone landscape characteristics.

The goal of developing the Fire Prone Landscapes (FPL) analysis is to make inferences about relative risk factors across large geographical regions for wildfire spread. This analysis uses the extent and occurrence of past fires as an indicator of characteristics for a specific area and its propensity to burn in the future. Concisely, if a certain combination of vegetation cover type, canopy closure, aspect, slope, and position on the hillside, have burned with a high frequency in the past, then it is reasonable to extrapolate that they will have the same tendency in the future, unless mitigation activities are conducted to reduce this potential.

The basis of the analysis technique is to bring all of these factors together in a geospatial model (GIS layers) to determine the area of each combination of input variables that is available to burn, and then determine how much of this area actually burned in past fire events. For this analysis, the areas of Owyhee County and Elko County were considered in order to guarantee a robust sample area.

Past fire extents represent those locations on the landscape that have previously burned during a wildfire. Past fire extent maps were obtained from a variety of sources for the Northern Basin and Range ecoregion and Great Basin.

The maximum derived FPL rating score for the Duck Valley Indian Reservation was 80, with a low of 0 (Lakes and Reservoirs). Table 39 details the distribution of these categories while Figure 109 graphically displays these results.

The FPL analysis is an appropriate tool for assessing the risk in the WUI to people, structures, and infrastructure. This analysis tool geographically shows where landscape components combine to create conditions where past fires have burned. It does not show predicted rate of spread or burn intensity, but it does show where resources are potentially at-risk to wildfire loss. Thus, FPL data are useful for community protection prioritization and WUI home defensibility precedence.

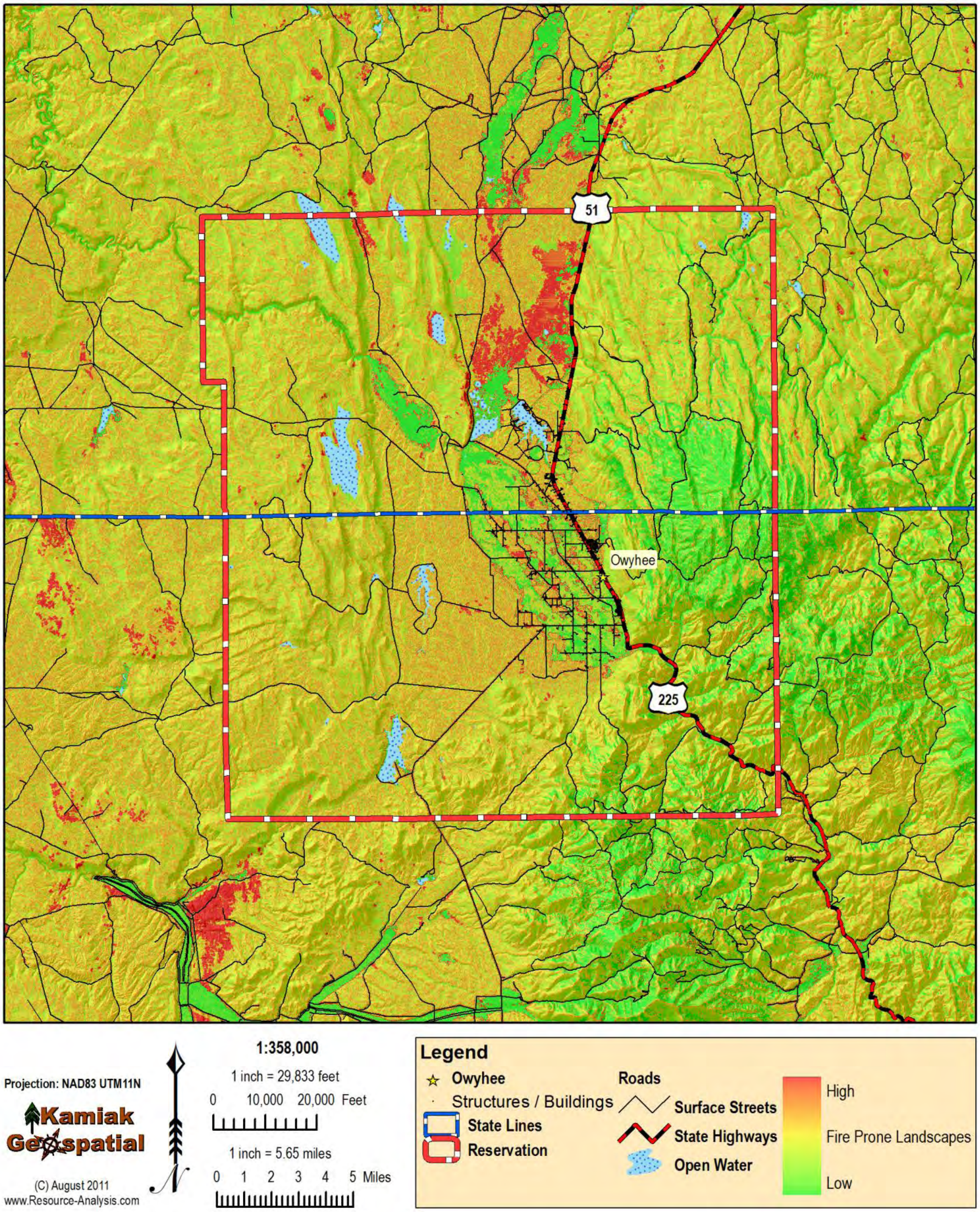
Table 39. Fire Prone Landscapes Analysis Results on the Duck Valley Indian Reservation.

Risk Category	Acres	Percent
0	-	0%
1-10	-	0%
11-20	183	0%
21-30	2,224	1%
31-40	14,695	5%
41-50	70,677	24%
51-60	156,121	54%
61-70	40,342	14%
71-80	5,069	2%
81-90	-	0%
91-100	-	0%
Total	289,311	

The risk values developed in this analysis should be considered **ordinal data**, that is, while the values presented have a meaningful ranking, they do not have consistent scale between numbers. Rating in the “40” range is not necessarily twice as “risky” as rating in the “20” range. These category values also do not correspond to a rate of fire spread, a fuel loading indicator, or measurable potential fire intensity. Each of those scales is greatly influenced by weather, seasonal and daily variations in moisture (relative humidity), solar radiation, and other factors. The risk rating presented here serves to identify where certain constant variables are present, aiding in identifying where fires typically spread into the largest fires across the landscape, and where wildfire mitigation efforts can be concentrated to achieve the greatest benefit.

A risk-rating score of zero represents no relative risk and a score of one hundred is considered extreme risk. In practice, very few areas of the highest risk category (100) are found. This rating scale should be considered as nominal data producing values which can be ordered sequentially, but the actual values are not multiplicative. The scale provides relative comparisons between sites.

Figure 109. Fire Prone Landscapes of the Duck Valley Indian Reservation.



4.9.6.3. Historic Fire Regime

The USFS, Northern Fire Plan Cohesive Strategy Team, in Kalispell, Montana, completed an analysis of Historic Fire Regime (HFR) in 2002 and revised it again in 2005 for distribution to land managers and analysts. This report uses those data and GIS layers to represent HFR (LANDFIRE 2006). These data are used for the analysis of the Historic Fire Regime within the Duck Valley Indian Reservation for this analysis effort.

In the fire-adapted ecosystems of the Northern Basin and Range ecoregion and Great Basin, fire is undoubtedly the dominant process in terrestrial systems that constrains vegetation patterns, habitats, and ultimately, species composition. Land managers seek to understand HFR (that is, fire frequency and fire severity prior to settlement by Euro-Americans) to be able to define ecologically appropriate goals and objectives for an area. Moreover, managers strive to grasp the spatially explicit knowledge of how historic fire regimes vary across the landscape.

Many ecological assessments are enhanced by the characterization of the historical range of variability which helps managers understand: (1) how the driving ecosystem processes vary from site to site; (2) how these processes affected ecosystems in the past; and (3) how these processes might affect the ecosystems of today and the future. Obviously, HFR is a critical component for characterizing the historical range of variability in the fire-adapted ecosystems of the Northern Basin and Range ecoregion and Great Basin. Furthermore, understanding ecosystem departures provides the necessary context for managing sustainable ecosystems. Land managers need to understand how ecosystem processes and functions have changed prior to developing strategies to maintain or restore sustainable systems. In addition, the concept of departure is a key factor for assessing risks to ecosystem components. For example, the departure from historical fire regimes may serve as a useful proxy for the potential of severe fire effects from an ecological perspective.

The Simulated Historical Fire Regime Groups (LANDFIRE HFRG 2006) data layer categorizes simulated mean fire-return intervals and fire severities into five fire regimes defined in the Interagency Fire Regime Condition Class Guidebook (Hann, et al. 2004). The classes are defined as:

- Fire Regime I: 0 to 35 year frequency, low-to-mixed severity
- Fire Regime II: 0 to 35 year frequency, replacement severity
- Fire Regime III: 35 to 200 year frequency, low-to-mixed severity
- Fire Regime IV: 35 to 200 year frequency, replacement severity
- Fire Regime V: 200+ year frequency, any severity

This data layer is derived from vegetation and disturbance dynamics simulations using LANDSUM (Keane, Parsons and Hessburg 2002, Keane, Holsinger and Pratt 2006, Pratt, Holsinger and Keane 2006). LANDSUM simulates fire dynamics as a function of vegetation dynamics, topography, and spatial context in addition to variability introduced by dynamic wind direction and speed, frequency of extremely dry years, and landscape-level fire size characteristics. This layer is intended to describe one component of simulated HFR characteristics in the context of the broader historical time period represented by the LANDFIRE Biophysical Settings layer and LANDFIRE Biophysical Settings Model Documentation.

Fire is the dominant disturbance process that manipulates vegetation patterns in the Northern Basin and Range ecoregion and Great Basin. The HFR data were prepared to supplement other data necessary to assess integrated risks and opportunities at regional and subregional scales. The HFR theme was derived specifically to estimate an index of the relative change of a disturbance process, and the subsequent patterns of vegetation composition and structure.

A historical (natural) fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning (Agee 1993, Brown 1995). Coarse scale definitions for natural (historical) fire regimes have been developed by Hardy *et al.* (2001) and Schmidt *et al.* (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001).

As the scale of application becomes finer these five classes may be defined with more detail, or any one class may be split into finer classes, but the hierarchy to the coarse scale definitions should be retained.

General Limitations

These data were derived using fire history information from a variety of different sources. These data were designed to characterize broad scale patterns of HFR for use in regional and subregional assessments. Any decisions based on these data should be supported with field verification, especially at scales finer than 1:100,000. Although the resolution of the HFR theme is a 30 meter cell size, the expected accuracy does not warrant their use for analyses of areas smaller than about 10,000 acres (for example, assessments that typically require 1:24,000 data).

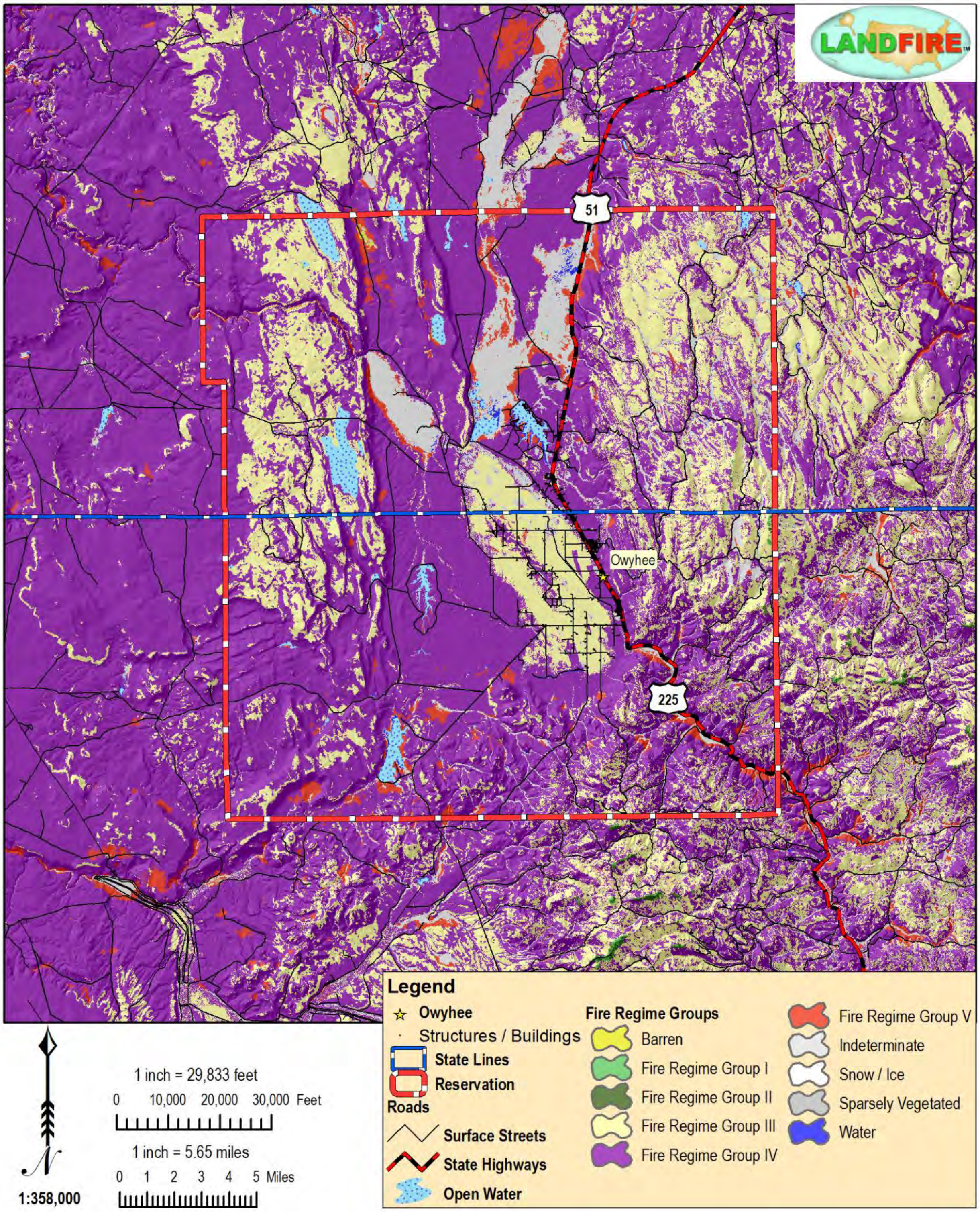
HFR identified in the Duck Valley Indian Reservation are presented in Table 40 and these data labels should be considered nominal data (they are not continuous-scale measurements). The HFR is shown graphically in Figure 110.

Table 40. Historic Fire Regime Group Analysis or the Duck Valley Indian Reservation.

Fire Regime	Description	Acres	Percent
Fire Regime Group I	<= 35 Year Fire Return Interval, Low-and-Mixed Severity	52	0%
Fire Regime Group II	<= 35 Year Fire Return Interval, Replacement Severity	83	0%
Fire Regime Group III	35 - 200 Year Fire Return Interval, Low-and-Mixed Severity	79,449	27%
Fire Regime Group IV	35 - 200 Year Fire Return Interval, Replacement Severity	176,468	61%
Fire Regime Group V	> 200 Year Fire Return Interval, Any Severity	8,498	3%
Water	Water	2,415	1%
Barren	Barren	296	0%
Indeterminate Fire Regime Characteristics	Indeterminate Fire Regime Characteristics	22,265	8%
(LANDFIRE HFRG 2006)	**Total**	**289,526**	

The most commonly represented HFR on the Duck Valley Indian Reservation (61% of land area, 176,468 acres) is Regime IV, characterized by 35 - 200 Year Fire Return Interval, with a vegetative structure replacement severity (Table 40). The next most represented historic fire regime is Regime III, characterized by 35 - 200 Year Fire Return Interval, with a Low-and-Mixed vegetative replacement severity (Table 40).

Figure 110. Historic Fire Regime Groups on the Duck Valley Indian Reservation (LANDFIRE 2006).



4.9.6.4. Fire Regime Condition Class

The USFS Northern Fire Plan Cohesive Strategy Team, in Kalispell, Montana, completed an analysis of Fire Regime Condition Class in 2002 and revised it again in 2005 for distribution to land managers and analysts. Since that time, the LANDFIRE (2006) project has revised this analysis substantially to include new and insightful data analysis techniques. These data are used for the analysis of Fire Regime Condition Class (FRCC) on the Duck Valley Indian Reservation for this analysis effort.

A FRCC is a classification of the amount of current departure from the natural fire regime (Hann and Bunnell 2001). Coarse-scale FRCC classes have been defined and mapped by Hardy *et al.* (2001) and Schmidt *et al.* (2002). They include three condition classes for each fire regime. The classification is based on a relative measure describing the degree of departure from the historical natural fire regime. This departure results in changes to one (or more) of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g. insect and disease mortality, grazing, and drought). All wildland vegetation and fuel conditions or wildland fire situations fit within one of the three classes.

The three classes (nominal data) are based on low (FRCC 1), moderate (FRCC 2), and high (FRCC 3) departure from the central tendency of the natural (historical) fire regime (Hann and Bunnell 2001, Hardy, et al. 2001, Schmidt, et al. 2002). The central tendency is a composite estimate of vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated natural disturbances. Low departure is considered to be within the natural (historical) range of variability, while moderate and high departures are outside this range.

Characteristic vegetation and fuel conditions are considered to be those that occurred within the natural (historical) fire regime. Uncharacteristic conditions are considered to be those that did not occur within the natural (historical) fire regime, such as invasive species (e.g. weeds, insects, and diseases), “high-graded” forest composition and structure (e.g. large trees removed in a frequent surface fire regime), or repeated annual grazing that maintains grassy fuels across relatively large areas at levels that will not carry a surface fire. Determination of the amount of departure is based on comparison of a composite measure of fire-regime attributes (vegetation characteristics; fuel composition; fire frequency, severity and pattern) to the central tendency of the natural (historical) fire regime. The amount of departure is then classified to determine the FRCC. A simplified description of the FRCC and associated potential risks are presented in Table 41. FRCC is displayed graphically in Figure 111.

Table 41. Fire Regime Condition Class Definitions.

Fire Regime Condition Class	Description	Potential Risks
FRCC I	Sites are determined to be within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.	Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regime and associated vegetation and fuel characteristics. Composition and structure of vegetation and fuels are similar to the natural (historical) regime. Risk of loss of key ecosystem components (e.g. native species, large trees, and soil) is low.
FRCC II	Moderate departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.	Fire behavior, effects, and other associated disturbances are moderately departed (more or less severe). Composition and structure of vegetation and fuel are moderately altered. Uncharacteristic conditions range from low to moderate. Risk of loss of key ecosystem components is moderate.
FRCC III	High departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.	Fire behavior, effects, and other associated disturbances are highly departed (more or less severe). Composition and structure of vegetation and fuel are highly altered. Uncharacteristic conditions range from moderate to high. Risk of loss of key ecosystem components is high.

