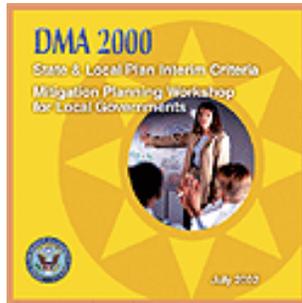
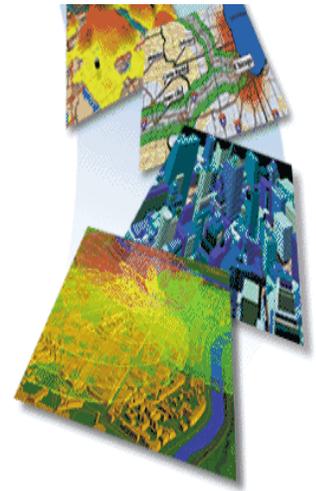


**FINAL**



**Yuba City-Sutter  
County, California  
Multi-Hazard  
Mitigation Plan**



## EXECUTIVE SUMMARY

The purpose of hazard mitigation and this plan is to reduce or eliminate long-term risk to people and property from natural hazards and their effects on the Sutter County Planning Area of California. The Sutter County Planning Area geographically corresponds to the jurisdictional boundaries of Sutter County, the City of Yuba City, and the City of Live Oak (collectively referred to in this plan as the Sutter County Planning Area and/or Sutter County.) This plan has been prepared to meet the Disaster Mitigation Act of 2000 (DMA 2000) requirements in order to maintain Sutter County's eligibility for the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation (PDM) and Hazard Mitigation Grant Programs (HMGP). More importantly, this plan and planning process lays out the strategy that will enable the Sutter County Planning Area to become less vulnerable to future disaster losses.

This multi-jurisdictional plan includes the County, and the incorporated communities of the City of Yuba City and the City of Live Oak. This plan also covers six participating districts: the Gilsizer County Drainage District, Levee District One, and Reclamation Districts 1001, 1500, 70, and 1660.

The DMA planning process followed a methodology prescribed by FEMA. It began with the formation of a Hazard Mitigation Planning Committee (HMPC) comprised of key county, city, district and stakeholder representatives. The planning process examined the recorded history of losses resulting from natural hazards and analyzed the future risks posed to the county by these hazards. Sutter County is vulnerable to several natural hazards that are identified, profiled, and analyzed in the plan. Floods, winterstorms and drought are some of the hazards that can have a significant impact on the Planning Area.

The plan puts forth several mitigation goals and objectives that are based on the results of the risk assessment. To meet identified goals and objectives, the plan also includes a Mitigation Action Plan detailing specific recommendations for actions that can mitigate future disaster losses. This Mitigation Action Plan is detailed in the following table.

### Sutter County Planning Area Mitigation Action Plan

Mitigation Type and Action #	Mitigation Action Title	Priority	Responsible Office
<b>COUNTYWIDE RECOMMENDED MITIGATION ACTIONS</b>			
<b>Emergency Services Measures</b>			
Action #1	Multi-Hazard Public Awareness Program	Medium	Sutter County OES, American Red Cross, City of Yuba City, City of Live Oak
<b>Flood Measures</b>			

<b>Mitigation Type and Action #</b>	<b>Mitigation Action Title</b>	<b>Priority</b>	<b>Responsible Office</b>
Action #1	Sutter Basin Feasibility Study and Improvements	High	USACE Sacramento District, California Reclamation Board, Sutter County
Action #2	O'Banion Road DWR Pump Station Improvements	High	State Department of Water Resources
<b>Agricultural Measures</b>			
Action #3	Noxious Terrestrial Weed Control Project	High	Sutter County Department of Agriculture
Action #4	Aquatic Weed Elimination Project	High	Sutter County Department of Agriculture
<b>UNINCORPORATED SUTTER COUNTY</b>			
<b>Flood Measures</b>			
Action #1	Road Projects to Improve Right of Passage and to Decrease Localized Flooding	Medium	Sutter County Department of Public Works
Action #2	Bypass Crossing @Sacramento Ave.	Medium	Sutter County Department of Public Works
Action #3	Live Oak Canal Constriction Removal	High	Sutter County Water Agency
Action #4	Bogue Road Flood Water Diversion Berm	High	Sutter County Water Agency
<b>CITY OF YUBA CITY</b>			
<b>Emergency Services Measures</b>			
Action #1	Emergency Communications Improvements	High	City of Yuba City Police and Fire Department
<b>Flood Measures</b>			
Action #2	Various Street Improvements to Decrease Localized Flooding	Medium	City of Yuba City Department of Public Works
Action #3	Low Lift Pump Access Road Improvements	Medium	City of Yuba City Department of Public Works
Action #4	Relocation of Wastewater Effluent Discharge Ponds	High	City of Yuba City Department of Utilities
Action #5	East and West Feather River Bank Stabilization	High	City of Yuba City Department of Utilities
Action #6	Gilsizer Slough Weir at Bogue Road	High	City of Yuba City Department of Utilities
Action #7	Comprehensive Flood Management	High	City of Yuba City

<b>Mitigation Type and Action #</b>	<b>Mitigation Action Title</b>	<b>Priority</b>	<b>Responsible Office</b>
	Plan		Department of Public Works
Action #8	Implementation of Additional CRS Activities	High	City of Yuba City Department of Public Works
Action #9	Floodplain Management Planning Outreach	High	City of Yuba City Department of Public Works
<b>Wildfire Measures</b>			
Action #10	Fire Flow Improvements for Groundwater Regions 1, 2 and 3	Medium	City of Yuba City Department of Utilities
<b>CITY OF LIVE OAK</b>			
<b>Flood Measures</b>			
Action #1	Road Projects to Improve Right of Passage and to Decrease Localized Flooding	Medium	City of Live Oak Department of Public Works
Action #2	Lift Pump Back Up Generator Improvements	Medium	City of Live Oak Department of Public Works
<b>GILSIZER COUNTY DRAINAGE DISTRICT</b>			
<b>Flood Measures</b>			
Action #1	Revetment of Slough Channel/Headwalls at Road Crossing	High	Gilsizer County Drainage District
<b>LEVEE DISTRICT ONE</b>			
<b>Flood Measures</b>			
Action #1	Bank Erosion Repairs To Levees in Several Areas	Medium - High	Levee District One
Action #2	Star Bend Set Back Levee	High	Levee District One
Action #3	Relief Well Location (N. Star Bend)	High	Levee District One
<b>RECLAMATION DISTRICT 1001</b>			
<b>Flood Measures</b>			
Action #1	Unit 2 LB Yankee Slough Levee Repairs	Medium	RD1001
Action #2	Feather River/Sacramento River Landslide Stability Berm	High	RD1001
Action #3	North Levee of Natomas Cross Canal Repairs	Medium	RD1001
Action #4	Infrastructure Improvements – District-wide and Main Pumping Facility	High	RD1001

<b>Mitigation Type and Action #</b>	<b>Mitigation Action Title</b>	<b>Priority</b>	<b>Responsible Office</b>
<b>RECLAMATION DISTRICT 1500</b>			
<b>Flood Measures</b>			
Action #1	Karnak Pump Plant Renovation	High	RD1500
<b>RECLAMATION DISTRICT 70</b>			
<b>Flood Measures</b>			
Action #1	Pumping Plant Project	Medium	RD70
<b>RECLAMATION DISTRICT 1660</b>			
<b>Flood Measures</b>			
Action #1	Sutter By-Pass Project	High	RD1660

This plan has been formally adopted by each participating entity and is required to be formally updated every five years.

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# Multi-Hazard Mitigation Plan

## 1.0 Introduction

Sutter County, City of Yuba City and the City of Live Oak (hereinafter collectively referred to the Sutter County Planning Area and/or Sutter County) has prepared this Multi-Hazard Mitigation Plan pursuant to the requirements of the Disaster Mitigation Act of 2000, PL 106-390 and established regulations at 44 CFR Part 201.6 (hereafter referred to as DMA; see Appendix A for a list of acronyms used in this document). This plan documents the DMA planning process, identifies natural hazards and associated risks of concern, and identifies Sutter County's hazard mitigation strategy to make the Planning Area less vulnerable and more disaster resistant and sustainable. Information in the plan can also be used to help guide and coordinate mitigation activities, local mitigation policies, and future land use decisions.

Hazard Mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards. Hazard Mitigation Planning is the process through which natural hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies that would lessen the impacts are determined, prioritized, and implemented. Hazard Mitigation Planning is required for state and local governments to maintain their eligibility for certain federal disaster assistance and hazard mitigation funding programs.

This section of the plan describes the purpose and need for the plan, the scope of this effort and plan organization.

### PURPOSE AND NEED

Each year, natural disasters in the United States kill hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses to insurance companies and non-government organizations are not reimbursed by tax dollars. Additionally, many natural disasters are predictable, often with the same results. Many of the damages caused by these events can be alleviated or even eliminated.

FEMA, the Federal Emergency Management Agency, a part of the Department of Homeland Security (DHS), has targeted reducing losses from natural disasters as one of its primary goals. Hazard Mitigation planning and subsequent implementation of projects, measures, and policies developed through those plans are the primary mechanisms for achieving these goals. Success in reducing disaster damages has taken place as the result of mitigation projects implemented subsequent to mitigation planning.

DMA 2000 requires state and local governments to develop Hazard Mitigation Plans in order to maintain their eligibility for certain Federal disaster assistance and hazard mitigation funding programs. Compliance with these requirements will maintain participating jurisdictions' continued eligibility for certain FEMA hazard mitigation grant programs. Communities at risk from natural disasters can not afford to jeopardize this funding.

More importantly, proactive mitigation planning at the local level can help reduce the cost of disaster response and recovery to property owners and governments by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption. The Sutter County Planning Area has been affected by natural hazards in the past and is committed to reducing disaster impacts and maintaining eligibility for federal mitigation grant funding.

## SCOPE

The Sutter County Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that covers the following communities that participated in the planning process:

- Sutter County
- City of Yuba City
- City of Live Oak

This plan also covers seven additional districts and organizations within the Sutter County Planning Area that meet the FEMA definition of "local government" and participated in the planning process. The participating districts include:

- Gilsizer County Drainage District
- Levee District One
- Reclamation District 1001 (RD1001)
- Reclamation District 1500 (RD1500)
- Reclamation Districts 70 & 1660 (RD70 & RD1660): Meridian Basin

This plan follows DMA planning requirements and associated guidance for developing Local Hazard Mitigation Plans. These guidance set forth a generalized 4-task planning process: 1) Organize your Resources, 2) Assess Hazards and Risks, 3) Develop a Mitigation Plan, and 4) Evaluate your Work.

This plan addresses natural hazards only. Although the participants of the Sutter County Hazard Mitigation Planning Committee (HMPC) recognize that FEMA is both encouraging and promoting communities to integrate human-caused hazards into the mitigation planning process, the scope of this effort did not address these human-caused hazards for two reasons. First, many of the planning activities for the mitigation of human-caused hazards are either underway or complete, and have been developed by a different set of organizations. Secondly, DMA requires extensive public information and input, and this is in direct conflict with the confidentiality necessary in planning for the fight against chemical, biological, and radiological terrorism. The HMPC determined it was not in the community's best interest to publicly share specific information about the area's vulnerability to human-caused hazards.

# PLAN ORGANIZATION

Sutter County's Multi-Hazard Mitigation Plan is organized as follows:

## Executive Summary

- 1.0 Introduction
- 2.0 County Profile
- 3.0 Planning Process
- 4.0 Risk Assessment
- 5.0 Mitigation Strategy
- 6.0 Plan Adoption
- 7.0 Plan Implementation & Maintenance

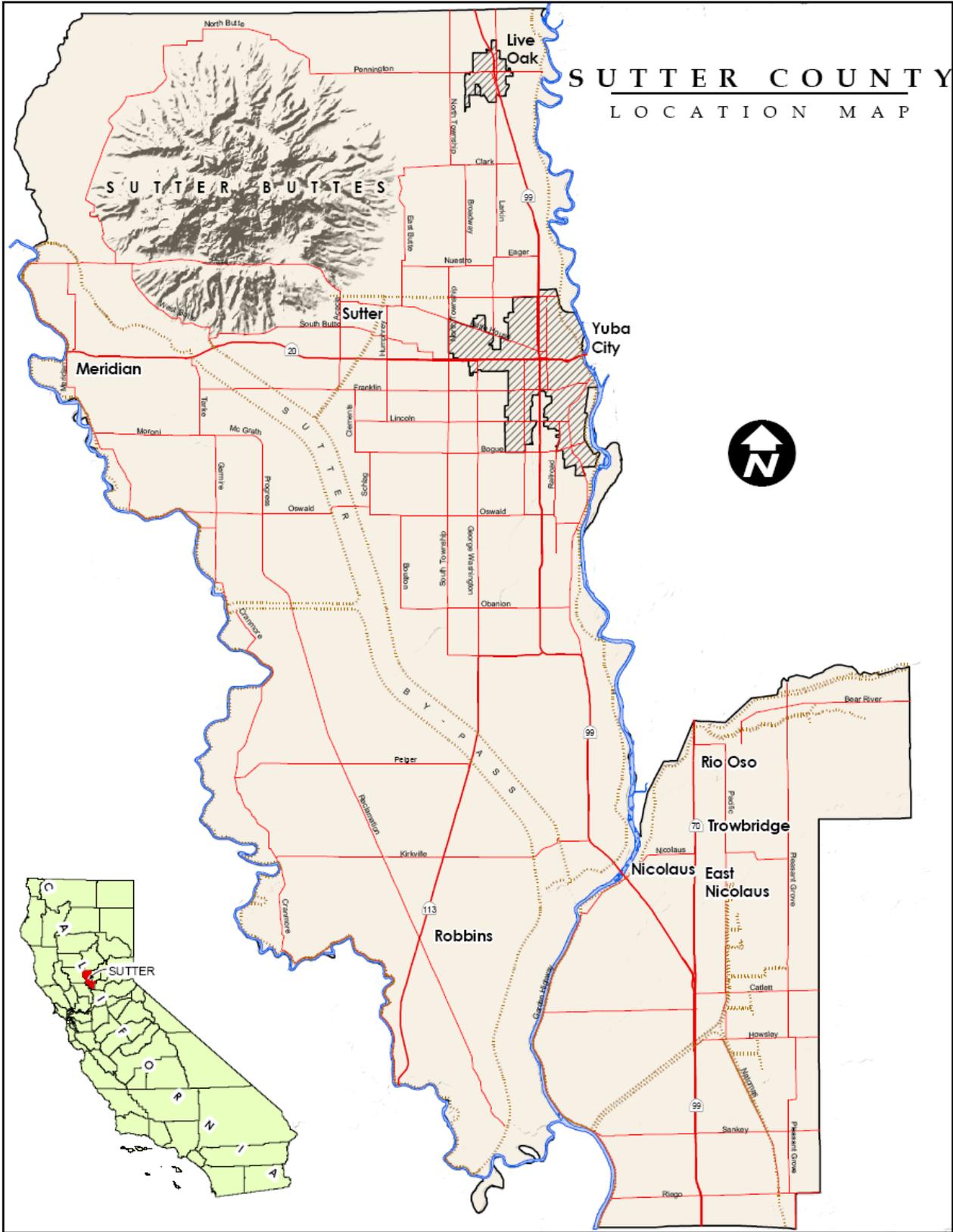
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# Multi-Hazard Mitigation Plan

## 2.0 Sutter County Planning Area Profile



The Sutter County Planning Area, which geographically corresponds to the jurisdictional boundaries of Sutter County, lies in a portion of north central California known as the Sacramento Valley, approximately 40 miles north of Sacramento. Sutter County's boundaries are generally defined by Yolo and Colusa Counties to the west with the Sacramento River and Butte Slough forming the western boundary; Butte County to the north; Yuba and Placer Counties to the east with the Feather and Bear Rivers forming the eastern boundary; and Sacramento County to the south. The County encompasses approximately 607 square miles (388,358 acres), which can be divided into two general topographical areas: a valley area and the Sutter Buttes. The Sutter County Planning Area is represented in the map that follows.



## **Location and Setting**

Sutter County includes two incorporated cities (the City of Yuba City and the City of Live Oak) and several unincorporated rural communities. A distinct "Yuba City Urban Area" exists which includes incorporated Yuba City, the unincorporated land area immediately surrounding the incorporated city limits (the urban fringe), and Tierra Buena. The following rural communities are also located within the unincorporated area of the county: Nicolaus, Rio Oso, Robbins, E. Nicolaus, Meridian, Sutter, and Trowbridge.

State Highway 99, which extends in a north-south direction through the County, defines the principal transportation corridor connecting the County to the region. State Route 20 is the principal east-west corridor between Highway 99 and Interstate 5.

The City of Yuba City lies west of the Feather River and is located in the northeastern portion of Sutter County, about 40 miles north of Sacramento and 46 miles south of Chico. Yuba City was incorporated in 1908 and has served as a rural farm service center until suburban growth during the 1950's and 1960's changed the character of the community to the primary urban center. Yuba City is relatively flat with no significant elevation variations. The City has historically been surrounded by profitable orchards due to its flat topography and good alluvial soils. Expansion of the City boundaries occurs via annexations of land contained within the City's Sphere of Influence.

The City of Live Oak is located along State Highway 99 in the northeast section of Sutter County approximately 6 miles north of Yuba City. The City was incorporated in 1947 and served as a rural service center for the surrounding agricultural area and serves the same primary function today. Live Oak is flat with less than two percent grade and is within an orchard belt characterized by good alluvial soils which extends westward from the Feather River. Growth within Live Oak primarily occurs within its Sphere of Influence.

The topography of Sutter County is comprised primarily of the gentle flatlands of the Sacramento River Valley. The only prominent topographic feature within the County is the Sutter Buttes, a Pliocene volcanic plug which rises abruptly 2,000 feet above the surrounding valley floor. Geographic features within Sutter County include the Sutter Buttes; the Feather, Sacramento and Bear Rivers, and associated levee system; localized drainage courses; oxbow lakes; the Butte Sink; and the expansive valley floor. The County can be divided into two major geographic units: the valley and uplands. Six major categories of natural features contribute to the overall visual and scenic quality of Sutter County based upon soil types, vegetation and topography: 1) Uplands, 2) Dissected Uplands, 3) Valley Orchards, 4) Valley Floor, 5) Butte Sink and 6) Riparian. Taken from the Sutter County General Plan, descriptions of these areas are included in the following sections.

### **Uplands**

The uplands consist of land ranging in elevation from approximately 100 feet mean sea-level up to the highest elevation in Sutter County (2,117 feet). The only land areas in the County reaching upland elevations are located in the Sutter Buttes (See photo that follows.)



### **Sutter Buttes**

(Source: [www.yubacity.net](http://www.yubacity.net))

There are approximately 32,000 acres of uplands in the Sutter Buttes. The majority of uplands in Sutter County are covered by oak woodlands and valley grasslands consisting of tall trees with scattered brush and grassland between the trees. The periphery of the upland area contains open grasslands generally used for agricultural purposes. Several vernal pools have been inventoried on the State of California's Department of Fish and Game's Natural Diversity Data Base. These pools are generally located in the southwestern and eastern portions of the Sutter Buttes.

The Sutter Buttes are volcanic in origin with many interesting and significant rock out-croppings. These upland areas contain shale, sandstone and soft sandstone. Upland soils are generally shallow with underlying fractured bedrock near the surface. Some small pockets of deeper soil are located in the canyon floor areas between ridges. The primary land use activity in the uplands is grazing with some more intensive agricultural uses located in the pocket areas. Four open-pit mines are located in the Buttes. Mined mineral is primarily used as material for construction base.

### **Dissected Uplands**

The classification "dissected uplands" is from the Agricultural Land Capability Map prepared for the 1972 Sutter County Conservation Element. It applies to the southeastern part of Sutter

County adjacent to Placer County. Dissected uplands are characterized by open grass lands with some row or field crops and with a slight rolling terrain where the land has been eroded by various streams and creeks running through it. The soils have a slow permeability and have difficulty complying with regulations for septic system design. Although generally medium to deep soils, the area contains a hard pan layer at or near the surface to give it the slow permeability. The area identified as dissected uplands in Sutter County has several dairies, stables and cattle ranches.

### **Valley Orchards**

The valley orchards are characterized as having some of the best soils in Sutter County. Soils are alluvial in origin having been laid down by historical flooding of the Sacramento, Feather and Bear Rivers. Valley orchards are located relatively close to Sutter County's rivers and are typically flat with slopes of generally less than two percent. The primary orchard crops in Sutter County based on acreages harvested are prunes, walnuts, peaches and pears. Soil types contained in valley orchards are considered to be the best of the soil classification types according to the U.S.D.A. Soils Conservation Service.

The valley orchards have encountered the most significant urban intrusion due to the proximity of valley orchards to the urbanizing areas. Historically, urban development has occurred at the confluence of rivers in the County; e.g., Yuba City, Nicolaus, Rio Oso and Meridian. These locations also happen to be the locations of the valley orchard areas. Any enlargement of Yuba City north, south, and to a lesser extent west, has been and continues to be into valley orchards.

### **Valley Floor**

The valley floor is a large area of Sutter County which is characterized by flat topography and open row or field crop type agricultural uses. This is the largest single physiographic area in Sutter County. Generally, the valley floor runs from the Butte County line on the north southward in a relative narrow band until reaching the southern side of the Sutter Buttes. South of the Buttes the valley floor widens to encompass the area between Township Road and the community of Meridian. From Highway 20, it runs south southeast encompassing the Sutter Basin to the confluence of the Feather and Sacramento Rivers. Another band of the valley floor area runs northward from the Sacramento County line, through the remainder of the North Natomas Basin, along Highway 70 almost to the Bear River.

The valley floor has an extremely low population density and is dominated by large scale farming operations. Primary crops based upon total acreage are rice, wheat, beans, tomatoes and various types of hay. Soil types are categorized as being moderately good by the U.S.D.A. Soil Conservation Service.

### **Butte Sink**

The Butte Sink is located in the northwestern portion of Sutter County, east of Butte Slough, west of the 50 foot mean sea level contour (which is west of West Butte Road), north of Pass

Road and south of the Butte County Line. The Butte Sink is a wetland, subject to annual flooding from the Sacramento River and Butte Slough with summer drought.

Vegetation in the Butte Sink is generally oak woodland. Some of the area contains species typified in a fresh water marsh environment. Due to the winter flooding which occurs in the Butte Sink, the area is used extensively for waterfowl hunting. Hunting clubs and related facilities are scattered throughout the area. Some agricultural activity is located in the area while other properties are being allowed to revert to natural conditions for hunting operations. In recent years, the U.S. Fish and Wildlife Service has been actively acquiring conservation easements in the area to maintain and improve waterfowl habitat.

### **Riparian**

The riparian areas are those very narrow bands of wetland habitat adjacent to the rivers and streams in Sutter County. The streamside natural communities are characterized by the abundance of water, shade and dense cover. Trees and understory are either dense or widely spaced in clumps. Riparian areas are the most popular wildlife habitat in the area due to the availability of water, food, protection from the sun and large scale human disturbance. Threats to riparian areas are generally from flood protection measures conducted within the levees, pollution, recreational activities and agricultural uses.

### **Infrastructure**

Also taken from the Sutter County General Plan, the paragraphs below provide a brief description of area infrastructure.

#### **Water Supply**

Water for urban uses in the county is obtained from surface impoundments from Oroville Reservoir and water for agricultural uses comes from the Bear, Feather and Sacramento Rivers. Yuba City and Live Oak each have a distributed water processing system. However, some urban areas of Yuba City and all of the rural communities rely on groundwater for supply.

#### **Electric Supply**

Electric power in Sutter County is mostly supplied by the Pacific Gas & Electric Company. Sutter County has five energy centers that sell the excess power to PG&E and the open market.

#### **Surface Transportation**

The main north and south corridor in the county is U. S. Highway 99. Another main transportation artery that passes through the County is Highway 20 and connects the west coast to the Sierra Nevada Mountains.

## **Public Communications Facilities**

Landline and cellular telephone service is available in all areas of the county. High-speed internet capabilities are available to those areas located within and close proximity to the city limits. Broadcast media in the county is out-of-the-area cable television access via microwave relay, and at local radio stations. Most of the television stations are located near Sacramento.

## **Airport**

The county operates a small airport that offers refueling, repair, and crop dusting services. Sacramento International Airport is located 45 minutes south of Yuba City in Sacramento and offers full services to the region.

## **Medical Facilities**

There is one medical center in Sutter County with a total bed capacity of 132. In addition, there are four skilled nursing facilities with a total of 331 beds. A hospital is located in Marysville with a 149 bed capacity that serves both the Sutter and Yuba areas. It also has the only Emergency Room between Chico and Sacramento.

## **Wastewater Facilities**

The wastewater treatment facility provides services to the residents within the city limits of Yuba City and Live Oak. Residents in other areas of the county rely on septic tanks and leach lines to dispose of fluid household waste.

## **Education Facilities**

Sutter County has 18 elementary schools, 2 middle schools, and 6 high schools with a total enrollment of approximately 17,774 students.

## **Parklands**

A variety of wildlife refuges and parks are located throughout Sutter County.

## **Structure Construction**

Framed-type, single-unit housing structures are predominant in county residential areas.

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# Multi-Hazard Mitigation Plan

## 3.0 Planning Process

*44 CFR Requirement 201.6(c)(1): [ The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Yuba City recognized the need and importance of this plan and was responsible for its initiation. The City obtained commitments from Sutter County and the City of Live Oak to pursue development of a multi-jurisdictional DMA plan to cover the entire Sutter County Planning Area. The primary funding source for this planning assistance contract was obtained by Yuba City in the form of a FEMA grant.

Yuba City contracted with AMEC Earth & Environmental (AMEC) to facilitate and develop this Multi-Hazard Mitigation Plan. AMEC's role was to:

- Assist in establishing a Hazard Mitigation Planning Committee (HMPC); as defined by DMA regulations;
- Meet the DMA requirements as established by federal regulations, following FEMA's planning guidance;
- Facilitate the entire planning process;
- Identify the data requirements that HMPC participants could provide, and conduct the research and documentation necessary to augment that data;
- Assist in facilitating the public input process;
- Produce the draft and final plan documents; and
- Coordinate the State OES and FEMA Region IX reviews of this plan.

In addition, planning team members contributed in-kind services to this effort by attending meetings, collecting data, managing administrative details, and providing facilities for meetings.

AMEC established the planning process utilizing the DMA planning requirements and FEMA's associated guidance. This guidance is structured around a generalized four-phase process:

- 1) Organize resources,
- 2) Assess hazards and risks,
- 3) Develop a mitigation plan, and
- 4) Evaluate the work.

This plan also utilizes the process set forth in FEMA Region IX's Crosswalk Reference Document for Review and Submission of Local Mitigation Plans, and the California Office of Emergency Services (CA-OES) guidance for Local Hazard Mitigation Plans (LHMP).

AMEC also integrated an older, more detailed 10-step planning process that was required, at the time this effort was initiated, for other FEMA mitigation plans such as for FEMA’s Community Rating System (CRS) and Flood Mitigation Assistance (FMA) programs. Thus, AMEC formulated a single planning process to meld these two sets of planning requirements together and that meets the requirements of five major programs: CRS, FMA, FEMA’s Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation program (PDM) and new flood control projects authorized by the U.S. Army Corps of Engineers (USACE).

The following table shows how the 10-step process fits within the four-phase process.

