# WILDFIRE

## Hazard/Problem Description

Wildland fire is an ongoing concern for the Sutter County Planning Area. Generally, the fire season extends from June through October of each year during the hot, dry months. Fire conditions arise from a combination of high temperatures, an accumulation of vegetation, low humidity, and high winds. Within the County, the Sutter Buttes are the primary concern when considering the wildland fire hazard, with their limited access, steep terrain and remote location. In other areas, large concentrations of highly flammable brush located in flat open spaces are also quite susceptible to wildland fire. Also at risk are the "river bottoms" or those areas along the Sacramento, Feather and Bear Rivers within the levee system, since much of the area inside these levees are left in a natural state, allowing combustible fuels to accumulate over long periods of time.

Potential losses from wildfire include: human life, structures and other improvements; natural and cultural resources; the quality and quantity of the water supply; other assets such as crop land, recreational opportunities; and economic losses. Smoke and air pollution from wildfires can be a severe health hazard. In addition, catastrophic wildfire can lead to secondary impacts or losses such as future flooding, landslides, and erosion during the rainy season. Generally, there are three major factors that sustain wildfires and predict a given area's potential to burn. These factors are fuel, topography, and weather.

- **Fuel –** Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also to be considered as a fuel source are man-made structures, such as homes, and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Fuel is the only factor that is under human control.

- **Topography –** An area's terrain and land slopes affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.

- **Weather –** Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed the wildfire creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most treacherous weather factor. The greater a wind, the faster a fire will spread, and the more intense it will be. Winds can be

significant at times in the Sutter County Planning Area. Lightning also ignites wildfires, often in difficult-to reach terrain for firefighters. Also of concern, during periods of drought, the threat of wildfire increases.

## Past Occurrences

Wildfires are of significant concern throughout California. According to the CDF, vegetation fires occur within CDF's jurisdiction on a regular basis; most are controlled and contained early with limited damages. For those ignitions that are not readily contained and become wildfires, damages can be extensive. There are many causes of wildfire from naturally caused lightning fires to human-caused fires linked to activities such as smoking, campfires, equipment use and arson. According to CDF, from 1994 to 1999, over 90 percent of fires in California were attributed to human causes. Further, recent studies conclude that the greater the population density in an area, the greater the chance of an ignition. With population continuing to grow throughout California and the Sutter County Planning Area, the risk from wildland fire also continues to grow.

From June through October, the Sutter County Planning Area is most susceptible to wildland fires. With the exception of the Sutter Buttes, most of the Planning Area is nearly level and agricultural lands, grasslands, and built environment characterize the fuel loads. This lack of topography and complex fuels throughout most of the Planning Area, limits the potential for severe wildfires to occur.

The Yuba City Fire Department provided the following synopsis of the wildland fire threat within both Unincorporated Sutter County, the Yuba City Urban Area, and the City of Live Oak:

### Unincorporated Sutter County

Sutter County Fire Department responded to 618 wildland fires from 2002 to 2007. Sutter County responded to 34 wildland fires in the Sutter Buttes for a total of 413 acres. From 2004 to 2007, they also responded to 15 river bottom fires in their jurisdiction for a total of 17 acres. The Yuba City Fire Department also assisted Sutter County Fire Department with 34 wildland fires from 2002 to 2007. The remaining fires occurred primarily on agricultural lands and in and around the levee areas.

### Yuba City Urban Area

Yuba City responds to a large number of grass related fires within the city and adjacent urban area. Utilizing local fire records, more than 90 grassland fires occur within the City each year. Although many of these fires remain small in size (i.e., less than 10 acres), the potential always exists for any fire to become out of control.

Yuba City's primary wildland fire threat is within the riverbottom areas. This is a stretch of land that runs along the Feather River from the Union Pacific Railroad trestle in the north to the "rapids" south of Shanghi Bend Road in the south. This stretch of land is contained by a flood control levee (Levee District One) on the west side and the Feather River on the east side. This

represents approximately 790 acres of land along a six mile strip. Within the river bottom areas, poor vehicular and general access as well as overgrown brush exacerbates the threat potential. In the past, the California Department of Fish and Game did not allow the use of vegetative management prescription (VMP) burns to reduce the fuel load (fire threat). However, the Department of Fish and Game does now allow this practice.

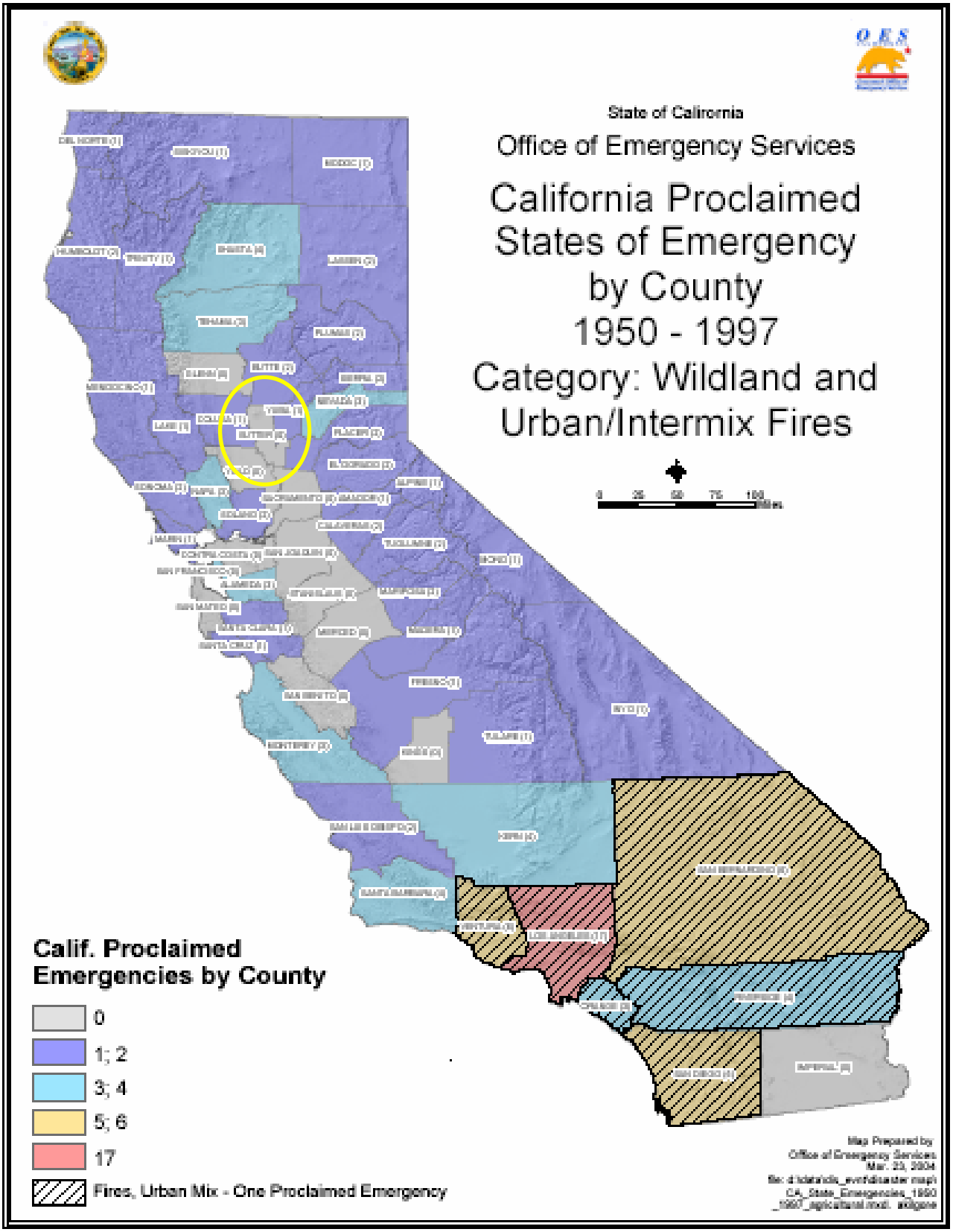
Wildfires in the river bottoms pose a significant life threat to the indigent population that lives there. At any one time there are about 135-140 transient citizens that live there. The Yuba City Fire Department has on occasion, had to evacuate the people living there due to the immediate threat from a wildland fire.

The Yuba City Fire Department responded to 433 vegetation fires from 2002 to 2007. Of those 433 fires, 69 or 16% of those fires occurred in the river bottoms. Of those 69 fires 69% of those were less than one acre of land and 17% were between 1and 5 acres. Five percent or 4 fires were between 5 acres and 10 acres and 7% or 5 fires were greater than 10 acres. Two of those fires were over 75 acres. The rest of the wildland fires Yuba City responded to were on smaller land parcels within Yuba City's jurisdiction that represent a diminishing threat due to development.

**City of Live Oak**

The City of Live Oak contracts with the Sutter County Fire Department for fire services and covers the urban and rural area around the City of Live Oak. From 2002 to 2007, they had 12 grass fires in the portion of the West Feather River riverbottom area within their jurisdiction which totaled approximately 108 acres.

Although, wildland fires do occur within the Planning Area, the potential for a large, damaging wildfire is limited due to the relatively flat topography and the lack of complex fuels. As illustrated in the map from the Draft California Multi-Hazard Mitigation Plan that follows, from 1950-1997, there has never been a state of emergency declared for wildfires in Sutter County.


State of California
Office of Emergency Services
California Proclaimed States of Emergency by County 1950 - 1997
Category: Wildland and Urban/Intermix Fires
Calif. Proclaimed Emergencies by County
0
1; 2
3; 4
5; 6
17
Fires, Urban Mix - One Proclaimed Emergency
Map Prepared by
Office of Emergency Services

## Likelihood of Future Occurrences

***Likely:*** From 2002 to 2007, there were 1063 vegetation fires throughout the Planning Area. A large percent of these were between 1-5 acres; there were a very limited number of fires in excess of 10 acres in size. Based on the small amount of acreage involved and the limited impacts to the community, wildfire is not considered a significant concern to the Planning Area.

# EARTHQUAKE

## Hazard/Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and causes the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. Seismologists have developed two scales (as seen in the table below) to quantify the shaking intensity of an earthquake's effects, which is measured by how an earthquake is felt by humans.

Earthquakes can cause structural damage, injury and loss of life, as well as damage to infrastructure networks such as water, power, gas, communication, and transportation lines. Other damage-causing effects of earthquakes include surface rupture, fissuring, settlement, and permanent horizontal and vertical shifting of the ground. Secondary impacts can include landslides, seiches, liquefaction, and dam failure.

In populated areas, the greatest potential for loss of life and property damage can come as a result of ground shaking from a nearby earthquake. The degree of damage depends on many interrelated factors. Among these are the Richter magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high ground water, topography, and finally, the design, type, and quality of building construction.

| | **EARTHQUAKE INTENSITIES WITH APPROXIMATE CORRESPONDING MAGNITUDES** | |
|---|---|---|
| **MERCALLI INTENSITY** | **DESCRIPTION** | **RICHTER MAGNITUDE** |
| I | *INSTRUMENTAL*: detected only by seismographs | 3.5 |
| II | *FEEBLE*: noticed only by sensitive people | 4.2 |

| | EARTHQUAKE INTENSITIES WITH APPROXIMATE CORRESPONDING MAGNITUDES | |
|---|---|---|
| **MERCALLI INTENSITY** | **DESCRIPTION** | **RICHTER MAGNITUDE** |
| III | *SLIGHT*: like the vibrations due to a passing train; felt by people at rest, especially on upper floors | 4.3 |
| IV | *MODERATE*: felt by people while walking; rocking of loose objects, including standing houses | 4.8 |
| V | *RATHER STRONG*: felt generally; most sleepers are awakened and bells ring | 4.9 - 5.4 |
| VI | *STRONG*: trees sway and all suspended objects swing; damage by overturning and falling of loose objects | 5.5 - 6.0 |
| VII | *VERY STRONG*: general alarm; walls crack; plaster falls | 6.1 |
| VIII | *DESTRUCTIVE*: car drivers seriously disturbed; masonry fissured; chimneys fall; poorly constructed buildings damaged | 6.2 |
| IX | *RUINOUS*: some houses collapse where ground begins to crack, and pipes break open | 6.9 |
| X | *DISASTROUS*: ground cracks badly; many buildings destroyed and railway lines bent; landslides on steep slopes | 7.0 - 7.3 |
| XI | *VERY DISASTROUS*: few buildings remain standing; bridges destroyed; all services (railways, pipes and cables) out of action; great landslides and floods | 7.4 - 8.1 |
| XII | *CATASTROPHIC*: total destruction; objects thrown into air; ground rises and falls in waves | > 8.1 |

*(Source: Math/Science Nucleus.Org website)*

The 1996 Background Report to the Sutter County General Plan contains an analysis of seismic hazards. Taken directly from the Background Report, this section provides a summary of the geologic setting of the County, a compilation of active and potentially active earthquake faults in or near the County, and an assessment of the potentially hazardous effects of earthquakes.

