



**Natural
Hazard Mitigation Plan**

LAKE COUNTY, CALIFORNIA
Natural Hazard Mitigation Plan



Prepared For:

Lake County Office of Emergency Services

Prepared By:

Gregg Smith

Fire Chief – OES Coordinator, retired
Emergency Management Planner



February 2005

TO: Officials, Employees, and Citizens of Lake County

RE: Commitment To Creating A Disaster Resistant County

The preservation of life, property and the environment is an inherent responsibility of local, state, and federal government. The County of Lake has prepared this Hazard Mitigation Plan to ensure the most effective and economical allocation of resources for protection of people and property prior to the onset of a natural or technological disaster.

While no plan can completely prevent death and destruction, good plans carried out by knowledgeable and well-trained personnel, can and will minimize losses. The plan establishes the priorities for future mitigation actions to begin the process of making the County of Lake a disaster resistant community.

The objective of this plan is to incorporate and coordinate the best possible approaches to mitigation from our four major threats, flooding, wildfire, earthquakes and technological hazards, so these approaches can be rapidly and effectively applied as resources become available to conduct these mitigation programs and measures. By implementing, over time the process and programs outlines in this plan, it will greatly enhance the survivability of key facilities and the ability of response personnel of the county in responding effectively to any emergency. This mitigation plan is an extension of the *California State Hazard Mitigation Plan*. It will be reviewed and exercised periodically and revised as necessary to meet changing conditions.

The Lake County Board of Supervisors gives its full support to this plan and urges all officials, employees, and the citizens, individually and collectively, to do their share in the total disaster mitigation effort of the County of Lake.

This letter promulgates the County of Lake Hazard Mitigation Plan, constitutes the adoption of the plan as a standing annex to the Lake County Emergency Operations Plan that repetitive and avoidable disaster loss must be prevented to make all communities disaster resistant. This mitigation plan becomes effective on approval by the Board of Supervisors.

Sincerely,

**Chairman
Board of Supervisors**



RESOLUTION NO: _____

RESOLUTION OF THE BOARD OF SUPERVISORS OF THE COUNTY OF LAKE, STATE OF CALIFORNIA APPROVING THE DISASTER MITIGATION ACT 2000, COUNTY OF LAKE NATURAL HAZARD MITIGATION PLAN

WHEREAS, the Lake County Office of Emergency Services has drafted a hazard Mitigation Plan to advance better mitigation planning and projects for the County of Lake; and

WHEREAS, County agencies, special districts, public organizations and the Governor's Office of Emergency Services has contributed to this planning process under the guidelines of the Federal Disaster Mitigation Act of 2000; and

WHEREAS, The Board of Supervisors has read and agrees to abide by the Federal Disaster Mitigation Act 2000 guidelines and this Plan represents the compliance with same;

NOW, THEREFORE, BE IT RESOLVED that the plan entitled "The Lake County Natural Hazard Mitigation Plan" is formally adopted as the county plan and road map to a more disaster resistant community.

The forgoing resolution was introduced by Supervisor _____, who moved its adoption, seconded by Supervisor _____, and adopted on roll call by the following vote:

Adopted by the Board of Supervisors of the County of Lake, State of California, at a regular meeting of said Board of Supervisors held on the _____ day of _____, 2005 by the following vote:

***SAMPLE RESOLUTION AS OUTLINE BY THE
FEDERAL EMERGENCY MANAGEMENT AGENCY***

NATURAL HAZARD MITIGATION PLAN

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SECTION ONE INTRODUCTION

Lake County lies within the Pacific Coastal mountain ranges approximately one hundred miles north of San Francisco, ninety miles northwest of Sacramento, and thirty-five miles east of the Pacific Ocean. Lake County is surrounded by Mendocino County to the west, Yolo, Colusa, and Glenn counties to the east, and Sonoma and Napa counties to the south. The major roadways that traverse the County include State Highways 20 which joins up with Highway 101 and Interstate 5, and State Highways 29, 53, and 175.

The history of Lake County centers on Clear Lake. Clear Lake may very well be the oldest lake in North America as scientific evidence has proven the lake to be at least 500,000 years old. The entire region in Lake County took shape from volcanic action and a landslide created Clear Lake's current form thousands of years ago that blocked the broad valley's drainage west into the Russian River. The water rose until it found a new outlet, Cache Creek, which drains eastward into the Sacramento River. Four thousand years before the rise of Egyptian civilization, the Pomo Indians were hunting, fishing, and collecting plant foods on the shores of Clear Lake. The lake yielded an abundance of fish, as well as tule reeds from which they made clothing, boats, dwellings, and household items.

In the 1850's, the first European families found their way to Lake County; the first of these settlers lived near what is now the community of Kelseyville. Farming and ranching grew rapidly and toll roads began climbing over the mountains in the 1860's, bringing settlers in increasing numbers. Lake County was set off from Napa County on May 2, 1861, ten years following the 1850 admission of California Statehood into the Union and the establishment of the 27 original California Counties. Lakeport was made the county seat.

Today, with 144 years of passage, the permanent population of Lake County remains low with 61,970 compared to surrounding counties that have experienced tremendous levels of growth in the past decade. During peak tourist season, from Memorial Day to Labor Day, the average daily population may reach 250,000. The economy is based on agriculture and tourism. Lake County is 1269 square miles with approximately half managed by the U.S. Forest Service (252,794 acres) and the Bureau of Land Management (123,035 acres).

Lake County is subject to flooding, wildland fires, severe weather conditions, landslides and earthquakes. It is essentially impossible to predict exactly when such disasters will occur. It is also impossible to gauge the extent of damage, the extended cost of that damage, or the degree to which the County will be affected.

What is certain is that these natural hazards will happen. Natural disasters highlight the County's past and they will continue to occur in the County's future. Nonetheless, with prudent and thorough planning, cooperation among County, state, and federal agencies, partnership with private sector organizations, and an informed citizenry, losses from natural disasters can be minimized.

Historical state records have shown that Lake County has declared fourteen local proclamation of emergencies accompanied with a Governor's State of Emergency and Presidential Disaster Declaration from 1950 through 1997. Local emergencies have included flooding (9), interface wildland fire (1), extreme drought conditions (1) and severe winter storm/weather conditions (3). State records of February 1986 floods indicate that Lake County suffered damage to an estimated 500 residences and 50 commercial facilities over a ten-day period from an estimated twenty inches of rainfall. The wake of the winter storm series left \$6,720,750 in private property damages, \$5,000,000 in public facilities damage, catapulting losses to the County with an estimate of \$11,750,000 in combine damages.

In August 1996, the Mendocino National Forest "Fork Fire" consumed 83,000 acres with the loss of eleven structures and threatened the communities of Upper Lake, Nice, and Lucerne. During this firestorm's two-week period, the air quality in the county was severally jeopardized with haze formation and smoke intrusion exposure.

Could damages have been less extensive if a natural hazard mitigation plan was present? Could government more effectively respond to natural hazards, when they occur in the future with a natural hazard mitigation plan in place and functioning? "Yes." This is the purpose of the following Natural Hazards Mitigation Plan for Lake County.

What is natural hazards mitigation?

Natural hazard mitigation is the development and implementation of actions intended to diminish or eliminate losses sustained as a result of natural hazard. The rising cost of natural disasters has led to a renewed interest in identifying effective ways to reduce vulnerability to such disaster events.

Why develop a natural hazards mitigation strategy?

Natural hazard mitigation planning will assist Lake County and its rural communities in reducing risk from natural hazards by identifying resources, information, and strategies from risk reduction, while helping to guide and coordinate mitigation activities throughout the County. This mitigation plan provides a set of action items to reduce hazards through public awareness programs, the development of partnerships, and implementation of preventive activities. This Hazard Mitigation Plan works in conjunction with the Lake County General Plan, the Floodplain Management Plan, the Emergency Operations Plan (EOP) and specific Contingency Emergency Response Plans.



This Hazard Mitigation Plan affects unincorporated areas in the County. While this plan does not establish requirements for the City of Lakeport and City of Clearlake, it does provide them with a framework for planning for natural hazards. The resources and background information in the plan is applicable countywide, and the goals and recommendations can lay groundwork for local mitigation plans and partnerships. This Lake County Natural Hazards Mitigation Plan (NHMP) is developed as a tool for realizing three intertwined goals:

1. Identifying natural hazards that potentially threaten the County.
2. Minimizing or eliminating the effects of these identified natural hazards.
3. Reducing the prospective costs of reparations before any natural disaster takes place.

What are the benefits of hazard mitigation?

There are many benefits to be realized in the creation and implementation of a natural hazards mitigation plan.

- ❑ **Save lives and property protection:** The County can save lives and reduce the amount of property damage by mitigating the effects of natural hazards. For example, the County can identify areas with high threat potentials from natural hazards, using zoning ordinances to guide the development of these properties, and subsequently facilitate a safer County for its citizens and their possessions.
- ❑ **Reduce impact of future disaster events:** By identifying natural hazards before they happen, the County can effectively plan for natural hazards and mitigate the damaging influences of natural hazards. Natural disasters are going to occur. This plan's goal is to reduce their effects.
- ❑ **Enable post-disaster funding:** In the past, federal public law has provided funding for disaster relief, recovery, and some hazard mitigation planning. With the federal Disaster Mitigation Act of 2000, the importance of natural hazard mitigation is reinforced as a primary tool in local and state natural disaster response preparedness. As such, this Act requires that an approved mitigation plan be in place prior to receiving any post-disaster Hazard Mitigation Grant Program funds. Lake County's NHMP will fulfill this requirement.
- ❑ **Hasten recovery from disasters:** In the development of hazards mitigation strategy, Lake County will be better prepared to react, respond, and recover from a future natural disaster by knowing in advance particular mitigation measures appropriate in post-disaster response scenarios.

- ❑ **Demonstrate a dedication to improving the County’s safety and well being:**
By having a natural hazard mitigation plan in place, the citizens of Lake County can rest assured that the County is committed to safeguarding the people and their possessions from unforeseen future natural disasters.

Who does the natural hazards mitigation plan benefit?

The Lake County NHMP was developed, written, and adopted as a jurisdictional planning document. In that there are two incorporated cities within Lake County, the primary recipients of the benefits of this plan are the citizens of the unincorporated areas of Lake County. It is anticipated that the various special districts located within Lake County will also benefit from this plan, the knowledge it provides, and the future natural hazard mitigation funding the plan enables. The information within this plan is generally applicable to the entire County. This information provides a framework for natural hazard mitigation within Lake County and is the primary natural hazard mitigation document for the County, plan participants, and plan stakeholders.

The *Lake County Natural Hazard Mitigation Plan* satisfies the federal public law. The Disaster Mitigation Act of 2000, and the requirement for local governments to formulate and enact a pre-disaster mitigation program in order “to identify the natural hazards that impact them, to identify actions and activities to reduce any losses from those hazards, and to establish a coordinated process to take advantage of the plan, taking advantage of a wide range of resources” (44 CFR, sec. 201.1). The Lake County NHMP is a “commitment to reduce risks from natural hazards and serves as a guide for decision makers as they commit resources to reducing the effects of natural hazard, {acting as a} basis for the State to provide technical assistance and prioritize project funding” (44 CFR, sec. 201.6).

Documentation of the Planning Process

On October 30, 2000, the president of the United States signed into law the Disaster Mitigation Act of 2000 (DMA 2000). The DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by adding a new section, 322 – Mitigation Planning. Section 322 placed a new emphasis on the importance of local hazard mitigation planning, and required local government to develop and submit hazard mitigation plans. In response to this requirement, The Lake County Office of Emergency Services was designated as the lead agency for preparation of the Lake County NHMP. In May 2004, the Lake County Office of Emergency Services began requesting information towards preparing the plan document. On September 16, and September 30, 2004, the Office of Emergency Services conducted two natural hazard mitigation plan meetings to solicit input and identify plan participants from various local government agencies. During the months of May through September 2004, a series of requests for information was made for natural hazard identifications, historical disaster background, research conducted and strategy developed in writing an effective natural hazard mitigation plan for Lake County.

In September 2004, an information planning team was established, comprised of key county departments, special districts, and other local government representatives in developing the plan. In October and November 2004, in conjunction with additional meetings and specific site visitation to high-risk areas, mitigation goals, objectives and actions were identified for each natural hazard. In November 2004, the information gathered over several months was assembled into the Lake County plan.

Public Input and Community Meetings

Lake County Sheriff's Department/Office of Emergency Services engaged the public in the NHMP planning process. From February 15, 2005 through February 17, 2005, three open public evening meetings were conducted throughout the County. The first public hearing was held in Lakeport, the second held in the Clearlake, and the third in Middletown. The draft NHMP was handed out and reviewed by the public attendees, with an open "Question and Answer" period following the review. Further, the attending public was given a handout "Natural Hazard Probability-Risk Assessment Rating Form" to be completed by each individual attendee. The form was then collected and is included into the overall Natural Hazard Rating Table on page 67 of this Natural Hazard Mitigation Plan.

Plan Development

The following is a list of organizations, departments and individuals who were instrumental in the providing information for the Lake County NHMP. Information in the mitigation plan is based on interviews, research and review of information from a variety of sources. The research methods and various contributions to the plan included several meetings and document reviews. Public and private source of information was obtained from the following:

- Lake County Office of Emergency Services
- Lake County Sheriff's Department
- Lake County Fire Safe Council
- Lake County Administrative Office
- Lake County Public Services Department
- Lake County Community Development Department
- Lake County Public Works Department
- Lake County Health Services Department
- Lake County Air Quality Management District
- Lake County Special Districts Administration
- Lake County Information Technology Department
- Lake County Department of Agriculture
- Lake County Museum-Lakeport
- Lake County Heritage Commission
- Lakeport Regional Chamber of Commerce
- Lake County Visitor Information
- Lake County Marketing & Economic Development
- Lake County Farm Bureau
- Hidden Valley Homeowners Association
- North Coast Emergency Medical Services Agency
- Yolo County Flood Control & Water Conservation District
- California Department of Forestry & Fire Protection
- California Governor's Office of Emergency Services
- California Highway Patrol
- California Division of Mines and Geology
- California State Parks
- Pacific Gas & Electricity – PG&E
- Federal Emergency Management Agency
- Mendocino National Forest – U.S. Forest Service
- Federal Bureau Land of Management
- U.S. Bureau of Reclamation
- U.S. Geological Survey
- U.S. Weather Services

Lake County Natural Hazard Mitigation Plan Participants

Mary Jane Fagalde, Director
Community Development Department
255 N. Forbes Street
Lakeport, CA 95453
Telephone: 707-263-2382
Fax: 707-263-5843

Caroline C. Chaves, Deputy Director
Public Services Department
333 Second Street
Lakeport, CA 95453
Telephone: 707-262-1760
Fax: 707-262-0973

Ed Townley, Deputy Director
Public Works Department
255 N. Forbes Street
Lakeport, CA 95453
Telephone: 707-263-2341
Fax: 707-263-7748

Thomas R. Smythe
Water Resources Engineer
Public Works Department
255 N. Forbes Street
Lakeport, CA 95453
Telephone: 707-263-2341
Fax: 707-263-7748

John D. Thompson, SMOM Coordinator
Special Districts Administration
230 A Main Street
Lakeport, CA 95453
Telephone: 707-263-0119
Fax: 707-263-3836

Alex Straessle
Assistant Water Resources Engineer
Public Works Department
255 N. Forbes Street
Lakeport, CA 95453
Telephone: 707-263-2341
Fax: 707-263-7748

Douglas Gearhart, Air Quality Engineer
Air Quality Management District
885 Lakeport Blvd
Lakeport, CA 95453
Telephone: 707-263-7000

Raymond Ruminski, Director
Environmental Health Division
Health Services Department
922 Bevins Court
Lakeport, CA 95453
Telephone: 707-263-1164
Fax: 707-263-1681

Lon Sharp, GIS Specialist
Information Technology Department
255 N. Forbes Street
Lakeport, CA 95453
Telephone: 707-263-2287
Fax: 707-263-2548

Willie Sapeta
Emergency Services Assistant
Office of Emergency Services
Sheriff's Department
1221 Martin Street
Lakeport, CA 95453
Telephone: 707-262-4091
Fax: 707-262-4220

Sgt. David Garzoli
Emergency Services Coordinator
Sheriff's Department – Office of Emergency Services
1221 Martin Street
Lakeport, CA 95453
Telephone: 707-262-4090

Local Capability Assessment

California Law requires each County and City to adopt a comprehensive long-term General Plan and supporting land use ordinances. The process for developing a general plan has evolved since mid-1950 in California as a result of requirements guided by a combination of state mandates through legislation and regulatory requirements through the California Code of Regulations. California Government Code requires the General Plan to address planning issues for Natural Hazards, calling for local plans to include inventories, policies, and ordinances to guide development in identified hazard areas along with other land use planning goals. Lake County already has a meaningful foundation of codes and ordinances in place to use as guidance within implementation of a natural hazard mitigation strategy. Of primary importance is the Lake County General Plan adopted in 1981, the General Plan is the principal guiding document of the County.

The plan acts as the template for future long-term development of Lake County. The information in the General Plan is the basis for any land use decisions, providing the framework to successfully convert community values and visions into actual realities. The California Environmental Quality Act (CEQA) ensures those actual realities are in harmony with the environment of the County. CEQA legislation acts as the environmental guide to appropriate development, development designed to be in harmony with the natural beauty of this northern California rural County.

Although Lake County's rural atmosphere, small population and limited funding base is a handicap to aggressive implementation of natural hazard mitigation projects, funding sources are still available to assist the County in accomplishing its natural hazard mitigation goals. Wherever feasible and possible, Lake County will pursue funding sources in an effort to complete the actions of this plan, bring the County to safer levels and eliminating dangerous consequences related to natural hazard incidents.

Within the Lake County Community Development Department, all construction within the County must meet or exceed the 2001 edition of the California Building Standards Code, known as the California Code of Regulations (CCR), Title 24. Incorporated within this code are the Uniform Building Code (UBC), Uniform Mechanical Code (UMC), National Electrical Code (NEC), Uniform Plumbing Code (UPC), Uniform Fire Code (UFC), Uniform Housing Code (UHC), Uniform Abatement of Dangerous Buildings Code (UADBC) and National Fire Protection Standards (NFPA).

The Lake County General Plan, CEQA, and County Building Standards, as well as many other county ordinances, state and federal mandates, all act as the platform from which effective natural hazards mitigation planning is coordinated. The County Hazard Mitigation Plan (NHMP) will function in conjunction and agreement with the pre-existing ordinances.

California State Support for Natural Hazard Mitigation

All mitigation is local, and the primary responsibility for development and implementation of risk reduction strategies and policies lies with the Lake County Board of Supervisors. Local jurisdiction, however, is not alone. Partnerships and resources exist at the state and federal levels. Numerous California state agencies have a role in natural hazards and hazard mitigation. Some of the key state agencies include:

- **California Governor's Office of Emergency Services (OES)**

Is responsible for disaster mitigation, preparedness, response, recovery, and the administration of federal funds following a major disaster declaration. Legal mandates are under the California Emergency Services Act and California Natural Disaster Assistance Act. (California Government Code)

- **California Department of Forestry and Fire Protection (CDF & FP)**

Is responsible for all designated State Responsibility Lands (SRA) wildland fire control management, natural resource protection, and fire safe standards enforcement under the California Public Resource Codes and Title 14, California Code of Regulations.

- **California Division of Mines and Geology**

Is responsible for geologic hazards characterization and classifying active or potentially active seismic hazards according to the Alquist-Priolo Special Studies Act of 1972.

Mitigation Plan Organization

The plan is divided into three separate sections. Each section of the plan provides information and resources to assist in understanding the county and the hazard related issues facing citizens, businesses, and the environment. Combined, the sections of the plan work together to create a document that guides the mission to reduce risk and prevent loss from future natural hazard events.

The Hazard Mitigation Plan is organized into the following:

- ***Section One: Introduction***

The first section is introduction to and overview of Lake County and the natural hazards that affect the County. This section acts as a primer to natural hazard mitigation, providing definition of what natural hazard mitigation is, justification for the creation of a natural hazard mitigation plan, and a set of goals that might be realized as a result of enacting the Lake County NHMP. Section One also documents the planning process and includes a local capabilities assessment.

- ***Section Two: Jurisdictional Risk Assessment***

Section Two is a natural hazards identification and risk assessment for Lake County and participating jurisdictions within this jurisdictional planning document. Potential losses are analyzed and future development trends examined as part of this section.