<b>Planning Process</b>	
<b>DMA 4-Task Process (44 CFR 201.6)</b>	<b>AMEC and CRS/FMA 10-Step Process</b>
<b>Planning process</b>	<b>Organize Resources</b>
201.6(c)(1)	1. Organize
201.6(b)(1)	2. Involve the public
201.6(b)(2) & (3)	3. Coordinate
<b>Risk assessment</b>	<b>Identify Hazards/Assess the Risks</b>
201.6(c)(2)(i)	4. Assess the hazard
201.6(c)(2)(ii) & (iii)	5. Assess the problem
<b>Mitigation strategy</b>	<b>Develop the Mitigation Plan</b>
201.6(c)(3)(i)	6. Set goals
201.6(c)(3)(ii)	7. Review possible activities
201.6(c)(3)(iii)	8. Draft an action plan
<b>Plan maintenance</b>	<b>Adopt and Implement the Plan</b>
201.6(c)(5)	9. Adopt the plan
201.6(c)(4)	10. Implement, evaluate, revise

## LOCAL GOVERNMENT PARTICIPATION

The DMA planning regulations and guidance stress that each local government seeking the required FEMA approval of their mitigation plan must participate in the planning effort which is defined as meeting all of the following requirements:

- Participate in the plan development process,
- Detail areas within the planning area where the risk differs from that facing the entire area,
- Identify specific projects to be eligible for funding, and
- Have the governing board formally adopt the plan.

For the Sutter County HMPC members, ‘participation’ meant that the local government representatives:

- Attended and participated in the HMPC meetings,

- Provided available data requested of the HMPC,
- Reviewed and provided comments on the plan drafts,
- Advertised, coordinated and participated in the public input process, and
- Coordinated the formal adoption of the plan by the governing boards.

## THE 10-STEP PLANNING PROCESS

As described in more detail below, plan development followed a 10-Step planning process:

### **Step 1: Get Organized – Building the Planning Team**

With the County’s commitment to participate in the DMA planning process, AMEC worked with the City of Yuba City Utilities Department, lead city agency responsible for plan development, to establish the framework and organization for development of the plan. The plan was developed by the HMPC led by the Utilities Department and facilitated by AMEC, and was comprised of key County, City and other local government and stakeholder representatives. The list of participating HMPC members is provided below.

#### **County**

- Agricultural Department
- Assessor’s Office
- Community Services
- County OES
- Geographic Information Systems (GIS)
- Planning Department
- Public Works Department
- Sheriff

#### **Cities**

- City of Yuba City
  - Fire Department
  - GIS
  - Planning Department
  - Utilities Department
  - Wastewater Treatment Facility
- City of Live Oak

#### **Local Government/Agency Representatives**

- ARES & ARC Radio Communications
- Bi-County Ambulance
- CA-OES
- Community (Public) Representative
- Gilsizer County Drainage District
- Levee District One

- NWS Sacramento
- RD 1001
- RD 1500
- RD 1660
- RD 70
- Red Cross
- Sutter County Resource Conservation District
- Yuba City School District
- Yuba-Sutter Salvation Army
- Yuba-Sutter Transit

The planning process officially began on July 18, 2006 with a kick-off meeting in the Sutter County Planning Area. The meeting covered the scope of work and an introduction to the DMA 2000 requirements. Participants were provided with a Data Collection Guide (Appendix B) that included worksheets to facilitate the collection of information necessary to support development of the plan. Utilizing FEMA guidance, worksheets were designed by AMEC to capture information on historic hazard events, identify hazards of concern to the Planning Area, quantify values at risk to identified hazards, and inventory existing capabilities. Participants were also provided a mitigation project worksheet to record ideas for possible projects identified during the planning process.

The HMPC communicated during the planning process with a combination of face to face meetings, by email and through the use of an FTP (file transfer protocol) site where draft documents were uploaded for download and review by team members. The HMPC met five times over a one-year period.

**HMPC  
Multi-Hazard Mitigation Plan  
Plan Development Meeting Summary**

HMPC Meeting	Meeting Topic	Meeting Date
1	Kick Off Meeting: Introduction to DMA 2000 and the Planning Process and Hazard Identification	July 18, 2006
2	Hazard Identification and Vulnerability Assessment Overview and Work Session	November 2, 2006
3	Risk Assessment Overview and Development of Mitigation Goals and Objectives	December 5, 2006
4	Developing and Prioritizing Mitigation Actions	December 6, 2006
5	Public Meeting Review & Plan Finalization	April 13, 2007

Attendees and agendas for each of the HMPC meetings are on file with the Yuba City Utilities Department.

## Step 2: Plan for Public Involvement – Engaging the Public

At the kick-off meeting, the HMPC discussed options for public involvement. The HMPC's approach utilized established public information mechanisms and resources within the community. Public involvement activities included press releases, website postings and collection of public comments to the draft plan. An early public meeting was held during the early stages of the plan development process (December 5<sup>th</sup>, 2006) and two public meetings (April 11<sup>th</sup> & 12<sup>th</sup> 2007) were held prior to finalizing the plan and prior to plan adoption. Stakeholder and public comments are reflected in the preparation of the plan, including those sections addressing mitigation goals and action strategies. All press releases and website postings are on file with the Yuba City Utilities Department. The plan is online (see screenshot below) and available for viewing at: <http://www.yubacity.net/index.cfm?navid=6797>



## Step 3: Coordinate with other Departments and Agencies

Early on in the planning process, the HMPC determined that data collection, mitigation and action strategy development, and plan approval, would be greatly enhanced by inviting other state and federal agencies to participate in the planning process. Based on their involvement in hazard mitigation planning, their landowner status in the county, and/or their interest as a neighboring jurisdiction, representatives from the following key agencies were invited to participate as members of the HMPC:

- Brittan Elementary School District

- Browns Elementary School District
- Butte County
- California Department of Forestry
- California Department of Water Resources
- California Office of Emergency Services
- Colusa County
- Fairview Cemetery District
- Feather River Air Quality Management District
- Feather Water District
- Levee District 9
- Live Oak Cemetery District
- Live Oak Unified School District
- Marcum-Illinois Union School District
- Meridian Cemetery District
- Meridian Elementary School District
- Meridian Fire Protection District
- National Weather Service
- Nuestro Elementary School District
- Placer County
- Pleasant Grove Cemetery District
- Pleasant Grove Joint Union School District
- Reclamation District 1660
- Sutter Basin Fire Protection District
- Sutter Cemetery District
- Sutter Community Services District
- Sutter County Resource Conservation District
- Sutter County Superintendent of Schools
- Sutter-Yuba Association of Realtors
- Sutter-Yuba Mosquito & Vector Control District
- Tisdale Irrigation District
- Winship Elementary School District
- Yolo County
- Yuba City Downtown Business Association
- Yuba City Unified School District
- Yuba County
- Yuba-Sutter Chamber of Commerce
- Yuba-Sutter Economic Development

In addition to those listed above, the HMPC utilized the resources of the agencies and groups listed below in the development of this plan. Specifically, technical data, reports and studies were obtained from those agencies and groups listed below as well as those identified above either through web-based resources or directly from agency resources.

- California Department of Forestry
- California Department of Health Services

- California Department of Transportation
- California Department of Water Resources
- California Geological Survey
- California Office of Emergency Services
- Department of Interior, U.S. Fish & Wildlife
- Department of Interior, U.S. Geological Survey
- FEMA Region IX
- National Oceanic and Atmospheric Administration, CIRES Climate Diagnostics Center
- National Oceanic and Atmospheric Administration, National Climatic Data Center
- National Oceanic and Atmospheric Administration, National Weather Service
- Seismic Safety Commission
- State and Federal Historic Preservation Districts
- Sutter County Resource Conservation District
- Western Regional Climate Center

## **Other Community Planning Efforts and Hazard Mitigation Activities**

Coordination with other community planning efforts is also paramount to the success of this plan. Hazard mitigation planning involves identifying existing policies, tools and actions that will reduce a community's risk and vulnerability from natural hazards. The Sutter County Planning Area utilizes a variety of comprehensive planning mechanisms such as the General Plan and County and City policies to guide and control community growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this Multi-Hazard Mitigation Plan establishes a credible plan that ties into and supports other County and incorporated community programs. The development of this plan utilized information included in the following key plans, studies, reports, and initiatives from the County and other participating jurisdictions:

- East Lincoln Area Specific Plan
- Emergency Management Plans
- Flood Insurance Studies
- Harter Specific Plan
- State of California, Multi-Hazard Mitigation Plan, 2004
- Sutter Basin Feasibility Study
- Sutter County, City of Yuba City and City of Live Oak General Plans
- Urban Water Management Plan
- West Yuba Drainage Study

A more complete listing of these resources is provided in Appendix E. In addition, many other documents were reviewed and considered, as appropriate, in Steps 4 and 5 during the collection of data to support the Risk Assessment portion of the plan.

## **Step 4: Hazard Identification and Step 5: Risk Assessment**

AMEC led the HMPC in an exhaustive research effort to identify and document all the natural hazards that have, or could, impact the Planning Area. Data collection worksheets were developed and utilized in this effort to aid in determining hazards and vulnerabilities, and where the risk varies across the Planning Area. GIS was also used to display, analyze, and quantify hazards and vulnerabilities. Step 5 included a Capability Assessment which documents the participating jurisdictions' current capabilities to mitigate natural hazards. A more detailed description of the risk assessment process and the results are included in this plan as Section 4.0 – Risk Assessment.

## **Step 6: Identifying Goals and Step 7: Review Possible Measures**

AMEC facilitated brainstorming and discussion sessions with the HMPC that described the purpose and the process of developing planning goals and objectives, examined a comprehensive range of mitigation alternatives, and utilized a method of selecting and defending recommended mitigation actions determined by a series of selection criteria. This information is included in this plan as Section 5.0 – Mitigation Goals and Strategy. Additional planning process documentation of the mitigation strategy development is provided in Appendix C.

## **Step 8: Draft the Mitigation Action Plan**

AMEC developed several drafts of this plan for the HMPC. The first preliminary draft consisted of the Risk Assessment portion of the plan and was reviewed by members of the HMPC in advance of the mitigation planning goals and strategy development meetings. AMEC received comments, made appropriate revisions at the direction of the HMPC, and developed a first complete draft of this plan, which included the HMPC's mitigation strategy and other required plan elements. This complete draft was posted for HMPC review and comment on an internal ftp site. Other agencies were invited to comment on this draft as well. HMPC and agency comments were integrated into the second complete draft, which was advertised and distributed for the purpose of collecting public input and comments. The comments and issues from the public and the additional internal review comments were then discussed with the HMPC, appropriate revisions were made, and a third and final draft of the plan was produced reflecting the public and technical input for CA-OES and FEMA review.

## **Step 9: Adopt the Plan**

In order to secure buy-in and officially implement the plan, the plan was adopted by the Sutter County Board of Supervisors, the City Councils for the City of Yuba City and the City of Live Oak, and governing boards for the other participating jurisdictions. Scanned versions of the adoption resolutions are included as part of Appendix D to this plan.

## **Step 10: Implement the Plan**

The true worth of this, and any mitigation plan, is its final step – implementation. To this point, all of the HMPC efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Each recommended action includes key descriptors, such as a lead manager and possible funding sources, to help initiate implementation of the specific action. Beyond that, however, an overall implementation strategy is described in Section 7.0 – Implementation and Plan Maintenance.

Finally, there are numerous organizations within the Planning Area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, both in the development and implementation of this plan, is paramount to the ongoing success of this plan and overall mitigation in the county and is addressed further in Section 7.0. A plan update and maintenance schedule and a strategy for continued public involvement is also documented in Section 7.0.

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# Multi-Hazard Mitigation Plan

## 4.0 Risk Assessment

*44 CFR 201.6(c)(2)(ii): “The risk assessment shall include...A description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community”.*

Risk from natural hazards is a combination of hazard and exposure. The risk assessment process identifies relevant hazards and the exposure of lives, property, and infrastructure to the hazards. The goal of the risk assessment is to measure the potential loss to a community, including loss of life, personal injury, property damage, and economic injury from a hazard event.

The risk assessment process allows a community to better understand their potential risk and associated vulnerability to natural hazards. This information provides the framework for a community to develop and prioritize mitigation strategies and plans to help reduce both the risk and vulnerability from future hazard events. This risk assessment for the Sutter County Planning Area followed the methodology described in the FEMA publication 386-2 Understanding Your Risks – Identifying Hazards and Estimating Losses (FEMA, 2002) and was based on a four-step process:

- (1) Identify Hazards,
- (2) Profile Hazard Events,
- (3) Inventory Assets, and
- (4) Estimate Losses.

This risk assessment covers AMEC’s Planning Step 4: Assess the Hazard and Planning Step 5: Assess the Problem. It also includes a third component, Existing Mitigation Capabilities, in which the risk and vulnerability are analyzed in light of existing mitigation measures such as building codes, warning systems and floodplain development regulations.

### **Risk Assessment Methodology**

The HMPC relied on a variety of sources to identify and profile the natural hazards affecting the Sutter County Planning Area. Utilizing existing data and plans available from participating jurisdictions as well as input from planning meetings, the HMPC agreed upon a list of those natural hazards of concern to the participating communities. Historical data from FEMA, the National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center (NCDC), CA-OES and other sources were also examined to profile and confirm the significance of these hazards to the planning area. The natural hazards evaluated as part of this plan include those that have either historically caused or have the future potential to cause significant human

and/or monetary losses. Only the more significant hazards have a more detailed hazard profile and are analyzed further in Section 4.2, Vulnerability Assessment.

### **Hazard Identification/Profiles (Section 4.1)**

Section 4.1 of the Risk Assessment identifies and profiles natural hazards affecting the Sutter County Planning Area. This section begins with an overview of the declared disasters in Sutter County and leads to a hazard profile for the identified hazards. The purpose of this section is to profile all the natural hazards that affect, or could affect, Sutter County and its participating jurisdictions. This sets the stage for the following section (Section 4.2, Vulnerability Assessment), where the risk to Sutter County is quantified for each of the significant hazards. Where the hazards and risk vary across the Planning Area or from jurisdiction to jurisdiction, the differences are noted in both Section 4.1 (Hazard Identification) and Section 4.2 (Jurisdictional Elements) of this plan. The following format is used to profile the hazards:

#### **Hazard/Problem Description**

This section gives a description of the hazard and associated problems, followed by details on the hazard specific to the Sutter County Planning Area. Where known, this includes information on the hazard extent, seasonal patterns, speed of onset/duration, and magnitude and/or any secondary affects.

#### **Past Occurrences**

This section contains information on historic incidents, including impacts where known. The extent or location of the hazard within or near the Sutter County Planning Area is also included here. A historic incident worksheet was used to capture information from participating jurisdictions on past occurrences. Information provided by the HMPC is integrated here with information from other data sources. This is the next step in defining where hazard impacts vary across the Planning Area.

#### **Frequency/Likelihood of Future Occurrence**

The frequency of past events is used in this section to gauge the likelihood of future occurrences. Based on historical data, the likelihood of future occurrences is categorized into one of the following classifications:

***Highly Likely:*** Near 100% chance of occurrence in next year, or happens every year.

***Likely:*** Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.

***Occasional:*** Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.

***Unlikely:*** Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

The frequency, or chance of occurrence, was calculated where possible based on existing data. Frequency was determined by dividing the number of events observed by the number of years

and multiplying by 100. This gives the percent chance of the event happening in any given year. An example would be 3 droughts occurring over a 30 year period which equates to 10% chance of that hazard occurring any given year.

### **Significant Hazards**

Once the hazards have been identified and profiled, this methodology includes an initial assessment at the end of Section 4.1 of the significance of each identified hazard. The objective is to identify those hazards requiring further evaluation during the vulnerability assessment in Section 4.2. Significance of an identified hazard to the community was measured in general terms using the hazard profile, focusing on key criteria such as frequency and resulting damage, including deaths/injuries and property, crop, and economic damages to a community. Those hazards that occur infrequently or when they do occur, damages are minimal or non-existent are determined to be insignificant to the Planning Area. This assessment is used by the HMPC to prioritize those hazards of significance to the Planning Area; thus focusing resources on priority hazards.

### **Vulnerability Assessment (Section 4.2)**

Section 4.2 of the risk assessment, consists of a vulnerability assessment to describe the impact that each significant hazard identified in Section 4.1 would have upon the Sutter County Planning Area. The vulnerability assessment was conducted based on the significance of the hazard utilizing best available data. This assessment is an attempt to quantify assets at risk, by jurisdiction where possible, to further define populations, buildings, and infrastructure at risk to natural hazards.

Data to support the vulnerability assessment was collected and compiled from the following sources:

- County GIS data (hazards, base layers, and assessor's data);
- Statewide GIS datasets compiled by CAL-OES to support mitigation planning;
- FEMA's HAZUS-MH MR 2 GIS-based inventory data (January 2005)
- Written descriptions of inventory and risks provided by participating jurisdictions;
- Existing plans and studies; and
- Personal interviews with planning team members and County and City staff.

Vulnerability is measured in general, qualitative terms, and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential:

***Extremely Low:** The occurrence and potential cost of damage to life and property is very minimal to non-existent.*

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

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

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

**Extremely High:** *Very widespread and catastrophic impact.*

The scope of the vulnerability assessment is to describe the risks to the county as a whole. Data from each jurisdiction was also evaluated and is integrated here in the jurisdictional elements, and noted where the risk differs for a particular jurisdiction across the Planning Area.

### **Jurisdictional Elements (Section 4.3)**

DMA regulations require that the HMPC evaluate the risks associated with each of the hazards identified through the planning process. For multi-jurisdictional plans, the regulations also require that the risks be further evaluated where a jurisdiction's risks vary from the risks facing the entire planning area. This section of the plan presents a summary, where data permits, of the possible impacts of identified hazards by participating jurisdiction. Note that data is provided only where the risk or impacts vary from those previously identified as impacting the entire Planning Area. If no additional data is included, it should be assumed that the risk and impacts to the affected jurisdiction would be similar to that previously described for the county.

### **Capability Assessment (Section 4.4)**

This risk assessment has identified the natural hazards posing a threat to the Sutter County Planning Area and described and quantified the vulnerability of the County and communities to these risks. This capability assessment identifies what loss prevention mechanisms are already in place to reduce the planning area's risk and vulnerability to identified hazards... Doing so provides the planning area's "net vulnerability" to natural disasters and more accurately focuses the goals, objectives and proposed actions of this plan.

The HMPC took two approaches in conducting this capability assessment. First, an inventory of existing policies, regulations and plans was made. These policy and planning documents were collected and reviewed to determine if they contributed to reducing hazard related losses, or if they inadvertently contributed to increasing such losses. Second, an inventory of other mitigation activities was made through the use of a matrix. The purpose for this effort was to identify activities and actions beyond policies, regulations and plans that were either in place, needed improvement, or could be undertaken, if deemed appropriate.

### **Summary**

This risk assessment for the Sutter County Planning Area, includes all incorporated communities, and covers the entire geographical extent of the county. Where the hazards and risks vary across the planning area, the differences are noted. Thus, the risk assessment for the

Sutter County Planning Area includes and directly corresponds to Sutter County and the following incorporated communities and districts:

- City of Yuba City
- City of Live Oak
- Gilsizer Drainage District
- Reclamation District 1001
- Reclamation District 1500
- Reclamation Districts 70 & 1660

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# Multi-Hazard Mitigation Plan

## 4.1 Hazard Identification

The Sutter County HMPC conducted a Hazard Identification study to determine what hazards threaten the Planning Area. This section of the plan provides a description of the hazard/problem and documents the previous occurrences of identified hazards and the likelihood of their recurrence. This Hazard Identification follows the methodology previously described in Section 4.0 and addresses steps 1 and 2 of FEMA's four-step process for conducting risk assessments:

- (1) Identify Hazards,**
- (2) Profile Hazard Events,**
- (3) Inventory Assets, and
- (4) Estimate Losses.

In alphabetical order, the natural hazards identified and investigated for the Sutter County multi-jurisdictional plan include:

- Agricultural Hazards
- Dam Failure
- Drought
- Earthquakes
- Floods
- Landslides
- Severe Weather
  - Extreme Temperatures
  - Fog
  - Winterstorms: Heavy Rains/Thunderstorms/Hail/Lightning/Wind
  - Tornadoes
- Soil Hazards
  - Erosion
  - Expansive Soils
  - Land Subsidence
- West Nile Virus
- Wildfires
- Volcanoes

Also discussed by the HMPC, the natural hazards listed below were eliminated from further consideration in this risk assessment because: (1) they either occur rarely or not at all, and (2) when they do occur, they are very limited in magnitude—no or very limited damages are sustained.

- Avalanches
- Dust Storms

In order to understand how natural hazards affect the Sutter County Planning Area, the Disaster Declaration History for the County is summarized, followed by a discussion of each natural hazard. Identified natural hazards start with severe weather, which is the driving force behind most all natural hazards affecting Sutter County, and then followed by the big three natural hazards in California: flood/dam failure, wildfire, and earthquake. The remaining natural hazards are then addressed alphabetically.

## DISASTER DECLARATION HISTORY

One method to identify hazards based upon past occurrence is to look at what events triggered federal and/or state disaster declarations within the Sutter County Planning Area. Disaster declarations are granted when the severity and magnitude of the event's impact surpass the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be of sufficient magnitude and severity that both the local and state government's capacity are exceeded, a federal disaster declaration may be issued, allowing for the provision of federal disaster assistance.

The federal government may issue a disaster declaration through the U.S. Department of Agriculture (USDA) and/or the Small Business Administration (SBA), as well as through FEMA. The quantity and types of damage are the determining factors. A USDA declaration will result in the implementation of the Emergency Loan Program through the Farm Services Agency (FSA). This program enables eligible farmers and ranchers in the affected county as well as contiguous counties to apply for low interest loans. A USDA declaration will automatically follow a Presidential declaration for counties designated major disaster areas and those counties that are contiguous to a declared county - including counties that are across state lines. As part of an agreement with the USDA, the Small Business Administration (SBA) offers low interest loans for eligible businesses that suffered economic losses in declared and contiguous counties that have been declared by the Secretary of Agriculture. These loans are referred to as Economic Injury Disaster Loans (EIDL).

### Declared Disaster History Analysis

Details on federal (i.e., FEMA) and state disaster declarations were obtained by the HMPC, FEMA, and CA-OES and compiled, in chronological order in the table below. A review of state and federal declared disasters indicate that within the Sutter County Planning Area there were 20 state declarations from 1950 through 2006 for Sutter County, 11 of which also qualified as federal disaster declarations. 18 of the 20 state declarations were associated with severe winter storms, heavy rains and flooding. The other two were declarations for drought and freeze. USDA declarations for the planning area are discussed in the agricultural hazard section of this plan.

This disaster history (combined FEMA and state) equates to a major event worthy of a disaster declaration every 2.8 years or a 35.7% chance of a disaster declaration any given year. Every historical declared disaster event resulted directly or indirectly from extreme weather conditions. The declared disaster data demonstrates that injuries to people and damages to property and crops are a result of severe weather conditions in the Sutter County Planning Area.

**Sutter County State and Federal Disasters Declaration  
1950-2006**

<b>Hazard Type</b>	<b>Disaster Name</b>	<b>Disaster #</b>	<b>Year</b>	<b>State Declaration</b>	<b>Federal Declaration Type/Date</b>	<b>Location</b>	<b>Damages*</b>
Flood	Floods	CDO 50-01	1950	11/21/50	State 11/21/50	Sutter County (statewide)	9 deaths; \$32,183,000
Flood	Floods	DR-47	1955	12/22/55	Federal 12/23/55	Sutter County (statewide)	74 deaths; \$200,000,000
Severe Storm, Economic	Unseasonal and Heavy Rainfall	N/A	1957	5/20/57 (Cherry-producing)	State 5/20/57	Sutter County (other cherry producing areas)	2 injuries; \$6,000,000
Flood	Storm & Flood Damage	CDO 58-03	1958	2/26/58	State 2/26/58	Sutter County (and 36 other counties)	Not available
Flood	Storm & Flood Damage	N/A	1958	4/2/58	82	Sutter County (statewide)	13 deaths \$24,000,000
Severe Storm	Unseasonal and Heavy Rainfall	N/A	1959	9/17/59	State 9/17/59	Sutter County (other Tokay grape producing areas)	2 deaths \$100,000
Flood	Flood and Rainstorm		1962	10/17/1962, 10/25/62, 10/30/62 & 11/4/62	Federal 138 (10/24/62)	Sutter County (and 11 other counties)	\$4,000,000
Severe Storm, Flood	Abnormally Heavy and Continuous Rainfall	N/A	1963	2/14/64	State 2/14/64	Sutter County (and 50 other counties)	Not Available
Flood	1964 Late Winter Storms	Unknown	1964	12/22/64, 12/23/64, 12/28/64, 1/5/65, & 1/1/65	Federal 12/29/64	Sutter County (and 25 other counties)	\$213,149,000
Flood	Northern California Flooding	Unknown	1970	1/26/70, 2/3/70, 2/10/70, 3/2/70	Federal 2/16/70	Sutter County (and 17 other counties)	\$27,657,478
Severe Storms	Severe Weather Conditions	N/A	1972	9/3/72	State 9/3/72	Sutter County	\$2,004,300
Flood	Storms and Floods	N/A	1973	2/28/73	State 2/28/73	Sutter County (and 5 other counties)	\$1,864,000
Drought	Drought	N/A	1976	2/9/76, 2/13/76,	State 2/9/76,	Sutter County (and 30 other	\$2,664,000,000

Hazard Type	Disaster Name	Disaster #	Year	State Declaration	Federal Declaration Type/Date	Location	Damages*
				2/24/76, 3/26/76, 7/6/76	2/13/76, 2/24/76, 3/26/76, 7/6/76	counties)	
Flood, Severe Storm	1982-83 Winter Storms	DR-677	1982	1982, 1983	Federal 2/9/83	Sutter County (and 43 other counties)	\$523,617,032
Severe Storm	Storms	DR-758	1986	2/18-86 - 3/12/86	Federal 2/18/86	Sutter County (and 38 other counties)	13 deaths; \$407,538,904
Freeze	Freeze	DR-894	1990	12/19/90- 1/18/91	Federal 2/11/91	Sutter County (and 32 other counties)	\$856,32 9,675
Severe Storm	Severe Winter Storms	DR-1044	1995	1/6/95 - 3/14/95	Federal 1/13/95	Sutter County (and 44 other counties)	11 deaths \$741,400,000
Severe Storm, Flood	Late Winter Storms	DR-1046	1995		Federal 1/10/95	Sutter County (and all other counties except Del Norte)	17 deaths; \$1,100,000,000
Flood	January 1997 Floods		1997	1/2/97 - 1/31/97	State 1/2/97 - 1/31/97	Sutter County (and 46 other counties)	8 injuries; \$1,800,000,000
	Severe Storms, Flooding, Mudslide, and Landslides	DR-1628	2006		Federal 2/3/06	Sutter County (and 28 other counties)	

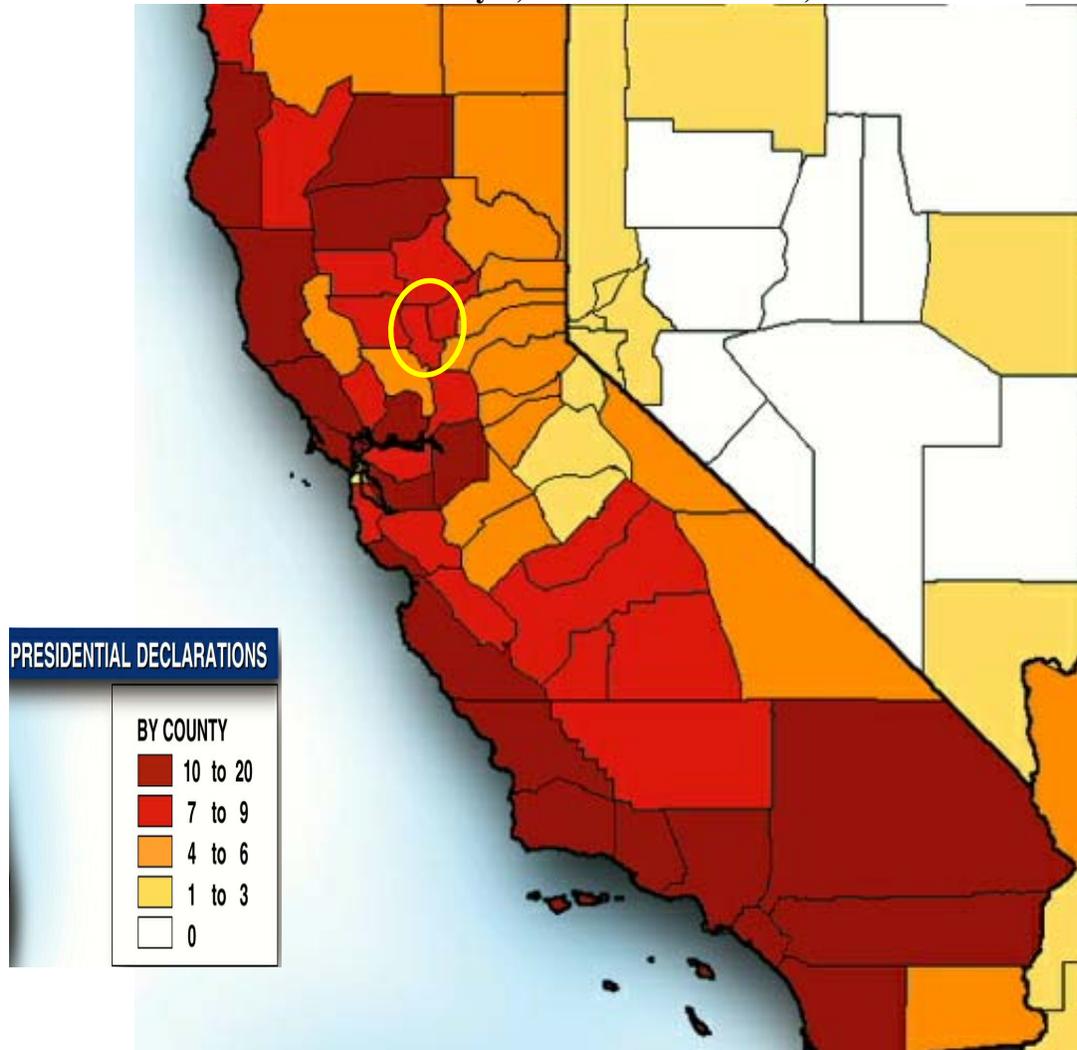
(Sources: CA-OES, Draft Multi-Hazard Mitigation Plan, 2004;  
[http://www.fema.gov/news/disasters\\_state.fema?id=6](http://www.fema.gov/news/disasters_state.fema?id=6))

\*Note: Damage amount reflects totals for all impacted Counties

The following map, from the FEMA Website, displays the number of Presidential Disaster Declarations within Sutter County between 1965 and 2002. Clearly, Sutter is among the many counties in California that are susceptible to disaster.