**Fault Classifications**

The California Mining and Geology Board has defined active faults as those for which there is evidence of surface displacement within the Holocene epoch; that is, within about the last 11,000 years. Some faults are characterized as active based on surface displacements within historic time, about the last 200 years, while others are characterized as active based on surface displacements in rocks or sediments which are less than 11,000 years old. This definition of active fault does not mean, however, that all faults for which there is no evidence of surface displacement during the Holocene are inactive. Some faults may have been active in this time

period, but did not result in identifiable surface displacements, while other faults may still be active although they have not been active during the Holocene. Many recent, damaging California earthquakes including the 1975 Oroville earthquake, the 1983 Coalinga earthquake, and the 1987 Whittier Narrows earthquake occurred on faults not previously recognized as active.

The Mining and Geology Board has defined **potentially active faults** as those for which there is evidence of surface displacement within the Quaternary period, that is, within about the last 1.6 million years. Faults classified as potentially active faults show no evidence of surface displacements within the past 11,000 years, but this period of time is short geologically and thus such faults are considered potentially active. Faults which do not meet these criteria for being classified as active or potentially active are not necessarily permanently inactive.

Seismic risk is not limited to faults which have been currently identified. A significant fraction of small to moderately large earthquakes typically occur on faults not previously recognized. Such earthquakes are characterized as "background seismicity" or "floating earthquakes" which indicate that the expected sources and locations of such earthquakes are unknown.

**Active Faults**

No active earthquake faults are known to exist in Sutter County. Regionally, active faults could generate ground motion felt within Sutter County. Figure 10.2-1 is a regional fault map which includes Sutter County in relationship to fault locations. Table 10.2-2 lists key information about important active and potentially active, local and regional faults.

Numerous earthquakes of magnitude M 5.0 or greater have occurred on regional faults, primarily those within the San Andreas Fault System. The west side of the Central Valley is a seismically active region. The greatest historical amount of ground shaking along the west side of the Sacramento Valley resulted from the April 1892 earthquakes in the vicinity of Vacaville and Winters. The 1892 earthquakes are believed to have been produced by the Coast Range - Central Valley blind thrust fault located along the western margin of the valley, parallel to and west of Interstate 5, and about 20 to 30 kilometers west of Sutter County. The estimated magnitude (based on reported intensities) are in the range of M 6.5. For the period 1900-1974, two earthquakes of magnitude M 4.0 and M 4.9 had epicenters just west of Interstate 5 and north of Highway 20 near Williams.

Moderate to large earthquakes in the Foothills Suture Zone along the west slope of the Sierra Nevada are relatively rare. However, a magnitude M 5.7 earthquake occurred in 1975 on the Cleveland Hill Fault in the northern portion of the Zone, in Butte County. This fault up to that time had not been considered active.

**Potentially Active Faults**

Known fault locations within Sutter County are considered to be potentially active faults. A series of small faults within the Sutter Buttes exhibit evidence of Quaternary motion (within the past 1.6 million years). Generally, movements on these faults were associated with deep-seated volcanism, but may have been partially related to other crust-deformation processes. The faults are not considered active. Refer to Table 10.2-2 for a list of potentially active faults.

**Regional Earthquake Faults**

**Figure 10.2-1**

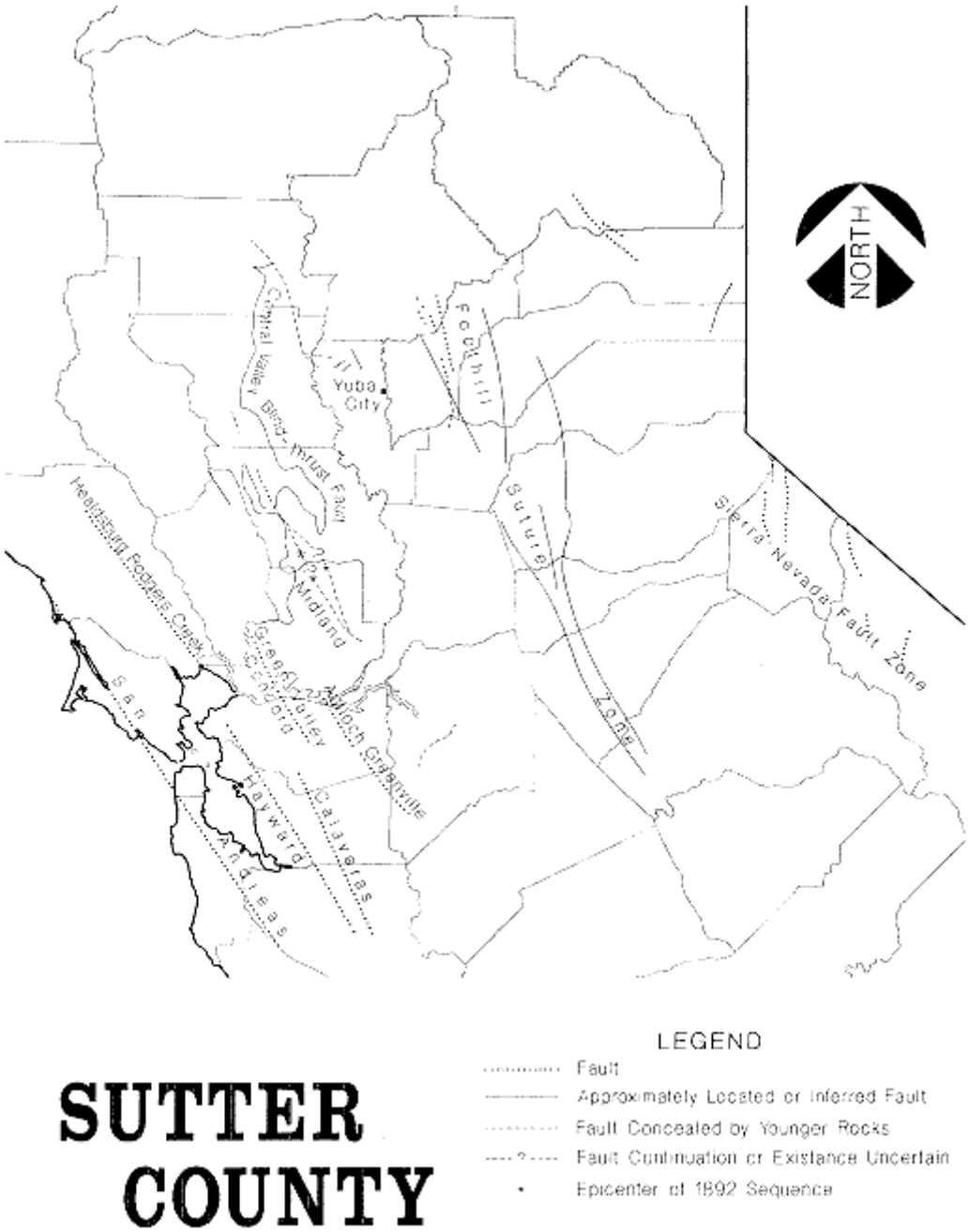


**TABLE 10.2-2**
**LOCAL AND REGIONAL FAULTS**

| Fault | Most Recent Significant Earthquake Year; Richter Scale Magnitude |
|---|---|
| Sutter Buttes | Quaternary |
| Dunnigan Hills (near Arbuckle) | Holocene |
| Foothills Suture Zone<br>Cleveland Hill<br>Swain Ravine-Spenceville | 1975; M 5.7 |
| Midland | Quaternary |
| Unnamed(1892 epicenters between Vacaville and Winters) | 1892; M 6.7<br>1892; M 6.5 |
| Green Valley-Concord-Calaveras | 1984; M 6.1<br>1979; M 5.9 |
| Rodgers Creek-Hayward | 1968; M 6.8<br>1936; M 7.0 |
| San Andreas | 1989; M 7.1 (Loma Prieta)<br>1906; M 8.3 |
| Eastern Sierra Nevada<br>Sulphur Creek<br>Stampede Valley<br>Genoa | <br>1875<br>1966<br>Holocene |

(Source: Sutter County General Plan/Environmental Science Associates, Proposed Ash Landfill EIR, 1992)

**Predicted Effects of Earthquakes**

**Ground Shaking**
Based on the known active faults and potentially active faults in the region, Sutter County has the potential to experience low to moderate ground shaking. The intensity of ground shaking at any specific site depends on the characteristics of the earthquake, the distance from the earthquake fault, and on the local geologic and soils conditions. At present there are insufficient data to accurately predict the expected ground motions at various locations within Sutter County.

**Liquefaction Potential**
Liquefaction, which may occur under strong ground shaking during earthquakes, is the transformation of a granular sediment or fill material from a solid state to a temporarily liquid state. Liquefaction is a serious hazard because buildings on ground which undergoes liquefaction may sink or suffer major structural damage. Evidence of liquefaction may be observed in "sand boils", which are expulsions of sand and water from below the surface due to increased pore-water pressure below the surface. Liquefaction during an earthquake requires strong shaking

continuing for a long time period and loose, clean granular materials (particularly sands) that may settle and compact because of the shaking.

Areas paralleling the Sacramento River, Feather River and Bear River which contain clean sand layers with low relative densities coinciding with a relatively high water table are estimated to have generally high liquefaction potential. Granular layers underlying certain areas in the Sacramento Valley have higher relative densities and thus have moderate liquefaction potential. Clean layers of granular materials older than Holocene are of higher relative densities and are thus of low liquefaction potential. Areas of bedrock, including the Sutter Buttes have no liquefaction potential, although localized areas of valley fill alluvium can have moderate to high liquefaction potential.

**Seiches**
A seiche is a periodic oscillation of a body of water such as a reservoir, river, lake, harbor or bay resulting from seismic shaking or other causes such as landslides into a body of water. The period of the oscillation varies depending on the size of the body of water and may be several minutes to several hours. Depending on the magnitude of the oscillations, seiches can cause considerable damage to dams, levees, and shoreline facilities. The potential for seiches in Sutter County is low as a predicted effect of an earthquake since groundshaking in Sutter County is low to moderate and no reservoirs or dams are located in the County. The County is surrounded by the Feather River and the Bear River on the east and the Sacramento River on the west which could be subject to seiches corresponding to the potential risk of groundshaking.

**Landslides**
Earthquakes may initiate landslides, particularly during the wet season, in areas of high water or saturated soils. The most likely areas for earthquake-induced landslides are the same areas of high landslide potential discussed in the section of this plan on landslides.

**Dam Safety**
Earthquakes can endanger dams in several ways, including failure of the foundations or dams themselves due to ground failures. Sutter County does not contain any dams large enough or located such that failure would result in any significant property damage. Dam safety is discussed under the Dam Failure section of this plan and includes a list of dams which could cause varying degrees of inundation in Sutter County if they failed.

## Past Occurrences

Although the County has felt ground shaking from earthquakes with epicenters located elsewhere, no major earthquakes have been recorded within the County. Notable regional earthquake events include those detailed below. It is unknown whether damages occurred within the Sutter County Planning Area or to what extent these events were actually felt by county residents.

- A potential earthquake source is the Midland Fault Zone on the western side of Sacramento Valley, where in 1892 an earthquake centered between the cities of Vacaville and Winters caused minor damage in surrounding areas.

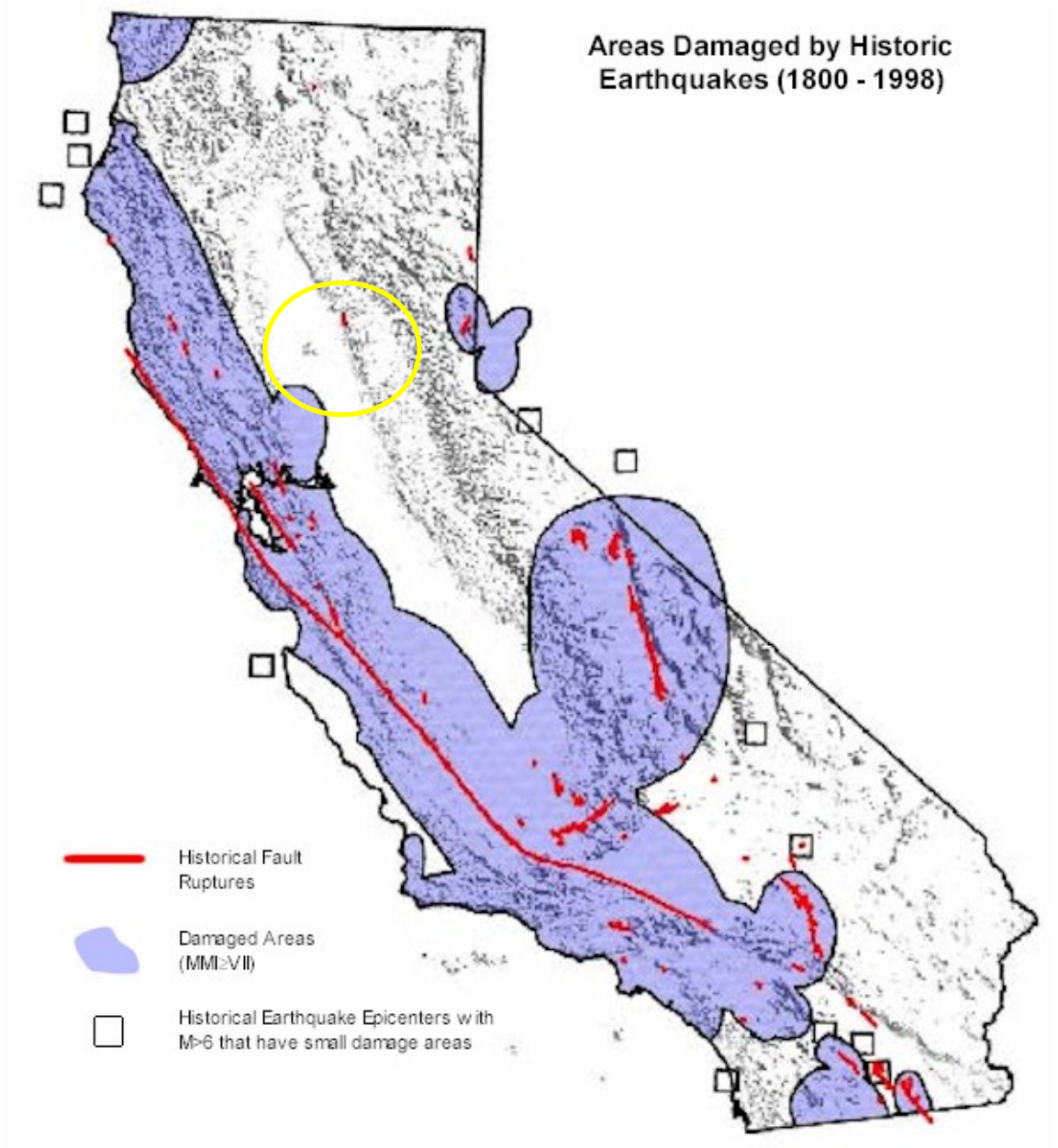
- An estimated 4.0+ Richter magnitude earthquake occurred between Auburn and Folsom in nearby Placer County in 1908 with an epicenter possibly associated with the Bear Mountain fault.