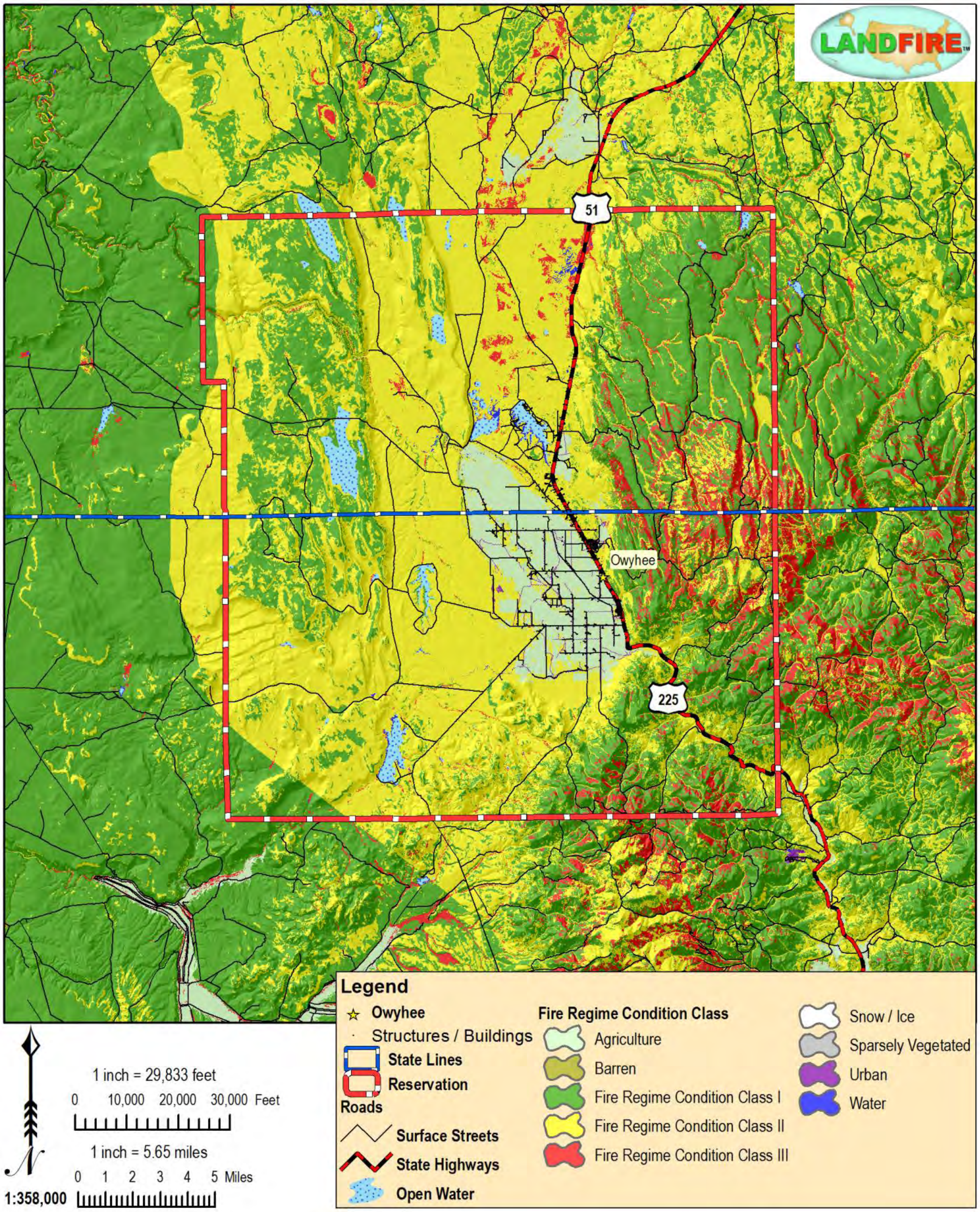
An analysis of FRCC on the Duck Valley Indian Reservation shows that approximately 32% of the land area is in FRCC I (low departure from historical), just about 55% is in FRCC II (moderate departure), with 6% of the area in FRCC III (Table 42).

Table 42. FRCC by Area on the Duck Valley Indian Reservation.

Fire Regime Condition Class		Acres	Percent of Area
Fire Regime Condition Class I	Low Vegetation Departure	93,520	32%
Fire Regime Condition Class II	Moderate Vegetation Departure	159,598	55%
Fire Regime Condition Class III	High Vegetation Departure	16,206	6%
Water		2,415	1%
Urban		1,745	1%
Barren		296	0%
Agriculture		15,746	5%
(LANDFIRE 2007)	**Total**	**289,526**	

These data represent a substantial adjustment to the USFS Northern Fire Plan Cohesive Strategy Team (Kalispell, Montana) analysis of Fire Regime Condition Class in 2002 (used in the Duck Valley Indian Reservation Fire Management Plan). The LANDFIRE (2006) data used in this analysis provide substantially improved analysis basis and updated input data, leading to a better assessment of derivative data for both HFR and FRCC.

Figure 111. Fire Regime Condition Class on the Duck Valley Indian Reservation.



4.9.6.5. Application of Assessment Tools Presented

The introduction of this section included a statement that each wildfire analysis tool has an appropriate application for illuminating different wildfire management questions. MFRI, HFR, and FRCC were developed by the federal land management agencies (LANDFIRE 2007) in order to quantify vegetation characteristic departures from historical conditions. These assessments become extremely valuable tools in ecosystem restoration efforts when attempting to return the natural cycle of vegetation, fire, wildlife, soil and water processes, and other ecosystem management questions. Neither Historic Fire Regime nor Current Condition Class can be taken independently from the other; they are an integrated set of analysis tools.

The Fire Prone Landscapes assessment tool was developed specifically to address WUI wildfire risk challenges. This tool is not intended to illuminate the departure from historical conditions. This tool sheds a light of understanding on fire risk based on topographic and vegetative conditions. Where areas possess a high risk rating and those high risk ratings are continuous over large areas (seen as a large “splash of red” on the maps - Figure 109) surrounding or adjacent to homes and infrastructure, a wildfire risk is interpreted.

4.9.7. Site Vulnerability to Wildfire Damage

Sites with clay and fragile soils can respond poorly to hot fires at the surface. The Soil Data Viewer is a tool built as an extension to ArcMap that allows a user to create soil-based thematic maps (NRCS 2010). The application can also be run independent of ArcMap, but output is then limited to a tabular report.

The soil data viewer uses detailed soil survey data to determine a potential damage profile to soils when a hot fire burns over the site. The ratings in this interpretation indicate the potential for damage to nutrient, physical, and biotic soil characteristics by fire. The ratings involve an evaluation of the potential impact of prescribed fires or wildfires that are intense enough to remove the duff layer and consume organic matter in the surface layer.

The ratings are based on texture of the surface layer, content of rock fragments and organic matter in the surface layer, thickness of the surface layer, and slope.

The ratings are both verbal and numerical. The soils are described as having a "low," "moderate," or "high" potential for this kind of damage. "Low" indicates that fire damage is unlikely. Good performance can be expected, and little or no maintenance is needed. "Moderate" indicates that fire damage can occur because one or more soil properties are less than desirable. Fair performance can be expected, and some maintenance is needed. "High" indicates that fire damage can occur because of one or more soil properties and that overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration.

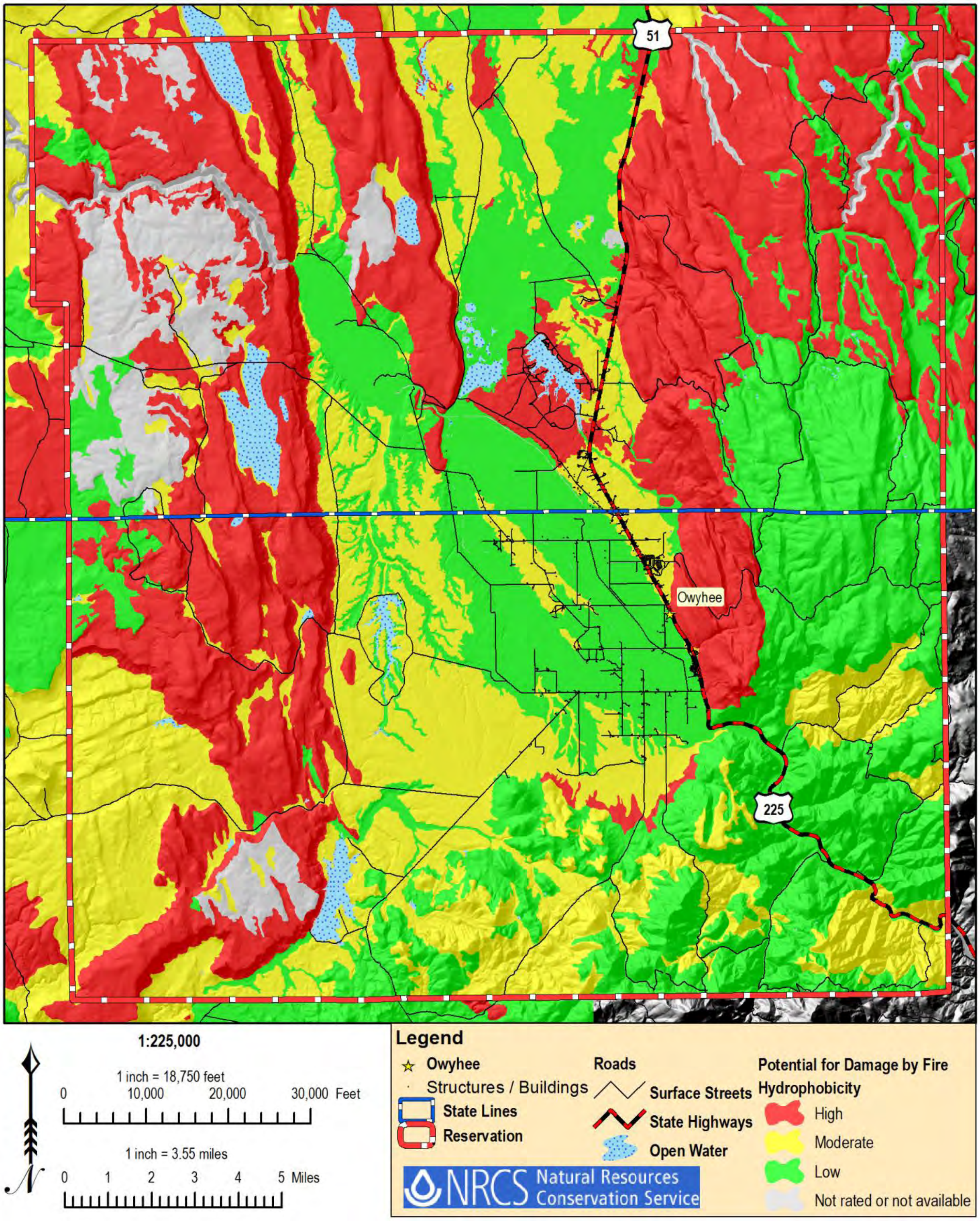
Numerical ratings indicate gradations between the point at which the potential for fire damage is highest (1.00) and the point at which the potential is lowest (0.00).

The map unit components listed for each map unit (Figure 112) in the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site (NRCS 2010). Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

The Soil Survey and the Soil Data Viewer are supported by the USDA Natural Resource Conservation Service.

Figure 112. Potential for site damage by hot fires (hydrophobicity).



Within the Duck Valley Indian Reservation, these risk rated soils for potential damage by wildfire provide useful insights that could help to prioritize lands for wildfire fuel mitigation measures to protect agricultural lands, grazing lands, range production, forest productions, and the protection of wildlife habitat or the protection of fisheries water quality. The protection of the soil is necessary to sustain the land for human habitation and wildlife and fisheries species. When soils are affected by hot fires, one of the hydrophobic responses is for the clay particles in the upper layers of the soil to 'bake', like clay in an oven when making pottery. These soils to not accept precipitation infiltration, but instead they convert the moisture to overland flow that can carry large loads of sediment to the river. It may take years for the site to recover from hot fires.

Wildfire fuels mitigation measures can maintain vegetation types and concentrations at densities to promote low 'resistance to control' locations where wildfires can be halted quickly. These mitigation measures can include prescribed burning when the Fire Management Officer can select the timing and conditions of ignition (to prevent extreme wildfire weather conditions), grazing at selected periods of the year and by selected species (such as horses, cattle, or sheep), conversion to farming acres, and other land management practices.

The distribution of the lands on the Reservation to sensitive soils to hot fires places over 99,000 acres (35%) at the lowest risk to damage from hot fires (Table 43). An almost equal share of land area (96,500 acres – 35%) is ranked at the high risk rating. Approximately 74,300 acres are classified in the moderate risk rating for hot wildfire reaction (Table 43).

Table 43. Potential for site damage by hot fires acreage allocation.

	Acres	Percent of Total Area
Low:	99,037	35%
Moderate:	74,284	27%
High:	96,511	35%
Not Rated:	9,765	3%
Total	**279,597**	

These risk rankings can be evaluated alongside the analysis of the lands at the highest potential for wildfire ignition and large fire event possibility. This combination of analysis tools can allow the land managers to identify where high risks to wildfires exist, and where those fires have a potential to cause both loss of life and structures, and also a potential to cause soil damages that may take years, or even decades, to recuperate the losses to soil productivity or wildlife habitat.

4.9.8. Probability of Future Events

The probability of future wildfire events can be interpreted from the Mean Fire Return Interval analysis and the Fire Prone Landscape numbers. The Mean Fire Return Interval assessment considers the historical return interval over a long period (10,000 years) of estimated fire occurrence. Current conditions are not directly integrated into this analysis for determining current probability of wildfire return.

Fire Prone Landscapes can be used to estimate the probability of future wildfire return. In order to put these numbers in terms of probability of occurrence, the FPL rating score can be modified to represent a probability of a wildfire event occurring during a given period of time. The lower the FPL rating score, the lower the probability of witnessing a wildfire event in that area. Directly, the FPL rating score can be converted to a probability by stating the relative score as a probability of occurrence within a 50-year period. Using the conversion defined by the Extreme Value Theory (Castillo 1988), the 50-year wildfire probability event would be stated as the FPL rating score converted to a percent. Thus, a FPL rating score of 45 would represent a 45% probability of witnessing a 50-year wildfire event. This conversion is intended for illustrative purposes only and the actual probability of occurrence may differ from these estimates.

Further extrapolation of these data can be made in order to better understand the probability of future wildfire events on the Duck Valley Indian Reservation. If the site is left undisturbed and unmitigated, the risk of future wildfire events for each area evaluated can be estimated by the risk rating score expressed as a percent (rating score of 15, expressed as 15%). This modified score can then be treated as an expression of the likelihood of that area experiencing a wildfire event within the next 50-year period. Of course, mitigation measures can be expected to decrease the likelihood of large-scale wildfire events.

The probability of wildfire events within the Duck Valley Indian Reservation is moderate to high and greatly dependent on topography, soils, lightning ignitions, and human ignited wildfires. This places specific areas within the Duck Valley Indian Reservation likely to experience damages due to wildfires.

Ordinarily, the region within and surrounding the Duck Valley Indian Reservation is expected to experience wildfire events to a high frequency (occurrence of multiple ignitions every year).

4.9.9. Resources at Risk

Using the approach implemented for assessing flood-risk exposure on the Duck Valley Indian Reservation, the value of resources at risk to wildfires has been completed. The FPL risk-rating score was assigned to each structure on the Duck Valley Indian Reservation. The individual structure values were summed together by use characteristics to reveal structural values that are at risk to wildfires (Table 44). This determination was combined with the number of people currently living in each structure (souls). This portion of the analysis only applies to residential structures (Table 45).

The modal score (value of the dataset mode – analogous to the mean) for these values was determined for each structure on the Duck Valley Indian Reservation. These “risk scores” for each structure were grouped into consolidated risk categories in units arranged for every tenth score. Thus, the consolidated risk score of 5 is the lowest-risk category (0-10), and is followed by consolidated-risk category 15 (10-20), then 25 (20-30), and so forth. The higher the consolidated risk category, the higher the comparative risk to structures.

It is important to understand that the risk assessment is not considering the structure to be at-risk. The risk analysis is considering the risk on the land where the structure is located. Through reasoning, it can be extrapolated that the land’s risk rating will translate directly to the risk of the structure or structures on the land.

The results of this analysis demonstrate that roughly an equal number of structures are located in FPL score locations rated as 40-50 and 50-60. When combined they represent 354 structures with $43,629,057 in value (Table 44). About 8% of the structure value represented by 59 structures is located on lands with an FPL score of 70-80, and two structures are located on sites with an FPL score above 80.

The number of people (souls) living in the residential structures on the Reservation are scattered across all FPL score sites from 20 to 90 (Table 44). Their distribution matches, roughly, the concentration of residential homes. Obviously, the best use of this assessment is to target the reduction of wildland fuels around residential structures, starting with the highest risk sites and working through the lower risk sites. A continuation of this effort is to continue wildfire fuels reduction around all structures on the Reservation.

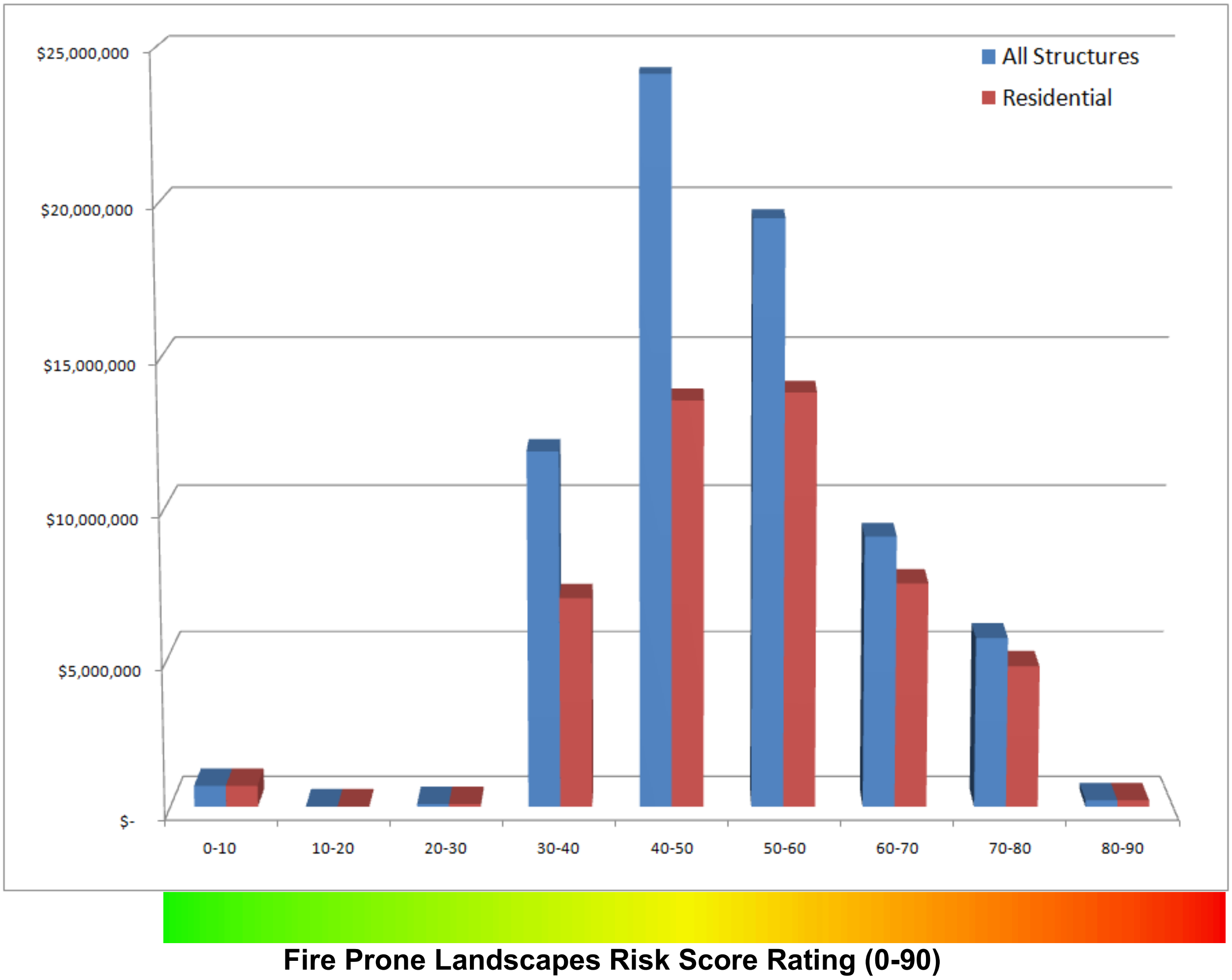
Table 44. Fire Prone Landscapes Risk Rating (0-100) for all structures, arranged by owner and FPL score.