## PRESIDENTIAL DISASTER DECLARATIONS MAP

January 1, 1965 to November 1, 2002



(Source: [www.fema.gov](http://www.fema.gov))

## SEVERE WEATHER

Severe weather is generally any destructive weather event, but usually occurs in the Sutter County Planning Area as localized storms such as heavy rains, winter storms, and strong wind events. Severe weather conditions generally occur on an annual basis throughout Sutter County; however, it appears that many of these events go unreported.

The NOAA NCDC has been tracking severe weather events since 1950. Their database tracks wildfire, flood, thunderstorms, wind, heavy snow, tornadoes, and funnel clouds, dense fog, extreme temperatures, hail, lightning, and microbursts. This database only identified 12 severe weather events occurring in Sutter County between January 1, 1950 and May 31, 2006, and these occurred during the 1993 to 2006 timeframe.

The NCDC database was supplemented with data from another source for disaster events called the SHELDUS database, produced by the Hazard Research Lab at the University of South

Carolina. SHELDUS is a county-level data set for the U.S. on 18 different natural hazard event types along with property and crop losses, injuries, and fatalities for the period 1960-2000. This database is a combination of information from several sources and can be searched by county. From 1960 to 1995, only those events that generated more than \$50,000 in damages were included in the database. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the counties (e.g., if 4 counties were affected, then each was given ¼ of the dollar loss, injuries, and deaths). From 1995 to 2000 all events that were reported by the NCDC with a specific dollar amount are included in the database.

The two databases were downloaded from the Internet, merged into one, and presented in the table below. Based on the combined NCDC/SHELDUS data bases, there have been 38 documented severe weather events resulting in \$42,492,942.21 in property damage and \$13,030,040.34 in crop damage since 1950 associated with events occurring in Sutter County. These events have also directly or indirectly caused 1.29 deaths and 16.98 injuries within the same timeframe. These sums do not likely represent the entire costs, as it is difficult to capture all the costs associated with an event. These events are discussed further in the hazard profiles that follow.

**NCDC/SHELDUS  
Severe Weather Reports  
Sutter County 1950-2006**

Type	Location	Date	Property Loss	Crop Loss	Deaths	Injuries	Data Source
Winter Weather	Sutter County	02/11/1992	\$892.86	\$0	0	0	SHELDUS
Winter Weather	Sutter County	02/16/1992	\$862,068.97	\$0	.12	.22	SHELDUS
Flooding, Winter Weather	Sutter County	02/13/1992	\$11,627.91	\$0	0	0	SHELDUS
Flooding, Winter Weather	Sutter County	02/16/1992	\$9,090.91	\$0	0	0	SHELDUS
Wind, Winter Weather	Sutter County	12/09/1992	\$2,631.58	\$0	0	0	SHELDUS
Funnel Cloud	E. Nicolaus	03/26/1993	\$0	\$0	0	0	NCDC
Wildfire, Wind	Sutter County	10/31/1993	\$36,777,777.78	0	0	9.89	SHELDUS
Winter Weather	Sutter County	12/11/1993	\$3,448.28	\$0	0	0	SHELDUS
Winter Weather	Central Valley	02/21/1994	\$1,282.05	\$0	0	0	SHELDUS
Downburst	Sutter County	01/10/1995	\$0	\$0	0	0	NCDC
Gustnado	Sutter County	01/10/1995	\$0	\$0	0	0	NCDC
Flooding, Severe	Statewide	03/31/1995	\$0	\$11,241,379.31	0	0	SHELDUS

Type	Location	Date	Property Loss	Crop Loss	Deaths	Injuries	Data Source
Storm, Thunderstorm							
Flooding	Sutter County	12/31/96	\$2,857.14	\$0	0	0	SHELDUS
Fog	Countywide	12/11/1997	\$300,000	\$0	1	5.2	SHELDUS
Heavy Rain	Countywide	01/12/1998	\$0	\$0	0	0	NCDC
Heavy Rain	Countywide	01/18/1998	\$0	\$0	0	0	NCDC
Flooding	Sutter County	02/28/1998	\$3362337.66	\$1637662.34	0	0	SHELDUS
Wind	Sutter County	02/07/1998	\$17,647.06	\$0	0	0	SHELDUS
Wind	Sutter County	06/16/1998	\$1000	\$0	0	0	SHELDUS
Wind	Sutter County	10/16/1998	\$9,090.91	\$0	0	0	SHELDUS
Wind	Sutter County	11/07/1998	\$41,176.47	\$0	0	0	SHELDUS
Fog	Sutter County	12/18/1998	\$83,333.33	\$0	.17	1.67	SHELDUS
Winter Weather	Sutter County	12/29/1998	\$0	\$141,176.47	0	0	SHELDUS
Wind	CAZ015>17	02/07/1999	\$3,846.15	\$0	0	0	SHELDUS
Wind	CAZ016	02/09/1999	\$7,000	\$0	0	0	SHELDUS
Wind	CAZ016>19	04/03/1999	\$1,333.33	\$2,600	0	0	SHELDUS
Wind	CAZ015-17-19	04/23/1999	\$1,538.46	\$0	0	0	SHELDUS
Flooding	Southern Sacramento Valley, CAZ017	01/24/2000	\$4,166.67	\$0	0	0	SHELDUS
Wind	CAZ015>017-019-067	02/14/2000	\$555.56	\$2,222.22	0	0	SHELDUS
Wind	CAZ015>017-019-063>064-066>069	10/23/2000	\$1,739.13	\$0	0	0	SHELDUS
Wind	Sacramento Valley, Carquinez Strait and Delta	02/07/2001	\$1,500	\$0	0	0	SHELDUS
Tornado: F0	Yuba City	03/29/2005	\$0	\$0	0	0	NCDC
Funnel Cloud	Yuba City	04/17/2005	\$0	\$0	0	0	NCDC
Funnel Cloud	Yuba City	05/09/2005	\$0	\$0	0	0	NCDC

Type	Location	Date	Property Loss	Crop Loss	Deaths	Injuries	Data Source
Tornado: F0	Yuba City	05/09/2005	\$85,000	\$5,000	0	0	NCDC
Funnel Cloud	Yuba City	05/09/2005	\$0	\$0	0	0	NCDC
Heavy Rain	Countywide	12/17/2005	\$0	\$0	0	0	NCDC
Flood	Countywide	01/01/2006	\$900,000	\$0	0	0	NCDC

The table above summarizes severe weather events occurring in Sutter County. Although identified as a severe weather events by these various data sources, only a few of the events identified above actually resulted in state and federal disaster declarations as previously detailed. It is further interesting to note that different data sources capture different events during the same time period, and often, different information specific to individual events. Recognizing that these inconsistencies are inherent to using existing data sources, the value of this data is in the “big picture” aspect of the story it tells, not in the individual details.

As previously described, all of Sutter County’s state and federal disaster declarations have been a result of extreme weather conditions. For this plan, severe weather is discussed in the following subsections:

- Extreme Temperatures
- Fog
- Winterstorms: Heavy Rains/Thunderstorms/Hail/Lightning/Wind
- Tornadoes

## **Extreme Temperatures**

### **Hazard/Problem Description**

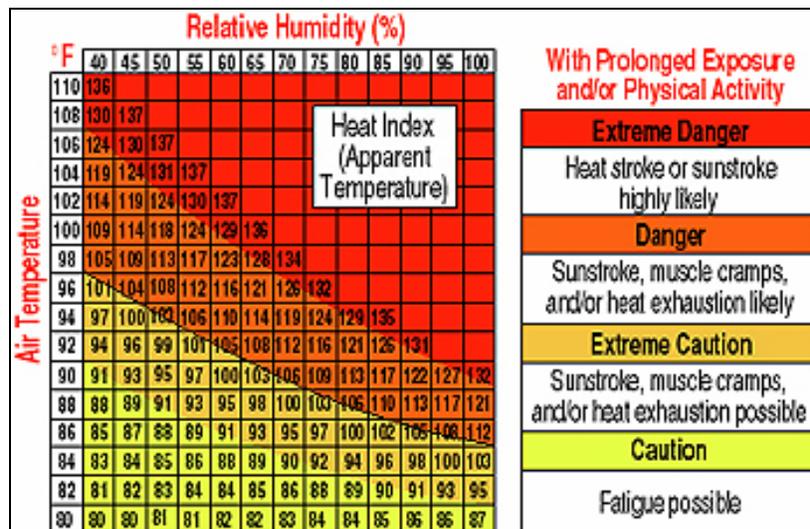
Extreme temperature events, both hot and cold, can have severe impacts on human health and mortality, natural ecosystems, agriculture and other economic sectors.

#### **Extreme Heat**

According to information provided by the FEMA website, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. According to the NWS, among natural hazards, only the cold of winter -- not lightning, hurricanes, tornadoes, floods, or earthquakes -- takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died.

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating, or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop. Elderly persons, small children, chronic invalids, those on certain medications or drugs, and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where

moderate climate usually prevails. The following graphic illustrates the relationship of temperature and humidity to heat disorders.



Note: Since HI values were devised for shady, light wind conditions, exposure to full sunshine can increase HI values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous. (Source: National Weather Service, 2004)

The NWS has in place a system to initiate alert procedures (advisories or warnings) when the Heat Index (HI) is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for the issuance of excessive heat alerts is when the maximum daytime HI is expected to equal or exceed 105°F and a nighttime minimum HI of 80°F or above for two or more consecutive days.

### Extreme Cold

Extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to cold can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat.

In 2001, NWS implemented an updated Wind Chill Temperature (WTC) index. This index was developed by the NWS to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

The NWS will issue a wind chill advisory for the central valley when it gets to be 25 degrees below 0 for 3 hours or more.

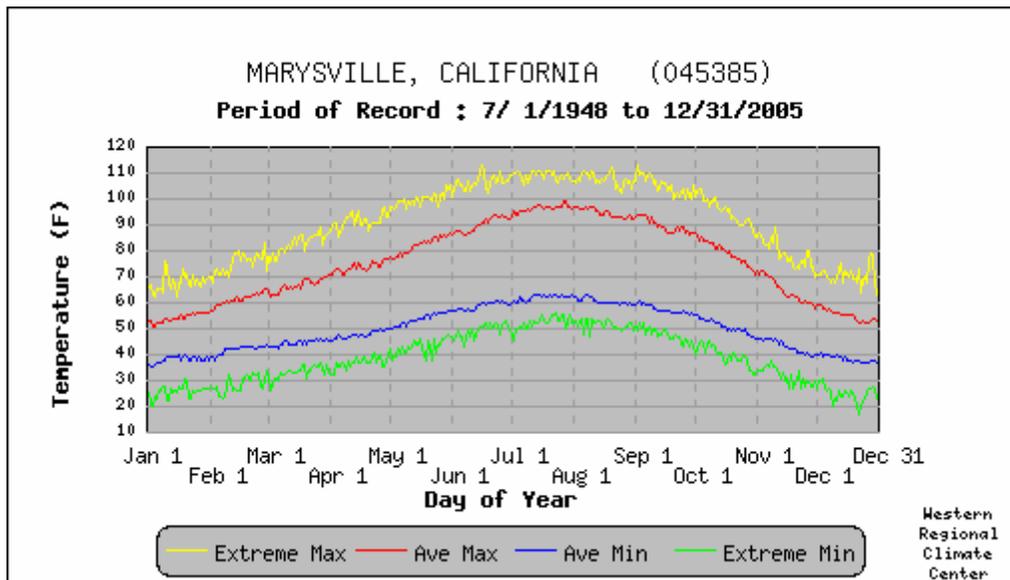
### Past Occurrences

An analysis of extreme temperature ranges in the Sutter County Planning Area is provided below using data obtained from the Western Regional Climate Center from the Marysville Weather

Station. This weather station sits on the Sutter County/Yuba County border and was used based on its location and the completeness of available data.

**Sutter County (Marysville Weather Station -Period of Record 1948 to 2006)**

In Sutter County, monthly average maximum temperatures in the warmest months (May through October) range from the high 70’s to the high 90’s. Monthly average minimum temperatures from November through April range from the high 30’s to the high 40’s. The highest recorded daily extreme is 113 degrees Fahrenheit (°F) on June 16, 1961. The lowest recorded daily extreme is 17°F on December 22, 1990. For the period of record (POR) for maximum temperature extremes (on an annual basis), 94.2 days exceeded 90°F and no days were less than 32°F. For the POR for minimum temperature extremes (on an annual basis), 14.6 days were less than 32°F and no days were less than 0°F.



- - Extreme Max. is the maximum of all daily maximum temperatures recorded for the day of the year.
  - - Ave. Max. is the average of all daily maximum temperatures recorded for the day of the year.
  - - Ave. Min. is the average of all daily minimum temperatures recorded for the day of the year.
  - - Extreme Min. is the minimum of all daily minimum temperatures recorded for the day of the year.
- (Source: <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca5385>)

The HMPC was not aware of any specific deaths, injuries or damages related to extreme temperatures.

**Likelihood of Future Occurrences**

**Highly Likely:** Temperature extremes are likely to continue to occur annually in the Sutter County Planning Area.

# Fog

## Hazard/Problem Description

Fog results from air being cooled to the point where it can no longer hold all of the water vapor it contains. One of the most dangerous aspects of the Sacramento Valley during the rainy season is the Tule fog. Tule fog is a thick ground fog that settles in the San Joaquin Valley and Sacramento Valley areas of California's Central Valley. Tule fog generally forms during the late fall and winter (November through March) after the first significant rainfall. The tule fog is a radiation fog, which condenses when there is a high relative humidity, typically after a heavy rain, calm winds, and rapid cooling during the night. The longer nights during the winter months creates this rapid ground cooling and results in a pronounced temperature inversion at a low altitude creating a thick ground fog. Above the cold, foggy layer, the air is typically warm and dry. Once the fog has formed, turbulent air is necessary to break through the inversion. Daytime heating can also work to evaporate the fog in some areas.

Tule fog is quite dense and visibility can vary and change rapidly. Visibility is usually less than an eighth of a mile, although, it can be less than 10 feet. Accidents caused by the tule fog are one of the leading causes of weather-related casualties in California. In addition to accidents, severe fog incidents can close roads and impair the effectiveness of emergency responders.

## Past Occurrences

Only two incidents of severe fog were identified in the NCDC/SHELDUS database search for Sutter County. These two events, occurring in December of 1997 and 1998 collectively resulted in \$383,333 in property damage and were responsible for 6.87 injuries and 1.17 deaths.

According to the HMPC, severe fog is a reoccurring problem within the Planning Area often resulting in car accidents, especially around intersections on some of the major two-lane roads.

## Likelihood of Future Occurrences

*Occasional:* Using the Sheldus data, two major fog incidents over a 56 year period equates to a major fog event occurring every 28 years and a 3.57% chance of a major fog event any given year. However, based on input from the HMPC, it is likely that minor fog events will continue to occur annually in the Sutter County Planning Area.

## Winterstorm: Heavy Rain/Thunderstorms/Hail/Lightning/Wind

### Hazard/Problem Description

Winterstorms in the Sutter County Planning Area are generally characterized by heavy rains often accompanied by strong winds, and sometimes lightning, and hail. Tornadoes and funnel clouds can also occur during these types of storms. Thunderstorms can produce a strong rush of wind known as a downburst, or straight-line winds which may exceed 120 miles per hour. These storms can overturn mobile homes, tear roofs off of houses and topple trees.

Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: (1) Hail, three-quarters inch or greater; (2) Winds gusting in excess of 50 knots (57.5 mph); or (3) A tornado.

High winds often accompany thunderstorms. High winds can result in property damage and injury. Strong gusts can rip roofs from buildings, snap power lines, shatter windows, down trees, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire from this natural hazard.

Hail is formed when water droplets freeze and thaw as they are thrown high into the upper atmosphere by the violent internal forces of thunderstorms. Hail is usually associated with severe winter storms which occur throughout Sutter County Planning Area. Hailstones are usually less than 2 inches in diameter and can fall at speeds of 120 mph. Severe hailstorms can be quite destructive causing damage to roofs, buildings, automobiles, vegetation, and crops.

Lightning is defined as any and all of the various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning are usually (but not always) accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be directly struck and this impact may result in an explosion, burn, or total destruction. Or, damage may be indirect when the current passes through or near an object, generally resulting in less damage.

Given the near sea level elevation of the area, snow within the limits of the Planning Area is extremely rare and limited to the occasional dusting of the Sutter Buttes at an elevation of 1,600 to 2,100 feet above msl.

According to the HMPC, short-term, heavy storms can cause both wide spread flooding as well as extensive localized drainage issues. With the increased growth of the area, the lack of adequate drainage systems has become more of an issue. In order to properly drain excess water from these intense storms, the southern part of the County must drain first, followed by the central portion and then the northern portion of the County. Inadequate drainage in one area can severely impact drainage in another.

In addition to the flooding that often occurs during these storms, strong winds when combined with saturated ground conditions often result in the downing of very mature trees throughout the Planning Area.

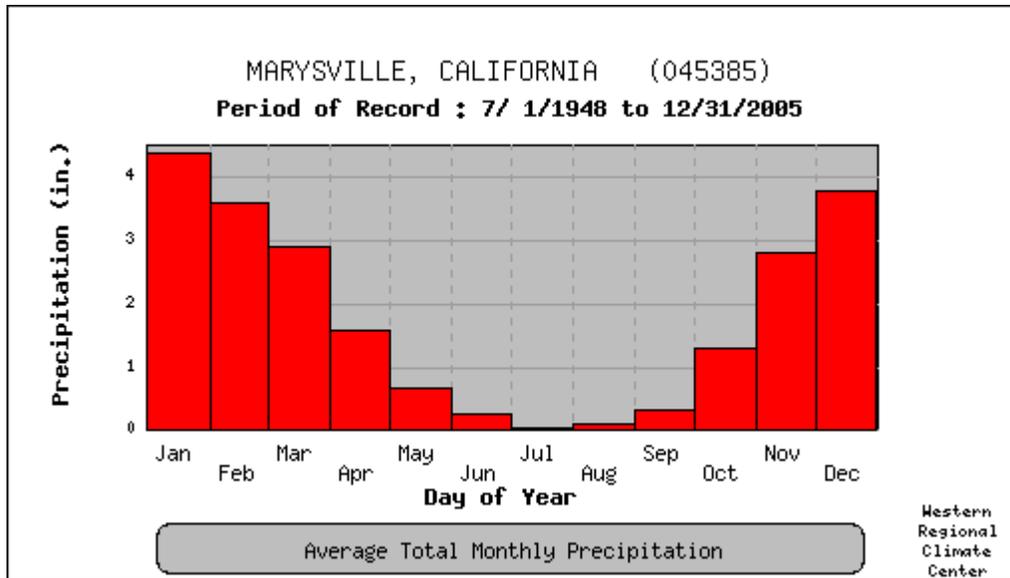
## **Past Occurrences**

Heavy rains and severe storms occur in the Sutter County Planning Area primarily during the late fall, winter and spring seasons. According to the Sutter County General Plan, 88% of the average annual rainfall occurs between November and April. Annual average rainfall varies for the county, ranging from 17 to 21 inches and increases across the area from the southwest to the northeast.

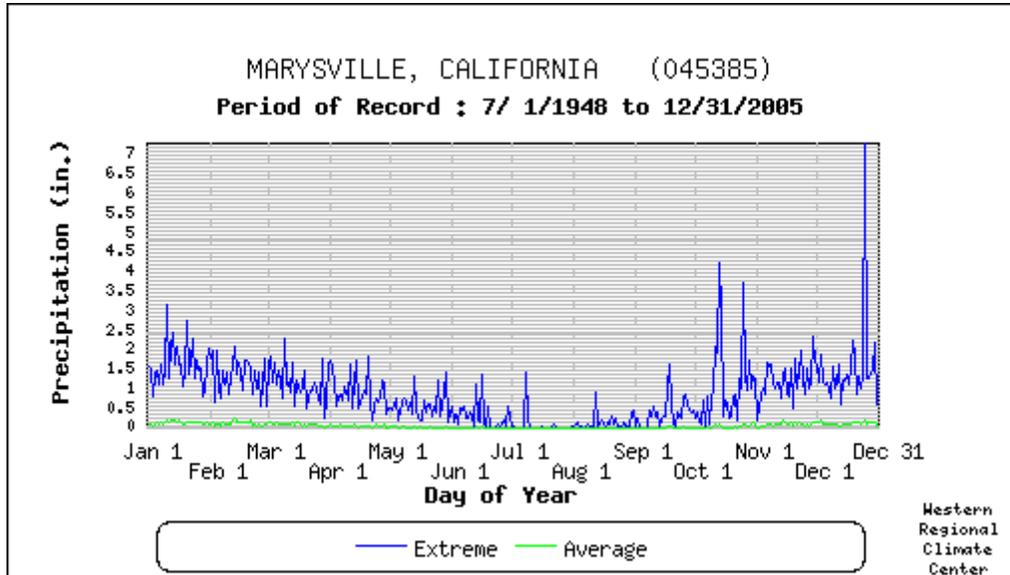
Information obtained from the Marysville weather station is summarized below.

**Sutter County (Marysville Weather Station -Period of Record 1948 to 2006)**

Average annual precipitation in Sutter County is 21.59 inches per year. The highest recorded annual precipitation for Sutter County is 46.26 inches in 1983; the highest recorded precipitation for a 24-hour period is 7.29 inches on December 25, 1983. The lowest annual precipitation total is 7.41 inches in 1976.



● - Average precipitation recorded for the month.



● - Extreme is the greatest daily precipitation recorded for the day of the year.

● - Average is the average of all daily precipitation recorded for the day of the year.

(Source: <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca5385>)

Extreme weather events associated with Heavy Rain/Thunderstorms/ Hail/Lightning/Wind include those specific events listed in the previous tables included in this severe weather section.

## Likelihood of Future Occurrences

**Highly Likely:** Severe weather, including thunderstorms, heavy rain, hail, and lightning is a well documented seasonal occurrence that will continue to occur annually in the Sutter County Planning Area.

## Tornadoes

### Hazard/Problem Description

Tornadoes are another weather-related event that occurs within the Sutter County Planning Area, primarily during the rainy season. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can be comprised of the same pressure differential that fuels 300-mile wide hurricanes across a path only 300 yards wide or less.

Figure 2-2 Potential impact of a tornado



## Potential Impact and Damage From a Tornado

Managing Risk	Damage Color Code	Description of Damage
The Threat to Property and Personal Safety Can Be Minimized Through Compliance With Up-To-Date Model Building Codes and Engineering Standards	Light Blue	Some damage can be seen to poorly maintained roofs. Unsecured light-weight objects, such as trash cans, are displaced.
	Yellow	Minor damage to roofs and broken windows occur. Larger and heavier objects become displaced. Minor damage to trees and landscaping can be observed.
Property and Personal Protection Can Be Improved Through Wind Hazard Mitigation Techniques Not Normally Required by Current Building Codes	Orange	Roofs are damaged, including the loss of shingles and some sheathing. Manufactured homes, on nonpermanent foundations can be shifted off their foundations. Trees and landscaping either snap or are blown over. Medium-sized debris becomes airborne, damaging other structures.
	Red-Orange	Roofs and some walls, especially unreinforced masonry, are torn from structures. Small ancillary buildings are often destroyed. Manufactured homes on nonpermanent foundations can be overturned. Some trees are uprooted.
Personal Protection Can Only Be Achieved Through Use of a Specially Designed Extreme Wind Refuge Area, Shelter, or Safe Room	Dark Orange	Well constructed homes, as well as manufactured homes, are destroyed, and some structures are lifted off their foundations. Automobile-sized debris is displaced and often tumbles. Trees are often uprooted and blown over.
	Red	Strong frame houses and engineered buildings are lifted from their foundations or are significantly damaged or destroyed. Automobile-sized debris is moved significant distances. Trees are uprooted and splintered.