- To the east in Nevada, there are several faults associated with a series of earthquakes in 1954, especially the major (7.1 Richter magnitude) December 16, 1954 Fairview Peak event (about 100 miles east of Carson City). These events caused no damage in Reno, but there was some damage in Sacramento, probably because of the soft soil conditions.

- A recently active fault in the western Sierra Nevada foothills is the Cleveland Hills fault. This fault was the source of the 1975 Oroville earthquake (Richter Magnitude: 5.7), which was felt strongly in neighboring areas.

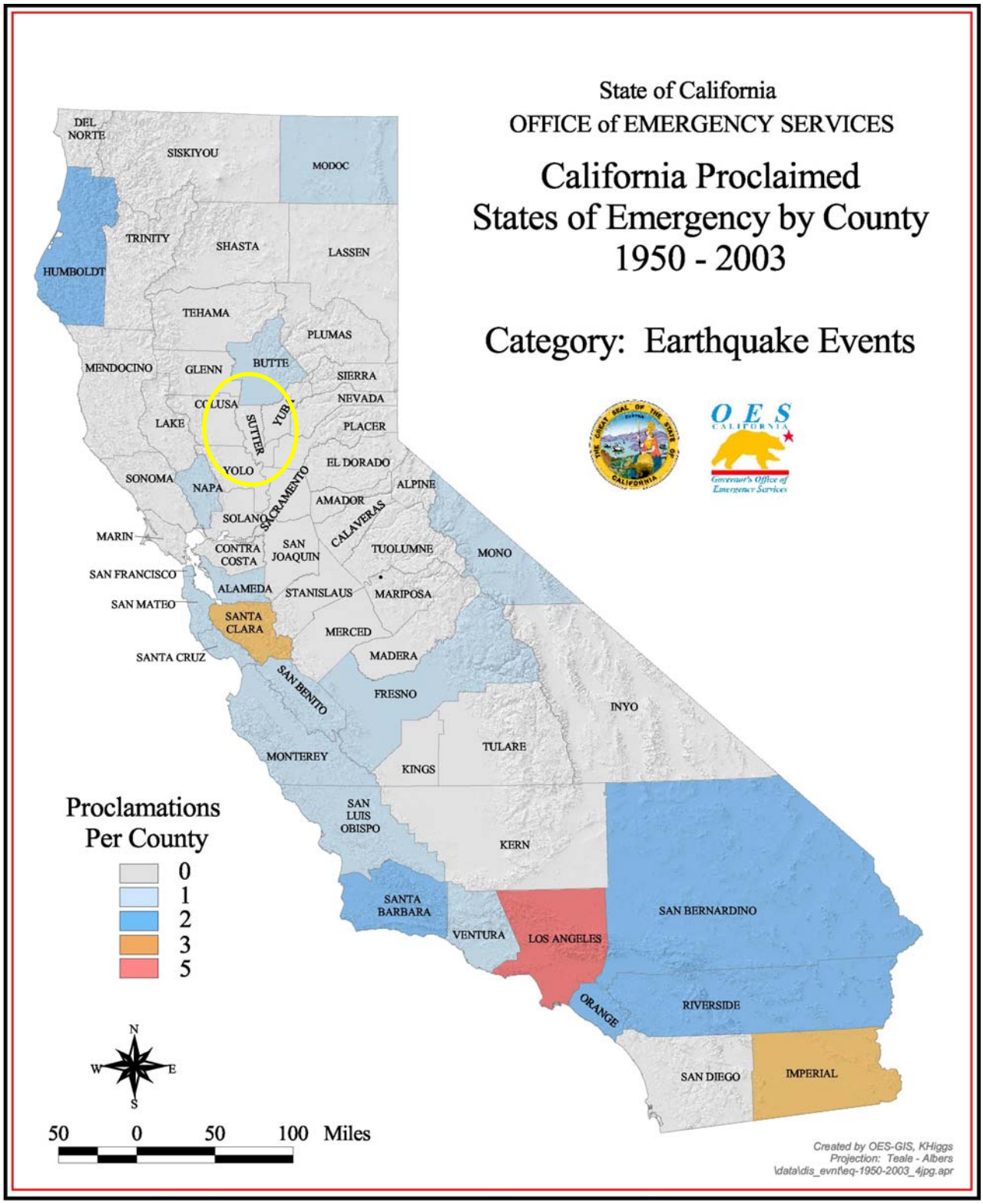
- According to the HMPC, the 1989 San Francisco earthquake was felt in the Sutter County Planning Area.

The map on the following page obtained from the California Geological Survey's website provides additional historical earthquake information for California and the Sutter County Planning Area. This map illustrates areas damaged by historic earthquakes. Based on this historical record, no damages occurred within the Planning Area.




*(Source: http://www.consrv.ca.gov/CGS/rghm/psha/ofr9608/index.htm#Faults%20in%20California)*

The map on the following page illustrates earthquake proclamations by County between 1950 and 2003. During that period, there were no earthquake proclamations for Sutter County.

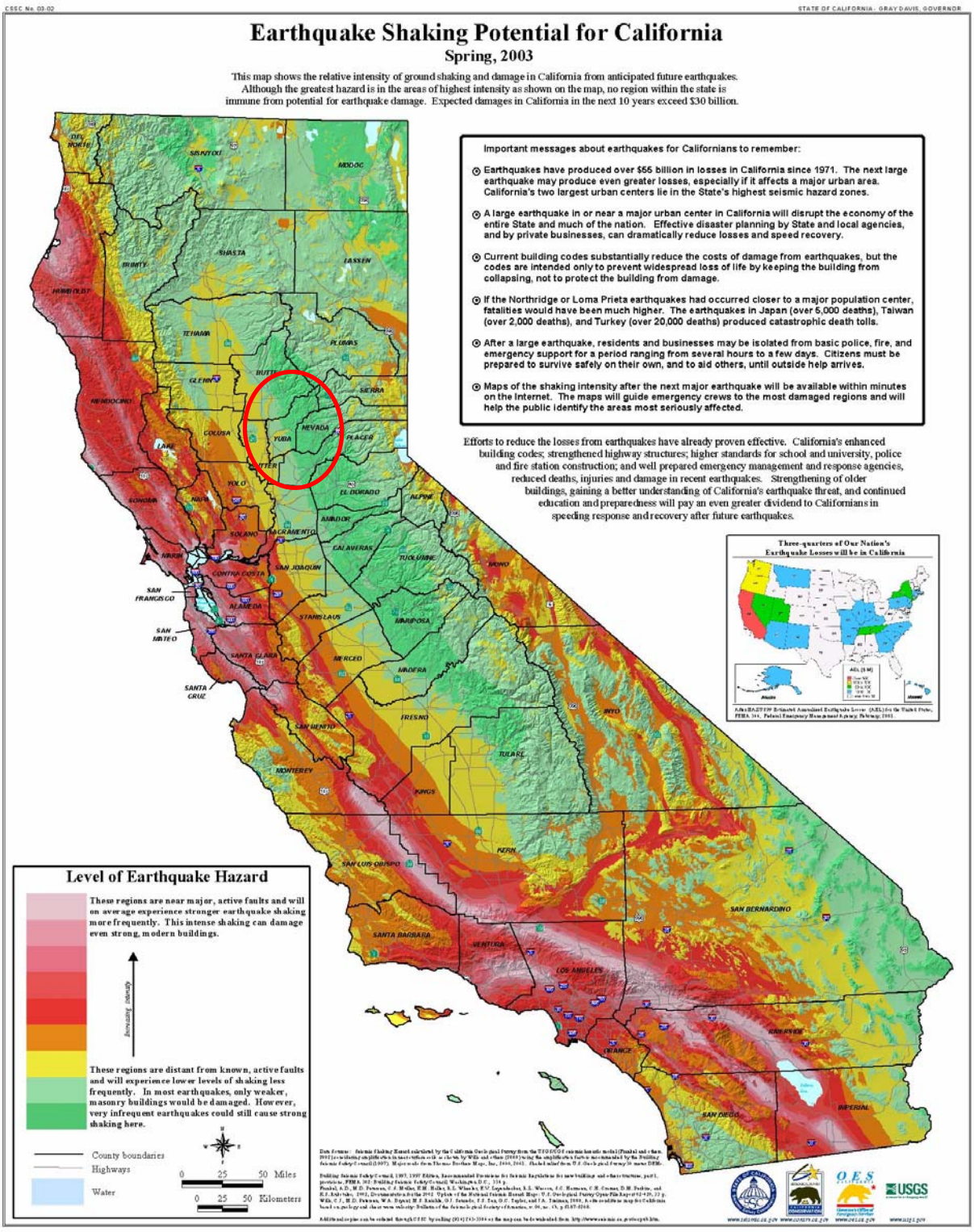


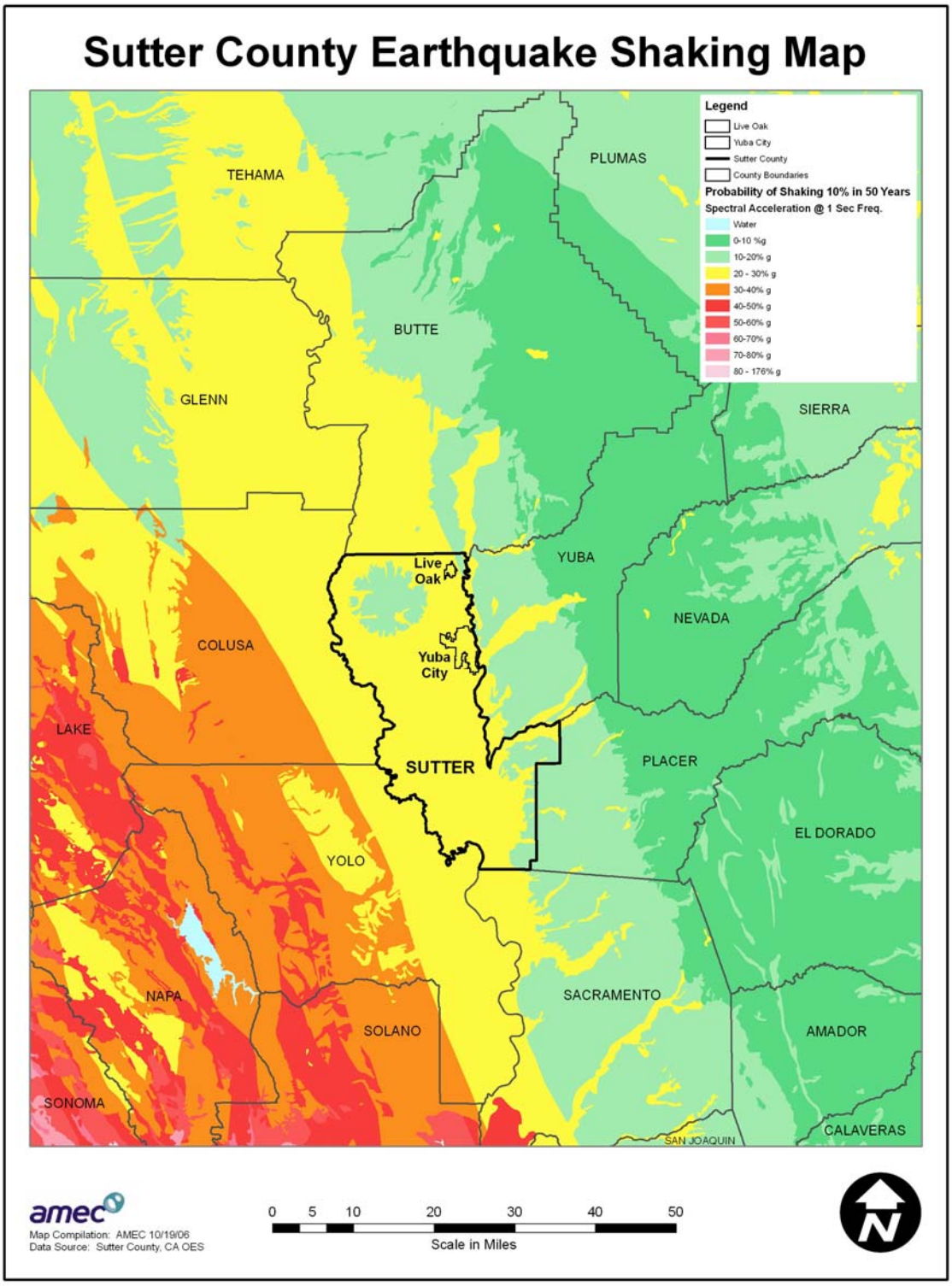

*(Source: State of California Draft Multi-Hazard Mitigation Plan)*

## Likelihood of Future Occurrences

***Unlikely:*** No major earthquakes have been recorded within the county; although the county has felt ground shaking from earthquakes with epicenters located elsewhere. Based on historical data and the location of the Sutter County Planning Area relative to active and potentially active faults, it is unlikely that the Planning Area will experience a significantly damaging earthquake.

