PLUMAS COUNTY HMP

Hazard Mitigation Plan
2013 Update

PLUMAS COUNTY HAZARD MITIGATION PLAN (HMP)

An Update to the 2006 Plumas County MHMP

JUNE 2013

PREPARED FOR:
PLUMAS COUNTY

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Section 1. Introduction

Natural disasters cause death and injuries, as well as significant damage to our communities, businesses, public infrastructure, and environment. The impacts of these damages result in the displacement of people and tremendous costs due to response and recovery dollars, economic loss and burden. The Plumas County Hazard Mitigation Plan (HMP) is an effort undertaken by the County to mitigate the effects of natural hazards and return to "the norm" earlier with lessened impacts.

Hazard mitigation is defined by the Federal Emergency Management Agency (FEMA) as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event."

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. While natural disasters cannot be prevented from occurring, the effects of natural disasters can be reduced or eliminated through a well-organized public education and awareness effort, preparedness activities and mitigation actions.

After disasters, repairs and reconstruction are often completed in such a way as to simply restore to pre-disaster conditions. Such efforts expedite a return to normalcy; however, the replication of pre-disaster conditions results in a cycle of damage, reconstruction, and repeated damage. Hazard mitigation ensures that such cycles are broken and that post-disaster repairs and reconstruction result in increased resiliency for Plumas County.

1.1 *Background and Purpose*

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. Many disasters cause extreme burden to county governments and small communities throughout California. In an attempt to reduce the community burden, Plumas County developed the 2006 Multi-Hazard Mitigation Plan in concordance with the Disaster Mitigation Act of 2000 (DMA 2000), which provides the legislative basis for FEMA hazard mitigation planning requirements and funding before and after a hazard event. FEMA requires an update to a HMP every 5 years. In response, Plumas County elected to allocate funding from the 2008 Disaster Recover Initiative (DRI)[1] for the time and effort required to fulfill update cycle requirements.

Over the past 60 years, Plumas County has experienced numerous natural disasters; disaster proclamations, declarations, and recorded natural hazard events each provide a hazard footprint across Plumas County. This is important, as historic hazard events can help shape future mitigation planning and actions. Since 1975, 12 federally-declared disasters have been documented in Plumas County, including one drought, four severe storm events, five flooding events, and two fires. In addition to the federally-declared disasters, the California Emergency Management Agency's (Cal EMA) Emergency and

[1] Made available after statewide fires in 2008.

Disaster Proclamations/Executive Orders lists the 1996 torrential winds and rain, the 1980 April storms, and the 1969 severe storm events affecting Plumas County. Lastly, the Plumas County Board of Supervisors declared a Proclamation of Local Emergency as a result of the Chips Wildfire burning in Plumas National Forest in July 2012. Together, these natural hazard events provide a baseline understanding of the natural hazard risks surrounding life and property within Plumas County. This understanding of the nature of the risks gives a foundation for developing solutions to mitigate or eliminate potential impacts through public education and outreach, preparedness activities, and mitigation actions.

For those hazards that can be mitigated, Plumas County must be prepared to implement efficient and effective short and long-term actions where needed. The purpose of the Plumas County HMP Update is to provide the County with a blueprint for hazard mitigation action planning. Furthermore, the plan identifies resources, information, and strategies for risk reduction, and provides a tool to measure the success of mitigation implementation on a continual basis. The strategies identified in the HMP were developed with the following intentions:

- Risk reduction from natural hazards through a set of defined mitigation actions.
- Establishment of a basis for coordination and collaboration among participating agencies and public.
- Assisting in meeting the requirements of federal assistance programs.[2]

The HMP does not supersede any other county plans, including the County's General Plan, but rather enhances the County's ability to communicate and mitigate natural hazard risk. Information in this plan will be used to help guide and coordinate mitigation activities and decisions for County personnel. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions from natural hazards.

1.2 *Authority*

The Plumas County HMP is the official statement of the County's commitment to ensuring a resilient community; this plan serves as a tool to assist decision makers in mitigation activities. This plan update was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the *Federal Register* on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA) or DMA 2000.)

While the DMA emphasizes the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations establishes the requirements that local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288).

[2] The HMP is developed to ensure eligibility for federal and state disaster assistance, including Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation (PDM), Hazard Mitigation Grant Programs (HMGP), Flood Mitigation Assistance Program (FMA), and other hazard mitigation program dollars from across a wide range of state and federal funding opportunities.

As described in this plan, Plumas County is subject to many kinds of hazards; thus, access to these federal disaster assistance and hazard mitigation funding is vital to ensure a more resilient community.

1.3 *Plan Organization*

The HMP is organized into seven sections to reflect the logical procession of activities undertaken to develop the plan and includes all relevant documentation required to meet the necessary criteria for FEMA approval. Each section is briefly described below.

- **Section 2, Community Profile** describes the County's history, geography, topography, climate, population, economy, housing, and land use and development trends in Plumas County.
- **Section 3, What's New** provides background to the 2006 MHMP and the 2013 HMP Update and details the process undertaken by the HMP Update Planning Committee to review, assess, and update the 2006 Plumas County MHMP. This section also describes the changes and additions that have been identified to develop the updated plan.
- **Section 4, The Planning Process** describes the 10-Step HMP Planning Process, as well as the meetings and outreach activities undertaken to engage County officials, staff, and the public.
- **Section 5, Natural Hazard Risk Assessment** identifies and prioritizes natural hazards affecting Plumas County, and assesses the County's vulnerability from the identified hazards.
- **Section 6, Mitigation Strategy** identifies mitigation goals, assesses the County's capabilities to implement mitigation actions, reviews the status of previously identified mitigation actions, and identifies and prioritizes new mitigation actions.
- **Section 7, Plan Implementation and Maintenance** discusses plan adoption and implementation, as well as the process to monitor, evaluate, update, and maintain the HMP. This section also includes a discussion on continued public involvement.

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Section 2. Community Profile

The Community Profile summarizes the County's history and existing environmental and socioeconomic conditions in the unincorporated areas of the County. Environmental and socioeconomic factors include geography, topography, climate, population, economic, housing, and land use and development trends.

2.1 *History (Referenced from Plumas County General Plan)*

The area currently known as Plumas County has been a site for human activity since the Stone Ages approximately 8,000 to 10,000 years ago. As glaciers receded from the Sierra Nevada and the Cascades, humans migrated to the foothills and valleys protected by higher elevation. Since then, humans have become an integral part of the ecology in Plumas County. This is particularly apparent through documented use of fire to facilitate the propagation and gathering of plant species used for medicinal purposes, food, and other needs. Native peoples harvested or extracted and then processed stone, acorn, pine nut, basketry fiber, and other resources for their sustenance. This activity also resulted in visible alterations to the land and natural resources across Plumas County.

The Mountain Maidu were the last tribal group present in Plumas County when European migrants began to settle in the area. Some sources say the Mountain Maidu people have lived in various locations in Plumas County from hundreds to thousands of years and still do today. Other tribes, such as the Washoe and the Paiute, have also utilized the area but did not settle permanently. The existence of the Mountain Maidu people was disrupted in the 1850s by the gold-seeking miners, who, overnight, transformed Plumas County into a gold mining region. Rivers were diverted and ditches were dug to bring water from distant sources for mining purposes.

The North, Middle, and South forks of the Feather River were named in 1821 by Captain Luis Arguello as the Rio de las Plumas ("River of Feathers") after the Spanish explorer saw what looked like bird feathers floating in the water. "Plumas," the Spanish word for "feathers," later became the name for the county. The river and its forks were the primary sites of early mining activity, with many smaller camps located on their tributaries. Gold mining remained the main industry in the area for the next five decades. In March of 1854, Plumas County was formed from the eastern and largest portion of Butte County with the town of Quincy chosen as the county seat. A large part of Plumas County was carved off to form present day Lassen County in 1864, shortly after Plumas County annexed a small portion of Sierra County, which included the town of La Porte.

2.2 *Geography, Topography, and Climate*

Brief descriptions of the County's geography, topography, and climate are provided in the following discussions. This section provides an overview of existing environmental conditions that could influence the impacts of natural hazards on the County.

2.2.1 Geography

Plumas County is uniquely located at the northern end of the granitic Sierra Nevada where the range intersects with the volcanic Cascade Range. It is this geology that has laid the foundation for the diverse mineral resources and forest lands that are second only to the North Coast forests in production. Plumas County is also home to the largest high elevation valley-meadow complex in California, and is characterized by a large network of streams and rivers that are all part of the greater Feather River

Watershed. The Feather River Watershed is the largest watershed in the Sierra Nevada, and includes almost all of Plumas County. It contributes to the water supply of over 25 million Californians (60 percent of California's population).

The County has a total area of 2,613.48 square miles, of which 2,553.69 square miles is land and 59.79 square miles is water. It is bounded by Shasta County to the northwest; Lassen County to the north and east; Sierra County, Yuba County, and Butte County to the south; and Tehama County and Butte County to the west. Sixty-five (65) percent of the County's land area is public lands managed by the United States Forest Service, the majority of which falls within the Plumas National Forest and other areas within the Lassen, Toiyabe, and Tahoe National Forests. Additionally, the County contains a portion of the Lassen Volcanic National Park and is home to the Plumas Eureka State Park. Approximately 29 percent of the County's land area, or 482,908 acres, are privately-owned lands. Of the privately-owned lands, 33.4 percent are located within County planning areas. See Figure 2-1 for the location and extent of Plumas County.

2.2.2 Topography

Plumas County is topographically diverse. The elevation ranges from 1,180 feet in the Sierra Valley, to 8,376 feet in the Sierra Nevada range. The western portion of the County lies in the Sierra Nevada and is characterized by steep slopes, which become valleys and gentler rolling hills in the eastern portion of the County. This variation in topography has implications on the County's weather patterns, amount and type of precipitation, and overall vulnerabilities to natural hazards. Refer to Section 5.6 for the specific severe weather implications of Plumas County's varying topography.

2.2.3 Climate

Plumas County has a Mediterranean climate, with a mean annual temperature of 49 to 57 degrees Fahrenheit. Precipitation varies from 70 inches on the western slope to 12 inches on the eastern slope of the Sierra Nevada. Mean annual precipitation is 43 inches, which falls mostly as rain below 4,000 feet and as snow above 4,000 feet elevation.

2.3 *Socioeconomic Factors*

The population, economic, and housing factors in the unincorporated areas of Plumas County are described in this section. Understanding these socioeconomic factors is imperative to determining the potential impacts a natural hazard event can have on the County's population and economy.

2.3.1 Population

According to the 2010 U.S. Census Data, Plumas County's total population is 20,007 residents. Plumas County is one of California's most rural counties with 7.8 people per square mile, and is one of three counties in California to have experienced a loss in population over the past 10 years. Population within Plumas County in generally concentrated in the high mountain valleys. These areas include Sierra, American and Indian Valley. See Figure 2-2 for population distribution. Portola is the only incorporated city in the County, with a population of 2,104 and East Quincy, a census designated place, has the highest total population in the County with 2,489 residents.

The racial makeup of Plumas County is primarily White (89 percent). African-Americans make up 1.0 percent of Plumas County's population, while Native Americans make up 2.7percent of the population.

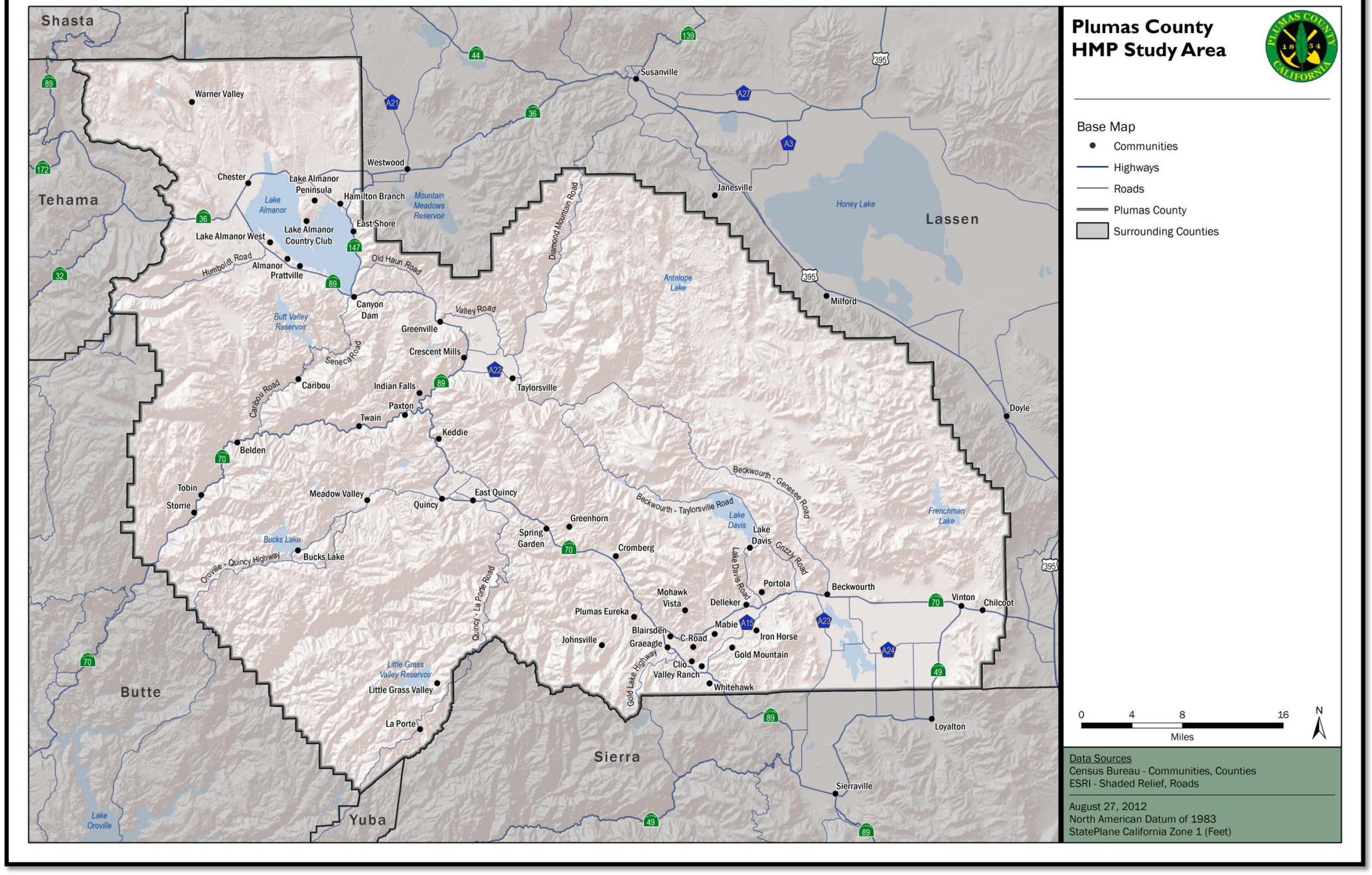
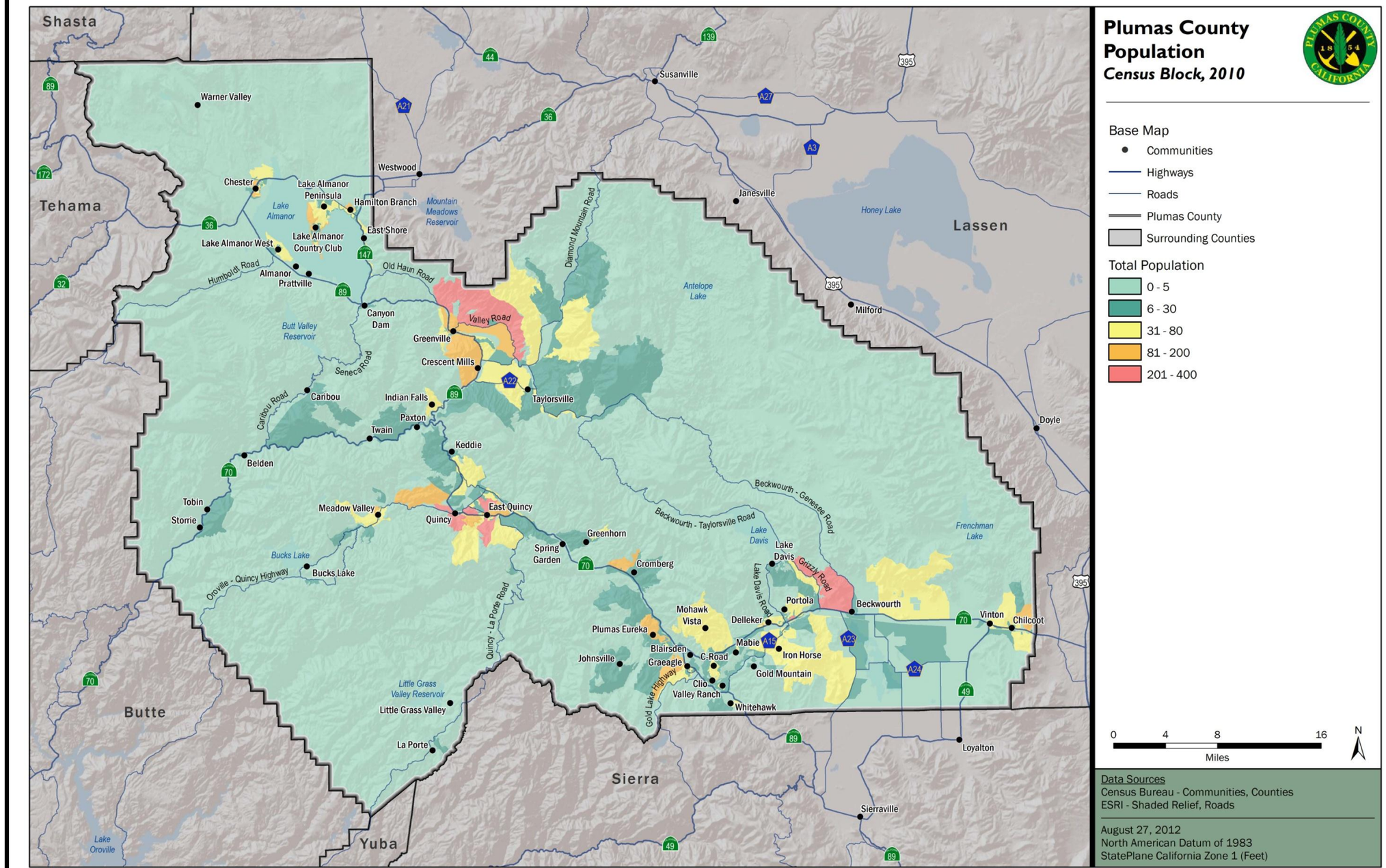


Figure 2-1: HMP Study Area



Plumas County Population

Census Block, 2010

Base Map
- Communities
- Highways
- Roads
- Plumas County
- Surrounding Counties

Total Population
- 0 - 5
- 6 - 30
- 31 - 80
- 81 - 200
- 201 - 400

0 4 8 16 Miles

N

Data Sources
Census Bureau - Communities, Counties
ESRI - Shaded Relief, Roads

August 27, 2012
North American Datum of 1983
StatePlane California Zone 1 (Feet)

Figure 2-2: Plumas County Population (2010) by Census Block

2.3.2 Employment

According to the 2007-2011 American Community Survey, U.S. Census Data, there are 16,864 people over 16 years of age, of which 9,272 are in the labor force. Out of the 9,272 people in the labor force, 7,948 are employed, and 1,319 are unemployed. Of the employed population 34.6% work in management, business science, and arts occupations; 23% work in service occupations; 18.6% work in sales and office occupations; 14.4% work in natural resources, construction, and maintenance; and 9.4% work in production, transportation, and material moving occupations. The median household income in Plumas County is $44,151.

The biggest industry type with respect to employers in the area (27.2%) is currently educational services, health care, and social services. Some of the largest employment centers in the County include:

- Plumas County Government
- Union Pacific Railroad
- Sierra Pacific Industries (Private Mill)
- National Forest Service
- California Fish and Game
- 3 – Local Hospitals
    - Quincy - Plumas District Hospital
    - Chester - Seneca District Hospital
    - Portola - Eastern Plumas District Hospital
- Feather River College

2.3.3 Housing

According to the 2007-2011 American Community Survey, U.S. Census Data, there are 15,501 housing units in Plumas County. Of the total housing units, 9,434 are occupied and 6,067 are vacant. Plumas County has a significant transient or "snowbird" population, which means many of the residents are not permanent and either own second homes or only live in Plumas County seasonally. For this reason, the housing vacancy rate is more accurate during the off-season (i.e. winter) months of the year. The majority of homes in Plumas County (79.6%) are 1-unit detached homes. The second largest type is mobile homes, which make up 10.4% of the total housing stock. The majority of homes in Plumas County are also owner-occupied (69.9%), with the remaining 30.1% categorized as renter-occupied units. On average, 97.2% of housing units have one occupant or less per room. Of the housing stock, approximately 26.8% are worth $300,000-$500,000 and 25.3% are worth $200,000-$300,000 in value.

2.4 *Land Use and Future Expansion Areas*

This section describes the land use and development trends in Plumas County. Information in this section can be used to help guide and coordinate future mitigation activities and decisions for anticipated development. The General Plan (GP) designates land uses throughout the County, including the unincorporated areas. The GP describes four planning areas and an Expansion Area (Town or Community). These planning areas are described below.

Towns are places where the highest complement of public infrastructure and services are available or can be made available. Such services consist of community water service, community sewer service, maintained year-round roads, fire, police and emergency medical services. In addition, towns serve as both the commercial and public services hubs for both local residents as well as surrounding communities. Representative areas include Chester, Lake Almanor Peninsula/Hamilton Branch, Greenville, East Quincy, Quincy, Graeagle, Delleker, and the City of Portola.

Communities are places where some public infrastructure and services are available. Few commercial services are present and these services generally are of the type, size, and scale that serve local residents. Representative areas include Crescent Mills, Taylorsville, Clio, Beckwourth, Vinton/Chilcoot and La Porte.

Rural Places are defined as having little to no public infrastructure and services. If commercial services are present they tend to be small and often seasonal. Rural places may also consist of a grouping of homes. Planning area and rural place boundaries may be one in the same. There is little or no identified expansion area. Representative areas include Prattville, East Shore of Lake Almanor, Canyon Dam, Indian Falls, Keddie, Meadow Valley, Spanish Ranch, Tollgate, Bucks Lake, Twain, Belden, Tobin, Greenhorn Ranch, Sloat/Cromberg, Blairsden, C-Road, Mohawk Vista, Lake Davis and Little Grass Valley.

Master Planned Community boundaries have been described or prescribed through their approvals and/or environmental documentation. The planning area and master planned community boundary are one in the same. There is no identified expansion area, as development potential has been specifically defined. Representative areas include Lake Almanor West, Gold Mountain, Valley Ranch, Grizzly Ranch and Whitehawk Ranch.

Expansion Area (Town or Community) is an area delineated within the General Plan Land Use Map that identifies potential future expansion of a Town or Community Boundary to accommodate additional growth, based upon the ability to provide services to the area.

Table 2-1 provides a breakdown of the General Plan land use designations by towns, communities, rural places, master planned communities, City of Portola Sphere of Influence, and expansion areas in Plumas County. The majority of Plumas County's land remains in protected National Forest (65 percent); however, a majority of the remaining land (16,033.17 acres) is designated as "town" in the General Plan. Within towns, single-family residential makes up the largest land use at approximately 6,752.41 acres. Resorts and recreation (2,172.28 acres) and commercial (1,018.66 acres) land uses also make up a significant portion of towns. Communities are similar to towns in terms of their overall land use, but at a much smaller scale. Generally, there is more suburban housing and less commercial and retail services, as well as public infrastructure. Rural areas are characterized by rural housing, suburban housing, and secondary suburban housing. With little to no public services, rural areas have a significant amount of timber resource land (1,174.87 acres) and general open space.

Table 2-1: General Plan Land Use Designations (Acres)

Land Use Type	Towns	Communities	Rural Places	Master Planned Communities	City of Portola Sphere of Influence	Expansion Areas
Significant Wetlands	38.07	n/a	3.56	n/a	n/a	0.77
Agricultural Preserve	3.42	11.78	13.38	217.43	949.34	786.98
Agriculture and Grazing	56.95	2.46	71.96	0.00068	n/a	65.77
Timber Resource Land	239.3	0.02	1,174.87	152.09	40.3	3,288.07
Mining Resource	53.36	n/a	4.78	n/a	76.46	128.05
Single-Family Residential	6,752.41	467.01	539.94	482.93	119.77	66.22
Multiple-Family Residential	677.61	3.97	0.00000022	n/a	2.1	7.93
Rural Residential	609.4	0.73	2,100.22	n/a	283.65	3,568.14
Suburban Residential	104.45	197.13	1,194.66	1,457.75	317.82	4,192.20
Secondary Suburban Residential	292.29	56.99	4,383.74	1,692.84	922.1	5,953.03
Limited Access Rural Residential	0.79	n/a	115.71	0.47	7.22	430.29
Commercial	1,018.66	128.69	44.1	0.67	51.41	525.26
Industrial	523.99	128.36	177.34	5.05	179.36	1,237.92
Resort and Recreation	2,172.28	41.95	713.26	126.94	15.27	908.64
Lake	0.06	n/a	14.08	0.02	n/a	n/a
City of Portola	3,490.13	n/a	n/a	n/a	0.0038	n/a
Total Acres	**16,033.17**	**1,039.09**	**10,551.60**	**4,136.19**	**2,964.80**	**21,159.27**

Also, Table 2-1 shows that the largest land use designation expansion is expected to be rural residential, suburban residential, and secondary suburban residential. Another significant expansion area noted in the General Plan is timber resource land; this land use designation is expected to increase by 3,288.07 acres. See Figure 2-3 for general land use across Plumas County.

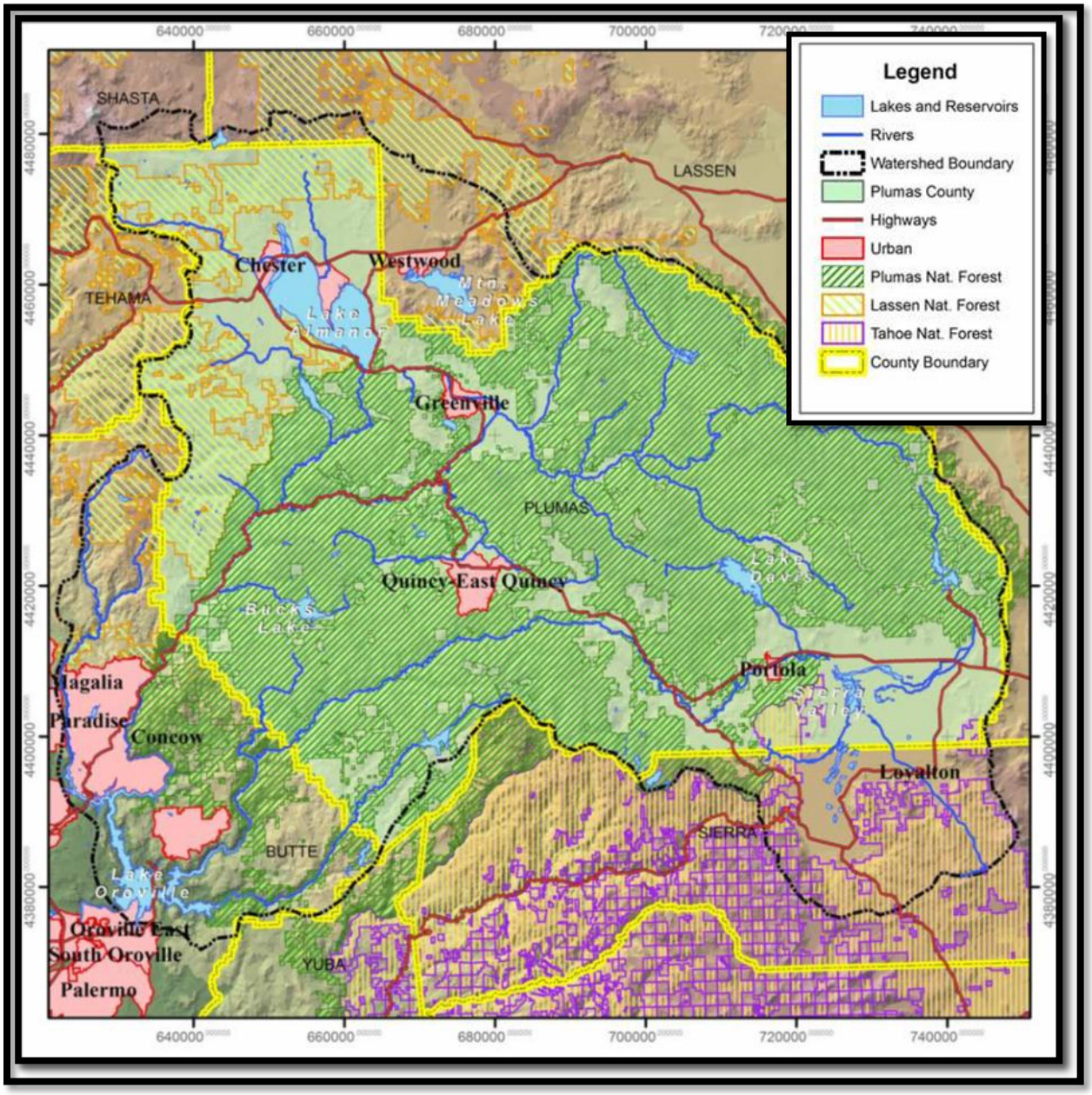


Figure 2-3: Plumas County General Land Use

Section 3. What's New

This section of the plan includes background information on the 2006 MHMP and the 2013 HMP Updates. The 2006 Mitigation Actions have been changed, updated, and revised to reflect new priorities in the 2013 HMP. The sections below describe the background and planning process for 2013 changes and updates.

3.1 *2006 MHMP and 2012 HMP Update Background*

On September 13th, 2005, Plumas County adopted their first Hazard Mitigation Plan as required by the DMA 2000. The 2006 MHMP focused on the incorporated and unincorporated areas of the County and provided a high-level overview of the hazards affecting the County. The hazards identified in the 2006 MHMP included flooding, winter storms, wildfire, drought, hazardous materials, dam failure, earthquake, and terrorism. The plan also included a vulnerability assessment and mitigation actions to decrease the impacts of these hazards on the County.

The mitigation actions in the 2006 MHMP focused on six classifications. These classifications include:

1. Preventative Activities – intended to reduce a County's vulnerability to future hazard events through the implementation of codes and regulations.
2. Property Protection – intended to protect existing structures by retrofitting, relocating or modifying the structure to withstand a hazard event.
3. Natural Resources Protection – to reduce the effects of hazards on the natural resources within a region by preserving and/or restoring natural areas along with their mitigation functions.
4. Structural Projects – reduce the impacts of a hazard event by modifying the physical environment to withstand the particular hazard.
5. Emergency Services – to minimize the impact of a hazard by preparing these services to respond efficiently and rapidly during and after a hazard event.
6. Public Information and Awareness – to advise residents, potential buyers and visitors about hazards, potentially hazardous areas and mitigation techniques.

3.2 *Successful Mitigation Activities Since 2006*

The 2006 Plumas County MHMP, adopted and approved by Plumas County Board of Supervisors, Cal EMA and FEMA, has been implemented through various on-going projects, plans and programs. In regards to the mitigation action items and strategy developed in 2006, Plumas County has been making significant improvements toward lowering natural hazard risk to life and property within the county. Significant risk reduction efforts have been made for floodplain management, flood damage prevention, and fire hazard abatement. These successful policies, programs, and projects are summarized below.

3.2.1 Floodplain Management

In 2011, at the request of the County, FEMA tasked the California Department of Water Resources (DWR) to conduct detailed hydrologic and hydraulic analyses of flood hazards in the Sierra Valley, impacting both Sierra County and Plumas County. This study is currently in progress, and preliminary results have already been identified. Upon approval of the completed analyses through an independent

review, FEMA will initiate the process of updating the relevant FEMA Flood Insurance Rate Map (FIRM) panels. . The extent of the Sierra Valley study is depicted in the work map (Figure 3-1) provided. For further details on the new FEMA projects located within Plumas County Visit:

http://www.r9map.org/Pages/ProjectDetailsPage.aspx?choLoco=32&choProj=252

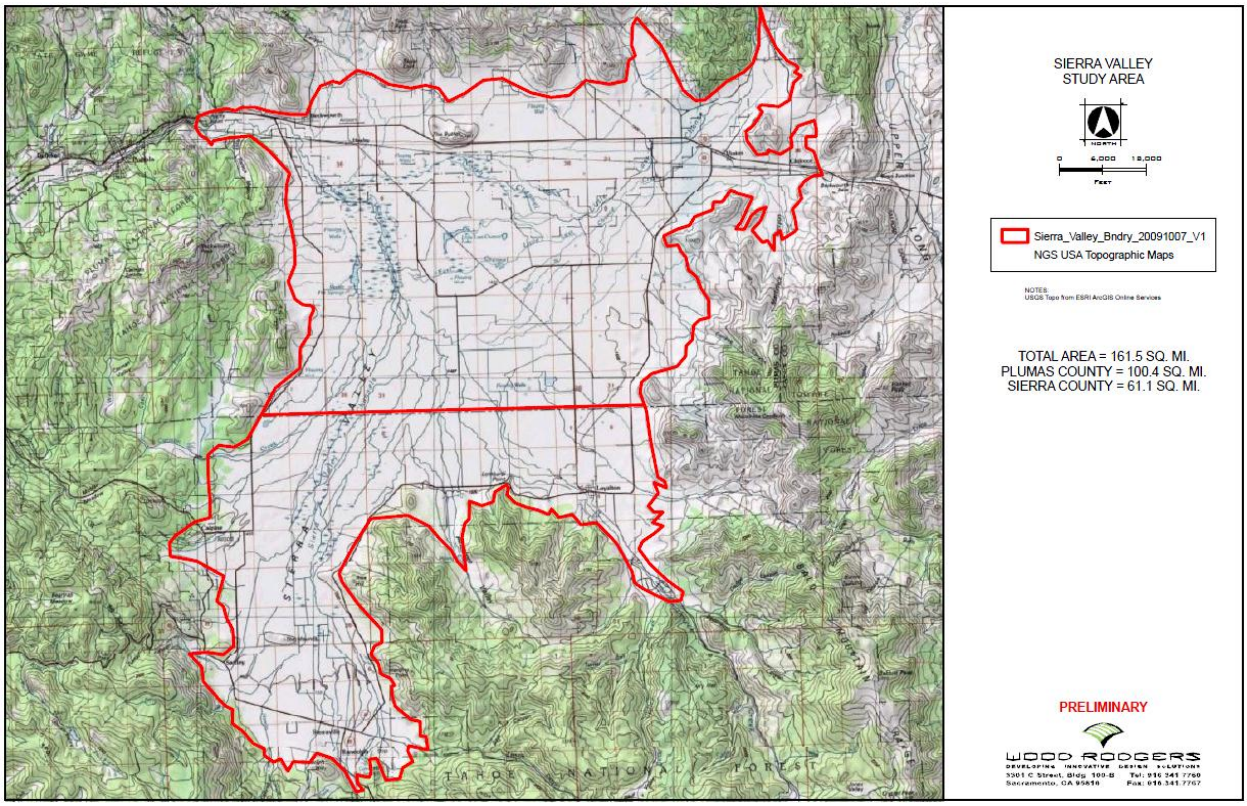


Figure 3-1: FEMA Sierra Valley Study Area

3.2.2 Building and Construction Codes for Flood and Climate Hazard Abatement

As a result of the 2006 MHMP, Plumas County has adopted and enforces new building codes and regulations that protect new development and buildings from flooding. These codes are described below:

3.2.2.1 Section 8-1.07 – Amendment of Section 1057 of the California Building Code: Ice Dam Protection

Since 2008, Plumas County requires additional flashing for ice dam protection and areas subject to wind-driven snow or roof ice buildup due to the severe climate. The following requirements satisfy the ice dam flashing requirements:

a. At eaves: An approved self-adhering, polymer-modified, bituminous sheet (or approved equal) shall be applied from eaves up the roof sheathing to a point of at least thirty inches (30") inside the exterior wall line (plate line) measured along the plane of the roof. When the roof overhang at the eaves is in excess of thirty inches (30"), such as covered porches, the ice dam flashing is

required to extend only thirty inches (30") below the exterior wall line measured along the plane of the roof.

b. At valleys: An approved self-adhering, polymer-modified, bituminous sheet (or approved equal) shall be applied the full length of all valleys, extending thirty inches (30") each side of the valley centerline.

c. At pitch changes: An approved self-adhering, polymer-modified, bituminous sheet (or approved equal) shall be applied the full length of all pitch changes (steeper to less steep only) and shall extend a minimum of thirty inches (30") above and thirty inches (30") below the pitch change. The lower edge of the material shall be applied shingle fashion to the roofing paper (sub-base roofing felt) for roof deck protection.

d. Exceptions: Subdivisions (a) through (c) above shall not apply:
    1. When located totally above unheated spaces (i.e., garages, porches, breezeways, carports, etc.);
    2. At eaves for metal roofing;
    3. At pitch changes for metal roofing when the metal roof sheathing is installed without any seams, laps, or splices at the pitch change; or,
    4. On built-up roofing.

3.2.2.2 Section 8-1.08 – Amendment of Section 1805 of the California Building Code: Frost Depth Required

Section 1805 of the California Building Code is amended by the addition of the following paragraph, which amends section 1805.2.1(1) by the addition of the following:

Since 2008, Plumas County requires footings and foundations to be of a depth sufficient to prevent disturbance due to frost because of the severe winter climatic conditions. Footings and foundations shall be constructed of masonry, concrete, or approved treated wood, per Chapter 18, Volume 2 of the California Building Code. All footings and foundations shall be placed a minimum of twelve inches (12") into native undisturbed soil and shall have a total depth of not less than eighteen inches (18") below finish grade unless another depth is recommended by a foundation investigation.

3.2.2.3 Section 9-4.606 – Construction Standards

Since, 2006, the structural section of the roadbed shall conform to the following thicknesses, or alternative thicknesses, utilizing the California Design Method and approved by the Public Works Director.

c. Culverts. Necessary culverts shall be installed before applying sub-base or base rocks, and the backfill shall be compacted to a relative compaction of at least ninety (90%) percent. The minimum size of culvert shall be eighteen (18") inches by eleven (11") inches arch or fifteen (15") inches round. If concrete culvert pipe is used, that part under the roadbed shall be the reinforced heavy wall type. Culverts shall have a minimum cover of twelve (12") inches below the surface. Culverts shall be located and sized in conformance with an engineered drainage plan for the road.

3.2.3 Fire Protection

In 2008, Plumas County adopted a section of the California Fire Code to reduce fire hazard risk on existing properties and for new construction.

3.2.3.1 Section 8-1.09 – Enforcement of Section 112.1.1 of the California Fire Code

Since 2008, Plumas County hereby appoints the Building Official to enforce Fire, Life Safety Standards of the State Fire Marshal for R-3's including egress windows, sprinklers, exits, smoke detectors, and Wildland Urban Interface Safety, per Section 111.2 of the California Fire Code.

3.2.4 Mitigation Projects Since 2006

Between 2006 and 2012, a number of mitigation projects have been initiated by various County departments. Mitigation projects include flood proofing, drainage maintenance, and fuel reduction. This section highlights these mitigation efforts.

3.2.4.1 Public Works Improvements

3.2.4.1.1 Humbug Road:

In the summer of 2000, a large wildfire started by a Union Pacific Railroad maintenance crew burned onto lands of the Lassen and Plumas National Forests. The railroad was found at fault for starting the Storrie Fire and was ordered to pay the National Forest Service a settlement. The monies are to be spent primarily on the restoration of the fire burn area. Plumas County Road 307 known as the "Humbug Road," was, and still is, the primary access into the fire burn area.

The Humbug Road project involved improving drivability and reducing watershed impacts of the Humbug County Road, a native surface road requiring maintenance to decrease impacts to watershed. The project included, among various treatments, replacing and adding drainage culverts and adding aggregate surfacing. The Plumas County Public Works Department provided time and material for the construction and upgrade of drainage facilities in the project area. There were 21 pipes placed in a four-mile section of the road and typical work consisted of:

- Trenching across road sections
- Placing a corrugated metal pipe (cmp) for drainage
- Backfilling around trench locations
- Rocking the inlet and outlet of each pipe section

3.2.4.1.2 Big Creek Road Improvements

To improve drainage and reduce risk of road washout, a 102-foot long bridge replacement project over Grizzly Creek was implemented in 2012. See Figure 3-4 and Figure 3-5. The bridge was constructed with precast concrete girders with a cast-in-place concrete deck. The remainder of the work in this segment consists mostly of pavement rehabilitation with some drainage improvements. See Figure 3-4 and Figure 3-5 for before and after photos.

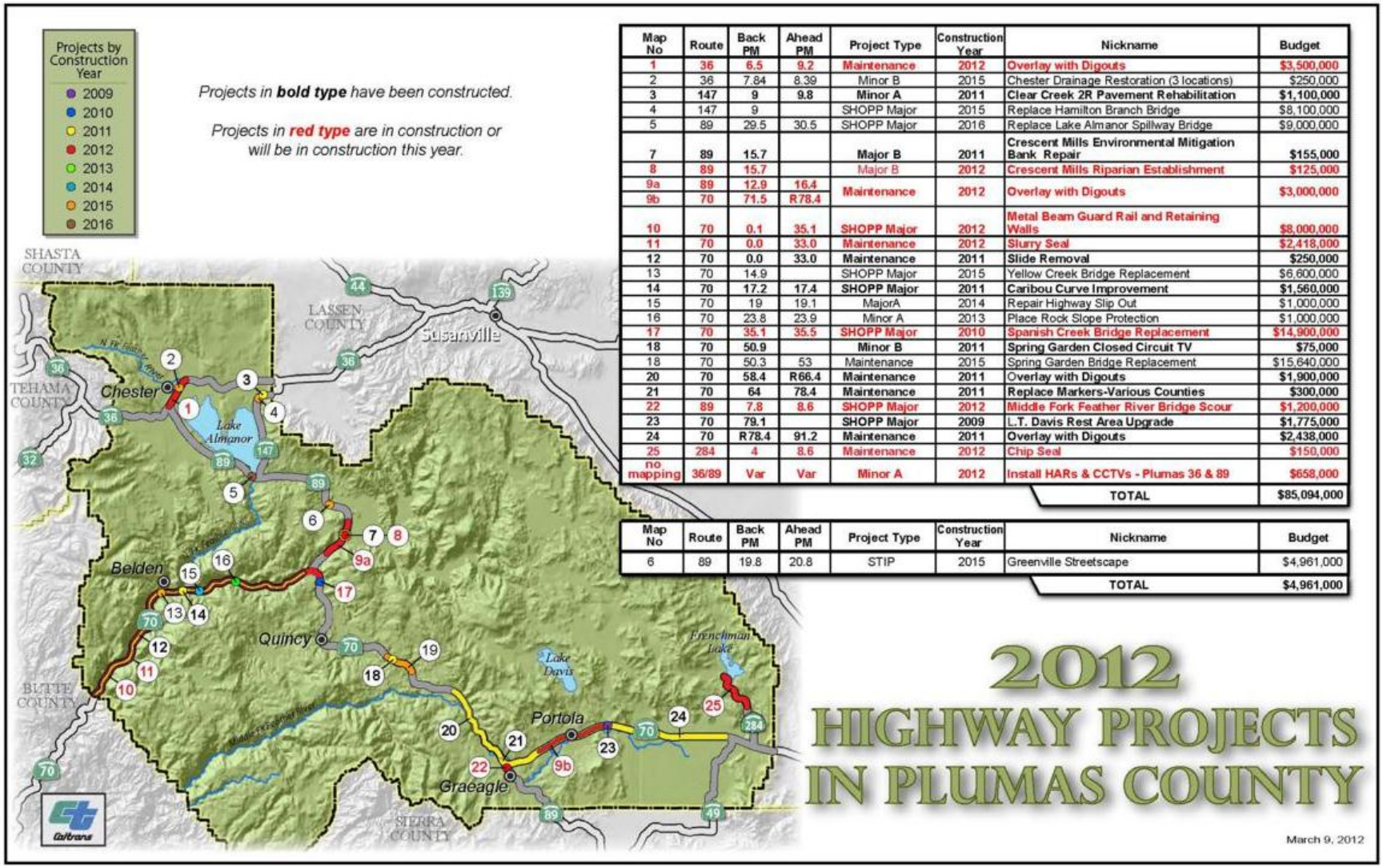
Mention the More Cal Trans and other Mitigation Projects Here!!!!

Figure 3-2: Humbug Road (Storrie Fire Access Road) Prior to Improvements

Figure 3-3: Humbug Road after Improvements

Figure 3-4: Grizzly Creek Bridge before Replacement

Figure 3-5: Grizzly Creek Bridge Replacement in Progress



Map No	Route	Back PM	Ahead PM	Project Type	Construction Year	Nickname	Budget
1	36	6.5	9.2	Maintenance	2012	Overlay with Digouts	$3,500,000
2	36	7.84	8.39	Minor B	2015	Chester Drainage Restoration (3 locations)	$250,000
3	147	9	9.8	Minor A	2011	Clear Creek 2R Pavement Rehabilitation	$1,100,000
4	147	9		SHOPP Major	2015	Replace Hamilton Branch Bridge	$8,100,000
5	89	29.5	30.5	SHOPP Major	2016	Replace Lake Almanor Spillway Bridge	$9,000,000
7	89	15.7		Major B	2011	Crescent Mills Environmental Mitigation Bank Repair	$155,000
8	89	15.7		Major B	2012	Crescent Mills Riparian Establishment	$125,000
9a	89	12.9	16.4	Maintenance	2012	Overlay with Digouts	$3,000,000
9b	70	71.5	R78.4				
10	70	0.1	35.1	SHOPP Major	2012	Metal Beam Guard Rail and Retaining Walls	$8,000,000
11	70	0.0	33.0	Maintenance	2012	Slurry Seal	$2,418,000
12	70	0.0	33.0	Maintenance	2011	Slide Removal	$250,000
13	70	14.9		SHOPP Major	2015	Yellow Creek Bridge Replacement	$6,600,000
14	70	17.2	17.4	SHOPP Major	2011	Caribou Curve Improvement	$1,560,000
15	70	19	19.1	MajorA	2014	Repair Highway Slip Out	$1,000,000
16	70	23.8	23.9	Minor A	2013	Place Rock Slope Protection	$1,000,000
17	70	35.1	35.5	SHOPP Major	2010	Spanish Creek Bridge Replacement	$14,900,000
18	70	50.9		Minor B	2011	Spring Garden Closed Circuit TV	$75,000
18	70	50.3	53	Maintenance	2015	Spring Garden Bridge Replacement	$15,640,000
20	70	58.4	R66.4	Maintenance	2011	Overlay with Digouts	$1,900,000
21	70	64	78.4	Maintenance	2011	Replace Markers-Various Counties	$300,000
22	89	7.8	8.6	SHOPP Major	2012	Middle Fork Feather River Bridge Scour	$1,200,000
23	70	79.1		SHOPP Major	2009	L.T. Davis Rest Area Upgrade	$1,775,000
24	70	R78.4	91.2	Maintenance	2011	Overlay with Digouts	$2,438,000
25	284	4	8.6	Maintenance	2012	Chip Seal	$150,000
no mapping	36/89	Var	Var	Minor A	2012	Install HARs & CCTVs - Plumas 36 & 89	$658,000
						TOTAL	$85,094,000

Map No	Route	Back PM	Ahead PM	Project Type	Construction Year	Nickname	Budget
6	89	19.8	20.8	STIP	2015	Greenville Streetscape	$4,961,000
						TOTAL	$4,961,000

Figure 3-6: Caltrans 2012 Highway Projects

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3.2.4.2 Wildland Fire Mitigation

The Plumas County Fire Safe Council, along with CAL FIRE, State Parks, the Natural Resources Conservation Service, the Herger Feinstein Quincy Library Group, and Industrial Timberlands, has completed and is in the process of planning a number of fuel reduction/fire mitigation projects. Due to wildfire suppression and historic land management practices, unnaturally high accumulations of biomass have collected in the surrounding forests, which can lead to wildfires in ecosystems where such fires were once rare. Thus, Plumas County has proposed activities to reduce forest biomass fuels by manually removing forest debris and small shrubs that contribute to the spread of wildfire. Fuel reduction projects are critical to protecting citizens and natural resources from wildfire threats. Refer to Figure 3-9 for all fuel reduction projects completed up to April 24, 2012.

A typical fuel reduction project requires coordination with land owners and the treatment of anywhere from a few to several hundred acres of forest land. Two Plumas County fuel reduction projects are summarized below.

3.2.4.2.1 Indian Falls Community HFR (Hazardous Fuel Reduction) Defense Zone

This project involved the treatment of 50 acres of hazardous fuels in the Indian Falls community common areas. The project was initiated by the Plumas County Fire Safe Council and was completed in December 2006 by Brian Weyland, a contractor with Weyland Resources. The total cost of the project was $56,800. Refer to Figure 3-7 for the subject parcels in Indian Falls.

3.2.4.2.2 Whitehawk Ranch Community Fuel Reduction

This project involved the treatment of approximately 100 acres of hazardous fuels within the Whitehawk Community. The project was initiated by the Plumas County Fire Safe Council and was completed in October 2007 by contractors Pete Thill and Paul Rouen. Refer to Figure 3-8 for the subject parcels in Indian Falls.

Figure 3-7: Indian Falls Community – After HFR project

Figure 3-8: Whitehawk Ranch Fuel Reduction Before and After

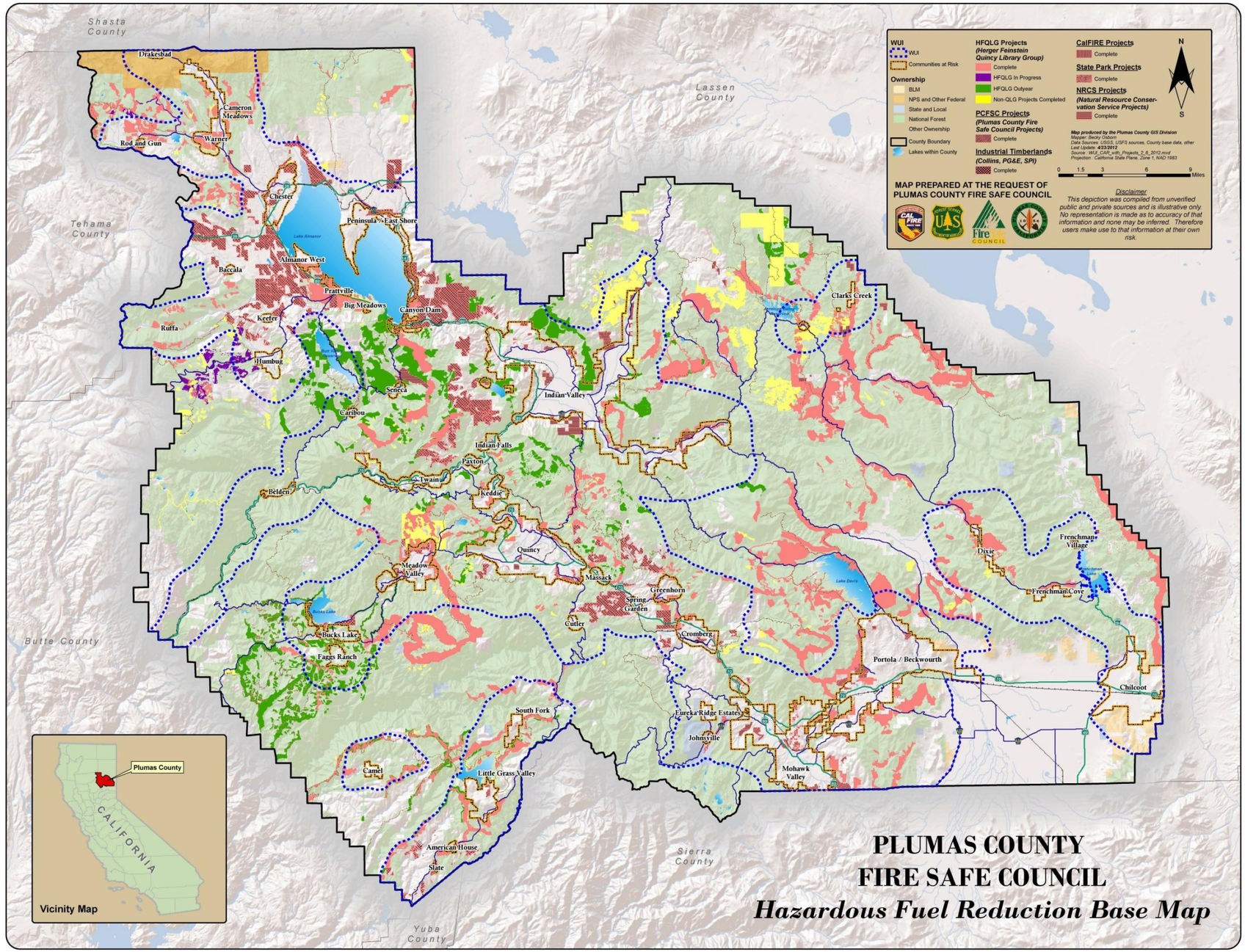

Figure 3-9: Plumas County Hazardous Fuel Reduction Projects

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3.3 *What's New in the HMP Update*

For the 2013 HMP Update, the Plumas County HMP Planning Committee reviewed and analyzed the 2006 MHMP. This included the review of the planning process, historical disasters, hazard and risk assessment, mitigation goals, mitigation actions, and plan maintenance and updating process sections.

In coordination with the HMP Update Planning Committee, the HMP Update Project Team decided to completely revamp 2013 HMP document with Plumas County-specific hazard information to fully capture the County's unique hazard environment and focus limited resources on relevant mitigation efforts. Table 3-1: Changes to the Plan Components, details the changes incorporated into the 2013 Plumas County HMP. These changes include an expanded community profile, extensive public outreach strategy, in-depth hazard profiles, detailed risk assessments including detailed overlay analysis, specific mitigation actions, and a specific maintenance and updating process for the next five years.

Table 3-1: Changes to the Plan Components

2006 Plumas County MHMP Sections	Changes Incorporated into the updated HMP
Introduction	▪ The 2013 HMP includes an expanded community profile section with updated demographic and other County-specific data to inform readers of the changes in the planning area. This is important, as hazard mitigation can be conducted early and ahead of population growth and future development.
Planning Process	▪ In order to meet DMA 2000 criteria, the 2013 HMP includes detailed documentation about the planning process. The 2013 HMP planning process, its participants, and the meetings/workshops conducted have been thoroughly documented to meet FEMA requirements. See Section 4 and Appendix B. ▪ Also included as part of the planning process is the documentation of the public outreach strategy and public participation in the plan development. See Section 4 and Appendix B
Historical Disasters	▪ Historical disaster information has been updated since the adoption of the 2006 MHMP. New information from the public, as well as the Plumas County Historical Museum, is now included as part of the hazard profiles. See information and photos throughout Section 5. ▪ The HMP now includes disasters that were not federally-declared in Plumas County, but resulted in substantial losses and damages to the County. This addition is specifically related to the 2012 Chips Fire, which caused significant damage in the County. Please refer to Section 5.3 for more information.