Figure 2-2 Potential damage table for impact of a tornado

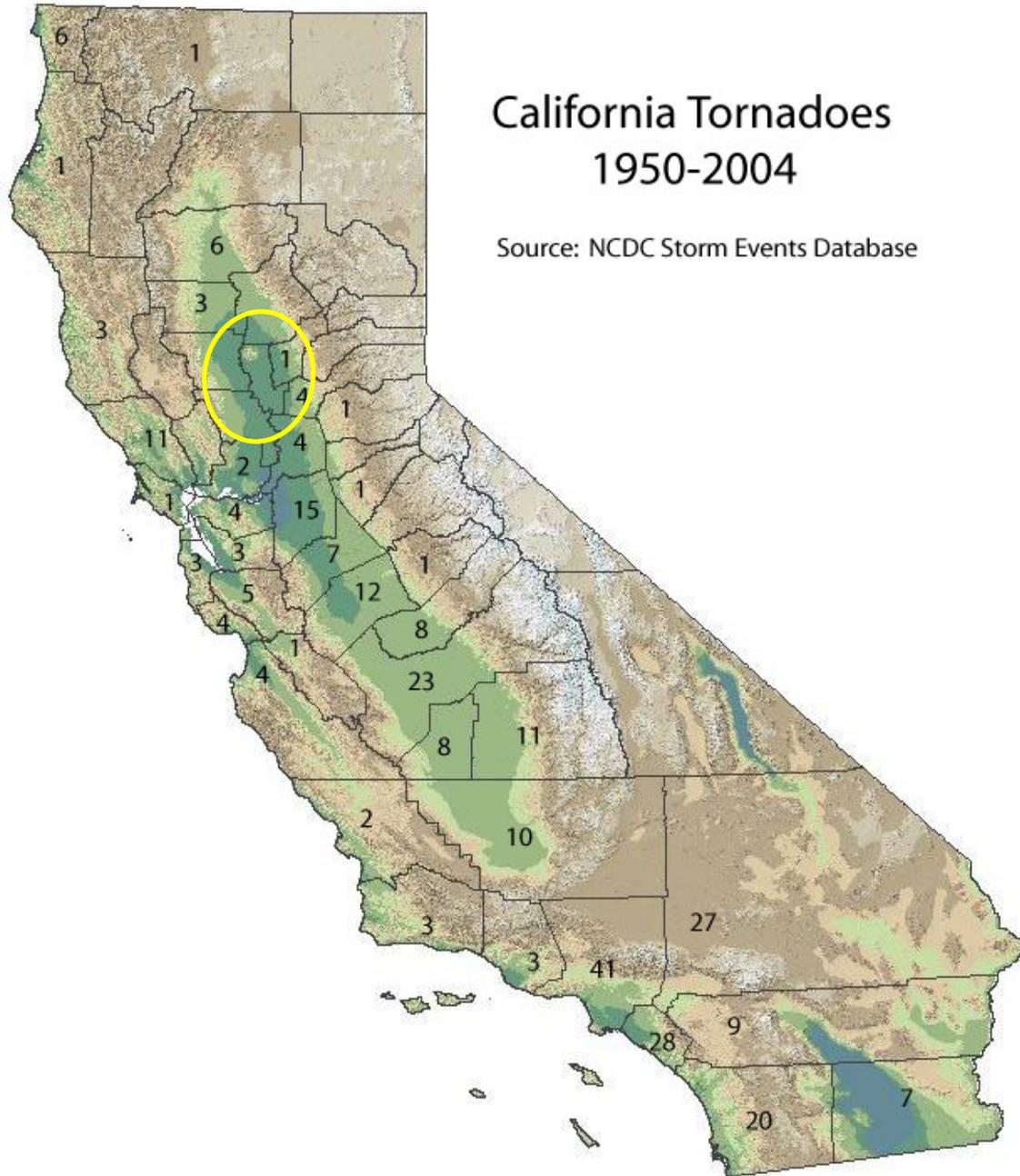
Tornado magnitude is ranked according to the Fujita scale listed as follows:

### Fujita Tornado Scale

- F0:** 40 - 72 mph (35-62 kt)
- F1:** 73-112 mph (63-97kt)
- F2:** 113-157 mph (137-179 kt)
- F3:** 158-206 mph (137-179 kt)
- F4:** 207-260 mph (180-226 kt)
- F5:** 261-318 mph (227-276 kt)

## Past Occurrences

Based on data from 1950 – 1995, California ranks 32 of 50 (compared to other states) for frequency of tornadoes, ranking 36 for injuries and 31 for cost of damages. When compared to other states by the frequency per square mile, California ranks number 44 for the frequency of tornadoes, 44th for injuries per area and 40th for costs per area. The following map shows tornado frequency by California county using NCDC data from 1950 to 2004. It was not until 2005 that the NCDC database had any recorded tornado events in Sutter County.



(Source: <http://ggweather.com/ca-tornado.jpg>)

According to the HMPC, during the rainy season the Sacramento Valley is prone to relatively strong thunderstorms, sometimes accompanied by funnel clouds and tornadoes. While they do occasionally occur, most often they are of F0 or F1 intensity. Documented incidents of tornadoes in the Sutter County Planning area include the following events, all occurring in 2005:

- 03/29/2005 – F0 tornado, no damages or injuries (NCDC)
- 04/17/2005 – Funnel Cloud (NCDC)
- 05/09/2005 – F0 Tornado, 50-60- plum trees destroyed (\$500,000); roof and deck damaged; (NCDC/NWS)
- 05/09/2005 – 3 Funnel Clouds (NCDC/NWS)

### **Likelihood of Future Occurrences**

*Occasional:* Recent tornado activity within the planning area indicates that the area will likely continue to experience the formation of funnel clouds and low intensity tornadoes during adverse weather conditions.

## **FLOOD**

### **Hazard/Problem Description**

Floods can be among the most frequent and costly natural disaster in terms of human hardship and economic loss, and can be caused by a number of different weather events. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Certain health hazards are also common to flood events. Standing water and wet materials in structures can become a breeding ground for microorganisms such as bacteria, mold, and viruses. This can cause disease, trigger allergic reactions, and damage materials long after the flood. When floodwaters contain sewage or decaying animal carcasses, infectious disease is of concern. Direct impacts such as drowning can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be paramount to reduce life and safety impacts with any type of flooding.

The area adjacent to a channel is the floodplain. Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. In its common usage, the floodplain most often refers to that area that is inundated by the 100-year flood, the flood that has a one percent chance in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP). The potential for flooding can change and increase through various land use changes and changes to land surface, resulting in a change to the floodplain. A change in environment can create localized flooding problems in and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

The Sutter County Planning Area is susceptible to four types of floods: localized flooding, riverine (slow rise) flooding, levee failure/overtopping, and dam failure floods.

**Localized Flooding.** Localized flooding problems are often caused by flash flooding, severe weather, or an unusual amount of rainfall. Flooding from these intense weather events usually

occurs in areas experiencing an increase in runoff from impervious surfaces associated with development and urbanization as well as inadequate storm drainage systems. The term “flash flood” describes localized floods of great volume and short duration. In contrast to riverine flooding, this type of flood usually results from a heavy rainfall on a relatively small drainage area. Precipitation of this sort usually occurs in the winter and spring. Flash floods often require immediate evacuation within the hour.

**Riverine (Slow Rise) Flooding.** Riverine flooding, defined as when a watercourse exceeds its “bank-full” capacity, generally occurs as a result of prolonged rainfall, or rainfall that is combined with already saturated soils from previous rain events. This type of flood occurs in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. The onset and duration of riverine floods may vary from a few hours to many days. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. In the Sutter County Planning Area, slow rise riverine flooding predominantly occurs caused by heavy and continued rains, sometimes combined with snow melt, increased outflows from upstream dams, and heavy flow from tributary streams. These intense storm events can overwhelm the local waterways within the Planning Area as well as the integrity of the levee system. The warning time associated with slow rise floods will assist in life and property protection. According to the 2006 Sutter County Operational Area Emergency Operations Plan (EOP), slow rise flooding is a well-established and potentially large-scale threat to the area.

**Levee Failure/Overtopping.** Generally, levees fail due to overtopping or collapse due to seepage, subsidence, erosion, or any combination thereof. A catastrophic failure resulting from collapse can occur very quickly with relatively little warning. Levee failure usually occurs when the levee is saturated from high flows or there is an inherent defect in the levee. Floodwater will flow in a relatively shallow path and collect in low-lying areas. Slow rise flooding in the Sutter County Planning Area can lead to a more catastrophic flood event due to the potential for a levee overtopping or failing.

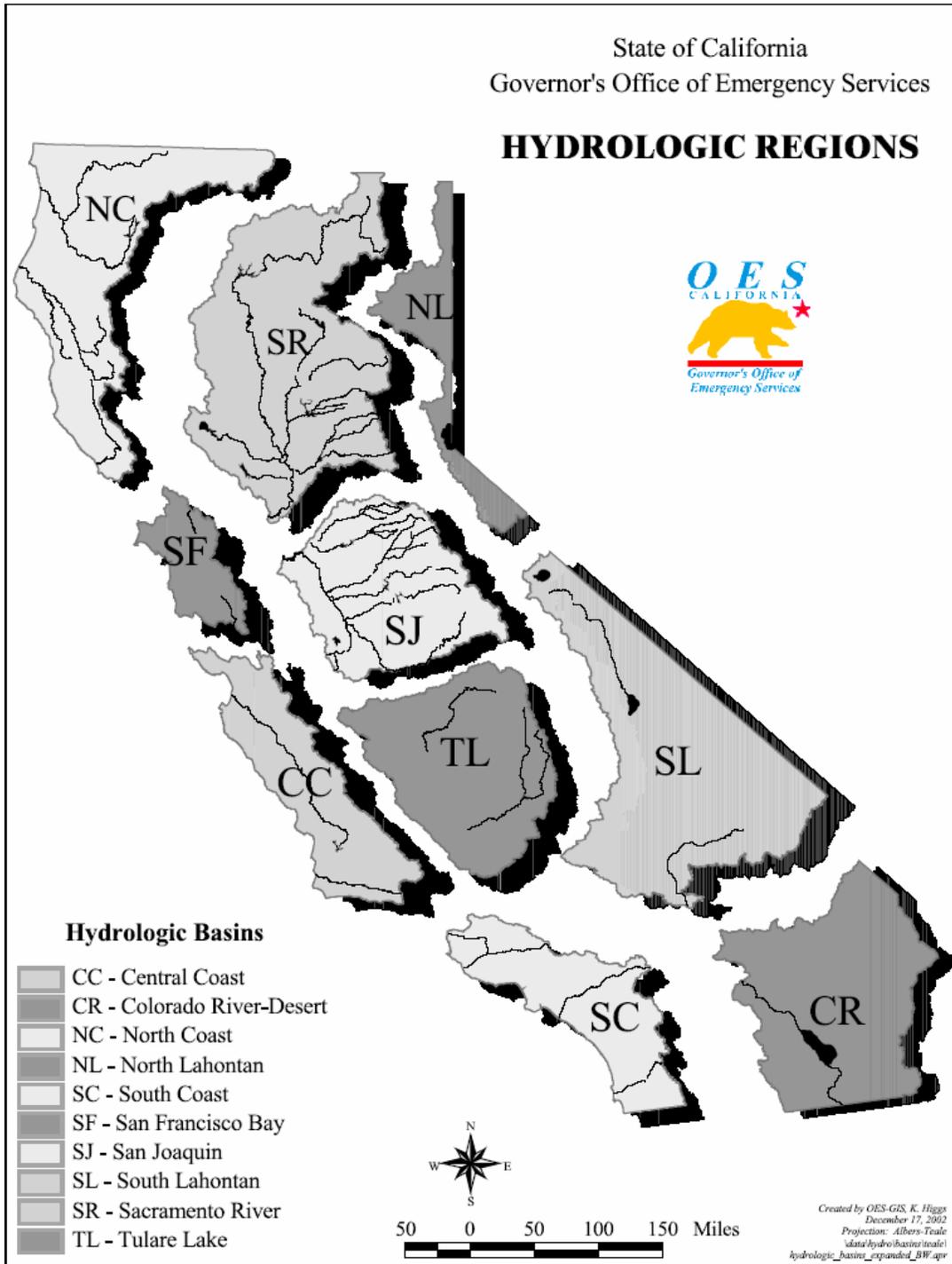
**Dam Failure.** Flooding from failure of one or more upstream dams is also a concern to the Sutter County Planning Area. A catastrophic dam failure could easily overwhelm local response capabilities and require mass evacuations to save lives. Impacts to life safety will depend on the warning time available and the resources to notify and evacuate the public. Major loss of life could result and there would be associated health concerns as well as problems with the identification and burial of the deceased. Dam failure impacts in the Planning Area are addressed further in a separate section following this section on floods.

## **Sutter County Hydrology**

California has 10 hydrologic regions. The Sutter County Planning Area sits in the Sacramento River hydrologic region. This region encompasses the northern half of the Central Valley bounded by the Sierra Nevada Mountains, the Coast Range, the Cascade Range, and the Trinity Mountains. This region is predominantly agricultural, but has experienced increased urbanization in recent years. The primary cause of flooding in the region is due to runoff from major winter storm events and/or snowmelt. Levee systems and dams built throughout the area have significantly reduced the historic flood hazards in this region. However, the area remains

vulnerable to flooding hazards due to an aging levee system combined with the increase urbanization of the County.

A map of the California’s hydrological regions is provided below.



The Sutter County Planning Area is located in the east-central part of the Sacramento Valley. The 2006 Sutter County Operational Area EOP describes the Sacramento Valley as forming the northern half of the Central Valley, which surrounded by mountains, creates a “bathtub effect,

with the Sacramento Valley, San Joaquin Delta, and San Francisco Bay forming the drain to the ocean. The lowest areas of the Central Valley, which includes Sutter County, are at the bottom of the bathtub and generally receive the brunt of any flooding.

More specifically, the topography of the Sutter County planning area is a relatively flat alluvial plain with the exception of the Sutter Buttes and the surrounding rolling terrain. The eastern part of the county is an alluvial terrace with elevations of 35 to 80 feet. This terrace generally drains to the southwest into the lower Sutter and American Basins, which are at 10-40 feet in elevation. Flooding is a common occurrence in areas adjacent to and in the lowlands of waterways in the Sutter County Planning Area.

Historically, the Sutter County Planning Area has always been at risk to flooding because of its high annual percentage of rainfall, the watercourses that bound the County, and the location of development adjacent to flood-prone areas. Drainage and stormwater runoff, in addition to natural and manmade waterways, all contribute to potential flooding in the Sutter County Planning Area.

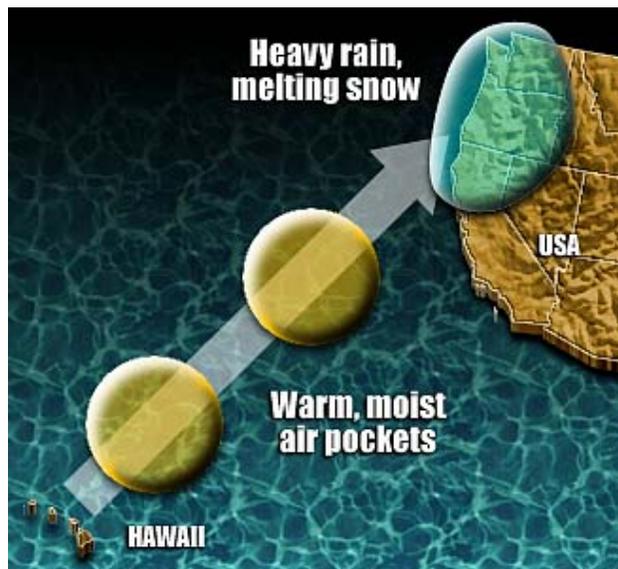
Further contributing to the flooding issue within the Planning Area, are the reduced flow capacity of many of the natural channels. Some factors contributing to this reduced flow include the increased sedimentation from historic upstream mining operations, in addition to the presence of bridges, overgrowth, debris, reduced cross sectional areas and limited or no banks to contain the water.

Also a factor in the flooding potential of the area, a weather pattern called the “Pineapple Express” frequents the Planning Area as described below.

**‘Pineapple express’ brings warm air, rain to West.**

A relatively common weather pattern brings southwest winds to the Pacific Northwest or California, along with warm, moist air. The moisture sometimes produces many days of heavy rain, which can cause extensive flooding. The warm air also can melt the snow pack in the mountains, which further aggravates the flooding potential. In the colder parts of the year, the warm air can be cooled enough to produce heavy, upslope snow as it rises into the higher elevations of the Sierra Nevada or Cascades. Forecasters and others on the West Coast often refer to this warm, moist air as the “Pineapple Express” because it comes from around Hawaii where pineapples are grown.

(Source: USA TODAY research by Chad Palmer  
<http://www.usatoday.com/weatherwpinappl.htm>)



## The Sutter County Waterway System

Positioned on an alluvial plain between the Sacramento River on the west and the Feather River on the east, the Sutter County Planning Area lies entirely within the Sacramento River watershed and within the Sutter and Butte Drainage basins. In the southeastern portion of the county lies another alluvial plain situated south of the Bear River and east of the Feather River. These alluvial plains were geologically formed by water running over the stream banks during naturally occurring historic floods.

The Sutter County Planning Area includes both natural and manmade waterways. In addition to the Sacramento, Feather, and Bear Rivers, natural waterways include Coon Creek, Pleasant Grove Creek, Markham and Auburn Ravines in the southeastern portion of the County, the Snake River on the east side of the Sutter Buttes, and other smaller streams and sloughs located throughout the county. Manmade waterways form an extensive network and are used for flood control as well as to convey irrigation water and to provide drainage channels from the croplands. Manmade waterways include the Sutter and Tisdale Bypasses, the Natomas Cross Canal, the Natomas East Main Drainage Canal, and Gilsizer Slough. Drainage and stormwater runoff, in addition to natural waterways, all contribute to potential flooding in the Sutter County Planning Area.

The more notable of these waterways are described in further detail below.

**Sacramento River.** The Sacramento River, the largest river in the state, extends for approximately 70 miles along the western border of Sutter County. Historically, the river has carved out a wide floodplain outside of its existing banks. The river provides drainage for all of Sutter County and the Sacramento Valley through a system of levees and bypasses completed in the 1920s. The final outlet of the water is the Delta and eventually, the San Francisco Bay. The river supports various recreational and boating activities, agricultural irrigation and diverse wildlife habitats. No communities in Sutter County use the river as a source of domestic or municipal water supply.

The State Department of Water Resources, Division of Water Resources (DWR) established the Sacramento River Flood Control Project to implement flood protection programs for the river and its tributaries. The upper portion of the river is controlled by Shasta Dam, Whiskeytown Dam and Keswick Dam.

**Feather River.** The Feather River extends approximately 45 miles through Sutter County, forming part of the east Sutter County boundary. The Feather River reaches its confluence with the Sacramento River at the southern county boundary near Verona. Similar to the Sacramento River, the Feather River provides for recreational activities, agricultural irrigation and a diverse wildlife habitat. The river is listed as navigable below the City of Yuba City; however, due to siltation caused by past mining practices in the Sierra Foothills and lack of maintenance, only small boats can pass. The City of Yuba City obtains a large part of its annual water supply for municipal and domestic use from the river.

The Feather River is also part of the Sacramento River Flood Control Project managed by the State DWR. Upstream the river is controlled by the Oroville Dam in Butte County.

**Bear River.** The Bear River roughly parallels about 11 miles of the eastern county boundary, entering the county from Placer County and crossing the boundary at several points. The river flows in a south-southwest direction until it joins the Feather River about one mile north of the town of Nicolaus. Although smaller than either the Sacramento or Feather Rivers, the Bear River also provides recreational opportunities, agricultural irrigation water and a diverse wildlife habitat. River flows are controlled by the Camp Far West Reservoir in Yuba County.

**Sutter Bypass.** The Sutter Bypass, part of the Sacramento Flood Control Project, is an artificial flood control corridor approximately 3/4 mile wide, bordered by two parallel channels. The Bypass extends from the Sacramento River in the northwest portion of the County, north of Pass Road, and proceeds west of the Sutter Buttes continuing generally in a south-southeast direction for approximately 27 miles where it intercepts the Feather River about three miles south of Nicolaus. The Sutter Bypass collects flood overflow water from the Sacramento River after passing through Butte Slough and the Butte Sink.





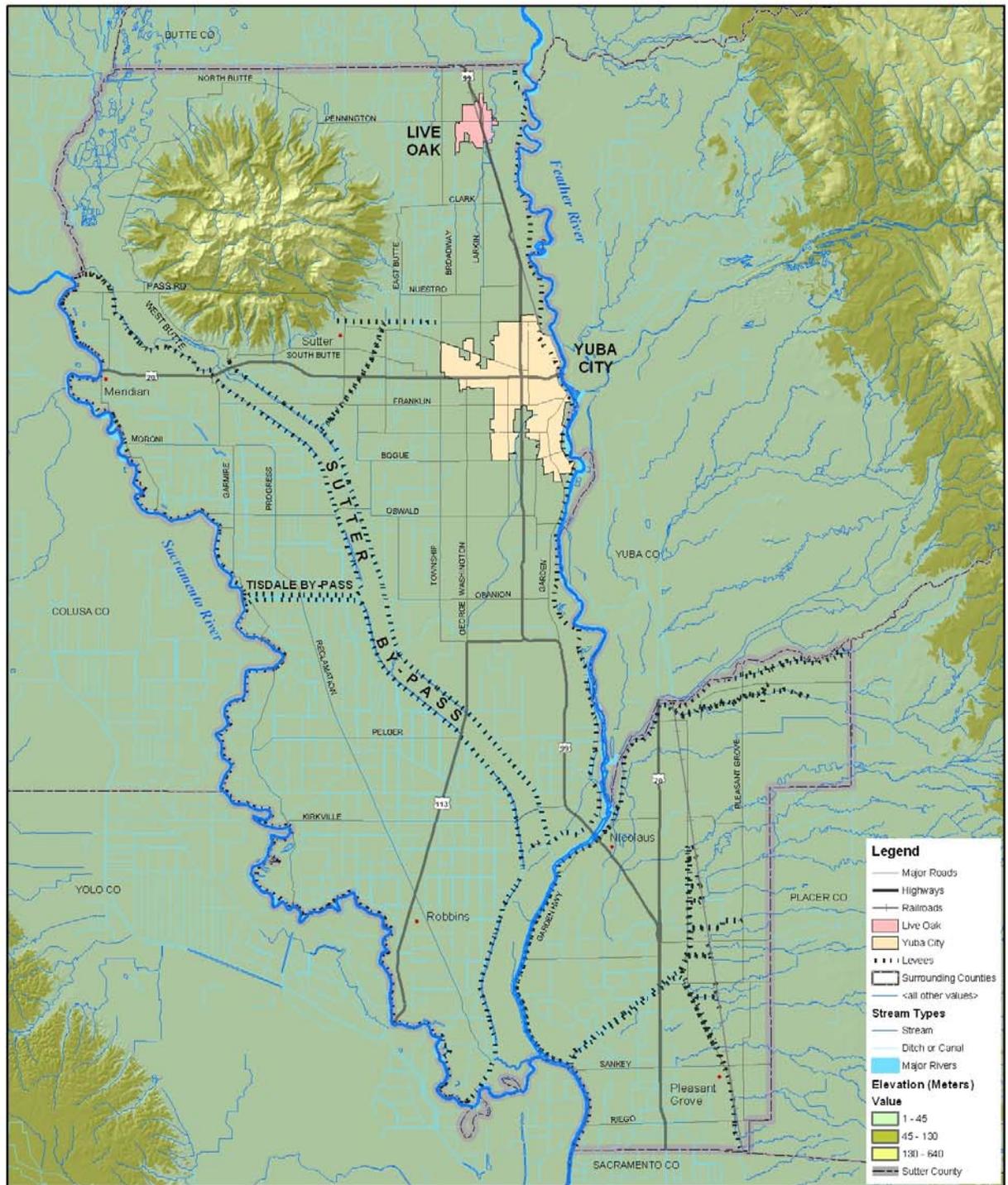
### **Sutter Bypass**

(Source: AMEC Earth & Environmental)

**Tisdale Bypass.** The Tisdale Bypass, another flood control corridor, extends for approximately four miles due west from the Sutter Bypass.

The following figure illustrates natural and manmade waterways in the planning area.

# Sutter County Drainage / Flood Control Map



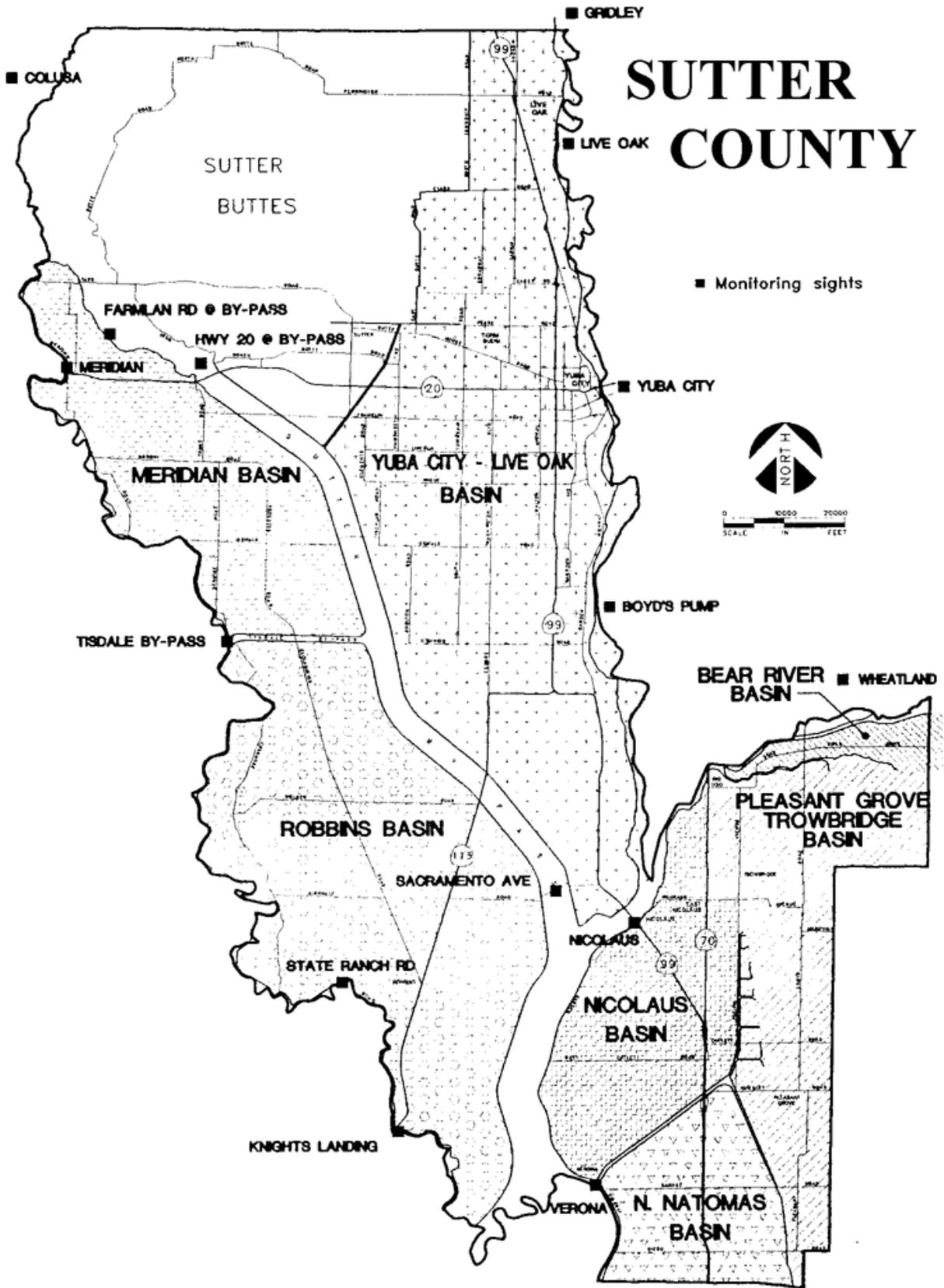
**amec**  
 Map Compilation: AMEC 10/19/06  
 Data Source: Sutter County, CA OES

0 1 2 4 6 8 10 Miles



Sutter County is divided into four primary basins: Yuba City/Live Oak Basin, Meridian Basin, Robbins Basin and the Southeast Sutter County Basin (consisting of the Nicolaus, Bear River, Pleasant Grove/Trowbirdge, and North Natomas Basins.) The following map taken from the Sutter County Operational Area EOP, Annex 5 – Floods and Dam Failure, illustrates the locations of these basins.