Seismic hazard zone maps and earthquake fault zone maps are used to identify where such hazards are more likely to occur based on analyses of faults, soils, topography, groundwater, and the potential for earthquake shaking sufficiently strong to trigger landslide and liquefaction. An analysis of these maps (that follow) support the conclusion that the Sutter County Planning Area is at limited risk to earthquake hazards.


CSSC No. 03-02
STATE OF CALIFORNIA - GRAY DAVIS, GOVERNOR
Earthquake Shaking Potential for California
Spring, 2003
This map shows the relative intensity of ground shaking and damage in California from anticipated future earthquakes. Although the greatest hazard is in the areas of highest intensity as shown on the map, no region within the state is immune from potential for earthquake damage. Expected damages in California in the next 10 years exceed $30 billion.
Important messages about earthquakes for Californians to remember:
Earthquakes have produced over $55 billion in losses in California since 1971. The next large earthquake may produce even greater losses, especially if it affects a major urban area. California's two largest urban centers lie in the State's highest seismic hazard zones.
A large earthquake in or near a major urban center in California will disrupt the economy of the entire State and much of the nation. Effective disaster planning by State and local agencies, and by private businesses, can dramatically reduce losses and speed recovery.
Current building codes substantially reduce the costs of damage from earthquakes, but the codes are intended only to prevent widespread loss of life by keeping the building from collapsing, not to protect the building from damage.
If the Northridge or Loma Prieta earthquakes had occurred closer to a major population center, fatalities would have been much higher. The earthquakes in Japan (over 5,000 deaths), Taiwan (over 2,000 deaths), and Turkey (over 20,000 deaths) produced catastrophic death tolls.
After a large earthquake, residents and businesses may be isolated from basic police, fire, and emergency support for a period ranging from several hours to a few days. Citizens must be prepared to survive safely on their own, and to aid others, until outside help arrives.
Maps of the shaking intensity after the next major earthquake will be available within minutes on the Internet. The maps will guide emergency crews to the most damaged regions and will help the public identify the areas most seriously affected.
Efforts to reduce the losses from earthquakes have already proven effective. California's enhanced building codes; strengthened highway structures; higher standards for school and university, police and fire station construction; and well prepared emergency management and response agencies, reduced deaths, injuries and damage in recent earthquakes. Strengthening of older buildings, gaining a better understanding of California's earthquake threat, and continued education and preparedness will pay an even greater dividend to Californians in speeding response and recovery after future earthquakes.
Three-quarters of Our Nation's Earthquake Losses will be in California
Level of Earthquake Hazard
These regions are near major, active faults and will on average experience stronger earthquake shaking more frequently. This intense shaking can damage even strong, modern buildings.
Increasing intensity
These regions are distant from known, active faults and will experience lower levels of shaking less frequently. In most earthquakes, only weaker, masonry buildings would be damaged. However, very infrequent earthquakes could still cause strong shaking here.
County boundaries
Highways
Water
0 25 50 Miles
0 25 50 Kilometers
DEL NORTE
SISKIYOU
MODOC
SHASTA
LASSEN
TRINITY
HUMBOLDT
TEHAMA
PLUMAS
GLENN
BUTTE
SIERRA
MENDOCINO
COLUSA
NEVADA
YUBA
PLACER
LAKE
SUTTER
YOLO
EL DORADO
SONOMA
NAPA
ALPINE
AMADOR
SOLANO
SACRAMENTO
CALAVERAS
TUOLUMNE
MARIN
CONTRA COSTA
SAN JOAQUIN
MONO
SAN FRANCISCO
ALAMEDA
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CLARA
MERCED
MADERA
SANTA CRUZ
FRESNO
INYO
SAN BENITO
TULARE
MONTEREY
KINGS
KERN
SAN LUIS OBISPO
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL
USGS


Sutter County Earthquake Shaking Map
Legend
Live Oak
Yuba City
Sutter County
County Boundaries
Probability of Shaking 10% in 50 Years
Spectral Acceleration @ 1 Sec Freq.
Water
0-10 %g
10-20% g
20 - 30% g
30-40% g
40-50% g
50-60% g
60-70% g
70-80% g
80 - 176% g
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA
YUBA
Live Oak
Yuba City
NEVADA
COLUSA
LAKE
SUTTER
PLACER
EL DORADO
YOLO
NAPA
SACRAMENTO
SOLANO
AMADOR
SONOMA
SAN JOAQUIN
CALAVERAS
amec
Map Compilation: AMEC 10/19/06
Data Source: Sutter County, CA OES
0 5 10 20 30 40 50
Scale in Miles
N

# AGRICULTURAL HAZARD

## Hazard/Problem Description

Sutter County is predominantly an agricultural county. The 2002 Census of Agriculture classifies 96% of the county's total acreage as agricultural. The county's valley floor location between two major rivers combined with its rich agricultural soils and inland climate provides for a long growing season. Agricultural activities within the county fall into two categories: 1) intensive agriculture, defined as all agricultural practices involving cultivation of the land for the production of field crops, seed crops, vegetable crops, fruit and nut crops, nursery stock, and apiary products, and 2) extensive agriculture, which involves animal husbandry forms of agriculture. The map on the following page illustrates the different types of agricultural land within the county.

Sutter County Orchards
(Source: AMEC Earth & Environmental)

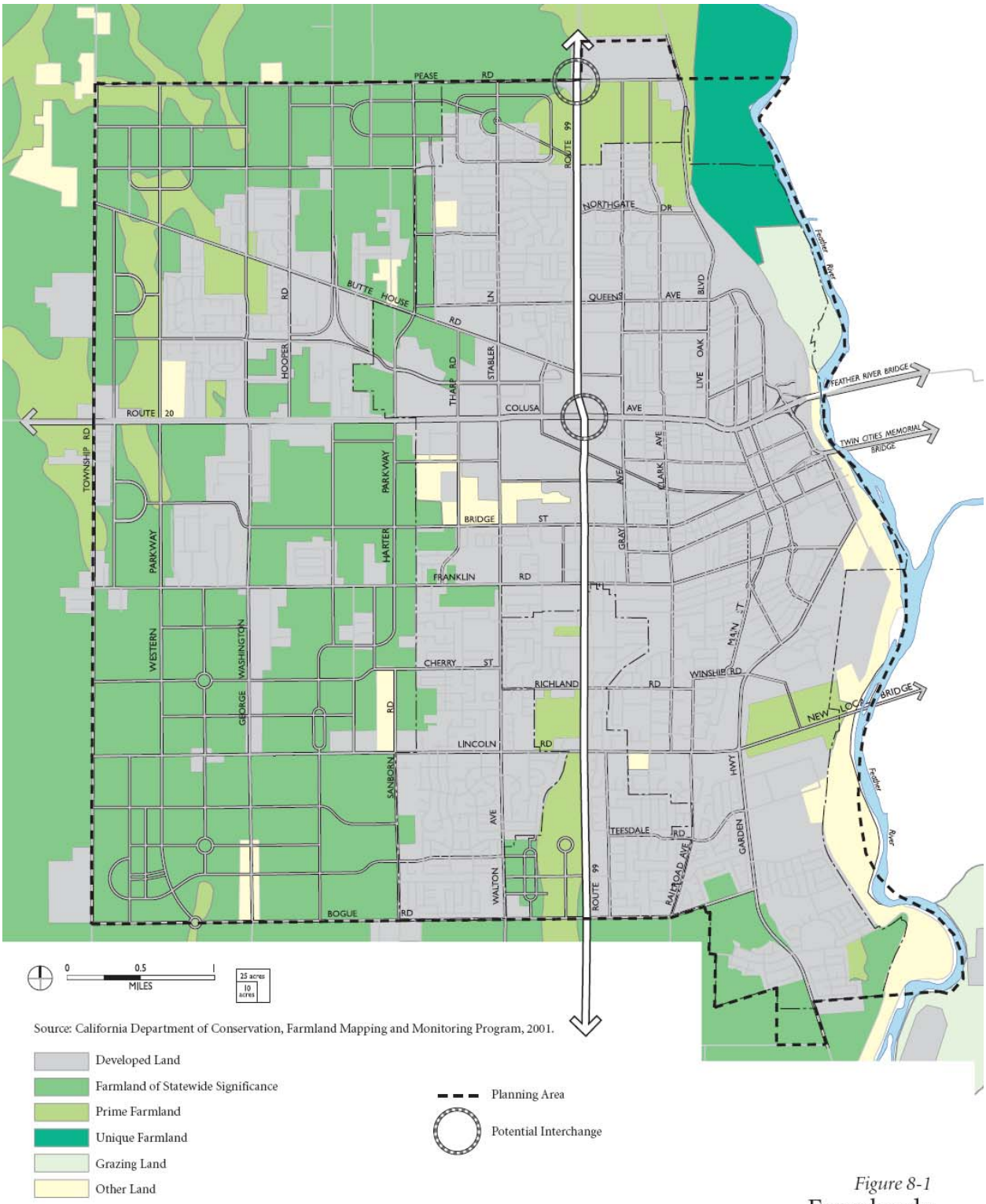



*Figure 8-1*
Farmlands

The 2002 agricultural census reported the total gross value of agricultural products at $298,725,100 which ranked it number 22 among California counties. According to the 2005 Crop report for Sutter County, the county's gross agricultural production value totaled $298,531,300 with rice, walnuts, peaches, dried plums and almonds as the leading agricultural commodities. However, the report indicates that for the second year in a row, agricultural crop production was compromised in 2005 by several factors:

- Cold, wet weather in early February prevented honeybee germination of almonds, affecting yield;
- Hot, dry and windy weather in March during dried plum and peach bloom caused yields to plummet; and
- Rain during early May split the fruit of the Cherry crop causing significant losses.

Some of this was, however, tempered by good market prices for many crops such as almonds, dried plums, and peaches, rice, pollination services, and cattle and calves. Overall the report concludes that the agricultural industry returned over $1.04 billion to the local economy in 2005.

According to the HMPC, agricultural losses occur on an annual basis throughout the County and are usually associated with severe weather events. California is also at risk from many insects that, under the right circumstances, can cause severe economic and environmental harm to the agricultural industry. Insects of concern to plants and crops include: Asian longhorn beetle, Caribbean fruit fly, Glassy-winged sharp shooter, Guava fruit fly, Gypsy moth, Japanese beetle, Mediterranean fruit fly, Melon fruit fly, Mexican fruit fly, Olive fruit fly, Oriental fruit fly, and Bark beetle. According to the Draft California Multi-Hazard Mitigation Plan, the primary causes of agricultural disasters in California are associated with drought, freeze, and insect infestations.

Also of concern to the Sutter County Planning Area is the problem of noxious weeds. Noxious weeds means any species of plant that is or is liable to be troublesome, aggressive, intrusive, detrimental, or destructive to agriculture, silviculture, or important native species and difficult to control or eradicate. Noxious weeds in the planning area have been introduced by many means including nurseries and fish aquarium supply stores. Without natural controls, combined with the aggressive growth characteristics and unpalatability of many of these weeds, once they get a foothold, they can dominate and replace more desirable native vegetation. Negative effects of weeds include:

- Loss of wildlife habitat and reduced wildlife numbers
- Loss of native plant species
- Reduced livestock grazing capacity
- Increased soil erosion and topsoil loss
- Diminished water quality and fish habitat
- Reduced cropland and farmland production
- Reduced land value and sale potential

Noxious weeds within the Sutter County weed management area include the following:

- Yellow Starthistle
- Giant Reed
- Scotch Broom

- Saltcedar
- Puncturevine
- Himalaya Blackberry
- Rush Skeletonweed
- Creeping Waterprimrose
- Parrotfeather
- Purple Loosestrife
- Perennial Pepperweed
- Hydrilla

## Past Occurrences

According to data obtained from CA-OES, since 2001, there have been 24 USDA designations for Sutter County. Prior to 2001, agricultural designations were minimal and were not being tracked. The following table lists those USDA designations on file. All of the disaster declarations were associated with severe weather events.