2006 Plumas County MHMP Sections	Changes Incorporated into the updated HMP
Hazard Profile and Risk Assessment	▪ The 2006 Plumas County MHMP hazards have been updated and changed based upon Planning Committee priorities, FEMA guidance, and risk assessment outcomes. ▪ The 2006 Plumas County HMP hazard profiles and risk assessments have been updated with new and current data from the County. ▪ Potential impacts to the County from identified hazards have been described in terms of exposure analysis of population, County parcel values, and critical facilities in the County. This was done to aid hazard mitigation planners to compare hazard risk for each hazard and provide data on how exposure to populations and assets change with each hazard. See Section 5 for more information on hazard risk and the related exposure.
Goals, Objectives and Mitigation Actions	▪ To meet FEMA requirements, the Planning Committee reviewed the 2006 MHMP goals and determined current day validity. Due to changes in County priorities, goals and objectives have been updated to meet the current hazard environments. ▪ The HMP now includes an expanded County-specific capabilities assessment for implementing the mitigation actions. By understanding capabilities to conduct mitigation actions within the County, the Planning Committee developed mitigation actions that meet current-day and near-term resources. ▪ The 2013 HMP includes detailed mitigation actions based upon the risk assessment and capabilities to carry out mitigation actions over the next 5 years. Newly identified and prioritized County-specific mitigation actions can be found in Section 6. ▪ The 2013 HMP now includes an expanded implementation strategy for selected mitigation actions. Implementation strategies provide a detailed step-by-step process for which mitigation champions throughout the County can follow when implementing mitigation actions. Implementation strategy worksheets can be found in Appendix D.
Plan Maintenance and Updating Process	▪ Following FEMA guidance, the 2013 HMP provides expanded plan maintenance and update processes. This is done to provide the County mitigation champions and administrators a consistent method to update and report on plan progress and successes, and/or difficulties in implementing mitigation actions. See Section 7 for more information. ▪ The 2013 HMP now includes plan monitoring and evaluation progress reporting forms which will be updated on an annual basis. The Annual Review Questionnaire and Mitigation Action Progress Report forms will assist the monitoring and evaluation process and reduce the burden of future plan updates. Reporting forms can be found in Appendix E.

Section 4. The Planning Process

This section describes each stage of the planning process used to develop the 2013 Plumas County HMP. The HMP planning process provides a framework for document development and follows the FEMA recommended steps. The Plumas County HMP follows a prescribed series of planning steps which includes organizing resources, assessing risk, developing the mitigation plan, drafting the plan, reviewing and revising the plan, and adopting and submitting the plan for approval. Each is described in this section.

4.1 *Planning Process*

Hazard mitigation planning in the United States is guided by the statutory regulations described in the DMA 2000 and implemented through 44 Code of Federal Regulations (CFR) Part 201 and 206. FEMA's HMP guidelines outline a four-step planning process for the development and approval of HMPs. Table 4-1 lists the specific CFR excerpts that identify the requirements for approval.

Table 4-1: DMA 2000 CFR Breakdown

DMA 2000 (44 CFR 201.6)	Plan Section
(1) Organize Resources	**Section 4**
201.6(c)(1)	Organize to prepare the plan
201.6(b)(1)	Involve the public
201.6(b)(2) and (3)	Coordinate with other agencies
(2) Assess Risks	**Section 5**
201.6(c)(2)(i)	Assess the hazard
201.6(c)(2)(ii) and (iii)	Assess the problem
(3) Develop the Mitigation Plan	**Section 6**
201.6(c)(3)(i)	Set goals
201.6(c)(3)(ii)	Review possible activities (actions)
201.6(c)(3)(iii)	Draft an action plan
(4) Plan Maintenance	**Section 7**
201.6(c)(5)	Adopt the plan
201.6(c)(4)	Implement, evaluate, and revise

For the development of the updated Plumas County HMP, a planning process was customized to address Plumas County's unique population and demographic. However, all the basic federal guidance documents and regulations are met through the customized process. As shown in Figure 4-1, the HMP planning process (and documented in the corresponding sections) included organizing resources, assessing risk, developing the mitigation action strategy, drafting the plan, reviewing and revising the plan, and adopting and submitting the plan.

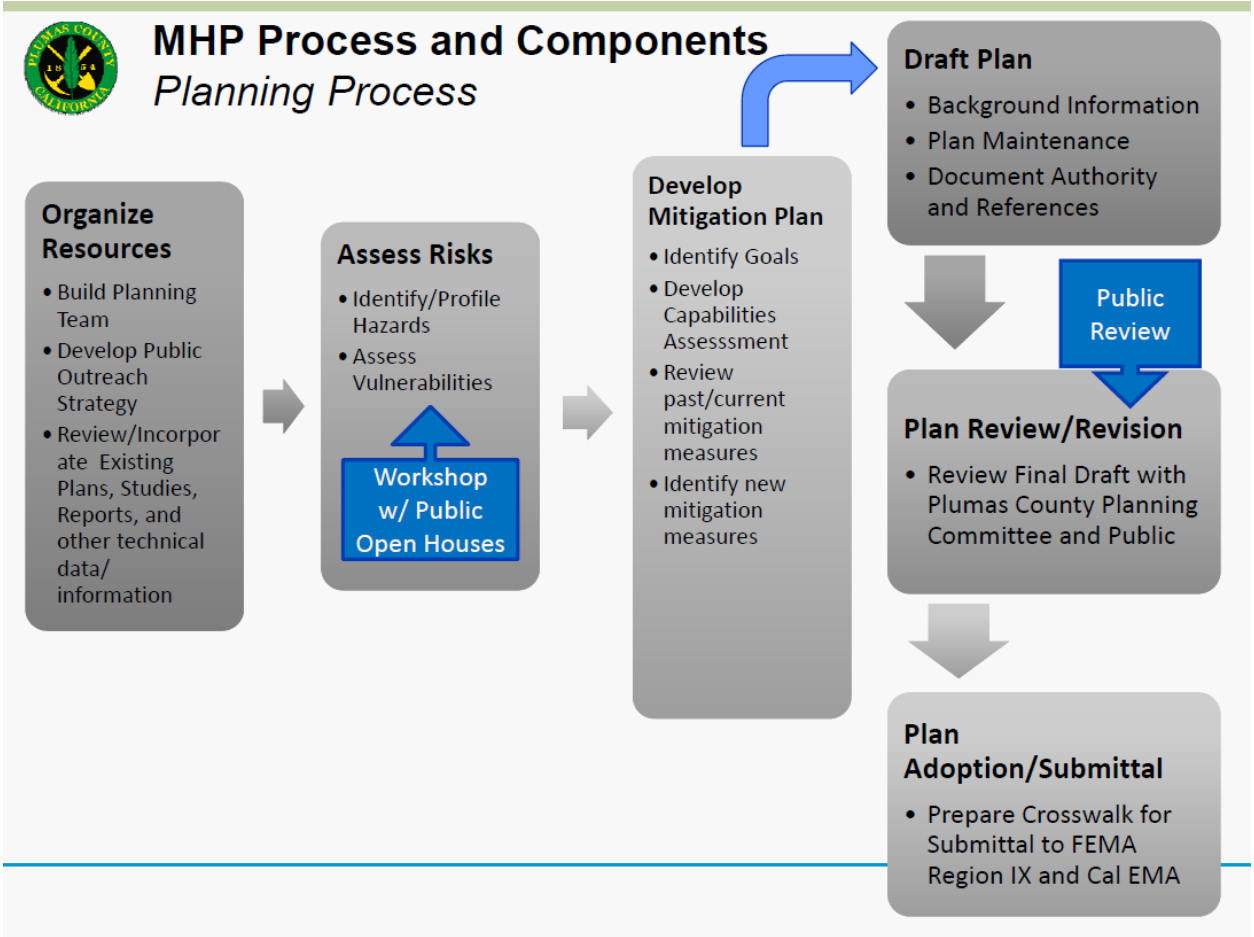


Figure 4-1: Plumas County HMP Planning Process

4.2 *Organize Resources*

This section describes the first step of the 2013 Plumas County HMP planning process – Organizing Resources. It outlines the HMP Update Planning Team, and includes information on the development of the HMP Update Planning Committee and Hazard Focus Groups. The figure in Section 4.2.1.1 illustrates the level of participation for each group that participated in the HMP Update planning process. As part of this step, a variety of existing plans, studies, reports, and other technical data/information was reviewed and incorporated into the HMP document, as appropriate.

4.2.1 Build Planning Team

The Planning Team is responsible for the back bone of the planning process and will provide direction for the development of the HMP Update. For this planning process, the Planning Team consisted of a HMP Planning Committee and Hazard Focus Groups. The Planning Team consists of key decision makers in specific government functions, and also represents the public face of the HMP Update Planning Process.

4.2.1.1 *Planning Committee*

The HMP Planning Committee guides the process and ensures the mitigation plan meets the goals of the County, State and Federal Hazard Mitigation Plan requirements. The HMP Planning Committee includes Plumas County Staff, as well as interested stakeholders, who actively participated in the planning process, such as:

- Attended and actively participated in a series of structured coordination meetings
- Assisted in the collection of valuable local information and other requested data
- Made decisions on plan process and content
- Identified mitigation actions for the HMP
- Reviewed/provided comments on plan drafts
- Coordinated/participated in public input process

Table 4-2 provides a list of the HMP Planning Committee members who provided input in the planning process.

The preparation of the HMP Update required a series of meetings and workshops intended to facilitate discussion and initiate data collection efforts with local community officials. More importantly, the meetings and workshops prompted continuous input and feedback from local officials throughout the update process.

Table 4-2: 2013 HMP Planning Committee

Name	Organization
Shane Vargas	CAL FIRE
Jerilyn Anderson	Cal EMA
Bruce Carpenter	California Highway Patrol
Keith Mahan	Plumas County Ag Commissioner
Terry Swofford	Plumas County Supervisor, District 1.
John Cunningham	Plumas County Building Official
David Keller	Plumas County Community Development Commission
Jim Perez	Plumas County Environmental Health
Jerry Hurley	Plumas County Fire Safe Council
Sue McCourt	Plumas County Fire Prevention Specialist
Jerry Sipe	Plumas County OES
Rebecca Herrin	Plumas County Planning Department
Becky Osborn	Plumas County GIS Planner
Tina Venable	Plumas County Public Health
Louise Steenkamp	Plumas County Public Health

Joe Blackwell	Plumas County Public Works
Mike Grant	Plumas County Sherriff's Office
Pete Duncan	National Forest Service
Lori Pini	Plumas County Public Health
Dan Martynn	NRCS
Jerry Blinn	Plumas County Public Works

4.2.1.2 Hazard Focus Groups

Hazard Focus Groups were created as teams of HMP Planning Committee members and subject matter experts to focus on flood and wildfire hazards within Plumas County. Together with the HMP Consultant Team, the Flood and Wildfire Hazard Focus Groups reviewed information created for the hazard profiles and developed mitigation actions to address these specific hazards. These groups met sporadically via conference calls and communicated through email throughout the HMP planning process.

4.2.1.3 HMP Consultant Team

To provide assistance to the HMP Planning Team, the County enlisted Michael Baker Jr., Inc. (Baker) due to the expertise it has in assisting public sector entities with developing hazard mitigation planning and strategies for particular hazard prone areas. Baker supported the County through facilitation of the planning process, data collection, and meeting material and document development. The HMP Consultant Team, as shown in Table 4-3, consists of a variety of hazard mitigation professionals.

Table 4-3: HMP Consultant Team

HMP Update Project Team	HMP Update Project Team Role
Ethan Mobley, AICP	Project Manager
Jason Farrell, CFM	Senior Planner
Desirae Hoffman	Planner
Nathaniel Mirin, GISP	GIS Specialist/Spatial Analyst
Jack Eldridge	NFIP Program, Senior Technical Advisor

4.2.1.4 Planning Committee Meetings

The HMP Planning Committee met throughout the development of the updated HMP document. Some meetings were conducted in person, while others were conducted via conference calls and webinars. Table 4-4 summarizes the meetings conducted throughout the planning process, including meeting date, type, and topics discussed. Meeting documentation, including agendas, hazard maps, PowerPoint presentations, sign-in sheets, and other relevant handouts, are provided in Appendix B.

Figure 4-2: Planning Committee Meeting #3

Figure 4-3: October 2012 Open House

Table 4-4: Meeting Summary

Date	Meeting Type	Topics
September 19, 2012	Planning Committee Meeting #1	*Part 1:* *Project Overview* *HMP Update Process and Components* *Overview of Existing MHMP* *Project Timeline* *Part 2:* *Planning Area Population / Land Use / Economics Resources* *Public Outreach Strategy* *Workshop Process, Format and Advertisement*
October 2012	Hazard ID and Profiling Workshops and Hazard Mitigation Open House Series	*Hazard Mitigation, What is it?* *Hazard Identification / Profile Development* *(4) Open House Events*
November 2012	Wildland Fire Focus Group	*Fire Hazard Regulatory Environment* *Fire Hazard Profile* *Sample Mitigation Actions*
February 2013	Planning Committee Meeting #2	*Hazard Review and Assessment*
March 2013	Planning Committee Meeting #3	*Capabilities Assessment*
April through May, 2013	Planning Committee Focus Group Meetings	*Mitigation Strategy and Mitigation Action Implementation*
June 3 to 5, 2013	Public Review and Participation	*Plan Review and Mitigation Action Prioritization.*

4.2.2 Public Outreach

Public outreach is a major and required component of the HMP Update. The Plumas County HMP Public Outreach Strategy was developed to maximize public involvement in the HMP planning process. The HMP Public Outreach Strategy details the utilization of websites, local media, and community-based services and establishments to engage the public throughout the HMP planning process. This section provides additional information on the project website and workshop process used during the HMP plan development.

4.2.2.1 Plumas County Hazard Mitigation Website

Online tools provide an efficient and easily-manageable platform to inform the public on the HMP planning process. The HMP project website is located at:

http://www.plumascounty.us/index.aspx?nid=2214

The website includes Information about the planning process, on-line documents, historic disaster photos, and other up-to-date information on meetings and other related project news. This website serves as a document repository for the Plumas County HMP. Since the Plumas County HMP must be updated every five years to ensure the plan remains current with natural hazard events, the webpage will remain permanently active to document past, current, and future hazard mitigation planning efforts for the public and county officials alike.

4.2.2.2 Hazard Mitigation Open House Workshops

In order to capture the hazards and critical infrastructure throughout Plumas County's 2,600 square miles, the HMP Planning Team worked with County agencies and the public in scheduled locations. The week-long "workshop" from October 22 to 26, 2012 consisted of field work and a series of open houses to provide information about local hazards within the County. During the October workshops, the HMP Planning Team worked with agencies in the field to identify hazards, critical infrastructure, and successful mitigation actions by "ground-truthing" areas prone to natural disasters. As part of this process, the HMP Planning Team worked with the Public Works Roads Department to capture historic damage to roads and other community infrastructure.

During the October Workshops, a number of public open houses were held in Portola, Greenville, Quincy, and Lake Almanor. The open houses showcased the hazard profiling process and the data collected during ground-truthing exercises. The public was able to learn about the HMP planning process and review the updated HMP Update documents, as well as provide input on the planning process and data/information collected to date. The open houses provided opportunities for the public to interact with County and Project staff. The public was asked to provide information about and pictures of local hazards. The HMP Planning Team collected historic photos from citizens and the Plumas County Museum in Quincy. Photos and other information collected during the October Open House Series are included throughout the hazard profiles provided in Section 5.

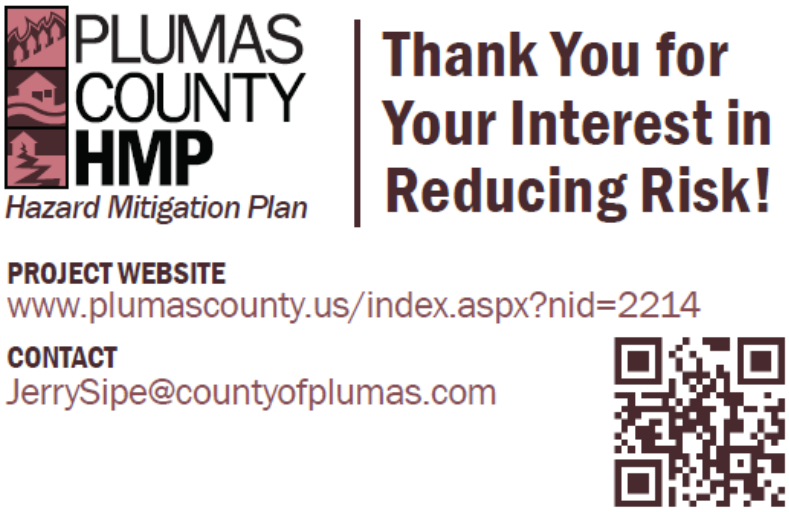
Figure 4-4: Greenville Town Hall Meeting

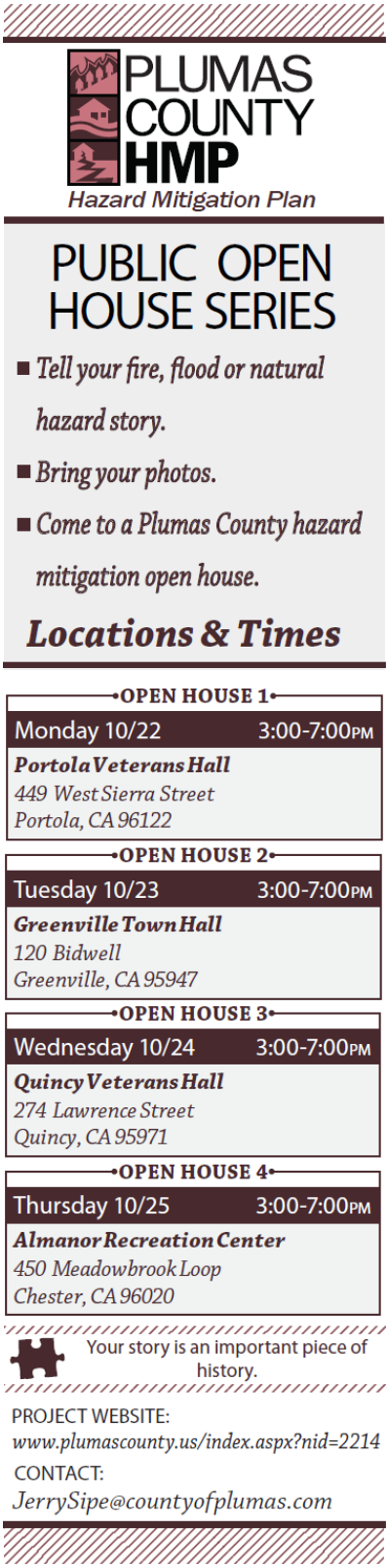
Figure 4-5: Chester Town Hall Meeting

4.2.2.3 Publicizing the Plan

The HMP Planning Team created public notices and press releases to publicize the HMP Update and associated planning processes. Public notices were published in a local newspaper production line called "The Regional". The Regional by Feather River Publishing Company runs a printed release every Wednesday. Printed press releases were coordinated with announcements on the Plumas County webpage. Additionally, Plumas County Public Health circulated postcard sized flyers at flu shot distribution locations and other Public Health outreach opportunities. The public notices and press releases for the HMP update process are included in Appendix B.

In addition to the public input received during the Open House Series, the draft final HMP document was posted on the Plumas County Hazard Mitigation website for general public review and comment and a document review open house was conducted before plan finalization. The HMP was also made available for review at the Plumas County Public Health Building. The updated HMPA was also available for review and comment at the Plumas County Public Library prior to adoption. These efforts provided citizens with several opportunities to review the content of each of the Plan's sections, to ask questions and suggest possible final revisions.





4.2.3 Review and Incorporate Existing Information

The HMP Planning Committee to reviewed and assessed existing plans, studies, and data available from local, state, and federal sources. Documents reviewed and incorporated as part of the HMP planning process are shown in Table 4-5.

Table 4-5: Existing Plans, Studies, Reports, and Other Technical Data/Information

Existing Plans, Studies, Reports, and Other Technical Data/Information
2004, 2007, and 2010 California State Enhanced MHMP
Plumas County GP and Specific Plans (Specifically the Safety Element)
Plumas County Emergency Operations Plan (EOP) and Associated Annexes
Plumas County Fire Safe Council work and associated GIS Data
California Drought Contingency Plan
California Drought Report 2010
The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2)
Sierra Valley FEMA DFIRM Study Map
FEMA Hazard Mitigation How-to Guides
Plumas County Digital Flood Insurance Rate Map (DFIRM) panels
FEMA Flood studies underway that may identify new special flood hazard areas
Existing County Zoning and Floodplain Management Ordinances
Repetitive Loss Areas and Properties, flood insurance policies and claims records.
FEMA E-74 Reducing the Risks of Nonstructural Earthquake Damage – A Practical Guide
FEMA Local Mitigation Planning Handbook
FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, January 2013
Recommended Procedures For Implementation Of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Landslide Hazards In California
USGS Landslide Types and Processes (White Paper)
Surrounding Local Hazard Mitigation Plans: ABAG, City of Roseville, Placer County, City of Portola, Huron County, and Solano County.
NOAA Record Storm Events
Emergency Preparedness Guide For Residents of Plumas County
Who's Who in the Feather River Watershed
USGS, Remediation Control Strategies and Cost Data for an Economic Analysis of a Mercury Total Maximum Daily Load in California
13 Fuels Key Guide, Documented by Albini (1976) and Rothermel (1972).
Plumas County Hazardous Fuel Assessment and Strategy
California Fire Alliance Community Wildfire Protection Plan Guidance
CAL FIRE 2010 Strategic Fire Plan

CAL FIRE, Fire Mitigation Webpage and GIS Data http://hazardmitigation.calema.ca.gov/hazards/natural/fire
American Planning Association – California Chapter; Planning for Wildfires, A Regulatory Agency Response
Chips Fire Burn Report 2012
California Geological Survey (CGS) Landslide GIS Data and Mapping Information

4.2.4 Assess Risks

In accordance with FEMA requirements, the HMP Planning Committee identified and prioritized the natural hazards affecting Plumas County and assessed the vulnerability from them. Results from this phase of the HMP planning process aided subsequent identification of appropriate mitigation actions to reduce risk in specific locations and hazards. This section of the HMP Update planning process is detailed in Section 5.

4.2.4.1 Identify/Profile Hazards

Based on a review of past hazards, as well as a review of the existing plans, reports, and other technical studies/data/information, the HMP Planning Committee determined if the existing hazards were still valid, and identified new hazards that could affect Plumas County. Updated content for each hazard profile is provided in Section 5.

4.2.4.2 Assess Vulnerabilities

Hazard profiling exposes the unique characteristics of individual hazards and begins the process of determining which areas within Plumas County are vulnerable to specific hazard events. The vulnerability assessment included field visits and GIS overlaying method for hazard risk assessments. Using these methodologies, vulnerable populations, infrastructure, and potential loss estimates impacted by natural hazards were determined. Detailed information on vulnerability assessment for each hazard is provided in Section 5.

4.2.5 Develop Mitigation Plan

The HMP Update was prepared in accordance with DMA 2000 and FEMA's HMP guidance documents. As such, this document provides an explicit strategy and blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and Plumas County's ability to expand on and improve these existing tools. Developing the mitigation plan involved identifying goals, assessing existing capabilities, reviewing the 2006 mitigation actions, and identifying new mitigation actions. This step of the HMP planning process is detailed in Section 6 and summarized below.

4.2.5.1 Identify Goals

The HMP Planning Committee reviewed the 2006 MHMP goals, hazards profiles, and vulnerability assessments, and developed new goals and objectives for the 2013 HMP based current and revised information. The Goals and Objectives are presented in Section 1 and again in Section 5.

4.2.5.2 Develop Capabilities Assessment

A capabilities assessment is a comprehensive review of all the various mitigation capabilities and tools currently available to Plumas County to implement the mitigation actions that are prescribed in the HMP Update. The HMP Planning Committee identified the technical, financial, and administrative capabilities to implement mitigation actions, as detailed in Section 5.

4.2.5.3 Identify Mitigation Actions

As part of the HMP planning process, the HMP Planning Committee reviewed and analyzed the status of the mitigation actions identified in the 2006 Plumas County MHMP and provided data and information on the status of the existing mitigation actions. Once the review and analysis of the 2006 MHMP mitigation actions was complete, the HMP Consultant Team and Hazard Focus Groups worked together to identify and develop new mitigation actions with implementation elements. Mitigation actions were prioritized and detailed implementation strategies were developed during Planning Committee Meeting #3. A detailed approach of the review of the existing mitigation actions, identification and prioritization of new mitigation actions, and the creation of the implementation strategy is provided in Section 6.

4.2.5.4 Draft HMP Update

Once the risk assessment and mitigation strategy were completed, information, data, and associated narratives were compiled into the 2013 Plumas County HMP. Section 3 provides detailed information on "what's new" and updated as part of the 2013 plan.

4.2.5.5 Plan Review and Revision

Once the "Draft" 2013 Plumas County HMP was completed, a public and government review period was established for official review and revision. Public comments were accepted, reviewed, and incorporated into this update. Applicable comments from the public have been received and addressed prior to the Board of Supervisors (BOS) *"authorization to submit"* to FEMA and Cal EMA review parties.

4.2.5.6 Plan Adoption and Submittal

This plan has been submitted and approved by FEMA and adopted by the BOS as the official statement of Plumas County hazards. A copy of the Board of Supervisors resolution is provided in Appendix E.

4.2.5.7 Plan Maintenance

Updated plan maintenance procedures, found in Section 7, include the measures Plumas County and participating agencies will take to ensure the HMP's continuous long-term implementation. The procedures also include the manner in which the HMP will be regularly monitored, reported upon, evaluated, and updated to remain a current and meaningful planning document.

Section 5. Natural Hazard Risk Assessment

Natural Hazard Risk Assessment is the process of measuring the potential impact to life, property and economic impacts resulting from natural hazards. The intent of the Risk Assessment is to identify, as much as practicable given existing/available data, the qualitative and quantitative vulnerabilities of a community. The results of the risk assessment provide a framework to better understand the potential impacts to the community and provide a foundation in which to develop and prioritize mitigation actions (see Section 6). Mitigation actions can reduce damage from natural disasters and having strategy toward implementation results can direct scarce resources to areas of greatest vulnerability describes in this section.

This risk assessment followed the methodology described in the FEMA publication, *Understanding Your Risks—Identifying Hazards and Estimating Losses* (FEMA 386-2, 2002), which outlines a four-step process:

1) Identify Hazards.

2) Profile Hazard Events.

3) Inventory Assets.

4) Estimate Losses.

Information gathered during the Plumas County planning process related to the above four steps has been incorporated into the following discussions in this chapter.

Section 5.1: Hazard Identification identifies and prioritizes the natural hazards that threaten Plumas County. The reasoning for omitting some hazards from further consideration is also provided in this discussion.

Section 5.2 through Section 5.9: Hazard Profiles describe each of the natural hazards that pose a threat to Plumas County. Information includes the location, extent/magnitude/severity, previous occurrences, and the likelihood of future occurrences.

Section 5.10: Vulnerability Assessment presents Plumas County's exposure to natural hazards, as it identifies at-risk populations and assets, including County-owned facilities and other critical facilities. Where the information was available, potential dollar loss estimates for facilities are provided to show a partial representation of the financial cost of a disaster to a community.

5.1 *Identifying the Hazards*

Per FEMA Guidance, the first step in developing the Risk Assessment is identifying the hazards. The Plumas County HMP Planning Team reviewed a number of previously prepared hazard mitigation plans and other relevant documents to determine the whole universe of natural hazards that have the potential to affect the County. Table 5-1 provides a crosswalk of hazards identified in the County's 2006 MHMP, General Plan Safety Element, Emergency Operations Plan, and 2010 California State Hazard Mitigation Plan. 11 relevant hazards were identified based on a thorough document review. The crosswalk was used to develop a preliminary hazards list providing a framework for Plumas County Steering Committee members to begin thinking about which hazards were truly relevant to Plumas County and which ones were not. For example, terrorism threats were considered to be of little relevance to Plumas County, while wildfire, flooding, and earthquake were indicated in almost all hazard documentation.

Table 5-1: Document Review Crosswalk

Hazards	Plumas County 2006 MHMP	Plumas County General Plan	Plumas County EOP	2010 CA State MHMP	Preliminary Hazards to address in HMP Update
Geologic and Seismic Hazards				■	■
Earthquake/Seismic Shaking	■	■		■	■
Landslides / Rockslides	■	■		■	■
Erosion				■	■
Volcano				■	
Dam Failure			■	■	■
Drought	■			■	■
Flooding	■	■	■	■	■
Climate Change				■	■
Wildfire	■	■	■	■	■
Severe Weather and Storms				■	■
Extreme Heat				■	
Freeze				■	

In addition to a document review, previous hazard occurrences were used to identify hazards for this HMP. Previous hazard occurrences provide a historical view of hazards that have affected the County in the past, and thus provide a window into the potential hazards that can affect the County in the future. Information about Federal and State disaster declarations in Plumas County was compiled from FEMA and Cal EMA's databases, as shown in Table 5-2. Though not a complete snapshot of hazard incidences in Plumas County (since not all hazard events are federally or state declared), Table 5-2 provided the

Plumas County Steering Committee with solidified accounts of the types and extent of disasters that have affected the County dating back to 1955 when flooding affected entire regions of Plumas County. As indicated in Table 5-2, large regional incidents have affected Plumas County, including state wide flooding in 1986 and 1997. Most recently, severe wildfires were declared in Plumas County during the 2008 fire season, causing extensive damage in the County and across California. As a caveat, deaths and injuries values indicated in Table 5-2 are part of state-wide or regional disaster event and "may not" have taken place in Plumas County.

Table 5-2: Federal and State Declared Disasters

Disaster Name	Disaster Type	Disaster Cause	Disaster#	Year	Deaths*	Injuries*	Cost of Damage*
Mid-Year Fires	Fire	Fire	EM-3287	2008			N/A
Winter Storms	Flood	Storms	DR-1628	2005-06			$128,964,501
August Fires	Fire	Fire	EM-3140	1999			$1,154,573
January Floods	Flood	Storms	DR-1155	1997	8		$194,352,509
Torrential Winds and Rain	Flood	Storms	GP96-01	1996			N/A
Severe Winter Storms	Flood	Storms	DR-1044	1995	11		$21,948,347
Late Winter Storms	Flood	Storms	DR-979	1992	20	10	$226,018,111
Wildland Fires	Fire	Fire	GP	1987	3	76	$18,000,000
Storms	Flood	Storms	DR-758	1986	13	67	$407,538,904
April Storms	Flood	Storms	80-01 -80-25	1980			N/A
Northern California Flooding	Flood	Flood	DR-283	1970			$27,657,478
Storms	Flood	Storms	DR-253	1969			N/A
Late Winter Storms	Flood	Storms	DR-183	1964			$213,149,000
Floods and Rains	Flood	Storms	N/A	1963			N/A
Widespread Fires	Fire	Fire	N/A	1960			$3,075,000

Source: FEMA: California State Disaster History; CAL EMA: Emergency & Disaster Proclamations and Executive Orders by Date (November 2003-Current)

****Note: Emergency & Disaster Proclamations, deaths, injuries and cost of damage is for total event. Event may be spread over multiple jurisdictions.***

Based on the review of hazards identified in similar and relevant documents and previous incidents, as well as historical knowledge of localized events, and natural hazard trends, the HMP Planning Team drilled down the preliminary list of hazards to eight (8) hazards with significant potential to occur in the County: Wildfire, Flooding, Geologic Hazards (Seismic Activity and Slope Failure), Severe Weather (Winter and Summer Storms), Dam Failure, Drought and Climate Change. With limited resources to implement mitigation actions, a streamlined list of identified hazards ensures that appropriate levels of efforts are allocated to the hazards determined to have the largest potential impacts on the County.

5.2 *Hazard Profiles*

Plumas County's identified hazards are profiled individually in this section, in order of priority. The hazard profiles in this section provide a baseline for the Vulnerability Assessment, where the vulnerability is quantified in terms of population and assets affected for each of the priority hazards. For reference, each hazard symbol, as shown below, is placed at the beginning of each profile.


-Wildfire


-Drought


-Flooding


-Climate Change


-Dam Failure


-Seismic (Geologic Hazard)


-Severe Weather


-Slope Failure (Geologic Hazard)

5.3 *Wildfire Hazard Profile*

Wildfire events are unwanted wildland fires including unauthorized human-caused fires, escaped prescribed burns, and other ignition sources that cause fire over wildland areas. Throughout California and Plumas County communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem.

Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas, such as large extents of forest land, the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. With exception to a few low lying meadow valleys such as the Sierra, American, and Indian Valleys, wildfire danger is a predominate natural hazard across the mountainous and fuel rich areas of Plumas County.

Potential losses from wildfire include human life, structures and other improvements, natural and cultural resources, quality and quantity of water supplies, cropland, timber, and recreational opportunities. Short and long-term economic losses could also result due to loss of business and other economic drivers associated with the Plumas County summer season activities. Smoke and air pollution from wildfires can be a severe health hazard. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

According to the Butte Fire Management Plan, 10 of the 13 NFFL fuel models are represented within the County. The fuel models include a variety of typical fuel complexes with the general types being grass and grass-dominated, chaparral and shrub fields, timber litter, and slash. There is dense forest on the Westside which includes douglas fir and oak hardwoods, heavy mixed conifer with both pine and fir species dominating, pure fir and sub alpine fir stands, and lodge pole stands surrounding high mountain lakes and meadows (some with stringers of aspens). The eastside forest is comprised of ponderosa pine stands, all interspersed with brush fields and plantations from prior large fires and forest management activities.

Generally, there are three major factors that sustain wildfires and predict a given area's potential to burn. These factors are fuel, topography, and weather.

- Fuel – Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches, to dead standing trees, live trees, brush, and cured grasses. Manmade structures are also considered a fuel source, such as homes and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Fuel is the only factor that is under human control. As a result of effective fire suppression since the 1930s vegetation throughout the county has continued to grow and accumulate and hazardous fuels have increased. As such, certain areas in and surrounding Plumas County are

extremely vulnerable to fires as a result of dense vegetation combined with a growing number of structures being built near and within rural lands. These high fuel hazards, coupled with a greater potential for ignitions, increase the susceptibility of the County to a catastrophic wildfire.

- Topography – An area's terrain and slope affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.
- Weather – Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed wildfires, creating a situation where fuel will ignite more readily and burn more intensely. Thus, during periods of drought the threat of wildfire increases. Wind is the most treacherous weather factor. The greater the wind, the faster a fire can spread and the more intense it can be. Winds can be significant at times in Plumas County. Wind from the Central Valley is especially conducive to hot, dry conditions, in the Sierra Foothills which can lead to extreme fire danger. Wind shifts, in addition to wind speed, can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. Most wind shifts in Plumas County occur in the Feather River Canyon. As part of a weather system, lightning also ignites wildfires, often in difficult to reach terrain for firefighters.

Factors contributing to the wildfire risk in Plumas County include:

- Overstocked forests, severely overgrown vegetation, and lack of defensible space around structures;
- Excessive vegetation along roadsides and hanging over roads, fire engine access, and evacuation routes;
- Drought and overstocked forests with increased beetle infestation or kill in weakened and stressed trees;
- Narrow and often one-lane and/or dead-end roads complicating evacuation and emergency response as well as the many subdivisions that have only one means of ingress/egress;
- Inadequate or missing street signs on private roads and house address signs;
- Nature and frequency of lightning ignitions; and increasing population density leading to more ignitions.

CAL FIRE has mapped fuel hazards in the County based on vegetation, fire history, and slope, with the hazards ranked as medium, high or very high. This data shows that fuel hazards are generally high throughout the entire county. According to the CAL FIRE state model the highest fuel hazards occur along the Feather River Canyon, and the north eastern portion of Plumas County along Wildcat and Story Ridge on the Lassen / Plumas National Forest Boarder. Regulatory Environment

5.3.1 Regulatory Environment

The regulatory setting for fire protection and management in Plumas County is comprised of multiple jurisdictions. Wildfires and structure fires are managed separately with local, state, and federal involvement occurring at defined geographical boundaries known as "Responsibility Areas". This system of responsibility, although fully encompassing, requires coordination among all levels of government as well as community service districts and local residents.

5.3.1.1 Federal

The U.S. Forest Service (USFS) plays a major role in wildfire protection on federal lands, including most wildfire prevention law enforcement, wildfire response and overall operations in Plumas County. Although the Federal Responsibility Area (FRA) technically comprises 65 percent of Plumas County, the USFS is also responsible for fire suppression in the State Responsibility Areas (SRA) via an "equal land swap" agreement made with the California Department of Forestry and Fire Protection (CAL FIRE). Through this agreement the USFS takes responsibility for fire suppression on private land previously monitored by the state, with the exception of the Lake Almanor Basin. Although the USFS is responsible for fire suppression in SRA's it has not been delegated law enforcement authority by the Sheriff to administer local codes.

5.3.1.2 State

The California Department of Forestry and Fire Protection (CAL FIRE) has statutory responsibility for wildfire protection on private lands in California. However, since wildfire protection for vegetation fire on private lands has been granted to the USFS through an equal land swap agreement, the USFS enforces the state laws associated with fire protection in SRAs within Plumas County. Granting the USFS the SRAs fire protection responsibilities was a strategic decision made on behalf of both entities since the USFS already has established access and existing infrastructure to manage forest protection in Plumas County. Consequently, the responsibility of wildfire suppression on private land in Plumas County is under the jurisdiction of the USFS, except for the Lake Almanor Basin, where CAL FIRE has remained the responsible agency.

5.3.1.3 Local

Fire protection for all other fire emergencies, including structures and vehicles, is the responsibility of the local district. The Local Responsibility Area (LRA) in Plumas County includes the City of Portola, portions of American, and Sierra Valleys. Fire protection for structure fires is provided to some of the communities by nineteen fire departments located throughout the county. Some of these departments have a paid Chief and staff, but more commonly these departments are comprised entirely of volunteers.

5.3.1.3.1 Plumas County Codes for Wildfire Hazards

Plumas County has adopted the State of California's Health and Safety Code to reduce fire hazard risk on existing properties and for new construction.

Below is a summary of some of the relevant sections in each code.

Health and Safety Code

Parts 5 and 6 of the Health and Safety Code address abatement of hazardous weeds and rubbish for the prevention of fires.

Section 14875; defines weeds that could potentially endanger public safety by creating a fire hazard.

"Weeds," as used in this part, means all weeds growing upon streets, sidewalks, or private property in any county, including any fire protection district and includes any of the following:

(a) Weeds which bear seeds of a downy or wingy nature.
(b) Sagebrush, chaparral, and any other brush or weeds which attain such large growth as to become, when dry, a fire menace to adjacent improved property.
(c) Weeds which are otherwise noxious or dangerous.
(d) Poison oak and poison ivy when the conditions of growth are such as to constitute a menace to the public health.
(e) Dry grass, stubble, brush, litter, or other flammable material which endangers the public safety by creating a fire hazard in an urbanized portion of an unincorporated area which has been zoned for single and multiple residence purposes.

Section 14880; allows the board of supervisors to declare weeds a public nuisance.

Whenever weeds are growing upon any street, sidewalk, or on private property in any county, the board of supervisors, by resolution, may declare the weeds a public nuisance.

Section 14890; allows the board of supervisors to designate the person to give notice to destroy weeds:

The board of supervisors shall designate the person to give notice to destroy weeds. This may be any one of the following:

(a) The county agricultural commissioner.
(b) The county forester.
(c) The county board of forestry.
(d) Any other officer, board, or commission.

Health and Safety Code

Part 2 of the Public Resources Code addresses the protection of forest, range and forage lands.

Note: Plumas County has not adopted Public Resources Codes (PRC) 4290 (Fire Safe Regulations) in its entirety. Instead, Plumas County adopted its own version of PRC 4290 which was certified in lieu of PRC 4290 by the Board of Forestry. Plumas County Code (PCC) State Responsibility Area Fire Safe Regulations start are located in PPC Section 9-9.101.

Section 4290; implements fire safety standards related to defensible space

(a) The board shall adopt regulations implementing minimum fire safety standards related to defensible space which are applicable to state responsibility area lands under the authority of the department. These regulations apply to the perimeters and access to all residential, commercial, and industrial building construction within state responsibility areas approved after January 1, 1991. The board may not adopt building standards, as defined in Section 18909 of the Health and Safety Code, under the authority of this section. As an integral part of fire safety standards, the State Fire Marshal has the authority to adopt regulations for roof coverings and openings into the attic areas of buildings specified in Section 13108.5 of the Health and Safety Code. The regulations apply to the placement of mobile homes as defined by National Fire Protection Association standards. These regulations do not apply where an application for a building permit was filed prior to January 1, 1991, or to parcel or tentative maps or other developments approved prior to January 1, 1991, if the final map for the tentative map is approved within the time prescribed by the local ordinance. The regulations shall include all of the following:

1) *Road standards for fire equipment access.*
2) *Standards for signs identifying streets, roads, and buildings.*
3) *Minimum private water supply reserves for emergency fire use.*
4) *Fuel breaks and greenbelts.*

(b) These regulations do not supersede local regulations which equal or exceed minimum regulations adopted by the state.

Section 4291; outlines the requirements for maintaining adjacent landscapes near structures

Any person that owns, leases, controls, operates, or maintains any building or structure in, upon, or adjoining any mountainous area or forest-covered lands, brush-covered lands, or grass-covered lands, or any land which is covered with flammable material, shall at all times do all of the following:

(a) Maintain around and adjacent to such building or structure a firebreak made by removing and clearing away, for a distance of not less than 30 feet on each side thereof or to the property line, whichever is nearer, all flammable vegetation or other combustible growth. This subdivision does not apply to single specimens of trees, ornamental shrubbery, or similar plants which are

used as ground cover, if they do not form a means of rapidly transmitting fire from the native growth to any building or structure.

(b) Maintain around and adjacent to any such building or structure additional fire protection or firebreak made by removing all brush, flammable vegetation, or combustible growth which is located from 30 feet to 100 feet from such building or structure or to the property line, whichever is nearer, as may be required by the director if he finds that, because of extra hazardous conditions, a firebreak of only 30 feet around such building or structure is not sufficient to provide reasonable fire safety. Grass and other vegetation located more than 30 feet from such building or structure and less than 18 inches in height above the ground may be maintained where necessary to stabilize the soil and prevent erosion.

(c) Remove that portion of any tree which extends within 10 feet of the outlet of any chimney or stovepipe.

(d) Maintain any tree adjacent to or overhanging any building free of dead or dying wood.

(e) Maintain the roof of any structure free of leaves, needles, or other dead vegetative growth.

(f) Provide and maintain at all times a screen over the outlet of every chimney or stovepipe that is attached to any fireplace, stove, or other device that burns any solid or liquid fuel. The screen shall be constructed of nonflammable material with openings of not more than one-half inch in size.

(g) Except as provided in Section 18930 of the Health and Safety Code, the director may adopt regulations exempting structures with exteriors constructed entirely of nonflammable materials, or conditioned upon the contents and composition of same, he may vary the requirements respecting the removing or clearing away of flammable vegetation or other combustible growth with respect to the area surrounding said structures. No such exemption or variance shall apply unless and until the occupant thereof, or if there be no occupant, then the owner thereof, files with the department, in such form as the director shall prescribe, a written consent to the inspection of the interior and contents of such structure to ascertain whether the provisions hereof and the regulations adopted hereunder are complied with at all times.

Sec 8-14.01 – 8-14.03 Plumas County, California, Code of Ordinances; Title 8 – Building Regulations

Section 8-14.01

Disposal of flammable vegetation and fuels removed during construction shall be completed before final inspection.

Section 8-14.02

(a) *General. Driveways shall be provided and maintained in accordance with the provisions of this section. Driveways shall be constructed as provided by Chapter 4 of Title 9 of this Code, commencing with Section 9-4.101*

(b) *Where required. Driveways shall be required for every building hereafter constructed when no portion of an exterior wall of the first story is located within 150 feet of a road which provides access to the property.*

EXCEPTIONS: Exceptions from the provisions of this section may be made as provided in Section 9-9.202 of Chapter 9 of Title 9 of this Code. More than one driveway may be required when it is determined by the chief that access by a single road may be impaired by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit access. For high-piled combustible storage, see Section 81-109 of this Uniform Fire Code.

(a) *Permissible modifications. Vertical clearances or widths required by this section shall be increased when, in the opinion of the chief, vertical clearances or widths are not adequate to provide fire apparatus access.*

(b) *Obstruction. The required width of any driveway shall not be obstructed in any manner, including parking of vehicles. Minimum required widths and clearances established under this section shall be maintained at all times.*

(c) *Signs. When required, approved signs or other approved notices shall be provided and maintained for driveways to identify such roads and prohibiting their obstruction.*

(d) *Gates. Gate entrances shall be at least two (2') feet wider than the width of the traffic lanes serving that gate. All gates providing access from a road to a driveway shall be located at least thirty (30') feet from the roadway and shall open to allow a vehicle to stop without obstructing traffic on that road.*

(e) *Where a one-way road with a single traffic lane provides access a gated entrance, a forty (40') foot turning radius shall be provided.*

(f) *Administration. It shall be the duty of the chief and the Building Official to administer the provisions of this section. Before issuing a building permit for new construction not related to an existing structure and before issuing a permit for siting of a manufactured home (as defined by the National Fire Protection Association, National Fire Code, Section 501A, Standards for Fire Safety, Criteria for Manufactured Home Installations, Sites and Communities, Chapter 1, Section 1-2, Definitions, page 4, 1987 edition and Health and Safety Code Sections 18007, 18008, and 19971), the Building Official shall require submittal of plans for required driveway construction. The County Engineer shall review those plans and may impose any needed conditions for their conformance with the provisions of this section. If a driveway will have any grade in excess of thirteen (13%) percent, a registered engineer shall prepare the plans. The driveway shall be constructed before final inspection or issuance of a certificate of occupancy as decided by the Building Official. The Building Official shall establish a procedure for coordination with the chiefs in the issuance of building permits.*

(g) *Reports of violations of this section shall be given to the Headquarters of the Ranger Units of the California Department of Forestry and Fire Protection which administer State Responsibility Area fire protection in Plumas County.*

(h) *Certain words and phrases used in this section are defined as set forth below:*

1) *"Driveway" shall mean a vehicular access that serves no more than two buildings, with no more than three dwellings on a single parcel, and any number of appurtenant buildings, when no portion of an exterior wall of the first story of*

any one of those structures is within 150 feet of a road which provides access to the property.

2) *"One-way road" shall mean a roadway designed for traffic flow in one direction only.*

3) *"Roadway" shall mean any surface designed, improved, or ordinarily used for vehicle travel including appurtenant structures.*

Sec 8-14.03

Addresses and road signs shall be posted and installed as provided for in Chapter 8 of Title 9 of this Code, commencing with Section 9-8.101. Reports of violations of this section shall be given to the Headquarters of the Ranger Units of the California Department of Forestry and Fire Protection which administer State Responsibility Area fire protection in Plumas County.

5.3.1.3.2 Local Community Codes

Plumas Eureka Community Services District

The Board of Directors of the Plumas Eureka Community Services District finds and declares that the real property within its boundaries constitutes an urban area in a rural forest setting with a consequent high danger in fire season to the start or expansion of wildland fire. The failure to maintain real property as set forth in California Public Resources Code Section 4291 constitutes a public nuisance. The purpose of the ordinance is to establish conditions which must be met uniformly throughout the Plumas Eureka Community Services District and which, if violated, must be abated by the property owner or the Plumas Eureka Community Services District if the property owner fails, refuses or neglects to do so in a timely fashion.

Greenhorn Community Services District

The Board of Supervisors of the County of Plumas, acting in its ex-officio capacity as the Governing Board of the Greenhorn Community Services District requires a Fire Fuel Clear Zone Ordinance of 100 feet around structures. The responsibility for enforcing the 100 foot perimeter is given to the Fire Chief of the CSD Fire Department.

Covenants, Conditions and Restrictions of West Almanor Community Club
Article 3.19; Clearing of Trees

All lots shall be kept in as natural condition as possible. Before trees are removed from a lot, the owner shall obtain approval pursuant to Article 83. Clearing of trees shall be limited to the minimum required for approved residential use, including access, and shall not exceed clearing of more than sixty percent of the total lot area unless specifically approved in advance by the Architectural Committee or the Board. For purposes of this Declaration, a tree shall mean any plant having a trunk diameter greater than six inches. Trees closer than five feet from concrete footing and foundations must be removed, but all standing trees on the lot are to be preserved if possible, trimmed up six feet from ground level. To prevent excess cutting, trees to be preserved should be clearly tagged. All dead combustible material

[3] CC&R Article 8 defines Architectural Committee functions

must be removed from the setback area and within thirty feet of any structure. All vegetation on lots, whether the lot is developed or undeveloped, shall be maintained in a neat and natural condition and shall be trimmed, cultivated, and managed to encourage healthy conditions.

5.3.2 Past Occurrences

In Plumas County there are approximately 170 ignitions per year, with over half being caused by lightning. Since 1988 approximately 15% of acres burned were caused by railroad ignitions, 18% were cause by equipment use, and 19% were attributed to unknown causes. Plumas County has averaged about 16,623 acres burned per year over the last 25 years. The majority of fires, 91%, are caught on initial attack and suppressed at less than 10 acres. The 9% that escape initial attack are responsible for 99% of the aces burned. The majority of fires, 87%, occur from May through September[4].

Since 1900, 340 wildland fires have occurred in Plumas County. These events range from one acre to more than 75,000 acres (CAL FIRE 2011)[5]. Of these documented occurrences, 11 had a perimeter greater than 10,000 acres. See Figure 5-1 for location and extent of each fire.

The 2012 Chips Fire owns the largest burn perimeter of 75,431 acres, of which 66,669 acres are located within the Plumas and Lassen National Forests; the remaining 8,762 acres are located on private land. While the Chips burn perimeter is the largest in recorded county history it was not the most severe. Only 35% of the burn area is classified as Moderate or High burn severity, see Table 5-3 (BAER report 9/12/2012). At this time of this report the cause of the fire is still under investigation and the totality of the damage is yet to be determined. See Figure 5-2 and Figure 5-3 for Chips fire photos documenting the 2013 devastation.

[4] Data source for whole paragraph is combination of 1985-2010 ignitions dataset and 2012 burn perimeters
[5] Data source is 2012 burn perimeters from CAL FIRE

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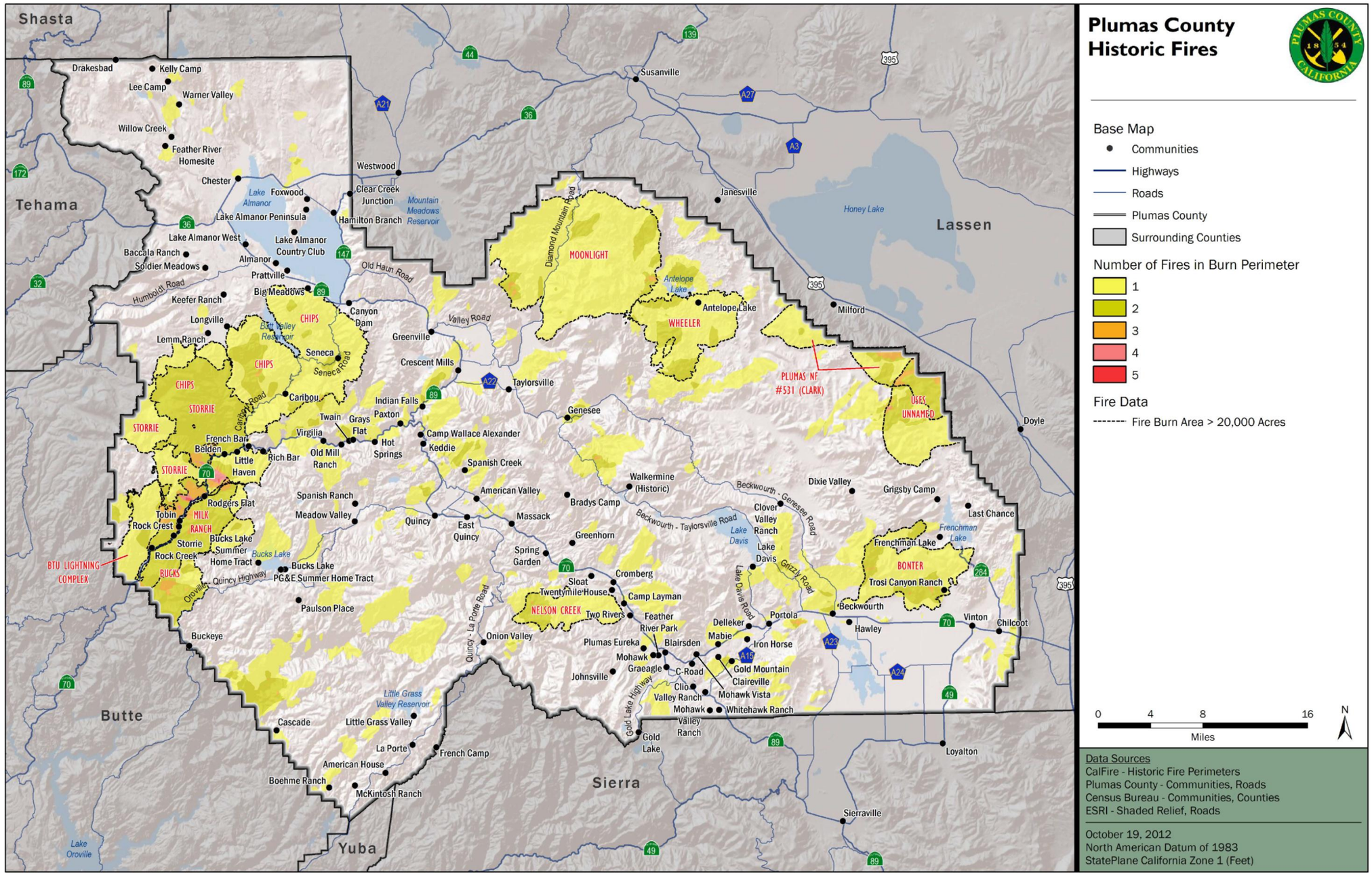

Plumas County Historic Fires

Base Map
- Communities
- Highways
- Roads
- Plumas County
- Surrounding Counties

Number of Fires in Burn Perimeter
- 1
- 2
- 3
- 4
- 5

Fire Data
- Fire Burn Area > 20,000 Acres

0 4 8 16 Miles

N

Data Sources
CalFire - Historic Fire Perimeters
Plumas County - Communities, Roads
Census Bureau - Communities, Counties
ESRI - Shaded Relief, Roads

October 19, 2012
North American Datum of 1983
StatePlane California Zone 1 (Feet)

Figure 5-1: Historical Fires

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Table 5-3: Chips Fire Burn Severity Classification:

Burn Severity	Plumas NF (acres)	Lassen NF (acres)	Private (acres)	Total (acres)	Percent of Burned Area (%)
Very Low/ Unburned	12,939	6,656	3,542	23,137	30%
Low	17,078	6,437	3,289	26,804	35%
Moderate	15,216	4,595	1,863	21,674	29%
High	3,064	684	68	3,816	6%
Total	**48,297**	**18,372**	**8,763**	**75,431**	**100%**

Source: BAER report (9/12/2012)

Figure 5-2: Chips Fire High Burn Severity area

Figure 5-3: Area inside Chips Fire Burn Perimeter; mix of high and low burn severity

The 2007 Moonlight Fire was one of the most destructive fires in Plumas County history with a burn perimeter of 64,997 acres. Seven structures were destroyed, 2 residences and 5 outbuildings, and 1 outbuilding was damaged. An additional 25 residences and 10 outbuildings were threatened due to their location within the interior of the fire containment lines. 34 injuries and zero deaths were reported. The total cost of fighting the fire was $31.5 million, utilizing 42 engines, one helicopter, 11 dozers, 34 water tenders, 11 fire crews, and 707 total fire personnel (http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=216). The blaze was caused by employees of Sierra Pacific Industries and a contractor who struck a rock with a dozer, causing sparks to ignite the dry ground in the area. The federal government was able to successfully sue the logging company for $122.5 million in damages resulting from the fire that killed 15 million trees (http://usnews.nbcnews.com/_news/2012/07/18/12804544-logging-company-to-pay-record-1225m-in-damages-over-2007-california-wildfire?lite). See Figure 5-4 for a photo documenting the historical burn area.

Other important wildfire occurrences over the past 25 years in Plumas County are listed in Table 5-4.