Structure Use	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	Number of Structures
BIA	$-	$-	$-	$250,000	$-	$200,000	$800,000	$-	$-	7
Church	$-	$-	$-	$-	$835,000	$385,000	$250,000	$750,000	$-	6
Commercial	$-	$-	$-	$1,400,000	$1,609,500	$2,250,000	$250,000	$-	$-	24
Hospital	$-	$-	$-	$-	$5,494,992	$14,204	$-	$-	$-	3
Residential	$703,543	$-	$84,000	$7,001,360	$13,550,055	$13,813,256	$7,498,508	$4,725,469	$211,170	483
Residential/Abandoned	$-	$-	$-	$4,000	$5,000	$1,000	$2,000	$3,000	$-	15
School	$-	$-	$-	$1,870,000	$435,000	$1,570,000	$-	$-	$-	13
Sho-Pai	$-	$-	$-	$1,340,000	$2,208,000	$1,258,050	$255,000	$189,000	$-	37
Count	**4**	**0**	**1**	**81**	**175**	**179**	**87**	**59**	**2**	**588**
Value	**$703,543**	**$0**	**$84,000**	**$11,865,360**	**$24,137,547**	**$19,491,510**	**$9,055,508**	**$5,667,469**	**$211,170**	**$71,216,107**
Percent of Total Value	**1%**	**0%**	**0%**	**18%**	**34%**	**27%**	**14%**	**8%**	**0%**	
Number of Souls (all Residential)	**0**	**0**	**2**	**98**	**309**	**327**	**174**	**122**	**4**	

Table 45. Structure count, souls, and value.

Structure Type	Total Number of Structures	Souls Living in Structures	Total Value
BIA (all uses)	7	0	$1,250,000
Churches	6	0	$2,220,000
Commercial	24	0	$5,509,500
Hospital	3	0	$ 5,509,196
Residential (including abandoned)	498	1,036	$47,602,361
School (all uses)	13	0	$3,875,000
Sho-Pai Tribes (all uses)	37	0	$5,250,050
Total	**588**	**1,036**	**$71,216,107**

Figure 113. Fire Prone Landscapes Risk Rating (0-90) arranged by use category.



4.9.10. Potential Mitigation Activities

For many decades in the 20th century the policy of the BIA, USFS, and other agencies, was to suppress all wildfires. This policy was epitomized by the mascot Smokey Bear and was also the basis of parts of the Disney produced Bambi movie. The previous policy of absolute fire suppression in the United States has resulted in the higher-than-historical buildup of fuel in some ecosystems such as dry ponderosa pine forests and chaparral rangelands. In acute cases, forest species composition has transitioned from a fire tolerant species mix to a mixture of these species plus a substantial component of non-tolerant species. When fire is suppressed long enough, fire intolerant species can dominate these sites. This example provides only a small insight to the vegetative ecosystem changes across the Northern Basin and Range ecoregion and Great Basin brought about by 20th century fire management policies.

In addition to the loss of human life from direct firefighting activities, homes designed without consideration of the fire prone environment in which they are built have been a significant reason for the catastrophic losses of property and life experienced in wildfires.

The risk of major wildfires can be reduced partly by a reduction or alteration of fuels present. In wildland areas, reduction can be accomplished by various methods: first, conducting controlled burns (prescribed burning); second, the alteration of fuel mechanics, which involves reducing the structure of fuel ladders. Fuel alteration can be accomplished by hand crews with chainsaws or by large mastication equipment that shreds trees and vegetation to a mulch. Another method is changing the vegetative component by replacing vegetation with less fire-susceptible species. Such techniques are effective within the WUI.

People living in fire prone areas can take a variety of precautions, including building their homes out of flame-resistant materials, reducing the amount of combustible fuel near the home or property (including firebreaks, effectively their own miniature control lines), and investing in their own firefighting tools (hand tools, water tanks, pumps, and fire-hose). Rural farming communities are also often threatened directly by wildfire. Expanding urban fringes have spread into wildland areas, and communities have literally built themselves in the middle of highly flammable rangelands and forestlands.

In 2005, the Duck Valley Indian Reservation developed and adopted a Duck Valley Indian Reservation Wildland-Urban Interface Wildfire Management Plan. This plan was developed to provide direction and continuity and to establish operational procedures to guide all wildland fire program activities to ensure that fire is properly used as a means of resource management. The Wildfire Management Plan presents actions that will integrate fire management with resource management goals. This plan will be evaluated and updated in future years as required by changes in policy, management actions, and priorities.

Planning objectives for Fire Management during 1995-2005 planning period included:

4.9.10.1. Homesite Evaluations and Creation of Defensible Space

Individual home site evaluations can increase homeowners' awareness and improve the survivability of structures in the event of a wildfire. Current management of the vegetation surrounding homes provides good protection; however, maintaining a lean, clean, green zone around structures to reduce the potential loss of life and property is recommended. Assessing individual homes in the outlying areas can address the issue of escape routes and home defensibility characteristics. Educating the homeowners in techniques for protecting their homes is critical in these hot, dry environments.

4.9.10.2. Travel Corridor Fire Breaks

Ignition points are likely to continue to be concentrated along the roads that run through the Reservation. These travel routes have historically served as the primary source of human-caused ignitions, particularly along Highway ID 51/NV 225. In areas with high concentrations of resource values along these corridors, plow or disk lines may be considered in order to provide a fire break in the event of a roadside ignition. Passage with a disk parallel to an access route can provide an adequate control line under normal fire conditions.

Alternatively, permanent fuel breaks can be established in order to reduce the potential for ignitions originating from the highway to spread into the surrounding lands. Application of a cheatgrass-specific herbicide such as Plateau followed by replanting with fire-retardant grass species such as Crested Wheatgrass would provide a longer-term firebreak.

In combination with these efforts, or in place of these efforts, concentrated livestock grazing within a corridor paralleling these travel routes is suggested; especially along Highway ID 51/NV 225. This effort will require cooperation between ranchers/farmers, land managers, and individuals to accomplish. In practice, this recommendation will necessitate the construction of temporary or permanent fencing along the right-of-way adjacent to the highway, and another fence set-back, and parallel, to the road approximately 500 feet to 1,000 feet away. By segmenting the corridor into smaller units (½ mile to 1 mile long), intensive cattle grazing of the fine fuels in this area during the late spring and summer may reduce the probability of human created ignitions (and lightning ignited fires) from spreading rapidly to the rangeland where people and communities are located.

4.9.10.3. Power Line Corridor Fire Breaks

The treatment opportunities specified for travel corridor fire breaks apply equally for power line corridors. The obvious difference between the two is that the focus area is not an area parallel to and adjacent to the road, but instead focuses on the area immediately below the infrastructure element. Protection under the power lines is strongly recommended. This may be just the right place to test intensive livestock grazing practices as a tool for reducing fine fuels around significant infrastructure.

4.9.10.4. Wildland Fire Suppression Activities

As part of the implementation of fire mitigation activities within the Duck Valley Reservation, a variety of management tools were recommended. Management tools included but were not limited to the following:

- Homeowner and landowner education
- Building code changes for structures and infrastructure in the WUI
- Home site defensible zone through fuels modification
- Community defensible zone fuels alteration
- Access improvements & fuels treatments
- Access creation
- Emergency response enhancements (training, personnel, equipment)
- Regional land management recommendations especially in terms of livestock management
- Prescribed Burning
- Wildland Fuels Management
- Wildland Fire Use

That plan identified several potential mitigation activities to reduce the risk of loss of life, destruction of homes and other structures, and the disruption of the local economy, and to facilitate the maintenance of a healthy rangeland environment.

A major emphasis in that plan was the creation of defensible spaces around homes and neighborhoods to increase the success potential of fire fighters in the case of wildfire emergency. This reduction of the “resistance to control” focused primarily on removing vegetation immediately adjacent to homes, improving ingress and egress, and replacing flammable structure materials with fire-resistant materials (e.g., decks and roofing).

Since that plan’s adoption, implementation has been targeted and effective. Homes have been “protected”.

4.9.11. Protection

A key component in meeting the underlying wildfire control need is the protection and treatment of fire hazard in the WUI (Figure 10). These WUI areas encompass not only the interface (areas immediately adjacent to urban development), but also the continuous slopes and fuels that lead directly to a risk to urban developments. Reducing the fire hazard in the WUI requires the efforts of tribal, federal, state, and local agencies and private individuals (Norton 2002). “The role of [most] federal agencies in the WUI includes wildland firefighting, hazard fuels reduction, cooperative prevention and education, and technical experience. Structural fire protection [during a wildfire] in the WUI is [largely] the responsibility of tribal, state, and local governments” (Norton 2002). Property owners share a responsibility to protect their residences and businesses and minimize fire danger by creating defensible areas around them and taking other measures to minimize the fire risks to their structures. With treatment, a WUI area can provide firefighters a defensible area from which to suppress wildland fires or defend communities. In addition, a WUI that is properly thinned will be less likely to sustain a crown fire that enters or originates within it.

Tools are available to emergency service responders and managers to assess wildfire fuels, structural risks, and infrastructure components. Computer programs such as RedZone® Software are written to assist fire departments and emergency services efforts to assess individual structures, communities, and regions to understand relative risk components of wildfire exposure and delineate these components of risk in a GIS map. RedZone Software’s suite of products provides agencies a comprehensive solution to data collection, visualization, and map production (Red Zone Software 2009).

By reducing hazardous fuel loads, ladder fuels, and tree densities, creating new defensible space, and reinforcing existing defensible space, landowners and managers would protect the WUI, the biological resources of the management area, and adjacent property owners by:

- Minimizing the potential of high-severity surface, ladder, and crown fires entering or leaving the area around homes.
- Reducing the potential for firebrands (embers carried by the wind in front of the wildfire) impacting the WUI. Research indicates that flying sparks and embers (firebrands) from a crown fire can ignite additional wildfires as far as 1¼ miles away during periods of extreme fire weather and fire behavior (Norton 2002).
- Improving defensible space in the immediate areas for suppression efforts in the event of wildland fire.

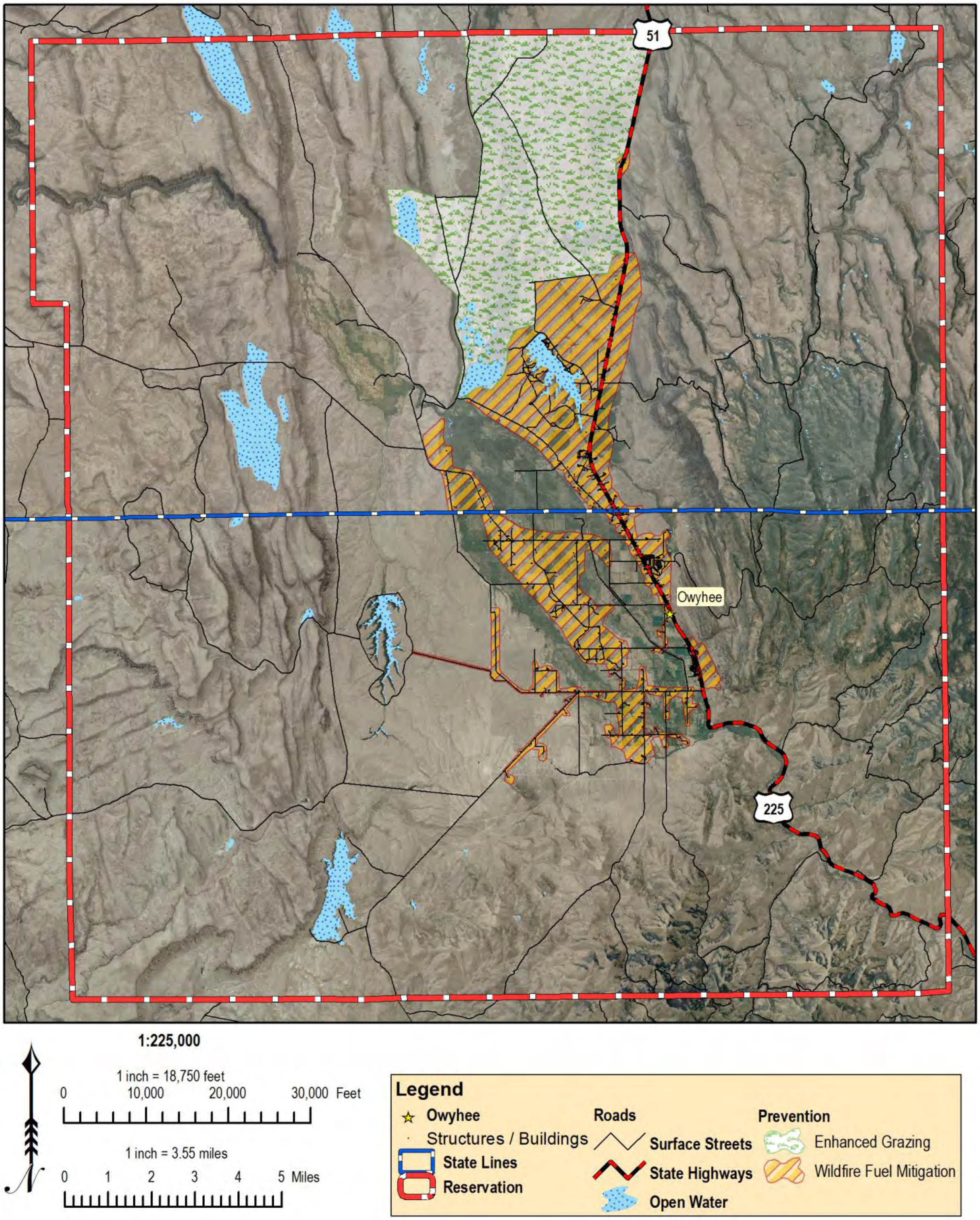
4.9.12. Wildfire Fuel Mitigation

Several areas within the Duck Valley Indian Reservation have been identified for wildfire fuels mitigation (Figure 114). These areas combine mechanical site manipulation through prescribed burning, vegetation conversion, enhanced grazing, and a combination of these and related treatments. The selection of these areas was made in recognition of highly ranked FPL score areas in combination with sites showing high risk to soil damage from hot wildfires. Most of these site selections were made along infrastructure routes (roads and power lines) and around homes.

These sites include approximately 17,345 acres of ‘enhanced grazing’ that would involve a cooperative effort with livestock ranchers to graze the site while vegetation is still palatable and before fuel loads become dense and then dried out. This may prevent heavy fuel loads later in the burning season when the resistance to control is increased.

The sites recommended for mechanical treatments include approximately 15,696 acres of roadside treatments and fuels modifications around structures and other infrastructure components on the Reservation.

Figure 114. Proposed Wildfire Fuels Mitigation Areas.



Chapter 5. Implementation Record

5.1. How Recommended Hazard Mitigation Activities Were Implemented

The implementation of the 2006 adopted Duck Valley Indian Reservation Hazard Mitigation Plan was implemented across many different departments of the Shoshone-Paiute tribes. This section documents what has been implemented, what was not implemented, and those activities that were proposed and placed in a continuation mode for implementation with this update to the plan.

The sub-headings within this chapter of this current plan, follow the heading titles of the previously adopted plan.

5.1.1. Policy Actions

Hazard mitigation efforts must be supported by a set of policies and regulations at the Tribal Council level that maintain a solid foundation for safety and consistency. The recommendations enumerated here serve that purpose. These recommendations are policy related in nature and therefore are recommendations to the Shoshone-Paiute Tribal Council; debate and formulation of alternatives will serve to make these recommendations suitable and appropriate.

Planning horizons reflect **Immediate** (to occur within the first planning cycle), **Short-Term** (to occur within the first 3 years), and **Long-Term** (to begin soon, but occur over a longer time horizon of 3 to 5 years).

5.1.1.1. Proposed Activities

Table 46. Action Items in Safety and Policy.

Action Item	Mitigated Hazard	Coordinating Department	Planning Horizon	Implementation Record
8.1.a. Develop and deliver public education programs on Hazard Mitigation.	All Hazards	TERC	• Immediate • Short-Term	Implemented; August 2005 and forward.
Planning Project Score: 28	Ranking: High			
8.1.b. Adoption and enforcement of International Building Codes and/or more stringent hazard--related building code provisions.	All Hazards	TERC	• Immediate • Short-Term	Not implemented; sustained into updated plan
Planning Pr	Ranking: High			
8.1.c. Tribal Policy to restrict development in flood zone.	Flood	Tribal Council	• Immediate	Not implemented; sustained into updated plan
Planning Project Score: 30	Ranking: High			
8.1.d. Tribal Policy to restrict development near landslide prone landscapes.	Landslide	Tribal Council	• Immediate	Not implemented; sustained into updated plan
Planning Project Score: 25	Ranking: High			
8.1.e. Tribal Policy to promote or require wildfire mitigation around homes in fire prone landscapes.	Wildfire	Tribal Council, TERC, Sho-Pai Fire	• Immediate • Short-Term	Implemented – sustained into updated plan.
Planning Project Score: 30	Ranking: High			
8.1.f. Create and maintain DVIR cadastral GIS layer showing land divisions, land uses, current occupants, development values.	All Hazards	TERC, Housing	• Immediate • Short-Term • Long-Term	Implemented – sustained into updated plan.
Non-Planning Project Score: 40	Ranking: High			

Table 46. Action Items in Safety and Policy.