Sutter County USDA Designations

| Incident | Incident Date | USDA Des. |
|---|---|---|
| Butte Windstorms | 03/03/01-03/04/01 | 06/25/01 |
| Butte Freeze | 04/08/01-04/09/01 | 09/27/01 |
| Butte Fires | 9/6/2001 | No |
| Drought | 2000-2002 | 11/18/02 |
| Freezing weather conditions | 2-Mar | 07/01/02 |
| Excessive Rain<br><br>(Colusa*) | 07/10/03 – 08/19/03 | 12/19/03 |
| Extreme heat, unseasonable rainfall (Sacramento*) | 06/10/03 – 08/26/03 | 12/19/03 |
| Excessive Rain & Wheat Stripe Rust<br>(Yuba*) | 03/14/03 – 05/09/03 | 10/23/03 |
| Spring Rains & Wheat Stripe Rust (Butte*) | 03/01/03 – 05/14/03 | 10/30/03 |
| Hail* | 4/4/03 – 5/9/03 | 10/30/03 |
| Rain/High Winds* | 12/13/03-12/16/03 | 04/30/03 |
| Drought* | 01/01/02 – 12/10/02 | 05/01/03 |
| High Temps and Winds (Solano/Yolo*) | 3/1/04-4/30/04 | 11/22/04 |
| High Temps<br>(Colusa*) | Week of 3/12/04 | 08/11/04 |
| High Temps Low Humidity | 3/12/04-3/15/04 | 08/02/04 |

Sutter County USDA Designations

| Incident | Incident Date | USDA Des. |
|---|---|---|
| (Butte, Glenn, Yuba*) | | |
| High Temps Low Humidity* | 3/9/04-3/22/04 | 08/02/04 |
| Unseasonable Rainfall<br><br>(Placer*) | 6/15/03-11/15/03 | 05/17/04 |
| Aug. rain, poor winter chill, high heat<br>(Placer*) | 8/1/03-10/31/03 | 04/23/04 |
| Unseasonable Rain* | 8/22/03-9/15/03 | 03/11/04 |
| Wildland Fires* | 8/11/04 & cont. | N/A |
| Sewage Spill<br>(Placer*) | 7/19/2005 | N/A |
| Unseasonable Heavy Rain<br>(Yuba*) | 5/9-5/19/05 | 10/04/05 |
| Unseasonable Rain* | 5/8-5/19/05 | 08/25/05 |
| Hail and Late Rain<br><br>(Butte*) | 4/25-5/20/05 | 08/22/05 |
| High Temps* | 3/5/05 – 3/15/05 | 08/18/05 |
| Unseasonable High Temps/Low Humidity (Yuba*) | 3/9/05 – 3/15/05 | 07/18/05 |
| Drought<br>(24 Primary Counties* - list1) | 1/1/04 & cont. | 01/19/05 |
| | **Total USDA Designations** | **24** |

*Shaded areas indicate no USDA Designation received.*
(Source: CA-OES)

## Likelihood of Future Occurrences

***Likely:*** As long as severe weather events continue to be an ongoing concern to the Sutter County Planning Area, the potential for agricultural losses remain.

# DROUGHT

Drought is a complex issue involving many factors, with differing conditions and drivers throughout the state making this more of a regional focus. Drought can be defined regionally based on its effects:

- Meteorological – this type of drought is usually defined by a period of below average water supply.

- Agricultural – this type of drought occurs when there is an inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock.

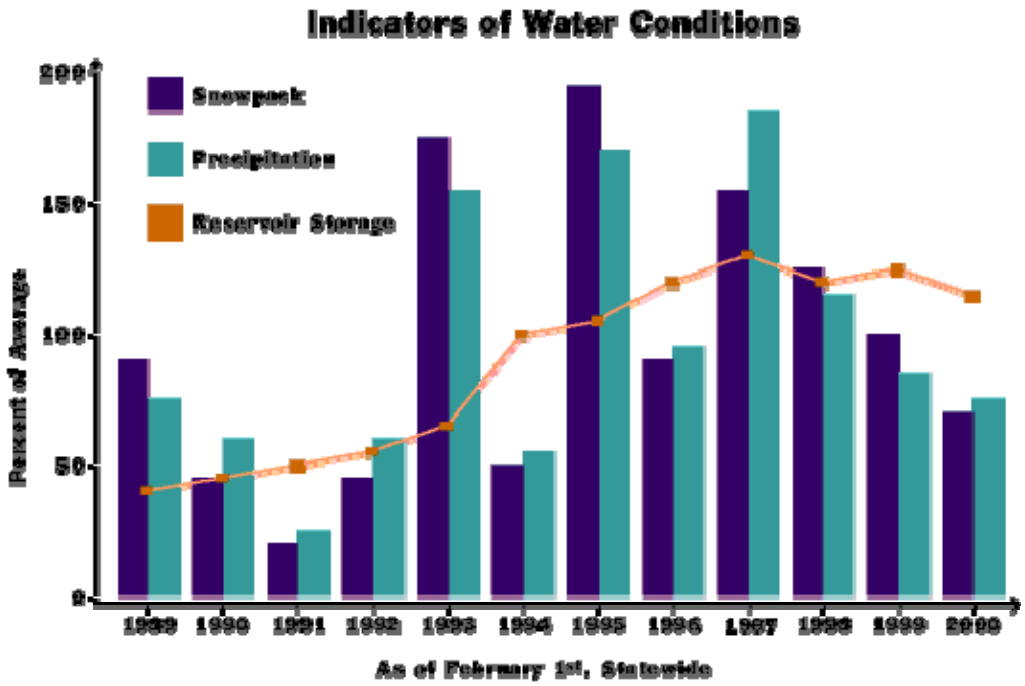
- Hydrological – a hydrological drought is defined as deficiencies in surface and subsurface water supplies. It is generally measured as stream flow, snowpack, and as lake, reservoir and groundwater levels.

- Socioeconomic – a socioeconomic drought occurs when the results of drought impacts the health, well being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

According to the California DWR drought is defined as follows: "One dry year does not normally constitute a drought in California. California's extensive system of water supply infrastructure—its reservoirs, groundwater basins, and inter-regional conveyance facilities—mitigates the effect of short-term dry periods for most water users. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions."

The drought issue is further compounded by water-rights specific to any state or region. Water is a commodity possessed under a variety of legal doctrines. In addition, the prioritization of water rights between farming and federally protected fish habitats in the state is also at issue.

The graphic on the following page, from the California DWR website, illustrates several indicators commonly used to evaluate California water conditions. The percent of average values are determined for measurement sites and reservoirs in each of the State's ten major hydrologic regions. Snowpack is an important indicator of runoff from Sierra Nevada watersheds, the source of much of California's developed water supply.




*(Source: California DWR Website)*

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multiyear period. There is no universal definition of when a drought begins or ends. Impacts of drought are typically felt first by those most reliant on annual rainfall—ranchers engaged in dryland grazing, rural residents relying on wells in low-yield rock formations, or small water systems lacking a reliable source. Criteria used to identify statewide drought conditions do not address these localized impacts. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

Within the Sutter County Planning Area, much of the water is taken from the river; although, many areas do rely on groundwater wells for their water. In years of drought, allocations go down resulting in reduced water availability to residents, farmers and businesses. Voluntary conservation measures are typically implemented during extended droughts. Other impacts to the community include higher water and utility bills and even rolling blackouts due to a reduction in available hydro-electric power to the area. During prolonged droughts, water quality issues also become a concern.

## Past Occurrences

Historically, California has experienced multiple severe drought conditions. According to the DWR website, droughts exceeding three years are relatively rare in Northern California, the source of much of the State's developed water supply. The 1929-34 drought established the criteria commonly used in designing storage capacity and yield of large Northern California

reservoirs. The table that follows compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to the 1976-77 and 1987-92 droughts. The driest single year of California's measured hydrologic record was 1977. California's most recent multi-year drought was 1987-92.

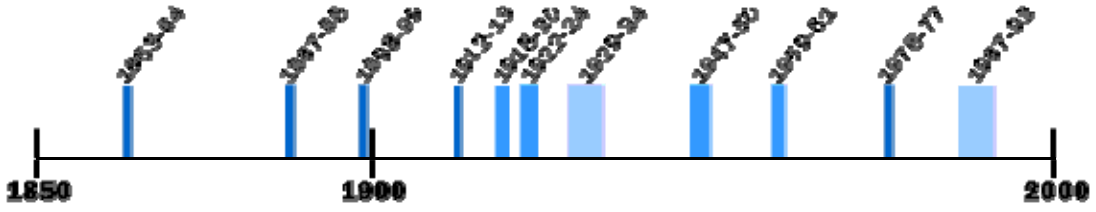
| **Severity of Extreme Droughts in the Sacramento and San Joaquin Valleys** | | | | |
|---|---|---|---|---|
| **Drought Period** | **Sacramento Valley Runoff** | | **San Joaquin Valley Runoff** | |
| | ***(maf/yr)*** | ***(% Average 1901-96)*** | ***(maf/yr)*** | ***(% Average 1906-96)*** |
| 1929-34 | 9.8 | 55 | 3.3 | 57 |
| 1976-77 | 6.6 | 37 | 1.5 | 26 |
| 1987-92 | 10.0 | 56 | 2.8 | 47 |

*(Source: California DWR Website)*

Based on additional information provided by the DWR, measured hydrologic data for droughts prior to 1900 are minimal. Multi-year dry periods in the second half of the 19th century can be qualitatively identified from the limited records available combined with historical accounts, as illustrated in the figure below, but the severity of the dry periods cannot be directly quantified.

**California's Multi-Year Historical Dry Periods**

**1850 - Present**




1. Dry periods prior to 1900 estimated from limited data.
2. Covers dry periods of statewide or major regional extent.

*(Source: California DWR Website)*

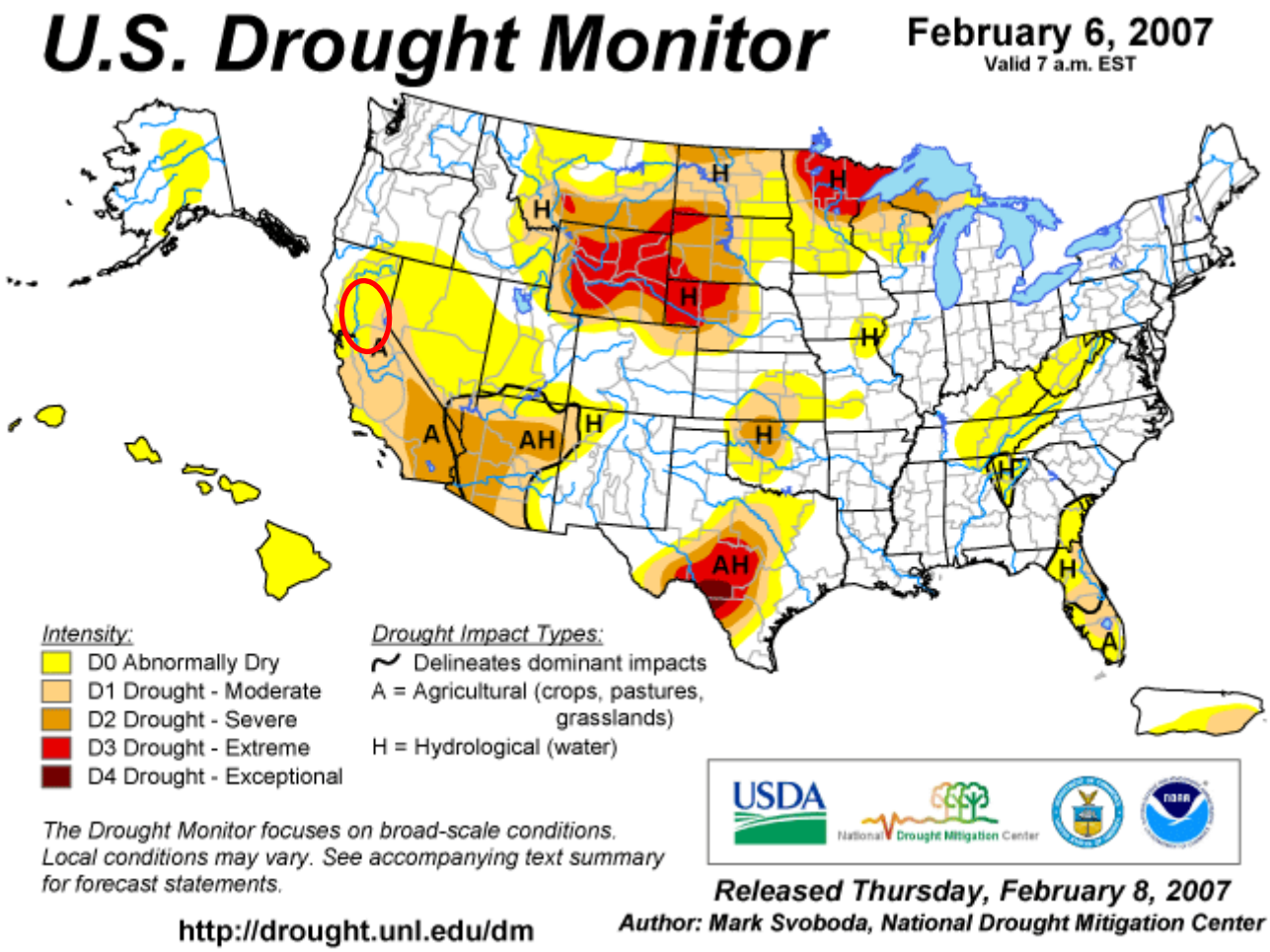
With respect to the Sutter County Planning Area, the following relatively recent drought events were identified by the HMPC:

- In 1976, a Federal Disaster Declaration was declared as a result of a drought affecting Sutter County and much of California.