# Sutter County Basins



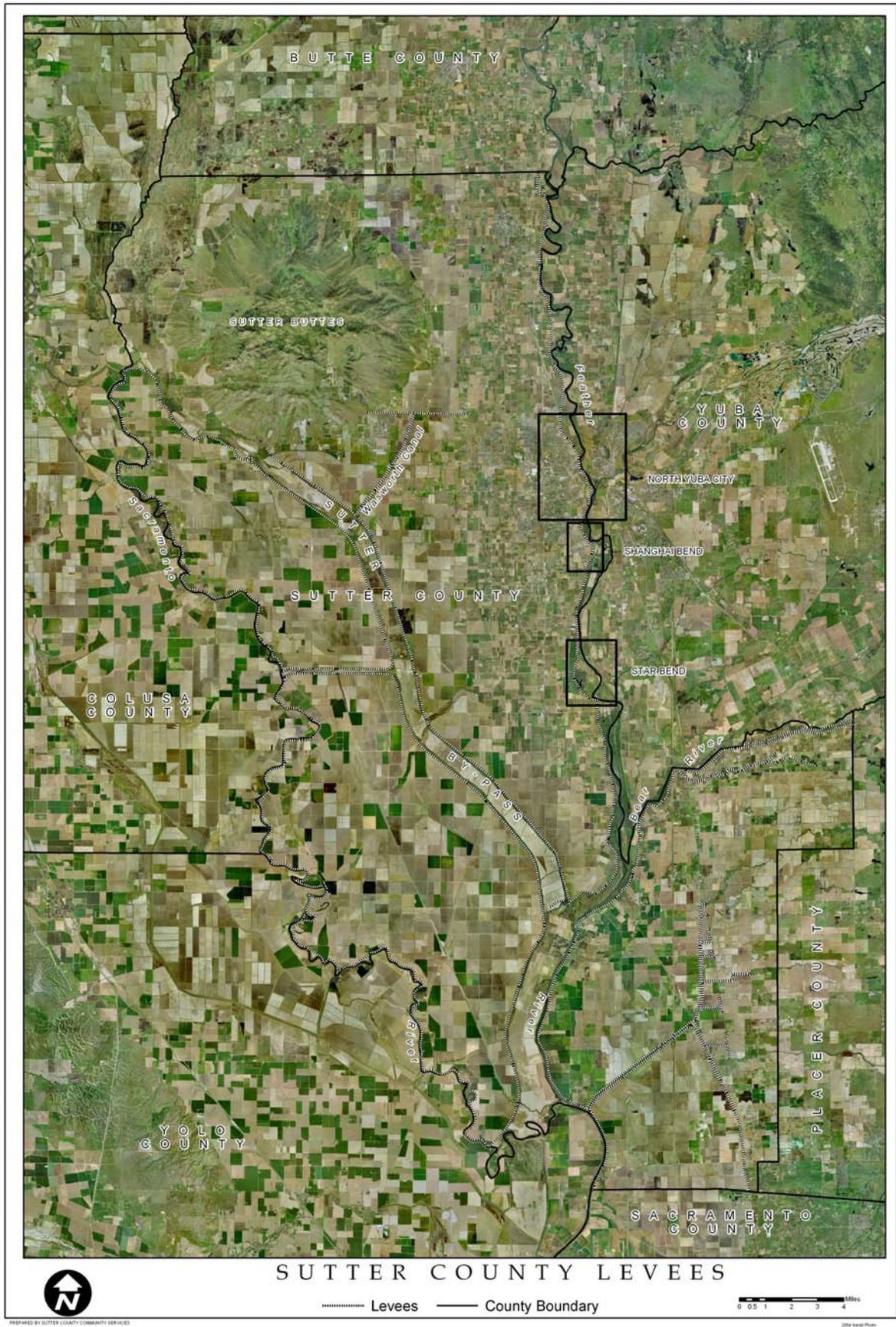
## County-Wide Flood Control Measures

The principal method of flood protection for the Sutter County Planning Area is structural, consisting of reservoirs (dams), levees and bypasses completed between the 1920s and 1960s. Most of the levees were constructed as parts of federal flood control projects and then, on completion, were turned over to local interests for operation and maintenance. Levees along the Sacramento River, Sutter Bypass, Feather River Yankee Slough, Wadsworth Canal, Cross Canal, and Tisdale Bypass are part of the Sacramento River Flood Control Project which was authorized by the Flood Control Act of 1917. According to the Flood Insurance Study (FIS) for unincorporated Sutter County (1998), the original project designs and later improvements to the Sacramento River Basin Flood Control System provided a 100-year level of protection. However, as discussed later in this section, more recent studies evaluating the levee system have identified several deficiencies which reduce the current level of protection of most area levees to below the 100-year level.

All of the reservoirs are located outside of the Planning Area. Within the Planning Area, the Sacramento and Feather Rivers rely primarily on a system of levees or earthen embankments to contain high river flows. Other flood control structures include bypasses. The bypasses, such as the Sutter Bypass, are auxiliary channels used to pass floodwater. Because the potential high flow of floodwaters within the Planning Area is larger than existing channel capacities, bypass systems have been developed to create additional capacity during critical peak flows. These bypass systems are needed only during major floods; as such, much of the lands reserved for this purpose can be used for agriculture, wildlife management, recreation or other compatible uses.

As the Sacramento River flows southward from Shasta Dam, natural overflow areas and two fixed weirs, Moulton and Colusa, permit floodwater to escape from the river into the Butte Basin. The Butte Basin is a natural flowage area that has not been drained and developed as have other basins in the area. Waters in the Butte Basin then flow into the upstream end of the Sutter Bypass. At the Tisdale Weir, additional water can be diverted from the Sacramento River directly into the Sutter Bypass. Draining the east side of the Sacramento Valley, flows from the Feather River enter the Sutter Bypass directly. The Sutter Bypass and the Sacramento River join just above the Fremont Weir. This weir divides the joint flow of the river-bypass system, limiting flow into the Sacramento River channel to its capacity and permitting the excess flow to cross the river and enter the Yolo Bypass. Near Sacramento, the Sacramento Weir provides the final escape route from the river to the Yolo Bypass. Also considered part of the flood control system within the Planning Area is a system of pumping plants which collect drainage waters and pumps the waters back into adjacent canals and rivers.

The map on the following page depicts the levee system within Sutter County.



While this system of levees and bypasses certainly provide a level of flood protection to the Planning Area, recent studies (e.g., Sacramento River Flood Control System Evaluation initial Appraisal Report – Marysville/Yuba City Area, 1990) have identified several deficiencies in the structural integrity of the levees along the Feather River. According to this study as summarized in the Sutter County General Plan:

“...the levee system contains a number of structurally deficient segments that are susceptible to seepage problems and do not provide the design levels of flood protection. Without the remedial repairs recommended in the report cited above, the levels of flood protection are well below the 100 year recurrence interval that the system was designed to provide. The U. S. Army Corps of Engineers is in the process of reconstruction efforts along the most critical areas of the levee system. Table 10.7-1 depicts the different segments of the rivers and their level of protection with and without the recommended remedial repairs.” (Source: Sutter County General Plan 2015: Background Report, November 1996. Pg. 10-17.)

Table 10.7-1 is reproduced in part below:

**Sutter County Planning Area  
Levels of Levee Protection\*  
With and Without Remedial Repairs**

<b>Levee Reach</b>	<b>Recurrence Interval Without Improvements</b>	<b>Recurrence Interval With** Improvements</b>
Feather River upstream from Honcut Creek	50 years	200+ years
Feather River between Honcut Creek and Jack Slough	50 years	175+ years
Feather River between Jack Slough and Yuba River	60 years	150+ years
Feather River between Yuba River and Bear River	70 years	150+ years
Feather River between Bear River and Sutter Bypass	65 years	150+
Yuba River upstream of mouth	30 years	100 years
Bear River upstream from mouth	65 years	100+ years
Sutter Bypass between Tisdale Bypass and Feather River	20 years	150+ years

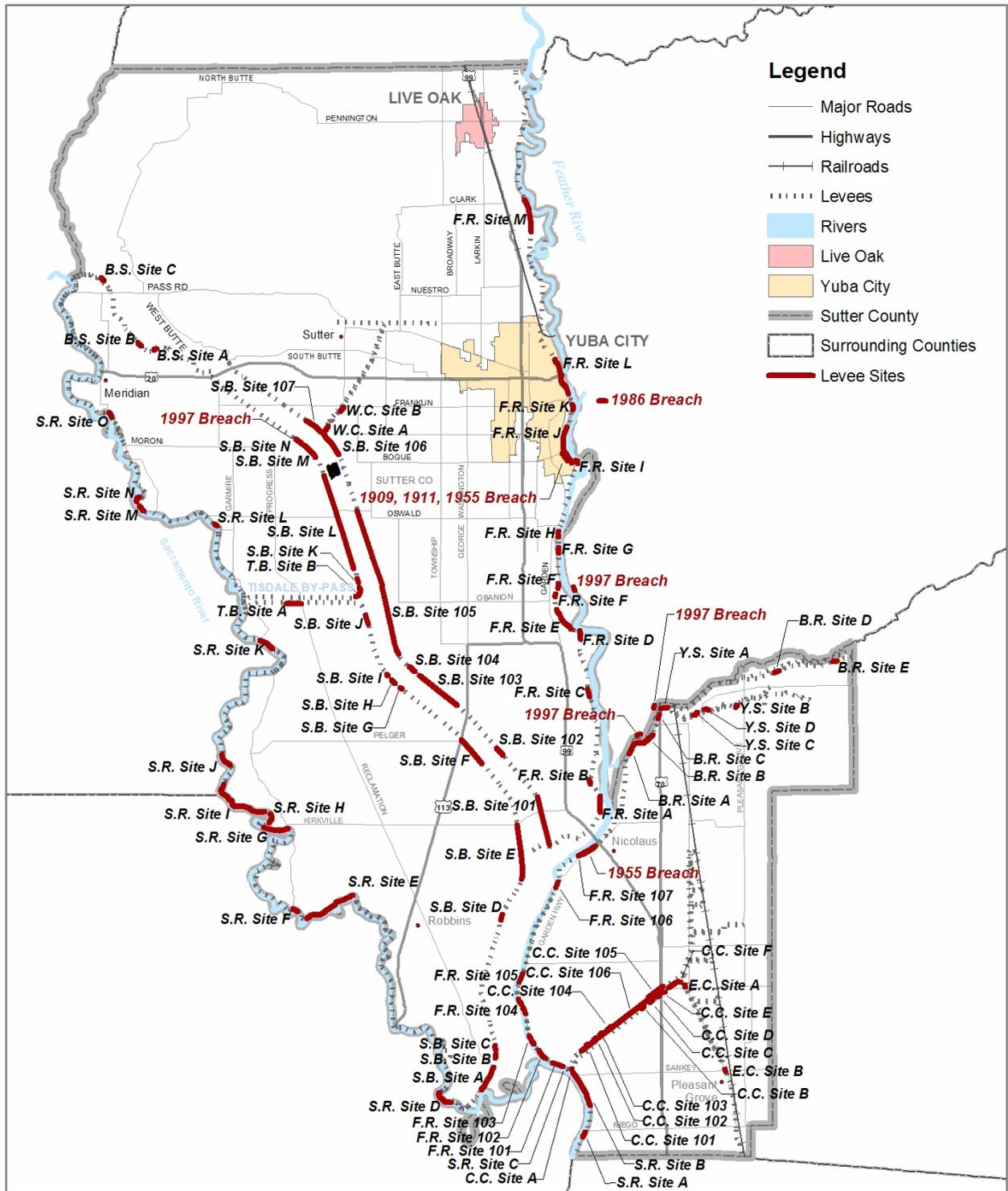
\* Recurrence intervals are based on the assumption that no levee breaches occur upstream. In reality, if a levee break occurred upstream, downstream levee reaches would have a higher level of flood protection than those shown above.

\*\* Levels of flood protection with remedial repairs are based on a minimum of 3 feet freeboard in a specified levee reach.

The above table and statements from the Sutter County General Plan provide an assessment of the levee system prior to the 1997 floods. Since then, while concerns with the levees remain, many improvements to the levees have been implemented. More recent evaluations and studies

of the existing levee system provide more comprehensive information on the status of the levee system in the Sutter County Planning Area. Summarizing the most significant issues with the levee system as well as identifying the various types of improvements, the following map and associated text identify locations and provide historical details on the status of the levees as of 2002.

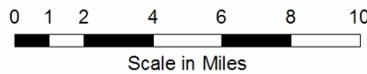
# Sutter County Historical Levee Information



## Legend

- Major Roads
- Highways
- Railroads
- - - - - Levees
- Blue Area Rivers
- Red Area Live Oak
- Yellow Area Yuba City
- Grey Area Sutter County
- White Area Surrounding Counties
- Red Line Levee Sites

**amec**  
 Map Compilation: AMEC 3/21/07  
 Data Source: Sutter County, CA



## SUTTER COUNTY AND YUBA CITY HISTORICAL LEVEE INFORMATION 2002

### Feather River, Right (West) Levee

**F.R. Site A:** This site is located between Sacramento Avenue and Laurel Avenue between approximate river miles 10.2 and 11.1 (levee mile 2.3 and 3.3). Excessive seepage occurs at this site during high water.

**F.R. Site B:** This site is located near Laurel Avenue at approximate river mile 11.6 (levee mile 3.7). A landside boil occurred in a landside drainage ditch near the levee toe during the 1986 flood. During the 1997 flood, the drainage ditch was sloughing and heavy but clear seepage was entering the ditch. During the flood, an emergency stability berm was constructed of sandbags placed on a geotextile within the drainage ditch. Later that year, the ditch was converted to a pervious toe drain. In 1998, a permanent seepage/stability berm was constructed at this site under the Marysville/Yuba City Levee Reconstruction Project.

**F.R. Site C:** This site is located 2.4 miles south of Star Bend at approximate river mile 14.7 (levee mile 1.5). During the 1986 flood, a crack formed in the levee. During the 1997 flood, seepage occurred at this site. A pervious toe drain and seepage/stability berm have been constructed at this site under a PL 84-99 action.

**F.R. Site D:** This site is located just south of Star Bend at approximate river mile 17.8 (levee mile 3.8). During the 1986 flood, boils carrying soil formed near the landside toe of the levee in a half-mile stretch. The ground to approximately 100 feet away from landside toe was very soft and wet. The peak floodwater was 5-6 feet below the top of the levee at this location. LD 1 personnel constructed sandbag rings around three of the worst boils. Seepage also occurred during the 1997 flood. In 1998 the levee was raised 1 foot and a pervious toe drain and seepage/stability berm was installed at the landside levee toe under the Marysville/Yuba City Levee Reconstruction project.

**F.R. Site E:** This site is located between Star Bend Road and Abbot Road at approximate river mile 18.1 to 19.0 (levee mile 4.1 to 5.0). During 1995, clear seepage exited the levee toe and the ground beyond the levee toe while the river level was approximately 12 to 15 feet below the top of levee. During the 1997 flood, numerous boils occurred in a 200 linear foot stretch. Sandbag rings were constructed around the boils that were moving material. The following day, the sandbagged boils were flowing clear. In 1997 the Corps of Engineers installed relief wells in this area to reduce seepage and instability of the levee under a PL 84-99 contract.

**F.R. Site G:** This site is located near Messick Road at approximate river mile 21.2 (levee mile 7.3). Waterside bank erosion is encroaching on the levee section.

**F.R. Site H:** This site is at the Boyd Pump Boat Ramp at levee mile 8, between Messick Road and Oswald Avenue at approximate river mile 21.7. During the 1986 flood, portions of the boat ramp parking lot and subgrade and portions of the levee toe were eroded. In 1998 the Corps raised the levee 1 foot and

installed a pervious toe drain and seepage/stability berm at this site under the Marysville/Yuba City Levee Reconstruction project.

**F.R. Site J:** This site is located between Shanghai Bend and the Yuba City Airport between approximate river miles 25.1 and 26.5 (levee miles 11.0 and 12.4). The levee broke in this area during 1909, 1911, and 1955. In 1957, the Corps of Engineers reconstructed the levee to the landside of its previous location and installed a row of relief wells near the landside levee toe. Water from the relief wells is pumped to the Feather River. During the 1986 flood, volunteers sandbagged several boils in this area. In 1990 the City of Yuba City installed a seepage interceptor system in the southern part of this site. The interceptor system consists of a perforated pipeline and filter 12-18 feet below ground surface to extract shallow seepage, and relief wells placed between the 1957 relief wells to extract deeper seepage. All water collected is pumped into the Feather River separately from the water collected by the 1957 relief wells. In 1993, an inspection of the shallow drain perforated pipeline discovered unacceptable deflections over large portions of the pipeline. The deformed plastic pipeline was removed and replaced with a

perforated clay pipeline. In 2000 or 2001 the Corps of Engineers rehabilitated the original 1957 relief wells under a PL 84-99 contract.

**F.R. Site K:** This site is located near the Yuba City airport at approximate river mile 27.0 (levee mile 13.6). Seepage occurs at this site during high water. An impermeable cutoff wall has been constructed in this area. The cutoff wall slightly overlaps the relief wells and deep seepage interceptor system at F.R. Site J, extends through this site, and ends 800 feet upstream of the Fifth Street Bridge in F.R. Site L. The southern portion of the cutoff wall was constructed under the Marysville/Yuba City Levee Reconstruction project. The northern portion of the cutoff wall was constructed under a PL 84-99 contract.

**F.R. Site L:** This site is located in Yuba City from Garden Highway north to the Drive In Cinema between approximate river miles 27.4 to 29.3 (levee miles 14.0 to 15.5). During the 1955 flood seepage was observed near the Tenth Street Bridge. During the 1986 flood the landside slope became saturated and unstable and bulged slightly in the area of the Corporation Yard. Water also flowed up through cracks in the parking lot pavement and the floor slab of an auto body shop on Teegarden Avenue. Erosion of the waterside levee toe occurred in the areas immediately upstream and downstream of the Fifth Street Bridge. Yuba City constructed a berm along the landside toe as an emergency action. A permanent seepage/stability berm was later constructed from the 5<sup>th</sup> Street Bridge extending northward to about 2500 feet beyond the 10<sup>th</sup> Street Bridge. An impermeable cutoff wall was also constructed in this area (see F.R. Site K). In 1998 rock protection was added to the waterside eroded area around the Fifth Street Bridge.

**F.R. Site M:** This site is located in the area around Koch Lane between approximate river miles 35.6 and 37.6 (levee miles 3.9 and 5.3) in LD 9. During high water, seepage and boils occur near the landside levee toe. The Corps relocated an open drainage ditch away from the toe of the levee at the north end of this site under the Marysville/Yuba City Levee Reconstruction project. A consultant to L.D. 9 recommended installing a pervious toe drain over the entire site to control seepage, but no improvements have been made.

#### **Sutter Bypass East Levee**

**S.B. Site 101:** This site is located between Pumping Station #1 and the confluence of the Feather River between river miles 66.2 to 68.5 (levee miles 20 to 22.37). During 1986 a 3,000 foot length of the

waterside levee north of the confluence with the Feather River was repaired under a PL 84-99 action. Wavewash and county maintenance equipment had resulted in erosion near the waterside toe and halfway up the waterside slope. Both areas were repaired using nearby materials. During the 1997 flood, the 1,000 linear foot segment immediately upstream of the Feather River exhibited seepage, boils, and a sinkhole on the landside berm. This landside berm is an abandoned railroad berm. A landside pervious toe drain was constructed at this site in 2001 under a cost-shared PL 84-99 action.

**S.B. Site 102:** This site is located between Pump Station #1 and Highway 113, at approximately river mile 70.1 (levee mile 17.6). During the 1997 flood seepage occurred at this site. A seepage/stability berm with a pervious toe drain was constructed at this site in 2001 under a cost-shared PL 84-99 action.

**S.B. Sites 103 and 104:** These sites are located between Highway 113 and Gilsizer Slough at approximately river miles 72.3 to 73.7 and 74.4 respectively (levee miles 14.1 to 15.5 and 13.4 respectively). Seepage occurred at these sites during high water. As part of the Mid Valley Phase III Levee Reconstruction project, seepage/stability berms have been constructed at both of these sites.

**S.B. Site 105:** This site is located between Hughes Road (upstream of Tisdale Bypass) and Gilsizer Slough, between river miles 75.0 and 80.1 (levee miles 7.5 and 12.6). Part of this site is upstream of the Tisdale Bypass and part of the site is downstream of the Tisdale Bypass. Boils occur near the landside levee toe during high water events at this site. In 1958 a landside pervious toe drain was installed from McClatchey Road to Gilsizer Slough.

**S.B. Site 106:** This site is located between Lincoln Road and McClatchy Road, immediately downstream of the Wadsworth Canal, between approximately river miles 82.8 and 83.7 (levee miles 4.4 and 5.4). During the 1997 flood, heavy seepage occurred in this area. During 2001 a pervious toe drain and seepage/stability berm was constructed at this site under a cost-shared PL 84-99 action.

**S.B. Site 107:** This site is located between Pump House #3 and the right bank of the Wadsworth Canal between approximately river miles 83.8 and 84.4 (levee miles 3.7 and 4.3). During the 1997 flood heavy seepage and soil heaving occurred at this site. A pervious toe drain and seepage/stability berm was constructed during 2001 under a cost-shared PL 84-99 action.

**Wadsworth Canal, Left (Southeast) Levee.**

**W.C. Site A:** This site is located where the Wadsworth Canal joins the Sutter Bypass (the Dean Property), river and levee miles 0 to 0.5. Seepage frequently occurs at this site during high flows. During 1997 and 1998 small boils were observed at the landside levee toe. In 2002 the Corps of Engineers recommended a slurry cutoff wall be constructed at this site under a cost-shared PL 84-99 action.

**W.C. Site B:** This site is located just downstream of Franklin Road, river and levee miles 1.0. During the 1997 flood heavy seepage occurred at this site. The water surface was observed to be about 5 feet below the levee crest. In 2001 the Corps of Engineers constructed a pervious toe drain at the landside toe of the levee under a cost-shared PL 84-99 action.

## **Floodplain Mapping**

FEMA established standards for floodplain mapping studies as part of the NFIP. The NFIP makes flood insurance available to property owners in participating communities adopting FEMA approved local floodplain studies, maps and regulations. Floodplain studies that may be approved by FEMA include federally funded studies, studies developed by state, city and regional public agencies, and technical studies generated by private interests as part of property annexation and land development efforts. Such studies may include entire stream reaches or limited stream sections depending on the nature and scope of a study. A general overview of floodplain mapping is provided in the following paragraphs. Details on the NFIP program, flood studies and mapping specific to each participating jurisdiction are provided in the jurisdictional elements of this plan.

### **Flood Insurance Study (FIS)**

The FIS develops flood-risk data for various areas of the community that will be used to establish flood insurance rates and to assist the community in its efforts to promote sound floodplain management. The current Sutter County FIS is dated July 6, 1998. A new, preliminary FIS for Sutter County (August 9, 2006) is currently under review. FEMA has never published any FISs for the Cities of Yuba City or Live Oak.

### **Flood Insurance Rate Map (FIRM)**

The FIRM is designed for flood insurance and floodplain management applications. For flood insurance, the FIRM designates flood insurance rate zones to assign premium rates for flood insurance policies. For floodplain management, the FIRM delineates 100- and 500-year floodplains, floodways and the locations of selected cross sections used in the hydraulic analysis and local floodplain regulation. Current FIRM map panels for each jurisdiction are identified in the jurisdictional elements of this plan.

### **Letter of Map Revision (LOMR) and Map Amendment (LOMA)**

LOMRs and LOMAs represent separate floodplain studies dealing with individual properties or limited stream segments that update the FIS and FIRM between periodic FEMA publications of the FIS and FIRM.

## **Digital Flood Insurance Rate Map (DFIRM)**

FEMA has begun the process of converting paper FIRMS to digital FIRMs. The end product is called the DFIRM. This is part of FEMA's Map Modernization program. The primary goals of the DFIRM are to:

- Incorporate the latest updates (LOMRs and LOMAs),
- Utilize community supplied data,
- Verify the currency of the floodplains and refit them to community supplied basemaps,
- Upgrade the FIRMs to a GIS database format to set the stage for follow on updates and to enable support for GIS analyses and other digital applications, and
- Solicit community participation.

In August of 2005, FEMA Headquarters' issued Memo 34, *Interim Guidance for Studies Including Levees*. This memo recognizes the risk and vulnerability of communities with levees. The memo mandates the inclusion of levee evaluations for those communities that are undergoing map changes such as the conversion to DFIRMs. No maps could become effective without an evaluation of all levees within a community against the criteria set forth in 44 CFR 65.10 *Mapping of Areas Protected by Levee Systems*.

As previously described, recent evaluations of the levee system in the Sutter County Planning Area have identified numerous deficiencies in the structural integrity of these levees. Additional evaluation and repairs to identified deficiencies in accordance with FEMA levee certification requirements are required before the levees can be properly certified. As a result, FEMA is in the process of issuing DFIRMs for the Planning Area that do not recognize the levees as providing protection from the 100-year flood. Specifically, FEMA is completing new flood studies and developing DFIRMS for the Sutter County Planning Area in two phases:

**Lower Feather River Study.** The Amended Draft of the Lower Feather River Floodplain Mapping Study, Revised February 17, 2005 (LFR Study), prepared by the U.S. Army Corps of Engineers (USACE) Sacramento District, was conducted, in part, to support the DFRIM mapping efforts within the Sutter County Planning Area. Generally, the LFR Study addresses flooding from the Feather River downstream of the Yuba River confluence to the mouth of the Feather River at the Sacramento River. It also addresses flooding from the Bear River downstream of Highway 65 and several tributaries to the Bear River. New hydrologic data and hydraulic models were developed as part of this study.

The LFR study was performed in compliance with current FEMA technical guidelines requiring certification of levees before crediting the levees with providing protection from the 1% annual event. According to the LFR study, at the time the study began, none of the levees in the study area were certified. And, most of the levees were "grand-fathered" as providing 100-year flood protection based on Flood Plain Information Reports performed in the 1960's by USACE. No new flood insurance studies had been conducted on either the Yuba or Feather Rivers since the 1986 or 1997 flood events and levee failures.

FEMA levee certification requirements include evaluations of freeboard, geotechnical stability and seepage, bank erosion potential due to currents and waves, closure structures, operations and maintenance, and wind set and wave run-up. The LFR Study, basing its assessment on only three of these requirements (i.e., freeboard, geotechnical stability and seepage, and bank

erosion), concluded that no levees within the study area could be certified in accordance with the requirements of 44 CFR 65.10. As a result of this finding, the new DFIRMs developed from this LFR study do not recognize the levees as providing 100-year flood protection.

According to the LFR Study, FEMA requires that a levee not be recognized on new maps if not certified for determination of flood insurance rate zones. New flood insurance rate zones were identified by considering: depth of flooding, nature of flow pattern, and whether the hydraulic computation method was considered detailed or approximate. Based on this Study, the following criteria were applied to the determination of flood insurance rate zones for the new DFIRMs:

- Areas of deep ponding, such as behind levees, were mapped as AE zones. The 1% water surface elevation for these areas is well defined as the water is typically ponded behind a levee of known height.
- Areas of shallow (less than one foot) overland flow were mapped as X zones.
- Areas of overland flow, ranging from 1 to 3 feet deep, were mapped as AO zones.
- Areas of deeper overland flow were mapped as A zones.

The resulting DFIRMs are discussed further in the Jurisdictional Elements of this plan.

**Upper Feather River Study (UFR Study).** Similar in scope to the LFR Study, the UFR Study will cover the portions of the Sutter County Planning Area, not included in the LFR Study. It is anticipated that the UFR Study will reach the same conclusions with respect to the inability to certify the levees within that study area resulting in new DFIRMs that do not recognize the levees as providing a 100-year level of flood protection. The UFR study and new DFIRMs are anticipated to be out in draft form sometime in 2008-2009.

### **Major Sources of Flooding/Problem Areas**

Floodwaters are a common occurrence for communities adjacent to and in the lowlands of rivers in Sutter County. Normally, wintertime storm floodwaters are kept within defined limits by levees, dykes, and open lowlands and cause no damage. Dams located outside Sutter County boundaries such as Oroville, Bullards Bar, and Shasta also help control floodwaters. But, occasionally, a combination of frequent storms, extended heavy rain, and melting snow results in floodwaters exceeding normal high-water boundaries and causing damage.