Action Item	Mitigated Hazard	Coordinating Department	Planning Horizon	Implementation Record
8.1.g. Participation in National Flood Insurance Program.	Flood	TERC	• Immediate • Short-Term	Not implemented; sustained into updated plan
Planning Project Score: 24	Ranking: High			
8.1.h. Post hazard related rural signage (road signs, Evacuation Route Signs) on DVIR.	Flood, Landslide, Wildfire	TERC, Roads Department	• Immediate	Not implemented; sustained into updated plan
Non-Planning Project Score: 41	Ranking: High			
8.1.i. Develop Government-to-Government formal relationship with State of Idaho, Bureau of Homeland Security for cooperation on hazard mitigation and response.	All Hazards	Tribal Council, TERC	• Immediate • Short-Term	Implemented – sustained into updated plan.
Planning Project Score: 25	Ranking: High			
8.1.j. Develop Government-to-Government formal relationship with State of Nevada, Bureau of Homeland Security for cooperation on hazard mitigation and response.	All Hazards	Tribal Council, TERC	• Immediate • Short-Term	Implemented – sustained into updated plan.
Planning Project Score: 25	Ranking: High			
8.1.k. Develop Government-to-Government formal relationship with Owyhee County, Idaho, Office of Emergency Services, for cooperation on hazard mitigation and response.	All Hazards	Tribal Council, TERC	• Immediate • Short-Term	Implemented – sustained into updated plan.
Planning Project Score: 25	Ranking: High			
8.1.l. Develop Government-to-Government formal relationship with Elmore County, Idaho, Office of Emergency Services, for cooperation on hazard mitigation and response.	All Hazards	Tribal Council, TERC	• Immediate • Short-Term	Not implemented; Considered not appropriate as Elmore County is not adjacent to Reservation.
Planning Project Score: 25	Ranking: High			
8.1.m. Develop Government-to-Government formal relationship with Elko County, Nevada, Office of Emergency Services, for cooperation on hazard mitigation and response.	All Hazards	Tribal Council, TERC	• Immediate • Short-Term	Implemented – sustained into updated plan.
Planning Project Score: 25	Ranking: High			
8.1.n. Develop formal mutual aid agreements with neighboring fire departments for emergency response support.	All Hazards	Tribal Council, TERC, Sho-Pai Fire	• Immediate • Short-Term	Elko County established on first response, and with Boise BLM. Still working on agreement with Owyhee County.
Planning Project Score: 26	Ranking: High			
8.1.o. Pursue the purchase of an AM Radio broadcast tower and equipment (low power) to serve as a 24/7 DVIR broadcast station for weather warnings and alters for hazards.	All Hazards	Tribal Council, TERC	• Immediate • Short-Term • Long-Term	Implemented – sustained into updated plan. Have the FM station 102.7 Owyhee Radio for that purpose.
Non-Planning Project Score: 35	Ranking: Medium			
8.1.p. Pursue the purchase and operation of a Verizon compatible cell phone tower, by the Shoshone-Paiute Tribes for use in communications at all times, especially during disasters.	All Hazards	Tribal Council, TERC	• Long-Term	Not Implemented; not within Tribal Operations.
Non-Planning Project Score: 35	Ranking: Medium			

Table 46. Action Items in Safety and Policy.

Action Item	Mitigated Hazard	Coordinating Department	Planning Horizon	Implementation Record
8.1.q. Integrate land use policy philosophy into all departments which reflects the importance of maintaining a healthy and functioning flood plain in Duck Valley.	Flood	Tribal Council, TERC, EPA, Wildlife	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Planning Project Score: 30	Ranking: High			
8.1.r. Develop Tribal Policy to snow plow private driveways not plowed by States or BIA.	Severe Weather	Tribal Council, TERC	• Short-Term • Long-Term	Not Implemented; sustained into updated plan
Planning Project Score: 17	Ranking: Medium			

5.1.2. Home and Business Protection Measures

The protection of people and structures will be tied together closely as the loss of life in the event of a natural hazard is generally linked to a person who could not, or did not, flee a structure threatened by a hazard. Many of the recommendations in this section will define a set of criteria for implementation while others will be rather specific in extent and application.

5.1.2.1. Proposed Activities

Table 47. Action Items for Home and Business Protection.

Action Item	Mitigated Hazard	Coordinating Department	Planning Horizon	Implementation Record
8.2.a. Assess and hardwire emergency facilities and shelters throughout DVIR for use with a portable generator.	All Hazards	TERC	• Immediate • Short-Term	Implemented: complete
Non-Planning Project Score: 50	Ranking: High			
8.2.b. Obtain needed resources for health care facilities, community centers, and other shelters to protect themselves from potential hazards (e.g. sandbags, cots, nonperishable foods, etc.).	All Hazards	TERC, Hospital, Roads Dept.	• Immediate • Short-Term • Long-Term	Implemented – sustained into updated plan.
Non-Planning Project Score: 37	Ranking: Medium			
8.2.c. Evaluate the 18 structures in DVIR which are located in the flood zone to determine protection measures needed to protect the structure (elevation of structure, barrier), create budget for implementation, and implement.	Flood	TERC, Housing	• Short-Term • Long-Term	Not Implemented; sustained into updated plan
Non-Planning Project Score: 27	Ranking: Medium			
8.2.d. Inspect buildings, particularly un-reinforced masonry, for earthquake hazard stability.	Earthquake	TERC, Housing	• Short-Term • Long-Term	Not Implemented; sustained into updated plan
Non-Planning Project Score: 33	Ranking: Medium			
8.2.e. Inspect home and business roofing materials and quality to identify at-risk roofs to windstorms and assist homeowners with replacement options.	Windstorms, Winter storms	TERC, Housing	• Short-Term • Long-Term	Implemented in 2006 – sustained into updated plan.
Non-Planning Project Score: 48	Ranking: High			
8.2.f: Inspect home and business building sites for hazard trees which pose threat to structure in event of a windstorm, winter storm, or flood. Assist with hazard tree removal	Windstorm, Winter storm, Flood	TERC, Housing	• Short-Term • Long-Term	Implemented in 2006 – sustained into updated plan.
Non-Planning Project Score: 48	Ranking: High			

Table 47. Action Items for Home and Business Protection.

Action Item	Mitigated Hazard	Coordinating Department	Planning Horizon	Implementation Record
8.2.g. Inspect homes during high volume snow events for potential structural damage to roofs. Assist homeowners with snow removal.	Winter storm	TERC, Housing	• Immediate • Short-Term • Long-Term	Implemented in 2006 – sustained into updated plan.
Non-Planning Project Score: 57	Ranking: High			
8.2.h. Reinforce the 3 well intakes in DVIR which are within the flood zone.	Flood	TERC	• Short-Term	Not Implemented; sustained into updated plan
Non-Planning Project Score: 54	Ranking: High			
8.2.i. Install audible warning system (sirens) at Police Station, Fire Station, and Tribal HQ for emergency warning system.	All hazards	TERC, Sho-Pai Fire, BIA Police	• Short-Term	Not Implemented; sustained into updated plan
Non-Planning Project Score: 56	Ranking: High			

5.1.3. Infrastructure Hardening

Significant infrastructure refers to the communications, transportation, energy transport supply systems (gas and power lines), and water supply that service a region or a surrounding area. All of these components are important to the DVIR. Without supporting infrastructure a community's structures may be protected, but the economy and way of life lost. As such, a variety of components will be considered here in terms of management philosophy, potential policy recommendations, and on-the-ground activities.

Infrastructure hardening is a term used here to signify the process of making critical infrastructure components more resistant to likely hazards to be faced based on their location, characteristics, and exposure.

5.1.3.1. Proposed Activities

Table 48. Action Items for Infrastructure Enhancements.

Action Item	Goals and Objectives	Coordinating Department	Planning Horizon	Implementation Record
8.3.a. Install 7 roadside debris catchment devices on Nevada State Hwy 225 as identified in Table 4.5.	Landslides	TERC, Roads Department, State of Nevada Highway Department	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Non-Planning Project Score: 44	Ranking: High			
8.3.b. Elevate Idaho State Hwy 51, in areas indicated in Table 4.5 to raise it above the flood zone, as identified in Table 4.5.	Flood	TERC, Roads Department, State of Idaho Highway Department	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Non-Planning Project Score: 40	Ranking: High			
8.3.c. Install the 5 embankment stabilization devices for roads and streams as identified in Table 4.5.	Flood and Landslides	TERC, Roads Department, State of Idaho Highway Department	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Non-Planning Project Score: 47	Ranking: High			
8.3.d. Improve ditching along Nevada State Hwy 225 in the Owyhee River corridor, maintain it, and size all culverts to match peak flow (Table 4.5).	Flood	TERC, Roads Department, State of Nevada Highway Department	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Non-Planning Project Score: 49	Ranking: High			

Table 48. Action Items for Infrastructure Enhancements.

Action Item	Goals and Objectives	Coordinating Department	Planning Horizon	Implementation Record
8.3.e. Replace (enlargement) of the 13 culverts identified in Table 4.5 to match peak flood stage water volume.	Flood	TERC, Roads Department, State of Nevada Highway Department	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Non-Planning Project Score: 49	Ranking: High			
8.3.f. Post "Emergency Evacuation Route" signs along the identified primary, secondary escape access routes.	All Hazards	TERC, Roads Department	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Non-Planning Project Score: 41	Ranking: High			
8.3.g. Install 5 debris catchment devices as identified in Table 4.5, in river upstream of bridges and diversion dams.	Flood	TERC, Roads Department	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Non-Planning Project Score: 47	Ranking: High			
8.3.h. Install the 3 bridges identified in Table 4.5. and elevate the bridge above peak flood zone level.	Flood	TERC, Roads Department	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Non-Planning Project Score: 41	Ranking: High			
8.3.h. Raise the 1 bridge identified in Table 4.5. to elevate it above peak flood zone level.	Flood	TERC, Roads Department	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Non-Planning Project Score: 39	Ranking: Medium			
8.3.i. Reinforcement of the FEMA "Emergency Evacuation Routes" in DVIR to insure these routes can be maintained in the case of an emergency.	All Hazards	TERC, Roads Department	• Short-Term • Long-Term	Not Implemented; sustained into updated plan.
Non-Planning Project Score: 53	Ranking: High			

5.1.4. Resource and Capability Enhancements

There are a number of resource and capability enhancements identified by the TERC. Additional recommendations have been specifically identified in the Wildfire Management Plan.

5.1.4.1. Proposed Activities

Table 49. Action Items for Resource and Capability Enhancements.

Action Item	Mitigated Hazard	Coordinating Department	Planning Horizon	Implementation Record
8.4.a. Obtain portable generators for use during power outages and other emergency situations.	All Hazards	TERC	• Short-Term • Long-Term	Implemented – sustained into updated plan.
Non-Planning Project Score: 40	Ranking: High			
8.4.b. Provide continued hazards response training for key department staff.	All Hazards	TERC, Sho-Pai Fire, Police	• Immediate • Short-Term • Long-Term	Implemented – sustained into updated plan.
Non-Planning Project Score: 48	Ranking: High			

Table 49. Action Items for Resource and Capability Enhancements.

Action Item	Mitigated Hazard	Coordinating Department	Planning Horizon	Implementation Record
8.4.c. Obtain needed resources to provide law enforcement with access control capabilities during disaster events.	All Hazards	TERC, BIA Police	• Immediate • Short-Term • Long-Term	Not implemented – sustained into updated plan.
Non-Planning Project Score: 65	Ranking: High			
8.4.d. Evaluate location of emergency services headquarters, field offices, and storage facilities for proximity to potential hazards, particularly the flood zone.	All Hazards	TERC	• Immediate • Short-Term • Long-Term	Implemented – sustained into updated plan.
Non-Planning Project Score: 50	Ranking: High			
8.4.e. Purchase Tribal snow removal equipment (snow plow) and develop schedule for clearing driveways and roads not cleared by state highway departments or the BIA.	Winter Storm	TERC, Roads Department	• Immediate • Short-Term • Long-Term	Not Implemented – funding shortcomings, but sustained into updated plan.
Non-Planning Project Score: 40	Ranking: High			
8.4.f. Develop responsibilities and schedule to maintain and clean river based debris catchment devices before and during flood seasons.	Flood, Landslide	TERC, Roads Department	• Immediate • Short-Term • Long-Term	Not Implemented – catchments not installed, but sustained into updated plan.
Non-Planning Project Score: 62	Ranking: High			
8.4.g. Develop responsibilities and schedule to maintain and clean ditches and road based debris catchment devices on Nevada State Hwy 225.	Landslide, Flood	TERC, Roads Department, Nevada State Hwy Dept.	• Short-Term • Long-Term	Implemented – sustained into updated plan.
Non-Planning Project Score: 62	Ranking: High			
8.4.h. Fixed location generator for HDC and School (double as emergency shelters and planning) – 75KW	All Hazards	TERC	• Short-Term • Long-Term	Implemented in 2008 – sustained into updated plan.
Non-Planning Project Score: 30	Ranking: Medium			

Implementation of the previously adopted Hazard Mitigation Plan was embraced by many Shoshone-Paiute people and departments. Funding was a major obstacle to project implementation. Financial resources available to the Shoshone-Paiute Tribes is extremely limited. The process of grant writing within timelines acceptable to FEMA and other granting organizations proved to be a large obstacle to successful project implementation as defined in the Hazard Mitigation Plan. When possible and feasible, the Shoshone-Paiute Tribes modified their regular programs to integrate practices of pre-disaster mitigation activities. Those activities were reflected in this chapter's summary of the implementation record.

The implementation timeframe imposed by FEMA for a 3-year planning cycle (for the 2006 plan) proved to be a challenge for the Shoshone-Paiute Tribal Council that is also on a 3-year cycle. Identifying funding opportunities, receiving grant application award, and arranging project implementation within that timeframe, while also preparing the update to the Tribal Hazard Mitigation Plan proved to be challenging for new project implementation. Integrating hazard mitigation philosophy was more successful and carried out in many projects.

Figure 115. Welcome to Duck Valley!

Chapter 6. Resources, Capabilities, and Needs Assessment

6.1. Tribal Resources, Capabilities, and Needs

The Resources, Capabilities, and Needs Summary was a survey given to all managers of Tribal Divisions, emergency services, agencies, and others involved in the administration of hazard mitigation, preparedness, and protection on the Duck Valley Indian Reservation and adjacent to it. It was also intended to collect information to ascertain the current status of protection responsibilities, current resources available to respond to hazard prevention, mitigation, and response, and to collect current information about resources needed by each respondent's organization to better meet the needs of the citizenry of the Duck Valley Indian Reservation.

A total of eight surveys have been received and are presented here. The technological and human resource needs identified by the respondents serves to identify needed enhancements to the Duck Valley Indian Reservation's preparedness for natural disaster preparedness.

6.1.1. Shoshone-Paiute Tribes; Water & Sanitation

Table 50. Water & Sanitation; Resources, Capabilities, and Needs.

Department Name		Water & Sanitation
Name & Position of Person Preparing this Summary		Nathan Bacon, Director
Address & Telephone		P.O. Box 219, Owyhee, NV, 89832-759-3100 ext. 208
Service Area		Duck Valley
Describe your services and organization goals in overview (100 words or less)		The Department is designed to operate and maintain domestic water and sewer facilities in the communities of Owyhee, Newtown and Thomas Loop. This Department is self-sustaining through the collection and use of fees from those utilizing the Department services. Services include: 1. O&M on water and sewer systems 2. Septic tank pumping & cleaning 3. Installation of individual water & sewer systems 4. Portable toilet rentals & piping 5. Gravel/rock delivery 6. Grave digging
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	1 – 310se John Deer Backhoe/loader 1 – Service Truck 1 – International Vacuum Truck 1 – 50 kw Generator 1 – Small Generator 1 – 6 yd. Dumptruck, Ford 4 – Sani-huts (Portable Toilets)
Major Equipment Resources	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	1 – Large Loader 1 –Large Dumptruck 1 – Transport Vehicle w/Trailer 1 – Backup Backhoe 1 – Trash Pump 2 – 25 hp Backup Submersible pumps

Table 50. Water & Sanitation; Resources, Capabilities, and Needs.

Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	2 – Radios 1 – Vehicle Radio
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	2 – Satellite Phones 2 – Cell/phones
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	Director – Fire Chief, water & sewer operator, heavy equipment operator, pipe fitter, CDL licensed w/HazMat endorsement. Operator – Fire dept, water & sewer operator, heavy equipment operator,, pipe fitter, CDL licensed
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	Need: 2 more paid staff members w/CDL More training for hazardous conditions
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Assist with: Wildfire control 7 suppression Sanitary facilities available Equipment available for use

6.1.2. Shoshone-Paiute Tribes; Property & Supply

Table 51. Property & Supply; Resources, Capabilities, and Needs.

Department Name		Property & Supply
Name & Position of Person Preparing this Summary		Rozilyn Jones Property & Supply Specialist
Address & Telephone		P.O. Box 219 Owyhee, NV, 89832
Service Area		Owyhee – unless authorized to go outside service area.
Describe your services and organization goals in overview (100 words or less)		Provide acquisition support & guidance for all tribal programs. Provide 100% inventorying of fixed assets, equipment minor & supplies reporting for all programs.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	1 vehicle (2010 Chevy 1500k 4x4 pickup) Miscellaneous office supplies Various sizes of disposable protective outerwear
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	2 additional vehicles Emergency supplies to put in vehicles, i.e., extinguishers, medical kits, etc.

Table 51. Property & Supply; Resources, Capabilities, and Needs.

Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	1 – Laptop 2 – Desk PCs – outdated & response time is very slow 3 ea – Printers 1 ea – Color copier w/print, scan & fax capabilities 2 ea – Copiers presently in storage
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	2 more Laptops & responding off site if necessary 2 more Cell/phones 3 Satellite phones
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	Present staff include: Rozilyn Jones, Property Supply Specialist Ted Thomas, Supply Technician Juanita Knight, Supply Clerk Available 100% May not be available depending on crisis
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	Training is needed for all staff
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Reporting/Response would be contingent on authorization from employer. However, needs would be prioritized: 1. Local community 2. Surrounding community 3. Other communities

6.1.3. Shoshone-Paiute Tribes; Fire

Table 52. Sho-Pai Fire; Resources, Capabilities, and Needs.

Department Name		Shoshone-Paiute Fire
Name & Position of Person Preparing this Summary		Justin Blossom -Firefighter/diesel tech
Address & Telephone		PO Box 219
Service Area		Duck Valley Indian Reservation
Describe your services and organization goals in overview (100 words or less)		All hazard emergency response.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	3- Rescue vehicles, 4-5 person crew transport vehicles, 2-structure engines, 1-tactical water tender, 2-Type 4 wildland engines, 2-Type 6 wildland engines, 1-90 hp tractor w/ loader, 1-16 ft. flatbed trailer, 1-cargo trailer, 1-20 person bus, 1-11 person van, 1- portable 20 ft. light tower/generator .
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	As of this time we are in no need of additional equipment.

Table 52. Sho-Pai Fire; Resources, Capabilities, and Needs.

Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	Two way radios, Full structure and wildland PPE, Haz Mat PPE level B, MRE's, Portable repeater, sat phones, weather station (RAWS), GPS, Thermal imager, gas monitor, lap top computer.
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	Rope rescue gear, Portable weather meter instruments, Combustible gas sniffer.
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	17 – Volunteer structure fire members 55 – Wildland fire fighters
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	NIMS training for volunteers and staff, Search and rescue training for volunteers.
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Wildfire fuel mitigation, Wild Horse dam failure mitigation, Flood mitigation, drought mitigation, Pestilence mitigation.

6.1.4. Shoshone-Paiute Tribes; EMS

Table 53. Sho-Pai EMS; Resources, Capabilities, and Needs.

Department Name		Shoshone-Paiute EMS
Name & Position of Person Preparing this Summary		Kenneth Pete, EMS Director
Address & Telephone		PO Box 130, Owyhee, NV., 757-2415
Service Area		Northeastern NV. South Western ID.
Describe your services and organization goals in overview (100 words or less)		Owyhee Ambulance Services provides Emergency Medical Services to the residents of Duck Valley and surrounding communities in a fifty mile radius and transports patients to either Northeastern Nevada Regional Hospital (Elko, NV.) or Elmore Medical Center (Mtn. Home, ID.). The mission is to promote the highest possible health of the people of the Duck Valley Indian Reservation through a quality health care system that respects cultural values and tribal sovereignty.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	OAS has three (3) Basic Life Support Ambulances and is Nevada State licensed. One of these ambulances is equipped with Extrication tools to free an entrapped victim, 20 ton hydraulic ram, 28" spreader and a cutter.
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	PPE, PAPR, Ventilators, Decon equipment, communication equipment.

Table 53. Sho-Pai EMS; Resources, Capabilities, and Needs.

Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	Communications via VHF radio, 800 mhz radio and satellite phones.
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	800 megahertz radios, and laptop computers with satellite service.
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	4 FTE EMT's, and 4 Intermittent EMT's
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	Additional staff is needed along with volunteers and more training for all staff. (i.e. EVOC, Awareness level hazmat, incident command systems, high angle rescue, confined space, MCI, paramedic, etc.)
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Able to provide limited EMS coverage depending on staffing availability.

6.1.5. Shoshone-Paiute Tribes; Wildlife and Parks Department

Table 54. Sho-Pai Wildlife and Parks Department; Resources, Capabilities, and Needs.

Department Name		Shoshone-Paiute Wildlife and Parks Department
Name & Position of Person Preparing this Summary		Edmond Murrell, Director Fish Wildlife & Parks
Address & Telephone		Owyhee 208-759-3246
Service Area		Duck Valley Reservation
Describe your services and organization goals in overview (100 words or less)		Management of the fish, wildlife and parks on the Duck Valley Reservation for the benefit of all tribal members.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	Will have the following available equipment resources; a) three ¾ ton trucks; b) 3 one ton trucks; c) two half ton trucks; d) two mini trucks; e) one two ton truck Backhoe; farm tractor; three polaris rangers; two snowmobiles One 28 foot long 24,000 lbs flatbed gooseneck trailer, one 16 foot bumper pull trailer & two 13 foot bumper pull trailers. Two portable generators.

Table 54. Sho-Pai Wildlife and Parks Department; Resources, Capabilities, and Needs.

	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	It would be good for us to have more radio phones and GPS units and human protective gear for different kinds of emergencies.
Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	We have 3 working radio phones and a large shop. The shop is hard to heat, so would not make good housing during the cooler parts of the year.
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	A more reliable, independent internet system and more reliable radio phones.
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	Five full time employees and 12 part time employees.
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	Training and personnel equipment storage. Also a way to contact employees and their families during off duty times.
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	There could be training sessions that we could attend. Emergencies would need to be coordinated through proper channels.

6.1.6. Shoshone-Paiute Tribes; Tribal Environmental Protection Program

Table 55. Tribal Environmental Protection Program; Resources, Capabilities, and Needs.

Department Name		Tribal Environmental Protection Program (TEPP)
Name & Position of Person Preparing this Summary		Chris Cleveland, Environmental Educator / Planner
Address & Telephone		PO Box 219, Owyhee, NV 89832 208-759-3100 Ext 228
Service Area		Duck Valley Reservation
Describe your services and organization goals in overview (100 words or less)		Do water quality up & down stream on the Owyhee River & creeks, Community outreach on Environmental Issues. Regulate pesticide use on the Reservation * give out permits. Our main project right now is the Rio Tinto mine located upstream.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	2 –Artic Cat Prowlers Hobart welder / generator on trailer 12 ft trailor 18 inch chainsaw 3 GSA work trucks We rent a backhoe & dump truck owhen the seasonal employees are available (March-Nov).
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	None

Table 55. Tribal Environmental Protection Program; Resources, Capabilities, and Needs.

Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	2 Motorola radios Hobart welder / generator on trainler
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	Not funded for that…
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	Heather Lawerenee – Director John Crum – Water Quality Chris Cleveland – Environmental Educator Claudia Thomas – Pesticides Coordinator Jack Thomas – Transfer Station Tech Manuel Blackhat – Seasonal Hend Field Tech Monty Ieyva – Seasonal Field Tech Dirk Jim – Seasonal Field Tech
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	Not funded for that…
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Depending on needs, we can work with other agencies.

6.1.7. Shoshone-Paiute Tribes; Natural Resources / Land Office

Table 56. Natural Resources / Land Office; Resources, Capabilities, and Needs.

Department Name		Natural Resources / Land Office
Name & Position of Person Preparing this Summary		Shery Crutcher
Address & Telephone		P.O. Box 219 Owyhee NV 89832 208-759-3100 ext 217
Service Area		Duck Valley Indian Reservation
Describe your services and organization goals in overview (100 words or less)		Land, irrigation, grazing, animal ID, Dam safety; goals continue to run on efficient program always room for improvement.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	Tractors, backhoe, trackhoe, pickups, flat bed trailers, power tools, dump buckets, chainsaws, etc. We have all tools and vehicles that may be needed in case of emergency.
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	Better radio communications

Table 56. Natural Resources / Land Office; Resources, Capabilities, and Needs.

Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	Satellite phone Cell phones & radios We would work closely with all available crews as to what would actually be needed in the case of an emergency.
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	Update GPS and Navigation Tools
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	Nathan Kelly & assistants for equipment needs Kristin Pete in radios & secretarial needs Shery Crutcher in all of the above and leadership as needed.
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	All tribal programs work together very well. Out program is always willing to help where needed.
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Again, all tribal programs work well together in time of emergencies.

6.1.8. Shoshone-Paiute Tribes; Duck Valley Housing Authority

Table 57. Duck Valley Housing Authority; Resources, Capabilities, and Needs.

Department Name		Duck Valley Housing Authority
Name & Position of Person Preparing this Summary		Milton Tybo, Director
Address & Telephone		1794 Horsehoe Bend, Newtown Subdivision
Service Area		Duck Valley Indian Reservation
Describe your services and organization goals in overview (100 words or less)		Provide housing needs for all tribal members.
Major Equipment	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	Vehicles, generators, trailers, snow plows
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	None
Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	We rely on fire station for all emergency response needs.
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	None

Table 57. Duck Valley Housing Authority; Resources, Capabilities, and Needs.

Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	Total of 10 staff, all can assist on emergencies as needed.
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	Training of volunteers and staff.
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	N/A

6.1.9. Shoshone-Paiute Tribes; Owyhee Airport

Table 58. Owyhee Airport; Resources, Capabilities, and Needs.

Department Name		Owyhee Airport
Name & Position of Person Preparing this Summary		Steve Dean, Airport Manager
Address & Telephone		P.O. Box 219 Owyhee NV 89832 *Telephone service not yet available*
Service Area		Duck Valley Indian Reservation, with access from surrounding region and points beyond.
Describe your services and organization goals in overview (100 words or less)		Provide airport services to the Shoshone-Paiute Tribes and surrounding region, for commercial, medical emergency, evacuation, emergency supply delivery, and associated needs. Provide for emergency firefighting operations and support should the need arise.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	We have limited/minimal supplies as the airport was recently constructed. We are in need of emergency equipment relative to airplane accidents, and for emergency (community) needs.
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	- spill or hazardous material mitigation (fuel spill) - emergency response (as a result of an airplane accident) - Emergency snow removal should an emergency landing become necessary (include not only equipment to remove snow, but a sanding truck as well. A twin axle dump truck with a blade with sanding (spreader) capability is what we could utilize immediately.) - Storage facility (to be built) to house equipment and supplies for use at the airport.

Table 58. Owyhee Airport; Resources, Capabilities, and Needs.

Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	None
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	- utilization and payment of SAT phones as the airport has limited (sometimes non-existent) cell service for contacting outside agencies should emergency evacuation become necessary (currently utilize radios but in some cases, it may become necessary to be able to talk to a doctor without transferring the message via open radio communications).
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	Currently limited
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	Emergency fire response is prime concern and additional personnel could be utilized for just this purpose.
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Cooperation with Sho-Pai Fire and all Tribal departments. Seeking cooperative coordination with the US Air Force at Mountain Home, Idaho, and the Bureau of Land Management.

6.1.10. Shoshone-Paiute Tribes; Our Grocery Store

Table 59. Our Grocery Store; Resources, Capabilities, and Needs.

Department Name		Our Grocery Store
Name & Position of Person Preparing this Summary		Theron Atkins, Manager
Address & Telephone		PO Box 299, Owyhee NV 775-757-3301
Service Area		Owyhee
Describe your services and organization goals in overview (100 words or less)		We provide groceries and fuel to the community.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	Generator
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	Vehicles, snow plows, rescue trucks, fire apparatus

Table 59. Our Grocery Store; Resources, Capabilities, and Needs.

Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	Food & fuel
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	Radios & vehicles
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	All, if needed
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	Training for our volunteers
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	N/A

6.1.11. Shoshone-Paiute Tribes; Sho-Pai News

Table 60. Sho-Pai News; Resources, Capabilities, and Needs.

Department Name		Sho-Pai News
Name & Position of Person Preparing this Summary		Yvonne Powers
Address & Telephone		P.O. Box 219 Owyhee NV 89832 208-789-3100 x 241
Service Area		Locally; publication reaches various states.
Describe your services and organization goals in overview (100 words or less)		We publish 2 monthly newspaper highlighting current tribal events with a circulation of 600. Our readers on our mailing list include both local and out-of-town subscriptions.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	None
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	
Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	None
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	
Human Resourc	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	1 editor 1 reporter

Table 60. Sho-Pai News; Resources, Capabilities, and Needs.

	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	We could publish evacuation plans, law/policy changes, surveys, stories on mitigation / prevention, and similar articles on disaster preparation or preparedness.

6.1.12. Bureau of Indian Affairs; Roads Department

Table 61. BIA Roads; Resources, Capabilities, and Needs.

Department Name		BIA Roads
Name & Position of Person Preparing this Summary		Carlyle Dick, Acting Roads Director
Address & Telephone		D Street, Owyhee, NV 89832 775-757-3330
Service Area		Duck Valley Indian Reservation
Describe your services and organization goals in overview (100 words or less)		Maintain pavement & gravel roads.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	• 130G Grader • 12 G Grader • Belly Pump Trailer • Lowboy trailer • Semi-tractor • D6 Dozer • JD 544B Loader • JD A10D backhoe
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	1 newer grader Backhoe Loader Ten-wheel dump truck
Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	Handheld radios Base roadio 1 vehicle radio
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	Radios need upgrading. Tools for emergency situations; fire, flood, etc.
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	**Roads:** Carlyle Dick – Acting Roads Manager Robert Crutcher – Equipment Operator **Facilities:** Marty Cummins – Acting Facilities Manager Samuel Thomas – Maintenance Worker
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	**Roads:** Equipment Operators Laborers Training **Facilities:** Maintenance Workers Laborers Training

Table 61. BIA Roads; Resources, Capabilities, and Needs.

Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Will cooperate with other Departments or Tribes – Agencies in emergency situations through our supervisor at Eastern Nevada Agency, Elko – Joeseph McDade.

6.1. Adjacent Jurisdiction Resources, Capabilities, and Needs

6.1.1. Owyhee County, Idaho

Table 62. Owyhee County, Idaho; Resources, Capabilities, and Needs.

Department Name		Owyhee County Emergency Services
Name & Position of Person Preparing this Summary		Jim Desmond, Emergency Services Coordinator
Address & Telephone		PO Box 128, Murphy, ID 83650--208 249-0571
Service Area		Owyhee County
Describe your services and organization goals in overview (100 words or less)		Coordinate the creation of response plans and the distribution of grant funds in support of responder activities. Develop and implement training and exercise plans in accordance with ICS and NIMS requirements. Allocate grant funding and authorize purchases in support of county goals and objectives as developed in response plans and training and exercise plans. Support the incident command when a major event requires multiple agency response.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	The responder agencies in Owyhee County are not under the control of the Owyhee County Board of County Commissioners. The Fire and Ambulance responders are nearly all separate taxing entities with their own controlling District Commissions. Silver City Fire and Rescue is a private corporation with a governing Board. City governmental maintenance and service capabilities are under the control of the Mayors and City Councils of Marsing, Homedale, and Grand View. The Fire and Ambulance response for those three cities is not under the direct control of the City Council/Mayor as they are separate taxing districts. Owyhee County Commissioners control two Road and Bridge Districts with multiple shop locations and a variety of road clearing and maintenance equipment. Law enforcement in Owyhee County adjacent to Duck Valley is provided by the Owyhee County Sheriff. Search and Rescue in Owyhee County is under the jurisdiction of the County Sheriff. Owyhee County response agencies Immediately adjacent to Duck Valley are: Grand View Ambulance, Grand View Fire, Bruneau Fire, and Bruneau QRU. When the proposed MOA is in place between the Owyhee County Commission and the Shoshone-Paiute Tribes, I will coordinate with those adjoining agencies for mutual support as provided for in the draft MOA.

Table 62. Owyhee County, Idaho; Resources, Capabilities, and Needs.

	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	Owyhee County has experienced flood and fire events in the past ten years which have exceeded the capability of county responders. Large fire events in the county nearly always involve federal lands managed by the BLM and, therefore, response equipment is brought to the scene by BLM Incident Command. There have been several flood events that exceeded the capability of the county and required either specialized equipment of additional equipment. When a flood took out a bridge used for local travel and school bus routes, the county was unable to immediately reconstruct a bridge. A portable bridge unit of the Army Guard was put in place. When the Silver City Road flooding event occurred, the reconstruction exceeded the capability of the county's road and bridge districts. FEMA funding provided for private contract engineering and construction resources. The county emergency operations center is currently without a backup power generator. In the event that a flood event restricted access to Owyhee County by way of the bridges downstream from CJ Strike Dam, aviation support would be needed into Murphy and other areas of the county in support of disaster management.
Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	The Owyhee County Sheriff maintains an incident command trailer. The County Commission established an Emergency Operations Center in McKeeth Hall of the County Historical Museum and has equipped that with computers and other items needed for the operation of the EOC or for an alternate source of Government in the event the courthouse is unusable. From the EOC, there is broadband communication with IBHS's EOC at Gowen Field. In the event that the Museum is not activated for an EOC, McKeeth Hall could be used for shelter and meals. School structures throughout the county could also be used for shelter and meals.
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	The County Interoperable Communications Plan calls for the placement of at least one 700 mhz capable radio into each responder vehicle in the county. We are at approximately 25% complete in that goal, however, funding is extremely tight and in addition to the 700 mhz requirement, many responder agency radios and/or repeater systems must be converted to the FCC's narrow banding requirement. Conversion will also require use of grant and other funds.
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	No Response Given
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	No Response Given

Table 62. Owyhee County, Idaho; Resources, Capabilities, and Needs.

Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Owyhee County already has a coordination MOU in place with the Shoshone-Paiute Tribes which provides for coordination on land management and other resource issues. I believe that Wildfire Fuel Mitigation would be addressed in that forum. In addition, there is an MOA in development which would provide for a coordinated mutual support response on natural disasters.

6.1.2. USDA Forest Service

Table 63. Mountain City Ranger District; Resources, Capabilities, and Needs.

Department Name		US Forest Service
Name & Position of Person Preparing this Summary		Tom Montoya, District Ranger
Address & Telephone		2035 Last Chance Rd, Elko, NV 89801
Service Area		Mountain City Ranger District
Describe your services and organization goals in overview (100 words or less)		Multiple use federal government agency with oversight of National Forest Lands. Manage natural resources that include but are not limited to vegetation, water, soils, fish & wildlife habitats, cultural & historic resources. Governed by federal law, policy & regulations. Uses include
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	No Response Given
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	No Response Given
Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	No Response Given
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	No Response Given
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	No Response Given
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	No Response Given
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	No Response Given

6.1.3. USDA NRCS

Table 64. Natural Resource Conservation District; Resources, Capabilities, and Needs.

Department Name		USDA/NRCS
Name & Position of Person Preparing this Summary		Chuck Petersen, RMS
Address & Telephone		555 W. Silver St. Suite 101, Elko, NV 89801, 775-738-8431 ext. 118
Service Area		Private & tribal lands natural resource conservation planning, Farm Bill (financial assistance Programs
Describe your services and organization goals in overview (100 words or less)		No Response Given
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	No Response Given
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	No Response Given
Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	No Response Given
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	No Response Given
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	No Response Given
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	No Response Given
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	NRCS provides: rangeland inventories and grazing management plans, Farm Bill programs that deliver technical and financial assistance to implement range improvements (including green strips/fuel breaks if identified as a resource concern), range seeding/prescribed grazing plans, and/or fire rehabilitation (programs available on agricultural lands).

6.1.4. Elko District BLM Fire

Table 65. Elko District BLM Fire; Resources, Capabilities, and Needs.

Department Name	Elko District BLM Fire
Name & Position of Person Preparing this Summary	Dylan Rader

Table 65. Elko District BLM Fire; Resources, Capabilities, and Needs.

Address & Telephone		3900 E Idaho Street Elko NV 89801 775-753-0395
Service Area		Elko District BLM
Describe your services and organization goals in overview (100 words or less)		The Elko District encompasses 12.5 million acres, and has primary wildland fire suppression responsibility for 7.5 million acres of public lands. Assistance is also provided to cooperating agencies such as the Nevada Division of Forestry (NDF), U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (FWS), Bureau of Indian Affairs (BIA), and numerous county, tribal and municipal governments.
Major Equipment Resources	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	Specific to wildland fire incidents, Elko District BLM has available the following resources: 10 – Type 4 Wildland Fire Engines 1 – Interagency Hotshot Crew 1 – Exclusive Use Type 3 10 Person Helitack Crew 1 – Exclusive Use Air Attack Ship with Air Tactical Group Supervisor 1 – Type 3 IA Dozer 2 – 20 Person Type 2 Crews 2 – 20 Person Camp Crews
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	Through existing agreements and pre-established ordering processes between the Duck Valley Shoshone-Paiute Tribes, Elko District BLM, and Western Region Office BIA the tribe has the ability to request / order any resources needed to support wildland fire incidents including suppression resources, equipment, personnel, support personnel, and administrative / supply / logistical needs.
Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	Satellite phones, narrowband radio system (BLM / USFS / NDF), and any other communication technology that can be ordered through the National Interagency Fire Center.
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	No Response Given
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	Division of Fire employs approximately 75-100 Permanent, Career Seasonal, and Temporary Seasonal Employees each year dependent upon annual funding. In addition, anywhere between 50-100 on-call (Administratively Determined) employees are also trained and available for wildland fire support each year.
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	No Response Given

Table 65. Elko District BLM Fire; Resources, Capabilities, and Needs.

Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Development of cooperative fuels reduction projects between Elko District BLM and Duck Valley Shoshone Paiute Tribe on borders of jurisdictional boundaries is highly encouraged and supported based on available funding opportunities.

6.1.5. Idaho Bureau of Homeland Security

Table 66. Idaho Bureau of Homeland Security; Resources, Capabilities, and Needs.

Department Name		Idaho Bureau of Homeland Security
Name & Position of Person Preparing this Summary		Pat Lucas, SW Area Field Officer Alternate POC: David Jackson, BHS Mitigation Program Mgr. 422-3040-3097
Address & Telephone		4040 Guard St., Bldg 600, Boise, ID 83705 208-861-4656 (cell) 208-422-3040
Service Area		Southwest Idaho
Describe your services and organization goals in overview (100 words or less)		No Response Given
Major Equipment	List your currently available major equipment resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. vehicles, generators, equipment trailers, fire protection apparatus, snow plows, search & rescue trucks, etc.)	No Response Given
	List your major equipment needs for responding to emergencies, or mitigating potential hazard conditions which are not currently in inventory.	No Response Given
Technological Resources	List your currently available technological resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. communications, emergency shelter/meals, etc.)	No Response Given
	List your organization's technological needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently in inventory, in your service area.	No Response Given
Human Resources	List your currently available human resources for use in responding to emergencies, or mitigating potential hazard conditions in your service area (e.g. detail staff by position and number, plus volunteers)	No Response Given
	List your organization's human resource needs for responding to hazard emergencies, or mitigating potential hazard conditions, which are not currently utilized, in your service area (e.g., additional number of paid staff, more volunteers, training for volunteers and staff, etc.)	No Response Given
Cooperative Activities	List the possibilities, as you see them, for your Department's cooperation with adjacent jurisdictions to conduct natural disaster mitigation activities (e.g., wildfire fuel mitigation, land management cooperation, etc.	Idaho BHS; Consultation, plan draft courtesy review, representation at all monthly meetings during plan development.