- 2002 drought conditions existed within Sutter County, with severe impacts to the agricultural industry. The USDA granted a Secretarial Disaster Designation listing Sutter County as a primary affected county. Agricultural losses were estimated in excess of $34,000,000.

- In 2004, drought conditions existed on a County-wide basis, with significant losses to the agricultural industry. The USDA granted a Secretarial Disaster Designation listing Sutter County as a contiguous affected county.

The map that follows provides a "snapshot in time" perspective of the current drought conditions during February 2007. According to the U.S. Drought Monitor, Sutter County and the Central Valley are currently experiencing abnormally dry conditions. This map considers several factors including the Palmer Drought Index, Soil Moisture Models, United States Geological Survey (USGS) Weekly Streamflows, Standardized Precipitation Index, and Satellite Vegetation Health Index.




## Likelihood of Future Occurrences

***Likely:*** Historical drought data for the Sutter County Planning Area and the Sacramento and San Joaquin Valley regions indicate there have been five multi-year droughts in the last 76 years. This equates to a drought occurring every 15.2 years on average, or a 6.6% chance of a drought any given year. Based on this historical data, droughts affecting the planning area will likely continue to occur on a cyclic basis.

# LANDSLIDES

Landslides refer to a wide variety of processes that result in the perceptible downward and outward movement of soil, rock, and vegetation under gravitational influence. Common names for landslide types include slump, rockslide, debris slide, lateral spreading, debris avalanche, earth flow, and soil creep. Landslides may be triggered by both natural and human-induced changes in the environment resulting in slope instability. The susceptibility of an area to landslides depends on many variables including, Steepness of slope, type of slope material, structure and physical properties of materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or man-made edits.

Precipitation, topography, and geology affect landslides. Human activities such as mining, construction, and changes to surface drainage areas also affect the landslide potential. Landslides often accompany other natural hazard events, such as floods, wildfires, or earthquakes. Landslides can occur slowly or very suddenly and can damage and destroy structures, roads, utilities, forested areas and can cause injuries and death.

The Sutter County General Plan describes that landslide potential in the county as follows:
"With the exception of the Sutter Buttes, Sutter County is located in a nil zone on a severity scale ranging from nil to high. These zones reflect an estimate of the relative amount of landslides for an area in California and don't preclude the possibility of nil zones having localized instances of landsliding. The Sutter Buttes are considered to be in a low zone as shown in Bulletin 198 by the California Division of Mines and Geology".

## Past Occurrences

The Draft California Multi-Hazard Mitigation Plan indicates there have been no disaster declarations between 1950 and 1997 associated with landslides in Sutter County. However, there have been a few incidents of slope failure resulting in localized landslides occurring within the Sutter Buttes area.

## Likelihood of Future Occurrences

***Occasional:*** The landslide risk map (on the following page) developed for the Draft State Multi-Hazard Mitigation Plan identifies all of Sutter County at low risk for landslides. Based on data provided by the HMPC, minor landslides have occurred in the past, probably over the last several hundred years, as evidenced both by past deposits exposed in erosion gullies and recent landslide events. With significant rainfall, additional failures are likely within the sloped areas of the Sutter Buttes. Given the nature of localized problems identified within the county, minor landslides will likely continue to impact the area when heavy precipitation occurs, as they have in the past.

## Map 7.3B – Landslide Risk Zones

# SOIL HAZARDS

Soil hazards vary in frequency and severity among communities and for purposes of this risk assessment include: Erosion, Expansive Soils, and Land Subsidence.

## Erosion

### Hazard/Problem Description

Erosion is the general process whereby rocks and soils are broken down, removed by weathering, or fragmented and then deposited in other places by water or air. The rate of erosion depends on many variables including the soil or rock texture and composition, soil permeability, slope, extent of vegetative cover, and precipitation amounts and patterns. Erosion increases with increasing slope and increasing precipitation and with decreasing vegetative cover. Erosion may increase in areas where protective vegetation has been removed by fire, construction, or cultivation. Significant erosion can cause degradation and loss of agricultural land, degradation of streams and other water habitats, and rapid silting of reservoirs.

The General Plan includes data on the vulnerability of natural soil types to erosion within Sutter County based on mapping provided by the U.S. Soil Conservation Service. The potential erosion hazard has been grouped into three generalized categories:

**Slight**. 82.9% of Sutter County soil types have been identified in the Soil Survey as having slight erodibility and generally consist of those soil types with slopes of 0-9%.

**Moderate.** 10.4% of Sutter County soil types have been identified in the Soil Survey as having moderate to high erodibility and generally consist of those soil types with slopes of 9-30%.

**High.** 5.6% of Sutter County soil types have been identified in the Soil Survey as having high to very high erodibility ad generally consist of those soil types with slopes of 30-75%.

1.1% of Sutter County is Water.

The moderate and high groups contain soil types found in the Sutter Buttes. According to the General Plan, the following factors make Sutter County an area of low erosion activity:

- Sutter County's annual precipitation is 21 inches
- During the winter rainy season, wind velocity is low
- Sutter County does not have slopes in excess of 9%, with the exception of the Sutter Buttes
- The naturally erodible soil types are located in the Sutter Buttes area

### Past Occurrences

Erosion occurs within the Planning Area primarily in sloped areas of unincorporated Sutter County and along banks of drainage areas. Erosion along the banks is especially severe during

heavy storms where high velocity waters are present. Areas with recent problems identified by the HMPC include banks along the Feather River and the Gilsizer Slough. Specifically, the HMPC provided information on the following erosion areas:

### Likelihood of Future Occurrences

***Likely:*** Based on input from the HMPC, erosion does occur in the Planning Area and is especially a concern along the banks of rivers and drainages during winter storm events. Given the nature of erosion problems identified within the county, erosion will continue to be an issue.

## Expansive Soils

### Hazard/Problem Description

Expansive (swelling) soils or soft bedrock are those that increase in volume as they get wet and shrink as they dry. They are known as shrink-swell, bentonite, expansive, or montmorillinitic soils. Swelling soils contain high percentages of certain kinds of clay particles that are capable of absorbing large quantities of water, expanding up to 10% or more as the clay becomes wet. The force of expansion is capable of exerting pressures of 20,000 per square foot (psf) or greater on foundations, slabs, and other confining structures. Soils composed only of sand and gravel have no potential for volume changes. Soils are generally classified into three expansive soils classes with low, moderate, and high potential for volume changes:

**Low.** This soils class includes sands and silts with relatively low amounts of clay minerals. Sandy clays may also have low expansion potential, if the clay is kaolinite. Kaolinite is a common clay mineral.

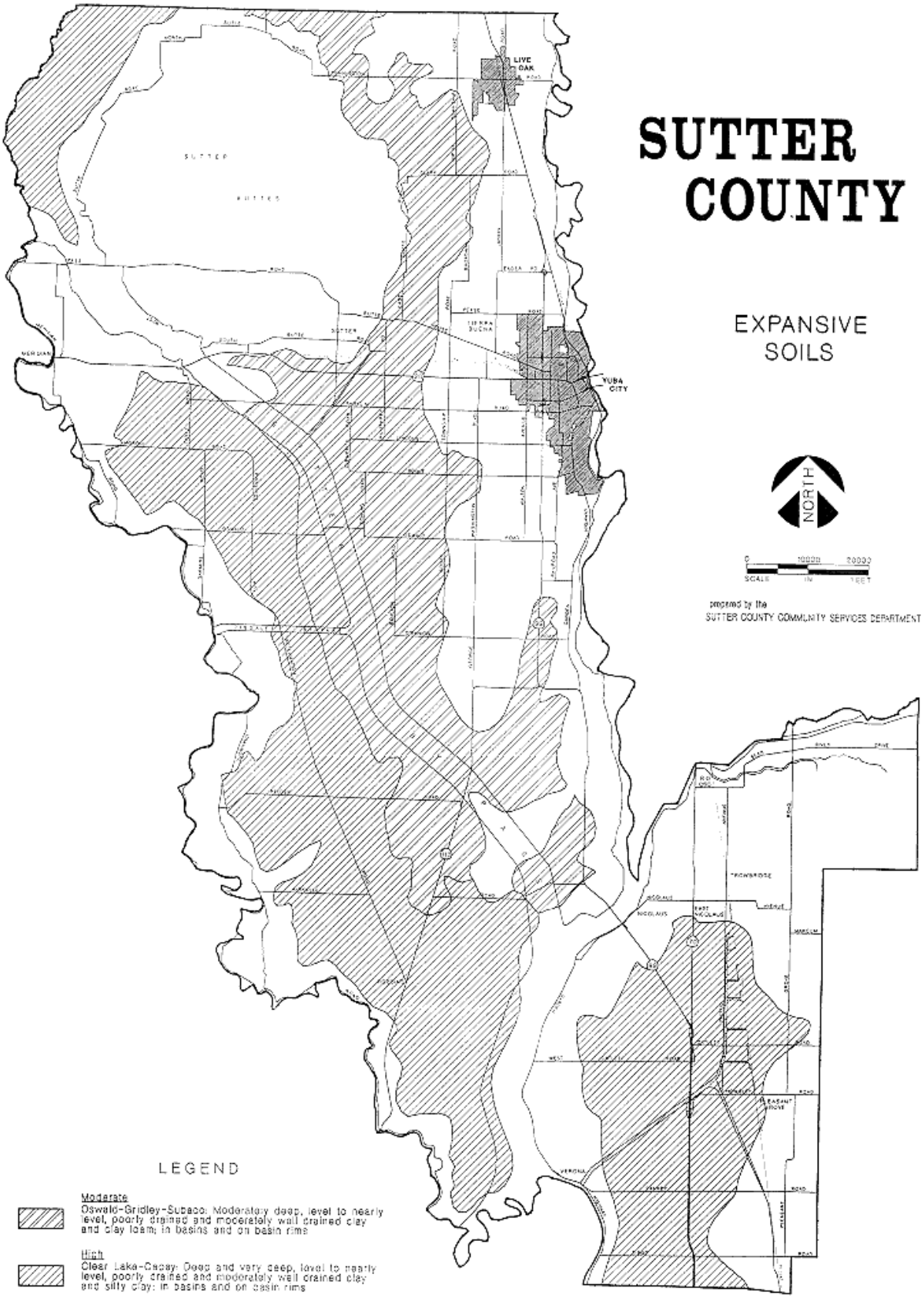
**Moderate**. This class includes silty clay and clay textured soils if the clay is kaolinite and also includes heavy silts, light sandy clays, and silty clays with mixed clay minerals.

**High.** This class includes clays and clay with mixed montmorillonite, a clay mineral which expands and contracts more than kaolinite.

Damages can include severe structural damage; cracked driveways, sidewalks, heaving of roads and highway structures; and disruption of pipelines and other utilities. Destructive forces may be upward, horizontal, or both. Building in and on swelling soils can be done successfully, although more expensively, as long as appropriate construction design and mitigation measures are followed.

According to the Sutter County General Plan, the distribution of expansive soils within Sutter County are most likely to occur in basins and on basin rims as shown in the expansive soil map that follows. Soils with no or low expansion potential occur along the rivers and river valleys and on steep mountain slopes. In addition, the Soil Survey for Sutter County identifies the shrink-swell potential for soil types in the County. Several soil types have a combination shrink-swell potential meaning that the potential for shrink-swell changes at varying soil depth. Based on this data, 34% of soil types in Sutter County have a high potential and 22.8% have a low

potential. The remaining soil types could not be placed into high, moderate or low categories due to changes in the potential shrink-swell capacities at varying soil depths. The map on the following page taken from the Sutter County General Plan illustrates the areas most susceptible to expansive soils.


SUTTER COUNTY
EXPANSIVE SOILS
LIVE OAK
YUBA CITY
NORTH
prepared by the
SUTTER COUNTY COMMUNITY SERVICES DEPARTMENT
LEGEND
Moderate
Oswald-Gridley-Subaco: Moderately deep, level to nearly level, poorly drained and moderately well drained clay and clay loam; in basins and on basin rims
High
Clear Lake-Cacay: Deep and very deep, level to nearly level, poorly drained and moderately well drained clay and silty clay; in basins and on basin rims

### Past Occurrences

Expansive soils occur within areas of the County. However, due to the ability to successfully mitigate by adhering to sound design and construction practices, the HMPC was unable to provide information on historical expansive soil problems within the Sutter County Planning Area.

### Likelihood of Future Occurrences

***Occasional:*** Based on the soil types found within Sutter County, the potential exists for expansive soils to be a future issue in the Sutter County Planning Area.