Figure 5-4: Moonlight Fire burn area shows foundation remaining from destroyed structure

Table 5-4: Plumas County Wildfire Occurrences

Year	FIRE NAME	ID No.	Acres Impacted
1988	UNNAMED	N/A	10
	UNNAMED	N/A	20
	UNNAMED	N/A	22
	UNNAMED	N/A	35
	UNNAMED	N/A	10
	UNNAMED	N/A	120
	UNNAMED	N/A	783
	UNNAMED	N/A	11
	UNNAMED	N/A	578
1989	UNNAMED	N/A	12
	EAGLE	00000724	4,400
	RACK	N/A	3,250
	LAYMAN	N/A	4,945
1990	HARTMAN	N/A	80
	UNNAMED	N/A	15
	UNNAMED	N/A	15
	WALKER	N/A	1,100
	GREENHORN	N/A	480
	WILDCAT	N/A	15
1996	CATEYES	N/A	10
	COOKS	N/A	1,138
	MADDALENA	N/A	4,660
	KUSS	N/A	13
	STAG	N/A	15
	GREENE	N/A	25
	TOWER	N/A	64
	MARTINECK	N/A	330
1997	RUSH	N/A	4
1999	HORTON 2	N/A	4,366
	CLAREMONT	N/A	178
	STAG	N/A	467
	DEVILS GAP	N/A	1,450
	LOOKOUT	N/A	2,630
	PIDGEON	N/A	4,713
	BUCKS	N/A	34,175
	CHROME	N/A	110
	UNNAMED	N/A	3,625
2000	STORRIE	N/A	55,261
2001	STREAM	N/A	3,560
2002	FERRIS	N/A	18
	POPLAR	N/A	63
	VINTON	N/A	13

2003	CORRECO	N/A	80
	CHILCOOT	N/A	5,635
	CINDER	N/A	100
2004	MISSION	N/A	15
	STONY	N/A	78
	MARTIN	N/A	131
	COTTONWOOD	N/A	560
	KETTLE	N/A	12
2005	NUGGET	N/A	18
	BELL	N/A	35
2006	GREASE	00000551	366
	FLOURNOY	N/A	20
	INDIAN	00000371	16
	SAGE	00000371	17
	FITCH	N/A	29
	BUTTES	N/A	30
	BOULDER COMPLEX	00000371	3,500
	HUNGRY	00000371	512
	BOULDER	00000371	2,920
	FOOT	N/A	40
2007	MARBLE	00000098	27
	CLIFTON	00000012	67
	MOONLIGHT	00000098	64,995
	DAVIS	00000055	31
	BABCOCK PEAK	00000056	400
	WHEELER	00000053	22,906
2008	KEDDIE	N/A	77
	SLATE	N/A	10
	CREST	N/A	39
	BIG	N/A	74
	HARTMAN	N/A	331
	LITTLE	N/A	1,450
	COLD	N/A	5,512
	SOUTH-FREY	00000052	11,000
	SCOTCH	N/A	13,009
	CUB	00000013	14,936
	BTU LIGHTNING COMPLEX	007660	53,699
	MCRAE	00000083	18
	OLIVER	00000023	44
	RICH	N/A	5,572
2009	MILFORD GRADE	000009	226
	SILVER	000092	307
	ELEPHANT	000071	445
2010	WOODY	0751	15
	ROCK	752	63
	BAR	0700	1,040
	MEADOW VIEW	0664	15
	GULCH	0669	105
2011	ADAMS	00000017	27
2012	PEAK	N/A	781
	CHIPS	N/A	79,399

Source: California Department of Forestry and Fire Protection (2011)

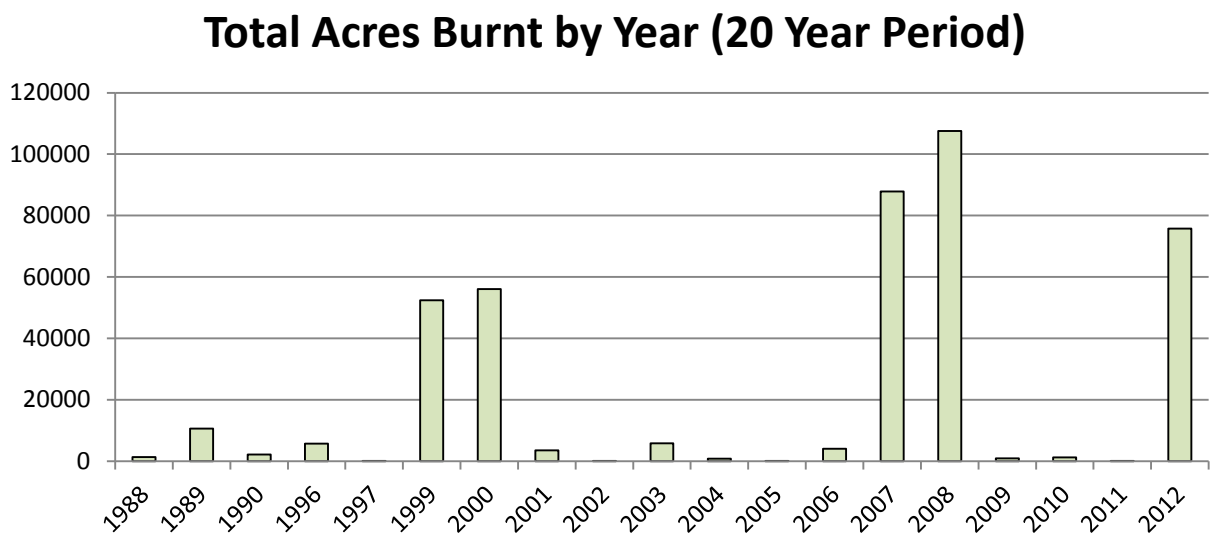
5.3.3 Location/Geographic Extent

Using information from CAL FIRE and USFS , illustrates the areas at risk to a wildfire event. The areas with the highest risk of wildfire are spread throughout the County and are generally located in areas with greater fuel loads resulting from denser forestation. The area that has seen the highest number of fires is the Feather River Canyon along the CA-70 corridor due to the high volume of auto and rail traffic, and also its accessibility to the population increases its risk for human-triggered fires. It is more relevant to identify areas of lower fire hazard, which are the larger valleys such as Indian, American, and Sierra, and also the high elevation peaks that receive the most precipitation.

5.3.4 Magnitude/Severity

The magnitude and severity of a wildfire event is measured by calculating the number of acres burned in a specific wildfire event and the severity of the burn classifications. Using the information provided in Table 5-4, Figure 5-5 highlights the numbers of acres burned for each recorded wildfire event since 1988 in Plumas County. The magnitude and severity

Figure 5-5: Number of Acres Burnt by Year



Source: California Department of Forestry and Fire Protection (2011), 2012 -2013 Plumas County HMP Data Gathering,

5.3.5 Frequency/Probability of Future Occurrences

In Plumas County, wildfire season commences in early spring through late fall every year during the hotter, dryer months. Topography, weather, and vegetation provide the ingredients for destructive wildfires that can spread rapidly throughout the County.

CAL FIRE adopted Fire Hazard Severity Zone maps for SRA in November 2007. Fire Hazard mapping is a way to measure the physical behavior to predict the damage a fire is likely to cause. Fire hazard measurement includes vegetative fuels, probability of speed at which a wildfire moves the amount of

heat the fire produces, and most importantly, the burning fire brands that the fire sends ahead of the flaming front.

The CAL FIRE model used to develop the information in accounts for topography, especially the steepness of the slopes (fires burn faster as they burn up-slope.). Weather (temperature, humidity, and wind) also has a significant influence on fire behavior. As a result, vast areas in the SRAs shown in the Fire Hazard Map are rated as high, very high and extreme fire hazard in the unincorporated areas of the County. The areas depicted as high, very high and extreme in are of particular concern and potential fire risk in these are constantly increasing as human development, and the wildland urban interface areas expand. See Figure 5-6 for Hazard Severity Zones in Plumas County.

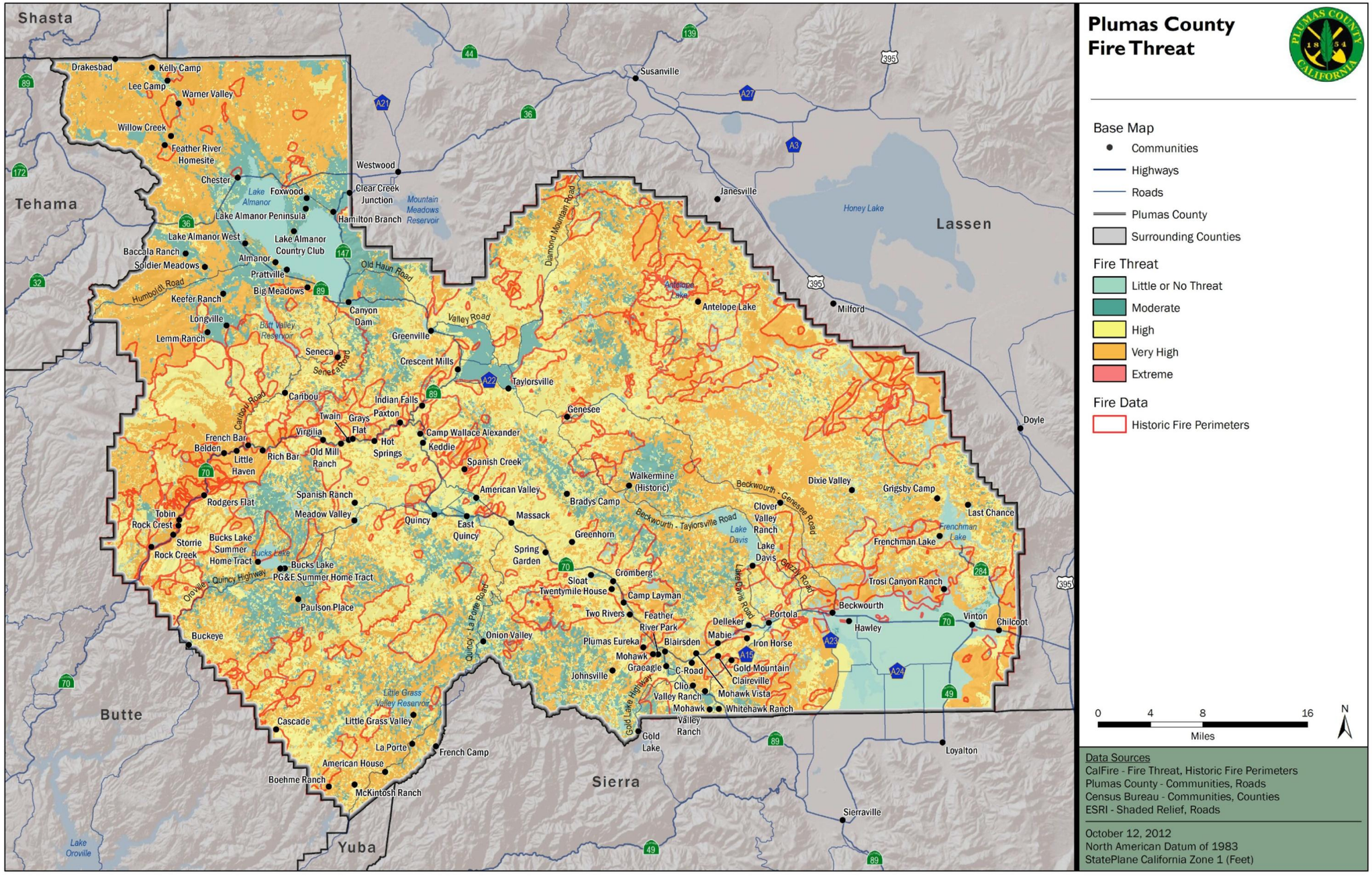


Figure 5-6: Wildfire Threat and Historic Wildfires Overlay

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5.4 *Flood Hazard Profile*

Flood reduction, prevention, and mitigation are a major challenge to Plumas County residents and floodplain managers alike. Many areas of Plumas County are at risk to flooding, especially property near rivers and along valley floors. Plumas County is almost entirely contained within the Upper Feather River Watershed creating a unique relationship between flooding issues in different geographic areas as water travels down from the high elevation headlands into the larger valleys and river canyons. Flood prone areas within Plumas County can be organized by elevation within the watershed, thus examining the impact of water as it travels downhill on its journey to the Central Valley. The primary areas discussed in the following sections are: Sierra Valley, Chester, Indian Valley, American Valley, and the North Fork Feather River Canyon. Localized flooding associated with creek or stream overflow occurs in Plumas County when rainfall runoff volumes exceed the design capacity of drainage facilities or a lack of flood control structures in place. Heavy seasonal rainfall, which typically occurs from November through March, often results in stream overflows.

5.4.1 Regulatory Environment

The regulatory environment for flood control at the local, state, and federal level is complex, difficult to navigate, and varies based upon flood control structure, location of water bodies, and local participation in state and federal programs. This section focuses on the regulations that Plumas County uses to regulate development within the floodplain. This section also highlights some of the new requirements from the State of California as well as the National Flood Insurance Program (NFIP).

5.4.1.1 Local Building Codes

Plumas County has a number of building codes and construction best management practices in place to reduce flood risk for new construction, substantial improvements, or other man-made changes. The Building Department, as the floodplain administrator for the County, determines if new construction will have to meet certain flood zone construction criteria.

The County Engineer, the Building Official, the Director of Environmental Health, and the Planning Director have authority to perform Flood Zone Determinations. Upon application for a development permit the application and plans and reviewed to determine whether or not the site of the proposed structure is within any Special Flood Hazard Area (SFHA) designated by FEMA on regulatory Flood Insurance Rate Maps (FIRMs). More information on FEMA flood hazard areas is provided further on in this section.

New construction and substantial improvements of any structure shall have the lowest floor, including the basement, elevated at least one foot above the base flood elevation. On completion of the structure, the elevation of the lowest floor shall be certified by a registered professional engineer or surveyor, and shall be verified by the Building Official, to be properly elevated. The certification and verification shall be provided to the Building Official and the County Engineer. All new construction and substantial improvement with fully enclosed area below the lowest floor, excluding basements, that are

usable solely for parking of vehicles, building access or storage, and which are subject to flooding, shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of flood water (Plumas County Code or Ordinances, Sec. 8-17.301. - Standards of construction).

5.4.1.1.1 National Flood Insurance Program (NFIP)

The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. As a participating member of the NFIP, Plumas County Officials are dedicated to protecting homes of more than 160 policies currently in force. FEMA has prepared a detailed Flood Insurance Study (FIS) for areas of Plumas County; the study presents water surface elevations for floods of various magnitudes, including the 1-percent annual chance flood (100-year flood, base flood) and the 0.2-percent annual chance flood (500-year flood). Base flood elevations and the boundaries of the 0.1% and 0.2% Annual Chance floodplains are shown on FIRMs. More information on location and geographic extent are provided in Section 5.3.3.

NFIP Community Overview

- 163 policies in force
- $37,987,500 insurance in force
- 34 paid losses
- $680,554 total paid losses
- 6 substantial damage claims since 1978

Plumas County entered the NFIP on December 20th, 1974, and its initial FIRM became effective on September 24th, 1984. As a participant in the NFIP the County is dedicated to regulating development in the FEMA floodplain areas in accordance with NFIP criteria.

Structures permitted or built in the County before the NFIP regulatory requirements were incorporated into the County ordinances (before the effective date of the County's FIRM) are called "pre-FIRM" structures. For the Plumas County unincorporated areas, pre-FIRM structures are those permitted or built before September 24th, 1984.

For more information on California Regulation and the NFIP, please see California's Department of Water Resources Quick Guide in Appendix C.

5.4.1.2 Central Valley Flood Protection Plan

Legislation spearheaded by the California Department of Water Resources (DWR) to provide protection to people and property in areas especially prone to flooding was enacted by State Legislation in 2007 in the California Central Valley. State legislative requirements provide Plumas County local planning responsibilities for floodplain management (e.g., general plans, zoning ordinances, development agreements, tentative maps, and other actions).

Some of the requirements of the 2007 flood risk management legislation apply Statewide, while other legislation is additive and provides provisions applicable to lands within the Sacramento-San Joaquin Valley (SSJV), and further to lands also within the Sacramento-San Joaquin Drainage District (SSJDD).

Plumas County is within the SSJV. Please see Appendix C for more information on implementing California Flood Legislation into local planning. Government Codes 65302 and 8685.9 are of particular importance to hazard mitigation planning.

Figure 5-7: Sacramento-San Joaquin Valley (SSJV)

5.4.1.2.1 Government Code 65302

Government Code 65302 authorizes, but does not require, cities and counties to adopt a local hazard mitigation plan specified in the Federal Disaster Mitigation Act of 2000 in conjunction with the safety element of the general plan.

5.4.1.2.2 Government Code 8685.9

Government Code 8685.9 prohibits the State share for any eligible project under the California Disaster Assistance Act from exceeding 75 percent of total State eligible costs, unless the local agency is located within a city, county, or city and county that has adopted a local hazard mitigation plan in accordance with the Federal DMA 2000 as part of the safety element of its general plan. In other words, the Legislature may provide for a State share of local costs that exceeds 75% of total State eligible costs if the local jurisdiction/agency has an adopted local hazard mitigation plan.

Most importantly the General Plan Safety Element will be required to reference information about floodplain management and flood hazards within Plumas County. For further information the crosswalks in Appendix C provide a checklist of the regulatory environment for California and SSJV.

Government Code Section 8685.9 now provides a financial incentive for implementation of Government Code Section 65302.6, which allows local jurisdictions that adopt a LHMP as part of the safety element. The financial incentive is realized when local jurisdictions incur State-eligible, post-disaster costs under CDAA.

5.4.2 Past Occurrences

Localized and regional flooding in Plumas County has been a continuous occurrence dating back to at least 1893 when Quincy experienced its first photographed flood. Major Disaster Declarations at the Federal level have occurred 9 times as a result of major regional flooding caused by severe storms and heavy rains in California. State Emergency Disaster Proclamations for flood damage as result of severe storms and heavy rains have been declared 10 times from 1950 to present. A total of 11 flood events have received a Federal or State disaster declaration; Table 5-2 for complete list of declared disasters.

1893 flooding in Quincy taken from the old Courthouse roof looking north.
Figure 5-8: 1893 Quincy Flooding

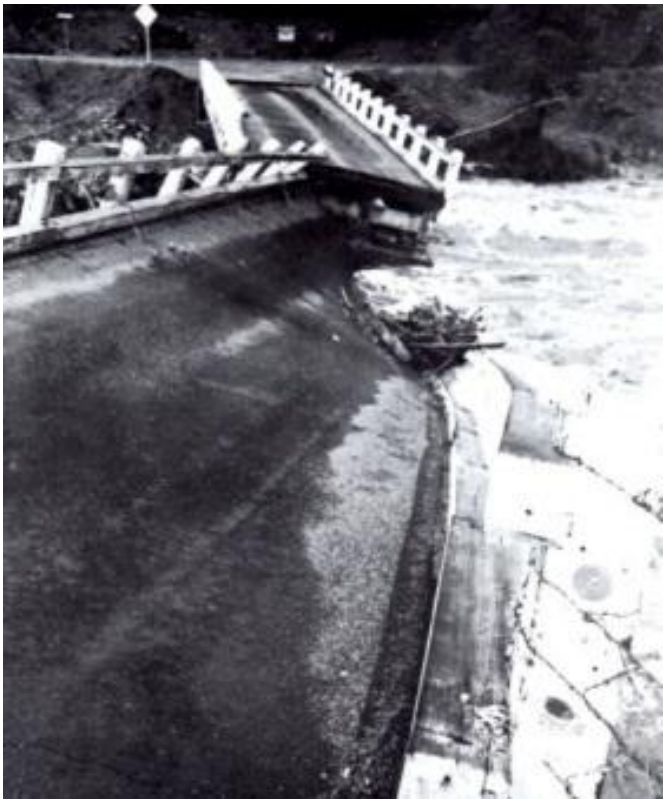
Winter storms in 1986 and 1997 caused tremendous flood damage to properties and infrastructure throughout the Upper Feather River Watershed. Both floods were state and federally declared disasters.

From February 8-20, 1986, a large storm lasting 13 days precipitated rain and snow across Northern California. Plumas County was located within the interior of the storm extent and experienced tremendous rainfall, causing the ground to saturate and allowed surface water to flow freely. As rain fell over the county filling creeks and drainage ditches it also flowed downhill through the Feather River system, incrementally adding more water to the lower elevation valleys and the river canyons. By the 11th day of the storm the capacity of the hydrologic system was exceeded and extensive damage was experienced throughout Plumas County. The most visually impressive damage was found in the North Fork Feather River Canyon, along CA-70 and the Railroad, due to the large volume of water that was funneled through the canyon.

Numerous bridges were severely damaged or destroyed, large sections of roadway and railroad were wiped out, many houses were flooded with over one foot of water, and debris was deposited in throughout Plumas County. Train service was disrupted for at least 3 days through the Feather River Canyon and several state highways were temporarily out of commission to public traffic for several weeks. In addition, many residential wells were flooded.

High waters scoured away the railroad bed in the Feather River Canyon during 1986 flood. (Source: "The Storm of '86" by Robert Moon, Feather River Publishing, Quincy, CA, 1986.)

Figure 5-9: Feather River Canyon 1986 Flooding



Indian Creek Bridge in Taylorsville destroyed by high waters and debris during 1986 flood. (Source: "The Storm of '86" by Robert Moon, Feather River Publishing, Quincy, CA, 1986.)

Figure 5-10: Indian Creek Bridge 1986 Flooding

Historic Mohawk Valley Bridge destroyed by high waters during 1986 flood. (Source: "The Storm of '86" by Robert Moon, Feather River Publishing, Quincy, CA, 1986.)

Figure 5-11: Mohawk Valley Bridge 1986

Winter storms in late December 1996 through January 1997 poured tremendous amounts of rain throughout Plumas County. Such as in 1986, the ground became saturated and the river system overflowed with excess water. On January 2nd the State declared a disaster and on January 4th a Federal disaster was declared. The extent and severity of flooding and related damage exceeded the 1986 event throughout Plumas County, from the high-elevation valleys to the low-elevation river canyons. The type of damage experienced was similar to that in 1986.

Erosion from floodwaters caused home to fall into Indian Creek in Genesee during 1997 floods. (Source: Feather River Bulletin, Wednesday, Jan. 29, 1997).

Figure 5-12: Indian Creek in Genesee 1997

Damage to home Genesee home resulting from 1997 flood. (Source: Feather River Bulletin, Wednesday, Jan. 8, 1997).

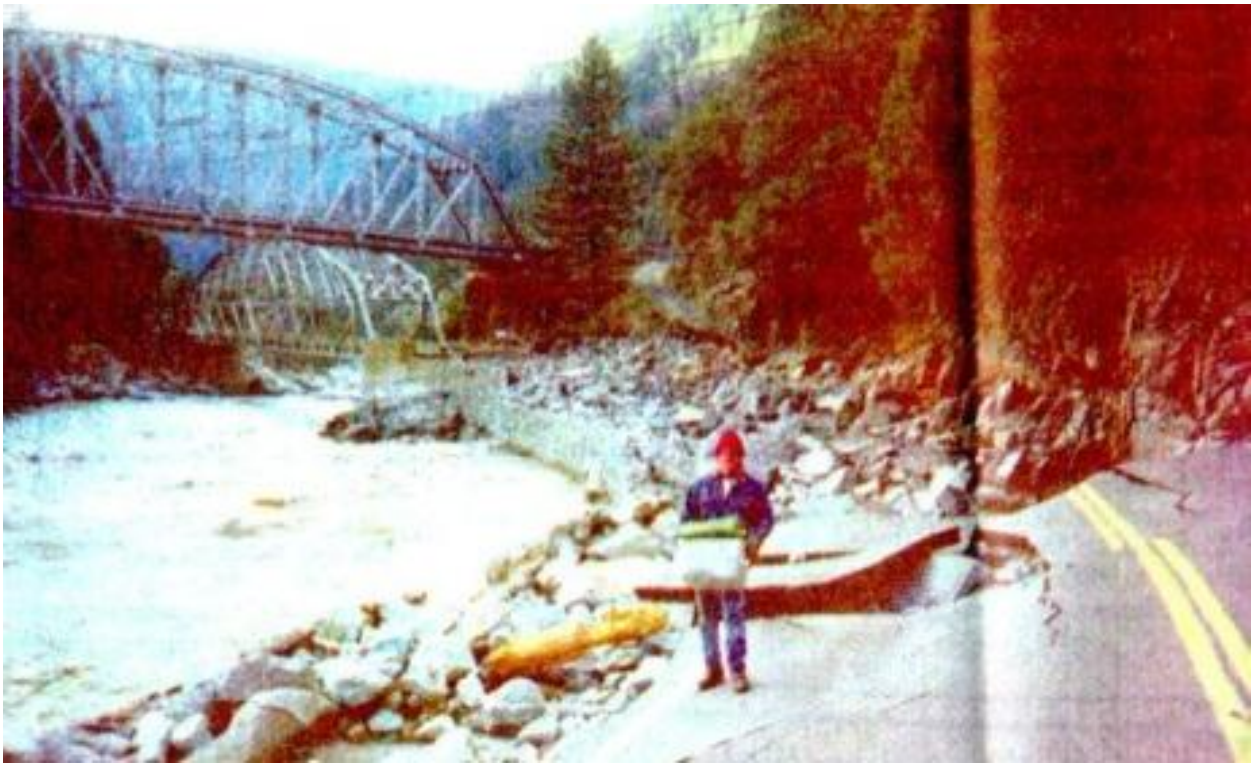
Figure 5-13: Flood damage in Genesee 1997

Waist-deep water in home due to 1997 flood. (Source: Feather River Bulletin, Wednesday, Jan. 15, 1997).

Figure 5-14: 1997 Flood Damage

Sloat Bridge washed away on January 1st, 1997. Source: Image captured by Plumas County Road Department on January 4th, 1997.

Figure 5-15: 1997 Bridge Washout



CA-70 near Tobin destroyed by flood waters during 1997 event. (Source: Feather River Bulletin, Wednesday, Jan. 15, 1997).

Figure 5-16: 1997 Flooding in Tobin

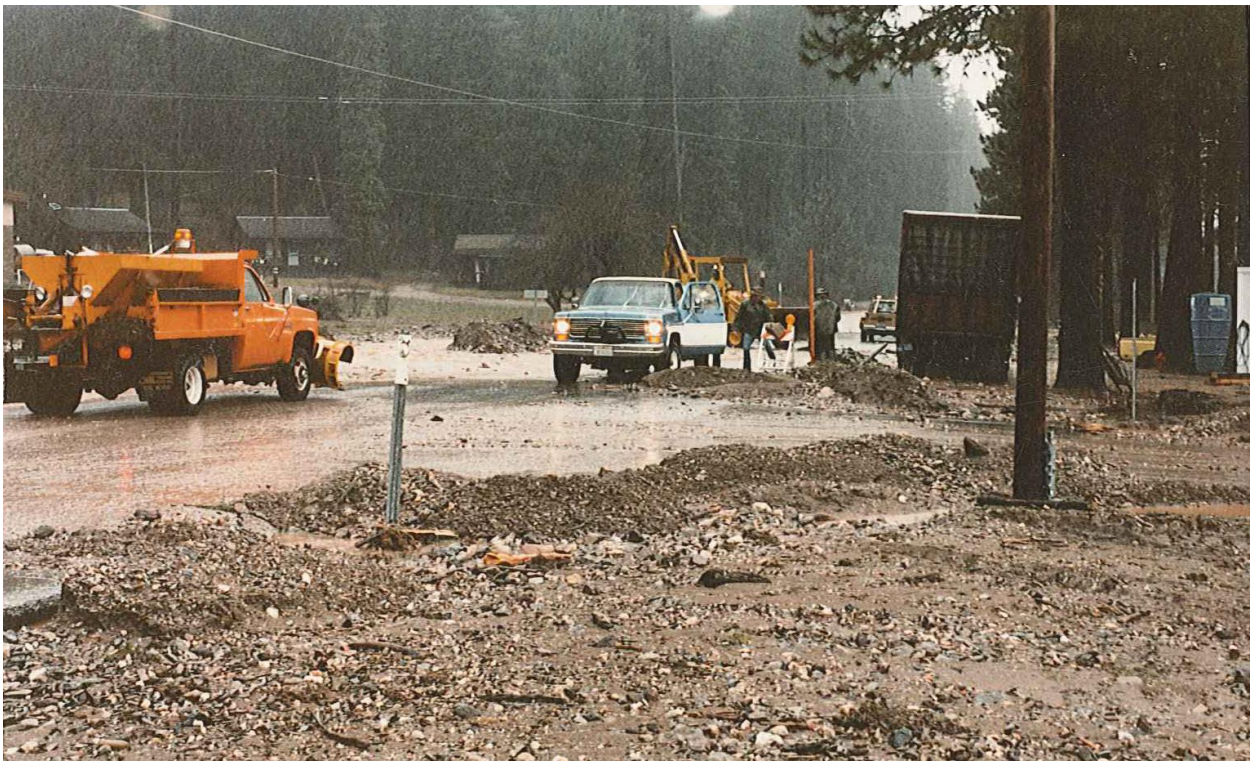


Figure 5-17: Plumas District Hospital 1986

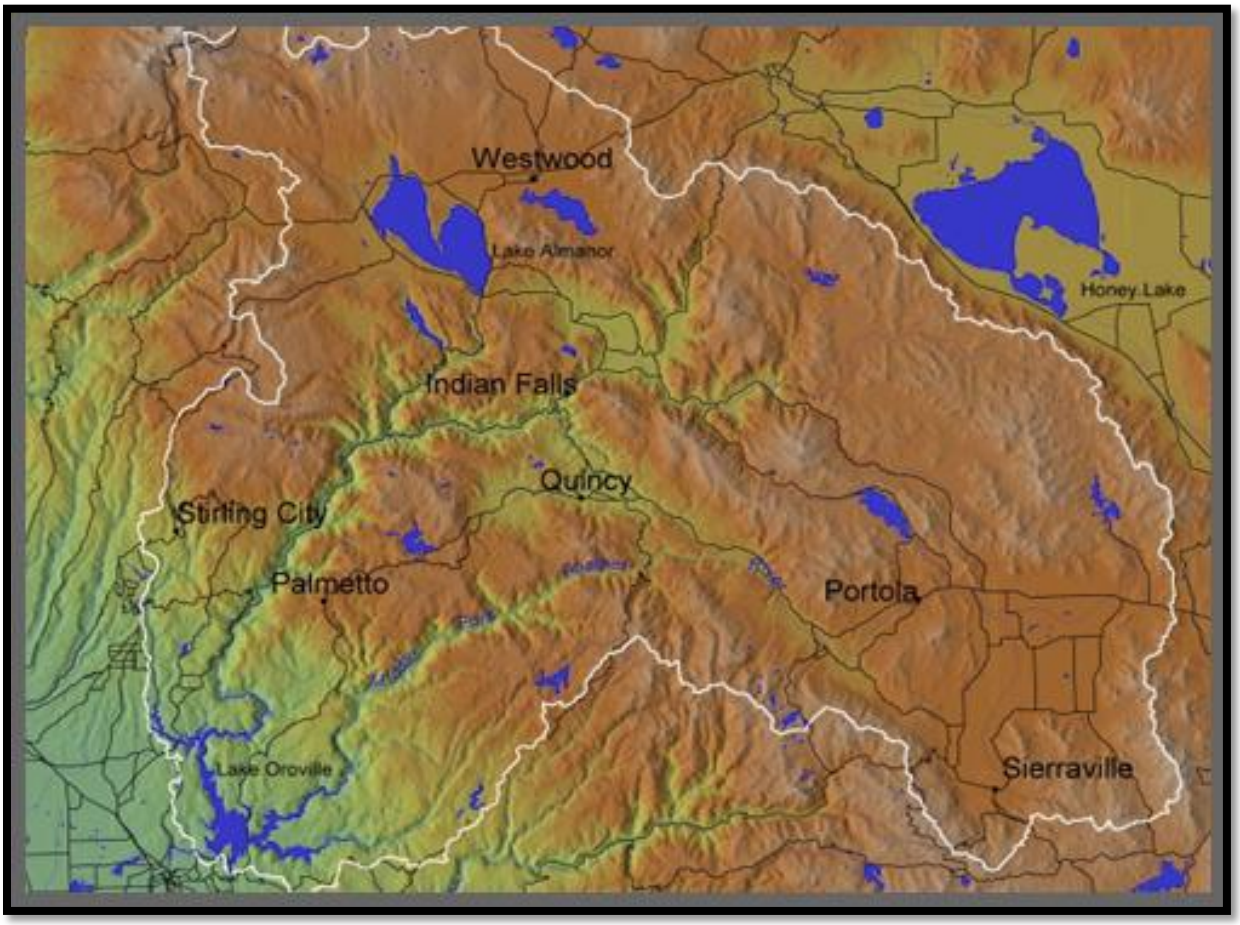
Photo captured along CA-70 in the North Fork Feather River Canyon in Butte County, less than 1 mile downstream from the Plumas County border. High water marks from 1986 and 1997 flood events

Figure 5-18: Feather River High Water

5.4.3 Location/Geographic Extent

There are 94 watershed basins, at the Hydrologic Unit Code 12-digit (HUC-12), that extend across Plumas County. Many of these watersheds may be at risk of flooding, in particular those that encompass the larger valleys that have been developed. Due to Plumas County's location within the Sierra-Nevada Mountain Range 99% of the precipitation that falls in the county flows into either the

North, Middle, or South Fork of the Feather River, and ultimately into Lake Oroville Reservoir in the foothills. See Figure 5-19.



(Source: Feather River Coordinated Resource Management, Plumas Corporation).

Figure 5-19: Upper Feather River Watershed

Flood prone areas within Plumas County can be organized by elevation within the Upper Feather River watershed, thus examining the impact of water as it travels downhill on its journey to the Central Valley. The primary areas at risk of loss from flooding are: Sierra Valley, Chester, Indian Valley, American Valley, and the North Fork Feather River Canyon.

A majority of the flood risk within Plumas County is specifically subject to inundation as a result of heavy rainfall and resulting stream overflows. In the unincorporated portions of Plumas County a majority of flood risk is located in alpine valleys that collect large amounts of runoff and areas close to regional watershed flooding sources such as the North Fork Feather River. The extent of flooding associated with a 1-percent annual probability of occurrence (the base flood or 100-year flood) is used as the regulatory boundary by many agencies, and helps identify the location and extent of flooding in areas across Plumas County. This area is also referred to as the Special Flood Hazard Area (SFHA) and is a convenient

tool for assessing vulnerability and risk in flood-prone communities[6]. Figure 5-20 shows modeled 1% Annual Chance and 0.2% Annual Chance FEMA floodplains. Plumas County contains over 86,000 acres of identified flood hazard areas. Table 5-5 provides the total area for both the 1% and 0.2% Annual Chance flood hazard areas.

Table 5-5: Flood Hazard Area

Flood Hazard Type	Square Miles	Acres
1% Annual Chance	132.45	84,766.65
0.2% Annual Chance	2.24	1,431.69
Grand Total	**134.69**	**86,198.34**

[6] Experience has shown that FEMA maps in the rural areas of Plumas County are not always accurate. A prime example is the Sierra Valley area. Plumas County is working with FEMA on updating flood hazard mapping in that area. FEMA flood insurance data is not always indicative of flood losses as not every property that floods has flood insurance.

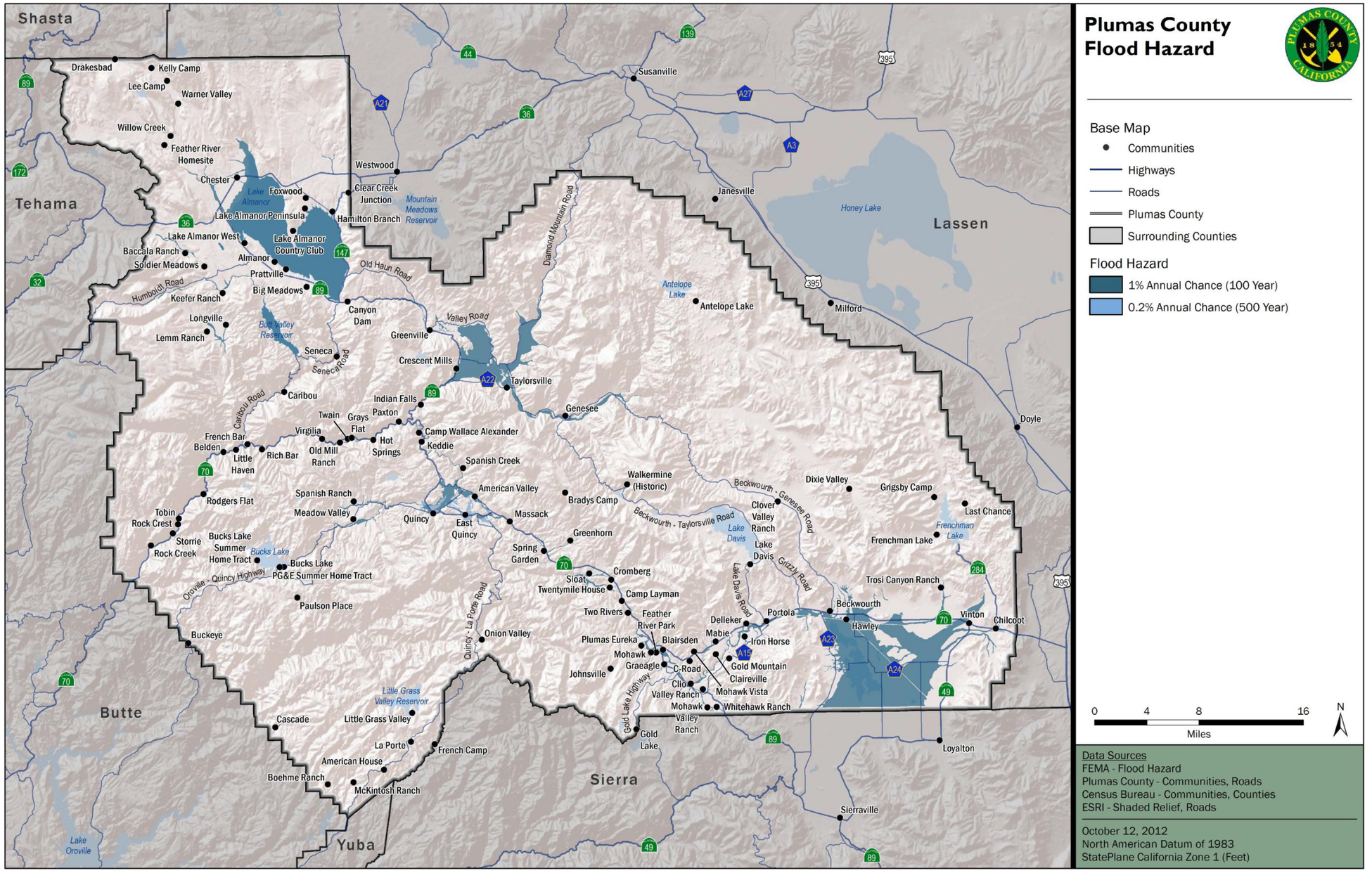


Figure 5-20: Flood Hazard Map

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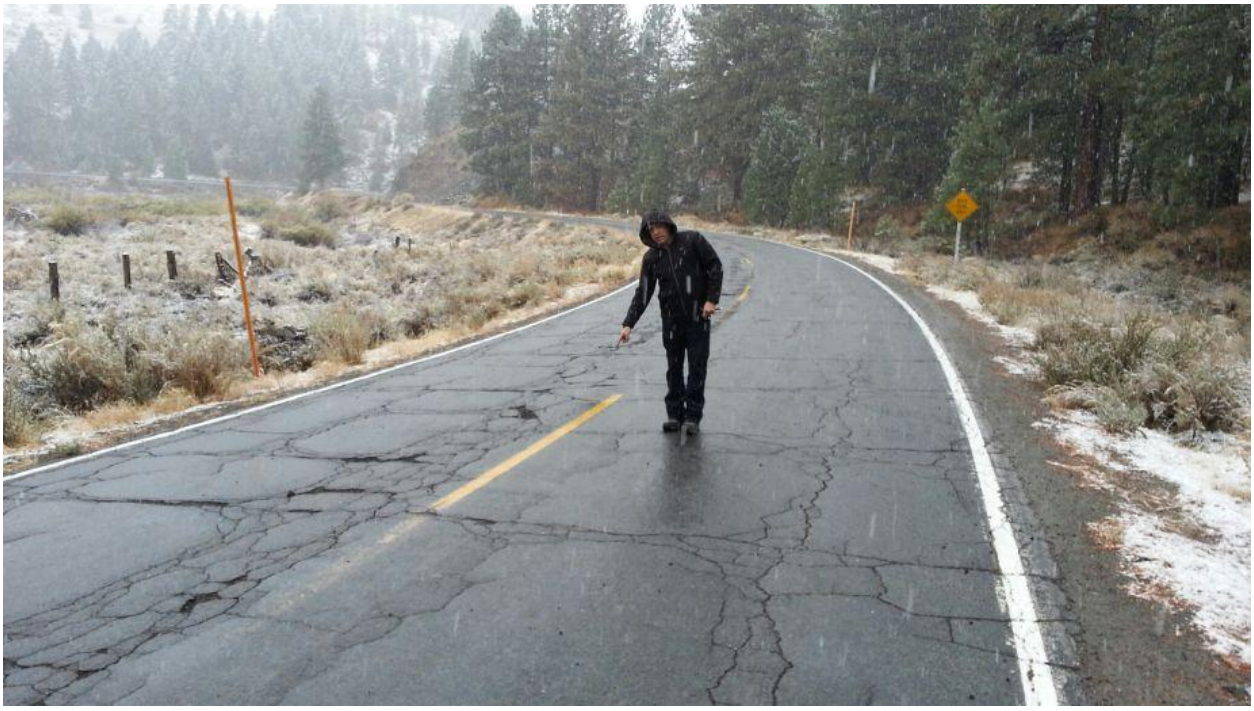
5.4.3.1 Sierra Valley

The Sierra Valley is a large intermountain valley on the eastern edge of Plumas County. It has an area of 120,000 acres and is primarily located in Plumas County, but also extends southward into Sierra County. The valley has an average elevation of 4,850 feet and serves as the headwaters for the Middle Fork Feather River. The Sierra Valley has minimal topographic relief and flooding is generally shallow and low velocity. During large storms, such as those in 1986 and 1997, the entire valley will fill with several feet of water. Table 5-6 provides a summary of the primary flooding problems in the Sierra Valley. See Figure 5-21 through Figure 5-25 for photos and description of Sierra Valley.

Table 5-6: Sierra Valley Flooding Issues

Area	Issues
Marble Hot Springs Road	▪ Annual flooding in various locations from rain and irrigation ▪ 0.7 mile stretch east of the historic bridge experiences repeated flooding ▪ Closed in winter due to snow ▪ Primary evacuation route
Rocky Point Road (Old Highway 70)	▪ Experiences shoulder and bank erosion and repeated flooding ▪ Will flood nearly up to road centerline during major events ▪ One or two homes have been damaged
Harriet Lane	▪ Experiences sheet flow across road ▪ Often inundates nearby agricultural/ranch facilities, specifically around Island Ranch ▪ Road has sub-layer integrity issues and contains clay road base requiring constant repair ▪ Major corridor for Hay transportation
Dyson Lane	▪ Experiences sheet flow and shallow flooding ▪ Flooded with entire valley in 1992 ▪ 0.1 mile low spot across the valley drainage area ▪ Serves local population and as a bypass



HMP project team member Ethan pointing to the high water mark during a 1992 valley flood event. Photo captured by project team along Rocky Point Road.

Figure 5-21: Sierra Valley high water mark.

Turn on Marble Hot Springs Road experiences repetitive flooding. Photo captured by project team.

Figure 5-22: Sierra Valley, Marble Hot Spring Road

Shoulder bank erosion around culvert on Rocky Point Road. Photo captured by project team.

Figure 5-23: Rock Point Road

Harriet Lane experiences sheet flow. Photo captured by project team.

Figure 5-24: Harriet Lane

1/10 mile low spot experiences flooding on Dyson Lane. Photo captured by project team.

Figure 5-25: Dyson Lane

5.4.3.2 Chester/Lake Almanor

Lake Almanor is a higher elevation alpine lake located at 4,505 feet in the northwestern portion of Plumas County. Chester is the largest community of several that surround the lake and is located at the inlet of the North Fork Feather River. The outflow of the North Fork Feather River is controlled by Canyon Dam at the southern edge of the lake.

Flooding issues in this region are minimal due to the construction of the Chester Flood Control Channel, or ACE bypass, a large diversion channel from the North Fork Feather River upstream of Chester/Lake Almanor. The diversion channel allows river water to enter once it reaches a certain height and directs it around Chester into Lake Almanor. The bypass also has a secondary set-back levee system outside of the channel for extreme flooding events.

The hydrography in the Lake Almanor area is important to understand as all water that flows through this region travels down into the Feather River Canyon that contains major road and rail transportation routes and a number of communities. See Figure 5-26 and Figure 5-27 for photos and descriptions of the Chester Bypass.

Project Team member Ethan Mobley indicates the height water has previously filled channel. Photo captured by project team.
Figure 5-26: Chester Flood Control Channel, North Fork Feather River.

Inlet to Chester Flood Control Channel from North Fork Feather River. Photo captured by project team.

Figure 5-27: Chester area flood control

5.4.3.3 Indian Valley

Indian Valley is located in the north-central portion of Plumas County at an average elevation of 3,500 feet. It contains several developed communities and is also utilized for farming. Indian Valley is the meeting place of four creeks: Wolf Creek, Cooks Creek, Lights Creek, and Indian Creek. Indian Creek is the dominant stream reach as the other three creeks confluence with it, and then exits the valley past Arlington Bridge.

Indian Valley exhibits a number of flooding issues due to its flat topography and hydrography. Much of the water that flows through the Upper Feather River watershed makes its way through Indian Valley on its journey into the Feather River Canyon. Table 5-7 provides a summary of the primary flooding issues in Indian Valley: Figure 5-28 through Figure 5-34 provide photos and descriptions of Sierra Valley flooding issues.

Table 5-7: Summary of Indian Valley Flooding Issues

Area	Issues
Williams Creek @ North Valley Road	▪ Road over culverts that drain water from upstream private land into the valley ▪ Road has been overtopped resulting from debris blockage in culverts ▪ Road Department uses logging equipment/poles to remove debris during high flows preventing flooding, which is a dangerous activity ▪ Major flooding in 1986 and 1997 ▪ Roadway serves large populations in Taylorsville and Diamond Valley and is heavily trafficked during winter due to its tendency to receive less snow and ice than alternative routes
Cassidy's Turn	▪ Shows high water mark from 1997 flood
Stampfli Lane	▪ Cross-valley road traveling E-W sits at low point in drainage area ▪ Annual flooding of 0.5-1.0 feet of water on roadway often renders road impassible ▪ Repeated flooding of residential structures ▪ Poor drainage, flooding is caused by saturation of adjacent agricultural fields
Mt. Hough Estates	▪ Low-lying subdivision, portion of which has repeated flooding ▪ Houses appear to be slab-on-grade ▪ Typically during valley-flooding events ▪ Residents aware of impending flooding by the presence of water in neighboring fields
Old Wagon Road, Crescent Mills	▪ Residential structure flooded repeatedly (5-6 times) ▪ High water mark 6 feet high in some locations ▪ House built at drain point for basin

Area	Issues
Arlington Bridge (State# 09C-007)	▪ Bridge overtopped by 3 feet during 1997 flood ▪ Flows often approach height of bridge deck ▪ Major drainage point for entire valley ▪ Sedimentation issues on downstream side ▪ Adding culverts may improve drainage
Genesee Road @ Little Grizzly Creek	▪ Flooding can close road cutting off access for 15-20 homes

Culverts often clog with debris during storms and can cause the road to overtop. Photo captured by project team.

Figure 5-28: North Valley Road crossing Williams Creek.

Road Department District 2 foreman identifies high water mark from 1997 flood. Photo captured by project team.

Figure 5-29: Indian Valley High Water

Ponding area of Stampfli Lane has poor drainage and floods annually. Photo captured by project team.

Figure 5-30: Indian Valley Flooding Location

Low-lying area of Mt. Hough Estates subdivision subject to flooding from Indian Valley creeks. Photo captured by project team.

Figure 5-31: Mt. Hough Estates, Indian Valley

Residential structure in Crescent Mills built at drain point of basin experiences repeated flooding. Photo captured by project team.

Figure 5-32: Crescent Mills Repetitive Flood Area

Stream flowing under Arlington Bridge. Photo captured by project team from bridge, looking north.

Figure 5-33: Headwaters of the Feather River

Location along Genesee Road where flood waters can cover road and cut off access. Photo captured by project team.

Figure 5-34: Genesee Road Evacuation Issues

5.4.3.4 American Valley

American Valley is located in the geographic center of Plumas County and sits at an average elevation of 3,500 feet. In American Valley, Greenhorn Creek confluences with Spanish Creek upstream near the Town of Quincy. A majority of the flooding issues are caused by localized drainage as opposed to valley-flooding events. The water in Spanish Creek that passes through American Valley confluences with Indian Creek flowing out of Indian Valley into the Feather River Canyon. Table 5-8 provides a summary of the primary flooding issues in American Valley. Figure 5-35 through Figure 5-43 provides photos and descriptions of American Valley flooding issues.

Table 5-8: American Valley Flooding Issue Summary

Area	Issues
Les Schwab	▪ Storm grate behind facility becomes clogged with debris causing water to overtop and flow into building ▪ Typically only floods with major events, not large storms; recalled events were in 1986, 1993, and 1997 ▪ Overtopping waters also flow into a nearby home and businesses further downhill
Quincy Café	▪ Water can overtop edges of earthen ditch ▪ Water flooding from behind Les Schwab will flow down street and into businesses in strip mall ▪ Historic flooding up to 2 feet of water in strip mall businesses
Henchels	▪ Storm drain on small creek gets clogged with debris and backs up, causing water to flow onto roadway and into the school and neighboring building across the street ▪ Grate is not easily accessible
Old Sewer Plant (at bike path)	▪ Drainage path takes 90-degree turn into culverts underneath bike path ▪ Water drains poorly and overtops path
West Ranch Road (at CA-70)	▪ Road needs to be elevated and larger pipes installed
East Quincy Drains	▪ Drainage problems at high water ▪ Pipes/drainage too small and becomes clogged with debris
Vieira's Field	▪ Better/safer access and larger pipe
Chandler Road (West)	▪ Beddell Ranch and Green Bridge areas often flood ▪ Easy fix is to elevate road and install culverts where needed
Oakland Camp Road	▪ Floods from intersection with Chandler Road to Oakland Camp gate ▪ Easy fix is to elevate road and install culverts where needed

Area	Issues
Gansner Creek	▪ Storm grate on south side of West Main Street becomes clogged with debris causing water to overtop and flow across road ▪ Flood water flows down into hospital flooding the ambulance entrance, ER entrance, and X-ray doors ▪ Hospital flooded in 1986, 1993, and 1997
Mill Creek	▪ Runs behind and alongside private property ▪ Small drain on private property can clog with debris ▪ During heavy rains and large-scale events water will bypass drain and flow down gravel road toward CA-70
Clear Creek	▪ Located in Meadow Valley outside of American Valley ▪ Grate clogs with debris causing water to back up ▪ Water can back up high enough to swirl around the base of Meadow Valley Road potentially causing erosion and damage to roadway ▪ System is stressed several times annually

Storm grate behind Les Schwab becomes clogged with debris causing flooding. Photo captured by project team.

Figure 5-35: American Valley drainage inlet.

Strip mall containing Plumas Café and other businesses. Water can overtop earthen ditch on right, or flow down street on left when storm drain floods behind Les Schwab. Photo captured by project team.

Figure 5-36: American Valley drainage Issues

Henchels storm grate, small grate for localized drainage clogs with debris and causing flooding over roadway. Photo captured by project team October 2012.

Figure 5-37: American Valley drainage issues

Flood water from Henchels flows across street and into school. Photo captured by project team.

Figure 5-38: American Valley Historic Flooding

Water overtops drainage at culverts where forced to take 90-degree right turn. Photo captured by project team.

Figure 5-39: American Valley historic drainage issue

View of Plumas District Hospital from storm grate along Gansner Creek. Apparent that Hospital is down slope from culvert and subject to flooding from overtopping water. Photo captured by project team.

Figure 5-40: Gansner Creek at Plumas District Hospital

Plumas District Hospital downhill from West Main Street, susceptible to flooding from waters overtopping storm grate on Gansner Creek. Photo captured by project team.

Figure 5-41: Gansner Creek at Plumas District Hospital

Small drain for Mill Creek can be bypassed during larger storms causing water to flow down adjacent gravel road. Photo captured by project team.

Figure 5-42: Mill Creek drainage inlet.

Culvert on Clear Creek in Meadow Valley becomes clogged with debris. Rising and swirling water poses erosion issue that could jeopardize roadway. Photo captured by project team.

Figure 5-43: Culver on Clear Creek in Meadow Valley

5.4.3.5 Feather River Canyon

The Feather River Canyon is a narrow river valley occupied by the North Fork Feather River and East Branch North Fork Feather River. At its upstream end is the confluence of Indian Creek, flowing from Indian Valley, and Spanish Creek, flowing from American Valley; here is the beginning of the East Branch North Fork Feather River. The East Branch meets the North Fork Feather River, flowing from Lake Almanor, about two miles upstream from Belden.

The Feather River Canyon is occupied by CA-70 and the Union Pacific Railroad, which comprise the two major E-W transportation routes through Plumas County. The canyon is home to a number of small towns adjacent to the river banks, highway, and train tracks.

Flooding issues in the Canyon are primarily related to larger events involving the North Fork Feather River, such as the 1986 and 1997 floods. Typical damage is washouts to roadways or train tracks. Much of the precipitation that falls in Plumas County flows through the Canyon.

5.4.4 Magnitude / Severity

As mentioned previously in this section, Plumas County is required to assemble a plan that addresses areas of repetitive loss (RL) and Severe Repetitive Loss (SRL) claims as prescribed by the FEMA's National Flood Insurance Program (NFIP) and Hazard Mitigation Program. The first step to conducting a basic Repetitive Loss Area Analysis (RLAA) is to designate the areas that will be considered to depict magnitude and severity of the flooding problems in each area. It is important to understand the difference between a repetitive loss *property* and a repetitive loss *area* as both are important in distinguishing an area for analysis.

A RL *property* is a FEMA designation defined as an insured property that has made two or more claims of more than $1,000 in any rolling 10-year period since 1978. The term "rolling 10-year period" means that a claim of $1,000 can be made in 1991 and another claim for $2,500 in 2000; or one claim in 2001 and another in 2007, as long as both qualifying claims happen within 10 years of each other. Claims must be at least 10 days apart but within 10 years of each other. RL properties may be classified as a Severe Repetitive Loss property under certain conditions. A Severe Repetitive Loss property (SRL) has had four or more claims of at least $5,000, or at least two claims that cumulatively exceed the buildings reported value. A property that sustains repetitive flooding may or may not be on Plumas County's RL property list for a number of reasons:

- Not everyone is required to carry flood insurance. Structures carrying federally-backed mortgages that are in a SFHA are required to carry flood insurance in Plumas County;
- Owners who have completed the terms of the mortgage or who purchased their property outright may not choose to carry flood insurance and instead bear the costs of recovery on their own;
- The owner of a flooded property that does carry flood insurance may choose not to file a claim;
- Even insured properties that are flooded regularly with filed claims may not meet the $1,000 minimum threshold to be recognized as an RL property; or

- The owner adopted mitigation measures that reduce the impact of flooding on the structure, removing it from the RL threat and the RL list (in accordance with FEMA's mitigation reporting requirements).

Many jurisdictions are required to address only the individual properties on the updated FEMA RL list. A property appears on FEMA's RL inventory because the structure had flood insurance and received two or more claims. These properties are merely representative of the community's overall repetitive flooding problem.