Chapter 7. Proposed Mitigation Measures

7.1. Summary of the Mitigation Measures Approach

This Tribal Hazards Mitigation Plan's implementation will reflect the unique challenges of the Duck Valley Indian Reservation. In response to these challenges, it is the desire of the Shoshone-Paiute Tribes, associated agencies and organizations to continue the implementation of existing programs that have already provided a level of safety and preparedness in the protection of people, structures, infrastructure, the economy, and traditional way of life of the Duck Valley Indian Reservation and to improve those efforts in the long term.

A series of potential mitigation measures have been developed in this section of the Tribal Hazards Mitigation Plan. These activities are listed in Table 70 - Table 73. While each of these activities has been presented as a stand-alone project, in reality these projects must be implemented in a holistic approach to hazard mitigation in order to achieve increased protection.

In order to accomplish these programmatic goals, the Shoshone-Paiute Tribes will continue to involve the neighboring jurisdictions mentioned in this plan. The implementation of this plan is applicable within the exterior boundaries of the Duck Valley Indian Reservation as defined by federal law.

Much of the funding for Shoshone-Paiute Tribes hazard mitigation projects identified in this effort will rely substantially on funding from outside sources. The Shoshone-Paiute Tribes have limited resources to provide in-kind services of professional staff and administrative staff in the development and implementation of hazard mitigation projects. The acquisition of materials and equipment to implement many of the projects will rely on grant funding and cooperation with partners and neighboring jurisdictions.

7.2. Potential Funding Opportunities

General long-range fiscal planning is needed to carry out the activities recommended in this plan. Financial considerations include Tribal, federal, state, and private granting entities, directed local in-kind services, local funding, and local funding assistance from Tribal and State resources. Funding mechanisms can be combined to maximize project financing and project diversity.

7.2.1. Traditional Funding Agency Approach

Traditional funding agencies (e.g., Rural Development, Department of Commerce, and USACE) are focused on particular infrastructure issues that address regulatory compliance or public safety. Regulated systems typically funded are water and sewer because of the Clean Water Act, National Pollution Discharge Elimination System (NPDES), Safe Drinking Water Act (SDWA), and other federal laws. These two systems are common to all communities and are a focus of lawmakers and regulators. Finally, these systems are necessary for development, job creation, and other high priority uses for grant and loan money made available by the federal government.

7.2.2. Non-Traditional Funding Opportunities

Private funding from foundations and corporations is very competitive, and their processes are different from federal government funding. Because they are not accountable to voters, they fund according to their own specific set of priorities. The most common recipients of this type of funding are non-profit organizations. These non-profit organizations typically carry forward the goals of these non-traditional funding sources and can be an important implementation mechanism for rural communities such as are found on the Duck Valley Indian Reservation.

This funding source will typically contribute $5,000 to $100,000 towards a project. This source should be viewed as a supplement to the major funding agencies or as a funding source for smaller projects.

7.2.2.1. Federal, State, and Local Funding Options

Tribal, federal, state, and local funding sources are available to Indian Communities and utility districts located on the Duck Valley Indian Reservation. In general, funding options can be broken down into several categories, including grant and loan programs. The following list provides potential sources of funding and contains outlines for availability and eligibility requirements for the various funding options.

7.2.2.1.1. Grant Programs

- Community Development Block Grant Program (Idaho & Nevada Departments of Commerce)
- Economic Development Administration (U.S. Department of Commerce)
- Rural Development Program, US Department of Agriculture (formerly Farmers Home Administration)
- Surface Transportation Program (STP) Local Rural, Idaho & Nevada Transportation Departments
- Surface Transportation Program (STP) Local Urban, Idaho & Nevada Transportation Departments
- Surface Transportation Program Enhancement, Idaho & Nevada Transportation Departments
- Indian Community Development Block Grant (ICDBG) Program
- Indian Health Service
- U.S. Environmental Protection Agency
- Department of Health and Human Services (DHHS)
- Housing and Urban Development (HUD)

7.2.2.1.2. Loan Programs

- Drinking Water State Revolving Fund Loan
- Wastewater Revolving Fund Loan

7.2.2.1.3. Local Resources

- Pay-As-You-Go
- Reserve Fund Financing
- General Obligation Bonds
- Revenue Bonds
- Local Improvement District
- Business Improvement District
- Impact Fees

7.2.2.2. Leveraging Funds

There are several methods to make grant dollars stretch so that the Shoshone-Paiute Tribes can get the "biggest bang for the buck." The concept of leveraging means that you use more than one source of money to supplement a project.

7.2.2.2.1. Percentage and/or In-Kind Match

The Percentage and/or In-Kind Match method requires a set percentage (such as 25%) in local cash or in-kind resources from an entity to support a project. Without this amount of local financial contribution the grant application may not receive sufficient scoring points used to calculate grant awards, or may not be qualified to receive the intended grant award. Often reduced or waived in-kind matches are provided for qualified tribes when requested. Each grant should be evaluated on a unique situation basis.

7.2.2.2.2. Direct In-Kind Match

A second method, Direct In-Kind Match, means that the agency or community will make a non-cash contribution toward the project. Non-cash contributions can be in the form of goods, services, facilities, space, personnel, materials, and equipment calculated at fair market value. Often reduced or waived in-kind matches are provided for qualified tribes when requested. Each grant should be evaluated on a unique situation basis.

7.2.2.2.3. Dollar-for-Dollar Leverage Match

A third method, Dollar-for-Dollar Match, means that an entity, like the Shoshone-Paiute Tribes, can leverage grant funds from one funding source with grant funds from a second funding source. For instance, the Shoshone-Paiute Tribes may be able to leverage state grant funds with federal dollars. Verification is necessary before implementation to confirm that a grantor agency will allow this arrangement. Some grantor agencies use a so-called leveraging ratio to measure money an entity has from other sources that could be matched to the project grant. Generally, the more money an entity can bring in from other sources the better the chance of being funded.

7.2.3. Project Funding Opportunities Identified by FEMA

FEMA Region X has provided valuable references for potential funding of projects identified in this planning effort. These are summarized in Table 67 and are available to the Shoshone-Paiute Tribes and associated cooperators.

Table 67. Federal Financial Resources for Hazard Mitigation.

Subtype	Administrator	Purpose	Amount/Availability
Hazard Mitigation Grant Program (HMGP)	Federal Emergency Management Agency (FEMA)	Support pre- and post-disaster mitigation plans and projects.	Available to communities after a Presidentially declared disaster has occurred within the state. Grant award based on specific projects as they are identified.
Pre-Disaster Mitigation (PDM) grant program	FEMA	Support pre-disaster mitigation plans and projects.	Available on an annual basis, nationally competitive grant. Grant award based on specific projects as they are identified (no more than $3M federal share for projects).

Table 67. Federal Financial Resources for Hazard Mitigation.

Subtype	Administrator	Purpose	Amount/Availability
Flood Mitigation Assistance (FMA) grant program	FEMA	Mitigate repetitively flooded structures and infrastructure.	Available on an annual basis, distributed to communities within state by the state emergency management grants specialists. Grant award based on specific projects as they are identified.
Assistance to Firefighters Grant (AFG) Program	FEMA/USFA (U.S. Fire Administration)	Provide equipment, protective gear, emergency vehicles, training, and other resources needed to protect the public and emergency personnel from fire and related hazards.	Available to fire departments and nonaffiliated emergency medical services. Grant award based on specific projects as they are identified.
Homeland Security Preparedness Technical Assistance Program (HSPTAP)	FEMA/DHS	Build and sustain preparedness technical assistance activities in support of the four homeland security mission areas (prevention, protection, response, recovery) and homeland security program management.	Technical assistance services developed and delivered to state and local homeland security personnel. Grant award based on specific projects as they are identified.
Community Block Grant Program Entitlement Communities Grants	U.S. Department of Housing and Urban Development	Acquisition of real property, relocation and demolition, rehabilitation of residential and non-residential structures, construction of public facilities and improvements, such as water and sewer facilities, streets, neighborhood centers, and the conversion of school buildings for eligible purposes.	Available to entitled jurisdictions (including Tribes in some situations). Grant award based on specific projects as they are identified.
Community Action for a Renewed Environment (CARE)	U.S. Environmental Protection Agency (EPA)	Through financial and technical assistance, offers an innovative way for a community to organize and take action to reduce toxic pollution (i.e., storm water) in its local environment. Through CARE, a community creates a partnership that implements solutions to reduce releases of toxic pollutants and minimize people's exposure to them.	Competitive grant program. Grant award based on specific projects as they are identified.
Clean Water State Revolving Fund (CWSRF)	EPA	The CWSRF is a loan program that provides low-cost financing to eligible entities within state and tribal lands for water quality projects, including all types of non-point source, watershed protection or restoration, estuary management projects, and more traditional municipal wastewater treatment projects.	CWSRF programs provided more than $5 billion annually to fund water quality protection projects for wastewater treatment, non-point source pollution control, and watershed and estuary management.
Public Health Emergency Preparedness (PHEP) Cooperative Agreement.	Department of Health and Human Services' (HHS) Centers for Disease Control and Prevention	Funds are intended to upgrade Tribal, state and local public health jurisdictions' preparedness and response to bioterrorism, outbreaks of infectious diseases, and other public health threats and emergencies.	Competitive grant program. Grant award based on specific projects as they are identified.

Table 67. Federal Financial Resources for Hazard Mitigation.

Subtype	Administrator	Purpose	Amount/Availability
FEMA Grant Programs	FEMA	Disaster mitigation and preparedness, post-disaster cleanup, and retro-fitting of at-risk structures, infrastructure, and Tribal preparedness planning and response.	Tribes must have a FEMA approved Tribal Hazard Mitigation Plan in place, and current, to apply for and receive most FEMA program funding for pre-disaster mitigation projects.

7.3. Tribal Mitigation Strategies

Mitigation strategies detailed within this Tribal Hazards Mitigation Plan have been developed through an integrated approach of (1) findings determined through this series of analyses, (2) recommendations from Planning Committee members, and (3) suggestions and ideas presented by the public during the Residential Survey, public meetings, and open discussions between the planning team members and the public.

Critical to the implementation of this Tribal Hazards Mitigation Plan will be the identification of, and implementation of, an integrated schedule of treatments within the Duck Valley Indian Reservation targeted at achieving an elimination of the lives lost and reduction in structures damaged or destroyed, infrastructure compromised, reduction to the economy of the Duck Valley Indian Reservation, and unique ecosystems damaged. Since there are many management agencies and hundreds of residents living on the Duck Valley Indian Reservation, it is reasonable to expect that differing schedules of adoption will be made and varying degrees of compliance will be observed across all properties.

The Shoshone-Paiute Tribes, and the communities of the Duck Valley Indian Reservation, encourage the philosophy of instilling disaster resistance in normal day-to-day operations. By implementing plan activities through existing programs and resources, the cost of mitigation is often a small portion of the overall cost of a project's design or program.

The federal land management agencies operating in and near the Duck Valley Indian Reservation, specifically the BIA, USFS, and BLM are participants in this planning process and have contributed to its development. Where available, their schedules of land treatments have been considered in light of the Shoshone-Paiute Tribes' management projections in this planning process, to better facilitate a correlation between their identified planning efforts and the efforts of government organizations.

The Shoshone-Paiute Tribes' efforts to implement this integrated Hazard Mitigation Plan has included participants from Emergency Management from both Owyhee and Elko Counties.

All risk assessments were made based on the conditions existing during 2010 and 2011; thus, the recommendations in this section have been made in light of the understanding of those conditions. However, the components of risk and the preparedness of the Duck Valley Indian Reservation's resources are not static. It will be necessary to fine-tune this plan's recommendations annually to adjust for changes in the components of risk, population density changes, infrastructure modifications, and other factors.

7.3.1. Prioritization of Mitigation Activities

The Shoshone-Paiute Tribes will complete the prioritization of the projects indicated in this plan. The Tribes will seek the assistance of and cooperation with other entities as appropriate.

The prioritization process includes a special emphasis on cost-benefit analysis review. The process will reflect that a key component in funding decisions is a determination that the project will provide an equivalent, or more, in benefits over the life of the project when compared with the costs. Projects will be administered by the Shoshone-Paiute Tribes to meet these goals.

If no federal funding is used in these situations, the prioritization process may be less formal. Often, the types of projects that the Shoshone-Paiute Tribes can afford to do on its own are in relation to improved codes and standards, department planning and preparedness, and education. These types of projects may not meet the traditional project model, selection criteria, and benefit-cost model. The Shoshone-Paiute Tribes will consider all pre-disaster mitigation proposals brought before the Tribal Council by department heads, and Tribal community representatives.

When federal or state funding is available for hazard mitigation, there are usually requirements that establish a rigorous benefit-cost analysis as a guiding criterion in establishing project priorities. The Shoshone-Paiute Tribes will follow the basic federal grant program criteria that will drive the identification, selection, and funding of the most competitive and worthy mitigation projects. FEMA's three primary grant programs (the post-disaster Hazard Mitigation Grant Program, and the pre-disaster Flood Mitigation Assistance Program and Pre-Disaster Mitigation Grant Program) that offer federal mitigation funding to state, Tribal, and local governments, all include the benefit-cost and repetitive loss selection criteria.

The Shoshone-Paiute Tribes are committed to compliance with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding from Federal agencies, in compliance with 44 CFR 13.11(c). The Shoshone-Paiute Tribes will amend this plan whenever necessary to reflect changes in Tribal or Federal laws and statutes as required in 44 CFR 13.11(d).

The prioritization of projects will be considered annually and be facilitated by the Shoshone-Paiute Tribes TERC. Prioritization will be based on the selection of projects that create a balanced approach to pre-disaster mitigation by recognizing the hierarchy of treating (highest first):

- People and Structures
- Infrastructure
- Local and Regional Economy
- Traditional Way of Life
- Ecosystems

The resources at risk within each populated place on the Duck Valley Indian Reservation and the Communities detailed in this document will serve to establish a consistent and uniform basis for the "benefit" portion of the cost-benefit ratio analysis for all projects.

7.3.2. STAPLEE Matrix for Initial Ranking of Mitigation Measures

The STAPLEE matrix has been proposed as an approach to use when creating unbiased evaluations of potential mitigation measures. These seven criteria are determined subjectively and independently from each other. For these purposes each project has been rated on a scale of zero (low benefit) to ten (high benefit). The cumulative scores can range from zero to seventy. The score of seventy would be considered a highly desirable project while a very low scoring project would be considered a very undesirable project (Table 68).

Table 68. Evaluation Criteria (STAPLEE) for Mitigation Actions.

Evaluation Category	Discussion "It is important to consider…"	Considerations
Social	The public support for the overall mitigation strategy and specific mitigation actions.	Community acceptance, or Adverse effect on the population
Technical	If the mitigation action is technically feasible and if it is the whole or partial solution.	Technical feasibility Long-term solutions Secondary impacts
Administrative	If the community has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.	Staffing Funding allocation Maintenance/operations
Political	What the community and its members feel about issues related to the environment, economic development, safety, and emergency management.	Political support Local champion Public support
Legal	Whether the community has the legal authority to implement the action, or whether the community must pass new regulations.	Tribal, and/or federal authority, Potential legal challenge
Economic	If the action can be funded with current or future internal and external sources, if the costs seem reasonable for the size of the project, and if enough information is available to complete a FEMA Benefit-Cost Analysis.	Benefit/cost of action Contributes to other economic goals Outside funding required FEMA Benefit-Cost Analysis
Environmental	The impact on the environment because of public desire for a sustainable and environmentally healthy community.	Effect on local flora and fauna Consistent with community environmental goals Consistent with Tribal and federal laws

All of these have been ranked on scale (subjective) from 0 to 10. The sum of the total will create the Mitigation Action's overall score, with the highest ranked scores achieving the highest ranked mitigation measures. If any one score of a project is equal to or below 3, the mitigation measure will be determined to be "unfeasible", removing it from further consideration.

7.3.3. Proposed Mitigation Measures

Potential mitigation measures are presented in Table 70 - Table 73. These measures include a Project Number. In the "1000" series (Policy Related Activities), and unique project number "1000-06". The definition of these codes is listed in Table 69. All projects identified in this plan will be led by the governing body of the Shoshone-Paiute Tribes.

Table 69. Unique project codes for potential mitigation measures.

Series Codes
1000: Policy Related Activities
2000: Activities to Reduce Loss Potential
3000: Resource and Capabilities Enhancements
4000: Activities to Change the Characteristics of Risk

The Series Codes (1000-4000) include projects generally listed by their potential to accomplish certain hazard mitigation goals. The first, Policy Related Activities (1000), are projects that specifically target the plans, policies, and programs conducted through existing Tribal programs. These efforts can preclude future developments from placing resources at risk to hazards currently identified (e.g., through Planning and Zoning). In this way, the Shoshone-Paiute Tribes can focus on correcting current problems without allowing the same risk exposure conditions to be repeated in the future. The Shoshone-Paiute Tribes can also ensure that currently ongoing beneficial practices, such as participation in astute range management practices, are continued into the foreseeable future. The update to existing policies, plans, and programs of the

Shoshone-Paiute Tribes, will be the focus of the aforementioned Policy Related Activities (1000 Series projects). Formally, this process requires existing planning documents to be updated with analyses contained in this planning document, and then each specific mechanism should be presented to Tribal Council, discussed, and potentially adopted through formal resolution of adoption that integrates the guidance of hazard preparedness. It is critical to recognize that although specific policy related recommendations are formally presented in this Duck Valley Indian Reservation Tribal Hazards Mitigation Plan, the formulation, specific wording, and implementation time horizon are at the discretion of the members of the Shoshone-Paiute Tribal Council. The members of this governing body are committed to the health, safety, welfare, and prosperity of the residents and visitors to the Duck Valley Indian Reservation, and implementation measures would reflect this commitment.

The second category, Activities to Reduce Loss Potential (2000 Series projects), includes activities targeted at changing a structure's risk or infrastructure component's risk profile. This may include elevating homes currently located within a flood zone above the height of flood waters, or replacing roofing on homes showing vulnerability to wind damage. These activities are targeted to change the risks of structures placed in harm's way. The implementation of these activities can only be accomplished through the efforts of the Shoshone-Paiute Tribes.

The third category, Resource and Capability Enhancements (3000 Series projects), contains efforts to expand the ability of the Shoshone-Paiute Tribes' Departments to respond to emergencies from natural hazards. For instance, one of the repeated themes in this risk assessment has been the need for increased communications between departmental administration, police, fire protection, regional, state, and federal agencies. These types of improvements generally apply equally to all hazard types and can impact the effectiveness of disaster response. Improving radio communications, power supply to run these communications, and increased cellular phone coverage may be applicable projects for the Duck Valley Indian Reservation in this category. The implementation of these activities can only be implemented through the integrated efforts of the Shoshone-Paiute Tribes.

Finally, the fourth category, "Activities to Change the Characteristics of Risk" (4000 Series projects), represents activities targeted at modifying the characteristics of the hazard. In the case of flooding, a wetlands improvement project (re-establishing a floodplain's historical water storage capacity) is an example of a mitigation measure to change the risk component based on the vector of the hazard. Another example is improving storm water handling as it moves through a community to alleviate potential damages from flood-type impacts. Elevating a road access and improving culvert sizing or bridge overpass freeboard clearance and location are examples to change the characteristics of risk exposure.