## Land Subsidence

### Hazard/Problem Description

Land subsidence is defined as the vertical sinking of the land over man-made or natural underground voids. Subsidence, usually as a direct result of groundwater withdrawal or oil and gas withdrawal is common in several areas of California, including parts of the Sacramento Valley and in large areas of the San Joaquin Valley.

Subsidence can result in serious structural damage to buildings, roads, irrigation ditches, canals, streams, underground utilities and pipelines. It can disrupt and alter the flow of surface or underground water. Weight, including surface developments such as roads, reservoirs, and buildings, and man-made vibrations from such activities as blasting, heavy truck or train traffic can accelerate the natural processes of subsidence. Fluctuations in the level of underground waters caused by pumping or by injecting fluids into the earth can initiate sinking to fill the empty space previously occupied by water or soluble minerals. The consequences of improper utilization of land subject to ground subsidence generally consists of excessive economic losses. This includes high repair and maintenance costs for buildings, irrigation works, highways, utilities and other structures. This results in direct economic losses to citizens, and indirect losses through increased taxes and decreased property values.

According to the Sutter County General Plan, Sutter County is not subject to high subsidence as many of the factors needed to cause subsidence do not exist in the county. In fact, the General Plan lists the following factors that contribute to the low subsidence potential in the county:

- Sutter County contains several natural gas withdrawal locations in the western and southern portions of the County; however, these gas fields are spread out over a large area (not producing concentrated drawdowns) and do not individually generate a high volume of gas.
- Sutter County does have groundwater drawdowns for domestic and agricultural water supply; however, the subsurface geology of the County has a significant recharge capability from the Sacramento River, the Feather River and runoff from the Sierra Nevada snow melt which reduces the drawdown affects.

- A large portion of Sutter County households do not rely on groundwater since the public water supply is delivered from surface withdrawal off the Feather River.
- Sutter County does not have oil withdrawal drawdowns.

However, the General Plan does indicate that a prolonged drought event or a significant increase in natural gas withdrawals could lead to incidents of subsidence in the future.

**Past Occurrences**

The HMPC was unaware of any past subsidence problems within the Sutter County Planning Area.

**Likelihood of Future Occurrences**

***Occasional:*** Historically, land subsidence issues in the county have been minimal. However, given the nature of the area as described above, the potential exists for subsidence to occur in the future. If properly identified and managed, it is unlikely to be a significant concern.

# WEST NILE VIRUS

## Hazard/Problem Description

The impact to human health that wildlife and insects, can have upon an area is substantial. Mosquito-borne diseases that have occurred in the Sutter County Planning Area include malaria, Western Equine Encephalomyelitis, ST. Louis Encephalitis, and West Nile Virus (WNV). These diseases can appear at any time and can be a very serious health threat to the community. Currently, the primary natural health hazard of concern associated with mosquitoes in the Sutter County Planning Area is WNV.

WNV is a more recent natural hazard to affect California. Mosquitoes transmit this potentially deadly disease to livestock and humans. WNV first struck the United States in Queens, N.Y., in 1999 and killed four people. From 62 severe cases in 1999, confirmed human cases of the virus spread to 39 states in 2002, and killed 284 people. In 2003, all 50 states warned of an outbreak from any of the 30 mosquitoes known to carry it. Less than one percent of those infected develop severe illness. People over 70 years of age are at high risk for the severe aspects of the disease.

The Sutter County Planning Area recognizes the potential for WNV to occur within the county and has initiated a public outreach campaign. The Sutter-Yuba Mosquito and Vector Control District (SYMVCD) has responded to the potential for WNV the last two years through focused efforts on reducing the mosquito population and educating the public. The District uses preventative methods which lower mosquito populations to levels that reduce chances for the spread of diseases. The District's programs integrate three methods of mosquito control. Physical control involves changing the environment, where allowed by law, to limit or prevent mosquito larval production. Biological control makes use of natural enemies or predators of mosquitoes and mosquito larvae. Chemical control utilizes natural and man-made compounds to suppress mosquito numbers. The county also has an active WNV surveillance program within its district and maintains records for all identified cases of the disease

## Past Occurrences

WNV was detected on a very limited basis in horses and humans in California in 2003. San Diego County reported one veterinary case; Imperial County and Riverside County each reported one human case. According to the California West Nile Virus Surveillance Information Center sponsored by the California Department of Health Services, a total of 28 California residents died from WNV in 2004, with most deaths occurring in Southern California

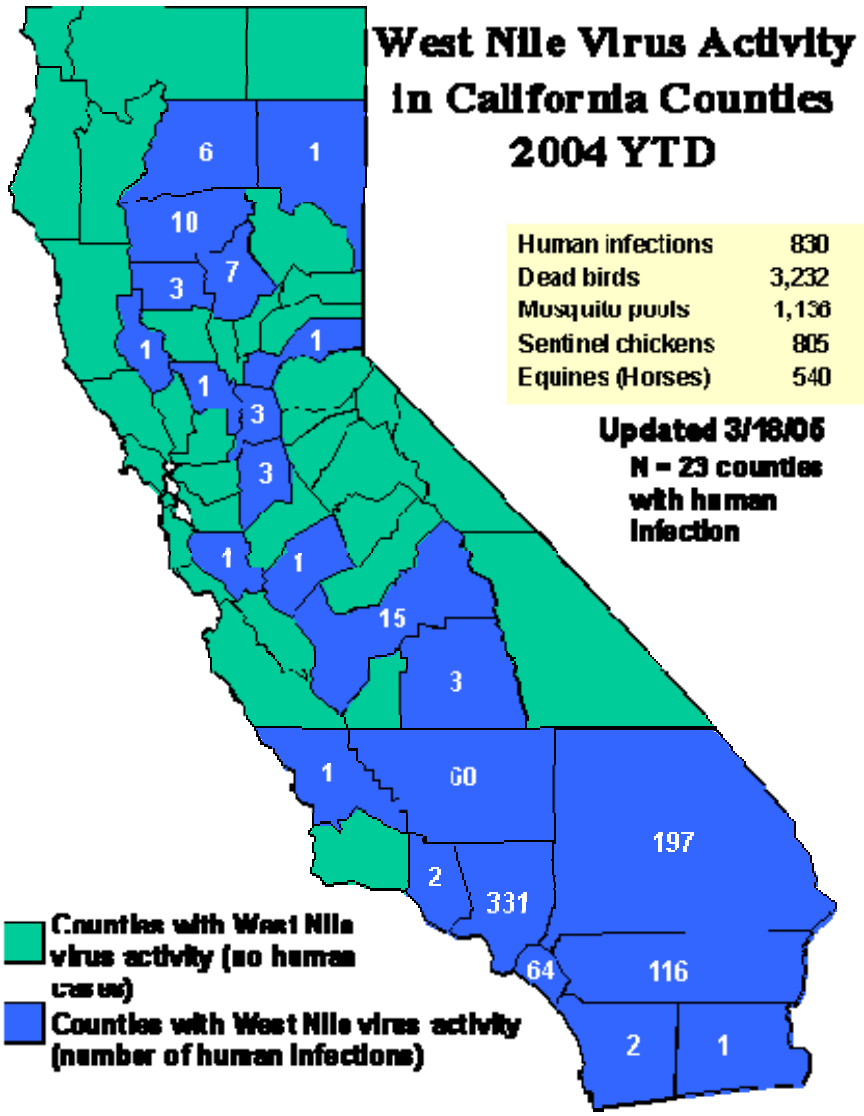
In 2005, WNV activity in California was increasing; 54 of the 58 California counties have had some WNV activity in 2005. A total number of 935 human cases of WNV were reported in 2005, which included 18 deaths from 11 counties (no deaths were from Sutter County). By September of 2006, the number of human cases in California (52/58 counties) was at 215, including 2 deaths, significantly down from 2005.

The table below summarizes WNV activity in Sutter County for the years 2004 through 2006.

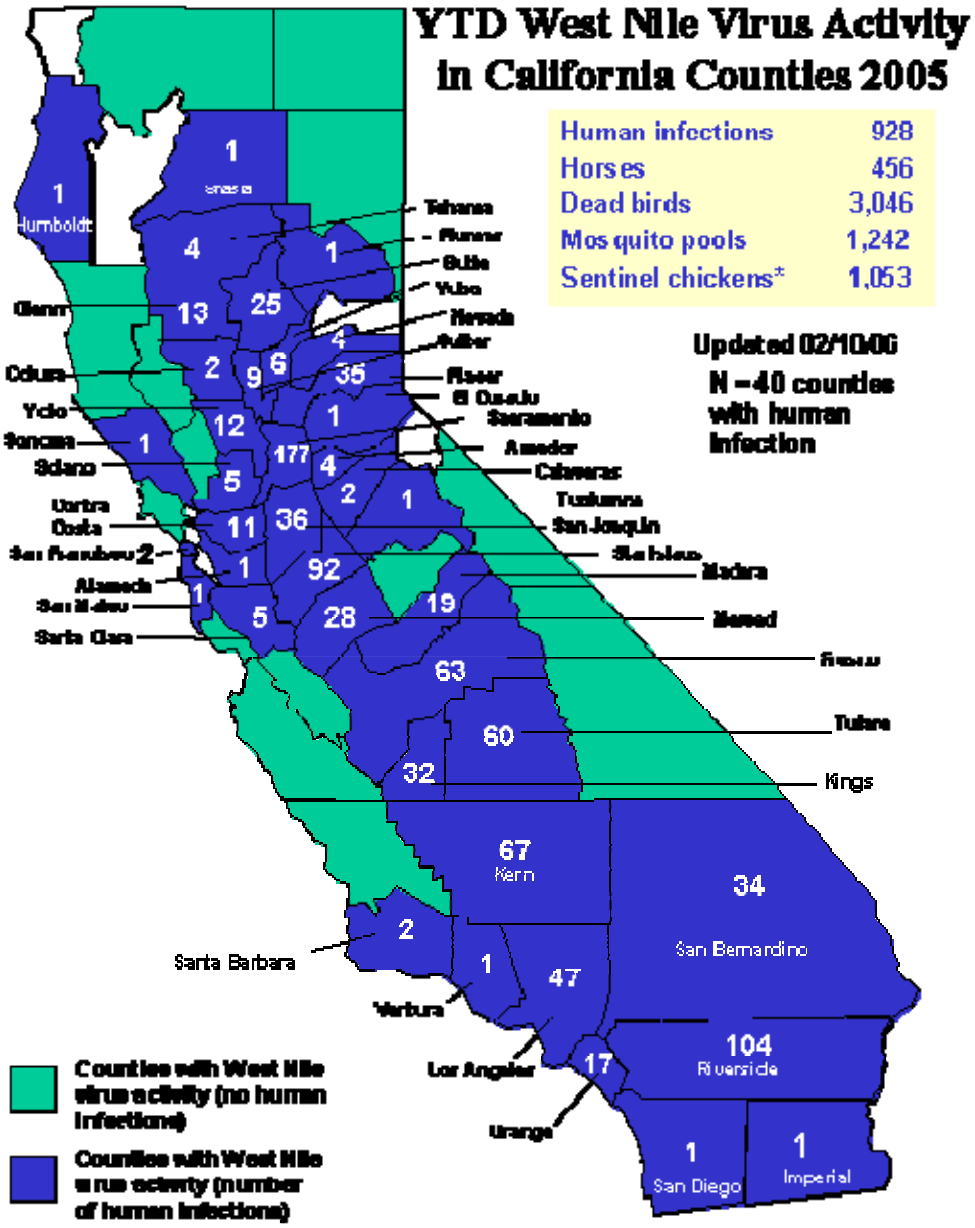
**Summary of WNV in California and Sutter County 2001 to 2006**

| Year/ Area | Humans | | Birds | | Mosquitoes | | Horses | | Sentinel Flock | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CA | Sutter County | CA | Sutter County | CA | Sutter County | CA | Sutter County | CA | Sutter County |
| **2004** | 830 | 0 | 3,232 | 28 | 1,136 | 8 | 540 | 11 | 809 | 12 |
| **2005** | 935 | 9 | 3,046 | 9 | 1,242 | 43 | 456 | 1 | 1,053 | 32 |
| **2006** | 276 | 12 | 1,446 | 2 | 832 | 55 | 58 | 1 | 640 | 36 |