- ***Section Three: Risk Assessment***

Section Three is the natural hazard mitigation strategy portion of the plan. This section includes a prioritization process in which natural hazards are rated. From the rating, mitigation measures for Lake County and all participating jurisdictions within the County are ranked. Implementation of mitigation strategies is discussed, as is the plan maintenance process.

SECTION TWO JURISDICTIONAL RISK ASSESSMENT

Lake County has identified several natural hazards that are examined and addressed within this Natural Hazards Mitigation Plan. These hazards were identified through several avenues of research. The first method utilized input from community members involved in the plan process. These members included individuals from participating jurisdictions, interested stakeholders, concerned citizens, and community organizations. Second, a thorough investigation was undertaken, incorporating data from numerous local, county, state and federal agencies. Third, governmental support from the California Governor’s Office of Emergency services (OES) and the Federal Emergency Management Agency (FEMA) was utilized. The OES Hazard Mitigation Branch, with information, guidance, and supervision provided invaluable aide. Written plan guides, on-line support, and personal assistance served as a major ingredient in the plan-writing process. FEMA guides and website support also provided important resource information.

In addition, the Lake County Community Development Department, Public Services Department and the Public Works Department provided in-depth support and coordination during the investigation and identification phase into natural hazards of Lake County.

- Declared Local Proclamation of Emergency

The following is a historical overview of Lake County’s declared emergencies within the last 25 years. This information is use in developing Emergency Operation Plans, Contingency Plans, Emergency Operational Guidelines, and Hazard Mitigation Planning.

February 1980	Flooding
March 1983	Flooding
February 1986	Flooding
August 1988	Drought Conditions
February 1993	Flooding
January 1995	Flooding
March 1995	Flooding
August 1996	Wildland Interface Fire-Fork Fire
January 1997	Flooding
February 1997	Flooding
February 1998	Flooding
January 1999	Flooding

June 2001

Extreme Weather Conditions-Agriculture Damage/Loss

WILDLAND FIRE

Wildland fire is perhaps the most dangerous natural disaster threat in Lake County. The potential for a large destructive wildland interface fire is considered to be extremely high.

California has a natural wildland fire potential that is found nowhere else on earth. The combination of highly flammable vegetation, long dry summer months, rugged topography, and humans who live, work, or conduct recreational activities in the wildlands adds up to a situation that results in several thousand wildfires annually throughout the State. Dependent upon local fire weather conditions, wildland fires can and do occur in any month of the year throughout California. Wildland fires are started by two general conditions: *Lighting and Humans*. Humans are responsible for 9 of 10 wildland fires. Miscellaneous agents unrelated to human cause a few fires. Once started, wildland fires burn according to a set of chemical and physical laws. Those factors most important to fire behavior are fuel; (in the form of wildland vegetation) plus structural improvements (residential and commercial), topography, and weather conditions.

Most wildland fires are controlled within the first few hours by the California Fire Services system that includes local government, state and federal fire protection agencies. A few wildland fires escape initial attack control efforts and become large and destructive, causing significant loss to natural resources, life and property. These few wildland fires often occur within a small number of critical days each year when air temperature rises to over 100 F degrees, relative humidity drops to near zero, and hot dry north or east winds blow at high velocities. Wildland fires burning under these conditions have two characters in common: *Rapid Spread and High Intensity*. (Example: high rate of heat energy output). Fire spread may catapult flaming embers several miles ahead of the main fire front engulfing structures or large numbers of homes in rural subdivisions or around the perimeters of urban communities.

Lake County history shows that there have been several major wildland interface fires. In fall of 1961, the Cobb Mountain area lost 9,000 + acres along with several structures. In the fall of 1964, the south county region again was subject to a 52,000 acre fire known as the Hanley Fire that started near the Lake-Napa County lines northwest of the City of Calistoga. This wildland fire ultimately burned to the city limits of Santa Rosa approximately 40 miles southwest. This same year, a 15,000 area wildland fire started at the county dump and threatened the community of Middletown. In the fall 1968, the Lower Lake area was subject to a 10,000 acre wildland fire. In 1981, the Lang Peak Fire consumed 11,000 acres. In 1982, the Cow Mountain Fire travel eastward from the Bureau of Land Management (BLM) lands near the City of Ukiah in Mendocino County and burnt to the foothills near the City of Lakeport. In 1985 a wildland interface fire burned through the Hidden Valley residential community, leaving major property damage

and loss of structures in its weak. In 1989, east of the Clearlake area the 8,000 acre Eagle Fire burned along State Highway 20.

In 1996, the Fork Fire consumed over 82,000 acres and threatened the Upper Lake and Nice communities. This wildland interface fire started in the Mendocino National Forest southern boundaries. On July 9, 1953, fifteen (15) fire fighters lives were lost to the Rattlesnake Canyon Fire in the Mendocino National Forest. The Rattlesnake Fire history served as the base for a best selling book titled: *Fire and Ashes, Authored by John N. Maclean, 2003*. In September 2003, thunderstorm activity from a former Pacific Ocean Hurricane produced hundreds of lightning strikes throughout the Mendocino National Forest and Lake County areas. The largest wildland interface fire of 4,000 acres was just south of the Hidden Valley Community.

Most recently, September 4th through September 9th, 2004 a 12,500-acre wildland fire threaten the Middletown area. The interface fire started under extreme weather conditions of hot dry north winds in Lake County off of Socrates Mine Road. The dry north winds carried the fire from Lake County southwest into Sonoma County. On September 6th, the southwest dry winds moved the fire north back into Lake County threatening Cobb Mountain and Middletown areas.

Hazard Assessment

The severity of wildland fire hazards exist in varying degrees over approximately ninety (90%) percent of Lake County. Critical fire weather extends approximately 5 to 6 months from late spring to fall with periods of relative low humidity, high heat and high winds.

- General Climate

Lake County's climate is typical of California's coastal range areas. The summer climate is dominated by semi-permanent high-pressure area centered over the eastern Pacific Ocean. Precipitation is minimal during the summer because of persistent airflow from northwest causes by the position of the Pacific high and California's central valley low. Fog and low clouds are created by northwest winds transporting air over cold offshore water. Summer fog occurs most frequently in the low areas near Clear Lake, and on some occasion's, marine air and high fog intrusion penetrates from the Pacific Ocean 35 miles from the west through neighboring Mendocino County and from the south through Sonoma and Napa Counties. In the winter the Pacific high moves south, allowing winter storms to bring frequent precipitation and lower temperatures. Heaviest precipitation occurs from November to April.

- Wind

Lake County generally comes from the west and southwest. Wind speeds range from less than 20 km/hr up to 35 km/hr during the summer and early autumn seasons. During the

winter southerly winds averaging more than 35 km/hr bring precipitation. In summer months wind flow from the Pacific Ocean in the afternoon toward low-pressure zones created by the differential manner in which the sun heats surface waters and land. Summer afternoon winds are stronger in the southern county zones than the north county zones due to relative few topographic obstructions.

- Temperature

Pacific Ocean marine airflow has a profound influence on dry season temperatures in Lake County. Traditionally, California coastal interior mountain zones remain cool, as do the many east-west trending valleys. However, inland zones not subject to marine airflow influences have temperatures that exceed over 100 F degrees.

<i>Temperature Averages:</i>	<i>Highs</i>	<i>Lows</i>
January – March	60	32
April – June	80	48
July – September	95	57
October – December	65	44

Vegetation growing seasons are a function of temperature measured by length of time between the first and last frost. Growing seasons range from approximately 230 to 260 days within the Clear Lake basin, to approximately 200 days in mountainous zones. Precipitation during the winter consists mainly of rain, although snowfall occurs in the mountain areas. Mountains near the coastal zone receive the heaviest precipitation. Average rainfall in Lake County is 25 inches in the Clear Lake basin, 45 inches in the south county Middletown area to 60 inches in the Cobb Mountain 4,720’ elevation area. Winter month’s humidity averages: 50%. Summer month’s humidity averages: 30%.

- Natural Fire Hazards

The climatic factors described above create a significant natural fire hazard in much of Lake County. Summer temperatures and the lack of precipitation increase the flammability of the natural vegetation to critical levels. Where vegetation is abundant and slopes are steep, the risk of wildland fire spreading rapidly out of control is especially high. In Lake County a significant percentage of the area is covered with woodland, brush or grasslands except for cultivated and populated lands in the Clear Lake basin.

In the early 1990’s, the California Department of Forestry & Fire Protection (CDF&FP) developed a system to classify fire severity zones throughout California counties. One of the key components in measuring severity is the type and quantity of flammable vegetation within a given unit of land area. This factor, also known as “fuel loading characteristics,” can then be combined with weather and slope to obtain a measure of relative hazard.

The California Department of Forestry & Fire Protection has identified three basic fuel-loading characteristics.

Heavy Fuel: Heavy fuel loading vegetation is assigned to woodland and brushwood areas. This characteristic is generally assigned to vegetation that is six feet or more in height and which has a crown density of 20 percent or more of the ground area. Heavy fuel loading vegetation types include conifers, mixed evergreen timberlands and chaparral, which are found in abundance in the county.

Medium Fuel: Medium fuel loading generally includes scrub vegetation that is less than six feet in height but with similar crown density characteristics. This category includes California sagebrush, coyote brush, manzanita, and other chaparral species common to the county.

Light Fuel: Light fuel loading vegetative types are various types of grasslands, herbaceous rangelands and irrigative pasturelands. These areas are almost completely treeless and, although highly flammable during dry seasons, do not have significant fuel content to sustain any fire that might be started.

- Slope Characteristics

A major characteristic of fire hazard measurement is the degree of slope present in a localized area. The rugged terrain and steep slopes that characterize much of Lake County's rural area can create extreme access problems during firefighting activities once a fire has started. Generally, vegetation is more abundant in steep canyon areas due to less severe sun and wind exposure and greater capture of rainfall runoff. Fires that start in the bottom of canyons will burn sixteen times faster upslope than if it had begun at the top of ridges and burn downslope.

- Developments

Growth and development into wildland interface areas is increasing the number of human-made structures throughout California. Wildfire has an effect on development, yet development can also influence wildfire. Owners often prefer homes that are private, have scenic views, are nestled in vegetation, and use natural materials. A private setting may be far from public roads or hidden behind a narrow curving driveway.

The degree of fire hazard in wildland areas is also greatly dependent on the number of persons whom have access to those areas, as permanent residents or daytime visitors. These conditions, however, make evacuation and fire fighting activities difficult. The scenic view found in Lake County along mountain ridges can also mean areas of

dangerous topography. Natural vegetation contributes to scenic beauty, but it may provide a ready trail of fuel leading a fire directly to the combustible fuels of the structure itself.

Although a significant amount of new residential developments has not occurred in these areas, the access to the developments that have occurred in the past does not always meet the current standards necessary for optimum fire apparatus access. This is true for certain private roads that have been constructed to serve existing developments and several public roads that were accepted into the county road system in like and kind.

- Drought

Concerns about the effects of climate change, particularly drought, are a contributing factor to wildfire vulnerability. The term drought is applied to a period in which an unusual scarcity of rain causes a serious hydrological imbalance. Unusually dry winters, or significantly less rainfall than normal, can lead to relatively drier conditions, and leave reservoirs and water tables lower. Drought leads to problems associated with water supply systems, and may contribute to difficulties in fire suppression. Most fuel types require two to three years of drought before the fuel becomes dangerously dry.

Historically, Lake County and California recorded the worst drought years from 1976 through 1978, impacting agriculture and increased fire suppression activities. The year 1977 was placed into California's recorded history as the second successive dry year of the worst drought California had experienced over a 100-year record keeping system. In the years of 1986 through 1988, drought conditions repeated history, recording those years to be the fourth driest period in California.

- Loss of Services

Depending on the location and size of the wildland fire, utilities, transportation and communication infrastructure could be seriously affected. Overhead power poles and transmission lines could be lost to flame penetration. Underground utilities could be damaged, including transmission cables, gas pipelines, and water delivery systems. Roadways could be closed for an extended length of time, or open on a reduced access schedule. Loss of power will complicate daily routines. Loss of electricity, natural gas and/or propane tank systems can make cooking, cleaning, and heating impossible for many. Electric pumps will not be useful for fire fighting water supply. More catastrophic is the potential loss of residences, structures, and lives if a wildland fire enters community developments. This becomes more and more a possibility as residential developments are built in the rural locations of Lake County.

Probability and Risk

Wildland fires are naturally occurring hazard events that have and will happen in Lake County. The probability and risk of a wildland fire is seasonal in nature, with the greatest potential for a wildland fire during the dry months of summer and early fall. Many

variables combine to dictate the severity of risk for wildland fire occurrence. These considered, there is a ***High to Very High Probability*** of a wildland fire in Lake County, and a ***High Risk*** associated with this natural hazard.

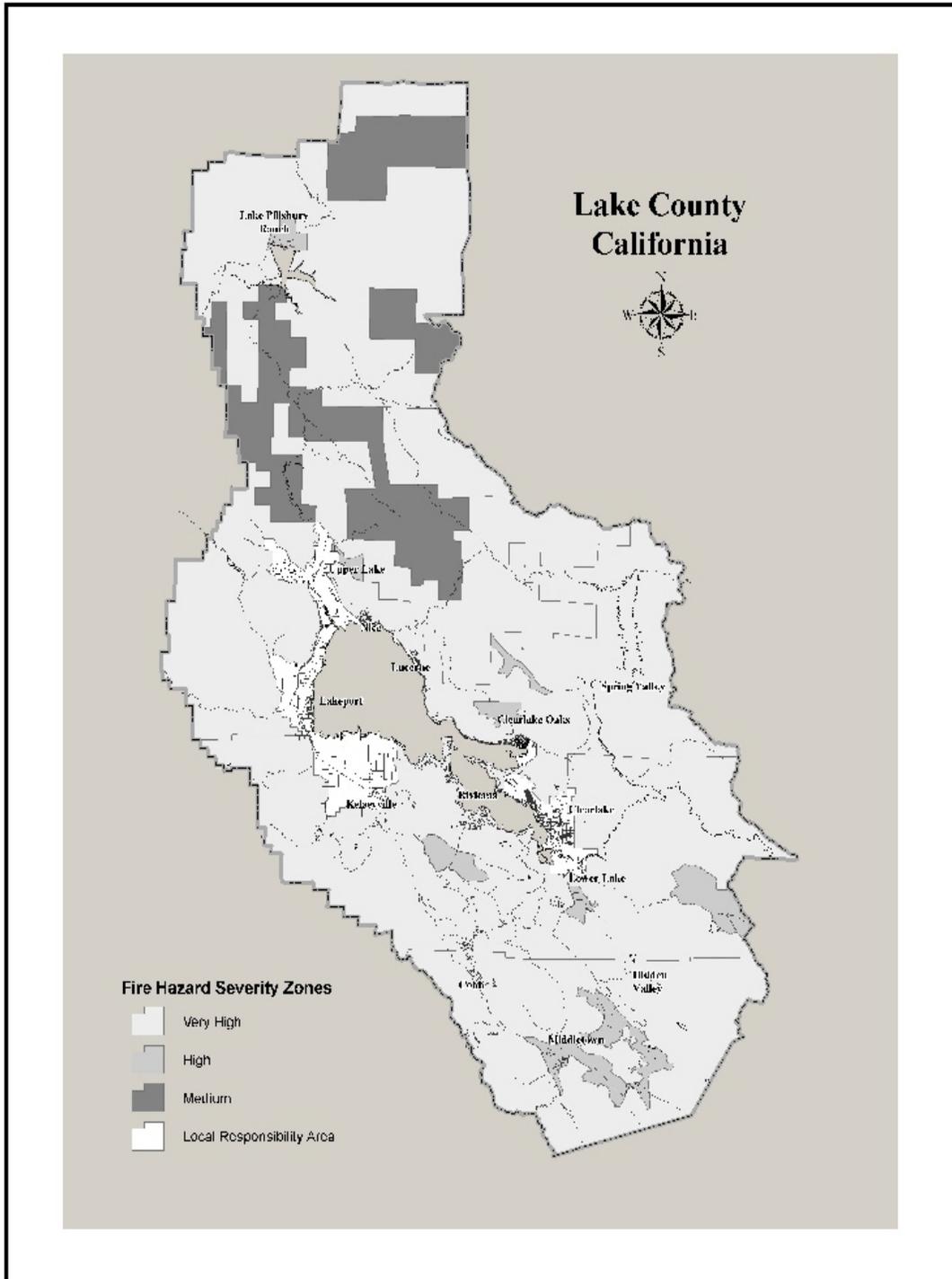
Conclusion

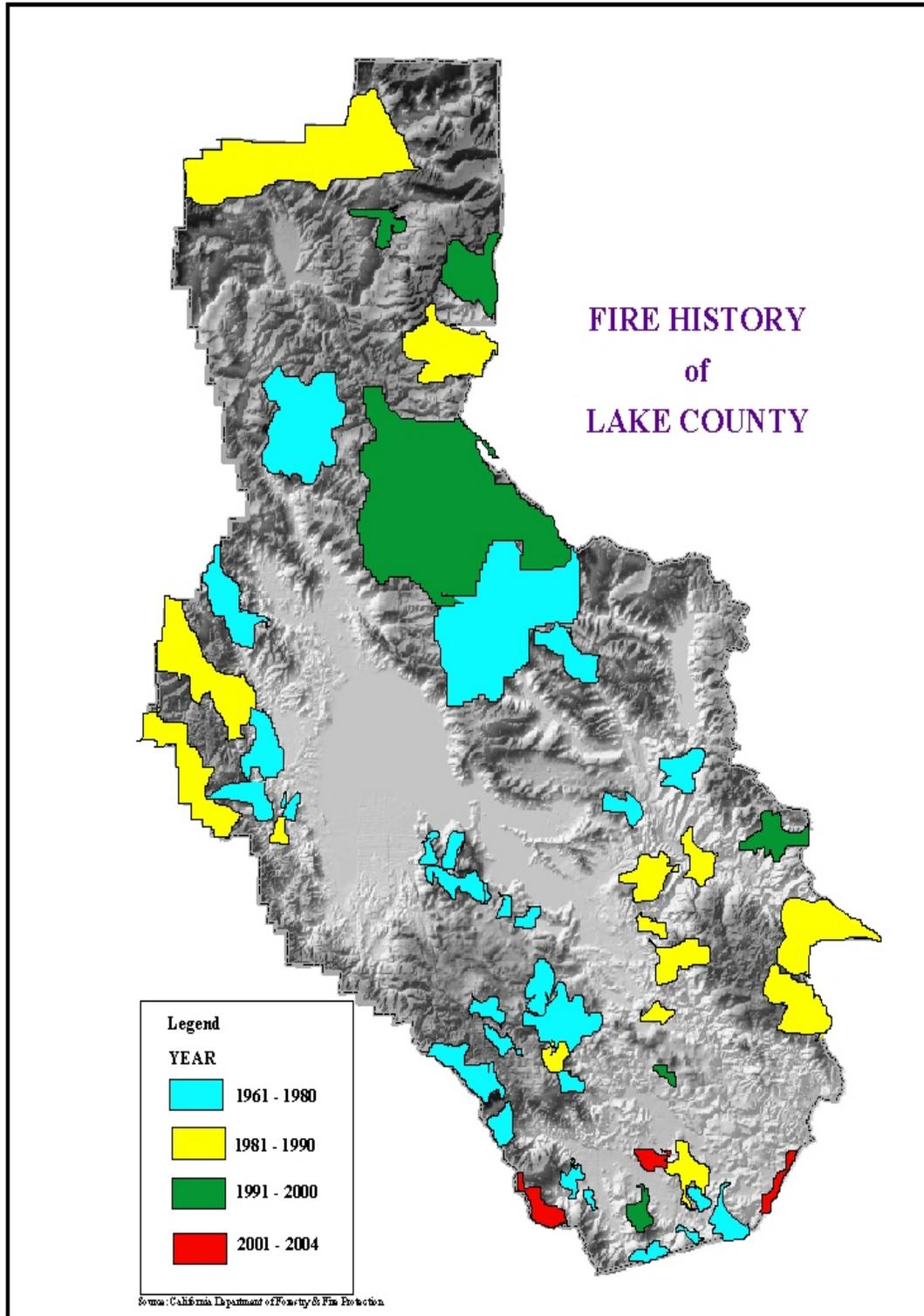
The potential for wildland interface fire increases as residential and recreational developments encroach further into wildlands. Many steps can be taken to reduce this potential loss to life and property by wildfire. Enforcement of proper building fire safe codes; use of green belting (removal of vegetation around structures or replacing with a fire resistant vegetation); prescription burning control fuel load; implementation of fire safe practices, including proper road construction and adequate water systems; and perhaps more important, proper land use planning and zoning.