Each table (Table 70 – Table 73) includes a project type, identification of the hazard most directly affected by the proposed activity. Some of the mitigation measures include multiple hazards, and others are applicable to "All Hazards". The listing order for these potential mitigation measures is random. The STAPLEE score is determined for each project in based on the discussion items listed in Table 68 and are presented in Table 74 – Table 77.

7.3.4. Implementation Time Frame

Each project listed here has been assigned an anticipated implementation time frame. It is the goal to complete these projects within a schedule that allows for modification that deals with the ever changing landscape of limited resources and changing priorities. The intention of this proposed implementation schedule is to implement 'immediate' projects within the next 2 to 3 years, short-term projects within a period of 2 to 5 years, intermediate projects between 4 to 8 years, and long-term projects between 7 and 10 years after adoption of this Tribal Hazards Mitigation Plan.

Table 70. Potential Mitigation Activities for Policy Related Activities (1000 series).

Project Number	Project Description	Type of Project	Responsible Department	STAPLEE Score	Implementation Time Frame
1000-1.	Shoshone-Paiute Tribes to implement a system of **tracking NIMS training** for staff and **CERT training** for residents, with verifications of training through learning plans and transcripts of people on the Reservation to serve in emergency response situations.	All	TERC	70	Immediate
1000-2.	Shoshone-Paiute Tribal Council to approve and facilitate training time and costs for staff to achieve **NIMS training** from the **basic level** for all staff, **intermediate level** for Department Heads, and **Advanced level** for Departments potentially involved in emergency response. A cadre of **Incident command staff** will be recruited and trained. An initial training capacity of 50 people with NIMS intermediate training by 2013 is targeted.	All	Shoshone-Paiute Tribal Council, TERC	70	Short-term
1000-3.	Shoshone-Paiute Tribal Council to arrange the completion of a **Comprehensive Emergency Operations Plan** for the Duck Valley Indian Reservation.	All	Shoshone-Paiute Tribal Council, TERC	70	Intermediate
1000-4.	**Duck Valley Indian Reservation** to consider entry into the National Flood Insurance Program. Include training and certification of a Duck Valley Indian Reservation Planning Department staff member as a Nationally Certified Floodplain Administrator (fill the role of **Duck Valley Indian Reservation Floodplain Administrator**).	Flood	Shoshone-Paiute Tribes	68	Immediate
1000-5.	**Duck Valley Indian Reservation** to work with neighboring agencies to provide **training in the usage of P-25 compliant communications equipment**.	All Hazards	Shoshone-Paiute Tribes, BLM, BIA, Owyhee County, Elko County	70	Immediate
1000-6.	Update the **Duck Valley Indian Reservation Wildland-Urban Interface Wildfire Mitigation Plan** and **Forest Management Plan**.	Wildfire	Shoshone-Paiute Tribes	69	Long-term
1000-7.	Obtain equipment and provide training to facilitate better **communications** between disaster response agencies on the Reservation.	All Hazards	Shoshone-Paiute Tribes, BLM, BIA, Owyhee County, Elko County	70	Intermediate
1000-8.	Implement an **Enhanced 911 Program** on the Duck Valley Indian Reservation and complete the saturation of 911 telephone service in the entire Reservation.	All Hazards	Shoshone-Paiute Tribes	67	Long-term

Table 70. Potential Mitigation Activities for Policy Related Activities (1000 series).

Project Number	Project Description	Type of Project	Responsible Department	STAPLEE Score	Implementation Time Frame
1000-9.	**Identify Shoshone-Paiute Tribes' Tribal Floodplain Administrator** who will complete requirements for training to certify through the Building Code Effectiveness Grading Schedule (BCEGS), which assesses the building codes in effect and how the communities enforce building codes, with special emphasis on mitigation of losses from natural hazards. The Tribal Floodplain Administrator will then work with the Tribal Council to implement these findings through current programs on the Duck Valley Indian Reservation.	All Hazards (especially Flood, Windstorm, and Earthquake damage)	Shoshone-Paiute Tribes	70	Long-term
1000-10.	**Shoshone-Paiute Tribes' Emergency Manager** will complete requirements for training to acquire National Incident Management System (NIMS) training for Incident Command.	All Hazards	Shoshone-Paiute Tribes	70	Long-term
1000-11.	**Duck Valley Indian Reservation Floodplain Administrator** will complete requirements for training to complete training course E-273- Managing Floodplain Development, through the NFIP.	Flood	Shoshone-Paiute Tribes	70	Long-term
1000-12.	Duck Valley Indian Reservation will begin implementing **flood administration activities** using the existing **floodplain projections** for floodplain location determination.	Flood	Shoshone-Paiute Tribes	70	Long-term
1000-13.	Duck Valley Indian Reservation Floodplain Administrator will complete requirements for training to complete training and certification as a **Federally Certified Floodplain Administrator** by FEMA (contingent on DVIR-1000-2).	Flood	Shoshone-Paiute Tribes	70	Long-term
1000-14.	Duck Valley Indian Reservation will take an active participant role in the identification and mapping of **Flood Insurance Rate Maps developed by FEMA**. This participation will be indicated by the development and sharing of pertinent locally collected information that influences the identification of the floodplain on Duck Valley Indian Reservation. This is dependent on the implementation of project DVIR-1000-2.	Flood	Shoshone-Paiute Tribes	70	Ongoing
1000-15.	Create the development of a Duck Valley Indian Reservation **comprehensive disaster database** of all hazards in terms of the hazard event, location, beginning date, ending date, and impact of the event on people, structures, infrastructure, and the economy of the Reservation. Include the cost of rehabilitating the site to pre-disaster conditions, and any mitigation measures implemented to prevent future disaster losses, and location dependent information (for mapping).	All Hazards	Shoshone-Paiute Tribes, BLM, BIA, Owyhee County, Elko County	70	Short-term

Table 70. Potential Mitigation Activities for Policy Related Activities (1000 series).

Project Number	Project Description	Type of Project	Responsible Department	STAPLEE Score	Implementation Time Frame
1000-16.	Develop and deliver an information sharing **public relations program** for residents and businesses of the Duck Valley Indian Reservation to disseminate detailed information about hazards, and to highlight ongoing management of hazard mitigation programs, information on risks, and regional responses to implementing programs and policies to reduce losses from natural disasters.	All Hazards	Shoshone-Paiute Tribes	70	Long-Term
1000-17.	Continue efforts of the Tribes in the **StormReady** Community Program.	Severe Weather	TERC	70	Short-term
1000-18.	Form and staff a **Tribal Emergency Operation Center** (EOC) of the Duck Valley Indian Reservation.	All Hazards	Shoshone-Paiute Tribes	70	Short-term
1000-19.	Develop **Minor Home Repair Program** and obtain grant funding support to award low-interest or deferred loans for emergency preparedness repairs to low income resident homeowners on the Duck Valley Indian Reservation.	All Hazards	Shoshone-Paiute Tribes	68	Mid-term
1000-20.	Develop a **flood response plan** to identify the activation of the EOC, emergency responses, human safety and health, and warning systems in advance of approaching flood hazards.	Flood	Shoshone-Paiute Tribes, TERC	70	Immediate
1000-21.	Consider a **Floodplain Ordinance** for the Duck Valley Indian Reservation to restrict the building of structures and infrastructure within the Duck Valley Indian Reservation to include new construction and substantial value structure remodeling.	Flood	Shoshone-Paiute Tribes	70	Long Term
1000-22.	Initiate the service of incorporating **high wind warnings** to the operation of the EOC. Work with residents to identify and mitigate high wind hazard components of buildings and vegetation surrounding homes and power lines.	Severe Weather	Shoshone-Paiute Tribes, TERC	70	Immediate
1000-23.	Duck Valley Indian Reservation to develop, adopt, and implement a **Cultural Awareness Program** related to the treatment and response to culturally sensitive sites and situations to be delivered to all Tribal department staff involved in potential response to hazard events and pre-disaster mitigation measures.	All Hazards	Shoshone-Paiute Tribes, TERC	70	Immediate

Table 70. Potential Mitigation Activities for Policy Related Activities (1000 series).

Project Number	Project Description	Type of Project	Responsible Department	STAPLEE Score	Implementation Time Frame
1000-24.	Initiate the **update of the Duck Valley Indian Reservation Tribal Hazards Mitigation Plan** starting 3 years from the effective date of this plan to guarantee the resources for personnel, funding, and integration with other Duck Valley Indian Reservation objectives leading to an updated Tribal Hazards Mitigation Plan within 5 years.	All Hazards	Shoshone-Paiute Tribes	70	Long-term
1000-25.	Integrate a **geotechnical site review** into the Planning and Zoning policies of the Duck Valley Indian Reservation for all new site subdivisions, new building sites within identified high risk areas, and remodeling activities of existing structures with a value equal to or greater than 50% of the total structure value before remodeling, to check for **expansive soils and expansive clays** and implement program to deal with the challenges faced.	Expansive Soils & Clays	Shoshone-Paiute Tribes	70	Long-term
1000-26.	**Enact updates to Planning and Zoning** policies, discourage new structure developments that are not pre-mitigated for targeted hazards, but located in hazard prone areas as identified in this plan for each of the high risk areas. Use recommended structure protection strategies as appropriate.	All Hazards	Shoshone-Paiute Tribes	70	Long-term
1000-27.	Develop Duck Valley Indian Reservation **Planning and Zoning Policy** to encourage or require new developments in the Wildland-Urban Interface to make initial installation of **home defensibility space around new structures,** and then maintain them.	Wildfire	Shoshone-Paiute Tribes	66	Short-term
1000-28.	Collect existing information and develop then deliver **educational programs** to educate homeowners on best management practices for building within floodplains and along levees.	Flood	Shoshone-Paiute Tribes	70	Short-term
1000-29.	Duck Valley Indian Reservation to provide a mechanism for the inspection of buildings it constructs within the exterior boundaries of the Duck Valley Indian Reservation.	All Hazards	Shoshone-Paiute Tribes	70	Immediate
1000-30.	Develop **public outreach and educational materials** specific to the Duck Valley Indian Reservation to provide information to all ages, as appropriate, **concerning natural disasters**, using examples of local conditions, mitigation measures, and success stories including cultural sensitivity to historical places. Include written materials, multi-media presentations, self-guided tours through "standing displays" erected at locations such as Tribal Long Houses and schools, and other media as deemed appropriate.	All Hazards	Shoshone-Paiute Tribes	68	Intermediate

Table 70. Potential Mitigation Activities for Policy Related Activities (1000 series).

Project Number	Project Description	Type of Project	Responsible Department	STAPLEE Score	Implementation Time Frame
1000-31.	Shoshone-Paiute Tribes to adopt and enforce the **International Building Code**. Combine this with the development, implementation, and enforcement of a Shoshone-Paiute Tribes' Comprehensive Building Plan.	All Hazards	Shoshone-Paiute Tribes	70	Immediate
1000-32.	Raise community awareness about earthquakes by providing important information to the community through the news media on the Reservation. Include features on **locating earthquake hazards** in the home, prepare special reports for people with mobility impairments on what to do during an earthquake, and provide tips on conducting earthquake drills in the home, schools, and public buildings.	Earthquakes	Sho-Pai News	70	Immediate
1000-33.	Create **interactive structure database** to document structure characteristics, potential disaster risks, and potential mitigation measures to reduce the risk. Keep record of implementation efforts and benefits. Store in SQL server and provide secure access to authorized users for updating and maintenance.	All Hazards	Shoshone-Paiute Tribes	70	Immediate

Table 71. Potential Mitigation Activities to Reduce Loss Potential (2000 series).

Project Number	Project Description	Type of Project	Responsible Organization	STAPLEE Score	Implementation Time Frame
2000-1.	Develop **evacuation sites** and improve defensible space for evacuation along all Reservation roads.	All Hazards	TERC, Shoshone-Paiute Tribes, Owyhee County and Elko County Emergency Management Departments	67	Immediate
2000-2.	Seek project funding for needed **roofing improvements**, and implement the improvements, especially for low income families and Tribal housing, related to severe weather events such as high winds and heavy snows within the **Duck Valley Indian Reservation**.	Severe Weather	Shoshone-Paiute Tribes	63	Mid-term
2000-3.	**Expansive Soil and Expansive Clay Damage Protection** of private structures and public structures: identification of public assistance money, design and implementation of structural enhancements and access route stabilization within the **Duck Valley Indian Reservation**.	Expansive soils & Clays	Shoshone-Paiute Tribes	63	Short-term

Table 71. Potential Mitigation Activities to Reduce Loss Potential (2000 series).

Project Number	Project Description	Type of Project	Responsible Organization	STAPLEE Score	Implementation Time Frame
2000-4.	**Wildfire Mitigation Protection** of private structures and public structures: identification of public assistance money, design and implementation of wildfire protection to homes and access within the **Duck Valley Indian Reservation**.	Wildfire	Shoshone-Paiute Tribes	63	Short-term
2000-5.	**Flood and Storm Water Protection** of private structures and public structures: identification of public assistance money, design and implementation of structural enhancements and access stabilization against water damages within the **Duck Valley Indian Reservation**.	Flood and Storm Water	Shoshone-Paiute Tribes	63	Short-term
2000-6.	Seek project funding, and identify exposed and **unreinforced masonry or brick chimney** structures, then design improvements and reinforce these structures to correct the risk to public safety within the **Duck Valley Indian Reservation (including the Owyhee Combined School building's chimney)**.	Earthquake	Shoshone-Paiute Tribes	56	Intermediate
2000-7.	Launch **public education program** and demonstrate techniques to **protect homes from wildfire risks** within the Duck Valley Indian Reservation. Demonstrate enhancement maintenance efforts for the long-term.	Wildfire	Shoshone-Paiute Tribes	67	Long-term
2000-8.	Develop and implement **road/stream crossing corrections** including catchment devices and bridge installations.	Flood	Shoshone-Paiute Tribes	63	Immediate
2000-9.	Assess individual mitigation measures to the structures currently located within the flood prone landscapes (162) to minimize potential flood impacts.	Flood	Shoshone-Paiute Tribes	62	Long-term
2000-10.	Develop and implement Tribal Policy to snow plow private driveways not plowed by States or BIA.	Snow	TERC	64	Intermediate

Table 72. Potential Mitigation Activities to Enhance Resources and Capabilities (3000 series).

Project Number	Project Description	Type of Project	Responsible Department	STAPLEE Score	Implementation Time Frame
3000-1.	Shoshone-Paiute Tribe Food Distribution Program staff will take NIMS courses including IS-100, IS-700, and IS-420 “Emergency Food and Shelter National Board Program” to implement the “Emergency Food and Shelter National Board Program” on the Duck Valley Indian Reservation as needed.	All	Food Distribution Program	70	Short-term
3000-2.	Incorporate high wind warning alert system within the Duck Valley Indian Reservation.	Severe Weather	TERC	70	Immediate
3000-3.	Continue participation in the **StormReady Program** and facilitate the placement of a NOAA weather radio tower on the Reservation. Work with NOAA to implement program.	All Hazards	TERC, NOAA	69	Immediate
3000-4.	Purchase radios, repeaters and associated equipment to make all radio communication departments on the Reservation **P-25 compliant**.	All Hazards	TERC	69	Immediate
3000-5.	**Develop** an all-jurisdiction / all-agency **communication plan**.	All Hazards	Shoshone-Paiute Tribes, BLM, BIA, Owyhee County, Elko County, Nevada and Idaho Dept. Lands.	70	Short-term
3000-6.	**Radio System Coverage Enhancement**. Enhance radio communications throughout Duck Valley Indian Reservation by locating **radio repeaters** in strategic locations to allow coverage in several remote areas accessed by emergency responders. Include narrow band repeater capabilities and program specific radio frequency (Natural Resources Department)	All Hazards	Shoshone-Paiute Tribes, BLM, BIA, Owyhee County, Elko County, Nevada and Idaho Dept. Lands.	69	Mid-term
3000-7.	**Fire Department Training Opportunities:** develop custom training programs for firefighting on the Duck Valley Indian Reservation and implement training for all fire department staff and volunteers on the Duck Valley Indian Reservation.	All Hazards	Fire Department, TERC	70	Short-term
3000-8.	Duck Valley Indian Reservation to sponsor and host **training opportunities** for all cooperators on the Reservation in coordination with American Red Cross to conduct **volunteer and first-responder training**.	All Hazards	Fire Department, TERC	70	Short-term
3000-9.	**Update the Duck Valley Indian Reservation Law Enforcement Office Command Center** for improved communications, internet connectivity, and facilitate emergency responder multi-jurisdictional coordination.	All Hazards	Shoshone-Paiute Tribes	68	Short-term

Table 72. Potential Mitigation Activities to Enhance Resources and Capabilities (3000 series).

Project Number	Project Description	Type of Project	Responsible Department	STAPLEE Score	Implementation Time Frame
3000-10.	Purchase and deploy miscellaneous **equipment for police and fire** to outfit personnel while responding to natural disaster events on the Duck Valley Indian Reservation.	All Hazards	Police and Fire Departments	68	Short-term
3000-11.	**Training** for all emergency response staff in the **Incident Command System** – all levels; 100, 200, 300, 400, 700, 800	All Hazards	TERC– All Emergency Response Depts.	70	Immediate
3000-12.	Develop and implement plans for the establishment of an **Evacuation Center**, large generators, portable showers, portable toilets.	All Hazards	Shoshone-Paiute Tribes	65	Short-term
3000-13.	Identify high quality **communication tower locations for cellular communications**, negotiate land leases (when needed) and work with commercial Cellular phone providers to install and activate services.	All Hazards	TERC	70	Short-term
3000-14.	Continue **Radio Station** operations, and use as a public service station for residents and visitors to the Duck Valley Indian Reservation that can be activated during emergency situations.	All Hazards	TERC	65	Mid-term
3000-15.	Install **gas pump on emergency generator** in case of power outage in Owyhee for use by emergency vehicles.	All Hazards	Shoshone-Paiute Tribes	63	Immediate
3000-16.	Conduct staff training for emergency response management for operating equipment and radio communications.	All	TERC	70	Short-term
3000-17.	Acquisition of generators, equipment trailers, and snow plows for emergency response needs of the Tribal Housing Authority.	All	Shoshone-Paiute Tribes	69	Short-term
3000-18.	Acquisition of shelters and meals for emergency response needs of the Tribal Housing Authority.	All	Shoshone-Paiute Tribes	68	Short-term
3000-19.	Acquisition of water tender and funding for equipment operators to provide protection against wildfire for the Sho-Pai Fire Department.	Wildfire	Fire Management	65	Immediate
3000-20.	Post hazard related rural signage (road signs, Evacuation Route Signs), and hazard warning signs/systems on DVIR.	All	TERC	70	Immediate
3000-21.	Obtain needed resources for health care facilities, community centers, and other shelters to protect themselves from potential hazards (e.g. sandbags, cots, nonperishable foods, etc.).	All	Owyhee Health Care Facility, TERC	61	Intermediate
3000-22.	Inspect homes during high volume snow events for potential structural damage to roofs. Assist homeowners with snow removal.	Snow	TERC	66	Immediate

Table 72. Potential Mitigation Activities to Enhance Resources and Capabilities (3000 series).