Extensive FEMA NFIP databases are used to track claims for every participating community including unincorporated Plumas County. Currently, unincorporated portions of Plumas County contain five RL properties under their jurisdictional umbrella (one additional property experienced repetitive loss in 1986 and 1997 but does not qualify because the claims were not within 10 years). The total dollar amount of claims paid to date by the NFIP is $169,555 of structural and $44,513 content claims. Together, the total claims paid by the NFIP are in excess of $214,068 for the unincorporated areas of the County. In order to make the NFIP a viable program it works to reduce the flood risk in the community and develop mitigation measure to reduce insurance payouts.

A property does not have to be currently carrying a flood insurance policy to be considered a RL or SRL property. Often homes in communities are not carrying flood insurance but are still on the community's repetitive loss list. The "repetitive loss" designation follows a property from owner to owner; from insurance policy to no insurance policy, and even after the property has been mitigated. Having an insurance policy and making claims that fall into the repetitive loss criteria will put a property on the RL list. Even after the policy on a property has lapsed or been terminated, the property will remain on Plumas County's RL list.

FEMA databases maintain all NFIP claims which allow for the examination of single-loss (SL) properties in addition to RL properties. Unincorporated Plumas County has 28 properties that have filed single-loss NFIP claims. The total dollar amount of claims paid to date by the NFIP is $420,770 (SL claims data does not differentiate between building and contents). This section will provide an overview of the general areas in Plumas County that have experienced loss due to flooding.

The Privacy Act of 1974 (5 U.S.C. 522a) restricts the release of certain types of data to the public. Flood insurance policy and claims data are included in the list of restricted information. FEMA can only release such data to state and local governments, and only if the data are used for floodplain management, mitigation, or research purposes. Therefore, this plan does not identify the repetitive loss properties or include claims data for any individual property.

5.4.4.1 Plumas Eureka Loss Area

Plumas Eureka is a small community in the Mohawk area near Graeagle. It is situated on the banks of the upper reaches of the Middle Fork Feather River east of the Sierra crest. Seven of the 34 properties that have filed NFIP claims are located in this area.

Claims Data: FEMA has reported six (6) SL properties and one (1) RL property7 along the Middle Fork Feather River. The SL properties account for $59,690 in claims and the RL property accounts for $29,748 in claims.

Building	Contents[8]	Losses	Paid	Average
$89,438	$0	8	$89,438	$11,180

5.4.4.2 American Valley Loss Area

American Valley is located in the center of Plumas County and is home to Quincy, the county seat. Greenhorn Creek and Spanish Creek flow through the valley. Seven properties have filed NFIP claims in American Valley. The properties are spread out across the valley; several are near the creeks and are subject to overbank flooding, while some are subject to localized drainage flooding within the developed area.

Claims Data: FEMA has reported six (6) SL properties and one (1) RL property in American Valley. The SL properties account for $7,068 in claims and the RL property accounts for $11,070 in claims.

Building	Contents[5]	Losses	Paid	Average
$18,138	$0	8	$18,138	$2,267

5.4.4.3 Mt. Hough Estates Loss Area

Mt. Hough Estates is a low-lying subdivision on the western edge of Indian Valley. It is subject to valley flooding events and shallow floodwaters often creep up the meadow near the subdivision. Six properties have filed NFIP claims in this area.

Claims Data: FEMA has reported five (5) SL properties and one (1) RL property in Mt. Hough Estates. The SL properties account for $120,479 in claims and the RL property accounts for $43,457 in claims.

Building	Contents[5]	Losses	Paid	Average
$163,936	$0	7	$163,936	$23,419

5.4.4.4 Genesee Loss Area

The valley area between Taylorsville and Genesee has recorded three NFIP claims, and an area several miles upstream of Genesee had a single NFIP claim. The flooding in this area results from Indian Creek.

Claims Data: FEMA has reported three (3) SL properties and one (1) RL property in the Genesee area. The SL properties account for $118,742 in claims and the RL property accounts for $2,557 in claims.

Building	Contents[5]	Losses	Paid	Average
$118,742	$2,557	5	$121,299	$24,260

[7] Claims filed in 1986 and 1997, technically not RL property but did have multiple losses
[8] SL claims data does not differentiate between building and contents losses; building totals may contain contents losses

5.4.4.5 Twain Loss Area

A stretch of the CA-70 corridor around Twain has recorded six NFIP claims to three properties. This area is located in the Feather River Canyon along the East Branch North Fork Feather River.

Claims Data: FEMA has reported one (1) SL property and two (2) RL properties in the Twain area. The SL property accounts for $51,602 in claims and the RL properties account for $156,984 in claims.

Building	Contents[5]	Losses	Paid	Average
$166,630	$41,956	6	$208,586	$34,764

5.4.4.6 Sloat Loss Area

The area around Sloat in the Middle Fork Feather River valley has recorded two NFIP claims.

Claims Data: FEMA has reported two (2) SL properties in the Sloat area. The SL properties account for $6,430 in claims.

Building	Contents[5]	Losses	Paid	Average
$6,430	$0	2	$6,430	$3,215

5.4.4.7 Other Loss Areas

Five additional NFIP claims for SL properties have been recorded in Plumas County. These properties are scattered across the county and are not grouped geographically with any other NFIP claims. They are generally located in the areas around Chester, Chilcoot, Clio, Crescent Mills, and Antelope Lake.

Claims Data: FEMA has reported 5 (5) SL properties generally located in the areas around Chester, Chilcoot, Clio, Crescent Mills, and Antelope Lake. The SL properties account for $56,759[9] in claims.

Building	Contents[5]	Losses	Paid	Average
$56,759	$0	5	$56,759	$11,352

5.4.4.8 Flood Warning and Notification

The degree of damage from flood hazards can be reduced with longer periods of warning time and proper notification before flood waters arrive. Warning times of 12 hours or more have proven adequate for preparing communities for flood and reducing flood damage. More than 12 hours advanced warning of a flood can reduce a community's flood damage by approximately 40% in comparison with unprepared communities (Read Sturgess and Associates 2000). In addition, seasonal notification for flooding can enhance awareness for citizens at risk, and when communicated effectively advance notification can reach target audiences on a large scale. Plumas county coordinates with National Weather Service in Reno, NV and the California Department of Water Resources to do flood forecasting in localized areas. Flood forecasts change depending on precipitation

[9] Only the property located in the Crescent Mills area filed a non-zero dollar claim.

5.5 *Geologic Hazards*

Geologic hazards pose a substantial danger to property and human safety, and are present due to the risk of naturally occurring geologic events, features and human development. Common geologic hazards present in Plumas County include seismic shaking or "earthquake" and slope failure. The information provided in this section will detail geologic hazards specific to Plumas County.

5.5.1 Earthquake

The term "earthquake" refers to the vibration of the Earth's surface caused by movement along a fault, by a volcanic eruption, or even by manmade explosions. The vibration can be violent and cause widespread damage and injury, or may be barely felt. Most destructive earthquakes are caused by movements along faults. An earthquake is both the sudden slip on an active earth fault and the resulting shaking and radiated seismic energy caused by the slip (USGS 2009). Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface (see Section 5.4.4 for more information on earthquake magnitude and potential ground shake maps). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Earthquakes can also cause seiches, landslides, and dam failures. A seiche is a periodic oscillation of a body of water resulting from seismic shaking or other factors that could cause flooding. Earthquake-induced seiches are considered a risk in the Eastern Sierras especially in nearby Lake Tahoe in Placer County. Earthquakes may also cause landslides, particularly during the wet season, in areas of high water or saturated soils. The most likely areas for earthquake-induced landslides are the same areas of high landslide potential discussed later in this section. Finally, earthquakes can cause dams to fail (see Section 5.7 Dam Failure).

5.5.2 Volcano (*Referenced from Lassen County Multi-Jurisdictional HMP*)

A volcano is an opening in the ground where magma forces its way to the surface. Magma which reaches the earth's surface is called lava. Volcanoes can be active (erupting), dormant (sleeping) or extinct (no eruption for 10,000 years and unlikely to erupt again). More than 50 volcanoes in the United States have erupted one or more times in the past 200 years. The most volcanically active regions of the Nation are in Alaska, Hawaii, California, Oregon, and Washington. Volcanoes produce a wide variety of natural hazards that can cause death and injury and destroy property hundreds of miles away and even affect global climate. Figure 5-44 provides a simplified sketch of a volcano typical of those found in the Western United States and Alaska, but many of these hazards also pose risks at other volcanoes, such as

those in Hawaii. Some hazards, such as lahars and landslides, can occur even when a volcano is not erupting.

Source: worldlywise.pbworks.com.

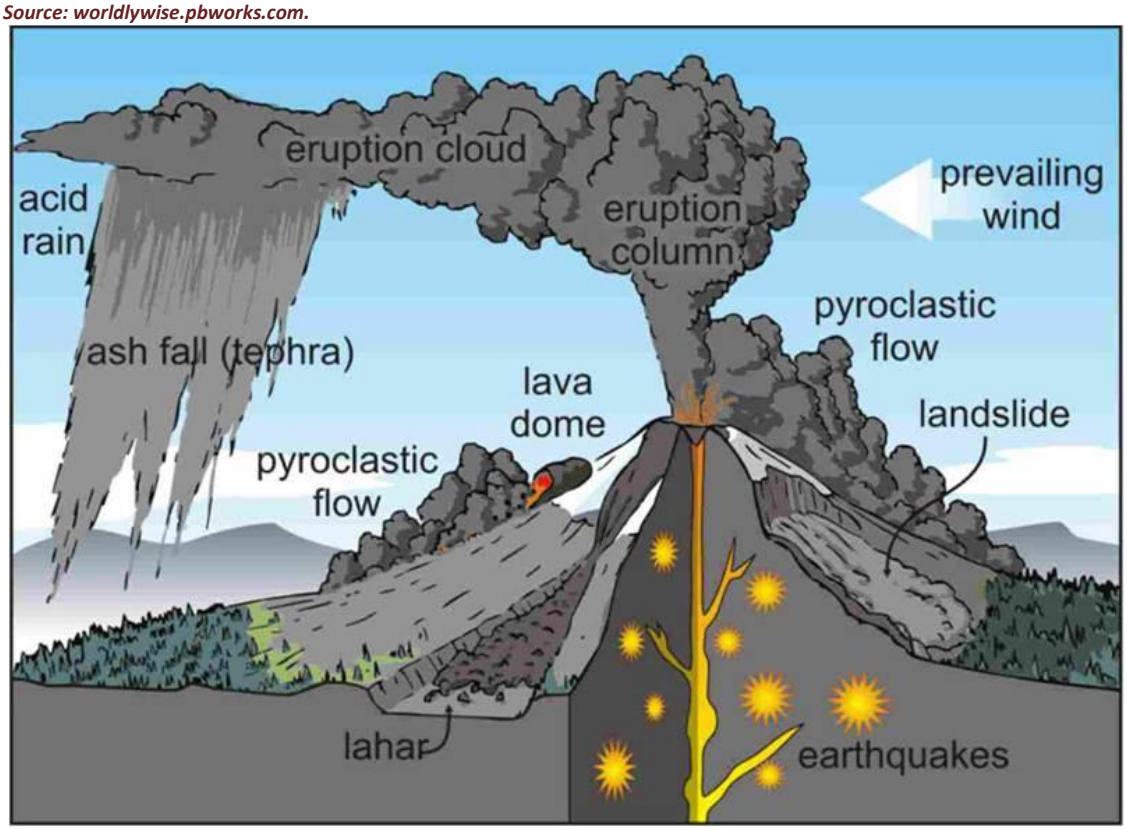


Figure 5-44: Volcano Cut-away diagram.

The effects of volcanic eruptions can be divided into primary and secondary effects. The primary effects are immediate and come from the eruption itself whereas the secondary effects result from the primary effects.

Primary effects of a volcanic eruption include:

Volcanic gases - All magma contains dissolved gases that are release during and between eruptions. These gases are mainly steam, carbon dioxide and compounds of sulphur and chlorine.

Lava flows - These are streams of molten rock.

Pyroclastic flows - These are high speed avalanches of hot ash, rock fragments and gas which move down the sides of a volcano. These flows occur when the vent area or ash column collapses.

Tephra - The explosive power of an eruption causes old lava to be blasted into tiny pieces and hurled into the air. The fragments are tephra.

Secondary effects of a volcanic eruption include:

Lahars - These are mixtures of water, rock, ash, sand and mud that originate from the slopes of a volcano. Lahars often happen because of heavy rainfall eroding volcanic deposits or heat from a volcanic vent suddenly melting snow and ice.

Landslides - Heat from cooling magma can cause hydrothermal alteration of the rocks, turning sections of them into clay. This weakens the rocks and increases the risk of slope failures.

Flooding - Explosive eruptions can change the surface areas around a volcano and disrupt drainage patterns, leading to long-term flooding.

Other secondary effects include:

- Food / water supply interrupted.
- Economic loss.
- Uninsured Losses.
- Unemployment.
- Long-term issues with logging and tourism industry.

5.5.3 Slope Failure

5.5.3.1 Landslides

A landslide is the movement of soil, rock, or other earth materials, downhill in response to gravity. Landslides include rock falls and topples, debris flows and debris avalanches, earthflows, mudflows, creep, and lateral spread of rock or soil. Slope failure (Landslides and or Avalanche) occur when the force pulling the material on the slope in a downward direction under gravitational influence exceeds the strength of the earth materials that compose the slope (USGS 2004). These materials may move by falling, toppling, sliding, spreading, and/or flowing. Strength of soil, rock (or snow), steepness of slope, and weight of the hillside material all play an important role in the stability of hillside areas.

Frequently landslides occur in areas where the soil is saturated from heavy rains or snowmelt. They can also be started by earthquakes, volcanic activity, changes in groundwater, disturbance or change of a slope by man-made construction activities, or any combination of these factors.

Similar to soil base landslides rock falls or topples are usually sudden and occur on steep slopes. In a rock fall, rocks may fall, bounce, or roll down the slope. A topple occurs when part of a steep slope breaks loose and rotates forward.

5.5.3.2 Avalanche

Avalanches consist of a rapid flow of snow down a slope. They often reoccur in the same areas annually and can be triggered by varying weather patterns and human activity. Avalanches occur when loading of new snow increases stress at a rate faster than strength develops, and the slope fails. Critical stresses develop more quickly on steeper slopes and where deposition of wind-transported snow is

common. The vast majority of avalanches occur during or shortly after storms. This hazard generally affects a small number of people, such as snowboarders, skiers, and hikers, who venture into backcountry areas during or after winter storms. Roads and highway closures, damaged structures, and destruction of forests are also a direct result of avalanches. The combination of steep slopes, abundant snow, weather, snowpack, and an impetus to cause movement creates avalanches. Areas prone to avalanche hazards include hard to access areas deep in the backcountry. Avalanche hazards exist in eastern Placer County where combinations of the above criteria occur.

5.5.3.3 Slope Erosion

Landslides often accompany other natural hazard events, such as floods, wildfires, or earthquakes. Landslides can occur slowly or very suddenly and can damage and destroy structures, roads, utilities, and forested areas, and can cause injuries and death.

5.5.4 Regulatory Environment

Numerous building and zoning codes exist at a state and local level to decrease the impact of geologic hazard events on residents and infrastructure. Building and zoning codes include the 2010 California Standards Building Code (CSBC) and Plumas County Codes. To protect lives and infrastructure in Plumas County, the Building Department is responsible for code enforcement and ensures citizens follow building and zoning codes that mitigate against geologic hazards. .

The 2010 CSBC is based on the International Building Codes (IBC), which is widely used throughout the United States. CSBC was modified for California's conditions to include more detailed and stringent building requirements. The Plumas County Building Department utilizes the 2010 CSBC to regulate the infrastructure and development within the county. For new buildings, Plumas County includes earthquake safety provisions, with enhancements for essential services buildings, hospitals, and public schools.

5.5.4.1 Plumas County General Plan Safety Element:

The Plumas County GP Safety Element includes the following policies for lowering the impacts of earthquakes on infrastructure within the County:

- Require new development proposals in moderate or high seismic hazard areas to consider risks caused by seismic activity and to include project features that minimize these risks.
- Review and limit the location and intensity of development and placement of infrastructure in identified earthquake fault zones.
- Identify and minimize potential hazards to life and property caused by fault displacement and its impact on facilities that attract large numbers of people, are open to the public, and/or provide essential community services.
- Based on the susceptibility of the bank to lurching caused by seismic shaking, require minimum setbacks for construction along creeks, between the creek bank and structure.
- Restrict the crossing of ground failure areas by new public and private transmission facilities, including gas, oil transmission, power, sewer, and water distribution lines.

- Require geotechnical investigation for buildings meant for public occupancy within earthquake fault zones.
- Require geotechnical evaluation and recommendations of new development in moderate or higher-earthquake fault zones.
- Require new development to incorporate project features that avoid or minimize the impacts of earthquakes.

In addition to the County enforcing seismic standards, Plumas County has adopted the CBSC for development in hillside areas in the County. Investigations and practices that are typically required for hillside development include the following:

- Conduct thorough geologic geotechnical studies by qualified engineering geologists and geotechnical engineers.
- Require both engineering geologists and geotechnical engineers during construction to confirm preliminary findings reported during initial studies.
- Require certification of the proposed building site stability in relation to the adverse effects of rain and earthquakes prior to the issuance of building permits.
- Mandate coordination between the civil engineer and the project engineering geologist and geotechnical engineer during construction grading.
- Require mitigation of onsite hazards caused by grading that may affect adjoining properties, including erosion and slope instability.

5.5.5 Past Occurrences

5.5.5.1 Earthquake

Plumas County-area historical earthquake activity is significantly below California state average. However, Plumas County has a 360% greater than the overall U.S. average. Table 5-9 for a list of major historical earthquakes.

Table 5-9: Major historic earthquakes in the Plumas County area greater than magnitude 5.0

Year	Magnitude	Depth (Kilometers)	Place Name	Distance from Place
1867	4	N/A	French Camp	6.1
1875	5.8	N/A	Antelope Lake	4.0
1885	5.7	N/A	Antelope Lake	16.1
1888	5.9	N/A	Gold Lake	2.2
1889	5.9	N/A	Clear Creek Junction	24.0
1931	4	N/A	Delleker	1.5
1934	4.5	N/A	Hot Springs	2.2
1941	4.5	N/A	Hot Springs	2.2
1946	5	N/A	Drakesbad	6.4
1947	4.2	N/A	Hawley	14.9

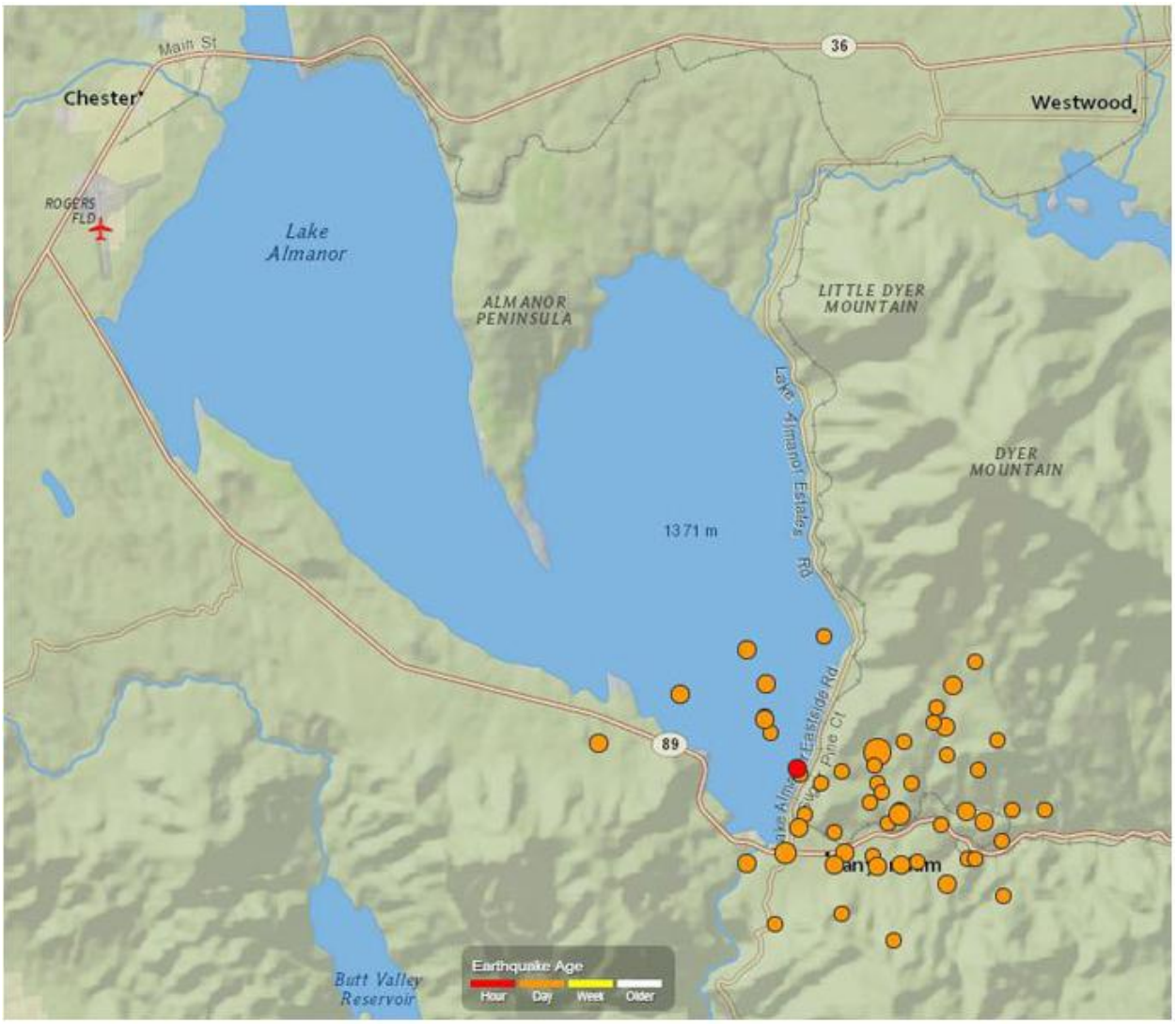
Year	Magnitude	Depth (Kilometers)	Place Name	Distance from Place
1947	4.4	N/A	Antelope Lake	9.3
1948	4	N/A	French Camp	9.7
1948	6	N/A	Chilcoot	17.4
1949	4.3	N/A	Chilcoot	17.4
1949	4.8	N/A	Chilcoot	17.4
1949	4.5	N/A	Lake Almanor West	2.3
1950	5.5	N/A	Drakesbad	3.5
1950	4.1	N/A	Whitehawk Ranch	7.7
1950	4.1	N/A	Drakesbad	5.7
1950	4.6	N/A	Drakesbad	5.7
1950	4.5	N/A	Drakesbad	5.7
1950	4	N/A	Drakesbad	5.7
1950	4.1	N/A	Drakesbad	5.7
1950	4.1	N/A	Last Chance	11.4
1950	4.5	N/A	Last Chance	11.4
1950	4	N/A	Last Chance	11.4
1950	4	N/A	Last Chance	11.4
1950	4	N/A	Last Chance	11.4
1950	4	N/A	Last Chance	11.4
1950	5.6	N/A	Last Chance	11.4
1950	4.1	N/A	Last Chance	11.4
1950	4.4	N/A	Last Chance	11.4
1950	4	N/A	Last Chance	11.4
1951	4.2	N/A	Genesee	3.5
1952	4.3	N/A	Genesee	2.7
1958	4.6	N/A	Whitehawk Ranch	16.5
1959	5.6	N/A	Vinton	5.9
1959	4.5	N/A	Mohawk Valley Ranch	3.2
1959	4.1	N/A	Chilcoot	7.1
1960	4.4	N/A	Whitehawk Ranch	9.0
1965	4.3	N/A	Chester	1.5
1965	4	N/A	Baccala Ranch	9.0
1972	4.1	N/A	Belden	3.1
1976	4.5	5	Antelope Lake	15.8
1976	4.2	5	Antelope Lake	17.3
1979	5.2	17	Last Chance	7.4
1982	4	5	Bradys Camp	2.2
1992	4	13	Vinton	7.8
1992	4	8	Bradys Camp	1.6

Year	Magnitude	Depth (Kilometers)	Place Name	Distance from Place
1992	4.2	16	Massack	2.0
1995	4.3	12	Twentymile House	1.9
1996	4	5	American Valley	2.7
1997	4.3	5	Massack	1.1
1998	4.1	10	Lake Davis	2.4
1998	4.1	16	Johnsville	1.5
2001	5.2	17	Two Rivers	1.2
2001	4.3	18	Two Rivers	2.2
2008	4.5	0	American Valley	1.1
2011	4.7	16	Whitehawk Ranch	8.2

Source: California Geologic Survey, 2012.

In additions to the entrees in Table 5-9, a series of earthquakes occurred near Lake Almanor on May 24, 2013. The series of earthquakes included a 5.7 magnitude earthquake near Canyon Dam, near the southern end of Lake Almanor. See Figure 5-45 for location of the May 24th earthquake series. Injuries were reported and damage to infrastructure and homes were sustained. Lake Almanor Mutual Water Company sustained a water main rupture which resulted in water supply loss, and 600 PG&E customers on the Lake Almanor peninsula lost power.

As a result of the 5.7 event, Plumas County BOS provided instituted an emergency proclamation. This provides businesses and homeowners official documentation in potential damage claim activity. Over one million dollars in damages were reported, and over 50 homes in the Lake Almanor basin were impacted. Broken or toppled chimneys were the most common report, however broken water lines caused flooding and water damage. At least one residential structure was shifted off its foundation as a result of ground shaking. Figure 5-46 depicts damage to a home in the Lake Almanor area.



Source: United States Geologic Survey earthquake map

Figure 5-45: Canyon Dam Earthquakes

According to the USGS, Volcanic activity is not expected as a result of the earthquakes, although changes may occur in hydrothermal areas for a few days following the nearby earthquakes (National Park Services n.d.).

Figure 5-46: Canyon Dam Earthquake Damage

5.5.5.2 Slope Failure

There has been no disaster declarations associated with slope failure in Plumas County. There have been a few isolated incidences of landslides and slope failure. These include one avalanche, two rock topples, and several landslides. Table 5-10 provides a brief summary on each.

Table 5-10: Major Landslides and Slope Failures

Year	Type	Damage	Injury or Death	Area
2006	Rockslide	State Route 70	No	1.5 miles west of Pulga
2007	Rock Fall	Rail Cars and Environment	No	MP 251 on State Highway 70, between Tobin and Rock Creek
2007	Rock Fall	Rail Cars and Environment	No	Storrie Resort on the Feather River
2009	Rock Slide	State Route 70	Yes	Rich Bar
2010	Landslide	USFS Road (Scales Road)	No	Scales Road
2010	Rockslide	State Route 70	No	Between Greenville Way and Elephant Butte Tunnel
2012	Avalanche	Timber Stock	No	Sloat
2012	Rock Fall	BNSF Locomotive Damage	No	Between Rich Bar and Twain on the Feather River
2013	Slope Erosion	To Co Hwy A14	No	Johnsville
2013	Rockslide	Damage to County Rd 411 5.3 west of SR70 at Quincy	No	Bucks Lake

Source: 2013 HMP Data Gathering. Web Based Searches, Plumas County OES, and Plumas County Department of Public Works.

Notable Slope failures of record include the following in Feather River Canyon in 2007 and 2012 and at active bank erosion location near Johnsville on Jamison Creek:

- **Union Pacific Rail Car Derail 2007 –** A boulder dislodged from a Feather River Canyon slope, and struck a Union Pacific rail car, on June 30th 2007 causing 22 cars to derail. During the derailment two liquid containers cars were punctured. One liquid container car leaked 20,000 Gallons of peanut oil into the Feather River; the other punctured car leaked an estimated 30,000 gallons of highly flammable denatured alcohol into the surrounding environment. The Plumas County Sheriff's Office, County Environmental Health and other state and local response crews were involved in the hazard event. See Figure 5-47 and Figure 5-48.

- **Burlington Northern Santa Fe Railway (BNSF) Locomotive Strike Boulder (2012) -** Diesel fuel spilled into the Feather River after a BNSF Railway locomotive struck a boulder early Friday morning about 24 miles west of Quincy. The accident was reported at 1:47 a.m. after the engine struck the rock as it was traveling between Rich Bar and Twain. The rock punctured a diesel fuel tank on the lead locomotive, spilling fuel along the tracks and into the track ballast. Railroad personnel estimate that up to 3,200 gallons of diesel may have been released. Some of the fuel reached the Feather River. Petroleum sheen was observed at various locations on the Feather River from the spill site to below Belden, a distance of seven or eight miles. With the assistance of a PG&E helicopter, booms were set up in five locations on the river to help collect the fuel. Although it was a BNSF locomotive that hit the rock, the stretch of track belongs to the Union Pacific. Both Union Pacific and BNSF were involved in the containment and cleanup.
- **Slope Failure / Erosion –** Describe Johnsville and Bucks Lake Road Slope Erosion. Will be updated in final draft.

Figure 5-47: 2007 Rockslide causing derailment

Figure 5-48: 2007 Rockslide causing derailment

Figure 5-49: Slope Failure near Johnsville on County Highway A14

5.5.5.3 Volcano (Referenced from Lassen County Multi-Jurisdictional HMP)

Due to the location near a tectonic plate boundary, the Cascade Mountains have experienced more than 50 earthquakes and eruptions over the past 4,000 years. The Cascades have formed as a result of the seduction of the small Juan de Fuca plate (oceanic) under the large North American plate (continental). The Cascades extend northward from Lassen Peak (also known as Mount Lassen) in northern California to the confluence of the Nicola and Thompson Rivers in British Columbia. Figure 5-50 from the USGS shows eruptions in Cascade Mountain Range over the last 4000 years.

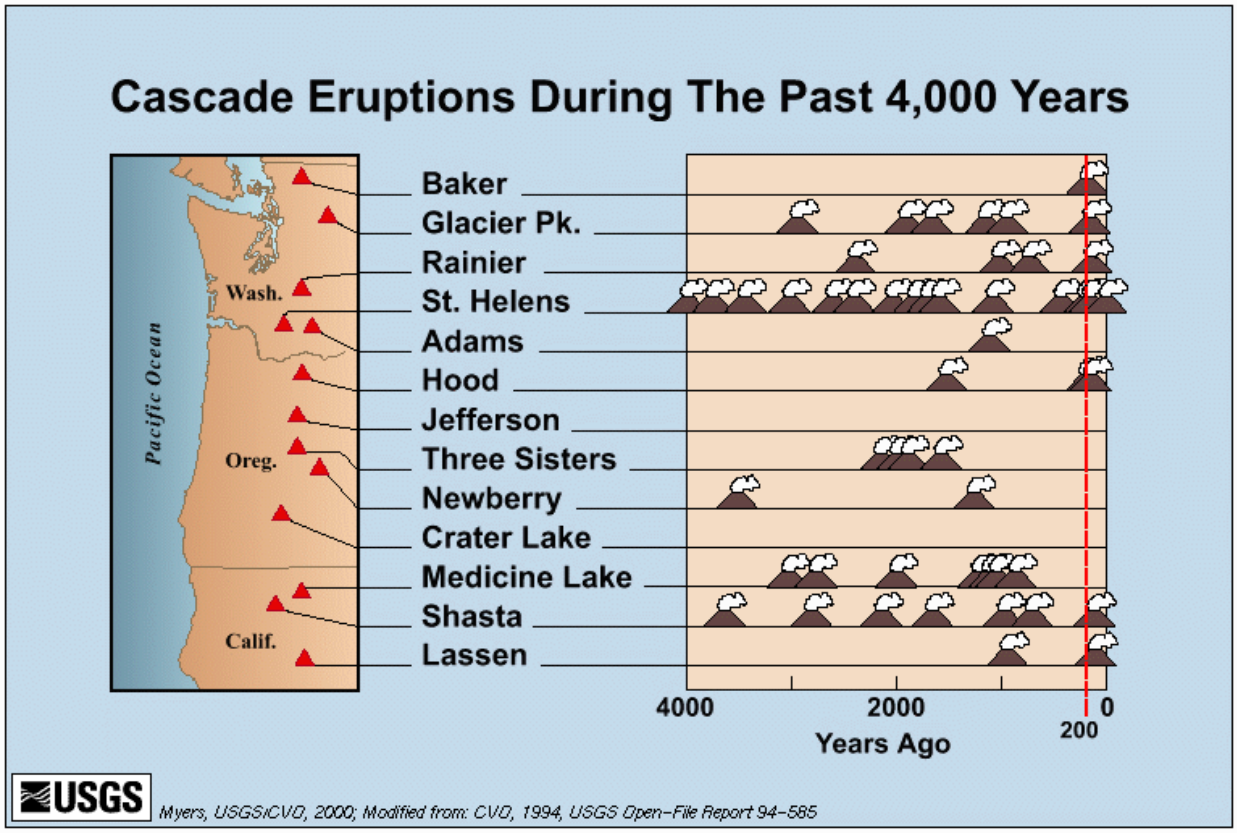


Figure 5-50: Historic Volcanic Eruptions

On May 22, 1915, an explosive eruption at Lassen Peak, the southernmost active volcano in the Cascade Range, devastated nearby areas and rained volcanic ash as far away as 200 miles to the east. This explosion was the most powerful in a 1914-17 series of eruptions that were the last to occur in the Cascades before the 1980 eruption of Mt. St. Helens. Lassen Peak is the largest of a group of more than 30 volcanic domes erupted over the past 300,000 years in Lassen Volcanic National Park. The picture (Figure 5-51) from the National Park Services provides an illustration of the Lassen Peak eruption (Lassen County March 2010).

Figure 5-51: Mt. Lassen Volcanic Eruption

5.5.6 Location/Geographic Extent

5.5.6.1 Earthquake

The risk of seismic hazards to residents of Plumas County is based on the approximate location of earthquake faults within and outside of the County. Several potentially active faults pass through Plumas County. The Almanor Fault, Butt Creek Fault Zone and the Mohawk Valley Fault are shown in Figure 5-53 and Figure 5-55. The Indian Valley Fault is also considered an active fault located within the County. Additionally, the Honey Lake and Fort Sage Faults are two active faults located east of the County. Although several faults are within and near the County, seismic hazard mapping indicates that the County has low seismic hazard potential. Additionally, the County is not located within a delineated Alquist-Priolo Earthquake Fault Zone (Plumas County 2012) which activates special regulations, reporting and building requirements.

5.5.6.2 Slope Failure

5.5.6.2.1 Landslides

Most landslide hazards are primarily associated with mountainous regions; however, landslides can occur in areas of low relief. Areas with steep slopes in the County could be prone to landslides, mud slides and even avalanches. Landslides, slope failure and avalanche, are dependent on slope (angle of

the hillside), geology, rainfall, excavation or seismic activity. Areas that have recently been subject to wildfire are susceptible to mud slides and debris flow as well.

As seen in Figure 5-54, the volcanic soils in the eastern portion of the Plumas National Forest are prone to landslides. The figure also shows that areas concentrated along the North and Middle Forks of the Feather River are also susceptible to landslides. The Feather River Canyon is especially prone to rock slides due to the steep canyon walls. Nearly every year, rock slides big enough to warrant an emergency construction for rock removal projects.

Asbestos is a naturally occurring fibrous material found throughout California. Disturbance of rocks and soil containing asbestos could lead to several public health issues. Figure 5-55 identifies areas with the potential to contain naturally occurring asbestos. The highest concentration naturally occurring asbestos is found in the western portion of the County.

5.5.6.2.2 Erosion

Rates of erosion are contingent on a number of factors, including the type of soil material and structure, slope, water runoff and levels of human activity. Overall, the County is primarily characterized as having a moderate potential for soil erosion (See Table 5-11). Areas classified as having a low and high potential for erosion are also found in the County, with a fairly significant portion of the County unclassified or not mapped. Areas with a high potential for erosion are identified on and coincide with locations located at higher elevations in the County. For erosion potential location on a map see Figure 5-55

Table 5-11: Soil Erosion Potential in Plumas County

Soil Erosion Potential* Acres in the County	
High	2,040
Moderate	1,178,600
Low	31,590
Not Mapped	460,240

Erosion potential is based on k factor, which is an indication of a soil's inherent susceptibility to erosion, absent of slope and groundcover factors.

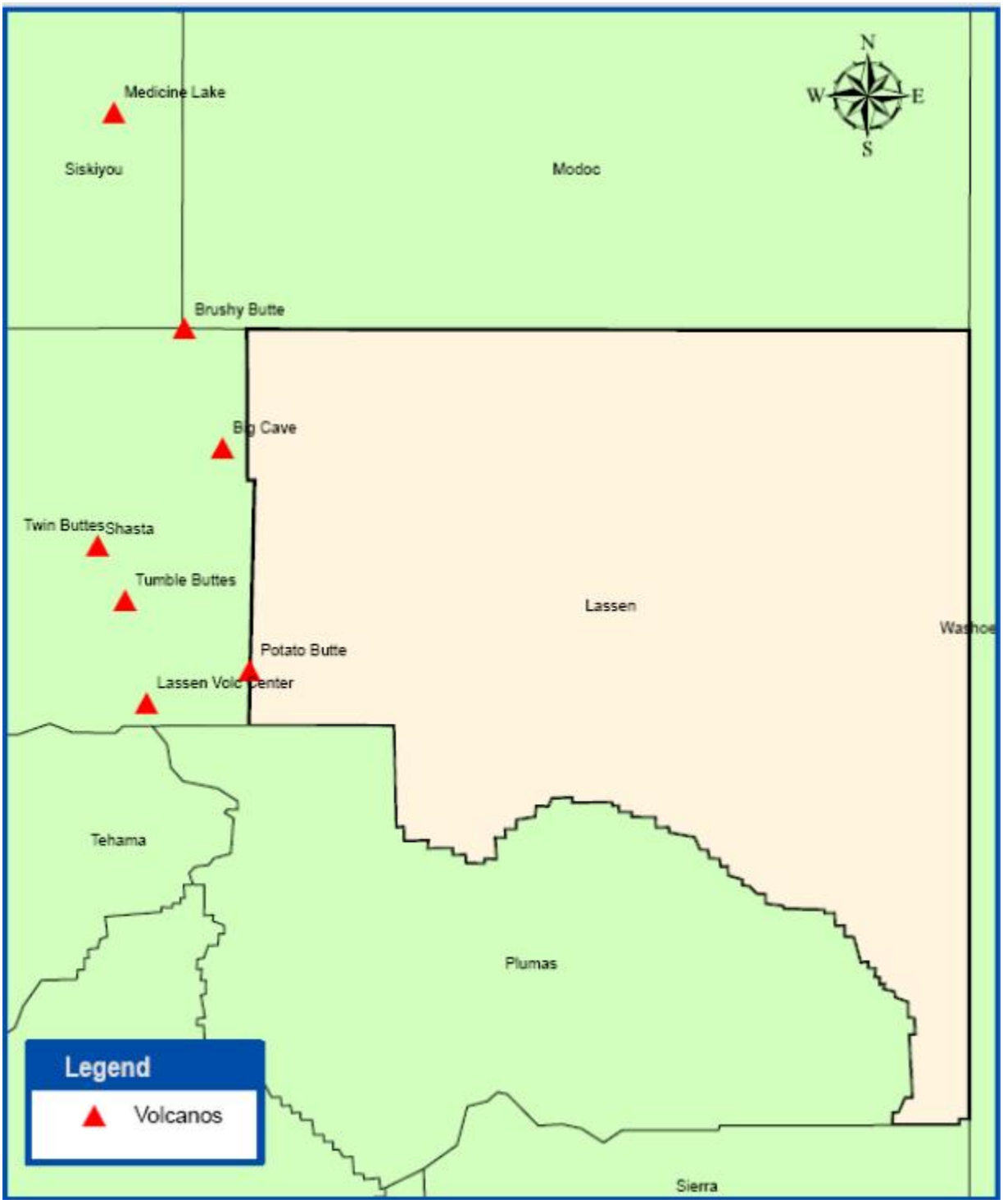
5.5.6.2.3 Avalanche

Historically, avalanches occur within the County between the months of December and March, following snowstorms. Although avalanches have occurred on slopes of many angles, they most often occur on slopes ranging between 30 degrees and 45 degrees. Therefore ski resorts, residences, roads, businesses, and other structures and activities in these areas are vulnerable.

5.5.6.3 Volcano

According to the information from Lassen National Park, the greater Lassen area has been volcanically active for about three millions years. Recently the region has seen eruptions from Cinder Cone (~350 years ago) and Lassen Peak (~100 years ago). While the area sleeps now, steam vents, boiling springs,

and bubbling mudpots remain active--direct evidence that the volcanic center still smolders. Figure 5-52 provides an overview of the volcanoes located within the vicinity of Plumas and Lassen County.



Source: Lassen County Multi-Jurisdictional Hazard Mitigation Plan

Figure 5-52: Volcanos in the Plumas-Lassen Region.

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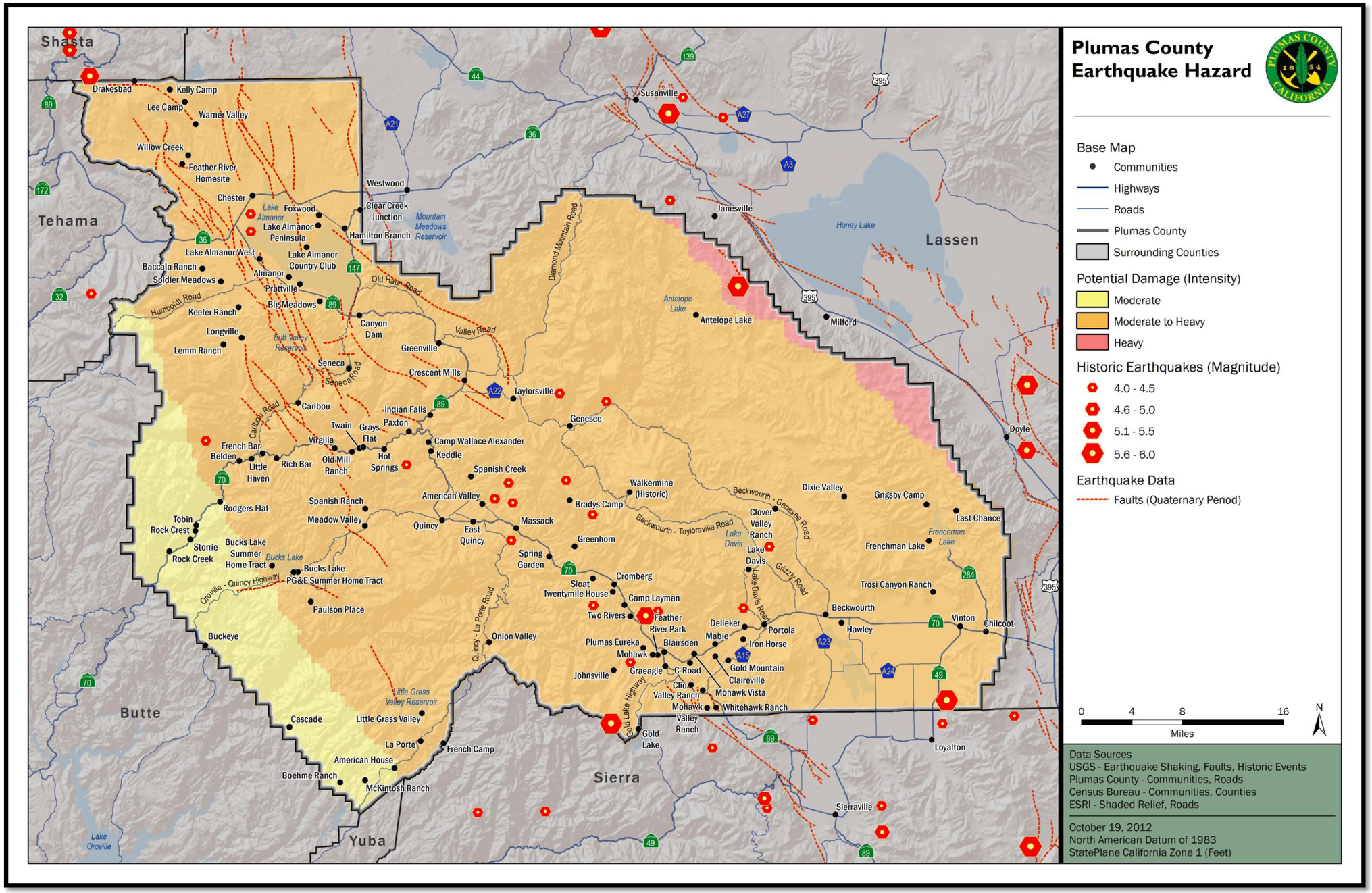


Figure 5-53: Earthquake Shake Intensity Map

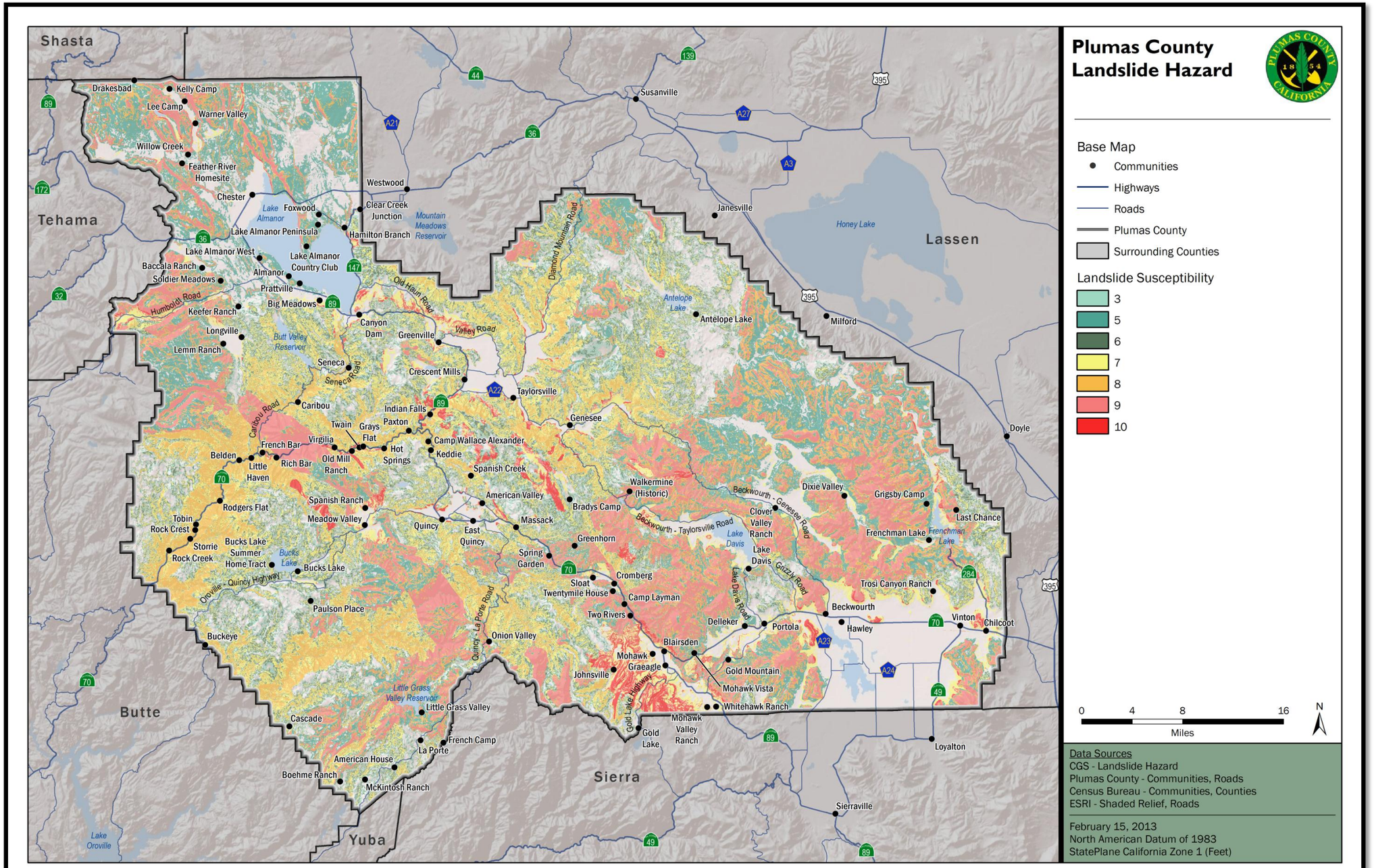


Figure 5-54: Landslide Hazard Map

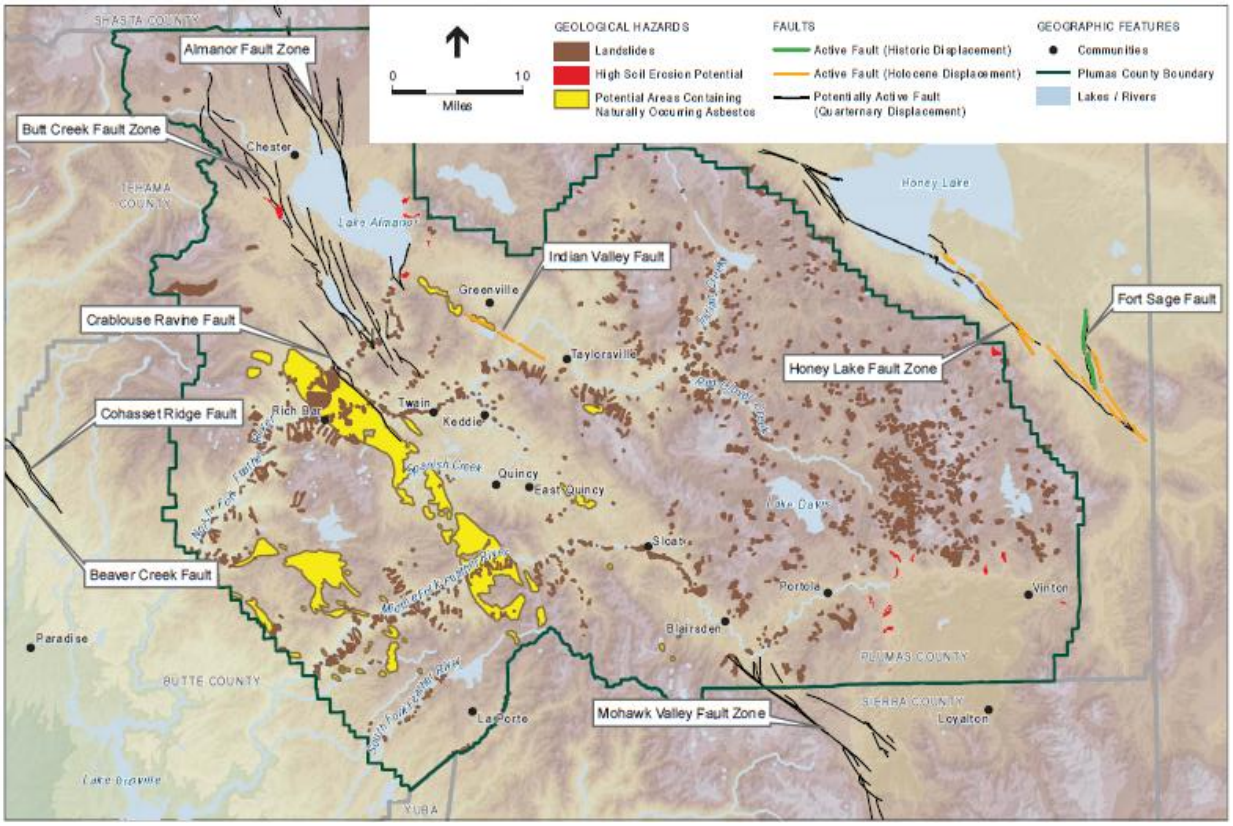


Figure 5-55: Geologic Hazard Map

5.5.7 Magnitude/Severity

5.5.7.1 Earthquake

The most common method for measuring earthquakes is magnitude, which measures the strengths of earthquake. Although the Richter scale is known as the measurement for magnitude, the majority of scientists currently use either the Mw Scale or Modified Mercalli Intensity (MMI) Scale. The effects of an earthquake in a particular location are measured by intensity. Earthquake intensity decreases with increasing distance from the epicenter of the earthquake.

The magnitude of an earthquake is related to the total area of the fault that ruptured, as well as the amount of offset (displacement) across the fault. As shown in Table 5-12, there are seven earthquake magnitude classes, ranging from great to micro. A magnitude class of great can cause tremendous damage to infrastructure in Plumas County, compared to a micro class, which results in minor damage to infrastructure.

Table 5-12: Moment Magnitude Scale

Earthquake Magnitude Classes		
Magnitude Class	**Magnitude Range (M = Magnitude)**	
Great	M > 8	Tremendous damage
Major	7 <= M < 7.9	Widespread heavy damage
Strong	6 <= M < 6.9	Severe damage
Moderate	5 <= M < 5.9	Considerable damage
Light	4 <= M < 4.9	Moderate damage
Minor	3 <= M < 3.9	Rarely causes damage.
Micro	M < 3	Minor damage

The MMI Scale measures earthquake intensity as shown in Table 5-13. The MMI Scale has 12 intensity levels. Each level is defined by a group of observable earthquake effects, such as ground shaking and/or damage to infrastructure. Levels I through VI describe what people see and feel during a small to moderate earthquake. Levels VII through XII describe damage to infrastructure during a moderate to catastrophic earthquake

Table 5-13: Modified Mercalli Scale

Earthquake Magnitude and Intensity		
Magnitude (M_w)	**Intensity (Modified Mercalli Scale)**	**Description**
1.0 – 3.0	I	I. Not felt except by very few people under especially favorable conditions.
3.0 – 3.9	II – III	II. Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
		III. Felt quite noticeably indoors. Many do not recognize it as an earthquake. Standing motorcars may rock slightly.
4.0 – 4.9	IV – V	IV. Felt by many who are indoors; felt by a few outdoors. At night, some awakened. Dishes, windows and doors rattle.
		V. Felt by nearly everyone; many awakened. Some dishes and windows broken; some cracked plaster; unstable objects overturned.
5.0 – 5.9	VI – VII	VI. Felt by everyone; many frightened and run outdoors. Some heavy furniture moved; some fallen plaster or damaged chimneys.
		VII. Most people alarmed and run outside. Damage negligible in well-constructed buildings; considerable damage in poorly constructed buildings.

Earthquake Magnitude and Intensity		
Magnitude (M_w)	**Intensity (Modified Mercalli Scale)**	**Description**
6.0 – 6.9	VII – IX	VIII. Damage slight in special designed structures; considerable in ordinary buildings; great in poorly built structures. Heavy furniture overturned. Chimneys, monuments, etc. may topple.
		IX. Damage considerable in specially designed structures. Buildings shift from foundations and collapse. Ground cracked. Underground pipes broken.
7.0 and Higher	VIII and Higher	X. Some well-built wooden structures destroyed. Most masonry structures destroyed. Ground badly cracked. Landslides on steep slopes.
		XI. Few, if any, masonry structures remain standing. Railroad rails bent; bridges destroyed. Broad fissure in ground.
		XII. Virtually total destruction. Waves seen on ground. Objects thrown into the air.

5.5.7.2 Slope Failure

Severity of landslides and slope failure are dependent on the area and amount of material. Currently this type of geologic hazard is not classified into magnitude or severity scales.

5.5.7.3 Volcano (Referenced from Lassen County Multi-Jurisdictional HMP)

There is a four-tiered Volcano Alert Level that uses the terms Normal, Advisory, Watch, and Warning (from background levels to highest threat). See Table 5-14. The Volcano Alert Levels are intended to inform people on the ground about a volcano's status and are issued in conjunction with the Aviation Color Code. Notifications are issued for both increasing and decreasing volcanic activity and are accompanied by text with details about the nature of the unrest or eruption and about potential or current hazards and likely outcomes. The table on the following page illustrates the Alert Level as well as the associated volcanic state.