Lake County citizens have an opportunity to minimize the threat of wildland fire by creating defensible space around structures, which includes appropriate fire resistant landscaping. Use of fire resistant roofing assists in protecting structures from fire penetration. Because of resident's ability to be prepared for the possibility of wildland fire, damage to property and the threat to human life are decreased.

To be able to most effectively address the threats of wildland fires, citizens, families, and businesses should:

- ❑ Have an escape plan, including alternative travel routes.
- ❑ Store extra water for use against wildland fire.
- ❑ Have a battery-operated radio within their home and business.
- ❑ Know the locations for turning off electrical and gas utilities.
- ❑ Develop defensible space around all structures on their property.
- ❑ Consult with fire officials for specific advice and guidelines to protect both their lives and their property.





FLOOD HAZARD

Flooding in Lake County results from heavy rainfall and drainage into the Clear Lake basin, mainly from November through March and can result in major damage to lakeside communities and farmland. Historically, more than fourteen damaging floods have occurred since 1938 with damage to agriculture, commercial, industrial, and residential areas. Utilities, roads, bridges, and surface streets also are subject to damage and require repair and clean up. Since 1980's Lake County residents and businesses have suffered millions of dollars in property damages.

Hazard Assessment

The County of Lake is located within the coastal range of Northern California. Average precipitation in the County ranges from over 80 inches per year in the mountains to less than 25 inches per year at the lower elevations. Precipitation patterns consist predominantly of rainfall, with snow occurring in limited amounts in the higher elevations.

Flooding in Lake County results from prolonged heavy rainfall over tributary areas during the period from November through March. Flooding is more severe either when antecedent rainfall has caused saturated ground conditions or when the ground is frozen in the higher elevations and infiltration is minimal. On rare occasions, melting snow could augment runoff from general rain. Rain flooding on streams is characterized by high peak flows with durations of several hours to several days. On Clear Lake, stage could continue above flood level for weeks. In the northern sector of the county, floods in the Eel River drainage would be extremely rare events and due to the lack of development, damage potential is minimal. The outlets of Lake Pillsbury are normally open during the winter and closed during spring to store for power and irrigation. The channel downstream is capable of containing all high flows that could reasonably be expected.

Flood problems along Cache Creek downstream from Clear Lake are largely confined to the main stem reach in the vicinity of Lower Lake and along the lower reaches of North Fork Cache Creek. In the Putah Creek basin, the principal flood problems are in Coyote and Collayomi Valleys and in Middletown. In general, major floods inundate highly developed agricultural lands and urban-suburban residential and commercial properties and create high lake stages and resultant flooding along lakeshores. Flooding kills or damages orchards, vineyards, and pasture; destroys livestock; keeps land out of production; damages farm and ranch improvements; erodes farmland; damages residential and commercial structures; and overtops and washes out roads, bridges, and flood control improvements. High lake stages result in inundation of orchards, vineyards and pasture, damage to lakeside dwellings and business structures, developed recreational areas, piers, and boats. Damage is widespread and takes many months to repair.

Cloudburst storms sometimes lasting as long as 3 hours can occur, practically anytime in the year and may occur as an extremely severe sequence within a general rainstorm. Cloudbursts are high intensity storms that can produce floods characterized by high peak flows, short duration of flood flows, and small volume of flows substantially larger than those of general rainstorm runoff. Cloudburst storms usually cover small areas. In watersheds of less than seven square miles, a cloudburst could cover the entire drainage area. The Department of Public Works maintains brief synopsis of all the hazard and problem assessments for each of the water bodies with FEMA mapped floodplains. Each area mapped shows floodplain extents.

Clear Lake, its tributaries, and other streams in Lake County have a long history of flooding. Records show that a full lake (7.56-foot stage on the Rumsey Gage) has been exceeded 60 times and flood stage (9-foot stage on the Rumsey Gage) has been exceeded 34 times since 1873. The maximum known stage on Clear Lake, 13.66 feet, occurred in January 1890. Some of the higher lake stages that have occurred since construction of the Clear Lake Dam in 1915 are:

<u>Date</u>	<u>Stage, feet</u>	<u>Elevation, feet</u>
February 1938	10.25	1328.51
February 1942	9.60	1327.86
February 1956	9.53	1327.79
February 1958	10.86	1329.12
January 1965	9.03	1327.29
January 1970	10.37	1328.63
April 1974	9.10	1327.36
February 1980	9.61	1327.87
April 1982	9.17	1327.43
March 1983	11.32	1329.58
February 1986	11.34	1329.60
March 1995	10.72	1328.98
February 1998	11.44	1329.70

Flood levels for varying frequencies on Clear Lake are:

<u>Date</u>	<u>Stage, feet</u>	<u>Elevation, feet¹</u>
10-year event	10.04	1328.30
50-year event	11.74	1330.00
100-year event	12.34	1330.60
500-year event	13.84	1332.10

¹ Flood elevations as given in the Lake County Flood Insurance Study, March 2, 1998. For flood insurance purposes, the base (100-year) flood elevation of Clear Lake has been determined to be 1331 feet NGVD, or 12.74 feet on the Rumsey Gage.

- *Repetitive Loss*

Flooding occurs around essentially the entire perimeter of Clear Lake and affects over 2,500 structures. There are 83 privately owned repetitive loss properties in the unincorporated County located in the floodplain of Clear Lake. Locations of the repetitive loss properties in the unincorporated areas are identified under a repetitive loss list maintained by the Department of Public Works. There are 45 privately owned repetitive losses in the City of Lakeport and 15 privately owned repetitive losses in the City of Clearlake, all located in the Clear Lake floodplain.

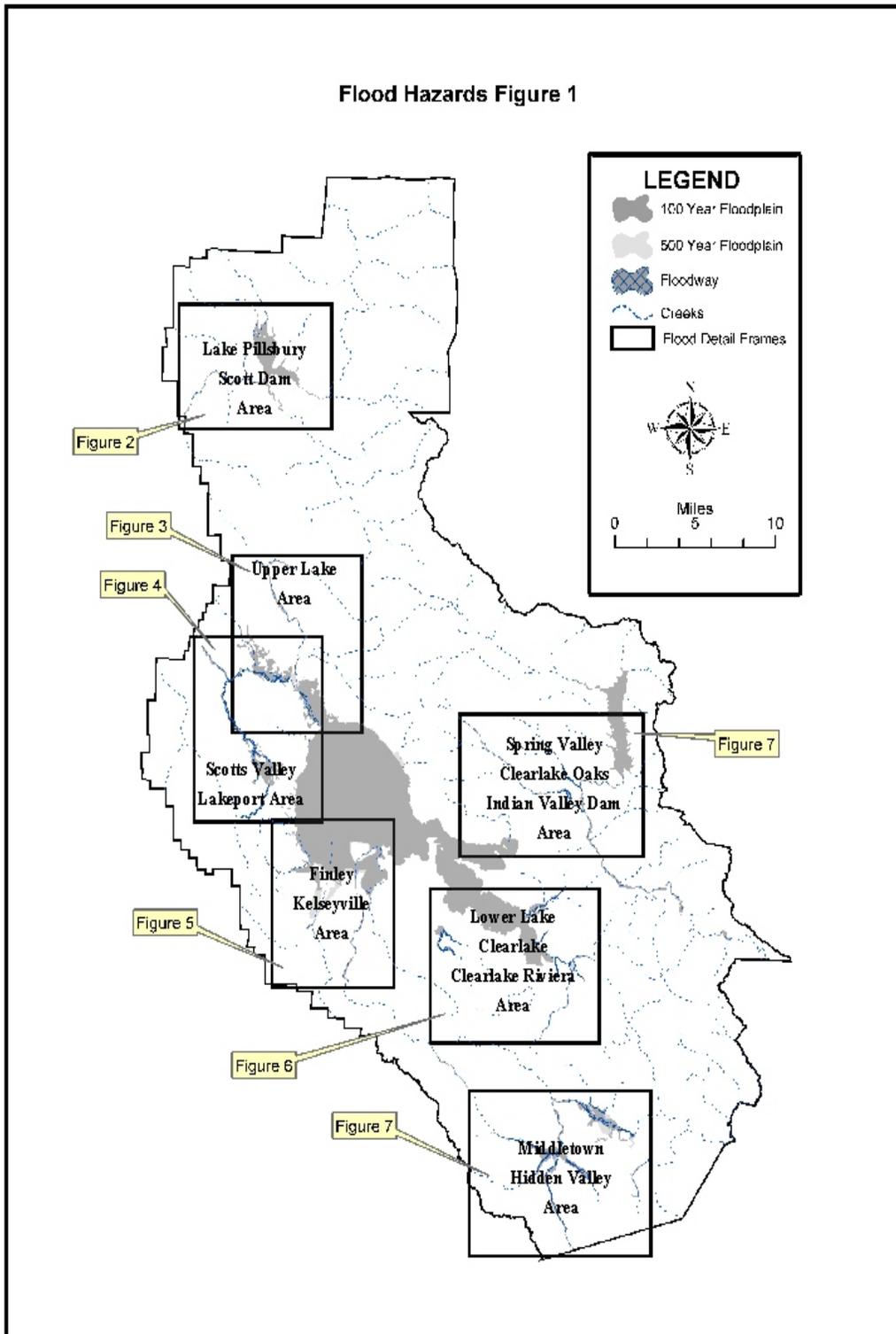
Probability and Risk

Floods have been a part of Lake County's historical past and will continue to be so in the County's future. Lake County geographically, namely it's well-defined higher elevation mountain watersheds, funnels floodwater and sediment to lower elevations into the Clear Lake basin. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways and Clear Lake basin. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. The majority of flood hazards in Lake County are transportation related. Flood related erosion could cause damages to homes, businesses, and government structures, including damage to ancillary structures, and utilities. Structural foundation undercutting is the most prevalent form of damage to structures. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Based on the history of flooding in Lake County, there is a *Moderate to High Probability* of a flood event occurring and a *Moderate to High Risk* to life and property due to the geography of this Pacific coastal mountainous drainage system into the Clear Lake basin.

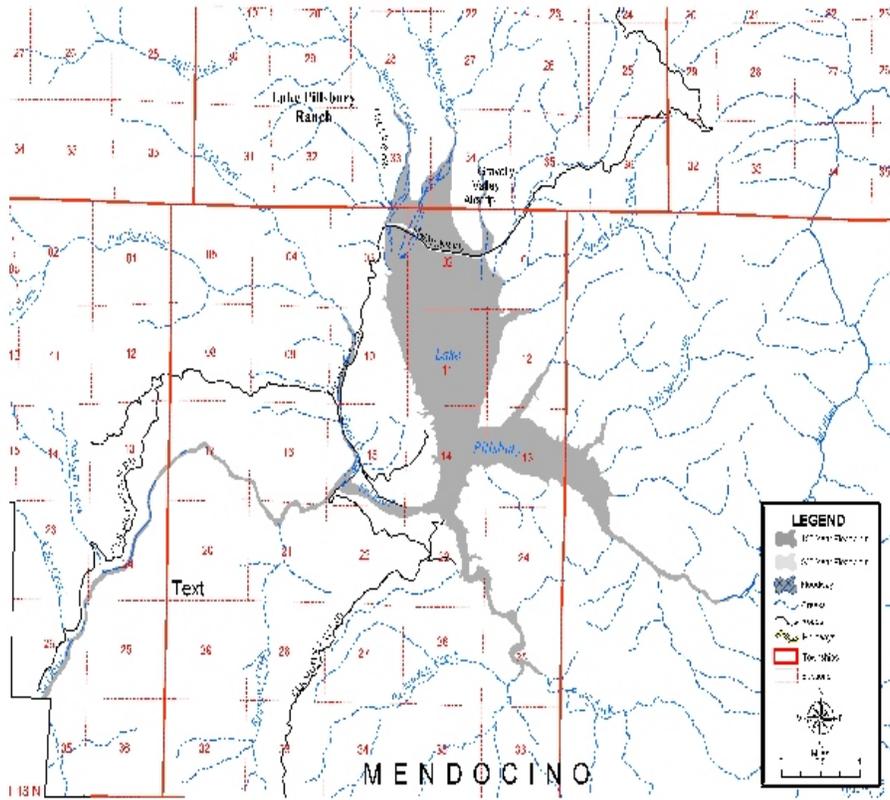
Conclusion

Aside from severe storms, flooding is the most frequent natural hazard event in Lake County. Floods can cause a tremendous amount of damage within the county. As in the case of wildland fire, earthquake, and other natural disasters, citizens should prepare themselves before such an event takes place. To be able to effectively address flood problems, citizens, families, and business should:

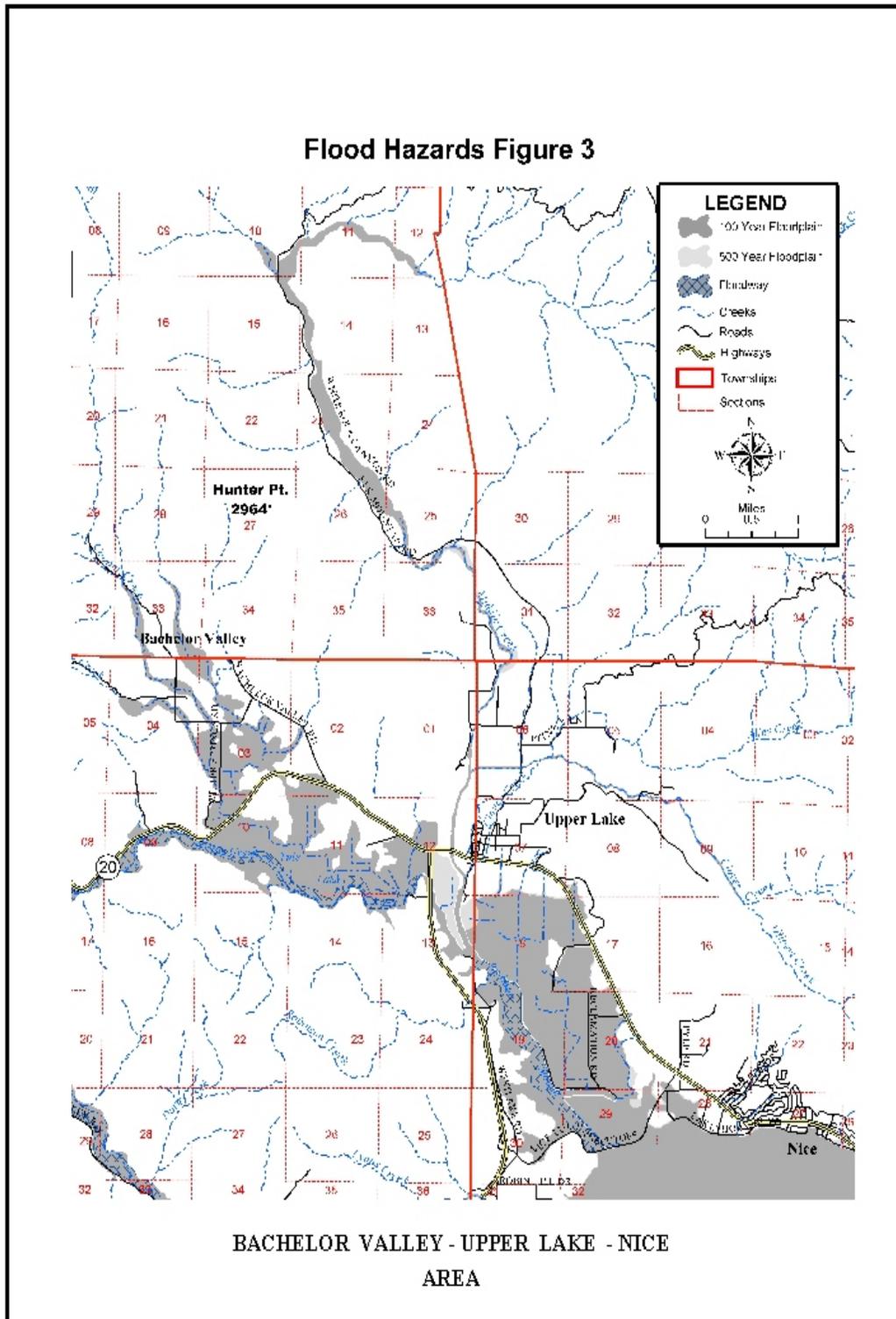
- ❑ Have a plan, including a set of alternate travel routes.
- ❑ Store extra supplies of food and water.
- ❑ Store other related supplies such as flashlights, batteries, firewood, etc.
- ❑ Have a battery-operated radio within their home or business.
- ❑ Stay aware of weather changing trends.