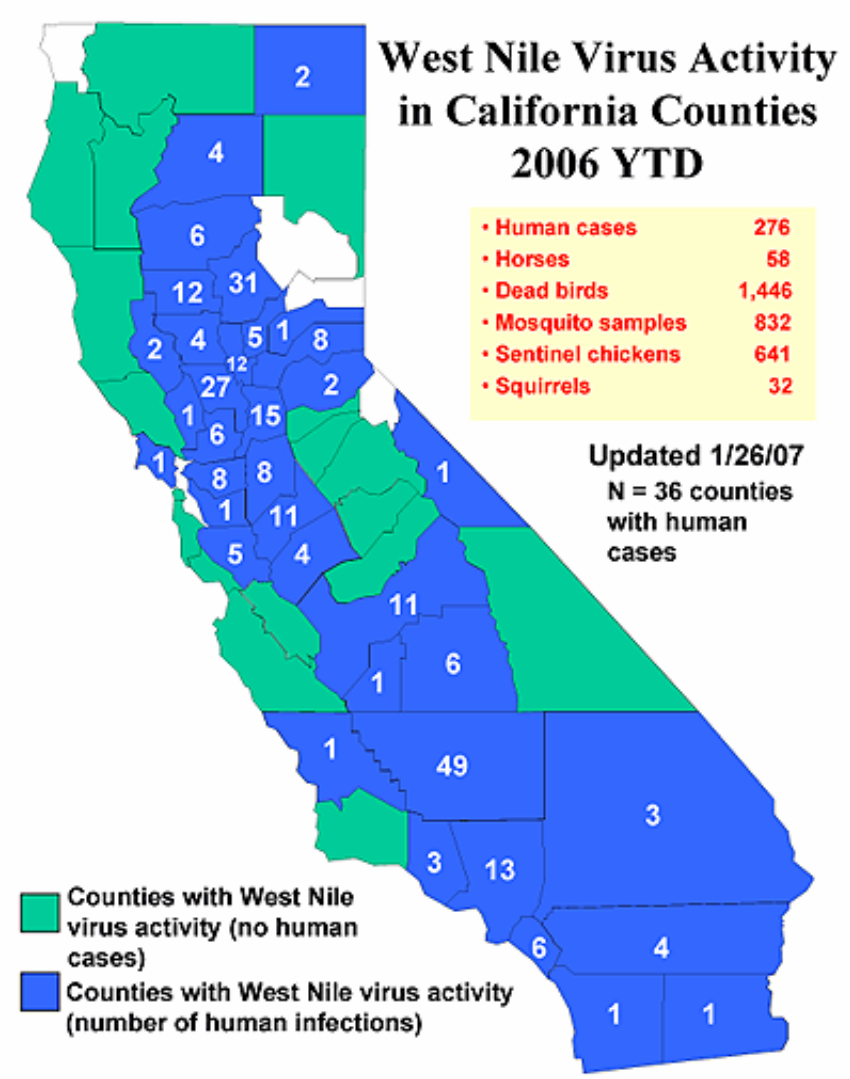
Taken from the California WNV website, WNV activity in California (and Sutter County) for 2004, 2005 and 2006 are illustrated in the maps on the following pages.




*(Source: http://westnile.ca.gov/2005_maps.htm*




*(Source: http://westnile.ca.gov/2005_maps.htm)*




*(Source: http://westnile.ca.gov/2006_maps.p)*

## Likelihood of Future Occurrences

***Likely:*** Based on historical data, the Sutter County Planning Area has experienced 21 human cases of WNV since its discovery in California in 2003. This is an average of 5.25 cases every year. The agricultural nature of much of the Planning Area combined with the great potential for standing water to be present throughout the county, puts the Planning Area at future risk of WNV. The state will continue their surveillance for the disease in 2007.

# VOLCANO

The Draft California Multi-Hazard Mitigation Plan identifies volcanoes as one of the hazards adversely impacting the state of California.. However, there have been few losses in California from volcanic eruptions. Of the approximately 20 volcanoes in the state, only a few are active and pose a threat. Lassen Peak and Clear Lake (see map that follows) are the closest active

volcanoes to the Planning Area. Mount Lassen has erupted at least seven times within the past 1,200 years and last erupted in the period between 1914 and 1921. This period of volcanic activity involved steam and ash eruptions as well as a small lava flow. According to the Sutter County General Plan, Mount Lassen is considered dormant which means that it is not currently erupting, but is expected to erupt again in the future. Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away.

Also of volcanic origin, the Sutter Buttes are located in the northwestern portion of the County. The Sutter Buttes, with its significant rock out-croppings can be seen from around the county. According to the Sutter County General Plan, the Sutter Buttes erupted between 1.60 and 1.35 million years ago. During their eruption, melted rock, or magma pushed its way upward beneath the flat valley layers of sandstone, shale, gravel beds, and marine deposits. The magma solidified into large lava domes of the Castellated Core of the Buttes, creating the various types of rock out-croppings. As stated in the General Plan, "According to the California Division of Mines and Geology, neither the Sutter Buttes nor Sutter County are identified as being located in an area of "Potential Volcanic Hazard."

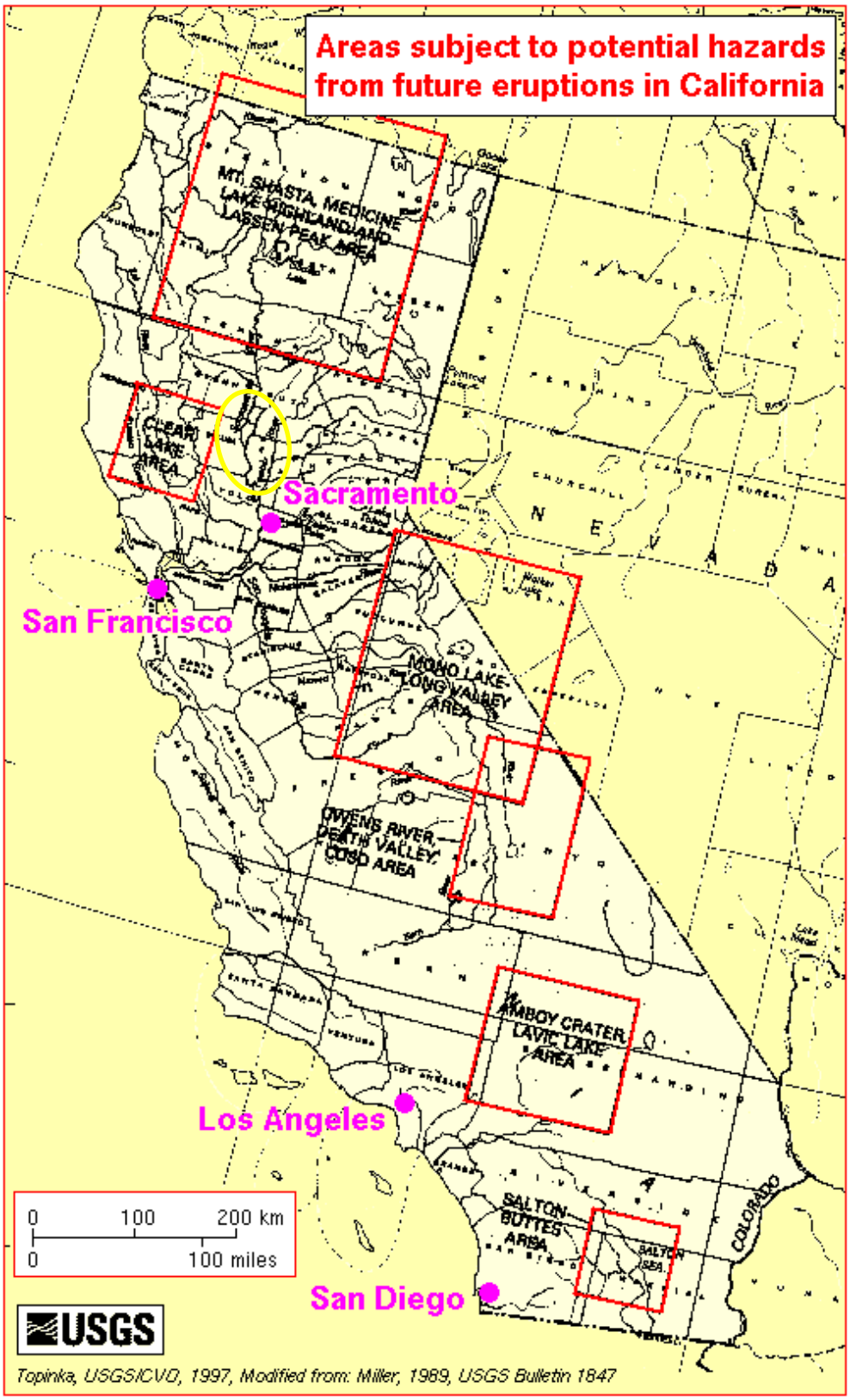
**Volcanoes in or near California**

## Past Occurrences

With the exception of the formation of the Sutter Buttes over a million years ago, the HMPC was unable to find any evidence of more recent volcanic activity within the Sutter County Planning Area.

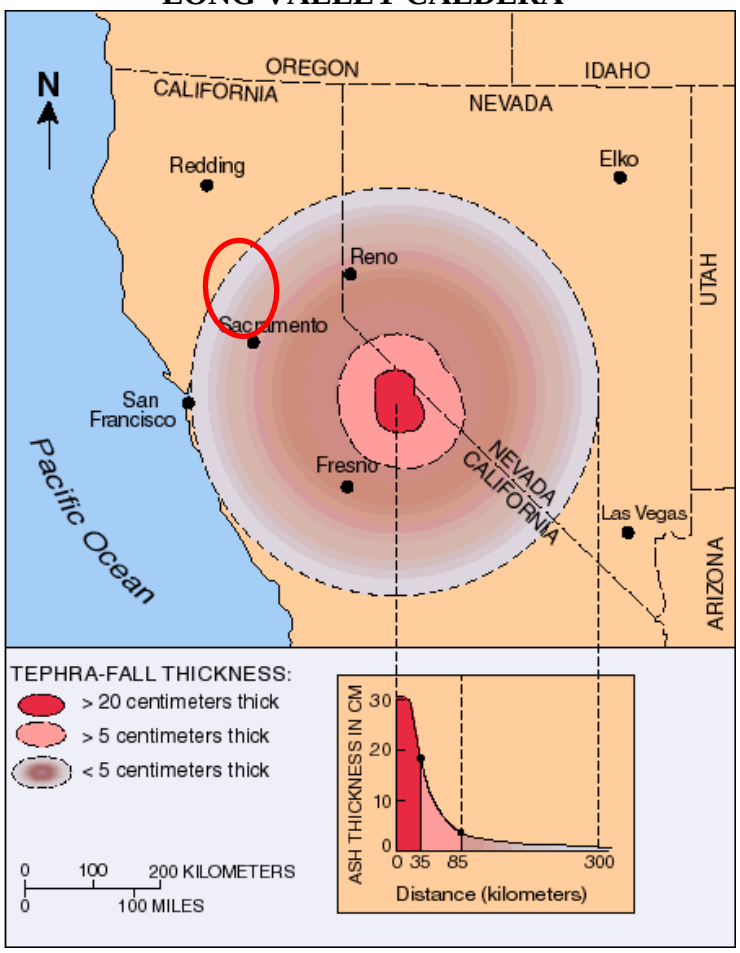
## Likelihood of Future Occurrences

***Highly Unlikely:*** Based on available data and the location of the county relative to potentially active volcanoes, it is highly unlikely that volcanic activity of sufficient magnitude to adversely impact the Sutter County Planning Area will occur. The USGS map that follows illustrates areas subject to potential volcanic hazards from future eruptions in California and supports the conclusion that the Planning Area is not at significant risk to volcanoes. However, the ash dispersion map that follows for the Long Valley Caldera indicates that the planning area may be affected by some ash fallout in the event of renewed volcanic activity from the Long Valley Caldera.




(Source: http://vulcan.wr.usgs.gov/Volcanoes/California/Hazards/Bulletin1847/map_calif_hazards_potential.html)

**VOLCANIC HAZARDS ASH DISPERSION MAP**
**LONG VALLEY CALDERA**




The map above illustrates volcanic hazards based on activity in the last 15,000 years. Areas in blue or purple show regions at greater or lesser risk of local volcanic activity, including lava flows, ashfall, lahars (volcanic mudflows), and debris avalanches. Areas in pink show regions at risk of receiving five or more centimeters of ashfall from large or very large explosive eruptions, originating at the volcanic centers. An eruption from Long Valley has the potential to adversely impact the Sutter County Planning Area with ashfall less than 5 centimeters thick.

## SUMMARY

The following table summarizes the results of the hazard identification and hazard profile for the Sutter County Planning Area based on the hazard identification data and input from the HMPC. Specifically, for each hazard evaluated in Section 4.1, this section includes an assessment of the likelihood of future occurrence and whether the hazard is considered significant to the planning area based on the methodology described in Section 4.0.

**Hazard Identification/Profile Summary and Determination of Significance of Hazard**

| Hazard | Likelihood of Future Occurrence | Significant Hazard |
|---|---|---|
| Agricultural Hazards | Likely | Yes |
| Dam Failure | Unlikely | Yes |
| Drought | Likely | Yes |
| Earthquakes | Unlikely | Yes |
| Floods | 100-year flood: Occasional <100-year flood: Highly Likely | Yes |
| Landslides | Occasional | No |
| Severe Weather: Extreme Temperatures | Highly Likely | Yes |
| Severe Weather: Severe Fog | Occasional | No |
| Severe Weather: Winterstorms | Highly Likely | Yes |
| Severe Weather: Tornadoes | Occasional | No |
| Soil Hazards: Erosion | Likely | Yes |
| Soil Hazards: Expansive Soils | Occasional | No |
| Soil Hazards: Land Subsidence | Occasional | No |
| West Nile Virus | Likely | Yes |
| Wildfires | Likely | Yes |
| Volcano | Highly Unlikely | No |

(Source: HMPC, 2006)

The HMPC determined that flood and potentially dam failure flood are clearly the most significant hazards to the Planning Area. The assets at risk and potential impacts and costs of these hazards are discussed in more detail in the next section. Only those hazards determined to be significant are discussed further in this plan.

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