Given their location relative to the county, the Feather and Sacramento Rivers and associated tributaries present the greatest flood potential to the Sutter County Planning Area. The following table provides a record of peak water levels at several key monitoring stations on both the Feather and Sacramento Rivers.

## Sutter County River/Stream Historic Levels

River/Stream	Forecast Point	MONITORING STATION	Top of Levee Elevation	Peak Level of Record
Feather River	Yuba City	Feather River @ 5th Street Bridge (YUB)	83.5'	<b>82.4'</b> 12/24/1955
Feather River	Nicolaus	Feather River @ Nicolaus (NIC)	60.3'	<b>51.6'</b> 12/23/1955
Sacramento River	Colusa Weir	Sacramento River @ Colusa Weir (CLW)	74.8'	<b>70.6'</b> 3/1/1940
Sacramento River	Colusa	Sacramento River @ Colusa Bridge (COL)	73.0'	<b>69.2'</b> 2/8/1942
Sacramento River	Tisdale Weir (Robbins Basin)	Sacramento River @ Tisdale Weir (TIS)	57.0'	<b>53.3'</b> 3/1/1940
Sacramento River	Knight's Landing (Robbins Basin)	Sacramento River @ Knights Landing (KNL)	47.5'	<b>41.8'</b> 2/8/1942
Sacramento River	Below Wilkins Slough (SE County Basin)	Sacramento River @ Wilkins Slough	56.1'	<b>52.8'</b> 3/1/1940
Sacramento River	Fremont Weir (SE County Basin)	Sacramento River @ Fremont Weir	45.4'	<b>39.7'</b> 12/23/1955
Sacramento River	Verona (SE County Basin)	Sacramento River @ Verona	46.0'	<b>41.2'</b> 3/1/1940
Sutter By-Pass	Meridian Basin	Sutter By-Pass @ Long Bridge (LNB)	61.8'	<b>57.7'</b> 3/1/1940
Yuba River	Englebright Dam		527.0'*	<b>546.1'</b> 12/22/1964

All elevations are United States Engineering Datum (USED)

\*Spillway crest elevation.

(Source: Sutter County Operational Area Emergency Operations Plan, Annex 5 – Floods and Dam Failure)

Flooding during periods of excessive rainfall can occur anytime in the Planning Area during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration. Flooding is more severe when previous rainfall has created saturated ground conditions. According to the 1998 FIS for the county, the severity of flooding is often intensified by backwater conditions between stream systems. This occurs when floodwater elevations are increased in lower portions of tributary streams due to the backwater effect from main streams reducing hydraulic gradients and flow-storage areas. The 1998 FIS identified several areas where the high flow of floodwaters cause backwater conditions on other channels:

- High flows on the Sacramento River generate backwater conditions on the lower reach of the American River and the Cross Canal.
- The American River peak 100-year flows induce backwater conditions in the lower reach of the Natomas East Main Drainage Canal.
- High flows on the Natomas East Main Drainage Canal cause backwater conditions on the lower reaches of Arcade and Dry Creeks.
- High flows on Cross Canal create backwater conditions on Pleasant Grove Creek Canal.

Localized flooding also occurs throughout the County with several areas of primary concern. According to the Sutter County Department of Public Works, numerous roads throughout the county are subject to flooding in heavy rains. In addition to flooding, damages to these areas during heavy storms include pavement deterioration, washouts, landslides/mudslides, debris areas, and downed trees. The amount and type of damage or flooding that occurs varies from year to year, depending on the quantity of runoff. These areas and the types of damages are presented in the following table. Photos and descriptions of these areas during flood conditions are included in Appendix F

**Unincorporated Sutter County  
Localized Flooding Areas and Related Impacts**

No.	Road Name	Flooding	Pavement Deterioration	Washouts	Landslide Or Mudslides	Debris	Downed Trees
1	Pass Rd	x	x	x	x	x	
2	West Butte Rd.	x	x	x		x	
3	North Butte Rd.	x	x	x		x	x
4	East Butte Rd.	x	x	x		x	x
5	South Butte Rd.	x	x	x		x	x
6	Powell Rd.	x	x	x		x	x
7	Pennington Rd.	x	x	x		x	x
8	Butte House Rd.	x				x	x
9	Kellogg Rd.	x	x	x	x	x	x
10	Lower Pass Rd.	x	x	x		x	x
11	Almond Orchard Rd.	x				x	
12	Hagaman Rd.	x					
13	Mettarr Rd.	x	x				
14	Fifield Rd	x		x	x	x	
15	Keyes Rd.	x	x	x			
16	Catlett Rd.	x		x		x	
17	Howsley Rd.	x	x			x	
18	Pleasant Grove Rd.	x	x	x		x	
19	Brewer Rd.	x	x	x		x	x
20	Sacramento Ave.	x	x	x		x	x
21	Reclamation Rd.		x		x		
22	Subaco Rd..		x	x	x		
23	Hicks Rd.	x	x			x	x
24	Hughes	x	x			x	x
25	Oswald	x	x			x	x

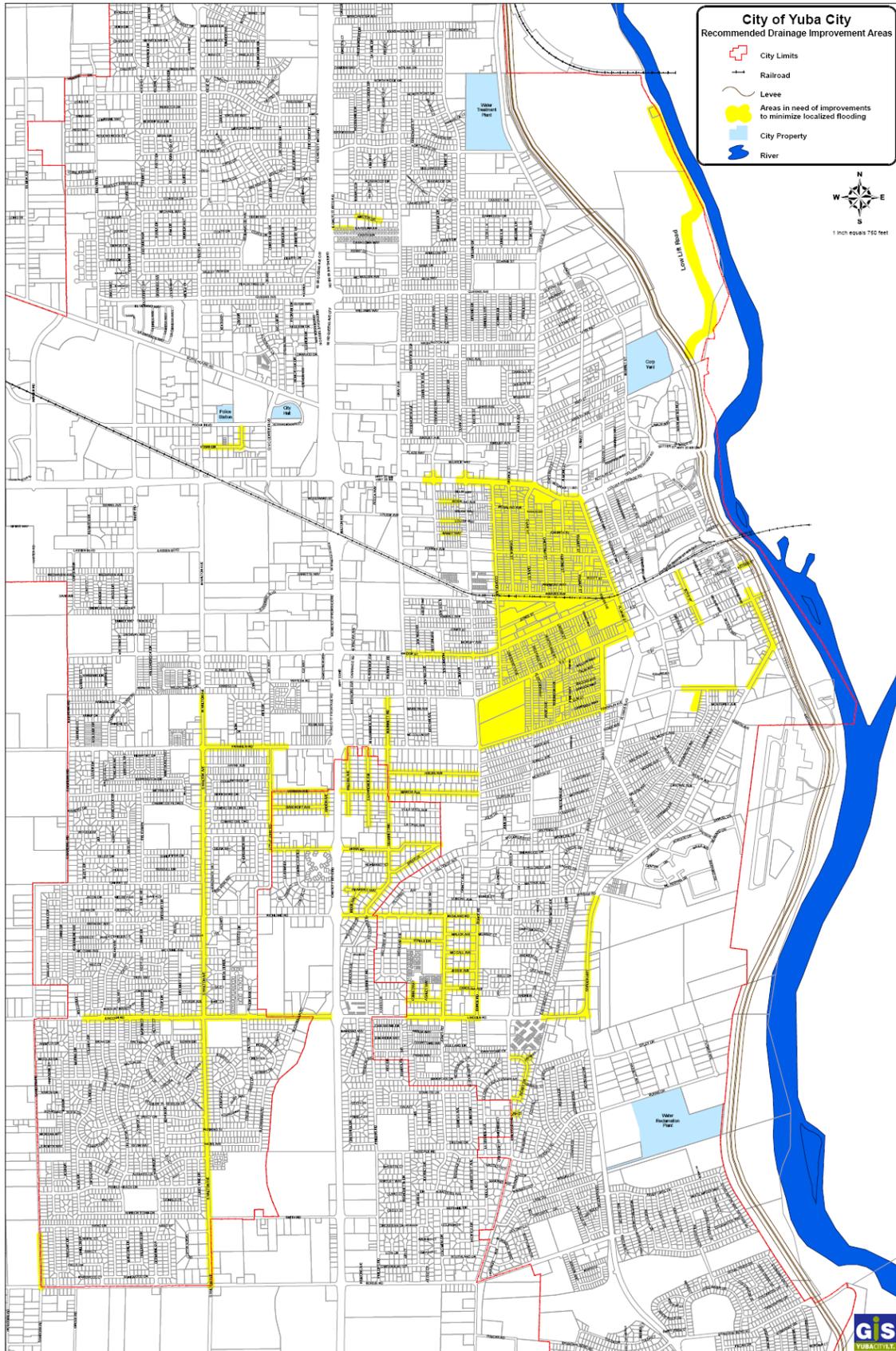
(Source: Sutter County Public Works)

Also of concern to the County is the Live Oak Canal area between Pease Road and Schlag Road. The Live Oak canal drains approximately 1/3 of the Yuba City Area and approximately 1/2 of the Yuba City rural area. Most of the problems are caused by heavy rains combined with inadequate pipe capacity due to increased development in the Yuba City rural area.

**Yuba City Urban Area** - The area of the county with the greatest potential to be impacted by drainage and flooding problems is the Yuba City Urban Area. The greatest potential threat to the Yuba City Urban Area is flooding resulting from failure of levees along the Feather River. In addition to a damaging flood resulting from a dam or levee failure, the urban area is highly susceptible to flooding from stormwater runoff. As development continues to occur in the urban

area, the increase in impervious surfaces will result in increased overall run-off at an accelerated rate. Ongoing improvements to the drainage infrastructure are being designed and constructed to accommodate this increase in run-off; however, removing run off and flood waters from the urban area does not in itself resolve drainage issues. Lack of downstream channel maintenance and limited flow capacity within the Sutter Bypass can backup flood waters and also contributes to localized flooding issues within the urban area. A map detailing recommended drainage improvement areas within the City of Yuba City is provided on the following page.

# City of Yuba City Recommended Drainage Improvement Areas



(Source: City of Yuba City, Departments of Public Works/GIS)

## Past Occurrences

Historically, flooding has been an ongoing problem throughout the Planning Area. The most notable major flood events occurred in 1955, 1986, 1995, and 1997 as described in detail below. Primary damages were to property and agricultural crops. These damaging floods were generally the result of failures of the levee systems rather than the levees being overtopped. Other lesser flooding events have also occurred in other years. A brief summary table is also included below that presents a timeline of past flooding events.

### Historic Timeline of Past Flooding Events in Sutter County and Surrounding Areas.

Date	Description
1805	Great Flood. Information from early settlers indicated the entire valley was inundated. Many lives were lost and villages destroyed.
1846-47	More data from early settlers indicated the loss of life and villages.
1852-53	More data from early settlers indicated the loss of life and villages.
1861	Dec. 10th. Marysville Appeal Newspaper described the entire town under water. All that was seen was the “roofs of houses and floating animals”
1862	Jan. 11th. Water was 6” higher than 1861. Farmers lost ¾ of herds.
1867-68	Extensive property and levee damage. 1/5 <sup>th</sup> of levees were washed away.
1870	Large levee constructed in Colusa county panned in water in Sutter County. Meridian and Kirksville were submerged.
1875	Jan. 19. Levees in Yuba City and Maryville broke and flooded both cities. Volume and height of water unprecedented.
1907	Three weeks of heavy rain and March snowfall led to levees breaking in District 1 & 2 in mid-March. Flood wave sustained 200 miles. Damage amounted to \$1000.
1937	Levee break in E. Biggs. Water flowed over Hwy 20. Nicolaus bridge was damaged.
1940	Flood in Meridian from Sutter Bypass. After this flood the Shasta Dam was built to control the Sacramento River.
1942	Break in Sutter Bypass flooded Sutter/Robbins Basin.
1944	Break in the Bear River flooded Sutter County.
1948	Break in Bear River flooded Rio Oso/Nicolaus Basin.
1950	Nov. 19 <sup>th</sup> break in Yankee Slough flooded Sutter County.
1955	Dec. All time record flow. Worst flood in Northern California history.
1986	Linda levee broke. Flooded 30 square miles. Emergency declared by Governor.
1995	Flooding caused by two direct downpours which created major surface drainage back-ups at numerous locations throughout the county. More than \$850,000 in damages to county facilities.
1997	Flood in Yuba County, Plumas Lake area. 80,000 evacuated. Meridian basin floods from a break in the Sutter Bypass Levee.

Taken directly from the 2006, Draft Sutter County Operational Area EOP, Annex 5 - Flood and Dam Failure, the following paragraphs provide a short synopsis of the most significant past flooding disasters occurring in the Sutter County Operational Area:

## 1955 Flooding

This was the most devastating of all the floods to this area. A break in this levee south of Yuba City occurred at about midnight on December 23<sup>rd</sup>. The initial surge of water spread westerly through Gilsizer Slough to the Sutter Bypass and northerly into Yuba City. Within less than 24 hours, the heart of Sutter County was flooded from the Feather River on the east and south to the Bypass on the west and southwest. To the north, the water spread north of Colusa Avenue (Highway 20) in several areas, including some west of Walton Avenue.

Nearly 100,000 acres were flooded and resulted in 38 deaths, injuries to 3,200 people, and nearly \$40 million in property damage. The bridge over the Feather River at 5<sup>th</sup> Street was washed out and telephone service was lost south of Colusa Avenue.



**Downtown Yuba City December 1955**

(Seepage Related Levee Break in Upper Center) View Southerly  
(Source: Yuba City Public Library)

## 1986 Flooding

While the most severe flooding occurred in neighboring Yuba County, Sutter County did experience flooding. The most serious problems were located in the southern area of the county which is sparsely populated. The county was fortunate not to have a break in the levee but did experience slumping in the Robbins area. In the southeast area of the county, surface flow from Placer County led to extensive ponding. This coupled with

two failures of minor levees, flooded numerous rural residences and agricultural facilities.

### **1995 Flooding**

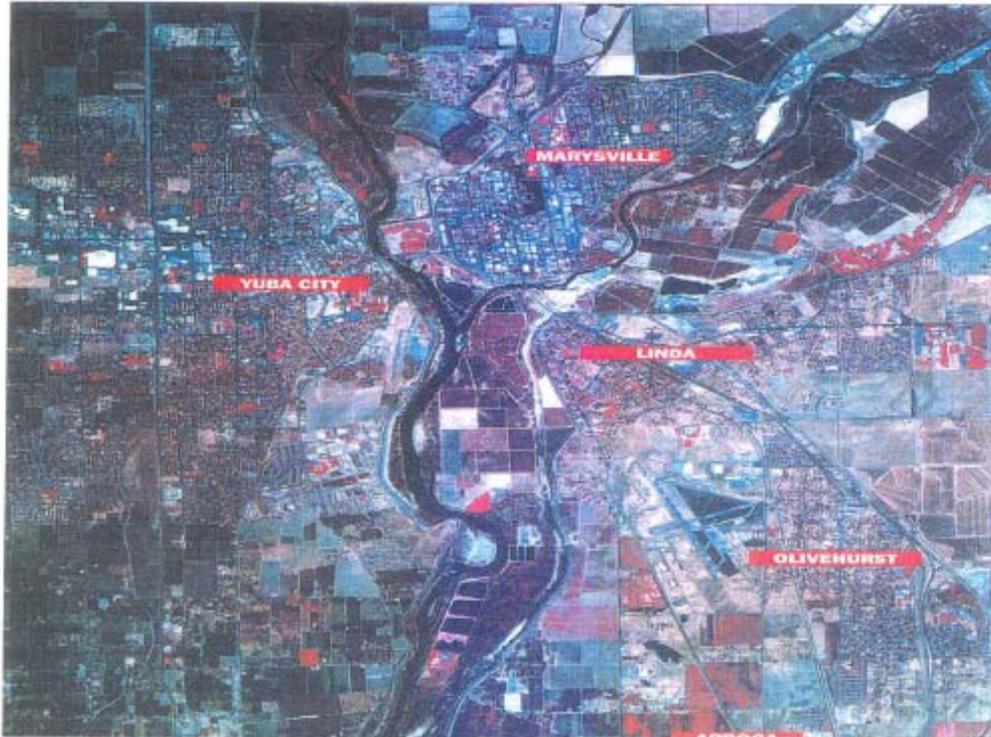
The 1995 floods were caused by two direct downpours which created major surface drainage back-ups at numerous locations throughout the county. Most of the water simply was on the wrong side of the levees. The storms were accompanied by high winds which also contributed significantly to the damage. The two separate events occurred in January and March and resulted in more than \$850,000 in damage to county facilities.

### **1997 Flooding**

A series of storms generated by the “Pineapple Express” dumped warm, heavy rains onto a nearly double than average snow pack in the Sierra Nevada Mountains in late December. Runoff was filling the Shasta, Oroville, and New Bullards Bar Dams. Sutter County was notified by Oroville Dam that uncontrolled releases of huge proportions within the next 24 hours were possible. Sutter County declared an emergency on New Years Day at 11 a.m. and advised residents of voluntary evacuation. As the river continued to rise, the Sutter County Board of Supervisors directed a mandatory evacuation of the Nicolaus area and of all areas east of the Sutter Bypass and south of Pease Road. A break in the levee occurred at Arboga in Yuba County and it brought inundation to southwestern Yuba County. The mandatory evacuation was extended to Pleasant Grove and Robbins was added to the list on January 4<sup>th</sup> due to dangerous levee conditions evolving on the south side of Tisdale Weir. The mandatory evacuation was lifted when the conditions stabilized and residents were allowed to return to the Yuba City area but the levee experienced a massive break in the Sutter Bypass. The town of Meridian was under a mandatory evacuation order and over the next three days earthen berms were constructed on the east and south sides of town which successfully protected it from being flooded. Meridian was the hardest hit area of Sutter County with approximately 50 square miles under water. Virtually every facility in the basin was destroyed or damaged including nearly 100 homes and a school standing in 4 feet of water. A second break in the levee was made at the south end of the basin to allow the waters to return to the Bypass. The mandatory evacuation order was lifted on January 22<sup>nd</sup> and the basin was not dry until June. Even though Sutter County did not experience loss of lives with this flood, the estimated financial losses to individuals and businesses were about \$18 million and agricultural losses exceeded \$5 million, not including long term damage to orchard trees. Losses sustained by public agencies within the county amounted to about \$10 million.

Illustrating the extent of flooding, a before and after aerial photo of the flooding of 1997 is included on the following page.

**1997 Flood Event  
(Before)**



**1997 Flood Event  
(After)**



(Source: Sutter County Public Works)

## Localized Flooding

In addition to the major historic flood events described above, as previously described, the Sutter County Planning Area remains at risk to annual localized flooding. Flood Damage Assessment reports for the 2005-2006 winterstorms/heavy rains illustrates the impacts of some of these localized flooding issues as well as impacts associated with riverine flooding.

A listing of those areas impacted by the 2005-2006 winterstorms include the following sites provided by the Sutter County Department of Public Works:

- Site No. 1: Sacramento Avenue
- Site No. 2: Keys and Natomas Road
- Site No. 3: Fifield Road
- Site No. 4: Howsely Road
- Site No. 5: East Catlett Road
- Site No. 6: Pleasant Grove Road
- Site No. 7: Pleasant Grove Road
- Site No. 8: Nicolaus Avenue
- Site No. 9: Brewer Road
- Site No. 10: Sabaco Road
- Site No. 11: Pennington Road
- Site No. 12: North Butte Road
- Site No. 13: West Butte
- Site No. 14: Kellog Road
- Site No. 15: Pass Road (Segment 1)
- Site No. 16: Pass Road (Segment 2)
- Site No. 17: Pass Road (Segment 3)
- Site No. 18: West Butte Road
- Site No. 19: Robbins Wastewater Treatment Plant
- Site No. 20: Yuba City Boat Ramp
- Site No. 21: Yuba City Boat Ramp Debris Removal

Yuba City also incurred damage as a result of high water events occurring during the 2005-2006 winterstorms from December 17, 2005 through January 3, 2006. Of primary concern to the city was damage associated with two city-owned properties:

- Damage to six effluent percolation ponds on the east side of the Feather River, southeast of the City's Wastewater Treatment Facility. The ponds, composed of graded earthen fill, are an integral part of the wastewater treatment process. Heavy rains and severe storms caused the Feather River to flood its banks, overtopping the adjacent percolation ponds and causing damage to the structure of each of the six ponds. The damages sustained include silt debris deposits, scour along the pond levee slopes and pond bottoms, tearing/displacement of the fabric lining of the ponds, washout of rip rap and fill along the pond slopes, and erosion damage and washout of fill around the concrete spillways of each pond. Similar damages occurred in previous high water events in 1986, 1995, and 1997.
- Damage to the Low Lift Station Access Road which runs along the banks of the Feather River. The roadway, shoulders and embankments are composed of graded and

compacted aggregate base and backfill. Severe storms caused the Feather River to flood over its banks and resulted in major roadway flooding that washed out the roadway, roadway shoulders and integral ground of both along sections of the Low Lift Station Access Road.

### **Past Occurrences Affecting Other Nearby Communities**

Although primarily affecting adjacent Yuba County, the 1986 and 1997 floods were the most significant flooding to occur since the completion of the Oroville Dam in 1964. This historical flood data is important to the Sutter County Planning Area as extreme flood conditions resulted in the failure of a levee that is part of the overall levee system protecting the Planning Area. Under slightly different circumstances, these same flood conditions could have resulted in a levee failure with more of a direct impact to the Sutter County Planning Area. As it was, in addition to the flooding it received, the Planning Area was also impacted through its efforts in assisting with evacuations and in providing shelter to those most affected from neighboring Yuba County. The affects of these flood events on neighboring Yuba County are described briefly below:

#### **1986 Flooding**

The left levee of the Yuba River failed just upstream of the Feather River confluence (RD 784). The communities of Linda and Olivehurst were inundated, resulting in one death, 895 destroyed homes, and 150 destroyed businesses.

#### **1997 Flooding**

The left levee of the Feather River failed near Arboga (RD 784), killing one person, destroying 180 homes and businesses, and prompting evacuation of about 15,000 people from Linda and Olivehurst.

### **Flood Data: California Multi-Hazard Mitigation Plan, 2004**

According to the 2004 Draft California Multi-Hazard Mitigation Plan, Sutter County has experienced 10-11 California proclaimed states of emergency for flood events between 1950 and 1997 as evidenced in the map on the following page. Also, according to the state plan, between 1955 and 2002, Sutter County has experienced 5 federally declared flood disasters.



The state plan also summarized past flood damage to Sutter County by program or claim type. Taken from the state plan, this information is detailed below.

**Hazard Mitigation Grant Program.** Based on data included in the state plan, in response to flood disaster #SW404, Sutter County and Gilsizer County Drainage District, applied for Hazard Mitigation Grant Funds for elevation and flood control projects. In total, three grants were submitted for a total of \$8,050,500; no monies were obligated in response to these grants. A breakdown of the grants is provided below:

- Sutter County – 2 grants
  - \$6,000,000 (Elevation Project)
  - \$1,312,500 (Flood Control Project)
  
- Gilsizer County Drainage District – 1 grant
  - \$738,000 (Flood Control Project)

**Individual Assistance Claims.** Individual Assistance (IA) flood damage claims include both residential and small business flood damage sites where either state or federal assistance was requested. The state plan indicates that Sutter County has an estimated 758 IA damage location properties (with 64 of these falling within the 100-year floodplain). This equates to only 8.44% of all IA flood damage occurring in the 100-year floodplain within Sutter County over the last 10 years.

**Public Assistance Claims.** Under the Public Assistance (PA) Program, FEMA reimburses, on a 75-25 cost share, state and local governments and certain non-profit agencies for disaster response and recovery activities. The state plan identifies 540 Sutter County PA applicants associated with historic floods, with PA eligible funds totaling \$11,974,730.

**Repetitive Loss Properties.** Repetitive loss (RL) refers to those properties insured by the NFIP incurring damages resulting in two or more claims greater than \$1,000 each in a ten year period. The state plan indicates that Sutter County has nine NFIP RL properties; of these eight RL properties are located within the incorporated portions of the county.

## Likelihood of Future Occurrences

**100-year flood – Occasional:** The 100-year flood is the flood that has a one percent chance in any given year of being equaled or exceeded.

**<100-year flood/Outside the 100-year floodplain – Highly Likely:** Based on historic data, flooding events less than a 100-year flood and those outside of the 100-year floodplain occur frequently during periods of heavy rains.

Historically, the current levee system has provided the Sutter County Planning Area with a certain degree of protection from major flood events (i.e., these levees were initially designed to provide protection from the 100-year flood). However, with the recent evaluations and review of levee certifications being conducted as part of the new floodplain mapping, new data is bringing into question the structural integrity and certification of these levees. Until the new DFIRMs have been developed and finalized for the entire Sutter County Planning Area and additional

evaluation and repairs to both the levees and local drainage systems have been completed, it is difficult to exactly predict the nature and extent of future flooding within the Planning Area. Although, one thing is for certain, seasons of prolonged heavy rainfall will continue to occur throughout the Planning Area creating a wide range of flooding conditions.

## DAM FAILURE

### Hazard/Problem Description

Dams are man-made structures built for a variety of uses including flood protection, power, agriculture, water supply, and recreation. When dams are constructed for flood protection, they usually are engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If a larger flood occurs, then that structure will be overtopped. Overtopping is the primary cause of earthen dam failure in the United States. Failed dams can create floods that are catastrophic to life and property as a result of the tremendous energy of the released water. A catastrophic dam failure could easily overwhelm local response capabilities and require mass evacuations to save lives. Impacts to life safety will depend on the warning time available and the resources to notify and evacuate the public. Major loss of life could result and there could be associated health concerns as well as problems with the identification and burial of the deceased.

Dams typically are constructed of earth, rock, concrete, or mine tailings. Three factors that influence the potential severity of a full or partial dam failure include:

- The amount of water impounded,
- The density, type, and value of development and infrastructure located downstream, and
- The onset/speed of failure.

Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, resulting in overtopping flows,
- Earthquake,
- Inadequate spillway capacity, resulting in overtopping flows,
- Internal erosion caused by embankment or foundation leakage or piping,
- Improper design,
- Improper maintenance,
- Negligent operation, and/or
- Failure of upstream dams on the same waterway.

There is only one dam located within Sutter County which is under the jurisdiction of the California, DWR, Division of Safety of Dams (DSD). This is Steidlmayer #3 dam which is located in the northwest interior of the Sutter Buttes. It is relatively small in size and a failure of this dam would result in minimal property damage. There are however, 10 larger dams located outside the county which, if they fail, can impact the people and resources in the Sutter County

Planning Area. According to information included in the Sutter County Background Report to the General Plan, a break in any one of the dams detailed in the following table could cause significant flooding in Sutter County. These dams have been designed and constructed for a variety of purposes with a wide range of capacities.