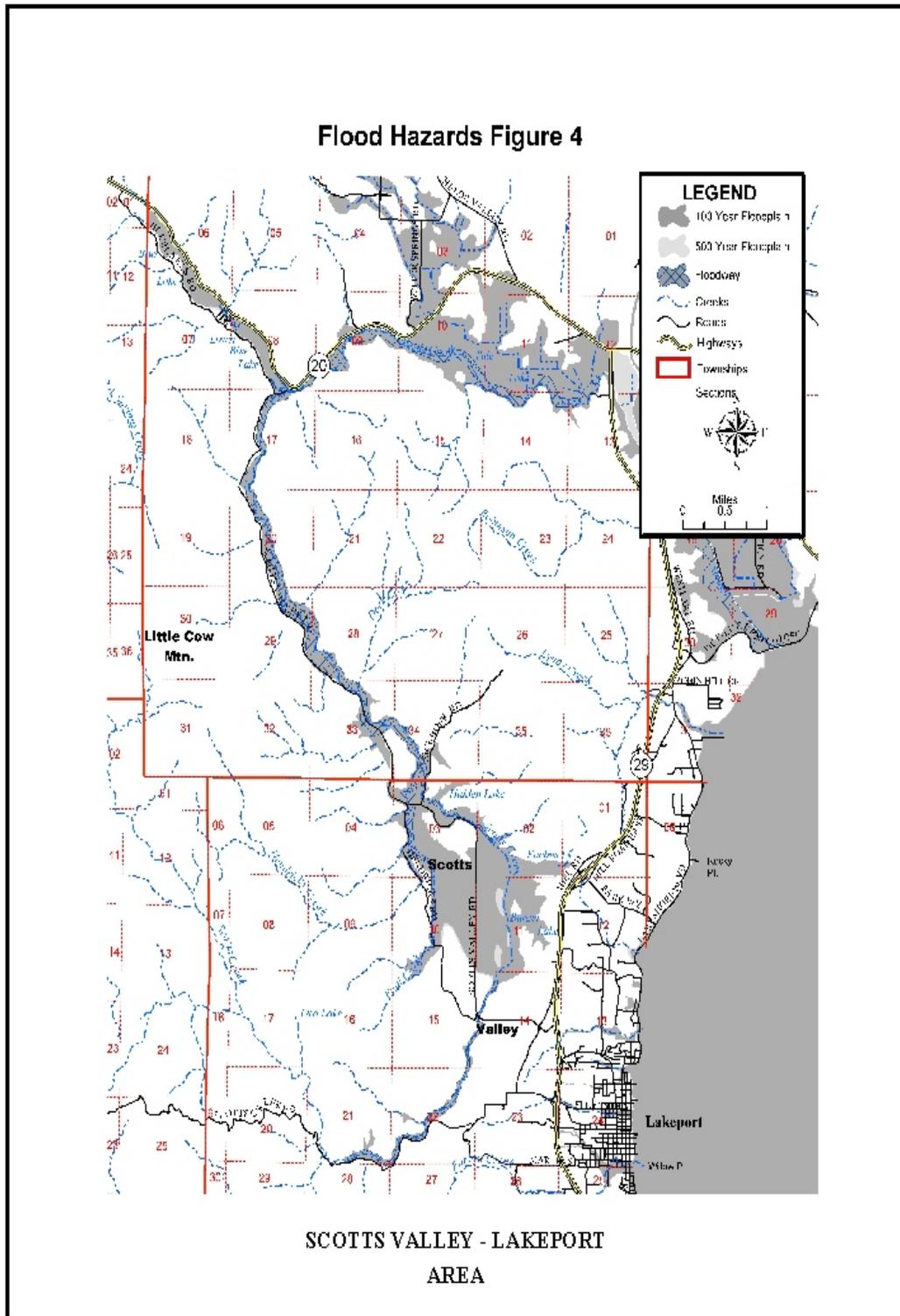


Flood Hazards Figure 2

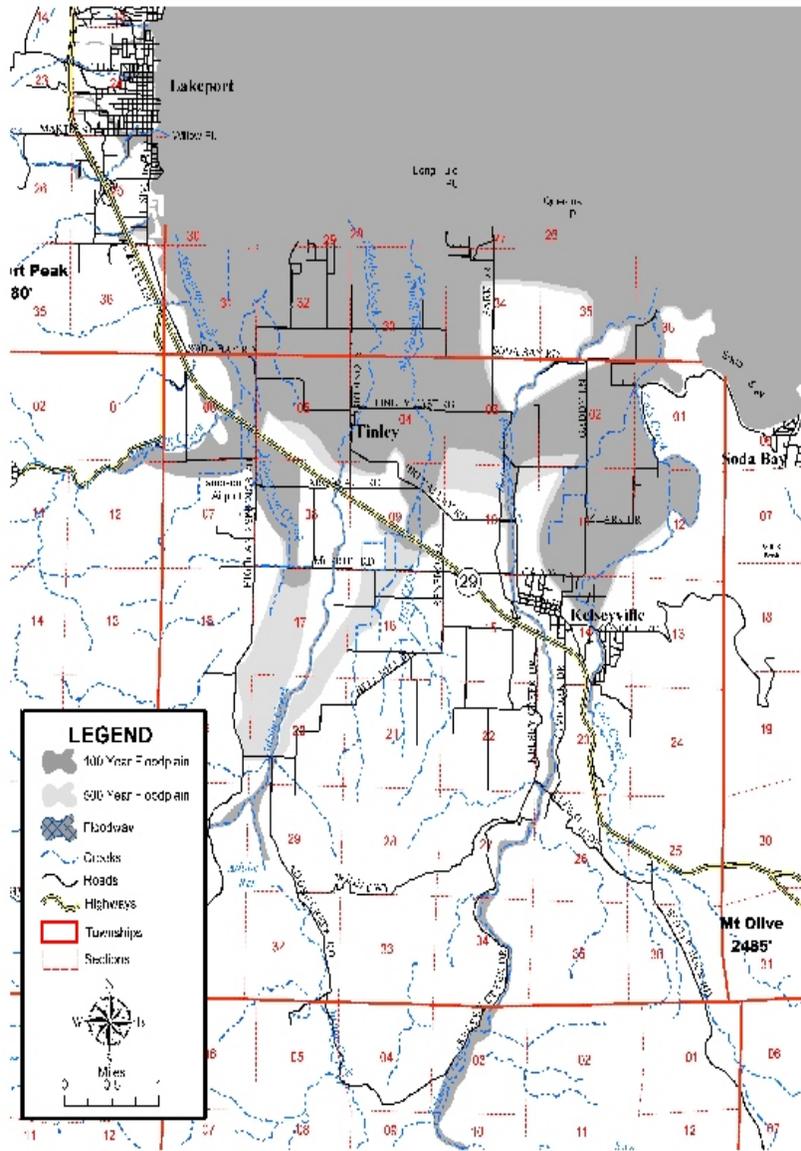


LAKE PILLSBURY
SCOTT DAM AREA

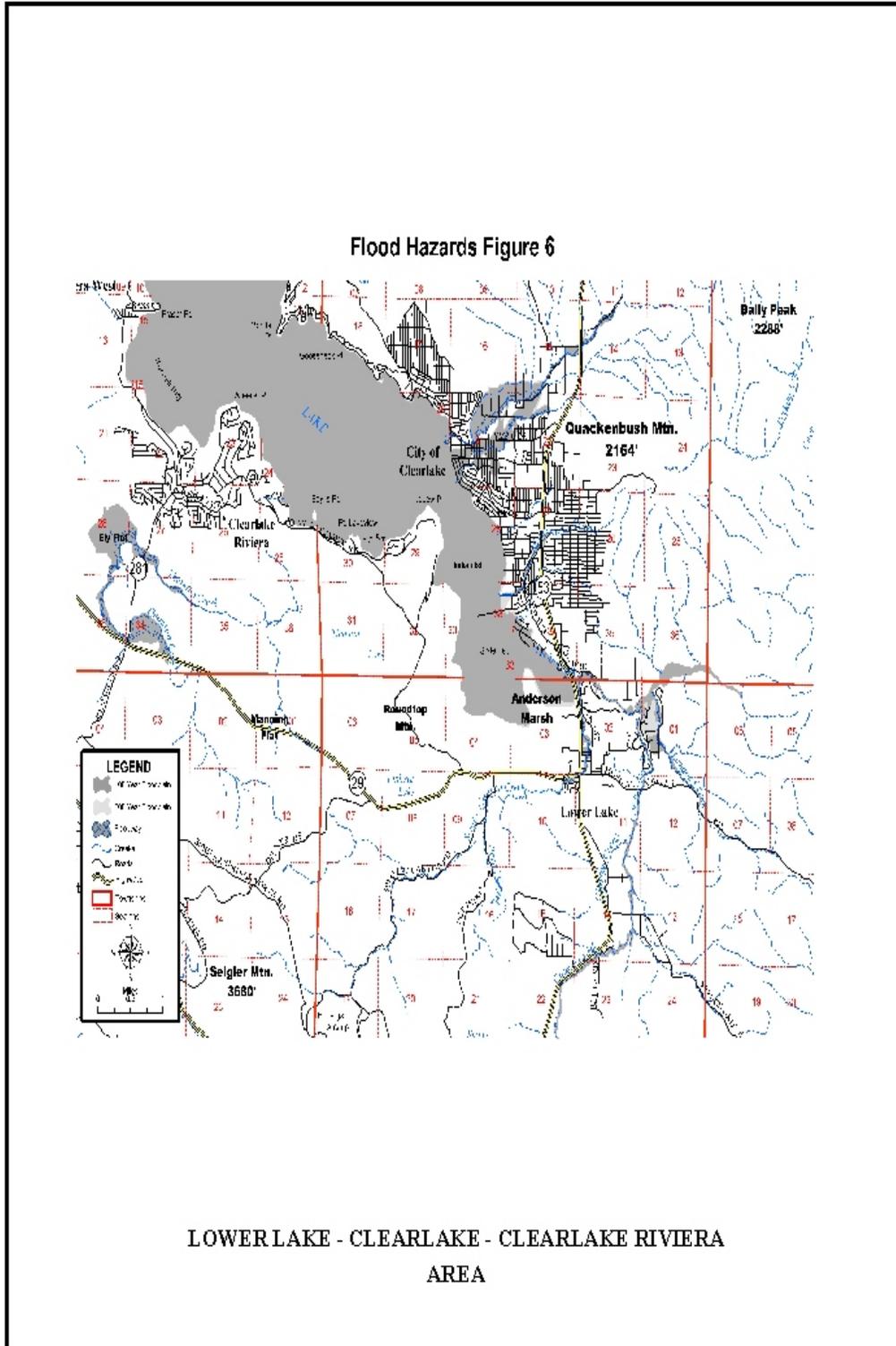


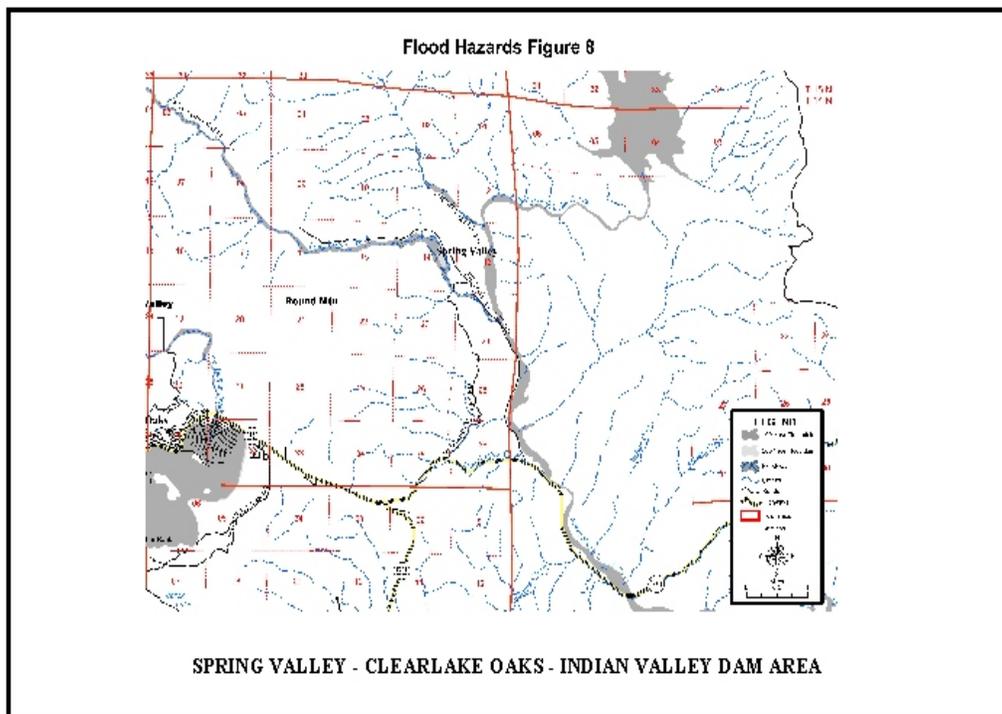
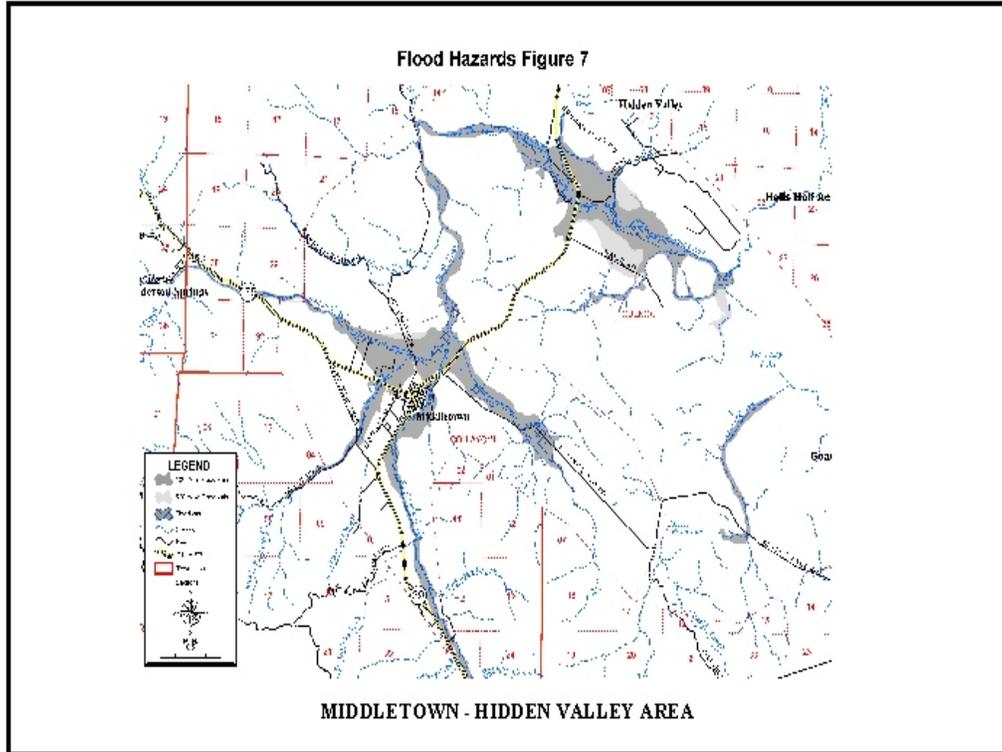


Flood Hazards Figure 5



FINLEY - KELSEYVILLE - SODA BAY
AREA





SEVERE STORMS

Lake County is susceptible to severe weather and storm conditions. The term *Severe Storm* are those conditions generalized and described as heavy precipitation, high winds, thunderstorms, extreme heat and/or cold temperatures. Extreme weather may cause a variety of damages, depending upon the type and impact of the weather situation. Damage may range from temporary power and utility outages due to high winds, thunderstorm activity to sometimes, although rare, destruction from a tornado. Heavy rainfall on saturated soils lead to mudslides that close state highways, county roads and streets, endanger lives and causes property damage. Heavy winds have been known to down trees and power lines damaging property, blocking roads, and cutting off utilities and communications. Lake County enjoys a temperate climate marked by brief cold snaps and summer heat waves. If these weather conditions occur for extended periods, the result would showcase damage to annual agricultural operations, cause roadway accidents, and property damage.

These severe weather events can be broken down into three categories:

- ❑ Severe Winter Storm
- ❑ Severe Thunderstorm
- ❑ Severe Windstorm

For Lake County, four climatic factors together work to develop this annual season of precipitation: geographical altitude, pacific coastal mountain range barriers, prevailing storm tracks, and air masses.

- The County's location in the Pacific Coastal mountain range naturally gives the county varying elevations. The coastal mountain elevations in the county range from an average of 1,200 feet to over 5,000 feet.
- Lake County is located in the center of the Pacific Coastal mountain range. The mountain range acts as a barrier to approaching air masses, which approach the mountains from the west, 30 miles inland from the Pacific Ocean coastline. The mountains act as a lifting mechanism as air masses migrate over them, increasing the chance for precipitation.
- The winter storm track for Lake County funnels storm systems from a semi-permanent low pressure system in the Gulf of Alaska southward to the California coast following the Westerlies, a global atmospheric wind pattern that provides a relatively consistent westerly flow of air throughout most of the year.
- Air masses typical of Lake County are classified as marine polar. The county's proximity to the Pacific Ocean, in conjunction with the aforementioned storm track, brings cold and moist marine polar air masses over the county throughout much of the year, especially during the winter months.

Bring all four of these climatic variables together equals a higher than average potential for severe winter weather conditions. Cold moisture-laden air masses are carried from the Gulf of Alaska southward with the Westerlies. Following the storm track, this moist air encounters the Pacific Coast mountain range, becomes unstable as it is forced over this natural barrier, and provides large amounts of precipitation before moving eastward. In the winter months, heavy precipitation mixed with snowfall might be the result in higher elevations with extremely strong winds accompanying the storm.

- Severe Thunderstorm

During the summer months, climatic factors combine to promote the development of thunderstorms. As cool marine air flows in from the Pacific Ocean across heated lower elevations, the marine air rises over the coastal mountain range and then rapidly cools, intense thunderstorm cells can develop in Lake County's higher elevation areas. In September 2003, thunderstorm activity from a former Pacific Ocean Hurricane produced hundreds of lightning strikes throughout the Mendocino National Forest and Lake County areas. The largest wildland interface fire of 4,000 acres was just south of the Hidden Valley Community.

- Severe Windstorm

In any season, Lake County's coastal mountain range vast drainages promote the formation of downslope winds, often winds at very high speed. Windstorms can affect all area of the Clear Lake basin during any month of the year.

- Flooding – Flash Flooding

Central to the County is Clear Lake. Clear Lake is a 71 square mile natural lake with a 100-mile rim laced with pocket communities. Clear Lake has a contributing watershed of 458 square miles with average rainfall ranging from over 60 inches per year at mountain top ridgelines to 25 inches per year at lake level. Flood risk is attributable to four key sources. Overflowing creeks, reservoir overflow, lake overflows, and dam failure. The degree of flood impact is dependent upon topography, vegetation, duration and intensity of rainfall with consequent storm water runoff. Pacific winter storms can generate heavy rainfall along the California coastal range mountains of which Lake County geographically is located well within the effected mountain range zone.

Those areas threatened by flooding are located along the tributaries traveling to Clear Lake and within the identified 100-year floodplain map zones. Flood risk is most extensive along Scott's, Cache, Adobe, Putah, Cole, Middle, Copsey, Herdon, and Kelsey Creeks. Clear Lake rises freely during heavy winter storm runoff. Flooding from the lake overflow poses the greatest threat to lakeshore communities adjacent to Clear Lake, Lake Pillsbury, Blue Lakes, and the Indian Valley Reservoir. The greatest concentration of these communities is located on the Clear Lake Rim, where approximately 60% of the 71-mile rim has been developed.

- *Isolation of Communities and County*

Lake County geographically has limited access into and out of the county. Flooding, landslides and/or snowfall may close the three state highways and county road systems for extended periods. Access around the Clear Lake Rim may become a limited route of travel with few alternate routes available for rerouting traffic or conducting rural pocket community evacuations. The County of Lake ingress and egress is served from California State Highways 20, 29, 53 and 175. California State Highway 20 is considered the main route connecting Lake County to U.S. Highway 101 to the west and Interstate Highway 5 to the east. Roadways may be reduced to passage in only one direction at a time or closed due to varying degrees of erosion-related washout. At the most severe levels, whole road structures can be eroded away or a bridge crossing threaten or lost because of debris impacting the bridge structure. In case, road damage or road closure affects the transportation infrastructure of the county, interrupting the movement of people, supplies, and services while reducing productivity due to increased travel time.

Lake County emergency services infrastructure becomes affected as well, slowing the arrival of law enforcement, fire-rescue, EMS, and other emergency response personnel and resource equipment.

- *Wastewater Treatment Facilities*

High lake levels impact wastewater treatment facilities as the collection systems for developments become inundated, resulting in significant inflow to the system. Discharge of raw and treated wastewater is prohibited within the Clear Lake Basin. This results in overloaded pumping facilities and storage reservoirs, which may cause overflows into tributaries of Clear Lake.

Hazard Assessment

The effects of severe weather events such as heavy precipitation, thunderstorms, and windstorms on Lake County are likely to exhibit certain similarities. Downed trees and fallen power lines might occur. Transportation around the county can be affected too, with road closures interrupting movement. Damages to homes, businesses, and government facilities are a possibility. Fatalities as a result of severe weather events are uncommon, but can occur on occasion. Electrical power outages happen with most severe weather events. The interruption of power causes many problems. Loss of electricity affects heating of residences, pumping of water, refrigeration, lighting, computing, television, Internet, and loss of public safety communication systems. Additionally, businesses lose the use of cash registers, gasoline pumps, restaurant kitchen appliances, and the like.

Severe winter storms produce snow and ice on the higher elevations. The majority of problems associated with severe winter storms are transportation related. Roads are closed or are open only to vehicles that are properly equipped. Productivity is lost due to the increased time it takes to go from one point in the county to another.

Government offices may be closed or subject to reduced schedules. Public schools also may be closed or on a delayed start schedule. Population and vehicular traffic are put at an increased risk due to falling trees and power lines and roadway mudslides. Severe windstorms pose potential hazards. Power and telephone lines may be knocked down and electric power might be lost. Downed power lines pose possible hazards to roadways, structures, vehicles, and people. Extremely violent windstorms might also damage the vast forestland in Lake County, causing economic losses to recreation and tourist activities. Severe thunderstorms introduce natural hazards of lightning, hailstones, and flash flooding. Electricity can be interrupted by lightning strikes, property damage can occur if hailstones reach a large diameter, and flooding can occur with particularly intense or prolonged precipitation events associated with the thunderstorm. Recreational activities can also be interrupted. Playing fields and swimming pools and beaches may be temporarily evacuated and golf course facilities may close for safety.

Probability and Risk

Severe storm activities can happen in any part of Lake County throughout the year. The degree of regularity is greater during various seasons for the different storm types. However the overall threat of a severe storm event is a relative constant over the four seasonal years. Some storms are more severe than others. When this is the case, assorted governmental services might be activated. These might include the public works department, fire-rescue services, emergency medical services, search and rescue units and the county sheriff's department. The length of time electrical power is interrupted is often the leading indicator of a storm's severity and also dictates the level of response resources from deployed emergency service agencies. If a storm causes an extended period of power interruption, emergency shelters might be required, particularly during winter months.

Based on the history of severe storms in Lake County, there is a ***Moderate to High Probability*** of a severe storm event occurring in Lake County. Although the probability of a severe storm is high, there is a ***Low to Moderate Risk*** to life and property within the county due to on-going preparedness programming.

Conclusion

Of all natural hazards, the severe storm event has the greatest probability of occurrence in Lake County. Severe storms of any type can cause a great amount of damage and can affect the lives of Lake County citizens in a meaningful way. All of Lake County is subject to severer storm events, and these events can occur during any time of the year. Severe weather events can take the form of heavy precipitation, thunderstorms, windstorms, hail and on rare occasion, low-level snowstorms. When severe storm events do occur, they have the potential to significantly impact Lake County presenting a genuine threat to lives of Lake County citizens and property, triggering the prospect for considerable economic loss.