Table 5-14: Volcano Alert State

Level	Volcanic State
Normal	Volcano is in typical background, noneruptive state or, after a change from a higher level, volcanic activity has ceased and volcano has returned to noneruptive background state.
Advisory	Volcano is exhibiting signs of elevated unrest above known background level or, after a change from a higher level, volcanic activity has decreased significantly but continues to be closely monitored for possible renewed increase.
Watch	Volcano is exhibiting heightened or escalating unrest with increased potential of eruption, timeframe uncertain, OR eruption is underway but poses limited hazards.
Warning	Hazardous eruption is imminent, underway, or suspected.

5.5.8 Frequency/Probability of Future Occurrences

5.5.8.1 Earthquake

Not Likely - Earthquakes over a magnitude of 6.0 affecting the Plumas County in the last 140 years have occurred once. It is unlikely that an earth quake of magnitude of 6.0 or greater will occur over the next 20 year. However, earthquakes occur less frequently than other primary natural hazard events, they have accounted for the greatest combined losses (deaths, injuries, and damage costs) in disasters since 1950 in California and have the greatest catastrophic disaster potential (Cal EMA 2010). Slope Failure

5.5.8.2 Slope Failure

Likely - The probability of future landslides, slope erosion and avalanche events occurring in the unincorporated areas of Plumas County is likely. It is estimated that the mean number of future damaging landslide events in Plumas County is approximately one event per year. Probability of future occurrences is dependent upon seasonal precipitation and seismic shaking.

Injuries and loss of life from an avalanche are usually due to people recreating in remote areas at the wrong time. Given the topography and amount of snow falling on an annual basis in Plumas County, avalanches and resulting damages, including injuries and loss of life, , may occur on a sporadic interval.

5.5.8.3 Volcano (Referenced from Lassen County Multi-Jurisdictional HMP)

Because geologically recent volcanic activity in an area is the best guide to forecasting future eruptions, scientists study the lava flows, ash, and other deposits from past eruptions. Volcanoes in the Plumas-Lassen area tend to erupt infrequently, and may be inactive for periods lasting centuries or even millennia. The most recent eruptions in the Plumas-Lassen area were the relatively small events that occurred at Lassen Peak between 1914 and 1917. The most recent large eruption produced Chaos Crags[10] about 1,100 years ago.

Such large eruptions in the Lassen area have an average recurrence interval of about 10,000 years. However, the geologic history of the Lassen area indicates that volcanism there is episodic, having periods of relatively frequent eruptions separated by long quiet intervals. For example, the last large event before the Chaos Crags eruption was the one that built Lassen Peak 27,000 years ago.

After the eruption of Mount St. Helens in 1980, the U.S. Geological Survey (USGS) intensified its monitoring of active and potentially active volcanoes in the Cascade Range. Monitoring of the Lassen area includes periodic measurements of ground deformation and volcanic gas emissions and continuous transmission of data from a local network of nine seismometers to USGS offices in Menlo Park, California. Should indications of a significant increase in volcanic activity be detected, the USGS will immediately deploy scientists and specially designed portable monitoring instruments to evaluate the threat. In addition, the National Park Service (NPS) has developed an emergency response plan that would be activated to protect the public in the event of an impending eruption.

[10] Chaos Crags is the youngest group of lava domes in Lassen Volcanic National Park, California, having been formed as five dacite domes 1,100-1,000 years ago

5.6 *Severe Weather*

Severe weather can be defined as any destructive weather event that has the potential to damage property or cause loss of life. For example, excessive localized precipitation over a short period of time may result in related flash floods that threaten life and property. In regards to Plumas County, severe summer weather usually occurs as localized storms that bring heavy rain, lightning, strong winds, and microbursts. A severe winter storm in Plumas County would typically result in heavy snowfall or hail.

Hailstones are usually less than two inches in diameter and can fall at speeds of 120 miles per hour (mph), which can be destructive to roofs, buildings, automobiles, vegetation, and crops. Thunderstorms and lightning can kill or injure people by direct or indirect means. Objects can be struck directly, which may result in an explosion, burn, or total destruction. Additionally, indirect lightning damage can also occur when electrical currents pass through or near an object.

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Strong winds can also damage roofs of houses, topple trees, snap power lines, shatter windows, and overturn mobile homes. Microbursts, which are created by a downdraft of air in a thunderstorm, can produce wind speeds as high as 150 mph.[11] Similar to a tornado, microbursts are characterized by extremely high wind speeds; however, they push wind out of a downburst instead of pulling wind inward as a tornado does.

Extreme snow events are also likely in Plumas County, particularly in higher elevation areas. Winter snow storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and down trees and power lines. The cost of snow removal, damage repair, and business losses can have a tremendous impact on communities.

5.6.1 Regulatory Environment

There are negligible formal regulations that pertain to generalized severe weather events.

5.6.2 Past Occurrences

Since 1964, nine federally or state declared severe weather events have occurred in Plumas County as shown in Table 5-15. According to FEMA Declarations and Cal EMA Emergency and Disaster Proclamations (November 1964 to present), these events include: severe winter and summer storms, flooding, landslides, and heavy rain.

[11] NOAA National Weather Service

Table 5-15: Severe Weather; Past Disaster Declarations, Proclamation and Other Recorded Events

Past Disasters in Plumas County							
Disaster Number	**Declaration Date**	**Disaster Type**	**Incident Type**	**Explanation**	**Deaths**	**Injuries**	**Cost***
Federal and State Declarations							
183	12/24/1964	DR	Severe Storm(s)	HEAVY RAINS & FLOODING			$213,149,000
253	1/26/1969	DR	Severe Storm(s)	SEVERE STORMS & FLOODING			Unknown
283	2/16/1970	DR	Severe Storm(s)	SEVERE STORMS & FLOODING			$27,657,478
758	2/21/1986	DR	Severe Storm(s)	SEVERE STORMS & FLOODING	13	67	$407,538,904
979	2/3/1993	DR	Severe Storm(s)	SEVERE WINTER STORM, MUD & LAND SLIDES, & FLOODING	20	10	$226,018,111
1044	1/10/1995	DR	Severe Storm(s)	SEVERE WINTER STORMS, FLOODING, LANDSLIDES, MUD FLOWS	11		$221,948,347
1046	3/12/1995	DR	Severe Storm(s)	SEVERE WINTER STORMS, FLOODING LANDSLIDES, MUD FLOW			Unknown
1155	1/4/1997	DR	Severe Storm(s)	SEVERE STORMS, FLOODING, MUD AND LANDSLIDES	8		$194,352,509
1628	2/3/2006	DR	Severe Storm(s)	SEVERE STORMS, FLOODING, MUDSLIDES, AND LANDSLIDES			$128,964,501

Events may have occurred over multiple counties, so damage may represent only a fraction of the total event damage and may be not specific to Plumas County

5.6.3 Location/Geographic Extent

Plumas County is located in the Sierra Nevada region of the State of California. Severe weather affects all areas of Plumas County but differs significantly by region. Throughout areas of the county there are significant variations in the average temperature and amount of precipitation received due to topography.

According to the U.S. Environmental Protection Agency (EPA) Plumas County is located within the Sierra Nevada eco-region. The Sierra Nevada eco-region is characterized by a severe to mild mid-latitude climate with Mediterranean characteristics. It has mild to hot, dry summers and cool to cold, wet winters. The mean annual temperature ranges from approximately -3°C (at high elevations) to 17°C (at low elevations) in the southwest. The frost-free period ranges from 30 to 320 days depending on region. The mean annual precipitation is 1,070 mm, ranging from 150 mm in the Sierra Valley to over 2,500 mm on high elevation peaks.

5.6.4 Magnitude/Severity of Storms

Plumas County is located in the Northern portion of the Sierra Nevada region and has significant topographic variation, which causes it to experience a more severe and geographically variable winter climate. The highest precipitation amounts are seen in the Western portion of the county where there is an orographic lift that forces air from low elevations to a higher elevation, quickly cooling down the air and raising the relative humidity to 100%. Under the right conditions orographic lifts create rain shadows where high amounts of precipitation are found on the crests of mountain ranges, but as the air descends to the leeward side of the mountain it warms and dries. In Plumas County the leeward side of the mountains represents the Eastern portion of the county where precipitation typically averages around two inches in the wettest months of the year (as seen in Figure 5-56). Areas west of the mountains, however, experience much higher precipitation levels. For example, Bucks Creek averages nearly 12 inches per month in December and January (see Figure 5-57).

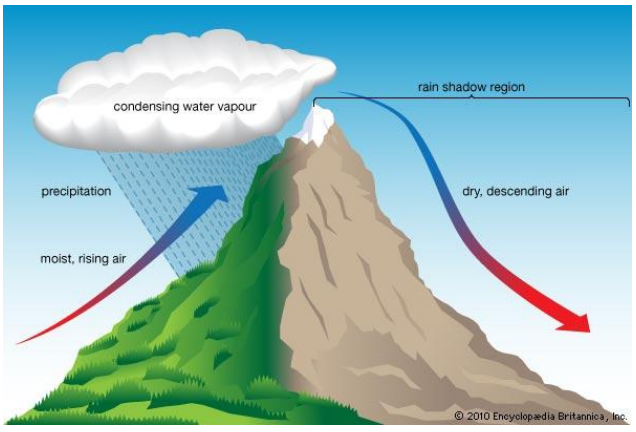


Figure 5-56: Orographic Lift and Rain shadow Effect

This climate regime is typified by annual precipitation from late October through May, with much more seasonally dependent precipitation in the Western portion of the county. The most severe storms occur during the winter months when Plumas County experiences periods of heavy rain and snow on an annual recurring basis. Though difficult to capture magnitude and severity of severe storms in a generalized region, two data sources can be used to develop a general sense of the magnitude and severity of severe storms within Plumas County. Data from both Spatial Hazard Events and Losses Database for the United States (SHELDUS) and the National Climatic Data Center (NCDC) Storm Events Database can be used to analyze the trends in severe weather patterns.

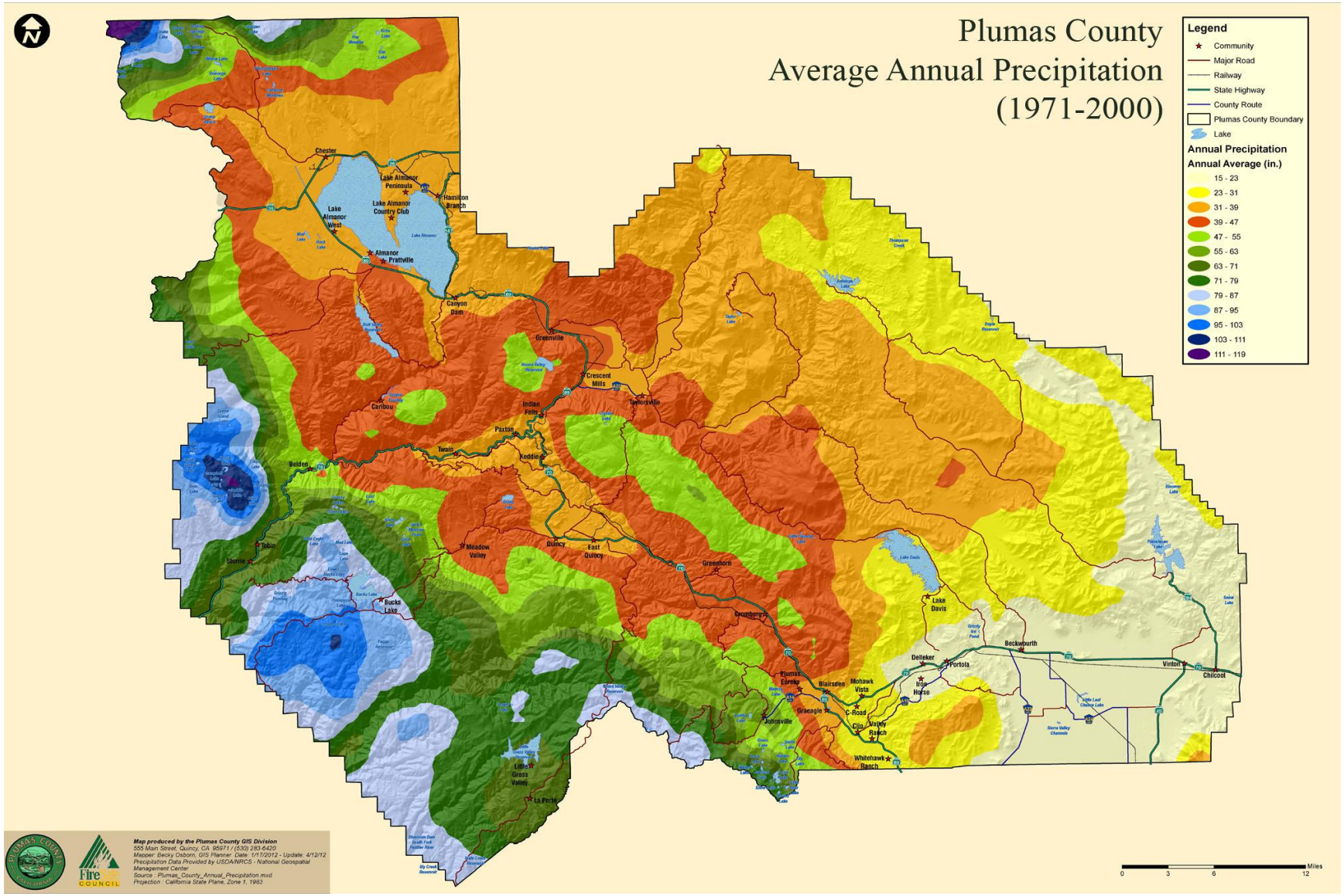


Figure 5-57: Annual Precipitation Map

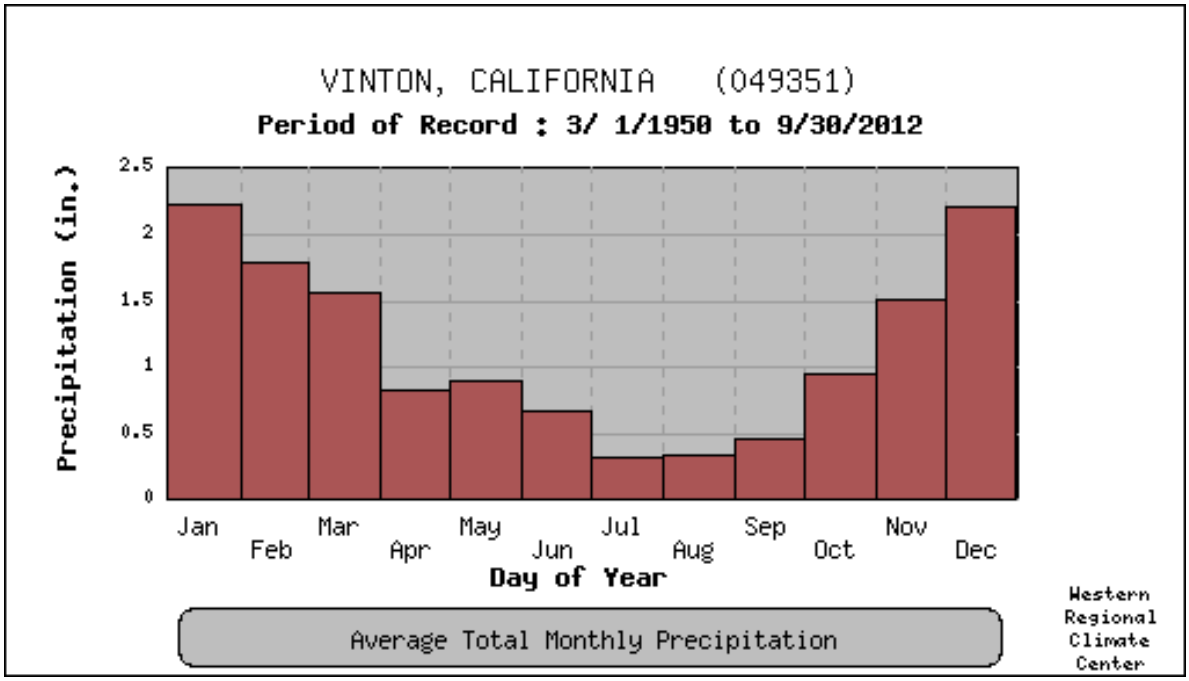


Figure 5-58: Vinton, California Average Monthly Precipitation

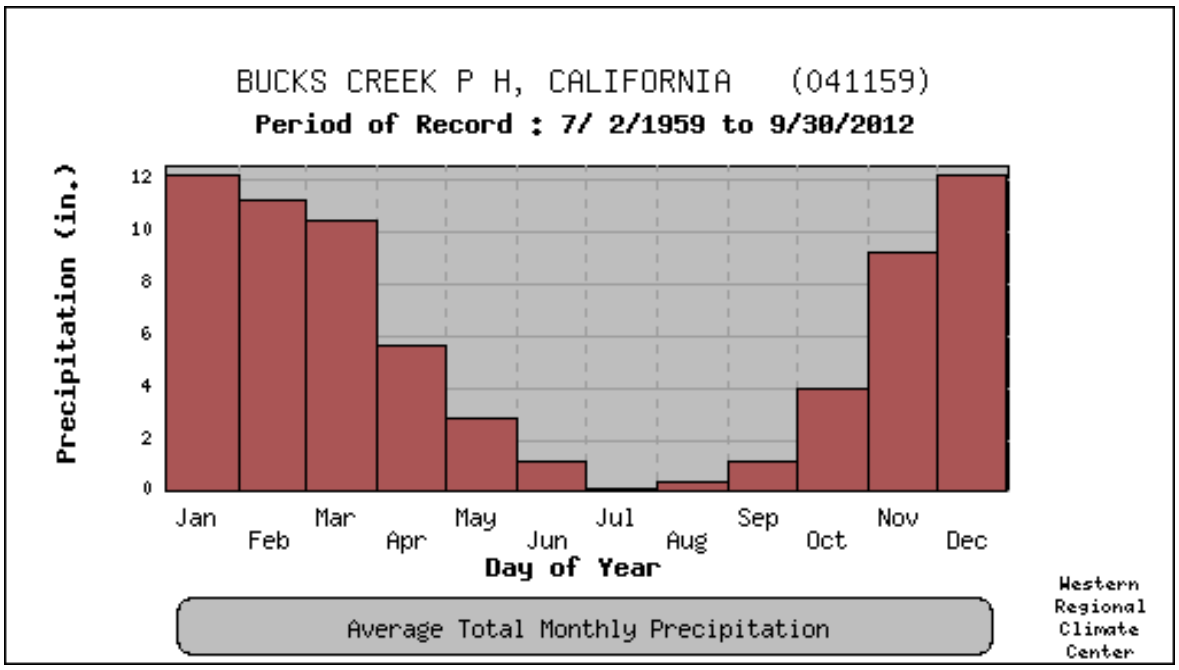
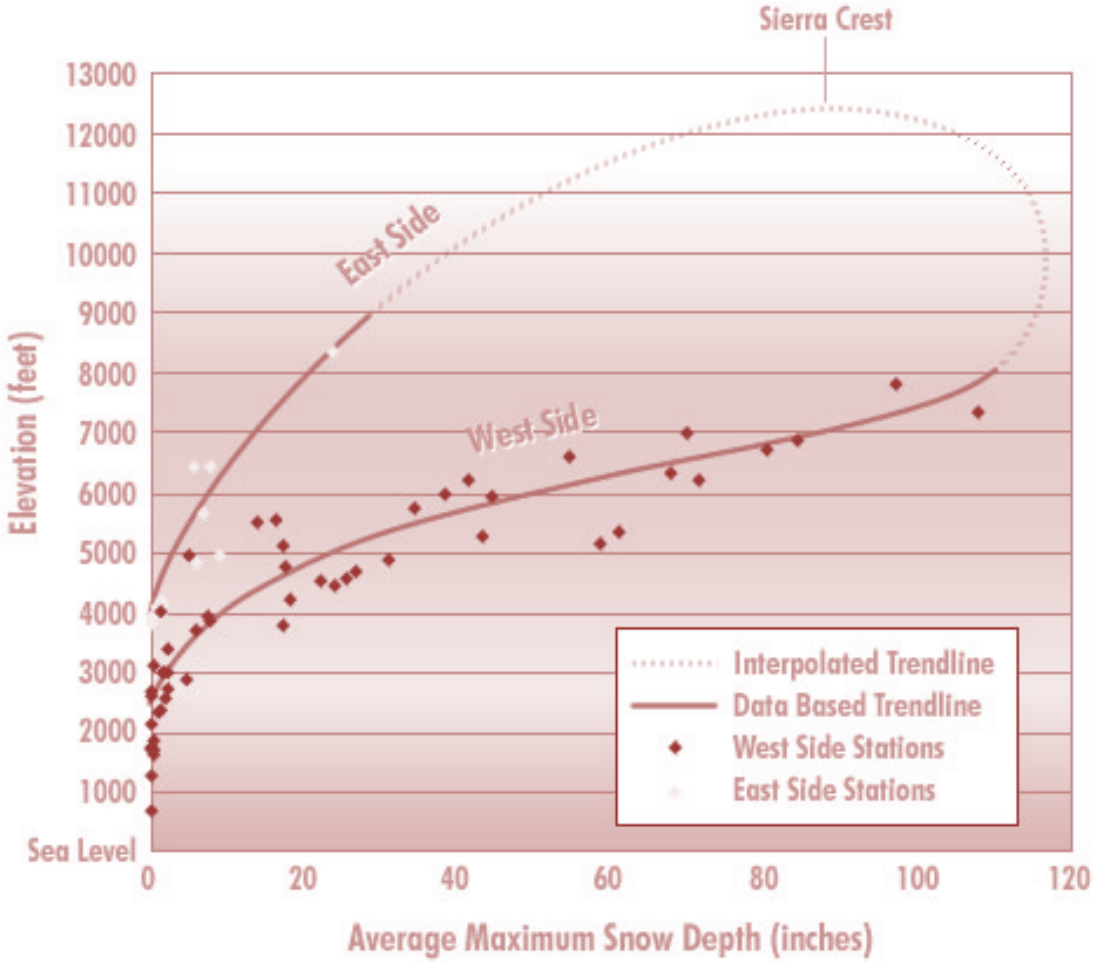


Figure 5-59: Bucks Creek, California Average Monthly Precipitation

Severe snow storms are some of the most common extreme weather events that occur in Plumas County. Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds combined with intense snow storms can knock down trees, utility poles, and power lines. Blowing snow can reduce visibility to only a few feet in areas where there are no trees or buildings, significantly increasing the likeliness of serious vehicle accidents.

There have been many extreme snow events that have occurred in Plumas County, most notably in the high elevation regions such as Chester and La Porte. However, lower elevation areas such as Quincy are also susceptible to extreme snow events. As seen in Figure 5-58 and Figure 5-59 the extreme snow events have included up to 60 inches of snow in Quincy and 45 inches of snow in Chester in one month. Two notable snow seasons occurred in 1951-52, and 1992-93. During these years the Chester area received a total of 362 inches of snow in 1951-52 and 295 inches in 1992-93. Figure 5-60 and Figure 5-61 show extreme snow events in Chester from 1951-52 and 2011. See Figure 5-62 and Figure 5-63 for photos of a 1951 and 2011 snow events.



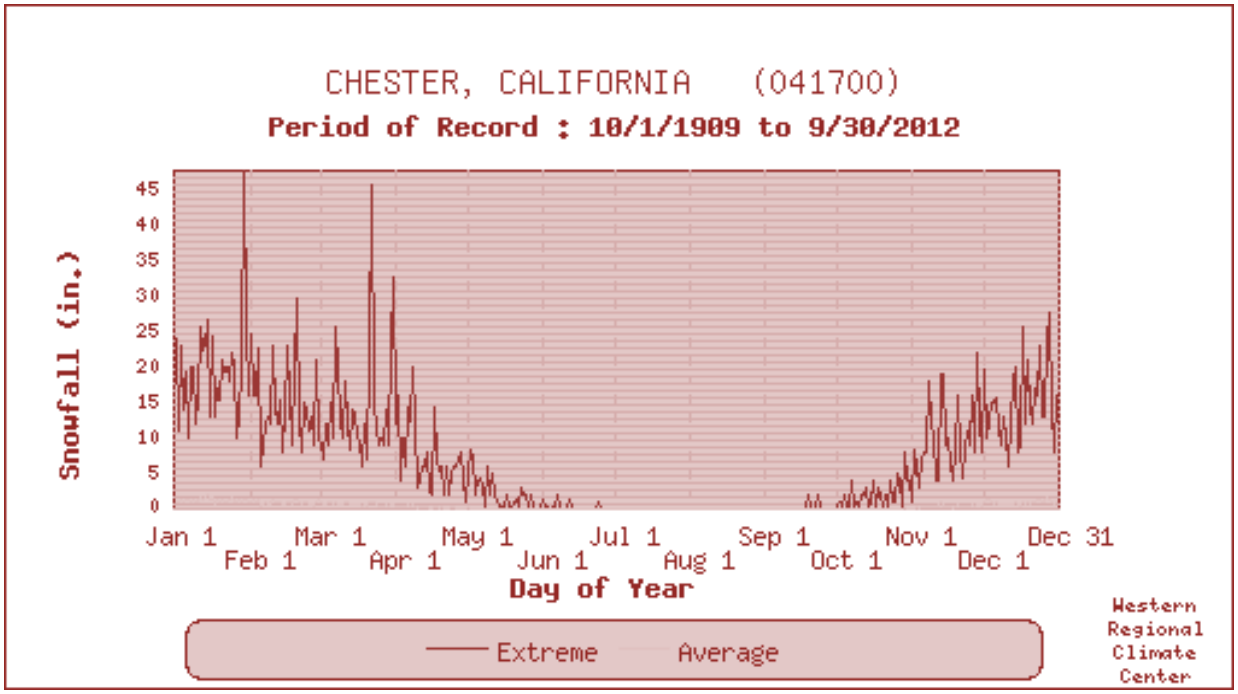


Figure 5-60: Chester, California Average and Extreme Monthly Snowfall

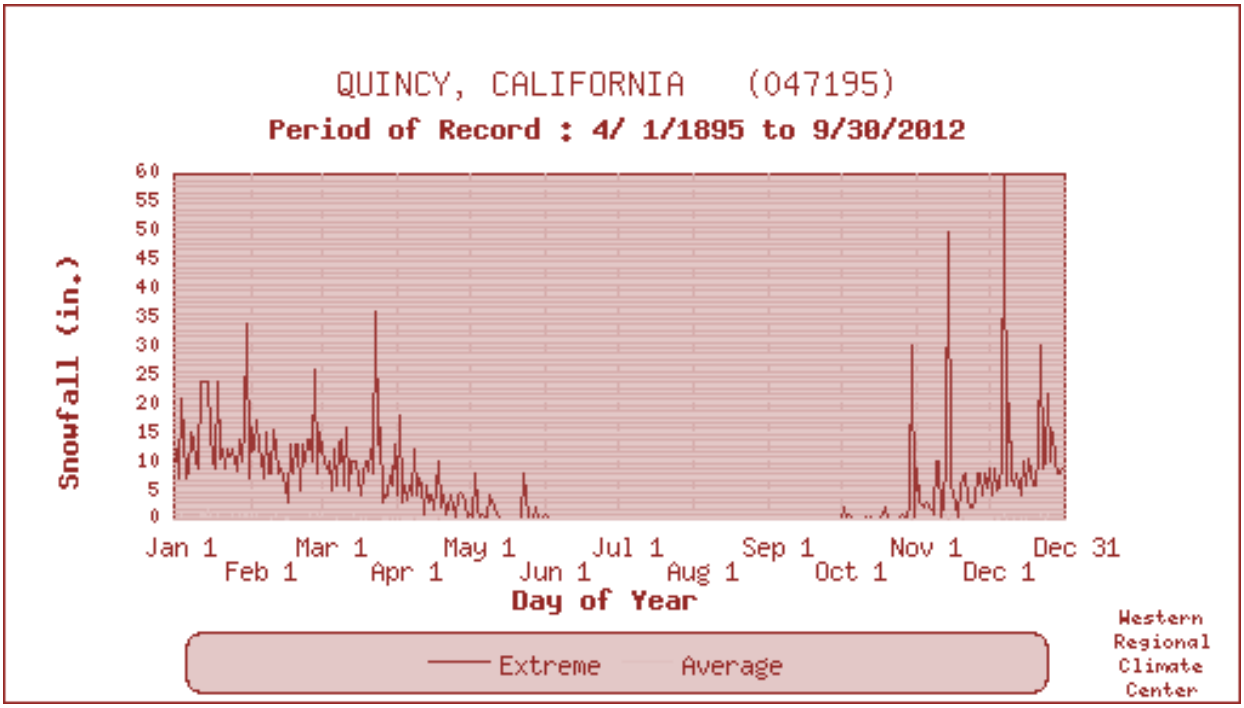


Figure 5-61: Quincy, California Average and Extreme Monthly Snowfall

Figure 5-62: City of Chester 1951-1952 Snow Event

Figure 5-63: City of Chester 2011 Snow Event

5.6.4.1 SHELDUS Data

Data from SHELDUS was used to develop the Table 5-16. SHELDUS is a county-level data set for the United States that tracks 18 types of natural hazard events (or a combination thereof) along with associated property and crop losses, injuries, and fatalities for the period 1960-2010. Produced by the Hazards Research Lab at the University of South Carolina, this database combines information from several sources (including the NCDC). Only events that generated more than $50,000 in damage were included in Table 5-12. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the affected counties (e.g., if four counties were affected, then a quarter of the dollar losses, injuries, and deaths were attributed to each county). Events that were reported by the NCDC with a specific dollar amount are included in SHELDUS.

The NCDC Events and SHELDUS tables below summarize severe weather events that occurred in Plumas County. Only a few of the events actually resulted in state and federal disaster declarations. It is further interesting to note that different data sources capture different events during the same time period, and often display different information specific to the same events. While these inconsistencies are recognized this data provides value by describing the County's "big picture" severe weather hazard environment.

5.6.4.2 National Climatic Data Center (NCDC) Events

In addition to the federally declared events in Plumas County and SHELDUS, the National Oceanic and Atmospheric Administration's (NOAA) NCDC has been tracking severe weather in Plumas County from 2006 through 2012. NCDC's Storm Events Database contains detailed data on six severe weather events for Plumas County. The information below summarizes the magnitude and severity of these events.

Event One: SLOAT

On October 19th, 2007, a strong cold front moved through the northern and central Sierra and western Nevada. Strong wind and locally heavy rainfall accompanied the cold front. A trained weather spotter reported a storm total of 1.25 inches of rainfall at Sloat.

Event Two: Tobin

On March 2nd, 2009, a cold winter storm brought one to five feet of storm total snow accumulation to the higher mountains of the southern Cascades and to the northern Sierra Nevada. Snow levels dropped to near 4000 feet during the latter part of the storm. Gusty winds brought reduced visibilities and broad drifting of snow. This system also generated thunderstorms in the Central Valley bringing heavy rain, flash flooding, and other severe effects. Large amounts of hail were reported over Shasta and Glenn Counties, larger than quarter size and more than 6 inches deep in some areas. Flash flooding and slides closed Highway 70 with minor flooding over a number of rural roads. Numerous car accidents from wet roads were reported across the area, as well as trees falling from a combination of wet ground and wind. CHP closed the west bound lane of Highway 70 in the Rich Bar area due to a rock slide resulting from heavy rainfall on a burn area.

Table 5-16: SHELDUS Severe Weather Hazard Data 1960-2005*

Severe Weather Type	Count of Hazard	Fatalities	Injuries	Property Damage**	Crop Damage**
Drought	1	0	0	$17,517	$-
Flooding	4	1.64	2.18	$66,352,875	$1,314
Flooding - Severe Storm/Thunder Storm	2	0	0	$443,966	$183,929
Flooding - Severe Storm/Thunder Storm - Wind	1	0	0	$-	$16,540,887
Flooding - Wind - Winter Weather	1	0	0	$2,118	$-
Flooding - Winter Weather	2	0	0	$31,134	$-
Fog	1	0	0	$435	$-
Hail	2	0	0	$130	$6,131
Hail - Severe Storm/Thunder Storm - Wind - Winter Weather	1	0.03	0.02	$634	$-
Heat	1	0	1.03	$-	$-
Landslide	1	0	0	$763	$-
Landslide - Winter Weather	1	1	0	$4,470	$-
Lightning	5	1.57	7.29	$7,083,321	$-
Lightning - Severe Storm/Thunder Storm	1	0	0	$1,314	$1,314
Lightning - Wind - Winter Weather	1	0	0.07	$8,759	$876
Severe Storm/Thunder Storm	9	0.8	0.3	$5,399,270	$122,632
Severe Storm/Thunder Storm - Wind	9	0.93	2.83	$1,387,676	$266,480
Severe Storm/Thunder Storm - Wind - Winter Weather	3	0.03	0	$109,704	$59,195
Severe Storm/Thunder Storm - Winter Weather	1	0	0	$24,524	$-
Wildfire	3	0	0	$31,199,838	$-
Wind	22	0.15	0.37	$3,281,888	$3,708
Wind - Winter Weather	3	0.07	0.43	$5,035	$0
Winter Weather	30	0.28	2.34	$960,072	$252,706,299
Grand Total	**105**	**6.5**	**16.86**	**$116,315,443**	**$269,892,765**

Source: SHELDUS, Hazards Research Lab, University of South Carolina, www.sheldus.org/
**Events may have occurred over multiple counties, so damage may represent only a fraction of the total event damage and may be not specific to Plumas County*
***Property and Crop Damage are adjusted for 2011.*

Event Three: Cromberg

Strong thunderstorms occurred across the eastern Sierra and western Nevada the afternoon and evening of May 28th, 2009. A trained weather spotter reported 1-inch diameter hail in Cromberg.

Event Four: Portola

On June 3rd, 2009, thunderstorms and heavy rainfall affected northeastern California. The Plumas County Sheriff's Department reported that a woman was struck by lightning at her home in Portola. She was transported by helicopter to the U.C. Davis Medical Center. She never regained consciousness and died from her injuries on June 11th.

Event Five: Chester Airport

On July 28th, 2009, an upper level low pressure system on the coast coupled with an unstable atmosphere brought isolated thunderstorms over the mountains of interior northern California. Hail was reported locally in western Plumas County each day. A Co-operative observer estimated hail from dime to penny sized.

Event Six: Wonderland

On July 29th, 2009, an upper level low pressure system on the coast coupled with an unstable atmosphere brought isolated thunderstorms over the mountains of interior northern California. Hail was reported locally in western Plumas County each day. Lassen Volcanic National Park rangers reported quarter sized hail.

5.6.5 Frequency/Probability of Future Occurrences

Severe weather will continue to occur annually throughout Plumas County. The frequency and probability of future occurrences is highly likely. Due to past existing weather patterns and climate change increases in the probability of future occurrences of severe weather events in the county are anticipated to continue.

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5.7 *Dam Failure*

A dam failure is usually the result of neglect, poor design, and/or structural damage caused by a major event such as an earthquake. When a dam failure occurs, an enormous quantity of water is suddenly released, destroying infrastructure and flooding the area downstream of the dam (ABAG 2011).

Dams are man-made structures built for a variety of uses. Uses include agriculture, flood protection, power generation, recreation, and water supply. Dam failure can occur with little warning. As outlined by FEMA, dam failure can occur due to one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam.
- Deliberate acts of sabotage to the dam.
- Structural failure of materials used in dam construction.
- Movement and/or failure of the foundation supporting the dam.
- Settlement and cracking of concrete in the dam.
- Piping and internal erosion of soil in the dams.
- Inadequate maintenance and upkeep of the dam.

5.7.1 Regulatory Environment

Dam regulatory requirements at a federal, state, and local level are critical for the safeguarding of agriculture, economy, power supply, and quality of life in Plumas County. At the federal level, FEMA is working to protect from dam failure through the National Dam Safety Program (NDSP). The Water Resources and Development Act of 1996 formally established the NDSP. The NDSP is a partnership of the states, federal agencies, and other stakeholders to encourage individual and community responsibility for dam safety. The Dam Safety and Security Act of 2002, signed into law on December 2, 2002, reauthorized the NDSP for 4 more years and added enhancements to the 1996 Act that are designed to safeguard dams against terrorist attacks (FEMA 2010).

The USACE maintains the National Inventory of Dams (NID), since its inception in 1972. Dams included in the NID are either greater than 25 feet high, hold more than 50 acre-feet of water, or are considered a significant hazard if they were to fail. Dams are classified based on the severity or magnitude of the potential devastation and losses of human life, economic, and environmental resources. Dam hazard classifications are defined as follows:

- High Hazard - loss of one human life is likely if a dam failure should occur.
- Significant Hazard - possible loss of human life and likely significant property or environmental destruction if a dam failure should occur.
- Low Hazard - no probable loss of human life and low economic, and/or environmental losses if a dam failure should occur.

At a state level, laws pertaining to the California dam safety program were originally adopted in 1929. Under this program, the DWR's Division of safety of Dams (DsoD) independently reviews and evaluates designs of new dams. DWR performs frequent inspections of dams under construction and of those recently completed to verify compliance with approved plans and specifications.

Due to the near failure of the Lower San Fernando Dam during the 1971 San Fernando earthquake, the State of California (Cal EMA) passed a law requiring dam owners to develop maps depicting areas that might be inundated due to dam failure. Cal EMA approves the dam inundation maps and distributes them to local governmental agencies, who in turn adopt emergency procedures for the evacuation and control of areas in the event of a dam failure. This law requires that each map be produced only once, without any requirements for updating.

Under the regulation of DsoD, dam owners and operators in Plumas County are required to routinely inspect their facilities. These inspections and evaluations will alert owners and operators to potential dam failures and allow immediate action to remedy the problem.

5.7.2 Past Occurrences

A dam failure event has never occurred in Plumas County. However, there have been four dam failures in surrounding counties, and 11 dam failures in California. One dam failure event near Plumas County was the failure of a Folsom Dam spillway gate. In July 17, 1995, nearly 40 percent of Folsom Lake drained before the spillway could be repaired. Nearly 40,000 cubic feet (1,100m^3) flowed through the broken gate. The United States Bureau of Reclamation (USBOR) attributed the failure to a design flaw.

Another dam failure occurred in Placer County on the Lower Hell Hole Dam on December 22, 1964. The dam location was approximately 100 miles east of Sacramento, California on the Rubicon River. The failure was caused by erosion that was a result of constructing the dam during a period of record rains. The 30,000 acre foot flood from the dam failure destroyed two suspension bridges and one steel girder State Highway bridge. The incident resulted in $160,000,000 in lawsuits filed for damages.

A dam failure at Lava Cap Mine tailings dam also occurred near Nevada City, California in the winter of 1997. The failure was caused by a rotted log in the dam which released 10,000 cubic yards of arsenic-tainted tailings into Little Clipper Creek and Lost Lake.

5.7.3 Location/Geographic Extent

According to data provided in the NID, there are 23 recorded dams within Plumas County. 8 High Hazard, 11 Significant Hazard, and 4 low hazard dams exist throughout the Feather River watershed. Refer to Figure 5-64 for the specific dam locations in Plumas County and Table 5-17 for more information on individual dams.

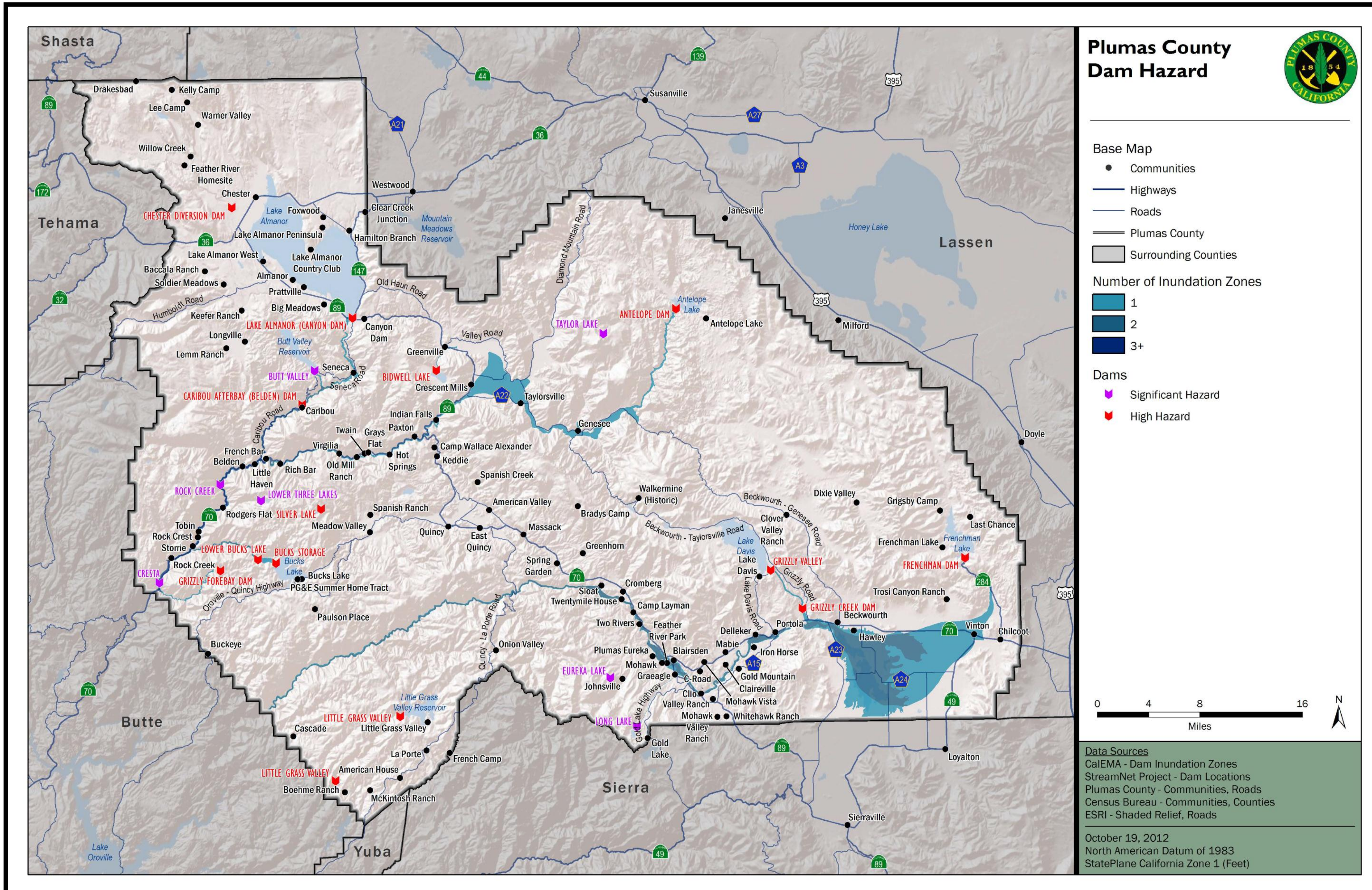

Figure 5-64: Dam Hazard Map

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Table 5-17: NID Recorded Dams within Plumas County

Dam Name	NID Id.	Hazard Class	Nearest Pop.	Dist. to Nearest Pop.	River	Owner Name	Year Built	Hgt.	Max. Storage	Norm. Storage	Max. Discharge	EAP	Inund Zone
Antelope	CA00037	S	Taylorsville	18	Indian Creek	DWR	1964	113	-	22566	30200	Y	Y
Belden Forebay	CA00413	H	Little Haven	7	North Fork Feather River	PG&E	1958	152	2477	2480	37000	Y	Y
Bidwell Lake (Round Valley)	CA00530	S	Greenville	2	Canyon Cr	Indian Valley CSD	-	35	-	5200	2575	Y	Y
Bucks Lake	CA00332	H	Pulga	20	Brush Creek	PG&E	1928	123	105605	102000	15000	Y	Y
Butt Valley	CA00326	H	Little Haven	11	Butt Creek	PG&E	1924	80	49897	49800	20000	Y	Y
Chester Diversion	CA01173	S	Chester	1	Nfk Feather Rv	Recl Board Sac-San Joaquin	1975	47	-	75	73400	Y	-
Cresta	CA00329	S	Pulga	7	North Fork Feather River	PG&E	1949	113	4140	2000	132000	Y	Y
Eureka	CA00031	S	Blairsden	5	Eureka Creek	State Dept. of Parks & Rec	1866	29	-	220	465	Y	-
Frenchman	CA00032	H	Vinton	8	Lit Last Chance Cr	DWR	1961	129	-	55477	173	Y	Y
Grizzly Creek	CA00532	S	Portola	5	Big Grizzly Cr	Jared Stein	1915	39	-	140	2490	Y	-
Grizzly Forebay	CA00333	S	Pulga	14	Grizzly Creek	PG&E	1928	98	1,112	1,110	3,200	Y	Y
Grizzly Valley (Lake Davis)	CA00039	H	Portola	8	Big Grizzly Cr	DWR	1966	115	-	83,000	3,450	Y	Y
Lake Almanor	CA00327	H	Seneca	5	North Fork	PG&E	1927	135	1,142,964	1,140,000	70,000	Y	Y

					Feather River								
Little Grass Valley	CA00269	H	Lumpkin	10	Sfk Feather Rv	SFWPA[12]	1961	210	0	93,010	21,350	Y	-
Long Lake	CA00534	S	Blairsden	6	Gray Eagle Creek	Graeagle Water Co	1938	12	0	1,478	625	Y	Y
Lower Bucks Lake	CA00331	S	Pulga	18	Brush Creek	PG&E	1928	99	5840	5,840	15,375	Y	Y
Rock Creek	CA00330	H	Tobin	4	North Fork Feather River	PG&E	1950	115	548	2,300	400	Y	Y
Silver Lake	CA00531	S	Quincy	10	Silver Creek	Soper-Wheeler Company	1906	21	0	650	715	Y	-
Slate Creek Diversion	CA00271	S	American House	2	Slate Creek	SFWPA	1961	72	0	643	39,100	Y	-
South Fork Diversion	CA00270	L	Forbestown	10	Sfk Feather Rv	SFWPA	1961	70	0	88	30,000	Y	-
Spring Val Lake	CA01077	L	Leavitt	1	Rock Creek	DFG	1979	11	0	75	600	Y	-
Taylor Lake	CA00533	L	Taylorsville	12	Tr Indian Creek	The Nature Conservancy	1929	14	0	380	490	Y	-
Three Lakes	CA00334	L	Rogers Camp	3	Feather River	PG&E	1928	33	606	513	500	N	-

[12] South Feather Water And Power Agency

5.7.4 Magnitude/Severity

Dam failure inundation zones have been prepared for a number of High Hazard and Significant Hazard dams in Plumas County. Dam failure Inundation zones are developed by using engineering hydrology modeling methods completed with various engineering technics. The results of the dam failure modeling often are displayed the form of inundation zones which are included in the dam emergency actions plan (EAP) held by dam owners, Cal EMA and DWR DsoD personnel. Modeled dam inundation zones represent the best estimate of where the water would flow if the dam completely failed with a full reservoir. Inundation pathways are often based upon a "sunny day event" however, some models may include dam failure results as a result of severe weather events with heavy precipitation. Weather event modeling provides the Probable Maximum Flood (PMF) in drainage areas, stressing the dam's maximum holding capacity. In Plumas County dam failure inundation zones cover 61,621 acres, or 3.6 percent of Plumas County land area. Refer to Figure 5-64 for dam inundation locations.

5.7.5 Frequency/Probability of Future Occurrences

No quantitative information exists for a dam failure in Plumas County. When a dam is recognized to have a potential failure, the water level is reduced to allow for a reduction in water pressure and volume behind the dam. This reduction of water level is required by the DSOD and by safety protocols established by each dam owner (ABAG 2011).

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5.8 *Drought*

Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. Drought severity depends on numerous factors, including duration, intensity, and geographic extent, as well as regional water supply demands by humans and vegetation. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity.

Drought originates from a deficiency of precipitation over an extended period, usually one or more seasons. Drought can result in a water shortage for some activity, group, or environmental sector. Drought is a complex natural hazard, which is reflected in the following four definitions commonly used to describe it:

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

Although climate is a primary contributor to hydrological drought, other factors such as changes in land use (e.g., deforestation), land degradation, and the construction of dams all affect the hydrological characteristics of the basin. Since regions are interconnected by hydrologic systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area. Similarly, changes in land use upstream may alter hydrologic characteristics such as infiltration and runoff rates, resulting in more variable stream flow and a higher incidence of hydrologic drought downstream. Land use change is one of the ways human actions alter the frequency of water shortage even when no change in the frequency of meteorological drought has been observed.

5.8.1 Regulatory Environment

A number of regulatory requirements and documents address planning for drought in California and Plumas County specifically. These regulatory documents include the 2004 Feather River Watershed Management Strategy, 2005 Upper Feather River Watershed Integrated Regional Water Management Plan, 2011 Plumas County General Plan, and the 2010 California Drought Contingency Plan.

5.8.1.1 2004 Feather River Watershed Management Strategy

Plumas County encompasses most of the Upper Feather River watershed, which is the watershed for the State Water Project's primary storage facility at Lake Oroville. As part of the Monterey Settlement Agreement, the Department of Water Resources (DWR), Plumas County, and the State Water Project Contractors created the Plumas Watershed Forum to implement watershed management and restoration activities for the benefit of the State Water Project. One of the goals of the management plan is to improve groundwater retention and storage in major aquifers in order to stabilize groundwater levels for drought purposes.

5.8.1.2 2005 Upper Feather River Watershed Integrated Regional Water Management Plan

The Integrated Regional Water Management (IRWM) Plan is an implementation plan for the management of water resources throughout the Upper Feather River Watershed. The IRWM Plan Objective 8: Groundwater Recharge and Extraction Balance, identifies drought conditions and increased competition for surface water. Action 6.3: Water Supply Actions, initiates management actions for the watershed to build better understanding of existing water right conflicts between urban, agriculture, and recreational stakeholders by sub-watershed. The action plan recognizes sub-watershed water budgets, the protection of agricultural water rights and urban water rights, and the protection and monitoring of groundwater recharge areas as action areas for improving drought control and preparedness within the watershed.

5.8.1.3 2011 Plumas County GP

The 2011 Plumas County GP addresses drought in its Water Resources element, Goal 9.5 Public Water Supply. The Public Water Supply goal is to encourage public water systems and their sources to provide an adequate supply to meet long-term needs provided in a manner that maintains water resources for other water users while protecting the natural environment. As part of this goal, the General Plan identifies policies such as Policy 9.5.2: Cooperative Planning for Water Supply, which encourages the County to work with public water supply purveyors to disseminate and discuss information on the limits of available water supplies, how the supplies can be used efficiently, the possible effects of drought conditions, and acceptable levels of risk of shortage for various water users. The GP also encourages the County to assist in the preparation of master facilities plans, and urban water management plans where required by State law.

5.8.1.4 2010 California Drought Contingency Plan

The California Drought Contingency Plan was prepared in conjunction with the 2009 California Water Plan and will be updated every five years. The purpose of the plan is to minimize drought impacts by improving agency coordination, enhancing monitoring and early warning capabilities, water shortage impact assessments and preparedness, response and recovery programs. The California Water Plan presents strategic plan elements including a vision, mission, goals, guiding principles, and recommendations for current water conditions, challenges and activities. The plan includes future uncertainties and climate change impacts, scenarios for 2050, and a roadmap for improving data and analytical tools needed for integrated water management and sustainability.

5.8.2 Past Occurrences

The 2010 State Hazard Mitigation Plan (SHMP) states that from 1950 to 2009, there have been eight-drought State Emergency Proclamations in California. Through 2007, Cal EMA's administered costs due to drought total $2,686,858,480. Specifically for Plumas County, there have been five drought incidences since 1972, however none of the incidences were considered a state or federally declared drought disaster.

Additional information about previous occurrences of droughts in California (in general) can be obtained from the California Department of Water Resources.

5.8.3 Location/Geographic Extent

Drought can affect the entire Plumas County. However, unlike much of Central and Southern California regions, Plumas County rarely experiences long periods of extremely low precipitation due to its geographic location in the Sierra Nevada region. Instead, Plumas County's drought issues stem from poor retention of precipitation and depletion of deep groundwater systems as a result of continued extraction and reduced recharge during dry periods. Loss of water tables and depletion of shallow aquifers is a typical consequence of headcutting[13] throughout the watershed. Poor retention of precipitation is also a consequence when headcutting lowers water tables and changes the vegetation to more desert types.

Some areas of the watershed are experiencing dry year depletions of deep groundwater systems as a result of extraction. The Sierra Valley is an example of a high desert groundwater basin developed for agriculture that experiences periodic drought depletions that only recover during wet periods. Prior to the end of the 1970's most groundwater use in the valley was stock water from deep flowing artesian wells. However, significant groundwater declines occurred in the 1980's when many deep, large capacity irrigation wells were developed to grow alfalfa and other crops. Since then, the Sierra Valley Groundwater Management District has monitored pumping rates on all wells pumping 100gpm or more. The District has also established water budgets in the areas of significant agricultural pumping in order to manage drought depletions.

5.8.4 Magnitude/Severity

The magnitude of drought is usually measured in time and the severity of the hydrologic deficit. There are several resources available to evaluate drought status and estimate future expected conditions. The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning. The NIDIS maintains the U.S. Drought Portal (www.drought.gov) which is a web-based access point to several drought related resources. Resources include the U.S. Drought Monitor (USDM) and the U.S. Seasonal Drought Outlook (USSDO).

[13] A head cut is an erosional feature of some intermittent and perennial streams where an abrupt vertical drop (or knickpoint) occurs in the stream bed. As erosion of the knickpoint and the streambed continues, the head cut will migrate upstream.

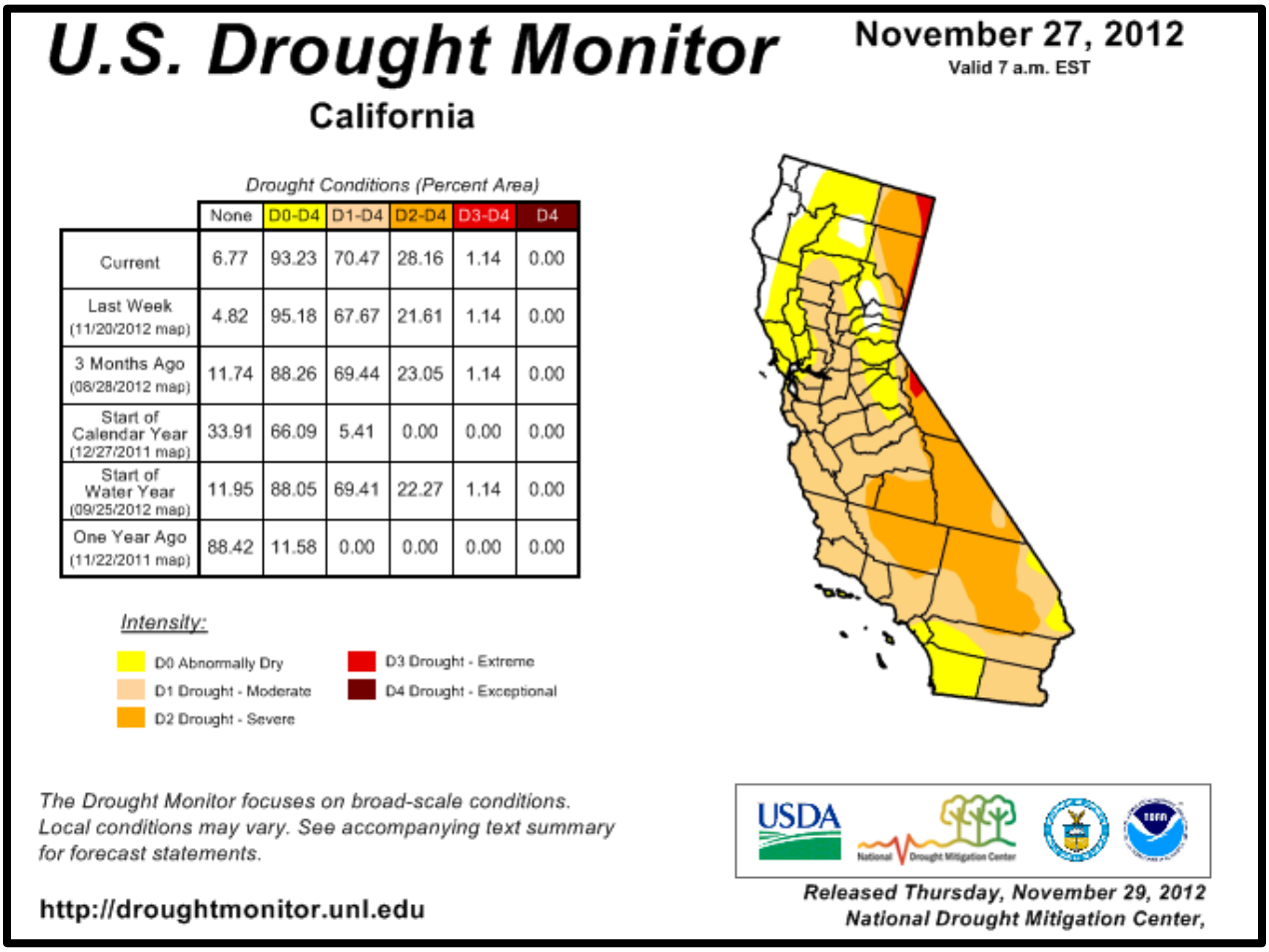

Figure 5-65: Drought Monitor Map for the State of California on November 27, 2012

The USDM provides a summary of drought conditions across the United States and Puerto Rico and is developed and maintained by the National Drought Mitigation Center (www.drought.unl.edu). USDM includes the U.S. Drought Monitor Map. This map is updated weekly by combining a variety of drought database and indicators, and local expert input into a single composite drought indicator. The map denotes four levels of drought intensity (ranging from D1 - D4) and one level of "abnormal dryness" (D0). In addition, the map depicts areas experiencing agricultural (A) or hydrological (H) drought impacts. These impact indicators help communicate whether short- or long-term precipitation deficits are occurring. An example Drought Monitor Map for the State of California on November 27, 2012 is illustrated in Figure 5-65.