Project Number	Project Description	Type of Project	Responsible Department	STAPLEE Score	Implementation Time Frame
3000-23.	Acquire equipment resource needs for the Water & Sanitation Department as identified in Table 50.	All	Sho-Pai Water & Sanitation Department	57	Intermediate
3000-24.	Acquire equipment resource needs for the Property & Supply Department as identified in Table 51.	All	Sho-Pai Property & Supply Department	61	Intermediate
3000-25.	Acquire equipment resource needs for the Fire Department as identified in Table 52.	All	Sho-Pai Fire Department	70	Intermediate
3000-26.	Acquire equipment resource needs for the EMS Department as identified in Table 53.	All	Sho-Pai EMS	69	Immediate
3000-27.	Acquire equipment resource needs for the Wildlife and Parks Department as identified in Table 54.	All	Sho-Pai Wildlife & Parks	68	Immediate
3000-28.	Install Automatic Laser Dam Safety Network Monitoring System on the Wild Horse Dam and monitor in Owyhee.	Flood / Dam Failure	Sho-Pai Land Department	61	Short-Term
3000-29.	Acquire and deploy hazardous materials mitigation supplies to the Sho-Pai Airport for use in case of airplane accident, wildfire, HazMat spill, or associated accident. Build a spill resistant storage facility at the Airport to house these supplies.	All	Sho-Pai Airport	62	Immediate
3000-30.	Assemble first responder cadre of Sho-Pai Tribal staff to respond to airplane accident situations, and provide needed training.	All	Sho-Pai Airport	68	Immediate
3000-31.	Acquire and deploy equipment to remove snow, a sanding truck, debris removal equipment, twin axle dump truck with a blade with sanding (spreader) capability for Sho-Pai Airport to maintain access to runways in hazardous conditions.	All	Sho-Pai Airport	64	Intermediate
3000-32.	Acquire satellite telephones for emergency services use and deploy to Hospital, Fire, Tribal Administration, Airport, BIA Police, and schools for use when power or cell phone coverage is limited. Use for emergency communications needs.	All	Shoshone-Paiute Tribes	66	Intermediate
3000-33.	Locate sites to house **Disaster Recovery Centers** near Airport (west side of Owyhee River) and Tribal Headquarters (east side of Owyhee River) outside of natural disaster prone landscapes and build facilities capable of housing evacuees, feeding, storage of food and water, with wastewater treatment capabilities, and backup power generators with fuel storage. Equip with radio communications capabilities.	All	Shoshone-Paiute Tribes	63	Long-term

Table 72. Potential Mitigation Activities to Enhance Resources and Capabilities (3000 series).

Project Number	Project Description	Type of Project	Responsible Department	STAPLEE Score	Implementation Time Frame
3000-34.	Collect LiDAR elevation modeling of the Reservation extending upstream to Wild Horse Dam for use in mapping the floodplain and understanding other natural hazards related to a high resolution digital elevation model.	All	Shoshone-Paiute Tribes & BIA	68	Intermediate

Table 73. Potential Mitigation Activities to Change Characteristics of Risk (4000 series).

Project Number	Project Description	Type of Project	Responsible Organization	STAPLEE Score	Implementation Time Frame
4000-1.	Inspect **Tribal Offices and other structures for snow-load capability** and retrofit (using budgets and grant funding) where appropriate and continue effort to create a snow removal plan.	Severe Weather	Shoshone-Paiute Tribes	61	Long-term
4000-2.	Improve road conditions to install **fuel break corridors** to provide safe evacuation routes and provide safety for responding emergency personal (site distance and fuel load).	Wildfire	Shoshone-Paiute Tribes, US Forest Service, and Bureau of Land Management	67	Short-term
4000-3.	**Bridge debris flow and ice buildup handling** enhancement at crossings of Owyhee River to facilitate better water flow at these points.	Flood	Shoshone-Paiute Tribes	69	Mid-term
4000-4.	Implement Wildland-Urban Interface **wildfire fuel reduction activity** on populated landscapes across the Reservation.	Wildfire	Shoshone-Paiute Tribes	70	Short-term
4000-5.	Elevate road surfaces, install improved water crossings (culverts), and remove water flow barriers along Idaho State Route 51 and Nevada State Route 225 as indicated in this plan.	Flood	Shoshone-Paiute Tribes	70	Short-term
4000-6.	Design and install bridge enhancements (new bridges / elevated freeboard crossings) along Owyhee River at National Guard Road, Boney Lane Road, McKinney Road, Harney Lane, and China Town Road.	Flood	Shoshone-Paiute Tribes	67	Long-term
4000-7.	Install debris catchment devices in the Owyhee River to intercept river debris above key road crossings above Granite Creek, above Fawn Creek, and above the China Town diversion dam.	Flood	Shoshone-Paiute Tribes	67	Intermediate
4000-8.	Install road system stabilization along embankments to prevent debris falling onto the road.	Flood and landslide	Shoshone-Paiute Tribes, Nevada State Highway Department	67	Intermediate

Table 73. Potential Mitigation Activities to Change Characteristics of Risk (4000 series).

Project Number	Project Description	Type of Project	Responsible Organization	STAPLEE Score	Implementation Time Frame
4000-9.	Determine culvert size needs and replace approximately 13 culverts.	Flood	Shoshone-Paiute Tribes, BIA Roads	66	Intermediate
4000-10.	Riverbank stabilization along River Road (between China Town Road and Boney Town Road about 5 miles) against flood damage.	Flood	BIA Roads	65	Intermediate
4000-11.	Elevate and stabilize Sheep Creek Road (between China Town Road and Sheep Creek Reservoir about 4.5 miles) against flood damage.	Flood	BIA Roads, Nevada State Highways, Elko County Roads	67	Intermediate
4000-12.	Blue Creek & Owyhee River flow enhancements to reduce flood damages.	Flood	Shoshone-Paiute Tribes	62	Intermediate
4000-13.	Pleasant Valley Road improvements for approach to river crossing: elevate, widen, and install culverts.	Flood	BIA Roads	69	Intermediate

7.3.5. Proposed Mitigation Measures STAPLEE Scores

STAPLEE Scores have been subjectively determined for each project proposed in Table 70 – Table 73 and are presented numerically in Table 74 – Table 77.

Table 74. STAPLEE Scores for 1000 Series Potential Mitigation Measures.

Project - Score	Social	Technical	Administrative	Political	Legal	Economic	Environmental
1000-1. 70	10	10	10	10	10	10	10
1000-2. 70	10	10	10	10	10	10	10
1000-3. 70	10	10	10	10	10	10	10
1000-4. 68	10	9	9	10	10	10	10
1000-5. 70	10	10	10	10	10	10	10
1000-6. 69	10	10	9	10	10	10	10
1000-7. 70	10	10	10	10	10	10	10
1000-8. 67	10	8	9	10	10	10	10
1000-9. 70	10	10	10	10	10	10	10
1000-10. 70	10	10	10	10	10	10	10
1000-11. 70	10	10	10	10	10	10	10
1000-12. 70	10	10	10	10	10	10	10
1000-13. 70	10	10	10	10	10	10	10
1000-14. 70	10	10	10	10	10	10	10
1000-15. 70	10	10	10	10	10	10	10
1000-16. 70	10	10	10	10	10	10	10
1000-17. 70	10	10	10	10	10	10	10
1000-18. 70	10	10	10	10	10	10	10
1000-19. 68	10	9	10	10	10	9	10
1000-20. 70	10	10	10	10	10	10	10
1000-21. 70	10	10	10	10	10	10	10
1000-22. 70	10	10	10	10	10	10	10
1000-23. 70	10	10	10	10	10	10	10
1000-24. 70	10	10	10	10	10	10	10
1000-25. 70	10	10	10	10	10	10	10
1000-26. 70	10	10	10	10	10	10	10
1000-27. 66	9	9	9	9	10	10	10
1000-28. 70	10	10	10	10	10	10	10
1000-29. 70	10	10	10	10	10	10	10
1000-30. 68	10	9	9	10	10	10	10
1000-31. 70	10	10	10	10	10	10	10
1000-32. 70	10	10	10	10	10	10	10
1000-33. 67	10	9	9	9	10	10	10

Table 75. STAPLEE Scores for 2000 Series Potential Mitigation Measures.

Project - Score	Social	Technical	Administrative	Political	Legal	Economic	Environmental
2000-1. 67	10	9	9	10	9	10	10
2000-2. 63	10	9	9	10	9	6	10
2000-3. 63	10	9	9	10	9	6	10
2000-4. 63	10	9	9	10	9	6	10
2000-5. 63	10	9	9	10	9	6	10
2000-6. 56	10	8	6	10	8	4	10
2000-7. 67	10	9	9	10	10	9	10

Table 75. STAPLEE Scores for 2000 Series Potential Mitigation Measures.

Project	- Score	Social	Technical	Administrative	Political	Legal	Economic	Environmental
2000-8.	63	10	9	9	10	9	6	10
2000-9.	62	10	9	9	8	10	6	10
2000-10.	64	10	9	9	10	9	7	10

Table 76. STAPLEE Scores for 3000 Series Potential Mitigation Measures.

Project	- Score	Social	Technical	Administrative	Political	Legal	Economic	Environmental
3000-1.	70	10	10	10	10	10	10	10
3000-2.	70	10	10	10	10	10	10	10
3000-3.	69	10	10	10	10	10	9	10
3000-4.	69	10	10	10	10	10	9	10
3000-5.	70	10	10	10	10	10	10	10
3000-6.	69	10	10	10	10	10	9	10
3000-7.	70	10	10	10	10	10	10	10
3000-8.	70	10	10	10	10	10	10	10
3000-9.	68	10	10	9	10	10	9	10
3000-10.	68	10	10	9	10	10	9	10
3000-11.	70	10	10	10	10	10	10	10
3000-12.	65	10	10	10	10	10	6	9
3000-13.	70	10	10	10	10	10	10	10
3000-14.	65	9	9	9	10	10	8	10
3000-15.	63	9	8	10	10	10	6	10
3000-16.	70	10	10	10	10	10	10	10
3000-17.	69	10	10	10	10	10	9	10
3000-18.	68	10	10	9	10	10	9	10
3000-19.	65	10	10	9	10	10	6	10
3000-20.	70	10	10	10	10	10	10	10
3000-21.	61	9	9	9	9	10	6	9
3000-22.	66	10	8	10	10	10	8	10
3000-23.	57	10	6	6	9	10	6	10
3000-24.	61	10	7	8	9	10	7	10
3000-25.	70	10	10	10	10	10	10	10
3000-26.	69	10	10	10	10	10	9	10
3000-27.	68	10	10	10	10	10	8	10
3000-28.	61	10	7	8	10	10	6	10
3000-29.	62	10	8	9	10	10	6	9
3000-30.	68	10	10	10	10	10	8	10
3000-31.	64	10	9	9	10	10	6	10
3000-32.	66	10	10	10	10	10	6	10
3000-33.	63	10	8	9	10	10	6	10
3000-34.	68	10	10	10	10	10	8	10

Table 77. STAPLEE Scores for 4000 Series Potential Mitigation Measures.

Project - Score	Social	Technical	Administrative	Political	Legal	Economic	Environmental
4000-1. 61	9	8	8	10	9	7	10
4000-2. 67	10	9	9	10	10	9	10
4000-3. 69	10	10	10	10	10	9	10
4000-4. 70	10	10	10	10	10	10	10
4000-5. 70	10	10	10	10	10	10	10
4000-6. 67	10	9	9	10	10	9	10
4000-7. 67	10	10	9	9	10	10	9
4000-8. 67	10	10	10	9	10	9	9
4000-9. 66	10	10	10	9	9	9	9
4000-10. 65	10	10	9	10	10	8	8
4000-11. 67	10	10	10	10	10	7	10
4000-12. 62	10	8	9	10	10	7	8
4000-13. 69	10	10	10	10	10	9	10

7.3.6. Identification and Analysis of Mitigation Measures

A comprehensive analysis of risk exposure, proposed mitigation measures, human resources, and funding mechanisms (including direct resources, grants and cooperative agreements) can ensure the consideration of a range of actions for each hazard. Within projects identified from Table 70 through Table 73, a collection of 76 potential mitigation measures have been identified. While some of these potential mitigation measures can “stand alone” to accomplish the stated goals of this planning effort, other measures must be implemented in concert with multiple activities to witness measurable change.

An analysis of these potential mitigation measures has revealed that this planning effort ensures consideration of a range of actions for each hazard.

Table 78. Identification and Analysis of Mitigation Measures format suggested by FEMA (March 2010), optional.

	Hazards Identified Per Requirement 201.7(c)(2)(i)		A. Comprehensive Range of Actions and Projects	
Hazard Type	Not a Hazard	Yes	N	S
Avalanche	X		X	
Coastal Erosion	X		X	
Coastal Storm	X		X	
Dam Failure		X		X
Drought		X		X
Earthquake		X		X
Expansive Soils		X		X
Extreme Heat		X		X
Flood		X		X
Hailstorm		X		X
Hurricane		X		X
Land Subsidence	X		X	
Landslide		X		X
Severe Winter Storm		X		X

Table 78. Identification and Analysis of Mitigation Measures format suggested by FEMA (March 2010), optional.				
	Hazards Identified Per Requirement 201.7(c)(2)(i)		A. Comprehensive Range of Actions and Projects	
Hazard Type	Not a Hazard	Yes	N	S
Tornado		X		X
Tsunami	X		X	
Volcano	X		X	
Wildfire		X		X
Windstorm		X		X
Legend: 201.7(c)(3)(ii) Identification and Analysis of Mitigation Actions A. Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?				

7.4. Monitoring and Maintenance Program

This Progress Report (below) is intended to be reviewed annually and completed by the Duck Valley Indian Reservation TERC staff. Once completed, the progress report and the annual review questionnaire for each Tribal Department will be summarized in an annual report notebook. This notebook of status reports will form the basis for a summary presentation, open to the Shoshone-Paiute public, discussing the status and pending action items related to hazard mitigation and preparedness on the Duck Valley Indian Reservation. If determined necessary by the TERC Chairman, the annual progress report and update may be presented to the Tribal Council.

The Shoshone-Paiute Tribes' TERC Chairman will take the responsibility for meeting with each Tribal Department and cooperating Agency and organization at least annually to discuss ongoing projects, needs, and changes in status of hazard preparedness. These annual meetings will be summarized in written form, then presented and discussed along with the summary to the Tribal Council. These meetings will result in an action plan to deal with the status of preparedness and mitigation measures.

These annual summaries will form the basis for updating the plan, and presenting it to Tribal Council for approval, within a five year cycle. The Shoshone-Paiute Tribes' TERC Chairman and Emergency Manager will be responsible for coordinating these efforts. Each project's manager will be responsible for completing these project evaluations as projects are implemented.

The monitoring of the impacts of the Duck Valley Indian Reservation Tribal Hazards Mitigation Plan will be completed formally on an annual basis, but ongoing evaluations of project impacts will be a critical measure of success for improvements and amplifications of the positive benefits of the hazard mitigation ethic expressed in this plan. Monitoring of the positive impacts of the Duck Valley Indian Reservation Tribal Hazards Mitigation Plan should be completed at critical event junctures, no less than annually. These critical event junctures include 1) when projects are launched to implement mitigation measures, 2) after disaster events happen within the Duck Valley Indian Reservation or on adjacent lands to determine how specific mitigation measures did positively impact the negative influences of disaster events, or could have benefited the Duck Valley Indian Reservation if implemented, 3) when new developments are proposed for structures or infrastructure and pre-disaster mitigation planning can be implemented to reduce future development losses, and 4) as new scientific data becomes available to cast new understandings about natural disasters on the Duck Valley Indian Reservation leading to increased understanding of risk exposure.

This monitoring of the Duck Valley Indian Reservation Tribal Hazards Mitigation Plan will serve to manage disaster preparedness as an ongoing effort, not a static five-year blueprint that cannot be modified. It should be continually updated and improved so that when the five-year life of this document expires, and it is updated for another five-year cycle, the growth of the hazard mitigation plan can continue to benefit the residents and visitors to the Duck Valley Indian Reservation.

Tribal Hazards Mitigation Plan Progress Report (Annual & Periodic)			
Progress Report Period From (date):		To (date):	
Plan Title:	Duck Valley Indian Reservation Tribal Hazards Mitigation Plan		
Description of Plan:	Hazard Preparedness & Disaster Mitigation		
Implementing Agency:	Duck Valley Indian Reservation		
Contact Name:			
Contact E-mail and Number:			
Summary of Progress of Tribal Hazards Mitigation Plan for this Reporting Period			
1. Did any hazard / disaster events occur during this report period? If so, list events.			
2. Did anyone from the public comment on the plan during this reporting period? If so, list the comments.			
3. Were any mitigation projects identified in the Hazard Mitigation Plan implemented during this reporting period?			
4. What obstacles, problems, or delays did any current or ongoing mitigation projects encounter, if any? How were the problems resolved?			

PLAN MAINTENANCE

Annual Review Questionnaire				
Project Title	**Questions**	**Yes**	**No**	**Comments**
PLANNING PROCESS	Are there internal or external organizations and agencies that have been invaluable to the planning process or to mitigation action?			
	Are there procedures (e.g., meeting announcements, plan updates) that can be done differently or more efficiently?			
	Has the Planning Team undertaken any public outreach activities regarding the THMP or a mitigation project?			
HAZARD ANALYSIS	Has a natural and/or human-caused disaster occurred in this reporting period?			
	Are there natural and/or human-caused hazards that have not been addressed in this THMP and should be?			
	Are additional maps or new hazard studies available? If so, what are they and what have they revealed?			
VULNERABILITY ANALYSIS	Do any new critical facilities or infrastructure need to be added to the asset lists?			
	Have there been changes in development trends that could create additional risks?			
CAPABILITY ASSESSMENT	Are there different or additional resources (financial, technical, and human) now available for mitigation planning?			
MITIGATION STRATEGY	Should new mitigation actions be added to the Implementation Strategy/Plan?			
	Are the mitigation actions listed in a community's Implementation Strategy/Plan appropriate for available resources?			

Individual Mitigation Project Progress Report			
Progress Report Period From (date):		**To (date):**	
Project Title and Project ID:			
Description of Project:			
Implementing Agency or Department:			
Contact Name:			
Contact E-mail and Number:			
Grant/Finance Administrator:			
Total Project Cost:			

7.5. Continued Public Involvement Program

The Shoshone-Paiute Tribes are dedicated to involving the public directly in review and updates of this Tribal Hazards Mitigation Plan. The Shoshone-Paiute Tribes' TERC Chairman and Emergency Manager are responsible for the annual review and update of the plan as advised in the “Recommendations” section of this document.

The Duck Valley Indian Reservation public will have the opportunity to provide feedback about the Tribal Hazards Mitigation Plan annually, coinciding approximately with the anniversary of the adoption of this plan. Copies of the Plan will be catalogued and kept at the Shoshone-Paiute Tribes' TERC Office. The existence and location of these copies will be publicized, including electronic copies. Instructions on how to obtain copies of the plan will be made available on the Shoshone-Paiute Tribes' Internet website and annually in a Sho-Pai News public notice article.

In addition, copies of the plan and any proposed changes will be posted on the Duck Valley Indian Reservation website, or other venue deemed appropriate by the Shoshone-Paiute Tribes' TERC Chairman. This information will also contain an e-mail address and phone number where people can direct their comments, ideas, and concerns.

A public meeting will be held as part of each annual evaluation or when deemed necessary by the Shoshone-Paiute Tribes' TERC Chairman. The meetings will provide the public a forum for expressing concerns, opinions, or ideas about the implementation of the Tribal Hazards Mitigation Plan. The Shoshone-Paiute Tribes' TERC Chairman will be responsible for using Tribal resources to publicize the annual public meetings and maintain public involvement through the webpage and Sho-Pai News articles.

Chapter 8. Information Citations

8.1. Acronyms and Abbreviations Used

8.2. Bibliography

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