Due to the possible frequency of severe storm activities, individual citizens, families, and businesses of the county need to be prepared to address severe storms when they occur. As in the case of earthquake, wildland fire, and other natural disasters, citizens should prepare themselves before such events occur. To be able to effectively be prepared, citizens, families, and businesses should:

- ❑ Have a family and/or business plan.
- ❑ Store extra supplies of food and water.
- ❑ Store other related supplies such as flashlights, batteries, firewood, etc.
- ❑ Have a battery-operated radio within their home or business.
- ❑ Trim all tree limbs from buildings.
- ❑ Secure all potentially wind-blown possessions when not in use.

DROUGHT

Droughts are a natural disaster that can impact Lake County. Extended periods of substantially reduced or no precipitation can severely injure the vast agricultural and recreational industries of the county. Reduction of ground and surface water resources resulting from periods of drought can also threaten residential and commercial water supplies, making drought a very serious matter among residences throughout the county.

There is no specific timeframe concerning droughts; a drought can occur at any time and last for wide-ranging periods of time. An exact threshold that indicates precipitation is at drought levels is lacking, subsequently drought measurement levels usually vary from one locale to another. There is no warning as to when a drought will begin either, making the phenomenon of drought a very enigmatic concern. For Lake County, drought occurs when winter precipitation fails to materialize. During the winter months, Lake County experiences the majority of its annual precipitation. Historical records show that Northern California drought cycles have occurred approximately every seven to eleven years. In August 1988 Lake County declared a drought related “Local Proclamation of Emergency”. Lake County’s agriculture industry was severely impacted.

For Lake County, four climatic factors together work to develop this annual season of precipitation: geographical altitude, pacific coastal mountain range barriers, prevailing storm tracks, and air masses.

- The County’s location in the Pacific Coastal mountain range naturally gives the county varying elevations. The coastal mountain elevations in the county range from an average of 1,200 feet to over 5,000 feet.
- Lake County is located in the center of the Pacific Coastal mountain range. The mountain range acts as a barrier to approaching air masses, which approach the mountains from the west, 30 miles inland from the Pacific Ocean coastline. The mountains act as a lifting mechanism as air masses migrate over them increasing the chance for precipitation.
- The winter storm track for Lake County funnels storm systems from a semi-permanent low pressure system in the Gulf of Alaska southward to the California coast following the Westerlies, a global atmospheric wind pattern that provides a relatively consistent westerly flow of air throughout most of the year.
- Air masses typical of Lake County are classified as marine polar. The county’s proximity to the Pacific Ocean, in conjunction with the aforementioned storm track, brings cold and moist marine polar air masses over the county throughout much of the year, especially during the winter months.

These climatic variables are the driving factors in analyzing and categorizing the climate of Lake County, identified by climate type with the Koppen Geiger climate classification system.

The classification system signifies that climate within the region can be considered generally temperate with a warm to hot temperature range and dry summers. Important here is the indication here is the indication that precipitation predominantly occurs in the winter months. Thus, drought events happen when conditions develop that redirect or hinder the path of the storm track or alter the characteristics of air masses that migrate through the region, or both conditions transpire to concurrently alter or stop the arrival of winter storms across Lake County. When the winter storms fail to arrive or fail to provide substantial amounts of moisture, then the potential for the development of drought is present.

Lake County most alarming period of drought occurred between 1977-78. Statewide, average precipitation in California is approximately 250,000 cubic hectometers (200,000,000 acre-feet) annually. In 1976 water year (October 1, 1975 to September 30, 1976), precipitation totaled 160,000 cubic hectometers (130,000,000 acre-feet), only 65% of average. In the 1977 water year ending September 30, 1977, precipitation totaled even less, 110,000 cubic hectometers (90,000,000 acre-feet), or 45% of average. The two years of limited precipitation and snowfall reduced runoff to streams and rivers to 47% and 22% for 1976 and 1977, respectively.

Other periods of recorded drought were from 1988 through 1991. Lake County agricultural industry was impacted.

Hazard Assessment

Drought can have extensive, far-reaching effects within Lake County. Below average precipitation can have increasingly dire effects as each year of substandard precipitation builds on the years before. As seasons of drought pass, more and more hazards and threats become real dangers to the population. Drought increases interface wildland fire danger and adversely affects agriculture; hence, the economy. Lake County has been exposed to thunderstorms and extreme heat for extended periods of time during summer months. Conditions may cause a variety of damage and health related issues depending on the length of conditions being experienced. The greatest affect from drought in Lake County is economic in nature. Impacts on agricultural operations can be devastating in an extended drought condition.

Water is a necessity whether you are a rancher raising beef cattle, growing vineyards and orchard crops or a farmer growing annual truck crops. Livestock must be supplied with water and crops must be irrigated. The vast forestlands in the county suffer during drought. Trees become weakened without a source of water. Trees can eventually die as a result of an extended period of no water or succumb to infestation in consequence of being in drought-weakened state. Regardless of the agricultural concern, water is an important ingredient. Lack of water equates to economic hardship. Drought also impacts recreational concerns and ventures within the county. In the summer, Clear Lake resort accommodations suffer fiscal hardship with lack of tourism. Drought conditions can have a major affect on the fresh water flow into and out of Clear Lake, thus producing stagnant water flows.

Camping can be substantially restricted during drought conditions into the Mendocino National Forest complex or the Bureau of Land Management primitive day use areas. Dry forest conditions can cause campgrounds to close or to have campfire restrictions.

Low stream and reservoir levels reduce or eliminate the potential for water sport activities. Lakeside beaches may be closed, recreational quality may be minimized, or the variety of water related activities may be lessened. Lake County visitors in the summer can expect numerous aquatic activities, including swimming, beach bathing, boating, sailing, canoeing, and fishing. All these endeavors can be eliminated or decreased during drought conditions.

Drought conditions mean fewer visitors to Lake County. Lowered tourism equates to lower county sales tax revenues. The effects on county economic infrastructure can be substantial, especially if the drought continues into an extended period of time. Drought conditions have a major threat to domestic and commercial water supply systems. Most of the county's water supply systems are drawn from groundwater systems. In drought conditions, depth to water table increases and well production can decrease.

Historically, in Lake County well production was severely impacted during long periods of drought. As drought conditions worsen, well production can continue to decrease. In the worst drought conditions, well production can be severely reduced or eliminated. This danger is a real concern of the population who, for the most part, rely upon well water systems for their primary water supply. County residents who rely upon surface reservoir water are no less at risk of reduced water supplies during extended periods of drought.

If drought conditions persist long enough, surface reservoir levels drop and water resources become compromised. Drought conditions also initiate concern for other natural hazards. Wildland interface fire potential grows exponentially as drought conditions lengthen in time. Additionally, to a lesser degree, drought conditions can be responsible for landslide events. Lowered moisture content weakens soil structure characteristics and increases landslide potential.

Probability and Risk

Droughts are naturally occurring climatic phenomena that can and do develop in Lake County as historical records indicate. Long periods of drought free years can allay concerns for drought and the level of preparation for addressing periods of drought. Inevitably though, drought conditions happen and residents learn to live with periods of less than normal precipitation.

Thus, there is a ***Moderate to High Probability*** of a drought developing in Lake County, with a ***Low to Moderate Risk*** associated with this natural hazard.

Conclusion

The possibility of drought in Lake County is a constant concern. As with most climatic trends, one cannot accurately predict when or with severity a drought might materialize.

Despite the inability to predict drought, the certainty that a drought will eventually develop and impact Lake County citizens is inarguable. Conservation of water resources should not be a response to drought conditions, however it should be conscious practice at all times. Communities and citizens should always be prepared for the onset of drought conditions.

Drought can be a devastating natural disaster. It can have far reaching economic impacts to the county and its residents. It can bring about devastating impacts on agricultural and recreational business concerns and leave residential and commercial properties without water resources.

Wildland fires can be heightening during long periods of drought. Learning to conserve water resources is perhaps the most effective way to mitigate drought.

The more residents of the County that work to protect the quantity and quality of ground and surface water resources, the more effectively and efficiently the county will be able to address drought conditions and related issues.

DAM FAILURE

Failure of a dams or reservoirs can result from a number of natural or man-made causes such as earthquakes, erosion of the face or foundation, improper sittings, rapidly rising floodwaters, and structural/design flaws. Seismic activity may also cause inundation by the action of a seismically induced wave that overtops the dam without causing failure of the dam, but significant flooding downstream. It is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, dam failure would most probably happen in consequence of the natural disaster triggered by the event. Almost all of the water bodies located in Lake County are man-created reservoirs. Some of the reservoirs only slightly raise the water level of the lake behind them. The Indian Valley Dam-Walker Lake is the county's largest man-made lake in size over 359,000 acre-feet. A large number of small reservoirs within the county harness agriculture waters that were created solely by the dam's construction.

Most dams in this sparsely populated county are removed from the population clusters of the county. The remote location of dam's shields residences from the potential hazards associated with dam failure and resulting inundation. Fortunately, investigation and review into historical records of Lake County have shown no dam failure events.

Hazard Assessment

Dams in Lake County are closely monitored to ensure dam stability and integrity. The California Department of Water Resources is entrusted with supervision and inspections over non-federal dams in the State. Dams under jurisdiction are artificial barriers, together with appurtenant works, which are 25 feet or more in height or have an impounding capacity of 50 acre-feet or more. Any artificial barrier not in excess of six feet in height, regardless of storage capacity, or that has a storage capacity not in excess of fifteen acre feet, regardless of height, is not considered jurisdictional.

There has never been a dam failure in Lake County. However, just because the county has never experienced a dam failure does not exclude the county from ever suffering a dam failure. Although a dam could be considered a very low possibility of failing due to poor construction or lack of appropriate maintenance, the possibility for dam failure increases during other natural hazard events. Dam failure could occur in an earthquake. Dependent upon the seismic epicenter, and the measured magnitude, it becomes increasingly possible for dam integrity to be compromised and dam failure to occur. If large amounts of precipitation fall in a very short period of time, dams can be crested, their structure weakened, and supports eroded. Added awareness of dam conditions is critical during these other natural disaster events. Infrastructure associated with dam failure, would be the loss of utility systems and transportation surface roadways in the path of inundation. Electricity service would be interrupted, Propane gas services impacted, telephone lines could be washed away, cellular towers might be lost, and cabling related to computer technologies might be damaged, further taxing information exchange options.

Loss of power and other services would inconvenience and discomfort both citizens inside and outside the path of inundation. Loss of roadways and other transportation amenities might be made impassible by mud and debris from the dam failure. Emergency personnel response times can be lengthened as a result of dangerous travel conditions. Other impacts of dam failure would be related to and determined by any natural disaster that could be considered responsible for the dam failure, such as an earthquake or severe storm. The major dams, reservoirs and diversion levees in Lake County with high inundation zones are identified. It is assumed for emergency planning purposes, that one or more of the dams located in Lake County would be seriously damaged from major seismic activity, or possible failure by natural means-erosion or excessive periods of heavy and continues rainfall upon isolated watersheds.

Cache Creek Dam

Lake Name: Clear Lake
 Dam Owner: Yolo County Flood Control & Water Conservation District
 Height of Dam: 35 feet high - Concrete

The Cache Creek Dam is located 3.5 miles downstream of the outlet from Clear Lake. The dam is concrete, gravity-type structure. The relationship between Clear Lake and the dam is unique in that the dam does not control maximum overflows from Clear Lake. The channel between Clear Lake and the dam controls maximum outflows. This dam is owned and operated by Yolo County Flood Control and Water Conservation District (YCFLWCD). Depending on the time of year and lake level, failure of the dam could result in flood damage to downstream areas adjacent to Cache Creek and communities in Yolo County. If the lake level is still high, failure of the dam could cause significant property damage along Cache Creek above the dam, as water would flow rapidly until the lake level dropped below the Grigsby Riffle barrier.

Scott Dam

Lake Name: Lake Pillsbury-Eel River
 Dam Owner: Pacific Gas & Electricity (PG&E)
 Capacity: 93,724 Acre Feet
 Height of Dam: 80 feet with a crest of 250 feet.

Scott Dam is located on the upper Eel River in the Mendocino National Forest. It can be reached through Potter Valley, Mendocino County or Elk Mountain Road from Upper Lake. Dam failure inundation zones include Mendocino County communities, and the Cities of Rio Dell, Fortuna and Ferndale in Humboldt County to the Pacific Ocean. The dam is owned and operated by Pacific Gas & Electricity (PG&E). Scott Dam is the second largest dam in Lake County, located at the western edge of Lake Pillsbury. Failure of this dam would result in potential damager to life and property at Soda Creek Station, PG&E campsites along the Eel River, and catastrophic damage to life and property in neighboring Mendocino County and further north into Humboldt County. Residents of Lake Pillsbury area would be isolated due to damage roads. Emergency planning considerations would be to conduct air evacuation from rural Gravelly Airport. Emergency management considerations would be to provide assistance to other counties.

Indian Valley Dam

Lake Name:	Indian Valley
Dam Owner:	U.S. Bureau of Reclamation/ Yolo Flood Control
Capacity:	359,000 Acre Feet
Height of Dam:	207 feet above streambed

Indian Valley Dam is located approximately 5 miles north of State Highway 20 between Clear Lake and Williams. It can be reached by Walker Ridge Road to the Chalk Mountain Area. The dam is an earthen structure, and is the largest dam in Lake County. The dam is owned and operated by the United States Bureau of Reclamation. Failure of this dam would result in flooding. The primary area of concern is the Spring Valley Development where residents are located in the inundation zone. The potential exists for the washout of the Long Valley Road, which would isolate and trap several residences. Other evacuation concerns would be for seasonal population along Cache Creek and vehicular traffic on State Highway 20. *Catastrophic damage would be experienced downstream to Yolo County communities.*

Coyote Creek Dam

Lake Name:	Hidden Valley Lake
Dam Owner:	Hidden Valley Lake Association
Capacity:	3,300 Acre Feet

Coyote Creek Dam is located east of Highway 29, between the communities of Lower Lake and Middletown at the Hidden Valley Lake residential area. Coyote Creek Dam is owned and operated by the Hidden Valley Lake Association. The dam is an earthen structure. *Failure of the dam would cause extensive property damage to 235 residential structures, an Elementary School, Golf Course and State Highway 29 within the inundation zone.*

Highland Creek Dam

Lake Name:	Highland
Dam Owner:	Lake County Flood Control & Water Conservation District
Capacity:	3500 Acre Feet

Highland Creek Dam is located approximately 0.5 miles west of Adobe Creek Dam. The dam can be reached on Highland Springs Road, Bell Hill Road or the Old Toll Road. The dam is an earthen structure. The dam is owned and operated by the Lake County Flood Control and Water Conservation District. Dam failure inundation zones include Adobe Creek areas and the community of Finley. *Failure of the dam would result in extensive property damage to residential structures along Adobe Creek.*

Adobe Creek Dam:

Lake Name:	Adobe
Dam Owner:	Lake County Watershed Protection District
Capacity	695 Acre Feet

Adobe Creek Dam is located approximately 5 miles south of Finley. It can be reached from State Highway 29 by the Highlands Springs turn-off on Bell Hill Road near Kelseyville or from Hopland in Mendocino County via Old Toll Road. Adobe Dam is an earthen structure. Lake County Flood control & Water Conservation District is the Owner and Operator of the dam. *Dam failure would result in extensive property damage to one hundred residential structures in the inundation zone.*

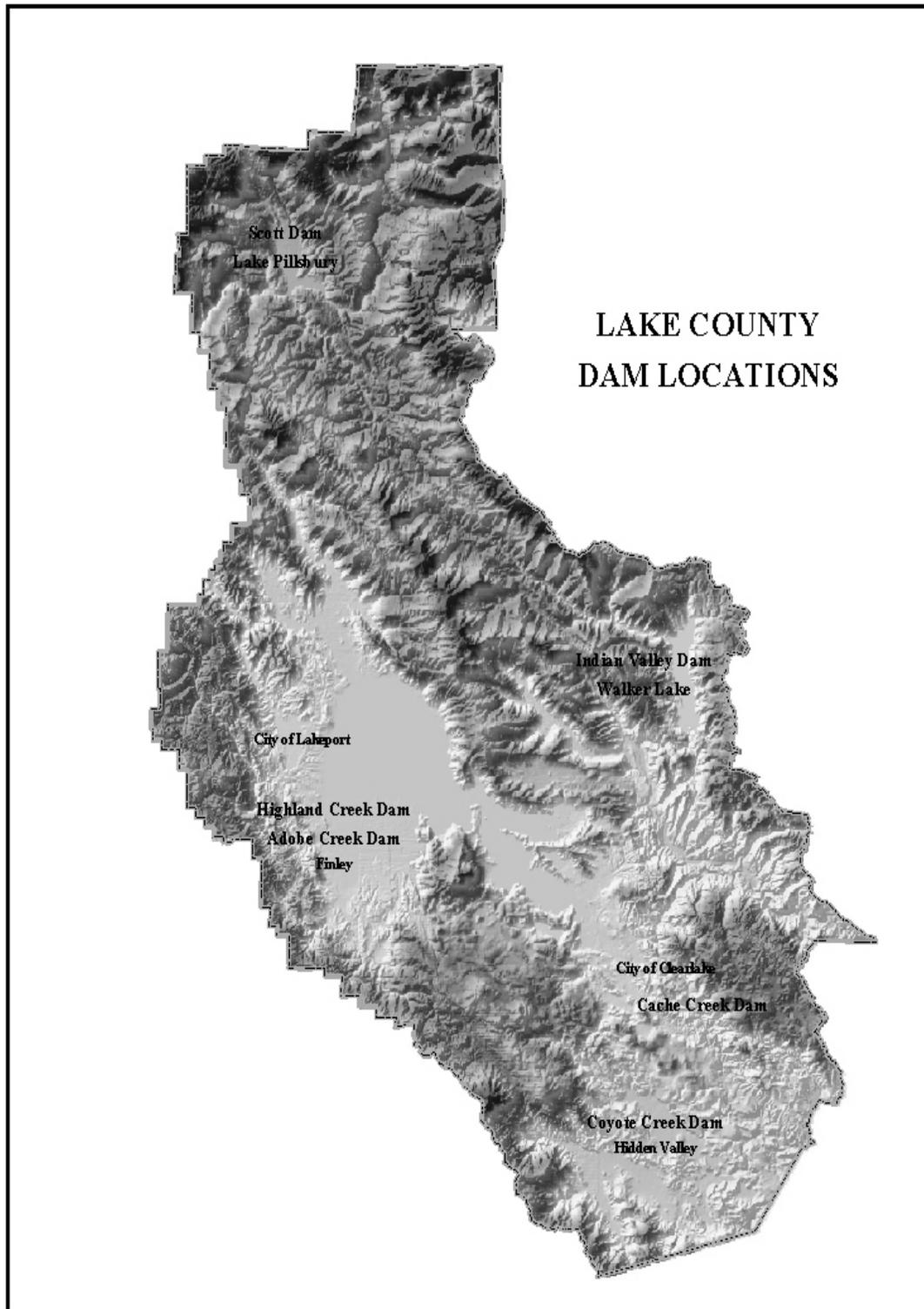
Probability and Risk

Dam failure is an ever-present threat to the residents of Lake County who live near or around a dam. Especially impacted are those residents who live below a dam and within the potential path of inundation from water released by a dam failure. Fortunately, very few residences in Lake County face those circumstances. Most dam sites are located in the predominantly remote areas of the county. Failure of one of these remote dams would cause damage to the natural landscape in the path of floodwaters, however, threat to life and property must always be considered. There has never been a dam failure in Lake County, further reducing the any present tangible danger of a dam failure materializing. Thus, there is a **Very Low Probability** of a dam failure in Lake County and a **Very High Risk** associated with this hazard.

Conclusion

The possibility of a dam failure is an ever-present possibility in Lake County. Just as one cannot accurately predict the occurrence of an earthquake, such is the case with dam failures as well. Individuals do have an opportunity to plan for a dam failure though, in order to lessen the potential impact of the hazard event and the resulting threat to life and property. In the areas of Lake County that are near a dam site or within a dam's potential path of inundation, damage to property and threat to the health of county residents is decreased with their ability to be prepared for dam failure. To be able to most effectively address the threat dam failure poses, citizens, families, and businesses should:

- Have an escape route plan, including a path out of the inundation zones.
- Store extra emergency supplies of food and water.
- Store other related emergency supplies such as flashlights, batteries, and firewood.
- Have a battery-operated radio for updated information.
- Know the locations for turning off all utilities to the structure.