The USSDO, shown in Figure 5-66, is a three-month projection of potential drought conditions developed by the National Weather Service's Climate Prediction Center at the following website: http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html.

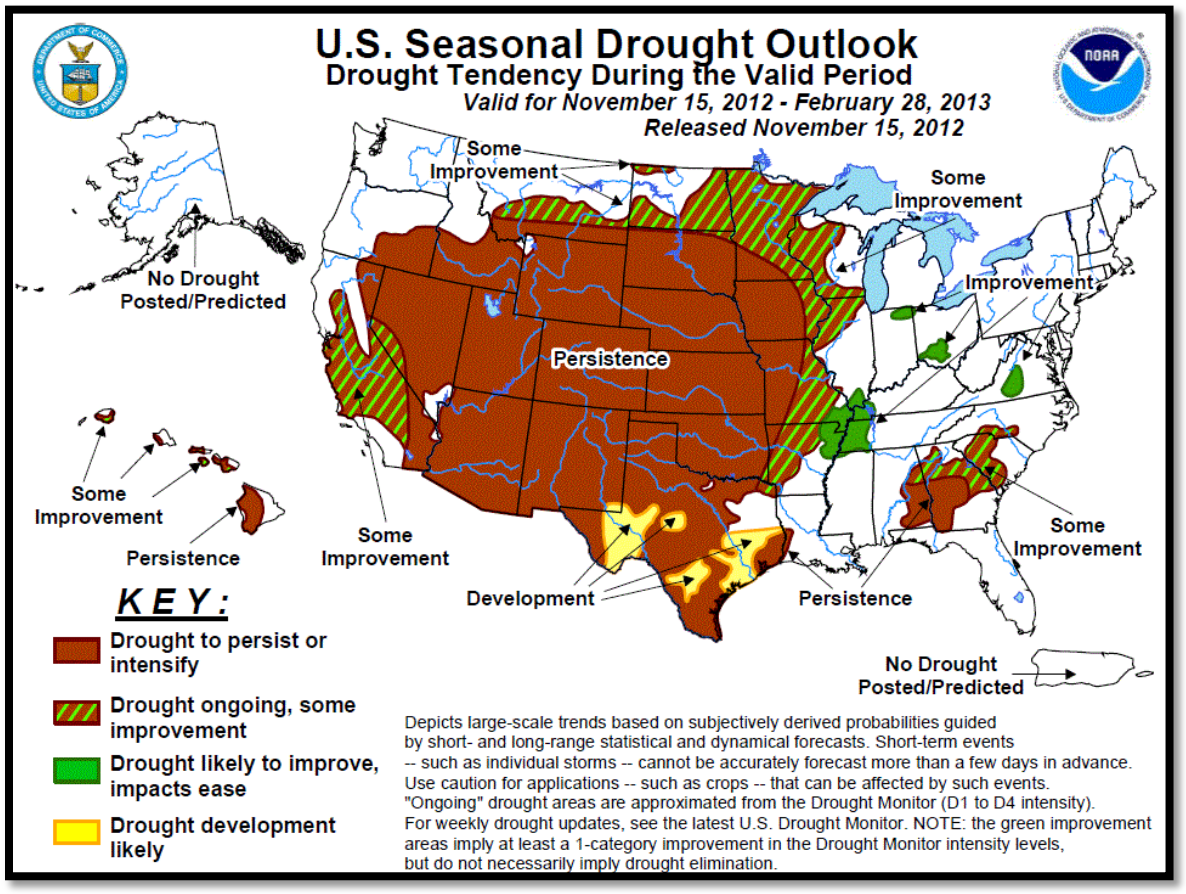

Figure 5-66: USSDO Drought Tendency Map (Valid November 15, 2012 to February 28, 2013)

A number of indices measure how much precipitation for a given period has deviated from historically established norms. The primary indicator for the USDM and USSDO for the western United States is the Palmer Drought Severity Index (PDSI). The PDSI is widely used by the USDA to determine when to grant emergency drought assistance to affected areas. PDSI is a commonly used index that measures the severity of drought for agriculture and water resource management. It is calculated from observed temperature and precipitation values and estimates soil moisture. However, the PDSI is not considered consistent enough to characterize the risk of drought on a nationwide basis (FEMA, 1997) and is not well suited to the dry, mountainous areas in the western U.S.

For western States with mountainous terrain and complex regional microclimates, it is also useful to supplement the PDSI values with other indices such as Surface Water Supply Index and Standardized Precipitation Index (SPI). The Surface Water Supply Index takes snowpack and other unique conditions into account. The National Drought Mitigation Center (NDMC) uses the SPI to identify emerging drought months sooner than the PDSI. It is computed on various time scales to monitor moisture supply conditions. The SPI is the number of standard deviations that precipitation value would deviate from the long-term mean. As shown in Figure 5-67 the 72-month SPI through the end of October 2012 for Plumas County is moderately dry.

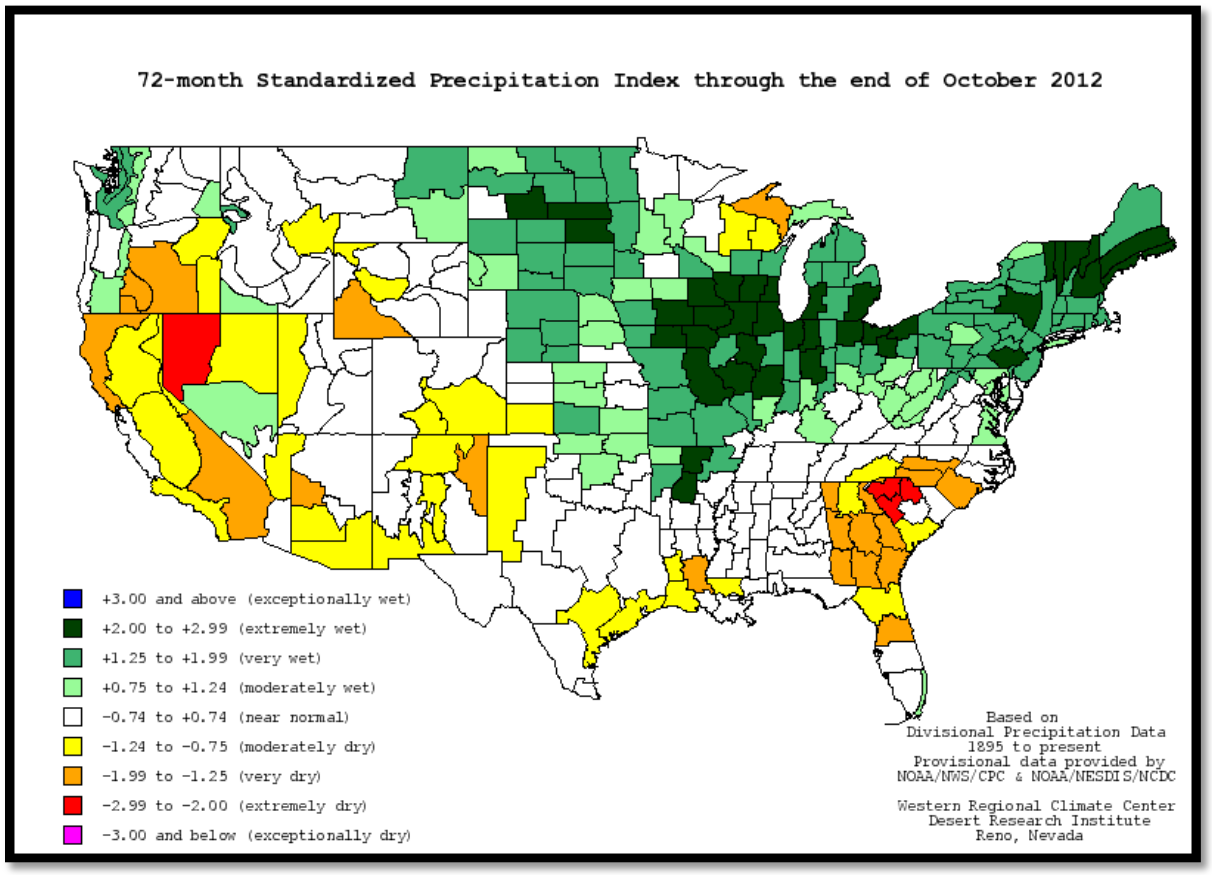

Figure 5-67: 72-Month SPI through the end of July 2011 for Plumas County

The Vegetation Drought Response Index, or VegDRI, is a bi-weekly depiction of vegetation stress across the contiguous United States. VegDRI is a fine resolution (1-km^2) index based on remote sensing data, and incorporates climate and biophysical data to determine the cause of vegetation stress. Development of the VegDRI map and associated products is a joint effort by the National Drought Mitigation Center (NDMC), the U.S. Geological Survey's (USGS) National Center for Earth Resources Observation and Science (EROS), and the High Plains Regional Climate Center (HPRCC). Figure 5-35 illustrates the VegDRI results for the San Francisco Bay Area for November 26, 2012.

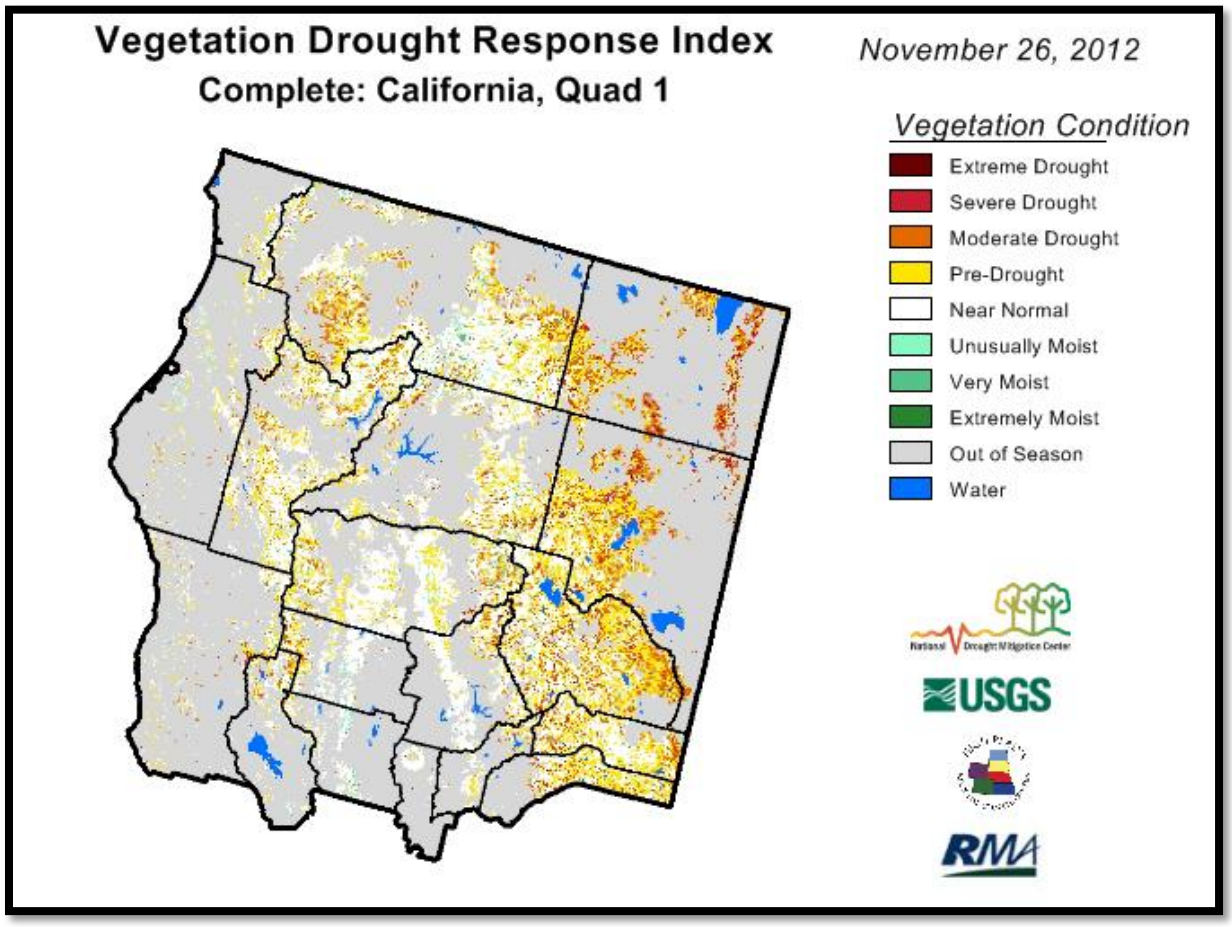

Figure 5-68: VegDRI results for California, Quad 1 for November 26, 2012

5.8.5 Frequency/Probability of Future Occurrences

Currently there is no data on the probability of drought that would be comparable to the USGS effort on earthquakes in the region, or how 100-year flood maps are created. According to the 2010 California State MHMP, climate scientists studying California find that drought conditions are likely to become more frequent and persistent over the 21st century due to climate change. The experiences of California during recent years underscore the need to examine more closely the state's water storage, distribution, management, conservation, and use policies.

5.9 *Climate Change*

Climate change refers to any distinct change in measures of climate lasting for a long period of time, more specifically major changes in temperature, rainfall, snow, or wind patterns. Climate change may be limited to a specific region or may occur across the whole Earth. Climate change may result from:

- Natural factors (e.g., changes in the Sun's energy or slow changes in the Earth's orbit around the Sun);
- Natural processes within the climate system (e.g., changes in ocean circulation); and
- Human activities that change the atmosphere's make-up (e.g., burning fossil fuels) and the land surface (e.g., cutting down forests, planting trees, building developments in cities and suburbs).

The effects of climate change are varied: warmer and more varied weather patterns, melting ice caps, and poor air quality, for example. As a result, climate change impacts a number of natural hazards including wildfires, floods, and drought.

Plumas County has its own set of expected hazards that are associated with climate change. Local weather station data (provide by the National Forest Service) for years 1930-2000 show mean temperatures increasing, especially nighttime temperatures. There has also been a significant decrease in the number of months below freezing. Precipitation has been steady on average, although there has been an increase in precipitation on the west side of the Plumas National Forest and a decrease on the east side. In general, there has been more recorded high and low precipitation levels, demonstrating less predictability and more sporadic rainfall patterns in recent years.

5.3.15.1 Past Occurrences

Climate change has never been directly responsible for any declared disasters. Past flooding, wildfire, and drought disasters may have been exacerbated by climate change, but it is impossible to make direct connections to individual events. Unlike earthquakes and floods that occur over a finite time period climate change is an on-going hazard, the effects of which are already being experienced. Other effects may not be apparent for decades or may be avoided altogether by mitigation actions taken today.

5.3.15.2 Location/Geographic Extent

Climate change is expected to affect the entire globe but will have varying effects on different geographical regions. It is expected that California coastal areas will be vulnerable to different hazards (e.g. sea level rise or more severe tropical storms) than inland areas, which will experience increased wildfire, drought, flooding from precipitation events, or other.

The Feather River watershed can be at risk due to winter temperature lows which are typically at or near freezing. Small warming trends (1-2 degrees F) will cause precipitation to shift from snow to rain which will decrease snow pack and exacerbate drought conditions in summer, creating the conditions for increased wildfires. These observed trends could also increase flooding as more rainfall will contribute to larger runoff rates.

5.3.15.3 Magnitude/Severity

Refer to other natural disaster sections such as drought, severe weather, flood, and wildfire for the magnitude and severity of a particular event.

5.3.15.4 Frequency/Probability of Future Occurrences

According to the 2010 State Hazard Mitigation Plan (SHMP), climate change is one of the few natural hazards where the probability of occurrence is influenced by human action. In addition, unlike earthquake and floods that occur over a finite time period, climate change is an on-going hazard with effects already experienced by some.

The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) projects possible changes in variability and the frequency/severity of future events based on climate scenarios. Scenarios, unlike projections, are not predictions or forecasts that indicate outcomes considered most likely, but are alternative images without ascribed likelihoods of how the future might unfold. Using four emissions scenarios that explore a range of alternative development pathways, the IPCC predicts a warming of about 0.2 degree Celsius per decade. Even if the concentrations of all GHGs and aerosols had been kept constant at year 2000 levels a future warming of about 0.1 degrees Celsius per decade would be expected.

Based on a 0.2 degree Celsius per decade increase scientists' project that snow cover area will contract, increases in thaw depth will occur in permafrost regions, sea ice will shrink, and hot extremes, heat waves, and heavy precipitation events will become more frequent. It is also predicted that tropical storms will become more intense and sea level rise will continue. These impacts of climate change are expected to influence ecosystems, coastlines, food and agricultural productivity, fresh water resources, and overall human health. Specifically in North America, warming in western mountains is projected to cause decreased snowpack, more winter flooding, and reduced summer flows, exacerbating competition for over-allocated water resources.

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5.10 *Vulnerability Assessment*

The information in this section provides an explicit representation of what a community stands to lose in a disaster. This is useful for county officials and other decision makers who will need to balance the costs of mitigation against the potential harm to citizens and damage to property. It provides comparable measurements of community natural hazard exposure[14] and assists in determining which hazards and/or what parts of Plumas County to focus on making resilient to disaster first. Based upon possible assets at risk, hazard mitigation resources can be directed where need be, in-part, by a vulnerability assessment and information found in hazard profiles presented in Section 5.3 through 5.9

The vulnerability assessment is developed by providing the hazard mitigation analysts with quantitative and qualitative information for each hazard. Through an exposure analysis, quantitative data is developed for each hazard. An exposure analysis provides quantities of people and assets at risk to particular hazards. Qualitative data has been developed and presented in this section for hazards without measurable data. Qualitative data provides information beyond quantities of people and assets at risk, but rather a description of how the hazard could affect a region like Plumas County.

***Note: The hazard exposure analysis has been developed with best available data and follows methodology described in the FEMA publication* Understanding Your Risks—Identifying Hazards and Estimating Losses.**

Note: There are other intangible losses that could result from a natural hazard event, such as losses of historic or cultural integrity or damage to the environment that are difficult to quantify. Other costs, including response and recovery costs, are often unrecoverable and are not addressed in this document.

5.10.1 Methodology

A vulnerability assessment was conducted for each of the priority hazards identified in Section 5.1.1. Geospatial data is essential in determining population and assets exposed to particular hazards. Geospatial analysis can be conducted if a natural hazard has a particular spatial footprint that can be overlaid against the locations of people and assets. In Plumas County wildfire, flood, earthquake, landslides and dam failure inundation zones have known geographic extents and corresponding spatial information about each hazard. The spatial information can be used in an overlay analysis to examine particular exposure to people and assets. Spatial overlay analysis was conducted as part of this hazard mitigation update enabling mitigation planners to compare results across a broad range of hazards.

Several sources of data are necessary to conduct a vulnerability analysis. Figure 5-69 provides an exhibit of the data inputs and outputs used to create the vulnerability analysis results. U.S. Census data is the primary source in determining natural hazards exposure to the populations in Plumas County. The Census data has been used to determine the population at risk, which is generally referred to as

[14] Elements at risk; Risk inventory; Exposure encompasses all elements, processes, and subjects that might be affected by a hazardous event. Consequently, exposure is the presence of social, economic, environmental or cultural assets in areas that may be impacted by a hazard.

population exposure. Population exposure is provided for wildfire, flooding, earthquake, landslide and dam failure inundation hazards later in this section.

In addition to U.S. Census data, asset data was used to provide a snapshot of how county assets are affected by natural hazards. For purposes of this study, asset data includes parcels and critical infrastructure within the Plumas County. Critical infrastructure is described as assets that are essential for people and a community to function. Critical infrastructure such as utilities, county owned facilities, bridges, roadways, etc. Critical facilities data were developed from a variety of sources including county owned and maintained data, state and federal government datasets, and private industry datasets. A large critical infrastructure spatial database was developed to translate critical facilities information into points and lines georeferenced[15] within Plumas County. Critical facility points and lines are overlaid with the spatial hazard layers to develop a list of "at risk" critical facilities. The county critical facilities that intersect with natural hazards are referred to as the critical facility exposure.

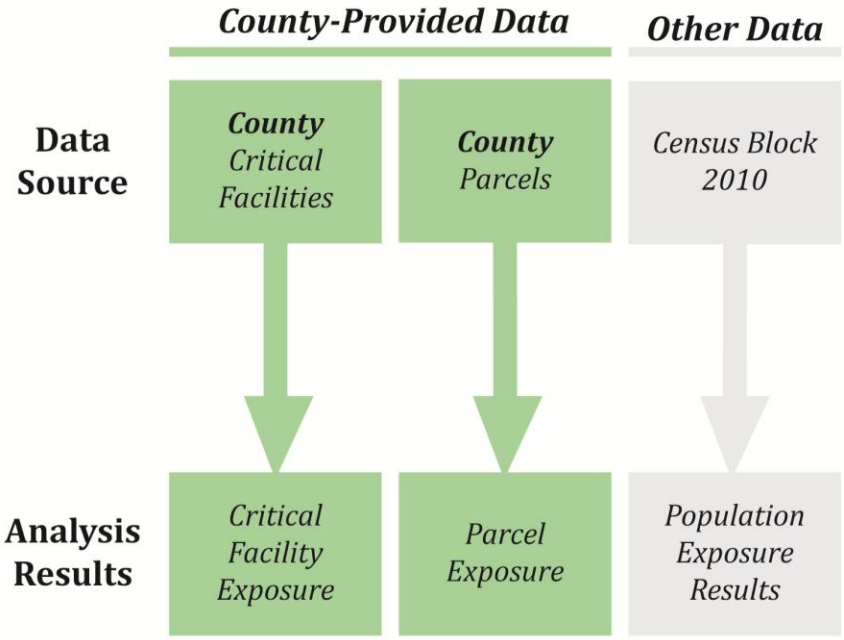


Figure 5-69: Data Source and Methodology

The vulnerability and potential impacts from priority hazards that do not have specific mapped areas nor the data to support additional vulnerability analyses are discussed in more general terms in alphabetical order following the discussion on wildfire, flooding, geologic hazards, and dam failure hazards.

[15] To georeference something means to define its existence in physical space. That is, establishing its location in terms of map projections or coordinate systems. The term is used both when establishing the relation between raster or vector images and coordinates, and when determining the spatial location of other geographical features.

5.10.2 Population and Asset Exposure

In order to describe exposure results for each hazard, it is important to understand the "total" population and "total" assets at risk. The risk for each hazard described in this section will refer to the percent of total population or percent of total assets exposed to a particular hazard. This provides the possible significance or vulnerability to people and assets during a "worst case scenario" for each hazard with spatial extents. Section 5.10.2.1, Section 5.10.2.2 and Section 5.10.2.3 provide a description of the total population, critical facilities, and parcel exposure inputs.

5.10.2.1 Population Exposure

In order to develop hazard specific vulnerability assessments, population near natural hazard risks should be determined to understand the total "at risk" population. We can understand how geographically-defined hazards may affect the County by analyzing the extent of the hazard in relation to the location of population within the county. According to the 2010 U.S. Census, the total population for Plumas County is 20,009 – this is the total population exposure to hazards. Each natural hazard scenario affects the County population differently depending on the location of the hazard and the population density where it occurs. Vulnerability assessment sections presented later in this section summarize the population exposure for each natural hazard.

5.10.2.2 Critical Facilities Exposure

Critical facilities are of particular concern when conducting hazard mitigation planning. Critical facilities are defined as essential services, and if damaged, would result in severe consequences to the health, safety, and welfare of the public. An inventory of critical facilities based on data from Plumas County Planning department and other publicly sourced information were used to develop a comprehensive inventory of facility points. See Figure 5-70 for a summary of critical facility points including communication buildings, emergency response buildings, healthcare, important private sector facilities (commercial and industrial), schools, transportation, utilities and County facilities.

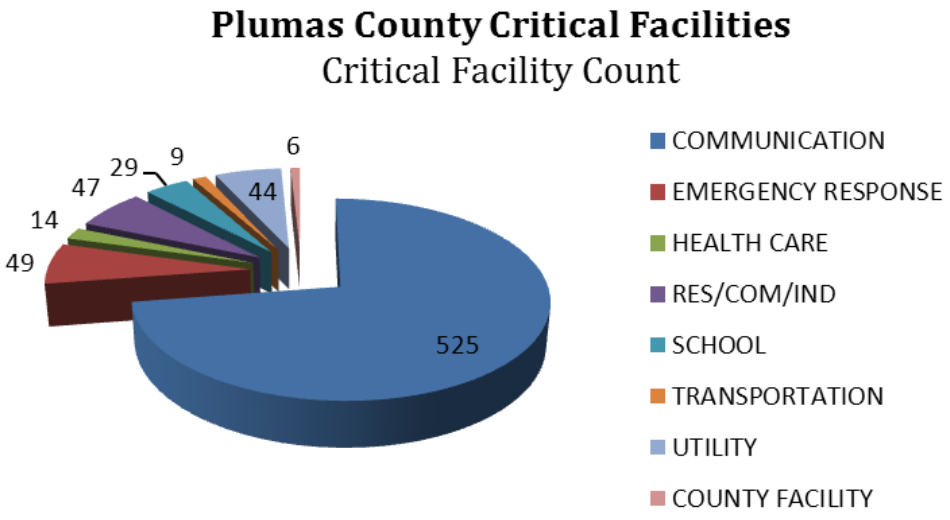


Figure 5-70: Plumas County Critical Facilities

A separate analysis was conducted for linear utilities and transportation routes, since these assets are represented in linear format rather than points. A current representation of the critical facilities and linear utilities are provided in Table 5-18 and Table 5-19. Some critical facility information has been omitted from documentation due to national security purposes. Plumas County Office of Emergency Service and the Plumas County Planning department manages and maintains a complete list of critical facilities.

Table 5-18: Critical Facility Inventory Summary Table

Facility Type	Count
COMMUNICATION	**525**
AM	1
ANTENNA STRUCTURE REGISTRATION	34
CELLULAR	6
FIXED MICROWAVE	174
FM	12
LAND MOBILE COMMERCIAL	7
LAND MOBILE PRIVATE	286
PAGING	3
TV NTSC	2
EMERGENCY RESPONSE	**49**
EOC	1
FIRE STATION	36
POLICE STATION	3
SHELTER	9
HEALTH CARE	**14**
CLINIC	1
HOME HEALTH AGENCY/HOSPICE	1
HOSPITAL	3
NURSING HOME	3
PHARMACY	5
PUBLIC HEALTH DEPARTMENT	1
RES/COM/IND	**47**
FINANCE	10
GOLD MINING	1
HISTORIC PLACE	18
PESTICIDE PRODUCER	1
PROPANE STATION	10
REFUSE FACILITY	1
TIMBER PRODUCTS	3
(blank)	3

SCHOOL	**29**
COLLEGE	1
DAY CARE CENTER	9
K-12	19
TRANSPORTATION	**9**
AIRPORT	4
HELIPORT	5
UTILITY	**44**
WASTEWATER TREATMENT PLANT	5
WATER TREATMENT PLANT	2
SUBSTATION	23
POWER PLANT	14
COUNTY FACILITY	**6**
PUBLIC WORKS YARD	6
Grand Total	**723**

Table 5-19: Linear Utility Inventory

Linear Utilities	Sum of Miles
Electric Transmission Line	**255**
NVENERGY_60KV	5
PG&E_115KV	31
PG&E_230KV	43
PG&E_34.5KV	1
PG&E_60KV	88
PLSR_60KV	88
Transportation	**5,276**
RAILROAD	185
ROAD	5,091
Grand Total	**5,532**

5.10.2.3 Improved Parcel Exposure

A standardized hazard overlay was conducted to develop hazard exposure results for improved county parcels. The Plumas County Assessor's data is pivotal to developing the total value of structures, personal property and fixtures exposed to each hazard – the value of parcels exposed to each hazard within the study area is referred to as parcel exposure. The spatial overlay method identifies parcels and the associated value of each to a particular hazard, allowing for parcel exposure results to be compared for each hazard.[16] The structure value, fixture value, and personal property value for each parcel is summed and provided in Table 5-20. Table 5-20 represents the total parcel count and associated value in Plumas County.

Table 5-20: Parcels with Structural Value > than or = 10K

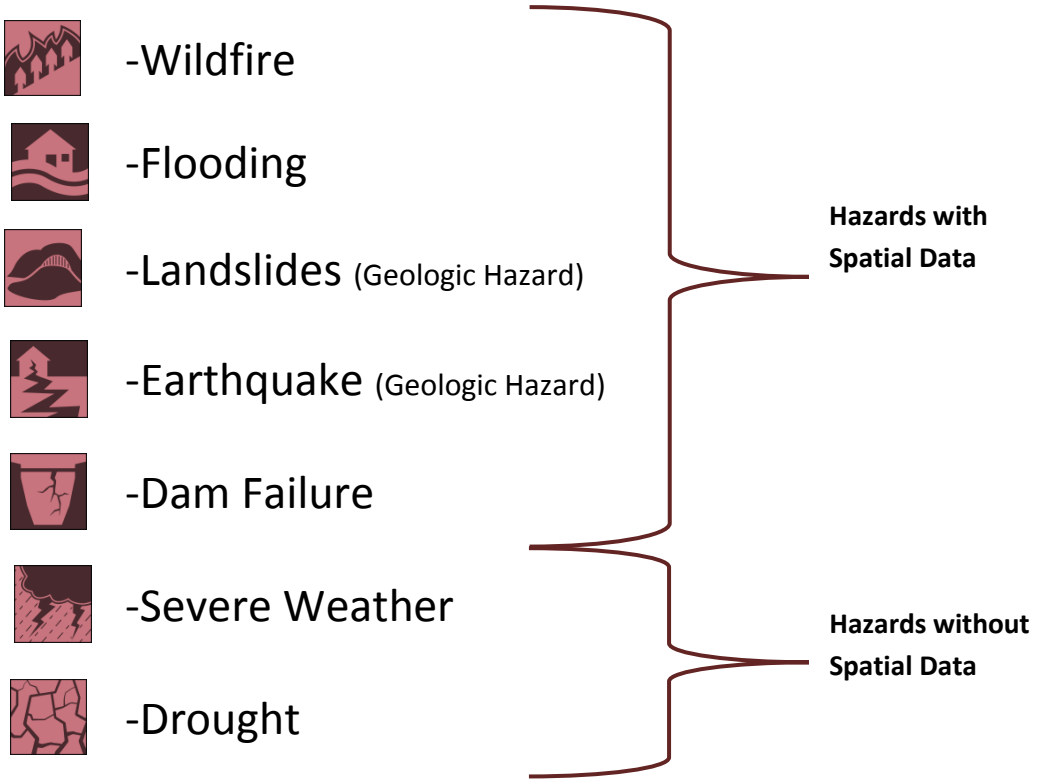
Parcel Count	Total Structure Value	Total Fixture Value	Total Personal Property Value
13,494	$ 1,895,437,450	$ 59,362,242	$ 16,833,898

Source: Plumas County Assessor's Role 2012

[16] County parcel data It is important to note that replacement cost is different than assessed market value for taxation purposes. In the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a total loss and structures can be rebuilt.

5.10.3 Hazard Specific Vulnerability

FEMA Disaster Mitigation Act regulations require that Plumas County evaluate the risks associated with each of the hazards identified in the planning process. This section summarizes the possible impacts and quantifies, where data permits, the County's vulnerability to each of the priority hazards identified in earlier in Section 5. Estimated community vulnerability from each hazard is provided in each hazard-specific section that follows. Vulnerability can be quantified instances where there is a known hazard area, such as a mapped floodplain or high hazard landslide area. The Planning Committee identified five hazards in the planning area for which specific geographical hazard areas have been defined and for which sufficient data exists to support a vulnerability analysis. The hazards evaluated as part the vulnerability assessment include:



Hazards with known geographical extents include wildfire, flooding, earthquake, landslides and dam failure. Hazards with spatial extents have discrete hazard risk areas; their risk varies and will affect people and assets differently. For hazards with spatial extents, "at risk" population and assets were inventoried by hazard area. To the extent possible, population and assets are quantified to define vulnerability in identified hazard areas. The hazard descriptions below include general hazard-related impacts, overall community impact, exposed population, assets and critical facilities at risk (i.e., types, numbers, and value of land and improvements). Together, this information conveys the vulnerability of particular populations and assets, and allows hazard mitigation planning to prioritize resources accordingly.

5.10.4 Assigning Risk Factors

The HMP Planning Committee assigned risk factors for each hazard profiled through a facilitated group exercise. During the group exercise, risk factor (RF) criteria worksheets were used to examine each identified hazard for potential risk. This methodology produces RF numerical values that allow identified hazards to be ranked against one another (the higher the RF value, the greater the hazard risk). Final RF values are obtained by assigning numerical criteria index values to five risk assessment categories. Risk assessment categories include *probability, impact, spatial extent, warning time*, and *duration*.

To obtain RF for each hazard the Planning Committee assigned a numerical range (1-4) to each risk assessment category. Based upon unique concerns for the planning area, a weighing factor can be agreed upon for each RF category. The RF weighting scheme is used to establish a higher degree of importance to selected risk assessment categories. To calculate the RF value for a given hazard, the Planning Committee developed the RF weighting scheme below:

RF Value = [(Probability x .30) + (Impact x .30) +
(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

The sum of all five categories shown in the equation above equals the RF final risk factor values presented in Table 5-22. Table 5-21 provides a summary of the RF criteria the Planning Committee used to assign *criteria index values* during a group exercise. This RF approach uses hazard data, local knowledge, and consensus opinions to produce numerical values that allow identified hazards to be ranked against one another. The final RF developed can be used to evaluate hazards and classify perceived hazard risk in Plumas County.

Table 5-21: Risk Factor Criteria

Risk Assessment Category	Degree of Risk	Level	Criteria Index	Weight Value
PROBABILITY **What is the likelihood of a hazard event occurring in a given year?**	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	**1**	**30%**
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	**2**	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY	**3**	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	**4**	
IMPACT ***In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?***	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	**1**	**30%**

Risk Assessment Category	Degree of Risk	Level	Criteria Index	Weight Value
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	**2**	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	**3**	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	**4**	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	**1**	**20%**
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	**2**	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	**3**	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	**4**	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	**MORE THAN 24 HRS**	SELF DEFINED	**1**	**10%**
	12 TO 24 HRS	SELF DEFINED	**2**	
	6 TO 12 HRS	SELF DEFINED	**3**	
	LESS THAN 6 HRS	SELF DEFINED	**4**	
DURATION *How long does the hazard event usually last?*	**LESS THAN 6 HRS**	SELF DEFINED	**1**	**10%**
	LESS THAN 24 HRS	SELF DEFINED	**2**	
	LESS THAN 1 WEEK	SELF DEFINED	**3**	
	MORE THAN 1 WEEK	SELF DEFINED	**4**	

Table 5-22 displays RF index criteria and weighting determinations from the HMP Planning Committee. Final RF scores determine *High*, *Moderate*, or *Low* risk designations based upon the conclusion index. It should be noted that although some hazards are classified as posing "Low Risk", their occurrence of varying or unprecedented magnitudes is still possible and will continue to be re-evaluated during future updates of this plan. Due to the inherent errors possible in any disaster risk assessment, the results of the risk assessment should only be used for planning purposes and in developing projects to mitigate potential losses.

5.10.5 Hazard Risk Factor

Table 5-22: Risk Factor Results Table

Rank	Natural Hazards	Probability	Wt.	Impact	Wt.	Spatial Extent	Wt.	Warning Time	Wt.	Duration	Wt.	RF Factor
1	Wildfire	4	1.2	3	0.9	4	0.8	3	0.3	4	0.4	**3.6**
2	Severe Weather	4	1.2	2	0.6	4	0.8	1	0.1	2	0.2	**2.9**
3	Flooding	3	0.9	3	0.9	2	0.4	1	0.1	4	0.4	**2.7**
4	Geologic Hazards	4	1.2	2	0.6	1	0.2	4	0.4	2	0.2	**2.6**
5	Drought	2	0.6	1	0.3	3	0.6	1	0.1	4	0.4	**2**
6	Climate Change	2	0.6	1	0.3	4	0.8	1	0.1	1	0.1	**1.9**
7	Dam Failure	1	0.3	2	0.6	1	0.2	2	0.2	1	0.1	**1.4**

Risk Factor Conclusion	
HIGH RISK (3.0 – 4.0)	Wildfire
MODERATE RISK (2.0 – 2.9)	Flooding, Severe Weather, Geologic Hazards, Drought
LOW RISK (0.1 – 1.9)	Climate Change, Dam Failure

The RF results assist planners to classify risk for each hazard regardless of hazard type. For purposes of this plan the following classifications are used:

Low Risk—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.

Moderate Risk —Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.

High Risk—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

5.10.6 Wildfire

Risk to Plumas County citizens and property from wildfire is of significant concern. With the exception of a few low lying meadow valleys such as the Sierra, American, and Indian Valleys, wildfire danger is a major threat across the mountainous and fuel rich areas of Plumas County. High fuel loads in the mountains, along with geographical and topographical features create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, lightning, low relative humidity, and significant winds can result in frequent and sometimes catastrophic fires. Any fire, once ignited, has the potential to quickly become large and out-of-control.

Table 5-23: Wildfire Vulnerability Analysis Summary

Wildfire Vulnerability Analysis		
Community Vulnerability Rating	**3.6**	**High Risk, Widespread potential impact.**

Exposure Type	Total Assets	Assets or Value at Risk	% of Total Asset	Assets in Very High Hazard Areas	Asset % in Very High Hazard Areas
Population	20,009	19,613	98%	11,473	57.3%
Critical Facilities	720	705	97%	502	69%
Parcels ≥ $10k	13,494	12,756	94%	7,584	56%
Miles of Roadway	5,091	5,019	99%	4,545	89%
Miles of Railroad	185	165	89%	140	76%
Miles of Linear Utilities	255	246	96%	200	81%

5.10.6.1 Population at Risk

Plumas County census block groups were used to estimate populations within the state produced Fire Hazard Severity Zones geospatial layer available from CAL FIRE. Wildfire risk is of greatest concern to populations residing in the moderate, high, and very high wildfire hazard severity zones. More than 5,204 residents live within areas considered very high hazard areas and more than 11,473 residents are shown to live within a high hazard severity area. Figure 5-71 shows U.S. census population who live within a very high, high or moderate hazard severity zone.[17]

[17] High and very high Fire Hazard Severity Zones as defined by the California Department of Forestry and Fire Protection (CAL FIRE).

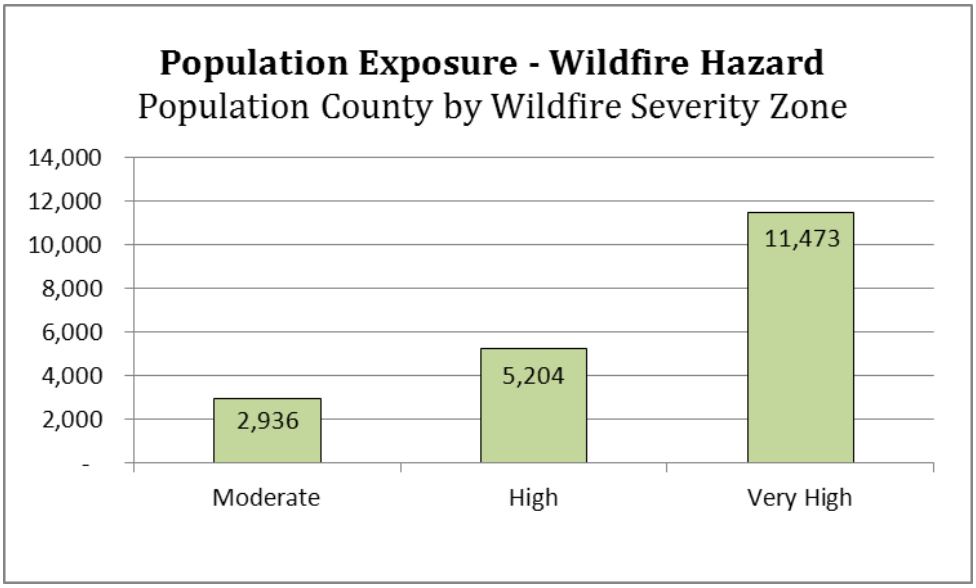


Figure 5-71: Population at risk from Wildfire Hazards

5.10.6.2 Improved Parcel at Risk

The County's parcel layer was used as the basis for the inventory of improved residential parcels. In some cases a parcel will be within multiple fire threat zones. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the fire threat layer to determine the risk for each parcel. The fire threat zone in which the centroid was located was assigned to the entire parcel, and only improved parcels were analyzed. Through this analysis, 12,756 parcels (or 88%) are exposed to wildfire threat. See Table 5-24 for more information on parcel values exposed to wildfire.

Table 5-24: Parcel Value Exposed to wildfire

	Parcel Count	% of County Total	Structure Value	Fixture Value	Sum of Total Value	% of County Value
Fire	**13,494**	**100.00%**	**$1,895,437,450**	**$59,362,242**	**$1,971,633,590**	**100.00%**
Very High	7,584	56.20%	$1,002,896,411	$1,504,866	$1,009,413,234	51.20%
High	4,423	32.78%	$731,161,784	$28,131,802	$767,108,007	38.91%
Moderate	1,329	9.85%	$146,059,022	$16,233,619	$165,473,540	8.39%
Urban Unzoned	116	0.86%	$9,139,396	$13,248,195	$22,468,105	1.14%
Non-Wildland / Non-Urban	42	0.31%	$6,180,837	$243,760	$7,170,704	0.36%

5.10.6.3 Critical Facilities at Risk

Critical facilities data were overlaid with fire hazard severity zone data to determine the type and number of facilities within each risk classification. Table 5-25 and Table 5-26 show the critical facilities in the high and very high wildfire hazard zones for unincorporated Plumas County.

Table 5-25: Critical Facility Exposure to Wildfire

Facility Type	Moderate	High	Very High	Total
COMMUNICATION	**32**	**99**	**382**	**513**
AM		1		1
ANTENNA STRUCTURE REGISTRATION	2	17	15	34
CELLULAR			6	6
FIXED MICROWAVE	11	18	142	171
FM		6	6	12
LAND MOBILE COMMERCIAL			7	7
LAND MOBILE PRIVATE	19	57	201	277
PAGING			3	3
TV NTSC			2	2
EMERGENCY RESPONSE	**6**	**13**	**29**	**48**
EOC			**1**	**1**
PLUMAS COUNTY OFFICE OF EMERGENCY SERVICES-EMERGENCY OPERATIONS CENTER			1	1
FIRE STATION	**6**	**9**	**21**	**36**
BECKWOURTH FPD, BECKWOURTH		1		1
BECKWOURTH FPD, GRIZZLY CREEK RD			1	1
BUCKS LAKE FPD, BUCKS LAKE			1	1
CHESTER FPD, CHESTER	1			1
CRESCENT MILLS FPD, CRESCENT MILLS			1	1
C-ROAD CSD, C-ROAD			1	1
EAST PLUMAS RURAL FPD, DELLEKER	1			1
EAST PLUMAS RURAL FPD, IRON HORSE			1	1
EAST PLUMAS RURAL FPD, LAKE DAVIS			1	1
GRAEAGLE FPD, GRAEAGLE		1		1
GRAEAGLE FPD, WHITEHAWK RANCH			1	1
GREENHORN CREEK FPD, GREENHORN RANCH			1	1
HAMILTON BRANCH FPD, HAMILTON BRANCH			1	1
INDIAN VALLEY FIRE, GREENVILLE			1	1
INDIAN VALLEY FIRE, TAYLORSVILLE			1	1
LA PORTE FPD, LA PORTE			1	1
LONG VALLEY CSD, CROMBERG			1	1
MEADOW VALLEY FPD, MEADOW VALLEY		1		1
PENINSULA FPD, PENINSULA		1		1
PLUMAS EUREKA FPD, PLUMAS EUREKA			1	1
PORTOLA FPD, PORTOLA	2			2
PRATTVILLE FIRE, PRATTVILLE			1	1
QUINCY FPD, AMERICAN VALLEY			1	1

Facility Type	Moderate	High	Very High	Total
QUINCY FPD, EAST QUINCY		1		1
QUINCY FPD, QUINCY		1		1
SIERRA VALLEY FPD, CHILCOOT	1			1
SIERRA VALLEY FPD, VINTON	1			1
USFS (PLUMAS NF) - BECKWOURTH RANGER DISTRICT, MOHAWK		1		1
USFS (PLUMAS NF) - BOULDER CREEK WORK CENTER, ANTELOPE LAKE			1	1
USFS (PLUMAS NF) - CHESTER, CHESTER			1	1
USFS (PLUMAS NF) - FRENCHMAN LAKE WORK CENTER, FRENCHMAN LAKE		1		1
USFS (PLUMAS NF) - GANSNER BAR, CARIBOU			1	1
USFS (PLUMAS NF) - GREENVILLE WORK CENTER, GREENVILLE			1	1
USFS (PLUMAS NF) - MT. HOUGH RANGER DISTRICT, QUINCY			1	1
WEST ALMANOR FPD, WEST ALMANOR		1		1
Law Enforcement			**3**	**3**
CALIFORNIA HIGHWAY PATROL - QUINCY AREA 165			1	1
NATIONAL PARK SERVICE - LASSEN NATIONAL FORREST - ALMANOR RANGER DISTRICT			1	1
PLUMAS COUNTY SHERIFFS DEPARTMENT			1	1
SHELTER		**4**	**4**	**8**
DISTRICT OFFICE ANNEX			1	1
GRAEAGLE COMMUNITY CHURCH		1		1
GREENVILLE SOUTHERN BAPTIST			1	1
GREENVILLE TOWN HALL			1	1
INDIAN VALLEY RESOURCE CENTER			1	1
PLUMAS-SIERRA COUNTY FAIR		1		1
PORTOLA MEMORIAL HALL		1		1
QUINCY MEMORIAL HALL		1		1
HEALTH CARE	**2**	**4**	**8**	**14**
CLINIC			**1**	**1**
GREENVILLE RANCHERIA TRIBAL HEALTH PROGRAM-GREENVILLE			1	1
HOME HEALTH AGENCY/HOSPICE		**1**		**1**
QUINCY HOME MEDICAL SERVICES - LAWRENCE - PARENT		1		1
HOSPITAL		**1**	**2**	**3**
EASTERN PLUMAS HOSPITAL - PORTOLA CAMPUS			1	1
PLUMAS DISTRICT HOSPITAL			1	1

Facility Type	Moderate	High	Very High	Total
SENECA HEALTHCARE DISTRICT HOSPITAL		1		1
NURSING HOME		**1**	**2**	**3**
COUNTRY VILLA QUINCY HEALTHCARE CENTER			1	1
HEAVENLY HOME		1		1
ASSISTED LIVING NURSING HOME			1	1
PHARMACY	**2**	**1**	**2**	**5**
KEHOE PHARMACY	1			1
LASSEN DRUG COMPANY	1			1
QUINCY DRUG STORE		1		1
RITE AID - 6093			1	1
VILLAGE DRUG COMPANY			1	1
PUBLIC HEALTH DEPARTMENT			**1**	**1**
PLUMAS COUNTY PUBLIC HEALTH AGENCY			1	1
COM /IND / HISTORIC	**3**	**14**	**27**	**44**
FINANCE	**2**	**3**	**5**	**10**
BANK OF AMERICA, NATIONAL ASSOCIATION, FEATHER RIVER BRANCH		1		1
BANK OF AMERICA, NATIONAL ASSOCIATION, QUINCY BRANCH		1		1
PLUMAS BANK			1	1
PLUMAS BANK, CHESTER BRANCH	1			1
PLUMAS BANK, GREENVILLE BRANCH			1	1
PLUMAS BANK, PLUMAS BANK			1	1
PLUMAS BANK, PORTOLA BRANCH		1		1
PLUMAS BANK, QUINCY ADMINISTRATIVE BRANCH			1	1
U.S. BANK NATIONAL ASSOCIATION, CHESTER BRANCH	1			1
U.S. BANK NATIONAL ASSOCIATION, QUINCY SAFEWAY BRANCH			1	1
HISTORIC PLACE		**2**	**14**	**16**
ABBEY BRIDGE GUARD STATION (HISTORICAL)			1	1
ALMANOR POST OFFICE (HISTORICAL)			1	1
ANTELOPE HOUSE (HISTORICAL)			1	1
CAMP ROGERS POST OFFICE (HISTORICAL)			1	1
CHESTER POST OFFICE (HISTORICAL)		1		1
FANT GATHERING CORRAL (HISTORICAL)			1	1
FLEMINGS SHEEP CAMP (HISTORICAL)			1	1
JACKSON CREEK UNITED STATES FOREST SERVICE CABIN (HISTORICAL)			1	1
LIGHTS CREEK GUARD STATION (HISTORICAL)			1	1

Facility Type	Moderate	High	Very High	Total
OTIS RANCH (HISTORICAL)			1	1
RHINEHART CABIN (HISTORICAL)			1	1
RUFFA RANCH (HISTORICAL)			1	1
SPRING GARDEN RANCH (HISTORICAL)			1	1
SULPHUR SPRING HOUSE (HISTORICAL)		1		1
THREEMILE GUARD STATION (HISTORICAL)			1	1
WALKER MINE COMPRESSOR (HISTORICAL)			1	1
PESTICIDE PRODUCER			**1**	**1**
PLUMAS-SIERRA COUNTIES DEPT. OF AGRICULTURE			1	1
PROPANE STATION	**1**	**5**	**3**	**9**
1633- PORTOLA - SUBURBAN		1		1
AMERIGAS		1		1
BI-STATE PROPANE			1	1
BI-STATE PROPANE - HERITAGE PROPANE		1		1
COAST GAS QUINCY STORE NUMBER 2675 - TITAN PROPANE - TITAN PROPANE			1	1
LAKE ALMANOR PROPANE STORE NUMBER 2481 - TITAN PROPANE - TITAN PROPANE	1			1
HIGH SIERRA PROPANE		1		1
COAST GAS - FERRELL PROPANE			1	1
SUBURBAN PROPANE		1		1
TIMBER PRODUCTS		**3**		**3**
COLLINS PINE CO		2		2
SIERRA PACIFIC INDUSTRIES QUINCY DIV.		1		1
SCHOOL	**6**	**10**	**13**	**29**
COLLEGE			**1**	**1**
FEATHER RIVER COMMUNITY COLLEGE DISTRICT			1	1
DAY CARE CENTER	**3**	**3**	**3**	**9**
CHESTER STATE PRESCHOOL	1			1
GRAEAGLE PRESCHOOL			1	1
INDIAN VALLEY STATE PRESCHOOL			1	1
MOUNTAIN METHODIST CHILDREN'S CENTER		1		1
MOUNTAIN MONTESSORI PRESCHOOL		1		1
PORTOLA HEAD START		1		1
PORTOLA KIDS, INC. PRESCHOOL	1			1
PORTOLA PRESCHOOL COOPERATIVE	1			1
QUINCY HEAD START			1	1
K-12	**3**	**7**	**9**	**19**
BECKWOURTH (JIM) HIGH (CONTINUATION)			1	1

Facility Type	Moderate	High	Very High	Total
C. ROY CARMICHAEL ELEMENTARY		1		1
CHESTER ELEMENTARY	1			1
CHESTER JUNIOR/SENIOR HIGH	1			1
GREENVILLE ELEMENTARY		1		1
GREENVILLE JUNIOR/SENIOR HIGH			1	1
HORIZON HIGH (CONTINUATION)		1		1
LAKE ALMANOR CHRISTIAN SCHOOL			1	1
PIONEER/QUINCY ELEMENTARY			1	1
PLUMAS CHARTER 146		1		1
PLUMAS COUNTY COMMUNITY	1			1
PLUMAS COUNTY OPPORTUNITY		1		1
PLUMAS COUNTY ROP		1		1
PORTOLA JUNIOR/SENIOR HIGH			1	1
PORTOLA OPPORTUNITY			1	1
QUINCY JUNIOR/SENIOR HIGH			1	1
SIERRA VALLEY CHRISTIAN SCHOOL		1		1
ST ANDREW'S ACADEMY			1	1
PLUMAS CHRISTIAN SCHOOL			1	1
TRANSPORTATION		**1**	**8**	**9**
AIRPORT		**1**	**3**	**4**
GANSNER FIELD (QUINCY)			1	1
NERVINO (BECKWOURTH)		1		1
ROGERS FIELD AIRPORT (CHESTER)			1	1
US FOREST SERVICE CHESTER AIR TANKER BASE			1	1
HELIPORT			**5**	**5**
INDIAN VALLEY HOSPITAL HELIPORT (GREENVILLE)			1	1
PLUMAS DISTRICT HOSPITAL HELIPORT (QUINCY)			1	1
RODGERS FLAT HELIPORT (BELDEN)			1	1
USFS CHESTER HELIPORT			1	1
USFS QUINCY HELITACK BASE			1	1
UTILITY	**3**	**9**	**30**	**42**
WASTEWATER TREATMENT PLANT		**1**	**4**	**5**
CHESTER WWTP			1	1
ES DISTRICT WWTP			1	1
PORTOLA WWTP		1		1
QUINCY WWTP			1	1
GRIZZLY LAKE CSD			1	1
WATER TREATMENT PLANT			**2**	**2**
JOHNSVILLE WTP			1	1

Facility Type	Moderate	High	Very High	Total
LAKE DAVIS WTP			1	1
SUBSTATION	**2**	**6**	**14**	**22**
MARBLE		1		1
GRAEAGLE			1	1
MOHAWK			1	1
CHILCOOT	1			1
PORTOLA		1		1
BECKWORTH		1		1
GRIZZLY			1	1
QUINCY			1	1
PLUMAS			1	1
EAST QUINCY	1			1
GANSNER		1		1
N.N.			1	1
BELDEN			1	1
GRAYS FLAT			1	1
SPANISH CREEK			1	1
CARIBOU 2			1	1
GREENVILLE			1	1
BIG MEADOWS			1	1
BUTT VALLEY			1	1
HAMILTON BRANCH			1	1
COLLINS PINE CO.		1		1
CHESTER		1		1
POWER PLANT	**1**	**2**	**10**	**13**
GRAEAGLE			1	1
PORTOLA		1		1
ROCK CREEK			1	1
GRIZZLY			1	1
BUCKS CREEK			1	1
BELDEN			1	1
FIVE BEARS			1	1
OAK FLAT			1	1
CARIBOU 1			1	1
CARIBOU 2			1	1
BUTT VALLEY			1	1
HAMILTON BRANCH	1			1
COLLINS PINE CO.		1		1
COUNTY FACILITY		**1**	**5**	**6**

Facility Type	Moderate	High	Very High	Total
PUBLIC WORKS YARD		**1**	**5**	**6**
LA PORTE PUBLIC WORKS YARD			1	1
GRAEAGLE PUBLIC WORKS YARD			1	1
BECKWOURTH PUBLIC WORKS YARD		1		1
QUINCY PUBLIC WORKS YARD			1	1
GREENVILLE PUBLIC WORKS YARD			1	1
CHESTER PUBLIC WORKS YARD			1	1
Total	**52**	**151**	**502**	**705**

Table 5-26: Linear Utilities and Transportation Routes with Wildfire Risk

Linear Utilities	Sum of Miles for Each Hazard Level			
Critical Facility Type	**Moderate**	**High**	**Very High**	**Grand Total**
TRANSMISSION LINE	**18**	**28**	**199**	**246**
NVENERGY_60KV	0	2	0	2
PG&E_115KV	2	0	28	31
PG&E_230KV	0	0	43	43
PG&E_34.5KV	0	1	0	1
PG&E_60KV	2	5	80	87
PLSR_60KV	14	20	48	82
TRANSPORTATION	**106**	**393**	**4,685**	**5,184**
RAILROAD	12	14	140	165
ROAD	94	380	4,545	5,019
GRAND TOTAL	**124**	**421**	**4,884**	**5,430**

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5.10.7 Flooding

Flooding is a significant problem in Plumas County as described in the flood hazard profile. Historically, Plumas County has been at risk to flooding primarily during the winter months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage or when there is a lack of flood control structures in place. Flooding has occurred on a continual basis throughout the County both within the 100-year floodplain and in other localized areas. GIS was used to determine the possible impacts of flooding within the County, and where the flood risk varies across the planning area. FEMA regulatory Digital Flood Insurance Rate Map (DIFRM) data were utilized to analyze the flood risk, and vulnerabilities were quantified using GIS analyses. The information in this section describes flood vulnerability methodologies for determining people and assets at risk to the 100- and 500-year flood events.