<b>Dams under State Jurisdiction with Potential to Flood Sutter County</b>				
<b>Dam</b>	<b>Owner</b>	<b>Stream</b>	<b>Type</b>	<b>Capacity (Acre Feet)*</b>
Oroville Dam	State DWR	Feather River	Earth	3,537,577
New Bullards Bar Dam	Yuba County Water Agency	Yuba River	Variable Radius Arch	969,600
Camp Far West Dam	South Sutter Water District	Bear River	Earth & Rock	103,000
Lake Almanor Dam	Pacific Gas & Electric	Feather River	Hydraulic Fill	1,308,000
Thermalito Afterbay Dam	State DWR	Feather River	Earth	57,041
Thermalito Forebay Dam	State DWR	Feather River	Earth	11,768
Shasta Dam	US Bureau of Reclamation	Sacramento River	Gravity	4,552,000
Whiskeytown Dam	US Bureau of Reclamation	Clear Creek (Sacramento River)	Gravity	241,100
Folsom Dam	US Bureau of Reclamation	American River	Gravity	1,010,000
Englebright Dam	Corps of Engineers	Yuba River	Variable	70,000

(Source: Sutter County General Plan Background Report)

\*One Acre Foot=326,000 gallons

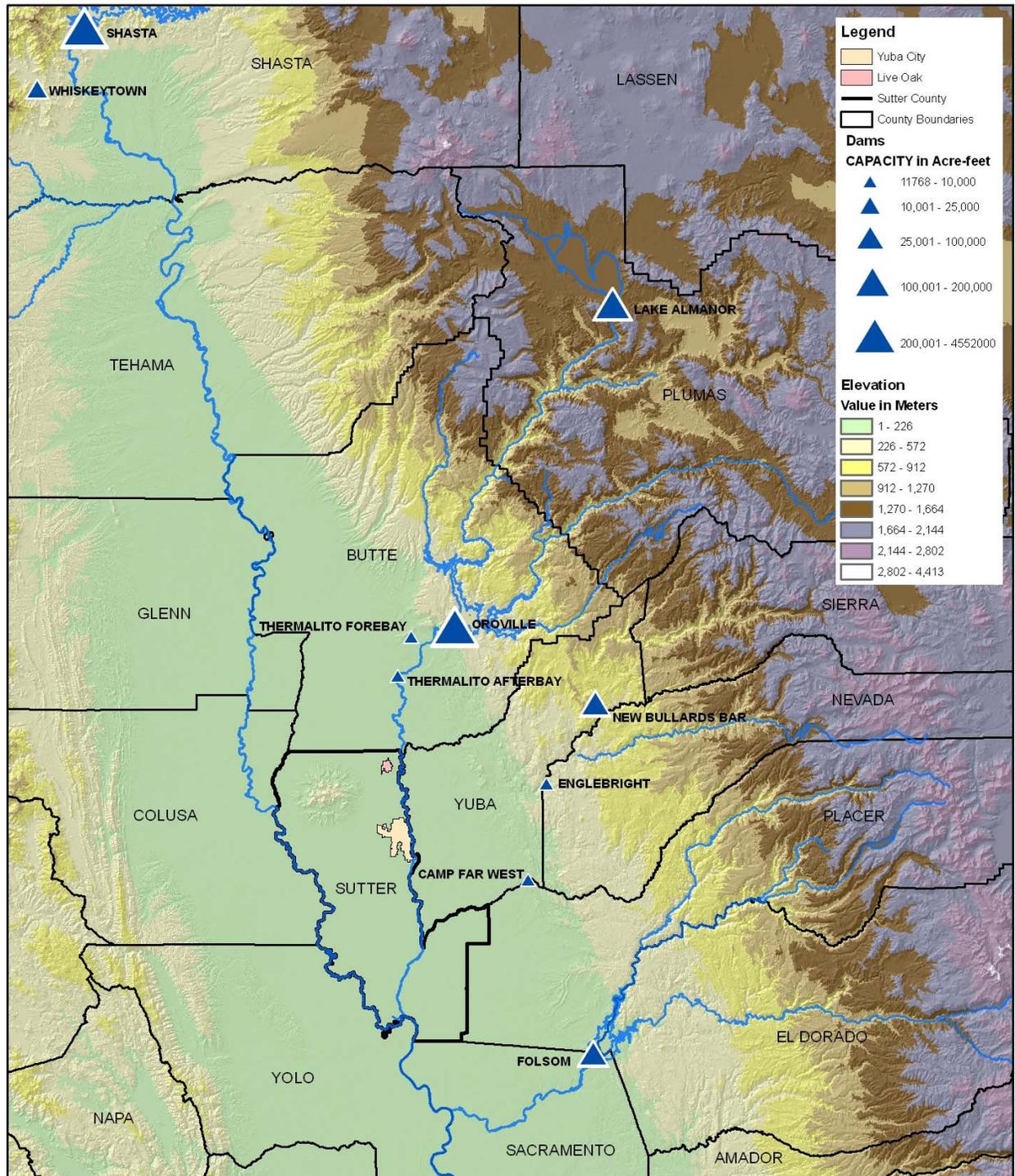
The Draft 2006 Sutter County Operational Area EOP, Annex 5 – Floods and Dam Failure refines this analysis further. According to the 2006 EOP, a catastrophic failure of four of these 10 dams would have a significant impact on Sutter County and the Sutter County Planning Area.

- Shasta
- Oroville
- Bullards Bar
- Camp Far West

The EOP indicates that with a failure of any one of these dams, “complete devastation could occur in and along the river bottoms to up their banks several hundred feet above normal river levels at a point from the dams themselves down river to near the ocean where the rivers widen. Water levels could be many times higher than those recorded in the worst floods.” (2006 EOP, p. 12.)

The following map illustrates the locations of identified dams of concern within and surrounding Sutter County.

# Dams of Concern to Sutter County



**amec**  
 Map Compilation: AMEC 10/19/06  
 Data Source: Sutter County, CA OES



## **Past Occurrences**

According to the HMPC, there have been no dam failures within or affecting the Yuba-Sutter Planning Area. However, during the winterstorms and flooding of 1996 and 1997, the Oroville Dam reportedly came very close to overtopping.

## **Likelihood of Future Occurrences**

*Unlikely:* Historically, there have been no dam failure flood events in the Yuba-Sutter Planning Area. The 2006 EOP notes that, “All area dams have performed well during past disasters and are expected to exceed their design limits during future events.” (2006 EOP, p. 12) However, the county remains at risk to dam failures from numerous dams under a variety of ownership and control and of varying ages and conditions. As a result, the potential exists for future dam failures in the Yuba-Sutter Planning Area.

## 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 1 and 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.

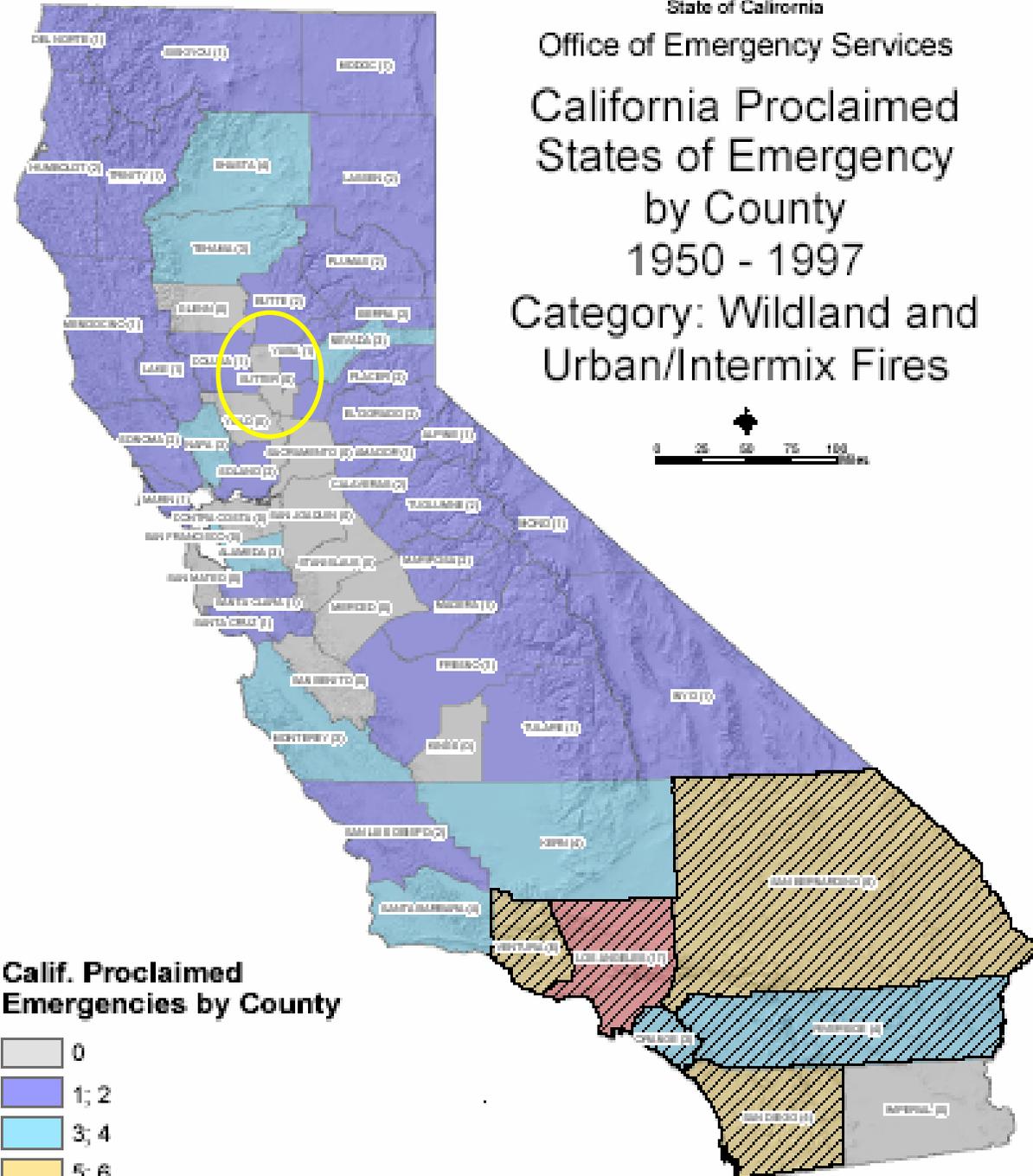
### **City of Live Oak**

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  
 Mar. 25, 2004  
 File: d:\data\ca\_emer\state\_emer.nsh  
 CA\_State\_Emergencies\_1950  
 \_1997\_agricultural.mxd. atlgene

## 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	<i>INSTRUMENTAL</i> : detected only by seismographs	3.5
II	<i>FEEBLE</i> : noticed only by sensitive people	4.2

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

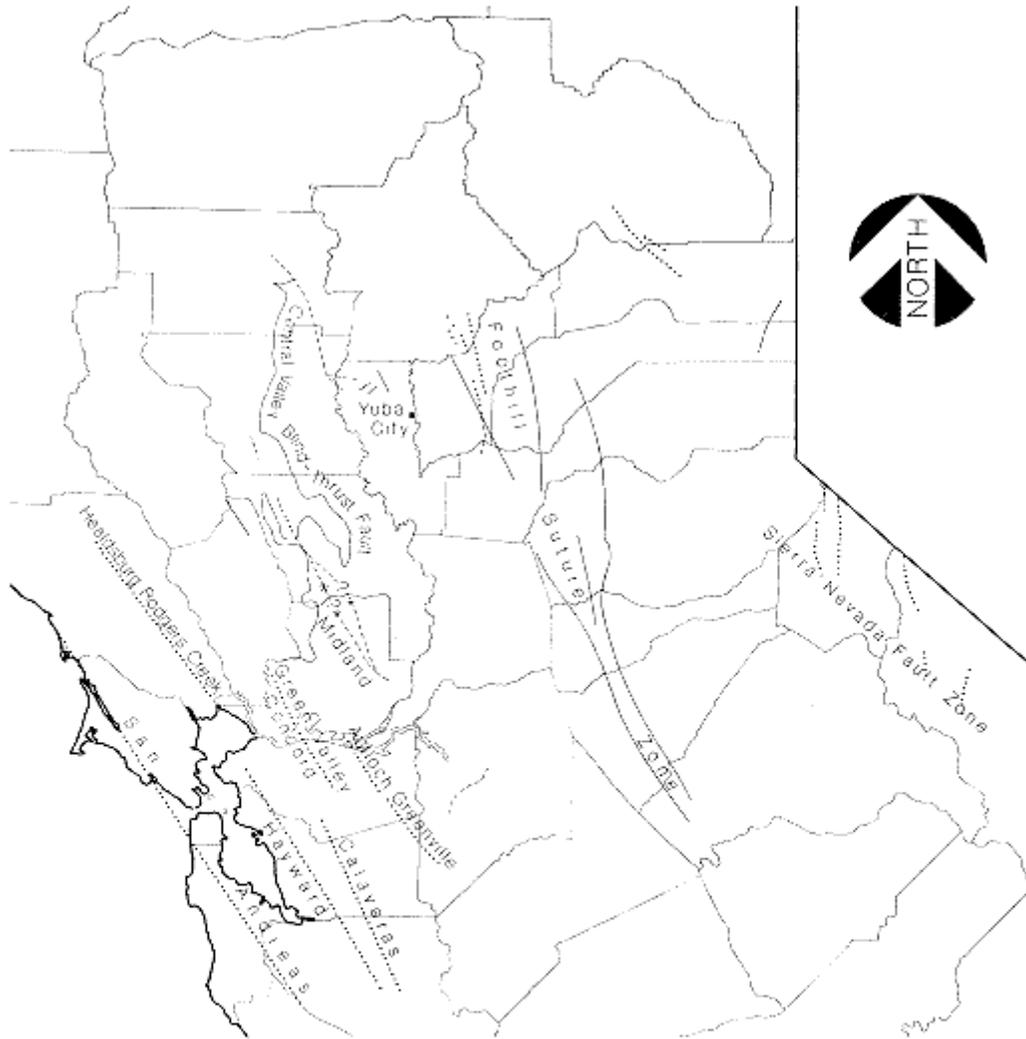
Moderate to large earthquakes in the Foothills Suture Zone along the west slope of the Sierra Nevada are relatively rare. However, a magnitude M 5.7 earthquake occurred in 1975 on the Cleveland Hill Fault in the northern portion of the Zone, in Butte County. This fault up to that time had not been considered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



# SUTTER COUNTY

### LEGEND

- ..... Fault
- Approximately Located or Inferred Fault
- ..... Fault Concealed by Younger Rocks
- ?--- Fault Continuation or Existence Uncertain
- Epicenter of 1892 Sequence

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

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

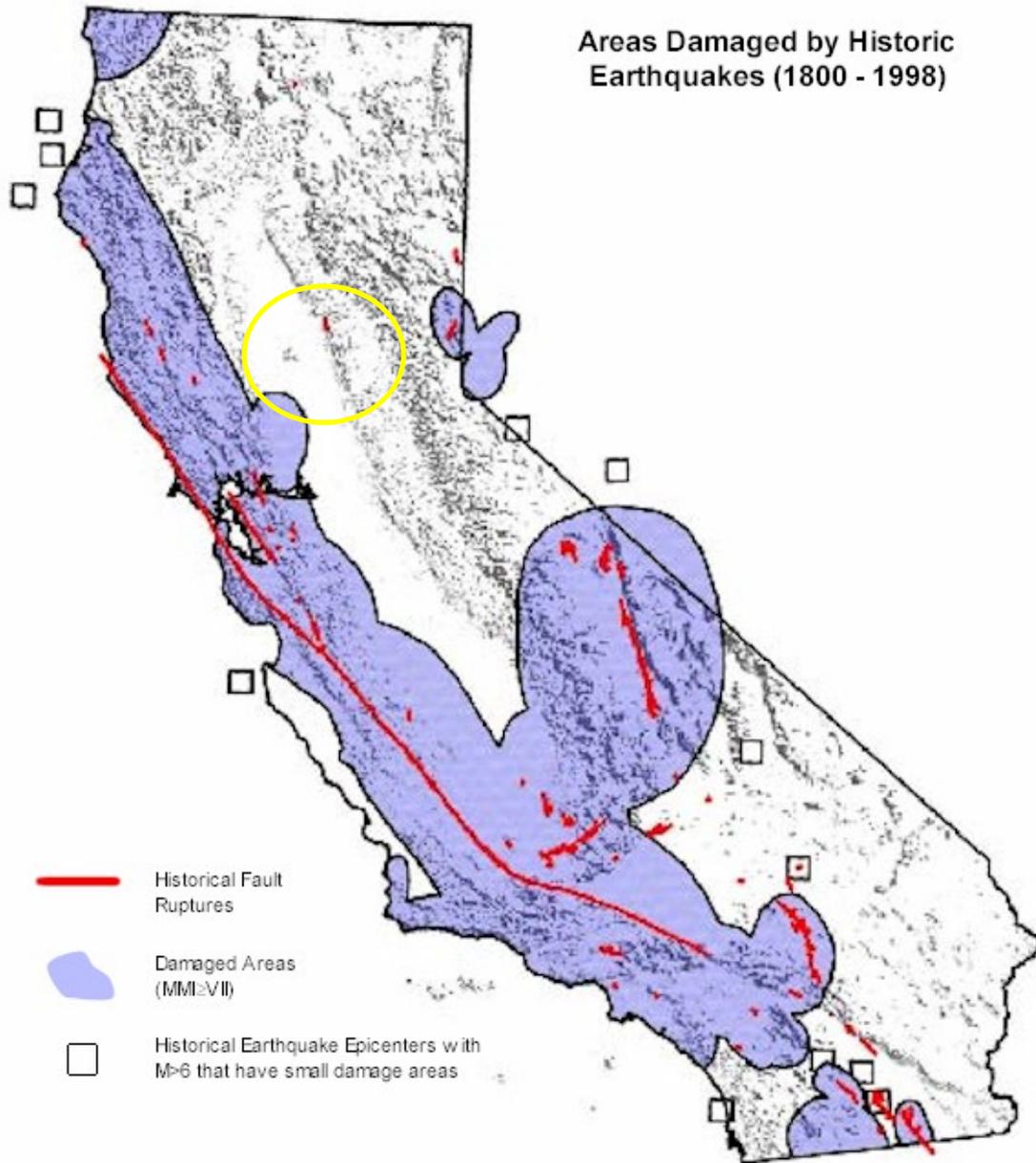
### **Past Occurrences**

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.



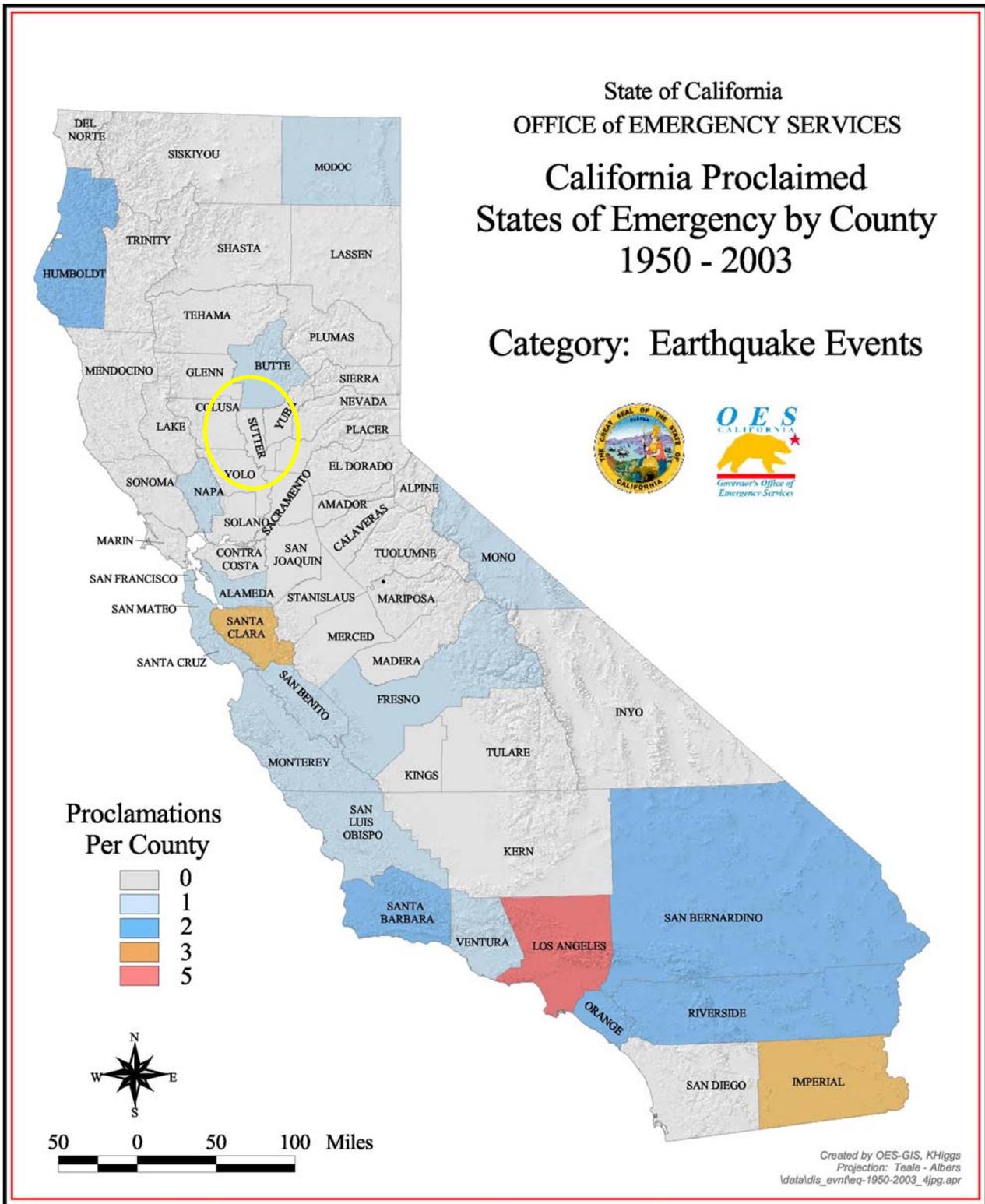
(Source: <http://www.consrv.ca.gov/CGS/rghm/psha/ofr9608/index.htm#Faults%20in%20California>)

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.

State of California  
OFFICE of EMERGENCY SERVICES

California Proclaimed  
States of Emergency by County  
1950 - 2003

Category: Earthquake Events



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

## **Likelihood of Future Occurrences**

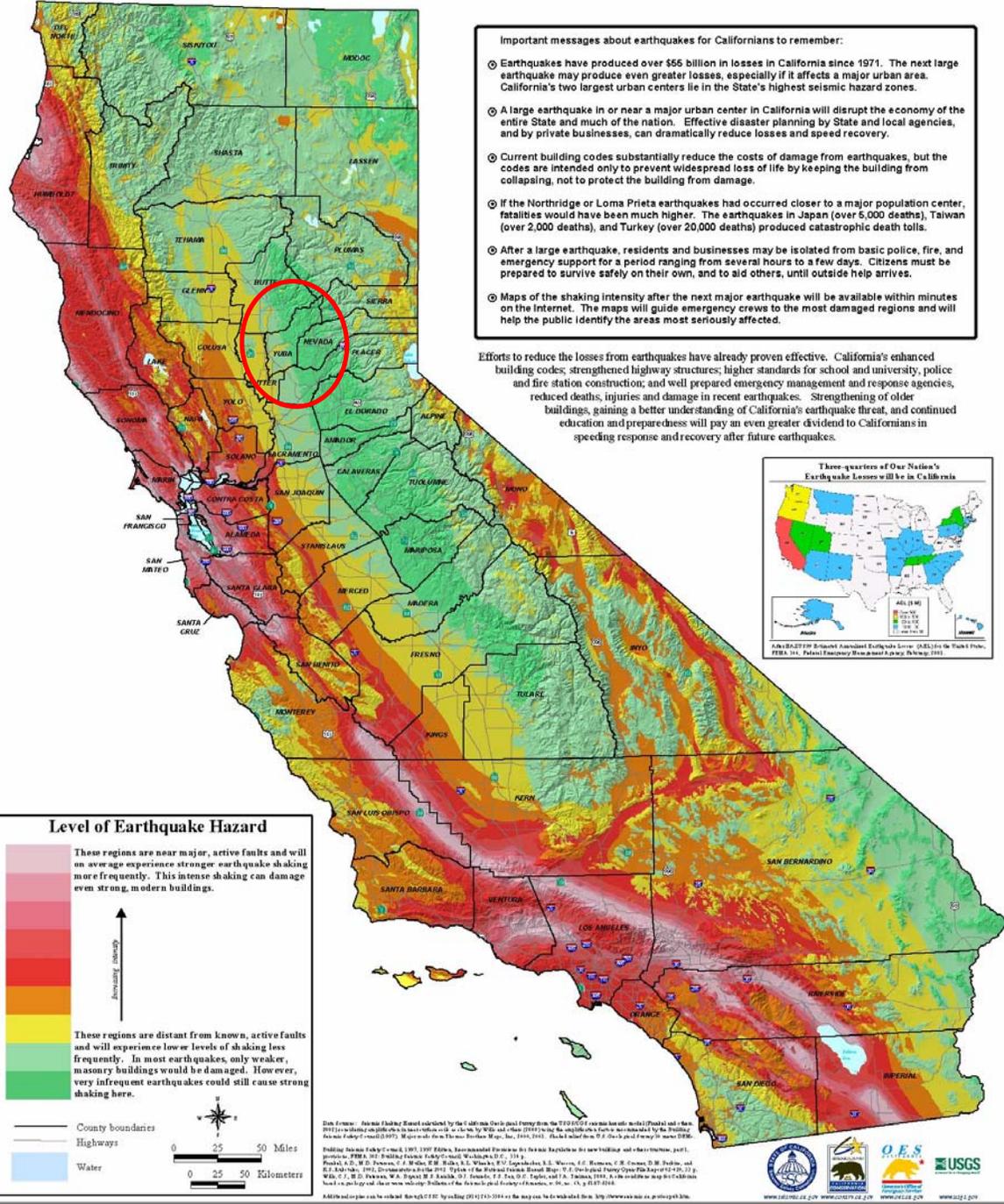
***Unlikely:*** No major earthquakes have been recorded within the county; although the county has felt ground shaking from earthquakes with epicenters located elsewhere. Based on historical data and the location of the Sutter County Planning Area relative to active and potentially active faults, it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

# 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 \$56 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.



**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.

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.

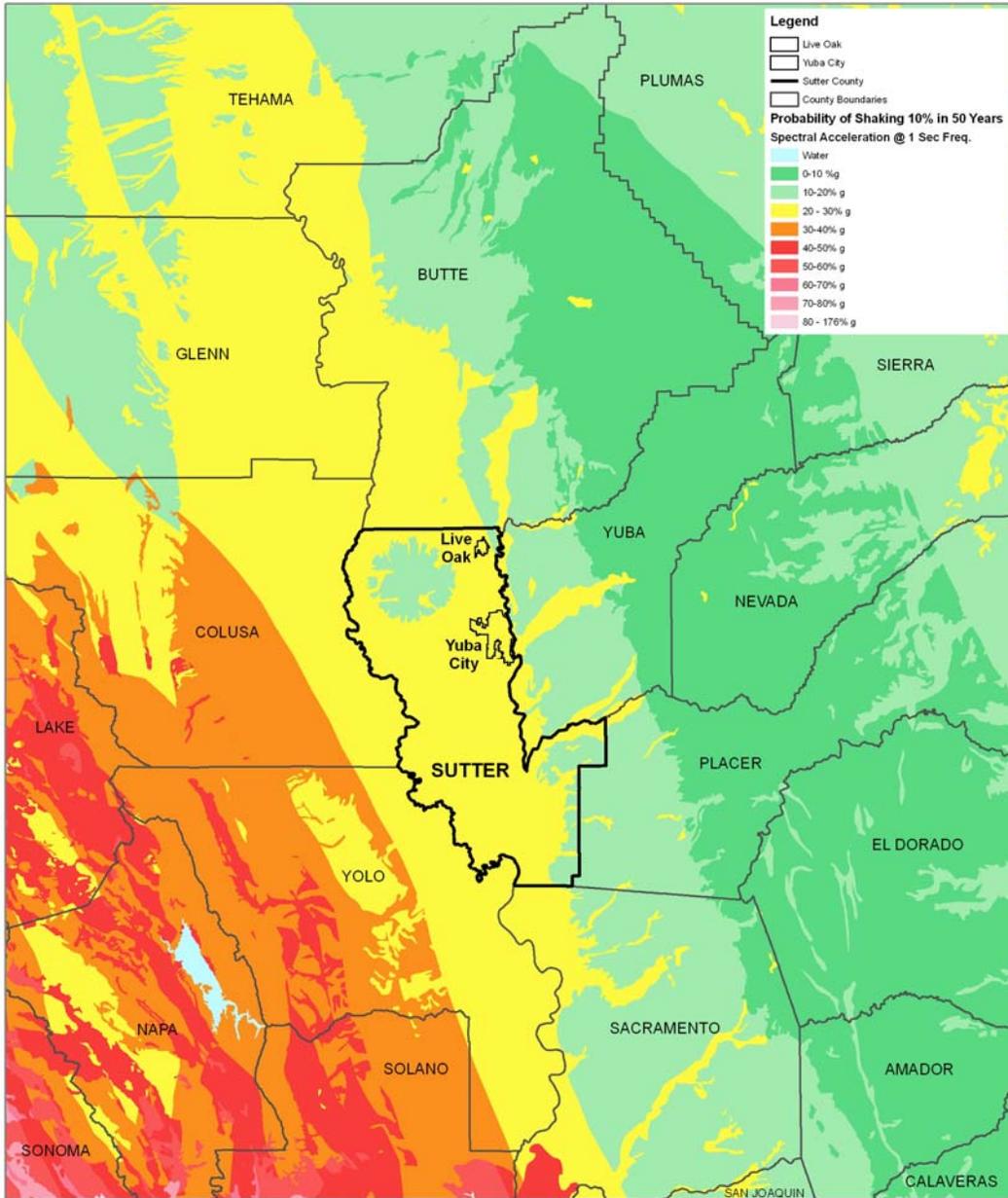
County boundaries  
Highways  
Water

0 25 50 Miles  
0 25 50 Kilometers

State of California - Seismic Hazard Report prepared by the California Geological Survey from the 2001 California Seismic Hazard Survey (CSHS) and the 2001 California Seismic Hazard Survey (CSHS) Report. The map was prepared by the California Geological Survey. The map was prepared by the California Geological Survey. The map was prepared by the California Geological Survey.