EARTHQUAKE

Earthquakes can occur at any time in Lake County. There are no precursory events to signal an increased potential for an earthquake, no advanced alarm to warn of impending seismic activity, and no earthquake season. Earthquakes are simply part of living in Lake County. A major earthquake occurring within Lake County or for that matter anywhere in Northern California could result in high casualties, extensive property damage and widespread life threatening situations. The effects could be aggravated by aftershocks, with secondary incidents of numerous structure fires, major power outages, hazardous material releases and dam failures.

Hazard Assessment

The time of day and season of the year will also have a profound effect on the number of dead and injured, as well as the amount of damage sustained. Such an earthquake, or series of earthquakes, would be catastrophic in its effect on the population and could exceed the emergency response capability of local government, state and federal agencies in Lake County. Damage control and disaster relief support would be required from statewide local governments, private organizations, state and federal agencies. Extensive search and rescue operations may be required to locate and assist trapped or injuries persons. Emergency medical care, food supplies, temporary shelters for humans and animals, reuniting of families would be required for injured and displace persons.

Identification and burial of the dead would pose significant problems; public health would also be a major concern. Evacuations may be necessary or essential to save lives, particularly in the areas hardest hit and inundation zones below dams and reservoirs. It is anticipated that many families would be separated, particularly if the event occurred during working hours. A system to identify, locate and reunite family members would be essential. Emergency operations could be seriously hampered by the disruption or loss of communications, damage to transportation routes to and within the disaster area and the disruption and/or loss of public utilities and services. Extensive mutual aid assistance would be required and continued for extended periods. Initial efforts would be required to move the injured, provide medical care, then remove debris, clear roadways, demolish unsafe structures, restore public services and utilities, provide continuing care and shelter for the affected population, including temporary housing for displaced persons.

- Ground Shaking

The primary seismic concern is ground shaking associated with regional and local faults. Regional faults are subject to very strong to very violent ground shaking. Earthquake generated ground shaking can cause both structural and nonstructural hazards, such as falling ceilings and light fixtures, toppling exterior parapets, shattered glass, and the dislodging of furniture and equipment. As with most communities in Northern California near active faults, much of Lake County would be susceptible to violent ground shaking.

- Liquefaction

Another earthquake-induced hazard, liquefaction, occurs when water-saturated, cohesionless soil loses its strength and liquefies during intense and prolonged ground shaking. Areas that have the greatest potential for liquefaction are those areas where the water table is less than 50 feet below the surface and soils are predominantly clean, composed of relatively uniform sands, and are of loose to medium density. The poorly consolidated younger alluvium that occupies valley floor areas of the county near Clear Lake basin are considered to have high to very high potential for liquefaction.

- Amplification

Soils and soft sedimentary rocks near the earth's surface can modify ground shaking caused by earthquakes. One of these modifications is amplification. Amplification increases the magnitude of the seismic waves generated by the earthquake. The amount of amplification is influenced by the thickness of geologic materials and their physical properties. Buildings and structures built on soft and consolidated soils can face greater risks. Amplification can occur in areas with deep sediment filled basins and on ridge tops.

- Earthquake-Induces Landslides

Earthquake induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy the roads, buildings, utilities, and other critical facilities necessary to respond and recover from earthquake.

- Dam Failure

Another hazard associated with major earthquakes is the collapse or failure of dams and reservoirs. Because dams can fail for reasons other than seismic activity, and the resultant hazard is from flooding, dam inundation hazards are described in the dam failure section of this plan.

- Regional Faults

San Andreas Fault Zone

The San Andreas Fault traverses the entire length of the State of California. The fault zone is located approximately 30 miles west of the Lake County line traveling the coastline of Mendocino County. The ground shaking of an 8.3 magnitude earthquake on the northern section of the fault would result in serious damage and loss of life to Northern California including Lake County. The maximum credible earthquake (MCE) capable of being generated along this system, which was responsible for the October 17, 1989 Loma Prieta earthquake (Richter magnitude 7.1), is 8.3 on the Richter scale.

Historically, On April 18, 1906 following the San Francisco 8.0 + earthquake on the San Andreas, widespread damage and loss of life affected several Northern California counties including Lake County. The United States Geological Survey (USGS) has estimated a relatively low probability of 2 percent that an earthquake of Richter magnitude 8.0 would occur along the North Coast segment (USGS 1990).

Mayacama Fault Zone

The Mayacama Fault traverses the Lake and Mendocino County lines in the eastern mountains less than 20 miles from the Clear Lake basin. The Maacama Fault is the northern segment of the Healdsburg/Rodgers Creek Fault Zone in Sonoma County. The Healdsburg/Rodgers Creek Fault line is the northern segment of the Hayward Fault Zone traversing the eastern portion of the San Francisco Bay Area. Trenching studies across the fault by USGS have resulted in an estimated 250-year recurrence interval for magnitude 7.0 earthquakes (Budding et al 1989 as cited by California Department of Mines & Geology-CDMG, 1991). The last major earthquake along the Healdsburg/Rogers Fault was in 1808, and the USGS considers this fault a prime potential for future large earthquakes (CDMG 1991). The Hayward Fault Zone has a 25 percent chance of producing an earthquake of magnitude 7.0 or greater within the next 30 years, according to the California Division of Mines and Geology (1990).

- Geysers Geothermal Steam Field

The Geysers Geothermal Field is located west of the Middletown area in both Lake and Sonoma Counties. Since the early 1980's, geothermal power development has occurred in this area as a major industry. Seismic studies of the area have indicate there is a potential increase in micro seismic of 4.0 or less on the Richter scale with a relationship between micro seismic activity and geothermal production in the Geysers. A 4.0 or less earthquake does not result in dangerous ground shaking.

- Lake County Fault Zones

Seismic activity within the past 200 years has shown absents of any major damaging earthquake occurring along the identified fault lines within Lake County. California Division of Mines and Geology (CDMG) classify faults as either active or potentially active according to the Alquist-Priolo Special Studies Act of 1972 (CDMG 1972). A fault that has exhibited surface displacement (movement) within the Holocene Epoch (the last 10,000 years) is defined as active by the CDMG. The CDMG suggests that this definition be used to evaluate faults located within a 60-mile radius of a project site. A fault that has exhibited surface displacement during the Pleistocene Epoch (1.6 million years ago to 10,000 years ago) is defined as potentially active. The State of California enacted the Alquist-Priolo Special Studies Zone Act in 1972 to assure that homes, offices, hospitals, public buildings, and other structures for human occupancy are not built on active faults, thereby preventing or avoiding potential damage resulting from fault surface rupture. Surface rupture is a break in the ground surface and associated deformation resulting from fault movement. The act requires a geological investigation before a local government can approve most development projects in special studies zones.

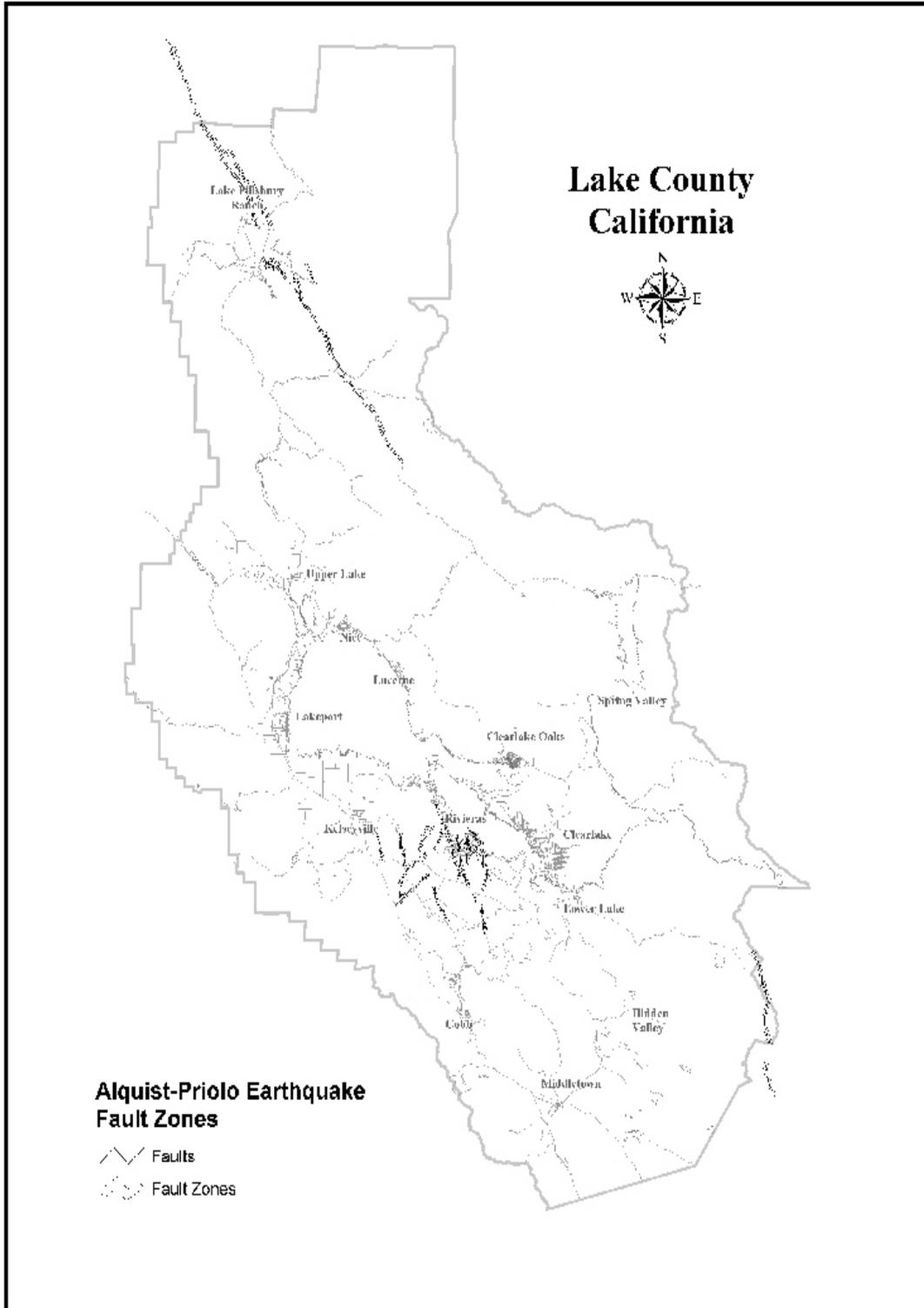
Probability and Risk

Earthquakes are naturally occurring events that will inevitably occur in this region of the world. The combination of plate tectonics and associated California coastal mountain range building geology, essentially guarantees earthquake as a result of the periodic release of tectonic stresses. Lake County's mountainous terrain lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region. There is a ***Moderate to High Potential*** of an earthquake occurring in and near Lake County, however a ***Moderate to High Risk*** associated with this natural hazard.

Conclusion

Lake County seismic activity within the past two hundred years has shown absents of any major or damaging earthquake occurring on identified fault lines within Lake County. However, the possibility of an earthquake is an ever-present phenomenon in Lake County. Although one cannot accurately predict the occurrence of seismic activity, they can be assured that the eventuality of an earthquake is a certainty. Therefore, individuals have an opportunity to plan for an earthquake in order to lessen the potential hazards that result either directly or indirectly from an earthquake event. With this said, damage to property and threat to the health of county residents is decreased with their ability to be prepared for earthquakes. To be able to most effectively address the threat of earthquakes, and the landslides, and dam failures, and other dangers associated with them, citizens, families and businesses should:

- ❑ Have a plan, including alternate travel routes.
- ❑ Store extra supplies of food and water.
- ❑ Store other related supplies such as flashlights, batteries, and firewood.
- ❑ Have a battery-operated radio within their home and business.
- ❑ Know the location for turning off electrical, natural gas lines and propane tanks.
- ❑ Develop family home escape plan and practice implementing the plan.
- ❑ Develop a telephone contact system with a family member outside of the county for welfare check-in by all family members.



LANDSLIDE

Lake County's natural terrain and climate combine to create conditions conducive to landslide. Where mudslides and flows are a threat isolated primarily to winter months, the threat of landslides is generally distributed throughout the year. Most landslide events are associated with and resultant from other natural hazards.

Landslides include all movements of soil, rock or debris as a result of falling, sliding or flowing. The triggering cause may be heavy rainfall or seismic activity. An untimely occurrence of a large earthquake during or soon after a sustained period of moderate to heavy rainfall could produce a landslide problem of monumental proportions. Debris flows and associated storm-triggered landslides have caused most of the deaths and much of the structural damage attributed to land sliding in California.

Landslide is a generic term, which is defined as the downward sliding of a relatively dry mass of earth and rock. An even more simplistic definition is "slope failure." The primary factor involved in landslides is gravity, but three other factors have varying degrees of influence. They are:

- Slope Angle
- Slope Material, and
- Amount of Water

Gravity is the constant in any equation trying to quantify the stability or instability of a slope face. Slope angle, slope material, and the amount of water are the variable factors that, combined with gravity, determine slope stability. Other factors that help identify the stability of slope to a lesser degree are vegetation and climate. Landslides are categorized into groups using two variables; the type of movement and the type of material that is involved. Type of movement is categorized into three groups:

- Falls
- Slides, and
- Flows

The amount of water usually is the defining ingredient when classifying the movement. In falls, very little water is present, whereas in flows there is a substantial amount of water involved. The type of material involved is broken into three groups:

- Soil (earth)
- Rock
- Debris

Landslide events can be determined by the composition of materials and the speed of movement. A rockfall is dry and fast while a debris flow is wet and fast. Regardless of the speed of the slide, the materials within the slide, or the amount of water present in the movement, landslides are a serious natural hazard.

Hazard Assessment

In Lake County, such incidents have occurred frequently in the past, and as growth and development place more people, more structures and more roadways in areas susceptible to landslides, the potential; destruction and cost of storm related landslides become greater and greater.

During severe storm activity, debris avalanches and debris flows may be triggered in both rural and urban areas, smashing structures, blocking roads, severing utilities and water supply, and injuring or killing people. Damage control and disaster relief may be required from local agencies, private organizations, and state and federal governments. Emergency operations may be seriously hampered by closure of major highways and main roads and loss of communications. Evacuation of dangerous areas may be necessary. Extensive efforts may be required to rescue trapped persons, recover bodies, remove debris, assist in reestablishing vital public services and utilities, and offer continuing care and shelter to affected persons.

Lake County lies within contrasting topographic settings: Steep hills and ridges. The hills and ridges to the southeast are characterized by very steep slopes and by sharp differences in the strength and stability of the geological materials underlying the surface soils. These differences are generally expressed by the lack or presence of landslide deposits, which are widely but unevenly distributed on the slopes. Most landslide damage has taken place within pre-existing landslide deposits.

Lake County could be isolated if State Highway 20, 175, and 29 were impacted by landslides or large debris flow. Landslides constitute one of the principal hazards to structures, roads, and utilities. A typical soil debris avalanche in Lake County involves a few hundred cubic yards of soil and colluvium and is the result of total saturation. The Cache Creek Slide Zone in the northeastern region of the county produces an annual debris flow of significant. The Lake County Office of Emergency Services maintains an updated emergency contingency plan for conducting evacuations and property protection for this zone.

Probability and Risk

Landslides are naturally occurring events that will inevitably happen as long as gravity itself is a controlling factor upon the landscape. Since Lake County's mountainous terrain challenges gravity as it rapidly rises to upper elevations, much of the high-relief topography in the county can be identified as land with the potential for landslides. Much of that land though is in remote and undeveloped locales, which reduces the risk of this natural hazard. There is a ***Moderate to High Probability*** of landslide activity in Lake County, however a ***Moderate to Low Risk*** associated with this natural hazard.

Conclusion

Landslide hazard in Lake County can be considered a year-round phenomenon. The County's natural terrain promotes the wearing away of the landscape via both physical and chemical weathering mechanisms. In the winter, added moisture in the soil strata can generate landslides, and the varying warm temperature ranges during the summer months can have a similar effect. In general, higher slopes equate to higher landslide potential. Therefore, individuals should be alert in high-relief areas to the threat to landslides at all times of the year. In lower level areas of the county, the threat from landslide were winter saturation occurred remains a threat, however landslide potential greatly diminishes. Landslides are more prevalent as a result of earthquakes, floods, and severe weather. They also are to be expected following wildland fire events. This tendency can act as an early warning to the presence of landslide danger, allowing the public to be appropriately prepared for possible occurrence of a landslide.

VOLCANO ERUPTION

A volcanic eruption within Lake County is unpredictable and can occur. However, history shows no volcanic activity in Lake County over the past two thousand years. It has not occurred in the Mount Konocti Volcano that is part of the Cascade Range, a chain of volcanoes that runs from Northern California into British Columbia. Mount Konocti is one of sixteen areas in California identified as likely to experience volcanic eruption.

Recent volcanic deposits dating only a few thousand years ago and the presence of geothermal resources suggest an event should be included as an identified threat. The Clear Lake volcanic field lies in a tectonically active, complex geologic setting within the San Andreas transform fault system in the northern Coastal Mountain Range of California.

Clear Lake and the volcanic field are located within a fault-bounded, locally extensional basin. The Lake is the largest freshwater lake entirely within California; it is volcano-tectonic in origin, but is not a caldera lake. The volcanic field is the northernmost of a series of young Cenozoic volcanic fields in the Coast Ranges. Within the field, eruptive loci have migrated northward through the last 2.1 million years.

Eruptive centers are lacking. Volcanism appears to be related to the extension in a pull-apart basin within the San Andreas Fault system and is not directly related to subduction, which ceased off the California coast at this latitude around 3 million years ago. However USGS suggest the Clear Lake Volcanic Field as “active status”. Source: USGS-potential active volcanoes of the Western United States Map, June 2004.

Mount Konocti is but one of the dormant, or extinct volcanoes that extended around the Pacific Ocean in a great Ring of Fire. This zone of volcanoes and earthquakes marks the edges of plates that form the Earth’s crust. Volcanic and seismic disturbances occur as these great slabs override or grind each other. The theory of plate tectonics holds that as the expanding oceanic crust is thrust beneath the continental plate margins, it penetrates deep enough into the Earth to be partly re-melted. Pockets of molten rock (magma) result. These become the feeding chambers for volcanoes.

Probability and Risk

Volcano Eruptions are naturally occurring events that will eventually occur in this region of the world. The combination of plate tectonics and associated California coastal mountain range building geology, essentially guarantees seismic and possibly volcanic activity as a result of the periodic release of tectonic stresses. Lake County’s mountainous terrain lies in the center of the North American and Pacific tectonic plate activity. There have been volcanic and seismic activity in the historic past with Mount Lassen eruption in May 1914 located less than 100 miles northeast of Lake County. There will continue to be seismic activity in the future of the California north coastal mountain region. There is a **Low Potential** of a volcano eruption occurring in and near Lake County, however a **High Risk** associated with this natural hazard.