Table 5-27: Slope Failure Vulnerability Analysis Summary

Flood Vulnerability Analysis		
Community Risk Factor Rating	**2.7**	**Moderate Risk, Moderate potential impact.**

Exposure Type	Total Assets	Assets at Risk	% of Total Asset	Assets in 100-YR Flood Zone	% of Assets in 100-YR Flood Zone
Population	20,009	2,902	14.5%	1,286	6.4%
Critical Facilities	720	69	9.5%	43	6%
Parcels ≥ $10k	13,494	1,202	8.9%	543	4%
Miles of Roadway	5,091	83	1.6%	83	1.6%
Miles of Railroad	185	12	6.4%	12	5.9%
Miles of Linear Utilities	255	22	8.6%	22	8.6%

5.10.7.1 Population at Risk

Of greatest concern in the event of a flood is the potential for loss of life. Using 2012 population data aggregated by census blocks, an estimate was made of the population within the 100- and 500-year floodplain. To account for census blocks that were partially within the floodplain, a weighted average was employed to calculate the proportion of the population within the floodplain. The results of the population overlay are shown in Figure 5-72. Approximately 1,286 people live within the 100-year floodplain and 1,616 people live within the 500-year floodplain.

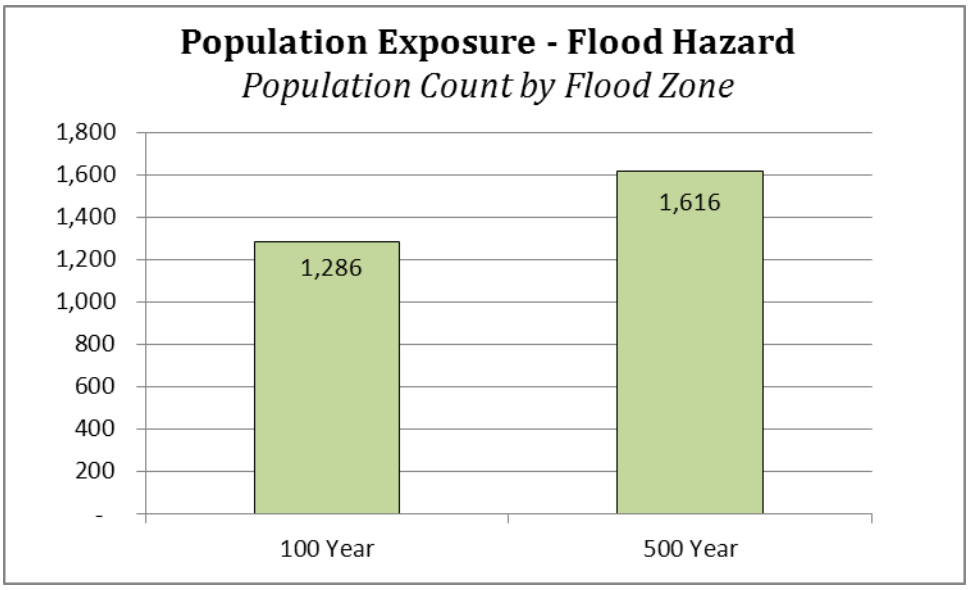

Figure 5-72: Population Exposed to Potential Flood Risk

5.10.7.2 Improved Parcel Value at Risk

The County's parcel layer was used as the basis for the inventory of improved residential parcels. In some cases a parcel will be within in multiple flood zones. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The parcel centroids were overlaid with the floodplain layer to determine the flood risk for each structure and assigned values base upon flood zone classification. Only improved parcels ≥ to $10,000 were analyzed. Through this analysis, 542 parcels were found to be within a 100 year flood zone, and 659 parcels were within a 500 year flood zone. Therefore, the total parcel exposure equals 1,202 parcels. See Table 5-28 for more information on parcel values exposed to flooding.

Table 5-28: Parcel Value Exposed to Flooding

	Parcel Count	% of County Total	Structure Value	Fixture Value	Sum of Total Value	% of County Value
Flood Hazard	**1,202**	**8.91%**	**$155,857,953**	**$29,325,229**	**$187,762,541**	**9.52%**
100-YR (Zone A)	442	3.28%	$69,014,269	$36,209	$69,420,579	3.52%
100-YR (Zone AE)	96	0.71%	$10,533,128	$80,930	$10,904,998	0.55%
100-YR (Zone AH)	5	0.04%	$569,425	$-	$569,425.00	0.03%
500-YR (0.2 PCT ANNUAL CHANCE FLOOD HAZARD)	659	4.88%	$75,741,131	$29,208,090	$106,867,539	5.42%

5.10.7.3 Critical Facilities at Risk

Critical facilities data were overlaid with flood hazard data to determine the type and number of facilities within the 100- and 500-year floodplain. Flooding poses numerous risks to critical facilities and infrastructure:

- Roads or railroads that are blocked or damaged can prevent access throughout the area and can isolate residents and emergency service providers needing to reach vulnerable populations or to make repairs.
- Bridges washed out or blocked by floods or debris from floods also can cause isolation.
- Creek or river floodwaters can back up drainage systems causing localized flooding.
- Floodwaters can get into drinking water supplies causing contamination.
- Sewer systems can be backed up causing waste to spill into homes, neighborhoods, rivers, and streams.
- Underground utilities can also be damaged.

Table 5-29 and Table 5-30 provide an inventory of these critical facilities in the floodplain for unincorporated Plumas County provides the locations of linear utilities relative to the floodplain in the unincorporated areas of the County. The impact to the community could be great if these critical facilities were damaged or destroyed during a flood event.

Table 5-29: Critical Facilities Exposed to Potential Flood Risk

Facility Type	100-YR A Zone	100-YR AE Zone	100-YR Zone-AH	500-YR (2% ANNUAL CHANCE FLOOD HAZARD)	Total
COMMUNICATION	**22**	**5**	**1**	**16**	**44**
ANTENNA STRUCTURE REGISTRATION				**3**	**3**
FIXED MICROWAVE	**6**	**2**		**2**	**10**
LAND MOBILE COMMERCIAL	**1**				**1**
LAND MOBILE PRIVATE	**15**	**3**	**1**	**11**	**30**
EMERGENCY RESPONSE	**3**	**1**		**1**	**5**
FIRE STATION	**3**			**1**	**4**
PLUMAS EUREKA FPD, PLUMAS EUREKA	1				1
QUINCY FPD, EAST QUINCY				1	1
SIERRA VALLEY FPD, CHILCOOT	1				1
USFS (PLUMAS NF) - BECKWOURTH RANGER DISTRICT, MOHAWK	1				1

Facility Type	100-YR A Zone	100-YR AE Zone	100-YR Zone-AH	500-YR (2% ANNUAL CHANCE FLOOD HAZARD)	Total
SHELTER		**1**			**1**
PORTOLA MEMORIAL HALL		1			1
COM /IND / HISTORIC	**2**	**1**		**3**	**6**
FINANCE				**2**	**2**
PLUMAS BANK				1	1
PLUMAS BANK, QUINCY ADMINISTRATIVE BRANCH				1	1
HISTORIC PLACE	**2**				**2**
ISLAND SCHOOL (HISTORICAL)	1				1
SPRING GARDEN RANCH (HISTORICAL)	1				1
PROPANE STATION		**1**			**1**
AMERIGAS		1			1
TIMBER PRODUCTS				**1**	**1**
SIERRA PACIFIC INDUSTRIES QUINCY DIV.				1	1
SCHOOL	**1**			**1**	**2**
K-12	**1**			**1**	**2**
PLUMAS COUNTY OPPORTUNITY				1	1
SIERRA VALLEY CHRISTIAN SCHOOL	1				1
TRANSPORTATION	**1**			**1**	**2**
AIRPORT	**1**			**1**	**2**
GANSNER FIELD (QUINCY)				1	1
NERVINO (BECKWOURTH)	1				1
UTILITY	**5**	**1**		**4**	**10**
WASTEWATER TREATMENT PLANT	**1**			**1**	**2**
PORTOLA WWTP	1				1
QUINCY WWTP				1	1
SUBSTATION	**2**	**1**		**2**	**5**
EAST QUINCY				1	1
GANSNER		1			1
SIERRA PACIFIC				1	1
GRAYS FLAT	1				1
BUTT VALLEY	1				1
POWER PLANT	**2**			**1**	**3**

Facility Type	100-YR A Zone	100-YR AE Zone	100-YR Zone-AH	500-YR (2% ANNUAL CHANCE FLOOD HAZARD)	Total
SPI- QUINCY				1	1
BUTT VALLEY	1				1
HAMILTON BRANCH	1				1
Total	**34**	**8**	**1**	**26**	**69**

Table 5-30: Miles of Linear Utilities Exposed to Potential Flood Risk

Linear Utilities	100-YR Zone AE	100-YR Zone A	500-YR (2% ANNUAL CHANCE FLOOD HAZARD)	Total
TRANSMISSION LINE	**3**	**17**	**2**	**22**
NVENERGY_60KV	0	5	0	5
PG&E_115KV	0	1	0	1
PG&E_60KV	2	3	2	7
PLSR_60KV	1	9	0	10
TRANSPORTATION	**8**	**73**	**15**	**96**
ROAD	7	63	14	83
RAILROAD	1	10	1	12
Grand Total	**10**	**90**	**17**	**118**

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5.10.8 Slope Failure (Geologic Hazard)

Plumas County has experienced a few isolated incidences of landslides and slope failure. These incidences include one avalanche, three rock falls, three rock slides, one landslide, and one instances of slope erosion. None of these incidences were declared a disaster; however all of them resulted in damage to infrastructure, and the environment. Most landslide hazards occur in areas of steeper slopes, however landslides can also occur in areas of low relief especially when the area has been recently subject to wildfire or is prone to earthquakes.

The steepest slopes are found in the western portion of the county, which lies in the Sierra Nevada Range, suggesting a greater susceptibility to landslides at these locations. Human activities also contribute to landslide events such as altering the natural slope gradient, increasing soil water content, and removing vegetation cover. The best available predictor of where landsides may occur is the location of previous occurrences. In addition, landslides are most likely to occur during severe weather events. The ground must be saturated prior to the onset of a severe weather event for a significant landslide to occur. Transportation routes throughout Plumas County at the base or crest of cliffs should be considered vulnerable to landslide hazard.

Table 5-31: Slope Failure Vulnerability Analysis Summary

Slope Failure Vulnerability Analysis		
Community Risk Factor Rating	**2.6**	**Moderate Risk, Moderate potential impact.**

Exposure Type	Total Assets	Assets or Value at Risk	% of Total Asset	Assets in High Hazard Areas	% Very High Hazard Areas
Population	20,009	8,534	42.7%	1,894	8.5%
Critical Facilities	720	371	51%	158	21.9%
Parcels ≥ $10k	13,494	6,368	47.1%	1,154	8.5%
Miles of Roadway	5,091	3,618	72.0%	965	19.2%
Miles of Railroad	185	114	61.6%	45	24.3%
Miles of Linear Utilities	255	169	66.3%	76	29.8%

5.10.8.1 Population at Risk

Of greatest concern in the event of a landslide is the potential for loss of life. Using 2012 population data aggregated by census blocks, an estimate was made of the population within the low, moderate and high landslide susceptibility areas. The results of the population overlay are shown Figure 5-73.

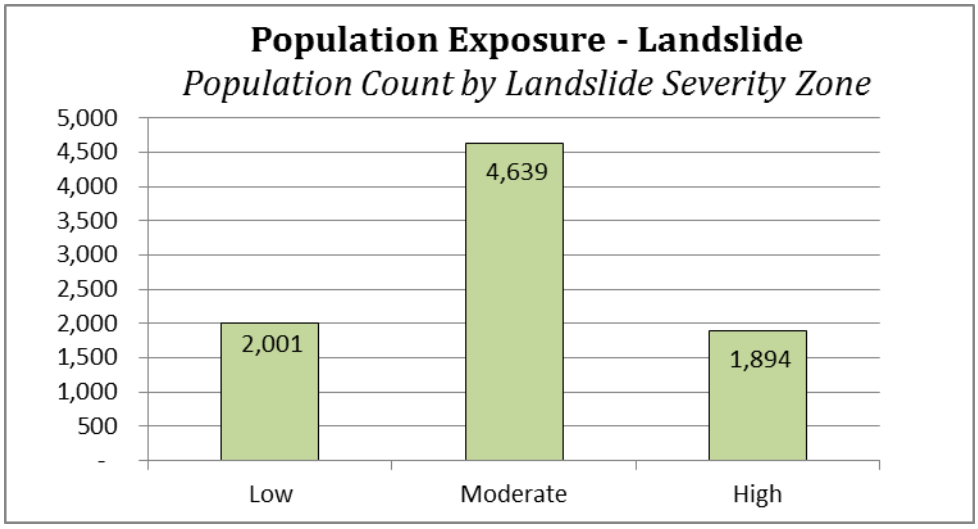

Figure 5-73: Population Exposure to Landslides Hazard

5.10.8.2 Improved Parcel Value at Risk

The County's parcel layer was used as the basis for the inventory of improved residential parcels. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The parcel centroids are overlaid with landslide susceptibility classes to determine at-risk parcels. Only improved parcels ≥ to $10,000 were analyzed. The results of the analysis show that ten percent of the county improved parcels (1,154 or 10.59%) to be located in a "high" landslide susceptibility areas. The remaining 5,214 parcels with land slide hazards are located in a low to moderate landslide susceptibility area. See Table 5-32 for more information on parcel values exposed to landslide risks.

Table 5-32: Parcel Value Exposed to Landslide Hazard

	Parcel Count	% of County Total	Structure Value	Fixture Value	Sum of Total Value	% of County Value
Landslide	**6,368**	**47.19%**	**$978,613,188**	**$1,449,107**	**$983,568,566**	**49.89%**
Low	2,519	18.67%	$413,830,294	$405,809	$415,219,742.00	21.06%
Moderate	2,695	19.97%	$356,969,168	$738,468	$359,486,558.00	18.23%
High	1,154	8.55%	$207,813,726	$304,830	$208,862,266.00	10.59%

5.10.8.3 Critical Facilities at Risk

Critical facilities data was spatially overlaid with landslide hazard data to determine the type and number of facilities within the low, moderate, and high landslide susceptibility areas. Landslide poses a small risk to critical facilities and infrastructure as compared to other hazards in Plumas County. However, if a landslide were to occur the potential damage could be severe. Some of the potential outcomes of a landslide include:

- Roads or railroads that are blocked or damaged can prevent access throughout the area and can isolate residents and emergency service providers needing to reach vulnerable populations or to make repairs.
- Rock falls could potentially crush buildings, vehicles and infrastructure, and present danger to people nearby
- Severe damage and sometimes destruction to homes and buildings.
- Disrupts water mains, sewers, power lines, and other utility lines.
- Potential loss of life from the collapse of buildings and roads.

Table 5-33 provides an inventory of these critical facilities in the moderate landslide hazard area. In total, 148 known facilities may be in an area of high landslide susceptibility. Table 5-34 provides the linear utilities and transportation routes that are within high landslide susceptibility areas in the County. Roadways and Rail lines are very susceptible to landslides due to the location and abundance of roadways in extremely sloped areas. There are over 900 miles of roadway and 45 miles of rail lines in high landslide susceptibility areas.

Table 5-33: Critical Facilities with Landslide Risk

Count of Facilities by Threat Classification				
Facility Priorities	**Low**	**Moderate**	**High**	**Total**
COMMUNICATION	**85**	**89**	**148**	**322**
AM			**1**	**1**
ANTENNA STRUCTURE REGISTRATION	**6**	**4**	**2**	**12**
CELLULAR	**2**		**3**	**5**
FIXED MICROWAVE	**31**	**29**	**66**	**126**
FM	**1**	**5**	**1**	**7**
LAND MOBILE COMMERCIAL	**1**	**1**	**3**	**5**
LAND MOBILE PRIVATE	**44**	**48**	**71**	**163**
PAGING			**1**	**1**
TV NTSC		**2**		**2**
EMERGENCY RESPONSE	**3**	**5**	**1**	**9**
EOC		**1**		**1**
PLUMAS COUNTY OFFICE OF EMERGENCY SERVICES-EMERGENCY OPERATIONS CENTER		1		1
FIRE STATION	**3**	**4**	**1**	**8**
C-ROAD CSD, C-ROAD		1		1
GRAEAGLE FPD, WHITEHAWK RANCH		1		1
GREENHORN CREEK FPD, GREENHORN RANCH			1	1
PLUMAS EUREKA FPD, PLUMAS EUREKA		1		1
PRATTVILLE FIRE, PRATTVILLE	1			1
USFS (PLUMAS NF) - BOULDER CREEK WORK CENTER, ANTELOPE LAKE		1		1

USFS (PLUMAS NF) - FRENCHMAN LAKE WORK CENTER, FRENCHMAN LAKE	1			1
WEST ALMANOR FPD, WEST ALMANOR	1			1
HEALTH CARE		2		2
HOSPITAL		**1**		**1**
EASTERN PLUMAS HOSPITAL - PORTOLA CAMPUS		1		1
PUBLIC HEALTH DEPARTMENT		**1**		**1**
PLUMAS COUNTY PUBLIC HEALTH AGENCY		1		1
COM / IND / HISTORICAL	**4**	**7**	**4**	**15**
FINANCE		**2**		**2**
PLUMAS BANK		1		1
PLUMAS BANK, GREENVILLE BRANCH		1		1
GOLD MINING	**1**			**1**
UNKNOWN	1			1
PROPANE STATION		**1**		**1**
AMERIGAS		1		1
REFUSE FACILITY	**1**			**1**
GOPHER HILL LAND LEACHATE DISP	1			1
(blank)		**1**		**1**
LAKE DAVIS PIKE ERADICATION PROJECT, PORTOLA		1		1
HISTORICAL PLACE	**2**	**3**	**4**	**9**
CAMP ROGERS POST OFFICE (HISTORICAL)		1		1
FLEMINGS SHEEP CAMP (HISTORICAL)	1			1
JACKSON CREEK UNITED STATES FOREST SERVICE CABIN (HISTORICAL)			1	1
RUFFA RANCH (HISTORICAL)		1		1
SPRING GARDEN RANCH (HISTORICAL)	1			1
SULPHUR SPRING HOUSE (HISTORICAL)		1		1
THREEMILE GUARD STATION (HISTORICAL)			1	1
WALKER MINE COMPRESSOR (HISTORICAL)			1	1
SCHOOL	**2**	**6**	**1**	**9**
COLLEGE		**1**		**1**
FEATHER RIVER COMMUNITY COLLEGE DISTRICT		1		1
DAY CARE CENTER	**1**	**2**		**3**
PORTOLA HEAD START	1			1
PORTOLA KIDS, INC. PRESCHOOL		1		1
PORTOLA PRESCHOOL COOPERATIVE		1		1
K-12	**1**	**3**	**1**	**5**
BECKWOURTH (JIM) HIGH (CONTINUATION)		1		1
HORIZON HIGH (CONTINUATION)			1	1
LAKE ALMANOR CHRISTIAN SCHOOL	1			1

PIONEER/QUINCY ELEMENTARY		1		1
PORTOLA OPPORTUNITY		1		1
UTILITY	**3**	**6**	**4**	**13**
WATER TREATMENT PLANT			**1**	**1**
JOHNSVILLE WTP			1	1
SUBSTATION	**2**	**2**	**1**	**5**
MOHAWK		1		1
GRIZZLY	1			1
BELDEN		1		1
SPANISH CREEK	1			1
BUTT VALLEY			1	1
POWER PLANT	**1**	**4**	**2**	**7**
ROCK CREEK		1		1
GRIZZLY		1		1
BUCKS CREEK		1		1
BELDEN		1		1
CARIBOU 1	1			1
BUTT VALLEY			1	1
HAMILTON BRANCH			1	1
COUNTY FACILITY		**1**		**1**
PUBLIC WORKS YARD		**1**		**1**
GREENVILLE PUBLIC WORKS YARD		1		1
Grand Total	**97**	**116**	**158**	**371**

Table 5-34: Miles of Linear Utilities and Transportation Routes at Risk to Landslide

Linear Utilities	Low	Moderate	High	Total (Miles)
TRANSMISSION LINE	**30**	**62**	**76**	**169**
NVENERGY_60KV	3	8	17	27
PG&E_115KV	1	13	26	40
PG&E_60KV	13	26	19	59
PLSR_60KV	13	14	15	42
TRANSPORTATION	**1,435**	**1,287**	**1,009**	**3,732**
ROAD	1,415	1,239	965	3,618
RAILROAD	21	48	45	114

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5.10.9 Earthquake (Geologic Hazard)

Major Impacts from earthquakes are primarily the probable number of casualties and damage to infrastructure occurring from ground movement along a particular fault (USGS 2009). The degree of infrastructure damage depends on the magnitude, focal depth, distance from fault, duration of shaking, type of surface deposits, presence of high groundwater, topography, and the design, type, and quality of infrastructure construction.

While Plumas County is not located within an Alquist-Priolo Earthquake Fault Zone, several potentially active faults pass through the County, including the Almanor Fault, Butt Creek Fault Zone, and the Mohawk Valley Fault. Additionally, the Honey Lake and Fort Sage Faults are two active faults located east of the County. While these faults are within and near the County and could result in several seismic-related effects (i.e., groundshaking, etc.) to County residents and property, seismic hazard mapping indicates that the County has low seismic hazard potential. To analyze the risk to Plumas County, potential damage zones were created by combining USGS shake maps[18]. Results were used to develop exposure results for population, critical facilities, and single family residential parcel values.

Table 5-35: Earthquake Vulnerability Analysis Summary

Earthquake Vulnerability Analysis		
Community Risk Factor Rating	**2.6**	**Moderate Risk, Moderate potential impact.**

Exposure Type	Total Assets	Assets or Value with Hazard Values	% of Total Asset	Assets in Heavy Damage Areas	% Very High Hazard Areas
Population	20,009	20,009	100%	N/A	0%
Critical Facilities	720	720	100%	5	.69%
Parcels ≥ $10k	13,494	13,494	100%	24	.17%
Miles of Roadway	5,091	5,019	100%	104	2.0%
Miles of Railroad	185	185	100%	0	0%
Miles of Linear Utilities	255	255	100%	0	0%

[18] Two USGS shake maps were used to develop the potential damage spatial layers. Peak Ground Velocity (PGV) for an earthquake having a 2% probability of occurring in 50 years with an Ls30 value of 360 m/s. Raster generated from points using IDW interpolation with a maximum input point of 4 and a maximum search radius of 15,000. Cell size is 2000' (much smaller than point spacing). Peak Spectral Acceleration (PSA) at 0.2 seconds for an earthquake having a 2% probability of occurring in 50 years with an Ls30 value of 360 m/s. Raster generated from points using IDW interpolation with a maximum input point of 4 and a maximum search radius of 15,000. Cell size is 2000' (much smaller than point spacing). Perceived Shaking and Potential Damage values are calculated from PGV based on documentation and table provided by California Integrated Seismic Network (CISN).

5.10.9.1.1 Population at Risk

According to the 2010 U.S. Census, Plumas County's total population is 20,007 residents. The County is one of California's most rural counties with 7.8 people per square mile without dense urban cores and large building masses vulnerable to earthquake hazards. Though rural residential construction is not particularly vulnerable to earthquakes, an earthquake could directly or indirectly expose the entire population of Plumas County to ground shaking. Depending on the time of day and year (the population differs significantly from summer to winter) and exact location of the modeled epicenter, an earthquake could be experienced differently. Figure 5-74 exhibits the population exposure totals in each modeled earthquake severity zone. Population location is based upon information taken during the 2010 U.S. Census.

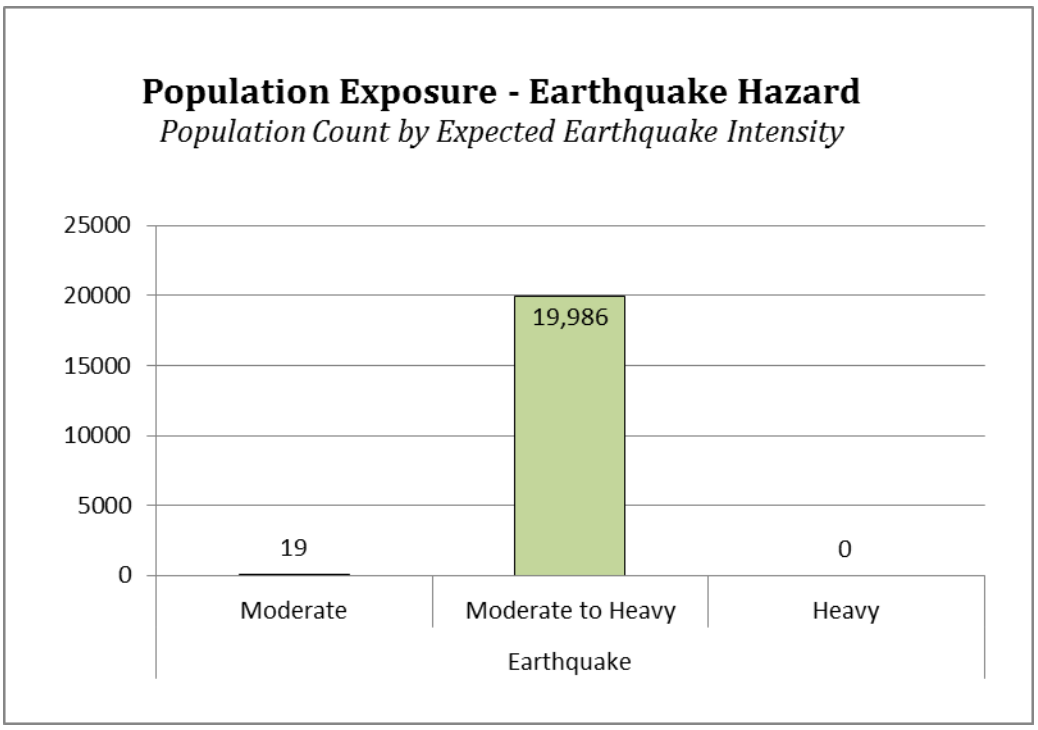

Figure 5-74: Population Exposure to Earthquake Hazard

5.10.9.1.2 Improved Parcel Value at Risk

The County's parcel layer was used as the basis for the inventory of improved residential parcels. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the shake severity zones to determine the at-risk structures. This methodology assumed that every parcel with a square footage value greater than zero was developed in some way. Only improved parcels were analyzed. See Table 5-28Table 5-36 for more information on parcel values exposed to earthquake hazards.

Table 5-36: Parcel Value Exposed to Earthquake Damage Potential

	Parcel Count	% of County Total	Structure Value	Fixture Value	Sum of Total Value	% of County Value
Earthquake Damage Potential	**13,494**	**100.00%**	**$1,895,437,450**	**$59,362,242**	**$1,971,633,590**	**100.00%**
Heavy	24	0.18%	$1,548,344	$ -	$1,548,344	0.08%
Moderate to Heavy	13,451	99.68%	$1,892,863,877	$59,355,360	$1,969,045,560	99.87%
Moderate	19	0.14%	$1,025,229	$6,882	$1,039,686	0.05%

5.10.9.1.3 Critical Facilities at Risk

Critical facilities data was spatially overlaid with earthquake hazard data to determine the type and number of facilities vulnerable to earthquake hazard classifications. Earthquakes pose numerous risks to critical facilities and infrastructure since the footprint of the earthquake hazard covers the entire county. However, most of the County's critical facilities have been built since the California Unified Building Code (UBC) was amended to include provisions for seismic safety. Seismic risks, or the harm or losses that likely to result from exposure to seismic hazards include:

- Casualties (fatalities and injuries).
- Economic losses for repair and replacement of critical facilities, roads, buildings, etc.
- Indirect economic losses such as income lost during downtime resulting from damage to private property or public infrastructure.
- Utility outages.
- Roads or railroads that are blocked or damaged can prevent access throughout the area and can isolate residents and emergency service providers needing to reach vulnerable populations or to make repairs.

Table 5-37 provides an inventory of critical facilities in each earthquake hazard category for Plumas County. The impact to the community could be great if these critical facilities were damaged or destroyed during a large earthquake event.

Table 5-37: Critical Facilities with Earthquake Damage Potential

Facility Type	Moderate	Moderate to Heavy	Heavy	Total
COMMUNICATION	**25**	**494**	**5**	**524**
AM		**1**		**1**
ANTENNA STRUCTURE REGISTRATION		**34**		**34**
CELLULAR		**6**		**6**
FIXED MICROWAVE	**12**	**158**	**4**	**174**
FM		**12**		**12**

Facility Type	Moderate	Moderate to Heavy	Heavy	Total
LAND MOBILE COMMERCIAL		**7**		**7**
LAND MOBILE PRIVATE	**13**	**271**	**1**	**285**
PAGING		**3**		**3**
TV NTSC		**2**		**2**
EMERGENCY RESPONSE		**49**		**49**
EOC		**1**		**1**
PLUMAS COUNTY OFFICE OF EMERGENCY SERVICES-EOC		1		1
FIRE STATION		**36**		**36**
BECKWOURTH FPD, BECKWOURTH		1		1
BECKWOURTH FPD, GRIZZLY CREEK RD		1		1
BUCKS LAKE FPD, BUCKS LAKE		1		1
CHESTER FPD, CHESTER		1		1
CRESCENT MILLS FPD, CRESCENT MILLS		1		1
C-ROAD CSD, C-ROAD		1		1
EAST PLUMAS RURAL FPD, DELLEKER		1		1
EAST PLUMAS RURAL FPD, IRON HORSE		1		1
EAST PLUMAS RURAL FPD, LAKE DAVIS		1		1
GRAEAGLE FPD, GRAEAGLE		1		1
GRAEAGLE FPD, WHITEHAWK RANCH		1		1
GREENHORN CREEK FPD, GREENHORN RANCH		1		1
HAMILTON BRANCH FPD, HAMILTON BRANCH		1		1
INDIAN VALLEY FIRE, GREENVILLE		1		1
INDIAN VALLEY FIRE, TAYLORSVILLE		1		1
LA PORTE FPD, LA PORTE		1		1
LONG VALLEY CSD, CROMBERG		1		1
MEADOW VALLEY FPD, MEADOW VALLEY		1		1
PENINSULA FPD, PENINSULA		1		1
PLUMAS EUREKA FPD, PLUMAS EUREKA		1		1
PORTOLA FPD, PORTOLA		2		2
PRATTVILLE FIRE, PRATTVILLE		1		1
QUINCY FPD, AMERICAN VALLEY		1		1
QUINCY FPD, EAST QUINCY		1		1
QUINCY FPD, QUINCY		1		1
SIERRA VALLEY FPD, CHILCOOT		1		1
SIERRA VALLEY FPD, VINTON		1		1
USFS (PLUMAS NF) - BECKWOURTH RANGER DISTRICT, MOHAWK		1		1

Facility Type	Moderate	Moderate to Heavy	Heavy	Total
USFS (PLUMAS NF) - BOULDER CREEK WORK CENTER, ANTELOPE LAKE		1		1
USFS (PLUMAS NF) - CHESTER, CHESTER		1		1
USFS (PLUMAS NF) - FRENCHMAN LAKE WORK CENTER, FRENCHMAN LAKE		1		1
USFS (PLUMAS NF) - GANSNER BAR, CARIBOU		1		1
USFS (PLUMAS NF) - GREENVILLE WORK CENTER, GREENVILLE		1		1
USFS (PLUMAS NF) - MT. HOUGH RANGER DISTRICT, QUINCY		1		1
WEST ALMANOR FPD, WEST ALMANOR		1		1
POLICE STATION		**3**		**3**
CALIFORNIA HIGHWAY PATROL - QUINCY AREA 165		1		1
NATIONAL PARK SERVICE - LASSEN NATIONAL FORREST - ALMANOR RANGER DISTRICT		1		1
PLUMAS COUNTY SHERIFFS DEPARTMENT		1		1
SHELTER		**9**		**9**
CHESTER MEMORIAL HALL		1		1
DISTRICT OFFICE ANNEX		1		1
GRAEAGLE COMMUNITY CHURCH		1		1
GREENVILLE SOUTHERN BAPTIST		1		1
GREENVILLE TOWN HALL		1		1
INDIAN VALLEY RESOURCE CENTER		1		1
PLUMAS-SIERRA COUNTY FAIR		1		1
PORTOLA MEMORIAL HALL		1		1
QUINCY MEMORIAL HALL		1		1
HEALTH CARE		**14**		**14**
CLINIC		**1**		**1**
GREENVILLE RANCHERIA TRIBAL HEALTH PROGRAM-GREENVILLE		1		1
HOME HEALTH AGENCY/HOSPICE		**1**		**1**
QUINCY HOME MEDICAL SERVICES - LAWRENCE - PARENT		1		1
HOSPITAL		**3**		**3**
EASTERN PLUMAS HOSPITAL - PORTOLA CAMPUS		1		1
PLUMAS DISTRICT HOSPITAL		1		1
SENECA HEALTHCARE DISTRICT HOSPITAL		1		1

Facility Type	Moderate	Moderate to Heavy	Heavy	Total
NURSING HOME		**3**		**3**
ASSISTED LIVING NURSING HOME		1		1
COUNTRY VILLA QUINCY HEALTHCARE CENTER		1		1
HEAVENLY HOME		1		1
PHARMACY		**5**		**5**
KEHOE PHARMACY		1		1
LASSEN DRUG COMPANY		1		1
QUINCY DRUG STORE		1		1
RITE AID - 6093		1		1
VILLAGE DRUG COMPANY		1		1
PUBLIC HEALTH DEPARTMENT		**1**		**1**
PLUMAS COUNTY PUBLIC HEALTH AGENCY		1		1
COMMERCIAL AND INDUSTRIAL	**1**	**46**		**47**
FINANCE		**10**		**10**
BANK OF AMERICA, NATIONAL ASSOCIATION, FEATHER RIVER BRANCH		1		1
BANK OF AMERICA, NATIONAL ASSOCIATION, QUINCY BRANCH		1		1
PLUMAS BANK		1		1
PLUMAS BANK, CHESTER BRANCH		1		1
PLUMAS BANK, GREENVILLE BRANCH		1		1
PLUMAS BANK, PLUMAS BANK		1		1
PLUMAS BANK, PORTOLA BRANCH		1		1
PLUMAS BANK, QUINCY ADMINISTRATIVE BRANCH		1		1
U.S. BANK NATIONAL ASSOCIATION, CHESTER BRANCH		1		1
U.S. BANK NATIONAL ASSOCIATION, QUINCY SAFEWAY BRANCH		1		1
HISTORIC PLACE	**1**	**17**		**18**
ABBEY BRIDGE GUARD STATION (HISTORICAL)		1		1
ALMANOR POST OFFICE (HISTORICAL)		1		1
ANTELOPE HOUSE (HISTORICAL)		1		1
CAMP ROGERS POST OFFICE (HISTORICAL)	1			1
CHESTER POST OFFICE (HISTORICAL)		1		1
FANT GATHERING CORRAL (HISTORICAL)		1		1
FLEMINGS SHEEP CAMP (HISTORICAL)		1		1

Facility Type	Moderate	Moderate to Heavy	Heavy	Total
ISLAND SCHOOL (HISTORICAL)		1		1
JACKSON CREEK UNITED STATES FOREST SERVICE CABIN (HISTORICAL)		1		1
LAST CHANCE VALLEY (HISTORICAL)		1		1
LIGHTS CREEK GUARD STATION (HISTORICAL)		1		1
OTIS RANCH (HISTORICAL)		1		1
RHINEHART CABIN (HISTORICAL)		1		1
RUFFA RANCH (HISTORICAL)		1		1
SPRING GARDEN RANCH (HISTORICAL)		1		1
SULPHUR SPRING HOUSE (HISTORICAL)		1		1
THREEMILE GUARD STATION (HISTORICAL)		1		1
WALKER MINE COMPRESSOR (HISTORICAL)		1		1
PROPANE STATION		**10**		**10**
1633- PORTOLA - SUBURBAN		1		1
AMERIGAS		1		1
AMERIGAS CHESTER		1		1
BI-STATE PROPANE		1		1
BI-STATE PROPANE - HERITAGE PROPANE		1		1
COAST GAS - FERRELL PROPANE		1		1
COAST GAS QUINCY STORE NUMBER 2675 - TITAN PROPANE - TITAN PROPANE		1		1
HIGH SIERRA PROPANE		1		1
LAKE ALMANOR PROPANE STORE NUMBER 2481 - TITAN PROPANE - TITAN PROPANE		1		1
SUBURBAN PROPANE		1		1
TIMBER PRODUCTS		**3**		**3**
COLLINS PINE CO		2		2
SIERRA PACIFIC INDUSTRIES QUINCY DIV.		1		1
SCHOOL		**29**		**29**
COLLEGE		**1**		**1**
FEATHER RIVER COMMUNITY COLLEGE DISTRICT		1		1
DAY CARE CENTER		**9**		**9**
CHESTER STATE PRESCHOOL		1		1
GRAEAGLE PRESCHOOL		1		1
INDIAN VALLEY STATE PRESCHOOL		1		1

Facility Type	Moderate	Moderate to Heavy	Heavy	Total
MOUNTAIN METHODIST CHILDREN'S CENTER		1		1
MOUNTAIN MONTESSORI PRESCHOOL		1		1
PORTOLA HEAD START		1		1
PORTOLA KIDS, INC. PRESCHOOL		1		1
PORTOLA PRESCHOOL COOPERATIVE		1		1
QUINCY HEAD START		1		1
K-12		**19**		**19**
BECKWOURTH (JIM) HIGH (CONTINUATION)		1		1
C. ROY CARMICHAEL ELEMENTARY		1		1
CHESTER ELEMENTARY		1		1
CHESTER JUNIOR/SENIOR HIGH		1		1
GREENVILLE ELEMENTARY		1		1
GREENVILLE JUNIOR/SENIOR HIGH		1		1
HORIZON HIGH (CONTINUATION)		1		1
LAKE ALMANOR CHRISTIAN SCHOOL		1		1
PIONEER/QUINCY ELEMENTARY		1		1
PLUMAS CHARTER 146		1		1
PLUMAS CHRISTIAN SCHOOL		1		1
PLUMAS COUNTY COMMUNITY		1		1
PLUMAS COUNTY OPPORTUNITY		1		1
PLUMAS COUNTY ROP		1		1
PORTOLA JUNIOR/SENIOR HIGH		1		1
PORTOLA OPPORTUNITY		1		1
QUINCY JUNIOR/SENIOR HIGH		1		1
SIERRA VALLEY CHRISTIAN SCHOOL		1		1
ST ANDREW'S ACADEMY		1		1
TRANSPORTATION		**9**		**9**
AIRPORT		**4**		**4**
GANSNER FIELD (QUINCY)		1		1
NERVINO (BECKWOURTH)		1		1
ROGERS FIELD AIRPORT (CHESTER)		1		1
US FOREST SERVICE CHESTER AIR TANKER BASE		1		1
HELIPORT		**5**		**5**
INDIAN VALLEY HOSPITAL HELIPORT (GREENVILLE)		1		1
PLUMAS DISTRICT HOSPITAL HELIPORT (QUINCY)		1		1

Facility Type	Moderate	Moderate to Heavy	Heavy	Total
RODGERS FLAT HELIPORT (BELDEN)		1		1
USFS CHESTER HELIPORT		1		1
USFS QUINCY HELITACK BASE		1		1
UTILITY	**3**	**41**		**44**
WASTEWATER TREATMENT PLANT		**5**		**5**
CHESTER WWTP		1		1
ES DISTRICT WWTP		1		1
GRIZZLY LAKE CSD		1		1
PORTOLA WWTP		1		1
QUINCY WWTP		1		1
WATER TREATMENT PLANT		**2**		**2**
JOHNSVILLE WTP		1		1
LAKE DAVIS WTP		1		1
SUBSTATION	**1**	**22**		**23**
MARBLE		1		1
GRAEAGLE		1		1
MOHAWK		1		1
CHILCOOT		1		1
PORTOLA		1		1
BECKWORTH		1		1
GRIZZLY	1			1
QUINCY		1		1
PLUMAS		1		1
EAST QUINCY		1		1
GANSNER		1		1
SIERRA PACIFIC		1		1
N.N.		1		1
BELDEN		1		1
GRAYS FLAT		1		1
SPANISH CREEK		1		1
CARIBOU 2		1		1
GREENVILLE		1		1
BIG MEADOWS		1		1
BUTT VALLEY		1		1
HAMILTON BRANCH		1		1
COLLINS PINE CO.		1		1
CHESTER		1		1
POWER PLANT	**2**	**12**		**14**
GRAEAGLE		1		1

Facility Type	Moderate	Moderate to Heavy	Heavy	Total
PORTOLA		1		1
ROCK CREEK	1			1
GRIZZLY	1			1
SPI- QUINCY		1		1
BUCKS CREEK		1		1
BELDEN		1		1
FIVE BEARS		1		1
OAK FLAT		1		1
CARIBOU 1		1		1
CARIBOU 2		1		1
BUTT VALLEY		1		1
HAMILTON BRANCH		1		1
COLLINS PINE CO.		1		1
COUNTY FACILITY		**6**		**6**
PUBLIC WORKS YARD		**6**		**6**
BECKWOURTH PUBLIC WORKS YARD		1		1
CHESTER PUBLIC WORKS YARD		1		1
GRAEAGLE PUBLIC WORKS YARD		1		1
GREENVILLE PUBLIC WORKS YARD		1		1
LA PORTE PUBLIC WORKS YARD		1		1
QUINCY PUBLIC WORKS YARD		1		1
Grand Total	**29**	**688**	**5**	**722**

Earthquake events can significantly impact roads, overpasses, and bridges which often provide the only access to some neighborhoods. Since soft soil regions generally follow floodplain boundaries, bridges that cross water courses are considered vulnerable. Since most of the County's bridges provide access across water courses, most are at least somewhat vulnerable to earthquakes. Key factors in the degree of vulnerability are the bridge's age and type of construction which indicate the standards to which the bridge was built.

Linear utilities and transportation infrastructure would likely suffer considerable damage in the event of an earthquake. Most of Plumas County is on well and septic tank service for water and waste water services respectively; however, major electrical transmission lines run through the county. Due to the amount of infrastructure and sensitivity of utility data, linear utilities are difficult to analyze without further investigation of individual system components. Table 5-38 provides the best available linear utility data for transportation and electric utilities and it should be assumed that these systems are exposed to breakage and failure.

Table 5-38: Linear Utilities with Earthquake Damage Potential (Miles)

Row Labels	Moderate	Moderate to Heavy	Heavy	Total (Miles)
Transmission	36	219	0	255
NVENERGY_60KV	0	5	0	5
PG&E_115KV	11	21	0	31
PG&E_230KV	25	17	0	42
PG&E_34.5KV	0	1	0	1
PG&E_60KV	0	88	0	88
PLSR_60KV	0	87	0	87
Transportation	504	4,624	104	5,232
RAILROAD	13	172	0	185
ROAD	491	4,451	104	5,047
Grand Total	540	4,842	104	5,487

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5.10.10 Dam Failure

The primary danger associated with dam failure is the high velocity flooding downstream of the dam and limited warning times for evacuation. Vulnerability varies by community and depends on the particular dam profile and the nature and extent of the failure. Vulnerable population is present directly below downstream elements of the dam, especially those incapable of escaping the area within the allowable time frame. This population includes the elderly and young who may be unable to self-evacuate from the inundation area. The vulnerable population also includes those who would not have adequate warning from a television or radio emergency warning system. Dam inundation zones created by Cal EMA were used to develop exposure results for dam failure. Eleven Dam Inundation Zones have been used in the vulnerability analysis to capture at risk populations, parcel values, and critical facilities.

Table 5-39: Dam Failure Vulnerability Analysis Summary

Dam Failure Vulnerability Analysis		
Community Risk Factor Rating	**1.4**	**Low Risk, Minimal potential impact.**

Exposure Type	Total Assets	Assets or Value at Risk	% of Total Asset	Assets in Very High Hazard Areas	% Very High Hazard Areas
Population	20,009	1,396	7%	1,396	7%
Critical Facilities	720	82	11.4%	82	11.4%
Parcels ≥ $10k	13,494	1,064	7.8%	1,064	7.8%
Miles of Roadway	5,091	154	3%	154	3%
Miles of Railroad	185	76	41%	76	41%
Miles of Linear Utilities	255	43	16.7%	43	16.7%

5.10.10.1 Population at Risk

Populations located in a dam failure inundation zone can be exposed to the risk of a dam failure. The potential for loss of life is affected by the capacity and number of evacuation routes available to populations living in areas of potential inundation. The estimated population living in a dam inundation area is 1,396, or 7% of the population of Plumas County. It is difficult to estimate injury and loss of life for dam inundation zones due to the fluctuation of populations below dams. The Census population figures for each inundation zone were developed to provide a general sense of vulnerability. Figure 5-75 exhibits the population count within a dam inundation area.

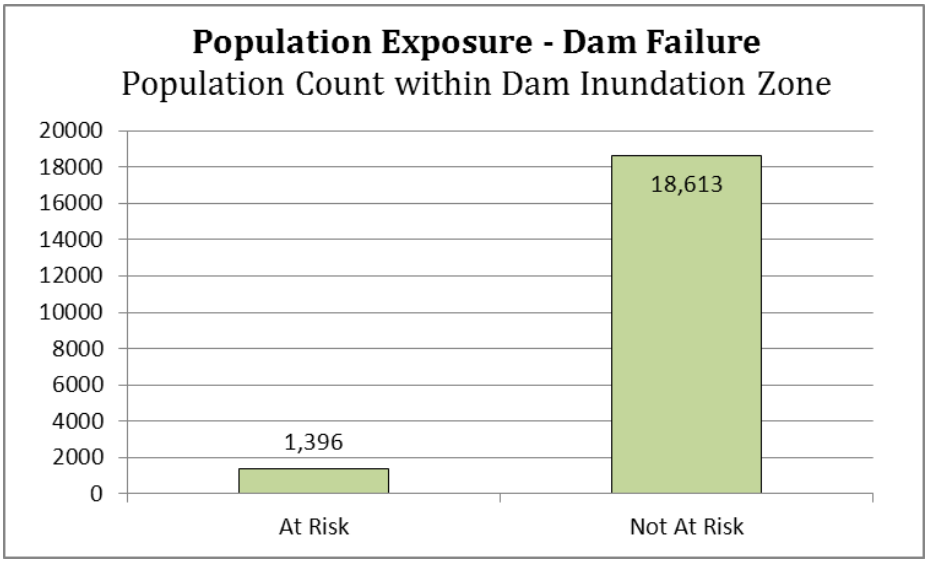


Figure 5-75: Population Exposure to Dam Failure

5.10.10.2 Improved Parcel Value at Risk

The County's parcel layer was used as the basis for the inventory of improved residential parcels. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the inundation zones to determine the at-risk structures. Only improved parcels were analyzed. Using this methodology, 1,151 (or 8%) of parcels was found to be within inundation zones. See Table 5-40 for more information on parcel values exposed to dam inundation hazards.

Table 5-40: Parcel Value Exposed to Earthquake Damage Potential

	Parcel Count	% of County Total	Structure Value	Fixture Value	Sum of Total Value	% of County Value
Dam Inundation Zone	1,064	7.88%	$133,511,400	$1,004,399	$136,958,212	6.95%

5.10.10.3 Critical Facilities at Risk

Critical Facilities at risk to dam inundation are on file with the County and for national security purposes can only be accessed through the Plumas County OES. As a general note, low-lying areas are vulnerable to dam inundation, especially transportation routes following valley floors. This includes all roads, railroads, and bridges in the flow path of water. The most vulnerable critical facilities are those in poor condition that would have difficulty withstanding a large surge of water. Utilities such as overhead power lines and communication lines could also be vulnerable. Loss of these utilities could create additional compounding issues for emergency management officials attempting to conduct evacuation and response actions.

5.10.10.4 Dam Failure Community Impact

The most significant issue associated with dam failure involves the properties and populations in the inundation zones. Flooding as a result of a dam failure would significantly impact these areas. There is often limited warning time for dam failure. These events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard. Important issues associated with dam failure hazards include the following:

- Federally regulated dams have an adequate level of oversight and sophistication in the development of emergency action plans for public notification in the unlikely event of failure; however, the protocol for notification of downstream citizens of imminent failure needs to be tied to local emergency response planning.
- Mapping for federally regulated dams is already required and available; however, mapping for non-federal-regulated dams that estimates inundation depths is needed to better assess the risk associated with dam failure from these facilities.
- Most dam failure mapping at federal levels requires determination of the probable maximum flood. While the probable maximum flood represents a worst-case scenario, it is generally the event with the lowest probability of occurrence. Mapping of dam failure scenarios for non-federal-regulated dams that are less extreme than the probable maximum flood, but have a higher probability of occurrence, can be valuable to emergency managers and community officials downstream of these facilities. This type of mapping can illustrate areas potentially impacted by more frequent events to support emergency response and preparedness actions.
- The concept of residual risk associated with structural flood control projects should be considered in the design of capital projects and the application of land use regulations.
- Addressing security concerns and the need to inform the public of the risk associated with dam failure is a challenge for public officials.

5.10.11 Summary of Spatial Hazards

In summary, hazards with spatial components can be analyzed with a side-by-side comparison. At-risk populations, critical infrastructure and improved parcels results for each hazard category are provided below. The side-by-side comparison allows officials to evaluate the impacts of potential hazards to determine what hazards to direct energy and financial resource for mitigation activities.

5.10.11.1 Population at Risk Summary

Figure 5-76 exhibits the amount of people living within wildfire, flood, landslide, earthquake and dam failure inundation zones. Though the earthquake hazard overlay has a large spatial footprint, only a small portion of the county contains heavy damage classifications. In addition, the potential for casualties is somewhat low due to the date of building construction and type of structures within Plumas County.

Wildfire poses a risk for more than 11,000 people; this staggering statistic confirms the County's need and desire to prioritize the mitigation of wildfire hazards for Plumas County. For detailed vulnerability assessment information on affected populations, see the individual hazard specific sections presented previously in this section.

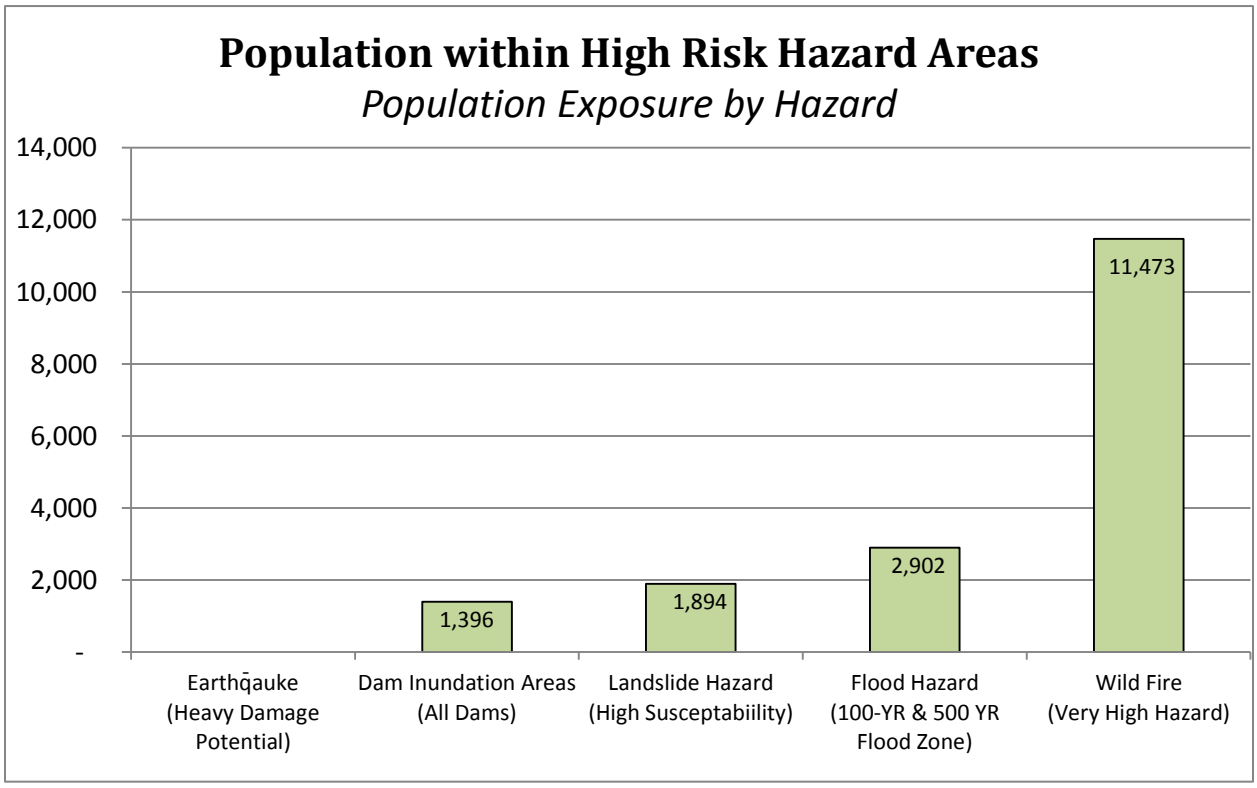


Figure 5-76: Population Exposure Summary

5.10.11.2 Parcel at Risk Summary

Table 5-41 and Figure 5-77 provide a summary of at-risk parcels by hazard. For detailed vulnerabilities assessment information see the individual hazard specific sections presented previously in this section.