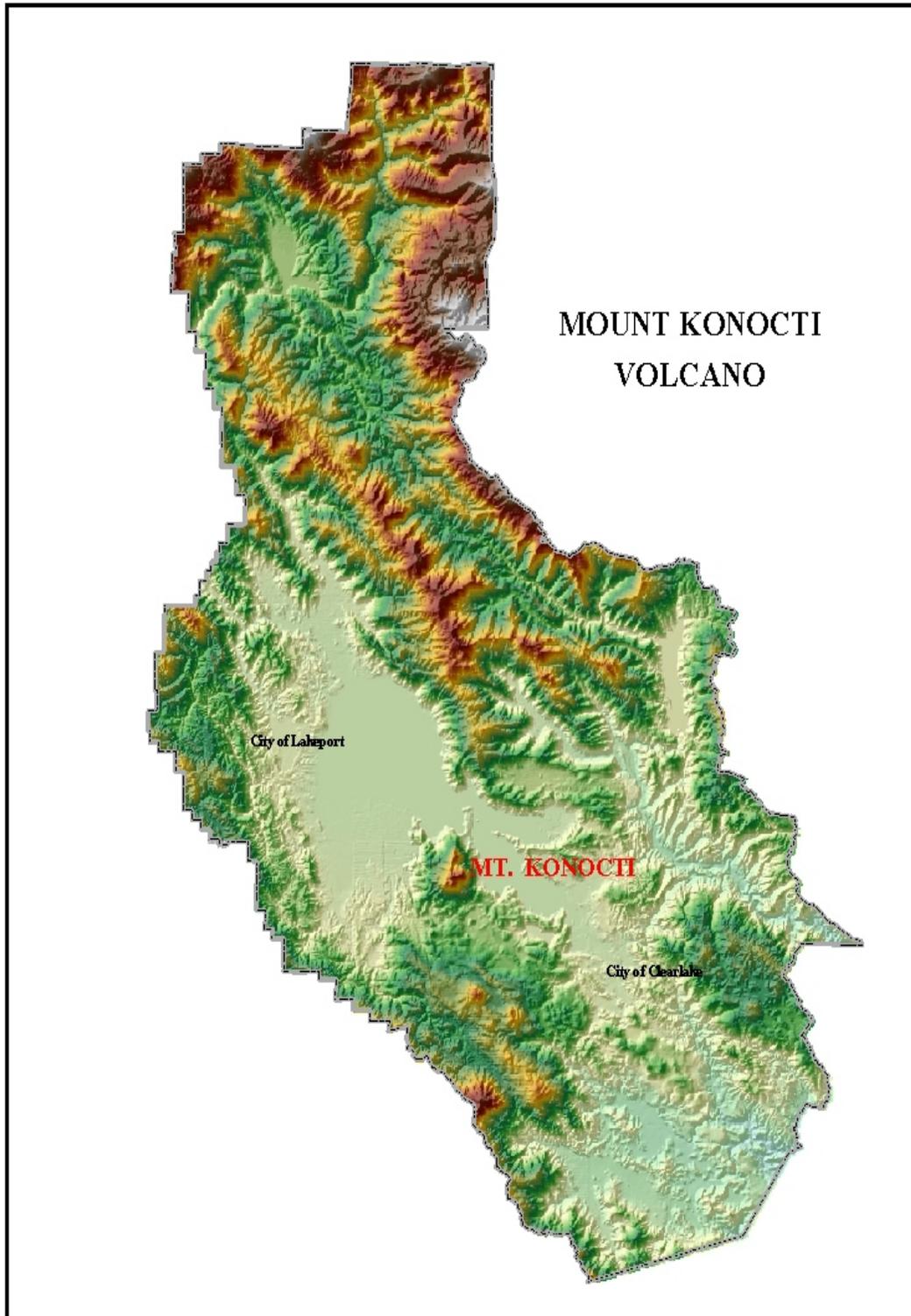
Conclusion

Lake County volcanic and seismic activity has shown absence of any major or damaging event occurring in Lake County. However, the possibility of a volcano eruption is an ever-present phenomenon in Lake County. Although one cannot accurately predict the occurrence of such an event, they can be assured that the eventuality of it is a certainty.

Therefore, individuals have an opportunity to plan for all seismic activity in order to lessen the potential hazards that result either directly or indirectly from an event. With this said, damage to property and threat to the health of county residents is decreased with their ability to be prepared for all levels of seismic events.

To be able to most effectively address the threat and other dangers associated, citizens, families and businesses should:

- ❑ Have a plan.
- ❑ Store extra supplies of food and water.
- ❑ Store other related supplies such as flashlights, batteries, and firewood.
- ❑ Have a battery-operated radio within their home and business.
- ❑ Know the location for turning off electrical, natural gas lines and propane tanks.
- ❑ Develop family home escape plan and practice implementing the plan.
- ❑ Develop a telephone contact system with a family member outside of the county for welfare check-in by all family members.



IDENTIFIED ASSETS AND POTENTIAL LOSSES

The Lake County Natural Hazard Mitigation Plan identifies critical facilities located in the County and the hazards to which these facilities are susceptible. A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in Lake County, or fulfills important public safety, emergency response, and/or disaster recovery functions.

The table on the following pages identifies critical facilities in the County, specific natural hazards that might affect each individual facility, and the potential losses that might occur. In order to compile this data, the Lake County Office of Emergency Services conducted meetings, organized a survey mailer sent to all participants and stakeholders, provided follow up instruction to accurately guide survey recipients, and investigated County records. Additionally, historical records were researched with the Public Services Department, citizens interviewed, and the County Information Technology Department was employed as an analysis toll to define hazards and gauge levels of vulnerability.

Lake County is rural with pocket communities, two incorporated cities, and mountainous area in the center of the Pacific Coastal Mountain Range, thirty miles east of the Pacific Ocean. The majority of the land in the County, roughly fifty-five (55) percent, is public held, most of this in federal and state trust. On the remaining forty-five (45) percent of privately held lands, agriculture uses have dominated. As of 2002, the County's population was 46,470 residents in the unincorporated area, 5,500 in the City of Lakeport and 10,000 in the City of Clearlake, with a forecasted growth rate of less than ten (10) percent projected for 2010.

Lake County is surrounded by areas that are experiencing high levels of development. In Yolo and Napa counties to the southeast, and Sonoma County to the southwest, there has been record growth in the past decade. To the west in Mendocino County, similar growth is beginning to show a very strong trend. To the north and northeast, Colusa and Glenn counties, is also beginning to experience development trends. It is foreseen that Lake County will experience development pressure in the very near future.

The Lake County General Plan will function to guide that development. It is expected that the greatest development pressure in the County unincorporated area will occur in the Hidden Lake community and Middletown areas. The remaining unincorporated areas of the County will anticipate some development, however not as significant as the south Lake County region. Improvements to the County road system and utility infrastructure will certainly be initiated within or apart from any development proposals.

LAKE COUNTY POTENTIAL LOSS OVERVIEW			NATURAL HAZARD THREAT						
			WILDLAND FIRE	FLOOD	SEVERE STORM	EARTHQUAKE	LANDSLIDE	DROUGHT	DAM FAILURE
ORGANIZATION	FACILITY	POTENTIAL LOSS							
County of Lake	Lakeport Area								
	Administration Center	\$ 13,442,129			X	X		X	X
	* CAO Office								
	* Board of Supervisors								
	* Airport Administration								
	* Assessor Office								
	* Auditor-Controller								
	* Community Development								
	* Planning Division								
	* County Clerk								
	* County Counsel								
	* Superior Court								
	* Elections Department								
	* Information Technology								
	* LAFCO								
	* Buildings & Grounds								
	* Economic Development								
	* Personnel Department								
	* Purchasing Department								
	* County Recorder								
	* Registrar of Voters								
	* Risk Management								
	* County Tax Collector								
	* Public Works Department								
	* County Treasurer								
	Courthouse Annex	\$ 1,844,099			X	X		X	X
	District Attorney	\$ 3,537,799			X	X		X	X
	Veterans Service Office	\$ 111,026			X	X		X	X

LAKE COUNTY POTENTIAL LOSS OVERVIEW			NATURAL HAZARD THREAT						
			WILDLAND FIRE	FLOOD	SEVERE STORM	EARTHQUAKE	LANDSLIDE	DROUGHT	DAM FAILURE
ORGANIZATION	FACILITY	POTENTIAL LOSS							
County of Lake	<u>Lakeport Area</u>								
	Public Health Dept.	\$ 1,417,865			X	X		X	X
	Social Services Dept.	\$ 321,380			X	X		X	X
	Special District Admin.	\$ 498,925			X	X		X	X
	Public Services Dept.	\$ 515,994			X	X		X	X
	Agriculture Dept.	\$ 922,461			X	X		X	X
	Buildings 2, 3 & 4	\$ 88,064							
	Animal Control Shelter	\$ 287,793			X	X		X	X
	Animal Control (O1d)	\$ 34,310							
	Animal Control (Shed)	\$ 36,256							
	Animal Control (Barn)	\$ 50,443							
	Animal Control (Office)	\$ 52,825							
	Sign Storage Shop, 1	\$ 138,333			X	X		X	X
	Service Garage, 4	\$ 360,932							
	Storage Building, 3	\$ 93,622							
	Equipment Building, 5	\$ 24,585							
	Equipment Building, 6	\$ 51,981							
	Service Garage, 7&8	\$ 62,862							
	Office Building	\$ 117,519							
	Equipment Building, 10	\$ 138,745							
Old Courthouse	\$ 1,488,525			X	X		X	X	
Museum Division	\$ 25,997								
Mental Health	\$ 313,980			X	X		X	X	
Family Support	\$ 41,864			X	X		X	X	
Social Services (Storage)	\$ 2,079			X	X		X	X	
Social Services (Conf)	\$ 6,239			X	X		X	X	

LAKE COUNTY POTENTIAL LOSS OVERVIEW			NATURAL HAZARD THREAT						
			WILDLAND FIRE	FLOOD	SEVERE STORM	EARTHQUAKE	LANDSLIDE	DROUGHT	DAM FAILURE
ORGANIZATION	FACILITY	POTENTIAL LOSS							
County of Lake	<u>Lakeport Area</u>								
	Law Library	\$ 93,404			X	X		X	X
	Vista Point Building	\$ 159,645			X	X		X	X
	Waste Transfer Station	\$ 300,209			X	X		X	X
	County Library	\$ 1,213,093			X	X		X	X
	County Jail	\$ 7,138,229	X		X	X		X	X
	County Jail	\$10,822,962	X		X	X		X	X
	Training Building	\$ 922,598			X	X		X	X
	Jail Warehouse	\$ 412,001	X		X	X		X	X
	DA Victim Witness	\$ 172,670			X	X		X	X
	Property Building	\$ 372,519			X	X		X	X
	Social Services Dept.	\$ 321,380			X	X		X	X
	Child Support	\$ 31,141			X	X		X	X
	Probation Office	\$ 708,260			X	X		X	X
	Sheriff's Admin.	\$ 877,671			X	X		X	X
	Sheriff's Quonset #3A	\$ 17,371			X	X		X	X
	Sheriff's Quonset #3B	\$ 17,371			X	X		X	X
	Sheriff's Quonset #3C	\$ 18,165			X	X		X	X
	Sheriff's Storage	\$ 7,013			X	X		X	X
	Family Support	\$ 483,033			X	X		X	X
Court Records Build.	\$ 7,514			X	X		X	X	

LAKE COUNTY POTENTIAL LOSS OVERVIEW			NATURAL HAZARD THREAT							
			WILDLAND FIRE	FLOOD	SEVERE STORM	EARTHQUAKE	LANDSLIDE	DROUGHT	DAM FAILURE	VOLCANO ERUPTION
ORGANIZATION	FACILITY	POTENTIAL LOSS								
County of Lake	Lakeport Area									
	Lakeside Park			X	X	X		X		X
	Pump Building	\$ 2,305								
	Public Restroom	\$ 79,726								
	Shop Building	\$ 93,283								
	Public Restroom#2	\$ 59,723								
	Storage Building	\$ 6,111								
	Playground Equipment	\$ 64,000								
	Keeling Dock	\$ 53,744								
CSA #21	N.W. Treatment System			X	X	X		X		X
	Operations Building	\$ 531,051								
	Equipment Shop	\$ 1,053,859								
	Office/Laboratory	\$ 214,565								
	Treatment Facility	\$ 3,485,847								
	Maintenance Building	\$ 217,017								
	Juvenile Hall	\$ 2,554,210		X	X	X		X		X
	Juvenile Hall (C/Rm)	\$ 137,525		X	X	X		X		X

LAKE COUNTY POTENTIAL LOSS OVERVIEW			NATURAL HAZARD THREAT							
			WILDLAND FIRE	FLOOD	SEVERE STORM	EARTHQUAKE	LANDSLIDE	DROUGHT	DAM FAILURE	VOLCANO ERUPTION
ORGANIZATION	FACILITY	POTENTIAL LOSS								
County of Lake	<u>Kelseyville Area</u>									
	Service Garage	\$ 204,991			X	X		X		X
	Equipment Canopy	\$ 34,759								
	Justice Court Building	\$ 86,052			X	X		X		X
	Senior Center	\$ 71,074			X	X		X		X
	Community Park Build	\$ 11,590			X	X		X		X
	Park Restroom	\$ 78,256								
	Playground Equipment	\$ 55,000								
	Sheriff Department	\$ 26,782			X	X		X		X
	KCWW # 3	Kelseyville Wastewater Treatment Plant	\$ 842,617	X	X	X	X	X		X
	Old Shop Building	\$ 93,838								
	Equipment Building	\$ 262,920								
CSA # 22	Mt. Hannah Water Equipment, Plant	\$ 80,345			X	X		X		X
CSA # 20	Soda Bay Water Pump Station	\$ 73,538	X	X	X	X	X	X		X
	Treatment Plant	\$1,053,859								
	Treatment Plant	\$ 258,128								
CSA # 6	Finley Water Equipment, Plant	\$ 210,410		X	X	X	X	X		X

LAKE COUNTY POTENTIAL LOSS OVERVIEW			NATURAL HAZARD THREAT							
			WILDLAND FIRE	FLOOD	SEVERE STORM	EARTHQUAKE	LANDSLIDE	DROUGHT	DAM FAILURE	VOLCANO ERUPTION
ORGANIZATION	FACILITY	POTENTIAL LOSS								
County of Lake CSA #1	Clearlake Area									
	S.E. Wastewater Treatment Plant	\$ 379,517	X		X	X		X		
	Equipment Building	\$ 526,022	X		X	X		X		
	Maintenance Building	\$ 106,749	X		X	X		X		
	Storage Building	\$ 6,763	X		X	X		X		
	Office-Lab Building	\$ 123,735	X		X	X		X		
	Chlorine Building	\$ 76,944	X		X	X		X		
	Courthouse/Substation	\$ 1,224,948	X		X	X		X		
	Public Health Dept	\$ 1,082,644	X		X	X		X		
	Mental Health Dept.	\$ 155,976	X		X	X		X		
	County Library	\$ 1,545,601	X		X	X		X		
	Parks Department	\$ 147,712	X		X	X		X		
	Solid Waste Dept.	\$ 69,922	X		X	X		X		
	Equipment Building	\$ 69,481	X		X	X		X		
	Storage Building	\$ 7,364	X		X	X		X		
		Clearlake Oaks Area								
		Public Restroom	\$ 62,583	X		X	X		X	
		Spring Valley Area								
		Clubhouse	\$ 278,350	X		X	X		X	
		Campground/Restroom	\$ 42,845	X		X	X		X	
CSA #2	Storage Building	\$ 11,328	X		X	X		X		
	Treatment Plant	\$ 972,989	X		X	X		X		

LAKE COUNTY POTENTIAL LOSS OVERVIEW			NATURAL HAZARD THREAT						
			WILDLAND FIRE	FLOOD	SEVERE STORM	EARTHQUAKE	LANDSLIDE	DROUGHT	DAM FAILURE
ORGANIZATION	FACILITY	POTENTIAL LOSS							
County of Lake	<u>Middletown Area</u>								
	Sheriff Substation	\$ 20,797	X		X	X		X	X
	Middletown Pool	\$ 144,006	X		X	X		X	X
	Library	\$ 213,531	X		X	X		X	X
	Middletown Treatment	\$ 152,106	X		X	X		X	X
	Treatment Pipeline	\$ 20,306,257	X		X	X		X	X
	Treatment Plant	\$ 210,228	X		X	X		X	X
	Middletown Park	\$ 40,000	X		X	X		X	X
CSA # 18	<u>Cobb Mountain Area</u>								
	Starview Water	\$ 173,707	X		X	X		X	X
	<u>Lower Lake Area</u>								
	Old County Jail	\$ 38,953	X		X	X		X	X
	Lower Lake Park		X		X	X		X	X
	Office Building	\$ 190,263							
	Meeting Hall	\$ 137,723							
	Park Building #1	\$ 101,454							
	Public Restroom	\$ 37,357							
	Gazebo	\$ 5,886							
	Shelter	\$ 20,132							
	Playground Equip.	\$ 55,000							
	Schoolhouse Museum	\$ 1,219,578	X		X	X		X	X
	Social Services Dept.	\$ 31,141	X		X	X		X	X
	Social Services #2	\$ 25,000	X		X	X		X	X
Environmental Health	\$ 257,615	X		X	X		X	X	
Maintenance Garage	\$ 372,182	X		X	X		X	X	

LAKE COUNTY POTENTIAL LOSS OVERVIEW			NATURAL HAZARD THREAT						
			WILDLAND FIRE	FLOOD	SEVERE STORM	EARTHQUAKE	LANDSLIDE	DROUGHT	DAM FAILURE
ORGANIZATION	FACILITY	POTENTIAL LOSS							
County of Lake	<u>Lucerne Area</u>								
		Public Restroom	\$ 36,299	X	X	X	X	X	X
		Public Restroom #2	\$ 52,203	X	X	X	X	X	X
		Clubhouse	\$ 279,424	X	X	X	X	X	X
		Public Restroom #3	\$ 23,969	X	X	X	X	X	X
		Visitor Center	\$ 846,622	X	X	X	X	X	X
		Alpine Park Equipment	\$ 55,000	X	X	X	X	X	X
		Keeling Park Equip.	\$ 55,000	X	X	X	X	X	X
		Harbor Park	\$ 64,000	X	X	X	X	X	X
	CSA # 13	Kono Tayee Water	\$ 149,186	X	X	X	X	X	X
CSA # 16	Paradise Valley Water	\$ 12,750	X	X	X	X	X	X	
CSA # 7	<u>Loch Lomand Area</u>								
		Bonanza Springs Water	\$ 157,716	X	X	X	X	X	X
	<u>Nice Area</u>								
		Clubhouse	\$ 237,238	X	X	X	X	X	X
		Public Restroom	\$ 44,939	X	X	X	X	X	X
		Clubhouse	\$ 237,238	X	X	X	X	X	X
		Public Restroom	\$ 44,939	X					
	<u>Upper Lake Area</u>								
		Upper Lake Park		X	X	X	X	X	X
		Public Restroom	\$ 46,507						
	Storage Building	\$ 61,640							
	Picnic Shelter	\$ 12,240							
	Playground Equipment	\$ 64,000							
	Library	\$ 200,497	X	X	X	X	X	X	
	Justice Court	\$ 108,974	X	X	X	X	X	X	
	Equipment Storage	\$ 73,906	X	X	X	X	X	X	
	Equipment Shop	\$ 79,570	X	X	X	X	X	X	

LAKE COUNTY POTENTIAL LOSS OVERVIEW			NATURAL HAZARD THREAT						
			WILDLAND FIRE	FLOOD	SEVERE STORM	EARTHQUAKE	LANDSLIDE	DROUGHT	DAM FAILURE
ORGANIZATION	FACILITY	POTENTIAL LOSS							
Special Districts	<u>Fire Districts</u>								
	Clearlake Oaks FPD	\$ 1,500,000	X		X	X		X	X
	Kelseyville FPD	\$ 2,750,000	X		X	X	X	X	X
	Lakeport FPD	\$ 2,800,000	X	X	X			X	X
	Lake County FPD	\$ 2,850,000	X		X	X		X	X
	Lucerne FPD	\$ 1,500,000	X		X	X	X	X	X
	Nice FPD	\$ 1,500,000	X		X	X	X	X	X
	South Lake County	\$ 3,100,000	X		X	X		X	X
	Upper Lake FPD	\$ 1,000,000	X	X	X	X		X	X
Special Districts	<u>School Districts</u>								
	Lakeport School District	\$ 21,455,902	X	X		X		X	X
	Oak Hill Middle School	\$ 6,181,766	X		X	X		X	X
	Pomo Elementary School	\$ 5,207,000	X		X	X		X	X
	Burns Valley Elementary	\$ 3,517,946	X		X	X		X	X
	East Lake Elementary	\$ 1,957,952	X		X	X		X	X
	Lower Lake Elementary	\$ 5,872,832	X		X	X		X	X
	Carle W. C. High School	\$ 1,113,702	X		X	X		X	X
	Lower Lake High School	\$ 12,257,611	X		X	X		X	X
	Kelseyville School District	\$ 26,989,163	X		X	X		X	X
Middletown School Dist.	\$ 21,990,679	X							

SECTION THREE MITIGATION STRATEGY

The Lake County Natural Hazard Mitigation Plan has identified the natural hazards that could impact the residents and property in Lake County and assessed the risks inherent to each hazard. Mitigating the effects of these natural hazards has long been a goal of County residents. Throughout the history of the County, residents have looked for and implemented measures designed to lessen the effects of natural hazards.

As an example, Lake County Board of Supervisors approved several completed hazard mitigation projects countywide that addressed storm culvert upgrades and replacements, flood water diversion levee and structure elevation projects in Hidden Valley, seismic retrofitting projects for bridge crossing at the Rodman Bridge on the Nice-Lucerne cutoff road, and bridge replacement at the Cole Creek Bridge crossing. Here, a combination of County general funds and state/federal grant fund programs were utilized to facilitate community-based hazard mitigation and prevention activities.

County Hazard Mitigation Goals

The goals identified in the Lake County Natural Hazard Mitigation Plan are multi-jurisdictional in their scope and intent. The mitigation goals describe the overall direction that Lake County agencies, organizations, and citizens propose to take toward mitigating risk from natural and man-made hazards. Goals and objectives of the Plan were developed during interviews and meetings with public officials. As indicated in the introduction of this document, the goals of creating and implementing the Lake County Natural Hazard Mitigation Plan are to:

- ❑ Save lives and protect property
- ❑ Create a more disaster resistant County
- ❑ Reduce impact of future disaster events
- ❑ Promote a fire safe County
- ❑ Promote a flood safe County
- ❑ Promote an earthquake safe County
- ❑ Demonstrate a dedication to improving the county's safety and well being
- ❑ Enable pre-disaster funding
- ❑ Hasten recovery from disasters

These goals are applicable to all natural hazards identified in this plan. Although the plan goals might appear overly broad in scope, their intent mainly is to reduce the threat of natural hazards through mitigation approaches is still quite clear in definition and vision.

From these goals come the objectives of the Lake County Natural Hazard Mitigation Plan. The objectives are arranged in a manner that addresses each natural hazard individually. From the goals, objectives are derived, and from the objectives, actions are formulated.

A final set of objectives addresses mitigation measures that are applicable to all natural hazards identified within the plan.

Prioritizing Mitigation Measures

In order to identify which natural hazards pose the greatest threat to the County and plan participants, a multi-faceted and multi-tiered approach was utilized. First, the probability and risk assessments from Section II of this plan were scaled and quantified in order to provide an overall countywide assessment of where the greatest threats from natural hazards lie. From this probability and risk matrix, an initial measure of the identified natural hazards was calculated. Although basic in nature, the Natural Hazard Probability/Risk Assessment Scoring Matrix provides a fundamentally sound, broad-based foundation from which to build more refined comprehension of natural hazard threats in the County.

Natural Hazard Probability/Risk Assessment Scoring Matrix

SCALING		NATURAL HAZARD	PROB.	RISK	TOTAL	High THREAT Low
Very Low	1	Wildland Fire	7	7	14	
Low	2	Flood	5	5	10	
Moderate/Low	3	Severe Strom	5	3	8	
Moderate	4	Drought	5	3	8	
Moderate/High	5	Earthquake	5	3	8	
High	6	Landslide	5	3	8	
Very High	7	Dam Failure	2	6	8	
		Volcano Eruption	1	6	7	

Secondly, County departments and plan participants responded to requested information during several meetings and field on-site investigation trips, specific risk assessment information was requested from individuals in order to rate overall hazards as they expressly related to their jurisdiction. This allowed for a more refined rating of natural hazards in relation to the various jurisdictions participating in the plan.

The following Natural Hazard Rating Table is the assemblage of those departments and individual responses during the field investigation and review providing a much clearer perspective of the variability of hazard threats experienced within Lake County.

Natural Hazard Rating Table

Jurisdiction	Wildland Fire	Flood	Severe Storm	Drought	Earthquake	Landslide	Dam Failure	Volcano Eruption	TOTAL
County of Lake, California	25	18	12	18	14	7	6	0	92
Lake County Unified School Districts	15	13	15	12	15	3	4	2	65
Lake County Special Districts	25	21	18	22	21	5	3	0	113
Lake County Fire Districts	25	20	22	19	15	12	0	0	103
City of Clearlake	5	5	5	3	3	5	0	1	27
City of Lakeport	3	5	5	2	5	0	0	0	20
Community Public Meetings	12	8	12	12	7	2	1	0	46
TOTAL	110	100	89	88	80	34	14	3	

The dual approach provides information that is not only countywide in scope but also allows for each plan participant to make jurisdictionally explicit measurements. Combined, these two natural hazard-rating mechanisms provide a solid foundation from which prioritization of natural hazard mitigation measures can be initiated. In cases, the higher the score, the higher the priority for implementing natural hazard mitigation measures.

Mitigation Objectives

The following is a list of objectives developed in conjunction with the overall goals of this plan. These objectives are multi-jurisdictional in their intent and scope. Within each objective, one or more actions designed to facilitate the realization of the objective are identified. The objectives are sorted by specific natural hazards and are arranged in the order of priority identified in the Natural Hazard Rating Table. The highest priority objectives and actions are listed first, with the lowest priority objectives and actions listed last. The action item list was developed to provide public policy makers with a list for potential implementation as mitigation resources; time, equipment and funding become available for selected projects.

WILDLAND FIRE

To minimize the threat to lives and property posed by the possibility of wildland fire within Lake County.

Objective 1.1: *The County should compile and disseminate information regarding the fire threat identifying Urban Interface Areas.*

Ideas for Implementation

Action 1.1.1: The County should encourage development and dissemination of maps relating to fire hazard to help educate and assist builders and homeowners to comply with wildfire interface mitigation activities.

Coordinating Agency: Community Development Department

Timeframe: Ongoing

Funding: Current funding

Action 1.1.2: The County should coordinate with the California Department of Forestry & Fire Protection (CDF&FP) and countywide Fire Districts in developing GIS based maps of fire access trails, firebreaks, water sources and structures within moderate to very high fire severity zones.

Coordinating Agency: County Office of Emergency Services

Timeframe: 1-2 years

Funding: When funds become available

Action 1.1.3: The County should prepare Structure Protection and Mutual Aid Fire Contingency Plans for each of the identified Urban Interface Communities in coordination with the California Department of Forestry & Fire Protection and local Fire Districts.

Coordinating Agency: County Office of Emergency Services

Timeframe: 1-2 years

Funding: When funds become available

Action 1.1.4: The County should prepare Evacuation Route Contingency Plans for each of the identified Urban Interface Communities in coordination with the California Department of Forestry & Fire Protection and local Fire Districts.

Coordinating Agency: County Office of Emergency Services

Timeframe: 1-2 years

Funding: When funds become available

Objective 1.2: *The County should attempt to decrease the potential risk associated from Urban Interface wildland fires through a variety of actions.*

Ideas for Implementation

Action 1.2.1: The County should continue to review new development in high fire hazard areas to assure that adequate access roads, onsite fire protection systems, signage, flame-retardant building materials, defensible space, and firebreaks are provided as required by state regulations and county ordinances.

Coordinating Agency: Community Development Department and Property Owners
Timeframe: Ongoing
Funding: Current funding

Action 1.2.2: The County should develop comprehensive defensive space ordinances to minimize risk throughout the identified urban interface zones. The ordinance is expected to include homeowner’s insights regulatory requirements and best practices. The ordinance will incorporate the Hazardous Fire Areas Fire Protection Standards.

Coordinating Agency: Community Development Department and Property Owners
Timeframe: 1-2 years
Funding: When funds become available

Action 1.2.3: The County should investigate the development and adoption of minimum standards to location, design and construction of buildings and structures or portions thereof for the protection of life and property, to resist damage from wildland interface fires, and to mitigate building and structure fires from spreading to wildland fuels.

Coordinating Agency: Community Development Department and Property Owners
Timeframe: 1-3 years
Funding: When funds become available

Action 1.2.4: The County should develop criteria and a process for a Fire Protection Plan.

Coordinating Agency: Community Development Department
Timeframe: 1-2 years
Funding: When funds become available

FLOOD

To minimize the threat to life and property posed by the possibility of flood damages within the County.

Objective 2.1: *The County should support programs and methods to reduce the flood damages to public and private property.*

Ideas for Implementation

Action 2.1.1: The county should continue to assist state and federal agencies, other responsible agencies and the public to maintain funding for the development of flood protection projects.

Coordinating Agency: Department of Public Works

Timeframe: Ongoing

Funding: When funds become available

Action 2.1.2: The County should pursue funding for design and construction of storm drainage projects to protect properties, including home elevations, property acquisitions, upstream storage such as detention basins, and channel widening with the associated right-of-way acquisitions, relocations and environmental mitigations.

Coordinating Agency: Department of Public Works

Timeframe: Ongoing

Funding: When funds become available

Objective 2.2: *The County should continue to provide for floodplain management to protect its residents and property from hazards of development the floodplain zones and its tributaries.*

Ideas for Implementation

Action 2.2.1: The County should continue to apply floodplain management regulations and County ordinances for development in the flood plain and floodway.

Coordinating Agency: Community Development Department, Department of Public Works

Timeframe: Ongoing

Funding: Current funding

Action 2.2.2: The County should continue to participate in the Federal Emergency Management Agency’s National Flood Insurance Program and Community Rating System.

Coordinating Agency: Community Development Department, Department of Public Works.
Timeframe: Ongoing
Funding: Current funding

Action 2.2.3: The County should continue to utilize the Federal Emergency Management Agency’s Flood Insurance Rate Map to define the special flood hazard area, the floodway and the floodplain.

Coordinating Agency: Community Development Department, Department of Public Works
Timeframe: Ongoing
Funding: Current funding

Action 2.2.4: Should funding opportunities become available the County would encourage private property owners to participate in home elevation and acquisition programs.

Coordinating Agency: Department of Public Works
Timeframe: Ongoing
Funding: When funds become available

Objective 2.3: *Develop and improve the countywide flood surveillance and early warning system.*

Ideas for Implementation

Action 2.3.1: The County has developed automated systems for rain and flood gauging on various tributaries and storm approach paths to the Clear Lake basin. The system is web enabled and accessible from the DPW flood operations Center and the County website. The tool is constantly used for surveillance during the rainy season.

Coordinating Agency: Department of Public Works
Timeframe: Ongoing
Funding: When funds become available

Action 2.3.2: Increase coverage of Flood Watch sensors to include small streams that, due to land use changes, have demonstrated an impact on existing streams and urban flooding.

Coordinating Agency: Department of Public Works
Timeframe: Ongoing
Funding: When funds become available

EARTHQUAKE

To minimize the threat to lives and property damages as a result of a possible earthquake with the Lake County region.

Objective 3.1: *The County should continue to require that all new buildings and infrastructure be designed and constructed to resist stresses produced by earthquakes.*

Ideas for Implementation

Action 3.1.1: The County should require all new buildings to conform to the structural requirements of the most recently adopted edition of the California Building Code.

Coordinating Agency: Community Development Department

Timeframe: Ongoing

Funding: Current funding

Action 3.1.2: The County should continue to discourage the placing of facilities necessary for emergency services, major utility lines and facilities, manufacturing plants using or storing hazardous materials, high occupancy structures (large public assembly facilities, schools, or convalescent facilities) within areas subject to very strong, violent, or very violent ground shaking, as indicated by the California Division of Mines and Geology reports, unless no alternative is available and adequate mitigation measures can be incorporated into the project.

Coordinating Agency: Community Development Department

Timeframe: Ongoing

Funding: Current funding

Action 3.1.3: The County should continue to require soils and geologic studies for proposed development with large client populations (schools and convalescent facilities) within areas subject to very strong, violent, or very violent ground shaking, as indicated in the California Office of Emergency Services shaking intensity map for Lake County. Such studies should determine the actual extent of the seismic hazards, optimum location for structures, the advisability of special structural requirements, and the feasibility and desirability of a proposed facility in a specified location. Mitigation measures should be incorporated as conditions of any project approval.

Coordinating Agency: Community Development Department

Timeframe: Ongoing

Funding: Current funding

Action 3.1.4: The County should continue to require special construction features in the design of structures where site investigations confirm potential seismic hazards. The County should encourage the study and rehabilitation of high occupancy structures susceptible to collapse or failure in an earthquake.

Coordinating Agency: Community Development Department
Timeframe: Ongoing
Funding: Current funding

Action 3.1.5: The County should continue to require that facilities necessary for emergency services be capable of withstanding a maximum credible earthquake from any of the known active faults in the region and remaining operational to provide emergency response.

Coordinating Agency: Community Development Department
Timeframe: Ongoing
Funding: Current funding

Objective 3.2: *Identify incentives and funding sources for structural retrofitting of structures that are identified as seismically vulnerable.*

Ideas for Implementation

Action 3.2.1: The county should develop a program to educate property owners on various methods of retrofitting pre-earthquake code designed structures, which would include: workshops, literature and public safety announcements.

Coordinating Agency: Community Development Department, Office of Emergency Services
Timeframe: 1-3 years
Funding: When funds become available

Action 3.2.2: The County should analyze the feasibility of a mandatory versus voluntary seismic retrofit program for un-reinforced masonry buildings.

Coordinating Agency: Community Development Department
Timeframe: Ongoing
Funding: When funds become available

Action 3.2.3: The County should pursue funding to seismically retrofit County-owned pre-earthquake designed structures.

Coordinating Agency: Community Development Department
Timeframe: 3-5 years
Funding: When funds become available

LANDSLIDES – SOIL EROSION

To minimize the threat to lives and property as a result of a possible landslide within Lake County.

Objective 4.1: *Encourage or regulate construction and subdivision design that can be applied to steep slopes to reduce the potential adverse impacts from development. To reduce landslide events and overall soil erosion.*

Ideas for Implementation

Action 4.1.1: The County should seek to minimize grading and impermeable surfaces in high-erosion areas. If grading or impermeable surfaces are necessary, they should be properly engineered and drained to reduce runoff and erosion impacts.

Action 4.1.2: The County should consider natural landform contours and geologic conditions in the development of roadways and individual project design.

Action 4.1.3: The County should continue to regulate development on hillsides to reduce the hazards posed by soil erosion and landslides.

Action 4.1.4: The County should require that an erosion control plan be prepared and approved for development on slopes of 15 percent or greater. The plan should include limitations on vegetation removal, re-vegetation, and installation of other erosion and sedimentation control measures.

Action 4.1.5: The County should continue to enforce the Grading and Hillside Development Ordinances to properties in sensitive areas.

Coordinating Agency: Community Development Department

Timeframe: 1-3 years

Funding: When funds become available

SEVERE STORM

To minimize storm related damages for all types of severe storms that impact Lake County.

Objective 5.1: *Review and update County ordinances to facilitate adequate drainage easements.*

Ideas for Implementation

Action 5.1.1: Dedicate proper drainage easements within all new developments.

Coordinating Agency: Department of Public Works, Community Development Department.

Timeframe: Ongoing.

Funding: Current funding.

DROUGHT

To Minimize the threat to property posed by the possibility of drought conditions within Lake County.

Objective 6.1: *Develop a homeowner's guide to water conservation techniques.*

Ideas for Implementation

Action 6.1.1: Review and update County ordinances concerning septic system installation and maintenance to protect County groundwater reserves from potential septic system contamination.

Coordinating Agency: Department of Public Health, Environmental Health Division

Timeframe: Ongoing

Funding: Current funding.

DAM FAILURE

To minimize the threat to life and property as a result of a possible dam failure within Lake County.

Objective 7.1: *Improve communication with the California Department of Water Resources to ensure that the larger dams in Lake County have been and continue to be inspected per state and federal laws.*

Action 8.1.1: Develop a “Living with Dams” pamphlet to inform potentially affected citizens about dam safety and being prepared in the event of a dam failure emergency.

Coordinating Agency: County and State Office of Emergency Services

Timeframe: Ongoing

Funding: When funds become available

VOLCANO ERUPTION

To education the citizens of Lake County about emergency evacuation routes and property protection measures as a result of a possible volcano eruption.

Objective 8.1: *Develop a “Living with a Volcano” pamphlet to inform citizens of being prepared in the event of a volcano eruption.*

Coordinating Agency: County and State Office of Emergency Services.

Timeframe: Ongoing.

Funding: When funds become available

GOAL: TO CREATE A DISASTER RESISTANT COUNTY

Objective 9.1: *Lake County should promote greater public awareness and understanding of natural hazards.*

Ideas for Implementation

Action 9.1.1: Provide community education through service programs offered by the County Office of Emergency Services and training for the Community Emergency Response Team (CERT) program.

Action 9.1.2: The County should support the addition of a mandatory hazards education program to the Governor’s Office of Emergency Services, as part of the state law required Standardized Emergency Management System.

Action 9.1.3: The County should continue to support the education and awareness programs developed and distributed by public services organizations such as the Red Cross.

Coordinating Agency: Lake County Office of Emergency Services.

Timeframe: Ongoing

Funding: When funds become available

Objective 9.2: *Lake County should review County resources and efforts to maintain a state of readiness in the event of an emergency.*

Ideas for Implementation

Action 9.2.1: The County should coordinate the revision of the Lake County Emergency Operations Plan (EOP) to address local need and to satisfy all state and Federal emergency management system requirements.

Action 9.2.2: The County should coordinate regular countywide training exercises that rehearse the procedures established by the Emergency Operations Plan (EOP) in order to maintain optimum readiness for disasters.

Coordinating Agency: Lake County Office of Emergency Services.

Timeframe: Ongoing

Funding: When funds become available

Implementing Mitigation Strategies

Many mitigation measures are preexisting functional strategies. These actions are included as a means of reinforcing those current hazard mitigation efforts. Many are linked to County and jurisdictionally specific codes and ordinances or to existing plans such as the Lake County General Plan. In all cases, the Lake County Natural Hazard Mitigation Plan seeks to function in harmony with and as an enhancement to preexisting plans, ordinance, rules and regulations.

Other mitigation actions are new and not a part of any preexisting governmental or organizational decree. In this case, the implementation of these action strategies will be contingent upon the necessary approvals from the appropriate governmental bodies and the securing of necessary funding from yet to be determined sources.

Generally speaking, Lake County has little or no funding earmarked for natural hazard mitigation. Thus, the County and plan participants will look to secure federal and state natural hazard mitigation grant funding in an effort toward implementing mitigation strategies. A comprehensive list of federal mitigation programs, activities, and initiatives is available online through the Federal Emergency Management Agency's website or contacting the California Governors Office of Emergency Services, Hazard Mitigation Branch.

A primary emphasis will be placed upon implementing actions that provide the highest cost-to-benefit ratio. Knowing that funding is an ever-present issue, all effort will be given to identify actions most beneficial to the citizens and property within the County.

The greatest natural hazard threat to lives and property is a wildland interface fire. Wildland fire is the highest-scoring natural hazard threat in the Natural Hazard Probability / Risk Assessment Scoring Matrix and also is identified as the greatest natural hazard threat in the Natural Hazard Rating Table by every participant of the Lake County NHMP. Therefore, it is clearly indicated that mitigation actions focused toward reducing the threat of wildland fire in the County have the greatest cost-to-benefits ratios and will provide the greatest mitigative relief for the residents of Lake County.

Plan Maintenance

The Lake County Natural Hazard Mitigation Plan will be evaluated every year to ascertain the effectiveness of the plan. As part of this evaluation, the overall effectiveness of the plan will be considered in context to:

- ❑ The number of natural hazard mitigation projects effectively completed
- ❑ The number of mitigation projects in progress, and
- ❑ The success of related programs and activities associated with the plan.

Additionally within these annual evaluations, natural hazard mitigation strategies will be examined for a continued level of appropriateness in relationship to any changes in land uses or the level of intensity associated with prevailing land uses. Participants of the plan will be asked to provide an annual evaluation report of the status of natural hazard mitigation efforts within their respective jurisdictions.

Whenever the annual evaluation indicates a necessity to update the plan, an update of the plan will be initiated. Regardless of the plan's status, a mandatory update to the Lake County NHMP will occur every five years in conjunction with the annual plan evaluation process.

The Lake County Office of Emergency Services will be the responsible organizing agency for both the annual evaluative efforts as well as any plan update initiated by the County. The County Office of Emergency Services will take responsibility for agendaing and noticing all action related to any plan review or update. The County Office of Emergency Services will also act as the intermediary between plan participants and the Board of Supervisors. The Lake County Board of Supervisors will be the determining body when assessing the need for any plan update in excess of the fixed five-year update period. The Lake County Board of Supervisors will have final authority for adoption of any updates or revisions to the Lake County Natural Hazards Mitigation Plan. At all times, opportunities for the incorporation of the Lake County NHMP into other appropriate County plans will be developed and utilized.

Lake County is committed to public involvement within this hazard mitigation plan. For both the plan evaluation and update, a public hearing will be held at a specific scheduled meeting. The hearing will be publicized and the public will be asked for comment concerning the plan.

With constant and concerned review, the Lake County Natural Hazard Mitigation Plan will continue to develop as an outstanding planning tool, helping the citizens of Lake County to create a safer place to live, work, and play.

Map Citations

<u>Page #</u>	<u>Map Title & Source</u>
3	Lake County, California Source: Lake County Information Technology Department
19	Fire Hazard Severity Zones Source: Lake County Information Technology Department
20	History of Fire in Lake County Source: data provided in part by the California Department of Forestry and Fire Protection
24-30	Areas of Potential Flooding in Lake County Source: Lake County Public Works Department
44	Lake County Dam Locations Source: Lake County Information Technology Department
49	Lake County Fault Zones Source: Lake County Information Technology Department
55	Mount Konocti Volcano Location Map Source: Lake County Information Technology Department