Table 5-41: Parcel Exposure Summary

Hazard	Parcel Count	Percent	Total Value	% of County Total
Earthquake (Heavy Shaking)	24	0.2%	$1,548,344	0.1%
Dam Failure (Inundation Zone Present)	1,064	7.9%	$136,958,212	6.9%
Flood (100-YR & 500-YR Flood Zones)	1,202	8.9%	$187,762,541	9.5%
Landslide (High Susceptibility)	1,154	8.6%	$208,862,266	10.6%
Fire (Very High)	7,584	56.2%	$1,009,413,234	51.2%

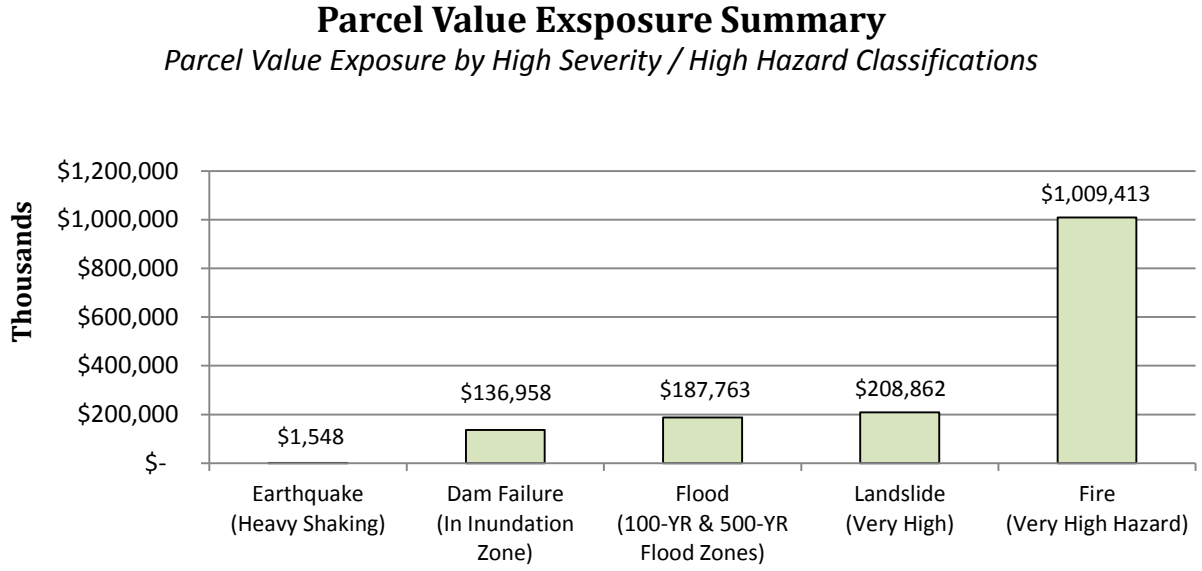
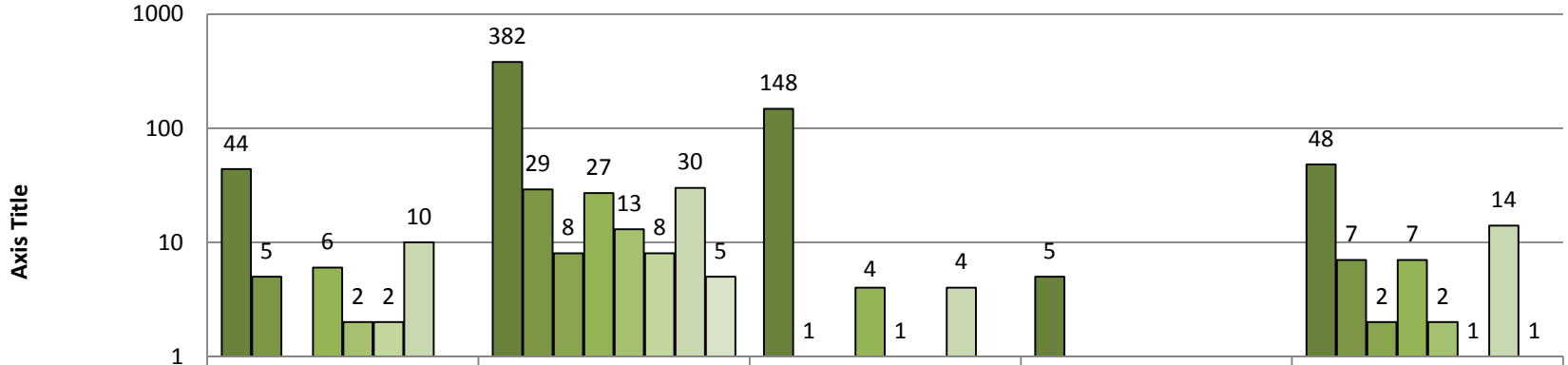


Figure 5-77: Parcel Exposure by High Severity / Hazard Classifications

5.10.11.3 Critical Infrastructure at Risk Summary

Critical infrastructure exposure by hazard comparison is provided in Figure 5-78 and Figure 5-79. Figure 5-78 provides a summary of at-risk critical infrastructure points for each hazard. Figure 5-78 provides a summary of at-risk electrical utilities and transportation routes by miles for each hazard. Critical infrastructure points include communication, emergency response, health care, schools, transportation point, utility points and county facilities. The County OES retains a complete record of all facilities in each hazard areas. For detailed vulnerabilities assessment information on critical infrastructure, see the individual hazard specific sections presented previously in this section.

Critical Facilities in Hazard Hazard Areas
Count of Facilities by Hazard Class and Facility Type

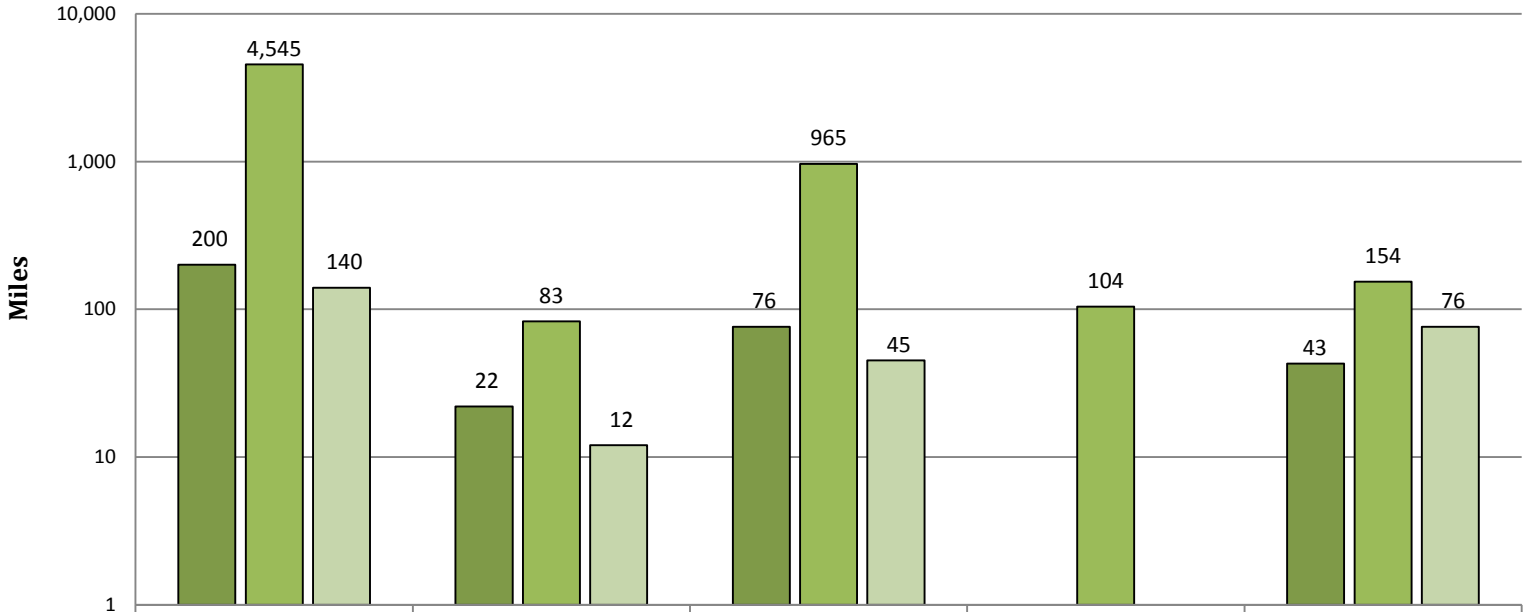


	Flood (100-YR & 500-YR)	Fire (Very High Hazard)	Landslide (High Susceptability)	Earthquake (Heavy Damage Potential)	Dam Failure (Within Dam Inundation Zone)
COMMUNICATION	44	382	148	5	48
EMERGENCY RESPONSE	5	29	1		7
HEALTH CARE	0	8	0		2
RES/COM/IND	6	27	4		7
SCHOOL	2	13	1		2
TRANSPORTATION	2	8	0		1
UTILITY	10	30	4		14
COUNTY FACILITY	0	5	0		1

Figure 5-78: Critical Facilities in High Hazard Area

Critical Facilities in High Hazard Areas

Length of Facilities (Miles) by Hazard Classification



	Fire (Very High Hazard)	Flood (100-YR & 500-YR)	Landslide (High Susceptability)	Earthquake (Heavy Damage Potential)	Dam Failure (Within Dam Inundation Zone)
Miles of Transmission	200	22	76	-	43
Miles of Roadway	4,545	83	965	104	154
Miles of Railroad	140	12	45	-	76

Figure 5-79: Critical Infrastructure Points Summary by Hazard

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5.10.12 Severe Weather

Severe weather in the Plumas County generally includes heavy rains or heavy snow and ice, often accompanied by strong winds, lightning, or hail. Heavy rains or snow, coupled with low temperatures or other severe weather conditions can result in increases in traffic accidents, disruptions in transportation, commerce, government, education, cause damage to buildings, communication towers, and electric power lines, and cause loss of life. Most commonly severe weather incidents can cause prolonged utility outages due to falling trees or other debris.

Severe weather can result in the closing of major and or secondary roads, particularly in rural locations, strand motorists, transportation accidents, loss of utility services, and loss of life. Environmental impacts of cold temperatures and heat include damage to shrubbery and trees and other vegetation. Personnel property such as cars, RVs, and small equipment is extremely vulnerable to severe weather hazards especially hail and damage as a result of fallen trees and other storm debris.

Severe Weather Vulnerability Analysis		
Community Risk Factor Rating	**2.9**	**Moderate Risk, Moderate potential impact.**

The agricultural industry is especially vulnerable to severe weather, mostly extreme temperatures. Freezing temperatures can cause significant loss to crops, and excessive heat can cause high levels of mortality among livestock as well as damage to crops

According to historical hazard data, severe weather is an annual occurrence in Plumas County. Many of the historical severe weather events were state and federally declared disasters and have resulted in damages up to $407 Million. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain, snow and thunderstorms are the most frequent type of severe weather occurrences in the County. Wind and lightning often accompany these storms and have caused damage in the past. The secondary hazards caused by severe weather such as floods, fire, landslides and agricultural losses have had enormous impacts on the County. The risk and vulnerability associated with these secondary hazards are discussed in their respective sections.

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5.10.13 Drought and Climate Change

Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the interplay between a natural event (less precipitation than expected resulting from natural climatic variability) and the demand humans place on the water supply.

The impacts of drought can be categorized as economic, environmental, or social. Many economic impacts occur in agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to obvious losses in yields in crop and livestock production drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and diseases to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn places both human and wildlife populations, as well as buildings, infrastructure, and critical facilities, at higher levels of risk.

Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Reduced income for farmers has a ripple effect. Retailers and others who provide goods and services to farmers face reduced business. This leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue for local, state, and federal government. Less discretionary income affects the recreation and tourism industries. Prices for food, energy, and other products increase as supplies are reduced. In some cases, local shortages of certain goods result in the need to import these goods from outside the stricken region. Reduced water supply impairs the navigability of rivers and results in increased transportation costs because products must be transported by rail or truck. Hydropower production may also be curtailed significantly.

Drought and Climate Change Vulnerability Analysis		
Community Risk Factor Rating	**2**	**Moderate Risk, Moderate potential impact.**

Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.

Social impacts mainly involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. A direct correlation to loss of human life due to drought is improbable for Plumas County.

The vulnerability assessment for drought is different from other natural hazards discussed in this HMP due to the lack of defined geographical boundaries. This section provides a summary of Plumas County's vulnerability as well as a description of the impacts resulting from a drought event.

No standardized methodology exists for estimating losses due to drought. Drought does not generally have a direct impact on critical and non-critical facilities and building stock. Instead, drought vulnerability is primarily measured by its potential impact to sectors of the County's economy and natural resources. In Plumas County some of the potential impacts to the economy include the following:

- Reduced agricultural and livestock production;
- Loss of timber from increased wildfires;
- Decreased municipal and industrial water supply;
- Loss of recreation/tourism; and
- Decreased wildlife and wildlife habitat.

For the purposes of this HMP Update potential dollar losses are determined based on historical data from disaster-related assistance funding from the USDA and the acreage and value of the crops currently grown in Plumas County. Since 1989, Plumas County has not received any indemnity payments for losses suffered due to drought. [19] This demonstrates Plumas County's historically low vulnerability to drought hazards.

According to the 2011 Plumas County Crop and Livestock Report the grand total of all agricultural products (excluding timber production) was approximately $24.7million in 2011. This represents a 23.6% increase over the 2010 value of $20 million. Livestock continues to be the primary commodity produced in Plumas County with an increase of almost 18% in the category overall. Field crops showed a very strong increase of 34%. Timber revenues also rose for the second consecutive year with a 14% increase. Table 5-42 summarizes the 2011 value of Plumas County's various agricultural crops.

Table 5-42: Plumas County's Crop Value (2011)

Crop	Acreage	2011 Total Value ($)
Alfalfa Hay	6,000	$3,834,000
Meadow Hay	3,000	$1,098,000
Grain Hay	1,000	$286,000
Irrigated Pasture	35,000	$2,800,000
Non-Irrigated Pasture	52,000	$1,248,000
Range Pasture	65,000	$325,000

[19] **Source: USDA Risk Management Agency, http://www.drought.unl.edu/Planning/Impacts/DroughtIndemnityData.asp**

Miscellaneous Crops*	-	$250,000
Total	**162,000**	**$1,209,100**

Note: Miscellaneous Crops include nursery, apiary, seed, fruit, potatoes, grain, etc.

Table 5-43 and Table 5-44 summarize the production value for livestock and timber for Plumas County in 2011.

Table 5-43: Production Value for Livestock (2011)

Livestock/Poultry	Number of Head	2010 Total Value ($)
Steers	8,250	$8,067,675
Heifers	6,750	$6,176,250
Slaughter	750	$536,192
Other	-	$125,000
Total	**15,750**	**$14,905,117**

Table 5-44: Production Value for Timber (2011)

Item	2011 Total Value ($)
Gross Timber Harvest	$11,510,226
Miscellaneous Timber Production	-
Total	**$11,510,226**

Direct costs such as increased pumping due to lowering of groundwater levels and costs to expand water infrastructure to compensate for reduced yields or to develop alternative water sources are a significant factor but very difficult to estimate due to a lack of documentation. Drought is also indirectly linked to wildfires which can have devastating impacts on timber and agricultural production, however loss estimations are difficult to determine since drought is an indirect contributor. There are also intangible costs associated with lost tourism revenues and impacts to wildlife habitat and animals. Typically, these impacts are realized in the form of higher food and agricultural goods prices and increased utility costs.

Although historically Plumas County has not experienced long-term drought conditions, increased demands on the downstream water supply, climate change and land use change such as deforestation and land degradation continue to have unpredictable effects on drought in Plumas County. The potential risks and vulnerabilities associated with drought are further discussed in the Drought Hazard Profile section.

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Section 6. Mitigation Strategy

The intent of the mitigation strategy is to provide Plumas County the tools that will serve as guiding principles for future hazard mitigation policy and project administration. The development of the mitigation strategy includes a review of the goals, objectives and mitigation actions identified in the 2006 Plumas County MHMP, a capabilities assessment, and the creation of a Mitigation Action Strategy, which includes a prioritization process for selected mitigation actions. The mitigation action plan represents the key outcomes of the 2013 Plumas County HMP planning process.

6.1 *Hazard Mitigation Goals and Objectives*

The HMP goal and objectives are broad policy statement representing Plumas County's desire for long-term hazard mitigation results. The Plumas County HMP Planning Committee reviewed the 2006 goals and objects throughout the planning process. A discussion on the goal's continued validity for the 2013 Plumas County HMP ensued, and concluded with the HMP Planning Committee voting to develop an entirely new set of goals and objects based upon hazard mitigation best practices and current day priorities. The HMP Planning Committee decided to develop goals and objectives to address each hazard identified in Section 5. More details of this particular meeting are provided in Appendix B. The following goals and objectives have been developed as part the 2013 planning effort:

ALL HAZARD GOAL: Maximize the use of mitigation actions to prevent losses from natural hazards identified in the 2013 HMP.

- ***ALL HAZAD OBJECTIVE 1: Increase the County's capability to provide mitigation opportunities and assistance to Plumas County communities.***
- ***ALL HAZARD OBJECTIVE 2: Continuously improve hazard assessments.***
- ***ALL HAZARD OBJECTIVE 3: Protect Natural and Cultural Resources through hazard mitigation.***
- ***ALL HAZARD OBJECTIVE 3: Support mitigation planning in all County Operations.***

GOAL 1: Minimize the losses of life and property due to Wildfire in Plumas County

- ***OBJECTIVE 1.1: Enhance community awareness of effective mitigation measures and wildfire impacts through education.***
- ***OBJECTIVE 1.2: Enhance the county's capability to notify and prepare the community during wildfire season.***
- ***OBJECTIVE 1.3: Continue reducing fuel hazards conditions within the wildland-urban interface.***
- ***OBJECTIVE 1.4: Continue implementation actions of the community wildfire protection plan (CWPP), and continue to seek establishment of fire wise communities.***
- ***OBJECTIVE 1.5: Enhance the county wildfire hazard code enforcement capabilities within wildland-urban interface.***
- ***OBJECTIVE 1.6: Continue land use planning efforts to ensure increased fire safety in new developments.***

GOAL 2: Minimize the losses of life and property due to Severe Weather in Plumas County

- *OBJECTIVE 2.1: Increase community capabilities to mitigate the impact of winter weather hazards.*
- *OBJECTIVE 2.2: Increase community capabilities to mitigate summer weather hazards.*
- *OBJECTIVE 2.3: Implement actions to enhance reliability of power supply during and after*

GOAL 3: Minimize the losses of life and property due to Flooding in Plumas County

- *OBJECTIVE 3.1: Mitigate flooding of structures and infrastructure.*
- *OBJECTIVE 3.2: Increase public awareness of flood mitigation.*
- *OBJECTIVE 3.3: Improve the effectiveness of flood insurance programs.*

GOAL 4: Minimize the losses of life and property due to Geologic Hazards in Plumas County

- *OBJECTIVE 4.1: Provide for earthquake resistance in new construction.*
- *OBJECTIVE 4.2: Mitigate potential damage to life and property from landslides and rock falls.*
- *OBJECTIVE 4.3: Educate the public in earthquake mitigation and readiness.*

GOAL 5: Minimize the effects of Drought and Climate Change in Plumas County

- *OBJECTIVE 5.1: Educate the citizens of Plumas County on methods to reduce the effects of Drought and Climate Change*
- *OBJECTIVE 5.2: Protect water resources within Plumas County watersheds from drought conditions.*

GOAL 6: Minimize the losses of life and property due to Dam Failure in Plumas County

- *OBJECTIVE 7.1: Reduce the Risk of Dam Failure*
- *OBJECTIVE 7.2: Increase capability for continuity of government.*
- *OBJECTIVE 7.3: Enhance warning capabilities.*

6.2 *Capabilities Assessment*

In preparing the mitigation actions, the Plumas County HMP Steering Committee members were asked to consider their overall capability to mitigate identified hazards. The mitigation strategy includes an assessment of Plumas County's planning and regulatory, administrative/technical, fiscal, and political capabilities to complete the identified mitigation actions.

6.2.1 Planning and Regulatory Mitigation Capabilities

Plumas County has several plans and programs in place that guide the County's mitigation of development in hazard-prone areas. The following table lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities. Table 6-1 provides a sample listing of possible planning and regulatory capabilities.

Table 6-1: Plumas County's Regulatory Mitigation Capabilities

Hazard	Plan/Program/ Regulation	Responsible Agency	Comments
Multi-Hazard	Hazard Mitigation Plan	PC OES	Implementation and updates over a 5 Year Period.
Multi-Hazard	Emergency Operations Plan (EOP)	PC OES	To address disasters, whether they are natural, technological or manmade. The Hazard Mitigation Plan addresses natural hazards only.
Multi-Hazard	Evacuation Plan	PC OES	PC might have an evacuation plan with the following elements: ▪ Transportation ▪ Housing / Shelters ▪ Large and Small animal Evacuation Washoe County NV, has a well-developed evacuation plan.
Multi-Hazard	California Building Codes	PC Building Department	Since 2006, Plumas County has adopted new building codes and regulations that protect new development and buildings from flooding, and Geo Hazards.
Multi-Hazard	Zoning Regulations	PC Planning Department	See Plumas County Building Regulations under Wildfire, Flood and Geo-Hazard.
Multi-Hazard	Subdivision Regulations	PC Planning Department	See Plumas County Building Regulations under Wildfire, Flood and Geo-Hazard.
Multi-Hazard	Comprehensive Land Use Plan (or General, Master or Growth Mgmt. Plan)	PC Planning Department	Current General Plan Update under development.

Multi-Hazard	Feather River Coordinated Resource Management Group	Volunteer Staff	The Feather River Coordinated Resource Management Group works to protect, maintain, and enhance ecosystems and community stability in the Feather River Watershed through collaborative landowner participation.
Multi-Hazard	Capital Improvement Plan	Public Works	Flood Control Needs a budget to Clean / Maintain drainage throughout county.
Multi-Hazard	Community Facility Development and Infrastructure Assistance	PC Community Development Commission (PCCDC)	The Plumas County Community Development Commission assists low income residents meet their housing needs, build and improve infrastructure.
Multi-Hazard	Statewide Historic Preservation Plan: Local Government Assistance	Office of Historic Preservation	OHP's Local Government Unit (LGU) offers guidance and assistance to city and county governments in the following areas: ▪ Drafting or updating historic preservation plans and ordinances ▪ Developing historic context statements ▪ Planning for and conducting architectural, historical, and archeological surveys ▪ Developing criteria for local designation programs, historic districts, historic preservation overlay zones (HPOZs), and conservation districts ▪ Developing and implementing design guidelines using the Secretary of the Interior's Standards - Developing economic incentives for historic preservation - Training local historic preservation commissions and review boards - Meeting CEQA responsibilities with regard to historical resources
Wildfire	Community Wildfire Protection Plan (CWPP), 2005	PC Fire Safe Council	Update edits occurring, expect approval 2013.
Wildfire	Fuel Reduction Map and Database	PC Fire Safe Council	Updated Annually. Included as appendix to 2005 CWPP.
Wildfire	Plumas County Hazardous Fuel Assessment and Strategy	PC Fire Safe Council	Lifespan of not more than 10 years from the date of issue. Included as appendix to 2005 CWPP.

Wildfire	Plumas County Health and Safety Code	Plumas County Building Department	Section 14875 Section 14880 Section 14890 Section 4290 Section 4291
Wildfire	Plumas County Building Regulations	Plumas County Building Department	Section 8-14.01 Sec 8-14.03 Sec 8-14.03
Wildfire	Local Community Codes	Local Communities	Plumas Eureka Community Services District Greenhorn Community Services District Covenants, Conditions and Restrictions of West Almanor Community Club
Wildfire / Flood	USDA	NRCS	Flood and Fire Recovery on Private Lands
Flood	Prop. 50/84 Integrated Regional Water Management (IRWM)	DWR	DWR has a number of IRWM grant program funding opportunities. Current IRWM grant programs include: planning, implementation, and stormwater flood management. http://www.water.ca.gov/irwm/grants/index.cfm
Flood	USDA	NRCS	Improve floodplain function and reduce effects of flooding on private lands
Flood	Central Valley Flood Protection Plan	DWR	State legislative requirements provide Plumas County local planning responsibilities for floodplain management (e.g., general plans, zoning ordinances, development agreements, tentative maps, and other actions).
Flood	NFIP	Plumas County Flood Control / Buildings Dept.	NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. As a participating member of the NFIP, Plumas County Officials are dedicated to protecting homes of more than 160 policies currently in force. ▪ 163 policies in force ▪ $37,987,500 insurance in force ▪ 34 paid losses ▪ $680,554 total paid losses ▪ 6 substantial damage claims since 1978
Flood	DWR Prop 84	DWR	Grant funding just came out from the Flood Operations Center.

Flood	***Central Valley Flood Protection Plan***	DWR	State legislative requirements provide Plumas County local planning responsibilities for floodplain management (e.g., general plans, zoning ordinances, development agreements, tentative maps, and other actions). 2007 flood risk management legislation apply Statewide, while other legislation is additive and provides provisions applicable to lands within the Sacramento-San Joaquin Valley (SSJV), Plumas County is within the SSJV. Government Codes of particular importance to hazard mitigation planning are: Government Code 65302 Government Code 8685.9
Flood	***Plumas Corporation, Feather River Coordinated Resource Management***	Plumas Corporation	Project Planning list has tons of projects related to stream restoration and watershed protection.
Flood	***USDA***	Natural Resources Conservation Service (NRCS)	Emergency Watershed Protection Program Environmental Quality Incentive Program
Geo-Hazard	***Plumas County General Plan Safety Element***	PC Planning Department	Develop sync with General Plan Safety Element. Following State legislation it will be important to reference the PC Hazard Mitigation Plan in the General Plan Safety Element Section.
Geo-Hazard	***Statewide Seismic Regulations***	PC Building Department	
Flood / Drought	***Farmland Preservation***	Statewide Drought Mitigation Plan	
Dam Failure	***PG&E Exercise Development***		Multi-Agency table top / field exercise conducted in Feather River Canyon 2 Yrs Ago.
Severe Weather	***Plumas County Building Codes***	PC Building Department PC Planning Department	Section 8-1.08 – Amendment of Section 1805 of the California Building Code: Frost Depth Required. Amendment of Section 1057 of the California Building Code: Ice Dam Protection

6.2.2 Administrative/Technical Capabilities

Plumas County has several departments and agencies that have both the administrative authority and technical capabilities related to hazard mitigation and loss prevention, as identified below:

- **Office of Emergency Services** develops, establishes, and maintains programs and procedures which provide for the protection of lives and property of Plumas County residents from the effects of natural disasters. The Office's functionalities include:
  - Manage and coordinate Disasters, Terrorism, Search & Rescue missions, Floods and other major emergencies within the Operational Area. Assist city and county departments with fire suppression activities, evacuations, hazardous materials incidents, disaster exercises, planning, and utilization of resources through the NIMS/SEMS/Incident Command System.
  - Manage the Operational Area emergency management program and all EOC functions for Plumas County. Communicate with and provide information as the primary reporting agency to State OES during disasters and emergencies. Coordinate all state and Federal assistance needed by cities and the county.
  - Facilitate the County Disaster Council, Shelter Task Force and Emergency Manager meetings. Participate in all related committees, groups and organizations.
  - Write, update and maintain the Plumas County Emergency Operations Plan to include supplements such as Animal Care, Earthquake, Evacuation, Mass Care and Shelter, People with Access and Functional Needs, Terrorism, Multi-Casualty incidents, School Violence and Hazardous Materials.
  - Manage and maintain the county's compliance with the Emergency Services Act Chapter 7 of Title 2 of the Government Code.
  - Conduct Emergency Preparedness training and awareness presentations for citizens and various organizations so they better understand what they should do before, during and after a disaster or major emergency. (CERT-Community Emergency Response Teams)
  - Conduct and participate in Tabletop, Functional and Field disaster exercises with county agencies.
- **Emergency Medical Services** works with acute care hospitals, fire departments, ambulance providers, law enforcement, State Agencies and others in public health to plan, manage and evaluate the essential components of emergency response.
- **Plumas County Sheriff's Office** is dedicated to the safety and well-being of all persons within Plumas County. The Dispatch Center dispatches law enforcement and fire services county agencies on a 24 hour basis. It also handles coordination of air ambulance for scene calls to all areas of the county (city or county), coordination of all mutual aid for the county and out of county requests. They handle after hours water problems for Solano Irrigation District, after hours contact for the Coroner's office, County Roads, Public Works, Communications, Building and Grounds, SWAT, Chaplain, DA's, Probation/Parole, Reserves and numerous others.
- **Planning Department** includes General Planning Services, Zoning Administrator, Design Review, General Plan implementation, and Planning Commission administrators.

- Current Planning Services staff ensure the timely and accurate processing of planning permit applications in the unincorporated County and ensure the accuracy and consistency of information provided to interested persons related to Federal, State and County statutes, codes and policies related to uses of land in Plumas County. Long-Range Planning/General Plan Implementation Planning Services staff prepares and maintains comprehensive plans and policies that guide development and land use decisions to meet the goals and policies of the County and its citizenry consistent with the best principles of planning practice.
- The GIS Department is responsible for the development, access, and distribution of GIS data, technology, and mapping services to multiple departments, agencies, and users within Plumas County local government.

- **Building Department** performs building plan reviews, issues building, grading and other construction related permits, performs inspections of permitted construction, grading and building improvements for compliance with all applicable codes and regulations, and enforces mandated State and Federal Codes, as well as County adopted California Building Standards Codes.
- **Public Works** provides protection of the public investment in the county's existing road system and public safety by maintaining and improving overall roadway conditions. The Public Works Department maintains approximately 680 miles of roadways, including over 500 bridges and drainage structures and more than 5,000 road signs. The mission of the Public Works Department includes:
  - Maintaining, repairing, designing, and constructing county roads, bridges, and storm water drainage systems in accordance with local, state, and federal laws / standards and in a manner that maximizes public safety
  - Reviewing and approving land development projects as they relate to the county road and drainage systems
  - Pursuing and obtaining federal and state funds for the county roads, bridges, and storm drainage systems
  - Encroachment permits
  - Transportation permits
  - Maintaining assessment districts and county service area administrative tasks
  - Supporting the implementation of area Geographical Information System (GIS) mapping
- **Engineering** services include:
  - Administration of the Plumas County Floodplain Ordinance.
  - State and Local code compliance consultation to applicants and contractors on project development and mapping requirements.
  - Performs plan checking functions pertaining to the following applications and maps: Records of Survey, Certificates of Corrections, Lot Line Adjustment Plans, Parcel Maps and Subdivisions, as well as reviews resultant parcel and parcel exchange deed descriptions related to Lot Line Adjustments.

- Perform plan checking for code compliance of infrastructure improvements that are required per Conditions of Approval imposed by the Zoning Administrator on approved development applications.
- Perform plan checking for code compliance on behalf of Building Department in regard to Fire Safe Driveway Designs and non-building-related Grading plans.
- Assures that engineering Conditions of Approval imposed by the Zoning Administrator on approved development applications are satisfied.
- Oversees construction of approved improvements for developments.
- Administers security (guarantee and warranty) documents pertaining to approved developments with infrastructure improvements.
- Responds to inquiries and requests from professionals, the public and other agencies related to civil engineering and survey matters, including County policies, the Subdivision Map Act and State and County requirements and practices.
- Participates in the periodic meetings of the Development Review Committee and the Public Works/Engineering Review Committee.
- Provides large format copier/scanner services to project development representatives and to other County departments.
- Provides additional staff support services, on a requested basis, to the Department of Public Works and the Plumas County Transportation Commission.
- Participates in the Plumas County Safety Program.
- Participates in the Plumas County Office of Emergency Services Program.
- Manages and provides staff support services to the following dependent special districts:
    - Beckwourth County Service Area
    - Crescent Mills Lighting District
    - Grizzly Ranch Community Service District
    - Walker Ranch Community Service District
    - Quincy Lighting District.

Table 6-2: Plumas County Administrative and Technical Mitigation Capabilities

Staff/Personnel Resources	*Yes*	*No*	*Department / Agency*	*Comments*
Planners (with land use / land development knowledge)	x		PC Planning Department	
Planners or engineers (with natural and/or human caused hazards knowledge) Public Works has capability.	x		PC Building Department PC Engineering Department PC Public Works Department	
Engineers or professionals trained in building and/or infrastructure construction practices (includes building inspectors)	x		PC Building Department PC Engineering Department PC Public Works	
Emergency Manager	x		PC OES	
Floodplain Manager (Planning Director / Public Works Director)	x		PC Planning Department PC Public Works Department	
Land surveyors	x		PC Engineering Department PC Public Works Department	
Scientists or staff familiar with the hazards of the community	x		National Forest Service	Climatologist
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program	x		PC Planning Department PC Public Works Department	
Grant writers or fiscal staff to handle large/complex grants (David Keller)	x		PC Administration	PC Administrative Offices handle
Construction Equipment	X		PC Public Works Department	Public Works owns and maintains over 300 pieces of equipment / 55-60 Employees.
Public Works: ▪ Technical Assistance ▪ Personnel Assistance	X		PC Public Works Department	No Funding Outside Road Right of Way.

Utilities / Dam Safety Experts ▪ Dam Safety Personnel ▪ PG&E Arborist	x		Emergency Management / Risk Management	Dam Failure Exercise Expertise. PG&E arborist can remove hazard trees next to electrical lines free of charge.
State Emergency Management Personnel ▪ State OES Access ▪ CCIC Access ▪ Mobile Emergency Personnel ▪ Medical Air Evacuation (Based in Auburn & Redding)	x		California Highway Patrol	CHP personnel can assist and maintain evacuation routes, radio communication, Aerial Support (Fixed Wing & Helicopter). CHP Maintains Mutual Aid Agreements with the State of Nevada during "State of Emergency".
Regional Medical Assistance Personnel ▪ Plumas District Hospital ▪ Renown Hospital / Reno? ▪ St. Mary's Hospital / Reno?	x		Various Hospital Staff / Departments	Washoe County NV, EOP might be a good document to reference.
National Weather Service Weather Watchers	X		SKYWARN Weather Spotters	Spotter training classes are offered periodically at various locations in the area. The training is taught by National Weather Service forecasters and takes approximately 2 1/2 hours. The classes are generally offered on week-nights. We strongly encourage volunteers to attend these classes to become weather spotters. National Coordinator: Chris Maier, phone: 301-713-0090, email: chris.maier@noaa.gov

In addition to the departments/agencies described in Table 6-2, Table 6-3 below provides a list of local, state and federal agencies and programs that could provide technical and financial assistance for hazard mitigation actions within Plumas County.

6.2.3 Fiscal Capabilities

This section identifies the financial tools or resources that the County could potentially use to help fund mitigation activities. These include County-specific capabilities, as well as state and federal resources. It is also important to note that funding can also be sourced from participating agencies/organizations that collaborate with the County in the implementation of mitigation actions.

6.2.3.1 Local Capabilities

A review of Plumas County's Annual Financial Report, Fiscal Year Ended June 30, 2011 resulted in the identification of a number of governmental funds, special revenue funds, and internal service funds that can be utilized for mitigation projects and activities.

- **Governmental Funds:**
  - *General Fund* is the County's primary operating fund, accounting for all financial resources of the general government.
  - *Public Safety Special Revenue Fund* is used to account for services to County residents in the area of public protection, among other areas.
  - *Capital Projects Funds* are used to account for and report financial resources that are restricted, committed, or assigned to expenditure for capital outlays, including the acquisition or construction of capital facilities and other capital assets.
  - *Accumulated Capital Outlay Fund* is used to account for all other countywide capital projects not accounted for in a special capital projects fund.
- **Special Revenue Funds:**
  - *?????*
- **Internal Service Funds:**
  - *???*

In addition to the above funds, the County has the ability to incur debt through general obligation bonds, special tax bonds, and private activities, as well as withhold spending in hazard-prone areas. Table 6-3 provides a summary of financial resource capabilities.

Table 6-3: Fiscal Capabilities Table

Financial Resources	Yes	No	Department / Agency	Comments
Capital improvement programming		x	Public Works	Financial Resources Limited to Infrastructure Projects.
Community Development Block Grants (CDBG)	x		Plumas County CDC	
Special purpose taxes	x			
Gas / electric utility fees	x			Local Districts (Community Service District, Fire, School etc.)

Water / sewer fees	x			Local Districts (Community Service District, Fire, School etc...)
Stormwater Utility fees	x			Local Districts (Community Service District, Fire, School etc...)
Development impact fees		x		
General obligation, revenue, and/or special tax bonds	x			Local Districts (Fire, School etc.)
Partnering arrangements or intergovernmental agreements	x			
DWR Position 84 Bond Funding	X			The Plumas County Community Development Commission assists low income residents meet their housing needs, build and improve infrastructure
Weatherization Services	x		PC Community Development Commission	Eligible households (owners and renters) can Receive energy efficiency improvements installed at no cost, such as weather-stripping, insulation, storm windows, water heater

6.2.3.2 *State and Federal Funding Resources*

The following table provides a list of potential funding programs and resources provided by state and federal agencies/programs the County can tap into for hazard mitigation activities. Please note that the information provided below is not exhaustive.

Table 6-4: Potential Funding Programs/Grants from State and Federal Agencies

Agency	Potential Programs/Grants
Department of Homeland Security – Federal Emergency Management Agency	Homeland Security Grant Program, Emergency Management Performance Grants Program, Transit Security Grant Program, Assistance to Fire Fighter Grants, Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program, Severe Repetitive Loss Program
US Department of Housing and Urban Development	Community Development Block Grants
US Department of the Interior	Coast Impact Assistance Program, US Geological Survey Research and Data Collection
US Department of Health and Human Services/California Department of Health Services	Grants for Public Health Emergency Preparedness
California Emergency Management Agency	Regional Catastrophic Preparedness Grant Program, Interoperable Emergency Communications Center Grant Program, Proposition 1B Grant, Citizens Corps Program, Metropolitan Medical Response System Program, Earthquake and Tsunami Grants Program
California Department of Housing and Community Development	Disaster Recovering Initiative
California Department of Forestry and Fire Protection	Western States WUI Fire Assistance Grant

6.2.4 Political Capability

Political capability in this instance is being measured by the degree to which local political leadership (including appointed boards) is willing to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum State or Federal requirements (e.g., building codes, floodplain management, etc.). The HMP Planning Committee rated the jurisdiction's political capability to enact policies and programs that reduce hazard vulnerabilities.

Figure 6-1 provides a simple 0 to 5 scale for which the Planning Committee used to assess the County. The Planning Committee agreed that that political boards are "moderately willing" to change policy or

programs. Generally, a higher the score corresponds to a higher degree of community political capability.

Figure 6-1: Political Self Assessemen Capability Scale

Very Willing ***Moderately Willing*** ***Unwilling to Adopt Policies / Programs***

Score: 2.7

6.2.5 Self-Assessment of Capability

The Plumas County HMP Planning Committee conducted a short *Capabilities Assessment Self-Survey* in order to understand the degree of capability for categories reviewed previously in this section. Using Table 6-5 as an outline, the Planning Committee agreed "as a group" upon the degree of capability; limited, moderate, or high for each capability area. The survey conclusion results are based upon information provided previously in this Section and working knowledge of County operations.

Table 6-5: Capabilities Assessment Self-Survey Conclusion

	Degree of Capability		
Capability Area	***Limited***	***Moderate***	***High***
Planning and Regulatory Capability		x	
Administrative and Technical Capability			x
Fiscal Capability	x		
Community Political Capability		x	

6.3 *Mitigation Actions*

With the results of the hazard risk assessment finalized, mitigation goal established, and capabilities assessed, mitigation actions are set to reduce the impacts of the identified natural hazards. A brief description of the mitigation action categories is provided below, followed by a discussion of the process undertaken to identify and prioritize mitigation actions. Supporting documentation for this section is provided in Appendix D.

6.3.1 Mitigation Action Categories

Mitigation actions are based on the hazard risk assessment results and FEMA's six hazard mitigation actions categories. Mitigation actions categories include prevention, property protection, public education and awareness, natural resource protection, emergency services, and structural projects. FEMA's six hazard mitigation categories are described below:

- Prevention (PRV): Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses.
- Property Protection (PP): Actions that involve modifying or removing existing buildings or infrastructure to protect them from a hazard.
- Public Education and Awareness (PE&A): Actions to inform and educate citizens, elected officials, and property owners about potential risks from hazards and potential ways to mitigate them.
- Natural Resource Protection (NRP): Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems.
- Emergency Services (ES): Actions that typically are not considered mitigation techniques but reduce the impacts of a hazard event on people and property.
- Structural Projects (SP): Mitigation projects intended to lessen the impact of a hazard by using structures to modify the environment.

6.3.2 Identification of Mitigation Actions

To begin the process to identify mitigation actions for the 2013 HMP update, the Plumas County HMP Planning Committee reviewed mitigation actions from the 2006 MHMP in May of 2013. Due to new priorities and risk assessment results, the HMP Planning Committee removed, edited and developed new mitigation actions. Additionally, the HMP Planning Committee developed new mitigation actions to acknowledge risk assessment results from the 2013 Vulnerability Assessment process outlined in Section 4 and Section 5.

As part of the mitigation actions identification process, the HMP Planning Committee and Hazard Focus Groups identified issues and/or weaknesses in the County's existing/current hazard mitigation activities. From this exercise new mitigation actions address issues summarized by individual hazard in Table 6-6.

Table 6-6: Identified Issues/Weaknesses to be addressed by Mitigation Actions

Hazard ID	Problem Statements
Multi-Hazard	▪ Agency Coordination for mitigation planning ▪ Incorporation of mitigation planning into other County planning activities (general plan, natural resource management and preservation) ▪ Maintenance of technical skills, databases, and systems related to hazard mitigation planning
Flood	▪ Repetitive Loss Areas in Indian Valley ▪ Critical Infrastructure in American Valley (One School, and One Hospital as Risk) ▪ Residual Risk beyond Identified FEMA Floodplains ▪ Feather River Canyon wash-outs
Wildfire	▪ Inadequate street or house signage ▪ Narrow and often one-lane and/or dead-end roads ▪ Heavy fuel loads on vacant parcels, lands adjacent to communities and roadsides ▪ Multi-jurisdictional mitigation environment ▪ Nature and frequency of ignitions, both natural and man-made ▪ Evacuation or closures of transportation and or communities ▪ At Risk Critical Infrastructure ▪ Education and Implementation of Defensible Space for reducing structure vulnerability ▪ Wildfire hazard mitigation funding / Code Enforcement
Geo Hazards	▪ Unknown location of hazard ▪ Hazard is spread across entire county ▪ Compounded Hazard Risk ▪ Landslides can be activated by seismic activity ▪ Wildfire can cause higher risk of landslides or mudslides ▪ Transportation Infrastructure at Risk ▪ Highway 70 ▪ Rail Road ▪ Human development can exacerbate speed of erosion
Severe Weather	▪ Short periods of extreme events. ▪ Long Periods of Winter Rains ▪ Secondary Hazards: Landslides, Storm Debris, Flash Flood, Lighting Strike, Snow Load ▪ Power Outages
Drought	▪ Poor retention of precipitation and depletion of deep groundwater systems as a result of continued extraction and reduced recharge during dry periods. ▪ Loss of water tables and depletion of shallow aquifers is a typical consequence of head cutting (not all drought related) throughout the watershed. ▪ Groundwater depletion high valley deserts such as Sierra Valley indicator of local drought.

Dam Failure	▪ Multiple Owners of Dams ▪ Dam Inundation Zones Information Distribution and Quality ▪ Emergency Action Plans responsibility of Cal EMA and DsoD ▪ County does not have jurisdictional authority for Dam Safety ▪ Communication of Hazard ▪ Warning Times for Sunny Day Event ▪ Maintenance on older dams
Climate Change	▪ Increased Precipitation in during winter rainy season. ▪ Increased wildfire risk due to decreased snowpack ▪ Changes in variability and the frequency/severity of hazard events. ▪ Other natural disaster such as drought, severe weather, flood, and wildfire occurrence intervals can change. ▪ Probability of occurrence is influenced by human action. ▪ Intergovernmental Panel on Climate Change (IPCC) predicts a warming of about 0.2 degree Celsius per decade

A comprehensive range of 50 mitigation actions, provided in Appendix D, were identified to reduce the effects of hazards and focus on new and existing buildings and infrastructure. The mitigation actions include the responsible agency(s) and/or department(s), existing or potential funding sources, timeframe, and mitigation category are identified. Additionally, the cost/budget for each mitigation action, when available, is provided.

6.3.3 Prioritization of Mitigation Actions

Implementing the identified mitigation actions can be overwhelming for any community, especially with limited staffing and fiscal resources. To ensure the Plumas County HMP reflects a reality of what Plumas County can do with its available resources, the mitigation actions are prioritized. The prioritization process, followed by the results, is discussed below.

To Be Completed After Public Input!!!!

Section 7. Plan Implementation and Maintenance

As this document is a living document, it is important that it becomes a tool in the County's arsenal to ensure minimal damage in the event of natural disaster event. This section discusses plan adoption and implementation, as well as the processes for monitoring, evaluating, and updating the HMP, to ensure that the HMP remains relevant and continues to address the changing environment in the County. In addition, this section describes the incorporation of the HMP into existing Plumas County planning mechanisms, as well as how the County will continue to engage the public.

7.1 *Plan Adoption*

To comply with DMA 2000, the Plumas County BOS will officially adopt the 2013 Plumas County HMP within one year of FEMA approval. The adoption of the updated HMP recognizes the County's commitment to reducing the impacts of natural hazards on the unincorporated areas of Plumas County. A copy of the 2013 HMP resolution is included in Appendix E.

7.2 *Implementation*

This section describes the role of the HMP Planning Committee in the implementation of the HMP.

7.2.1 Future Participation

The Plumas County HMP Steering Committee, established for this update, will become a permanent advisory body to administer and coordinate the implementation and maintenance of the HMP. The Chief Building Official for the Plumas County Department of Resource Management, in coordination with the Plumas County Office of Emergency Services Manager, will lead the HMP Steering Committee in all associated HMP maintenance requirements. On an annual basis, the HMP Steering Committee will report to the Board of Supervisors and the public on the status of plan implementation and mitigation opportunities in the County. Other duties include reviewing and promoting mitigation opportunities, informing and soliciting input from the public, and hearing and addressing stakeholder concerns about hazard mitigation.

The input required for effective periodic evaluations will come from local government officials and other interested stakeholders.

7.3 *Monitoring, Evaluating, and Updating the HMP*

This section describes the schedule and process for monitoring, evaluating, and updating the HMP.

7.3.1 Schedule

Monitoring the progress of the mitigation actions will be on-going throughout the five-year period between the adoption of this HMP and the next update. The HMP Planning Committee will meet on an annual basis to monitor the status of the implementation of mitigation actions.

As mentioned, one of the duties of the HMP Planning Committee is to report to the Board of Supervisors on the status of plan implementation. This annual review will take place each year on or near the

anniversary of the adoption of the plan. A month prior to this annual review, the HMP Planning Committee will meet to prepare the evaluation of the HMP.

The HMP will be updated every five years, as required by DMA 2000. The update process will begin at least one year prior to the expiration of the 2013 HMP. However, should a significant disaster occur within the County, the HMP Planning Committee will reconvene within 30 days of the disaster to review and update the HMP as appropriate. The Plumas County Board of Supervisors will adopt written updates to the HMP.

7.3.2 Process

The HMP Planning Committee will coordinate with responsible agencies/organizations identified for each mitigation action. These responsible agencies/organizations will monitor and evaluate the progress made on the implementation of mitigation actions and report to the Planning Committee on an annual basis. Working with the HMP Planning Committee, these responsible agencies/organizations will assess the effectiveness of the mitigation actions and modify the mitigation actions as appropriate. A HMP Mitigation Action Progress Report worksheet, provided in Appendix E, has been developed as part of this HMP to assist mitigation project managers in reporting on the status and assessing the effectiveness of the mitigation actions.

Information culled from the quarterly meeting to monitor mitigation actions can be used for the annual evaluation of the HMP. The following questions will be considered as criteria for evaluating the effectiveness the HMP:

- Has the nature or magnitude of hazards affecting the County changed?
- Are there new hazards that have the potential to impact the County?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the HMP?
- Should additional local resources be committed to address identified hazards?

An Annual HMP Review Questionnaire worksheet, also provided in Appendix E, has been developed as part of this HMP to provide guidance to the HMP Planning Committee on what should be included in the evaluation.

Future updates to the HMP will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. Issues that arise during monitoring and evaluating the HMP, which require changes to the risk assessment, mitigation strategy and other components of the HMP, will be incorporated into the next update of the Plumas County HMP in 2018. The questions identified above would remain valid during the preparation of the 2018 updated HMP.

7.4 *Incorporation into Existing Planning Mechanisms*

Another important implementation mechanism is to incorporate the recommendation and underlying principles of the HMP into other community plans and mechanizing, such as comprehensive planning, capital improvement budgeting, economic goals and incentives, and regional plans. Mitigation is most successful when it is incorporated within the day-to-day functions and priorities of government and development. Thus, the integration of a variety of County administrative departments on the HMP Planning Committee provides an opportunity for constant and pervasive efforts to network, identify, and highlight mitigation activities and opportunities at all levels of government, through the monitoring of agendas, attendance at meetings, and distribution of memos. This collaborative effort is also important in the monitoring of funding opportunities that can be leveraged to implement the mitigation actions.

Based on the comprehensive nature of the HMP, the HMP Planning Committee believes that this document will be highly useful when updating existing and developing new planning mechanisms in the County. Specific documents that the HMP Planning Committee will actively incorporate information from include:

- **Plumas County Building / Development Codes and Ordinances:** The 2013 Plumas County HMP will provide information to enable the County to make decisions on appropriate building/development codes and ordinances. Appropriate building codes and ordinances can increase the County's resilience against natural disasters.
- **Plumas County EOP**: The 2013 Plumas County HMP will provide information on risk and vulnerability that will be extremely important to consider and incorporate into the County's EOP. Probability and vulnerability can direct emergency management and response efforts.
- **Plumas County GP**: The 2013 Plumas County HMP will provide information that can be incorporated into the Land Use and Public Safety Elements during the next GP update. Specific risk and vulnerability information from the HMP can help to identify areas where development should not take place.
- **Plumas County Community Wildfire Protection Plan (CWPP):** The 2013 Plumas County HMP highlights wildfire areas of concerns in Plumas County. Suitable mitigation actions contained in the HMP can be included in the CWPP.
- **Plumas County Capital Improvement Plan (CIP):** Projects identified in the HMP can be included in the annual Capital Improvement Plan.

7.5 *Continued Public Involvement*

During the five year development (2013-2018) of the HMP, the HMP Planning Committee will involve the public during the monitoring, evaluating and updating process of the HMP through various public workshops and meetings. Information on upcoming public events related to the HMP or solicitation for comments will be announced via newsletters, newspapers, mailings, and on the County website (http://www.countyofplumas.com/index.aspx?NID=2214). An electronic copy of the current HMP document will be accessible through the Plumas County website, with a hard copy available for review

at the Plumas County Office of Emergency Services. The HMP Planning Committee will incorporate all relevant comments during the next update of the HMP.

During the development of this HMP, there was a "fair" amount of public involvement despite the efforts to engage the public. At the Public Workshop meeting in May 2013, the HMP Consultant Team asked booth attendees to provide feedback and ideas to improve public involvement during the HMP maintenance and update process. The HMP Planning Committee will, as much as practicable, incorporate the following feedback and ideas into its public outreach strategy to ensure continued public involvement in the HMP planning process.

- Collaborate with Plumas County Disaster Council and Shelter
- Collaborate with public service clubs, i.e., Lions, Rotary, Moose, etc. and other NGOs, such as SVOAD, Chambers of Commerce, etc., to get information to participants/members
- Collaborate with County places of worship to get information to congregants
- Create story ideas for media outlets, such as newspapers, local radio, and TV, that tell the message in an interesting way and disseminate information
- Send emails and postcards/mailers to County residents about hazard mitigation
- Post meeting announcements at coffee houses, libraries, shopping malls and centers, etc.
- Involve CERTs and other Citizen Groups
- Educate and collaborate with homeowners associations and Board of Realtors
- Piggy back on other existing local community meetings
- Distribute information through K-12 schools
- Continue to use County websites and the Hazard Mitigation Webpage to push information about the Plumas County HMP.

Section 8. Works Cited

ABAG. *Bay Area Dam Failure Inundation Hazards.* July 29, 2011. http://www.abag.ca.gov/bayarea/eqmaps/damfailure/damfail.html (accessed August 11, 2011).

ABAG. *Taming Natural Hazards.* Association of Bay Area Goverments, 2010.

CA Fire Alliance. "The California Fire Alliance." CA Fire Alliance, n.d.

Cal EMA. "State of California Multi-Hazard Mitigation Plan." 2010.

CAL FIRE. *Wild Fire Incident Information.* 2011. http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=281 (accessed August 8, 2011).

Carl M. Wentworth, Scott E. Graham, Richard J. Pike,Gregg S. Beukelman, David W. Ramsey, and Andrew D. Barron. "SUMMARY DISTRIBUTION OF SLIDES AND EARTH FLOWS IN THE SAN FRANCISCO BAY REGION, CALIFORNIA." 1997.

Congressional Research Service . *Considerations for a Catastrophic Declaration: Issues and Analysis .* Congressional Research Service , Washington: Congressional Research Service , 2011, 27.

Crovelli, J.A. Coe and R.A. "Landslide risk in the San Francisco Bay region." 2008.

FEMA. *About the National Dam Safety Program .* August 11, 2010. http://www.fema.gov/plan/prevent/damfailure/ndsp.shtm (accessed August 2011, 2011).

Lassen County. "Lassen County Multi-Jurisdictional Hazard Mitigation Plan." Hazard Mitigation Plan, March 2010.

Los Angeles Times. *Vacaville Blaze Spreads; More Homes Threatened.* Los Angeles, September 20, 1988.

National Park Services. *Volcanoes / Lava Flows.* n.d. http://www.nps.gov/lavo/naturescience/volcanoes.htm (accessed June 2, 2013).

National Weather Service. 2011.

Plumas County. *2035 Plumas County General Plan Update, Draft EIR.* EIR, Quincy, CA: Plumas County, 2012.

Read Sturgess and Associates. *Victorian Rapid Appraisal Method (RAM).* Victoria, Australia, 2000.

U.S Census Bureau. June 3, 2011. http://quickfacts.census.gov/qfd/states/06/06095.html (accessed August 4, 2011).

University of California Agricultural Issues Center. "The Economic Roots of Solano County Agriculture." 2007.

USGS. 2009.

USGS. "Landslide Types and Processes." http://pubs.usgs.gov/fs/2004/3072/pdf/fs2004-3072.pdf, 2004.

Weather Channel. 2011.

Appendix A.

Appendix B.
Planning Process Documentation

B.1 Steering and Planning Committee Meetings

B.2 Website Snapshots

B.3 October Risk Assessment Workshop

B.5 Stakeholder and Public Comments

B.1 Steering and Planning Committee Meetings

B.2 October Risk Assessment Workshop

B.3 Website Snapshots

B.4 Stakeholder and Public Comments

Appendix C.
Risk Assessment Documentation

C.1 DWR Quick Guide

C.2 DWR General Safety Plan Element Review Crosswalk

C.1 DWR Quick Guide

C.2 DWR General Safety Plan Element Review Crosswalk

Appendix D.
Mitigation Strategy

D.1 Plumas County HMP Mitigation Action Survey

D.2 Mitigation Action Table

D.3 Detailed Implementation Strategy Worksheets

D.1 Mitigation Action Table

D.2 Detailed Implementation Strategy Worksheets

Appendix E.
Plan Maintenance

E.1 Annual HMP Review Questionnaire

E.2 HMP Mitigation Action Progress Report

E.1 Annual HMP Review Questionnaire

E.2 HMP Mitigation Action Progress Report