# Sutter County Earthquake Shaking Map



Map Compilation: AMEC 10/19/06  
Data Source: Sutter County, CA OES



## 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)

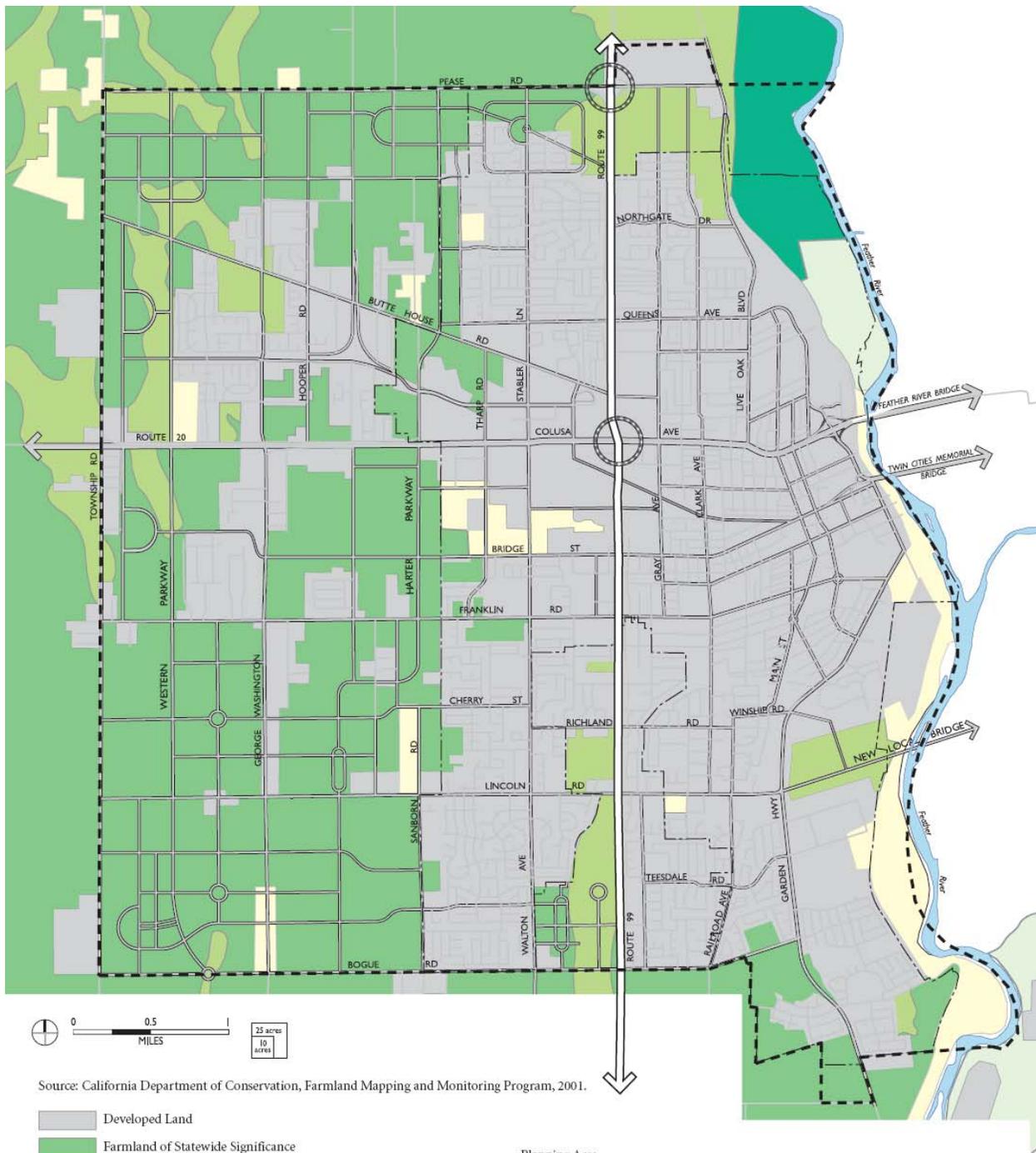


Figure 8-1  
Farmlands

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 (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 (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 (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 (Placer*)	6/15/03-11/15/03	05/17/04
Aug. rain, poor winter chill, high heat (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 (Placer*)	7/19/2005	N/A
Unseasonable Heavy Rain (Yuba*)	5/9-5/19/05	10/04/05
Unseasonable Rain*	5/8-5/19/05	08/25/05
Hail and Late Rain (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 (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:

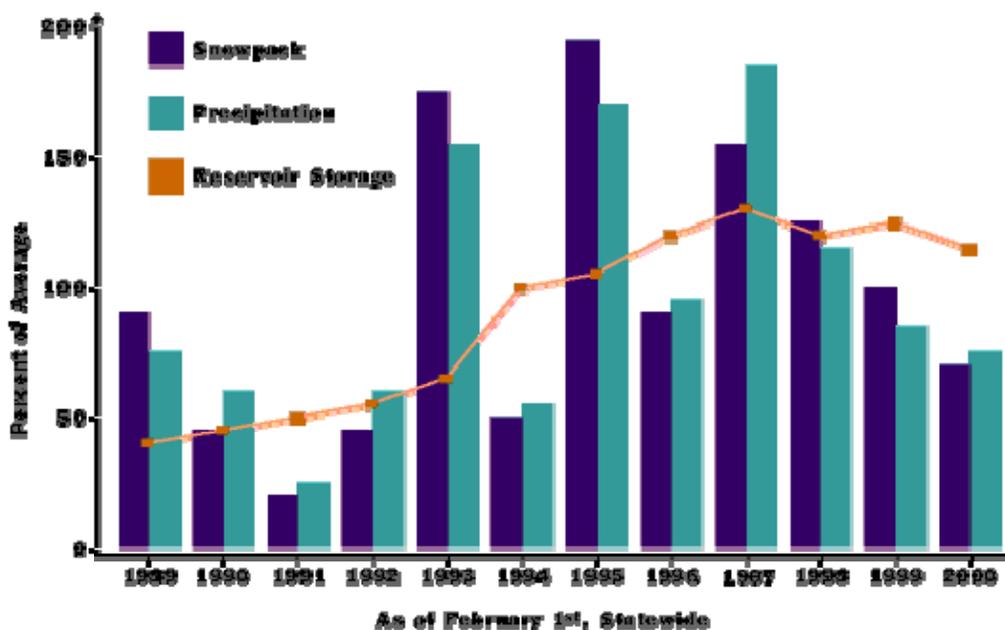
- Meteorological – this type of drought is usually defined by a period of below average water supply.
- Agricultural – this type of drought occurs when there is an inadequate water supply to meet the needs of the state’s crops and other agricultural operations such as livestock.
- Hydrological – a hydrological 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.

## Indicators of Water Conditions



(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

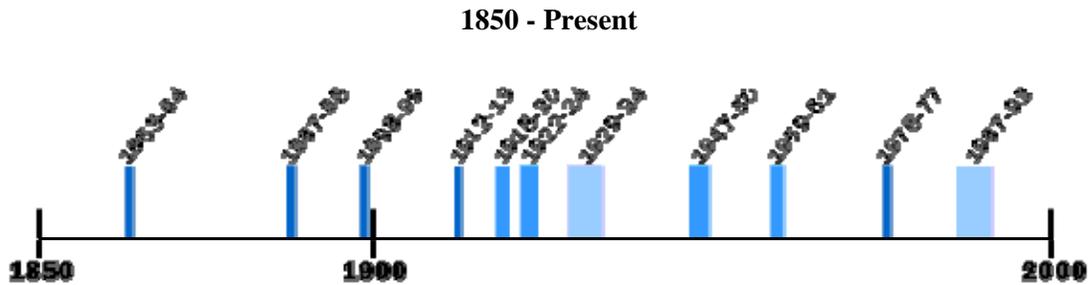
reservoirs. The table that follows compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to the 1976-77 and 1987-92 droughts. The driest single year of California's measured hydrologic record was 1977. California's most recent multi-year drought was 1987-92.

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



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:

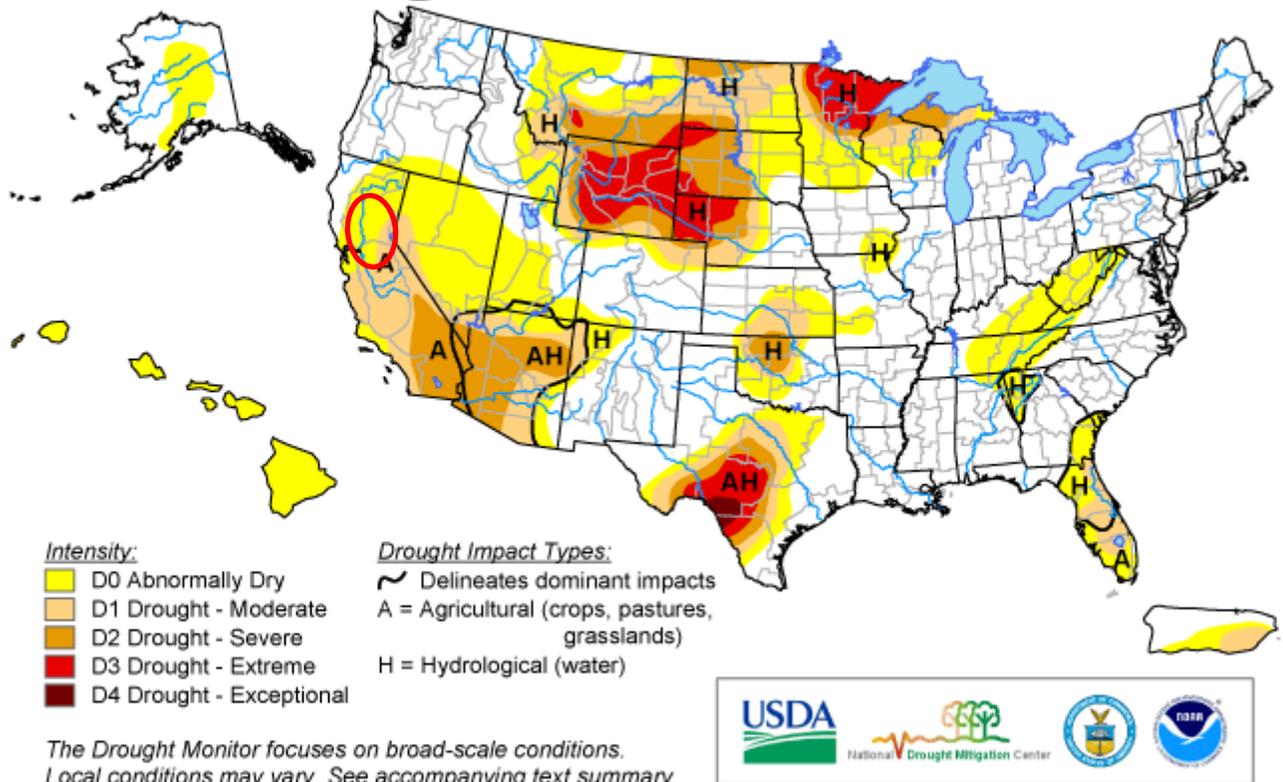
- In 1976, a Federal Disaster Declaration was declared as a result of a drought affecting Sutter County and much of California.
- 2002 drought conditions existed within Sutter County, with severe impacts to the agricultural industry. The USDA granted a Secretarial Disaster Designation listing Sutter 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.

# U.S. Drought Monitor

February 6, 2007  
Valid 7 a.m. EST



Released Thursday, February 8, 2007

Author: Mark Svoboda, National Drought Mitigation Center

<http://drought.unl.edu/dm>

## 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 and 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.

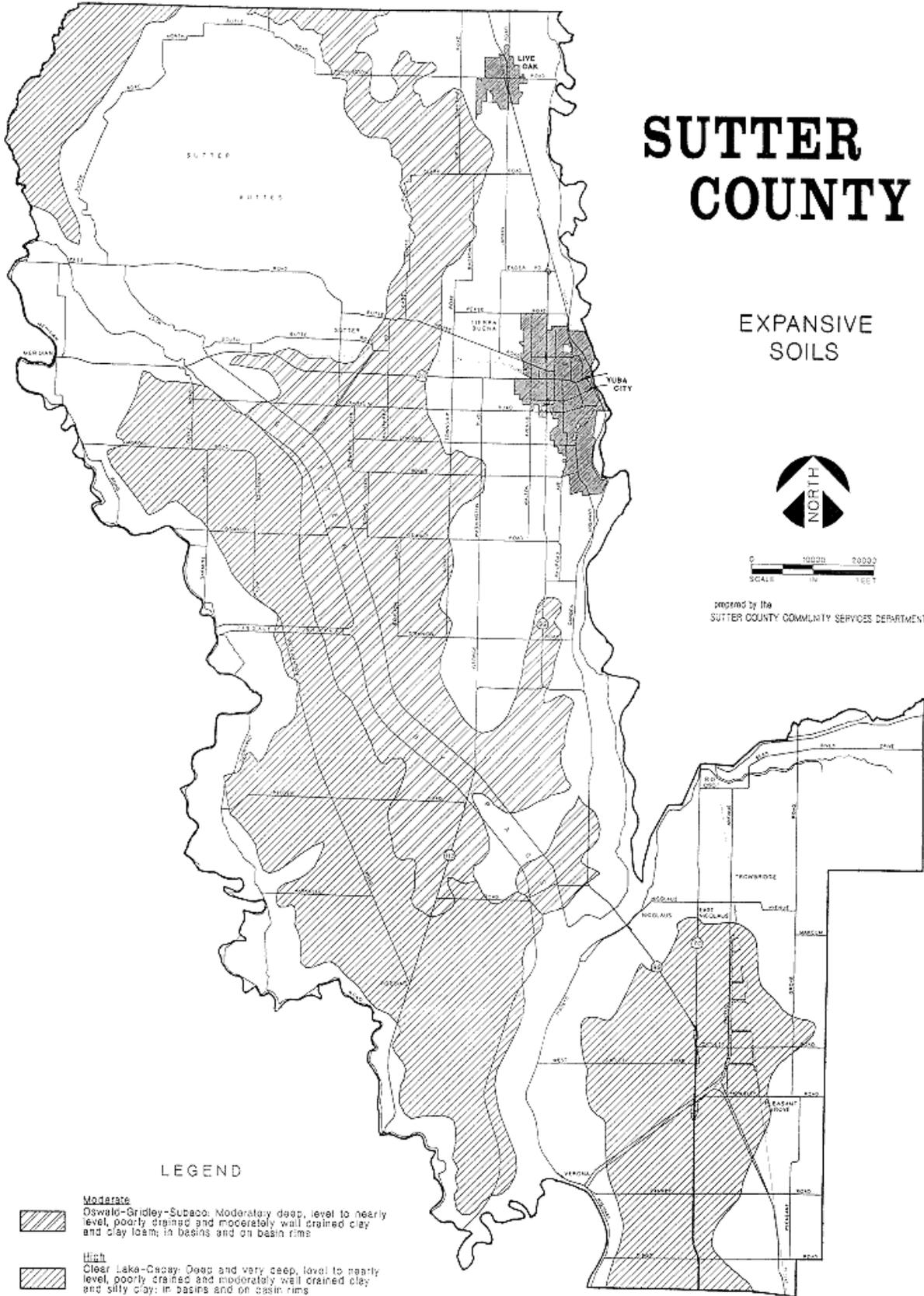
Damages can include severe structural damage; cracked driveways, sidewalks, heaving of roads and highway structures; and disruption of pipelines and other utilities. Destructive forces may be upward, horizontal, or both. Building in and on swelling soils can be done successfully, although more expensively,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



### 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-Cacoy: 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.

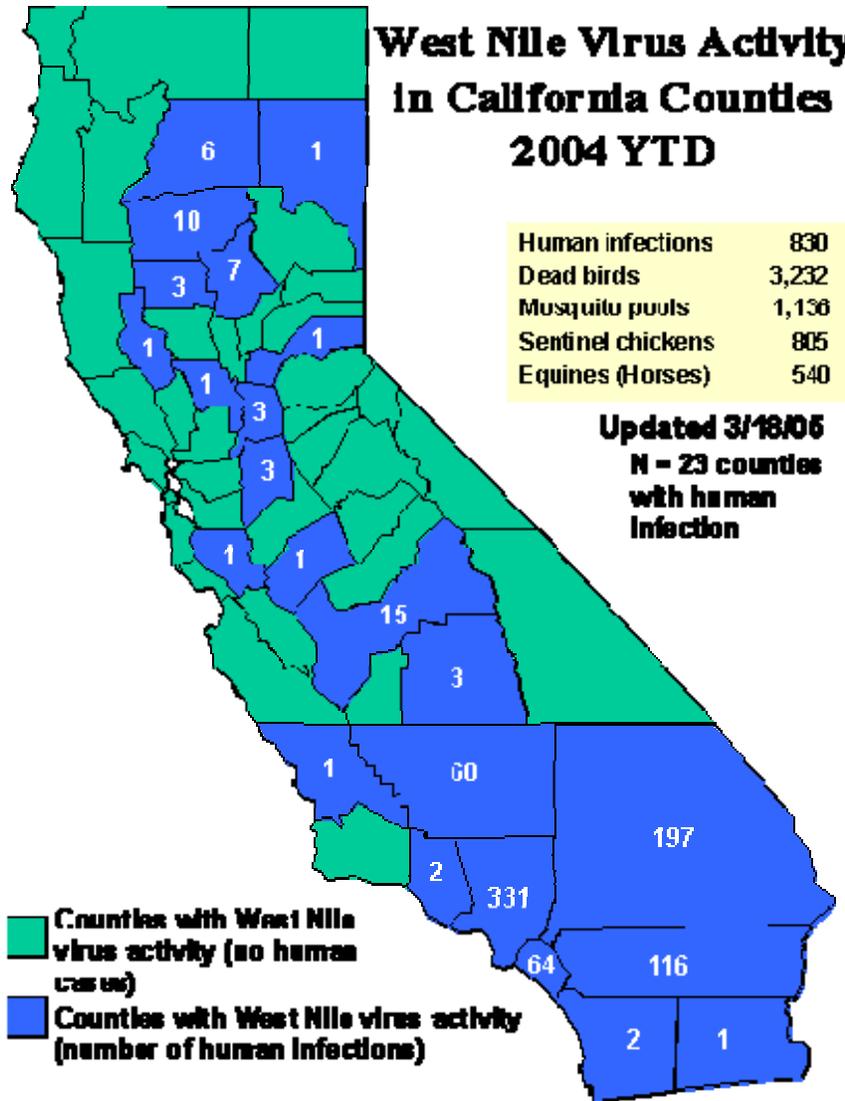
The table below summarizes WNV activity in Sutter County for the years 2004 through 2006.

**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
<b>2004</b>	830	0	3,232	28	1,136	8	540	11	809	12
<b>2005</b>	935	9	3,046	9	1,242	43	456	1	1,053	32
<b>2006</b>	276	12	1,446	2	832	55	58	1	640	36

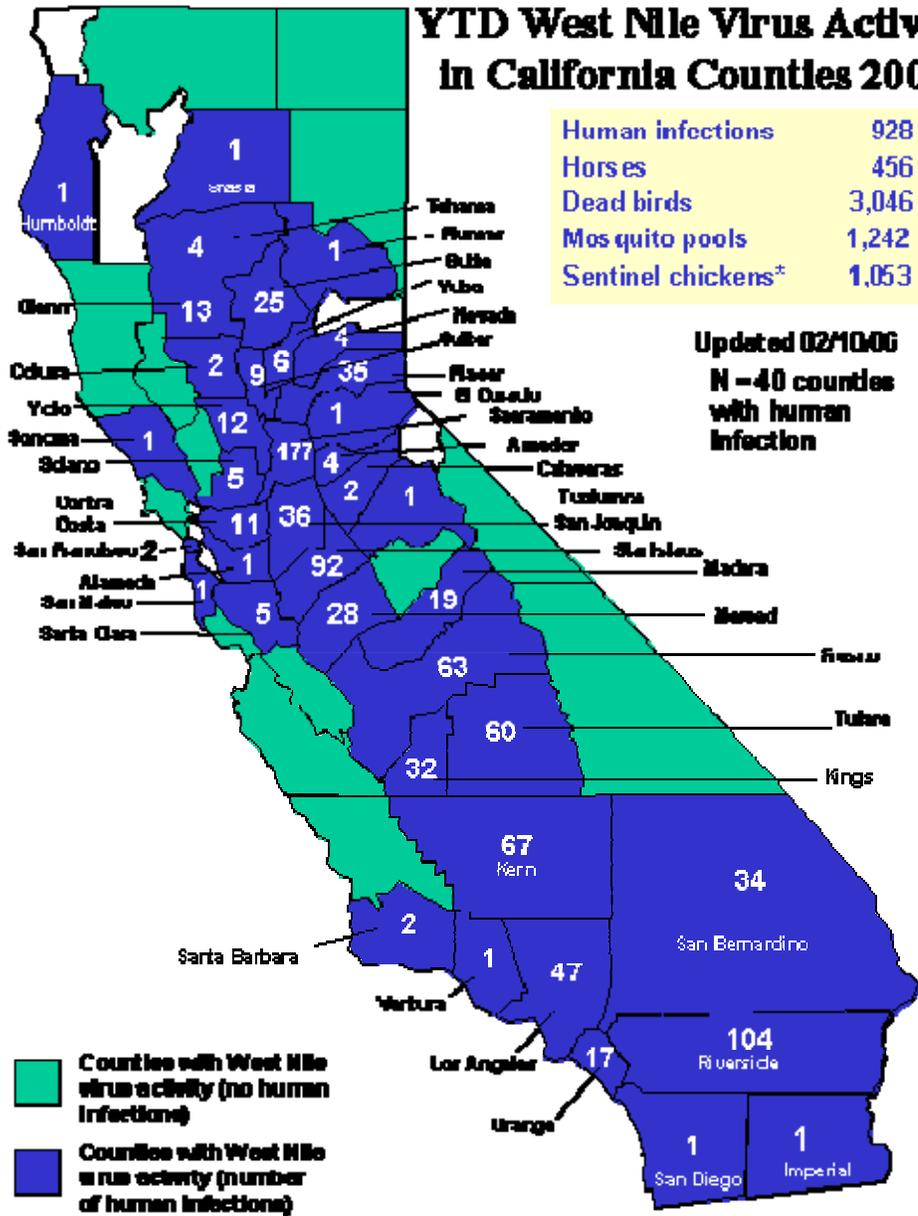
Taken from the California WNV website, WNV activity in California (and Sutter County) for 2004, 2005 and 2006 are illustrated in the maps on the following pages.

## West Nile Virus Activity in California Counties 2004 YTD

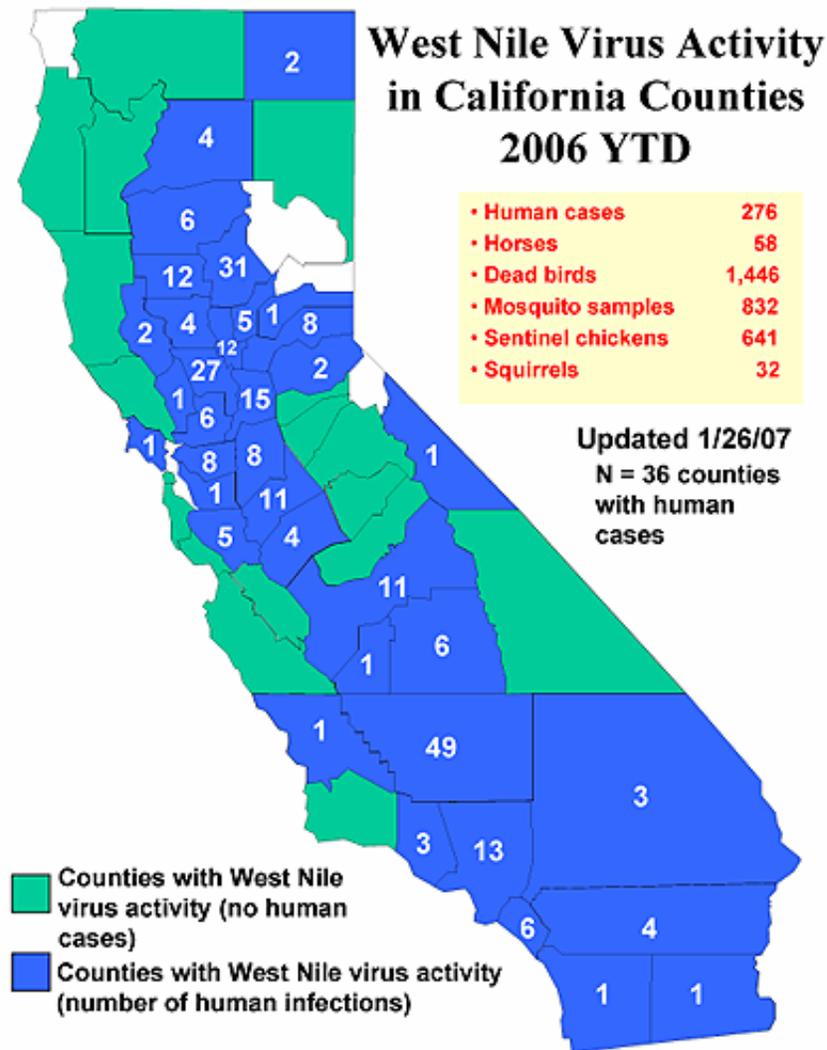


(Source: [http://westnile.ca.gov/2005\\_maps.htm](http://westnile.ca.gov/2005_maps.htm))

# YTD West Nile Virus Activity in California Counties 2005



(Source: [http://westnile.ca.gov/2005\\_maps.htm](http://westnile.ca.gov/2005_maps.htm))



(Source: [http://westnile.ca.gov/2006\\_maps.p](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**

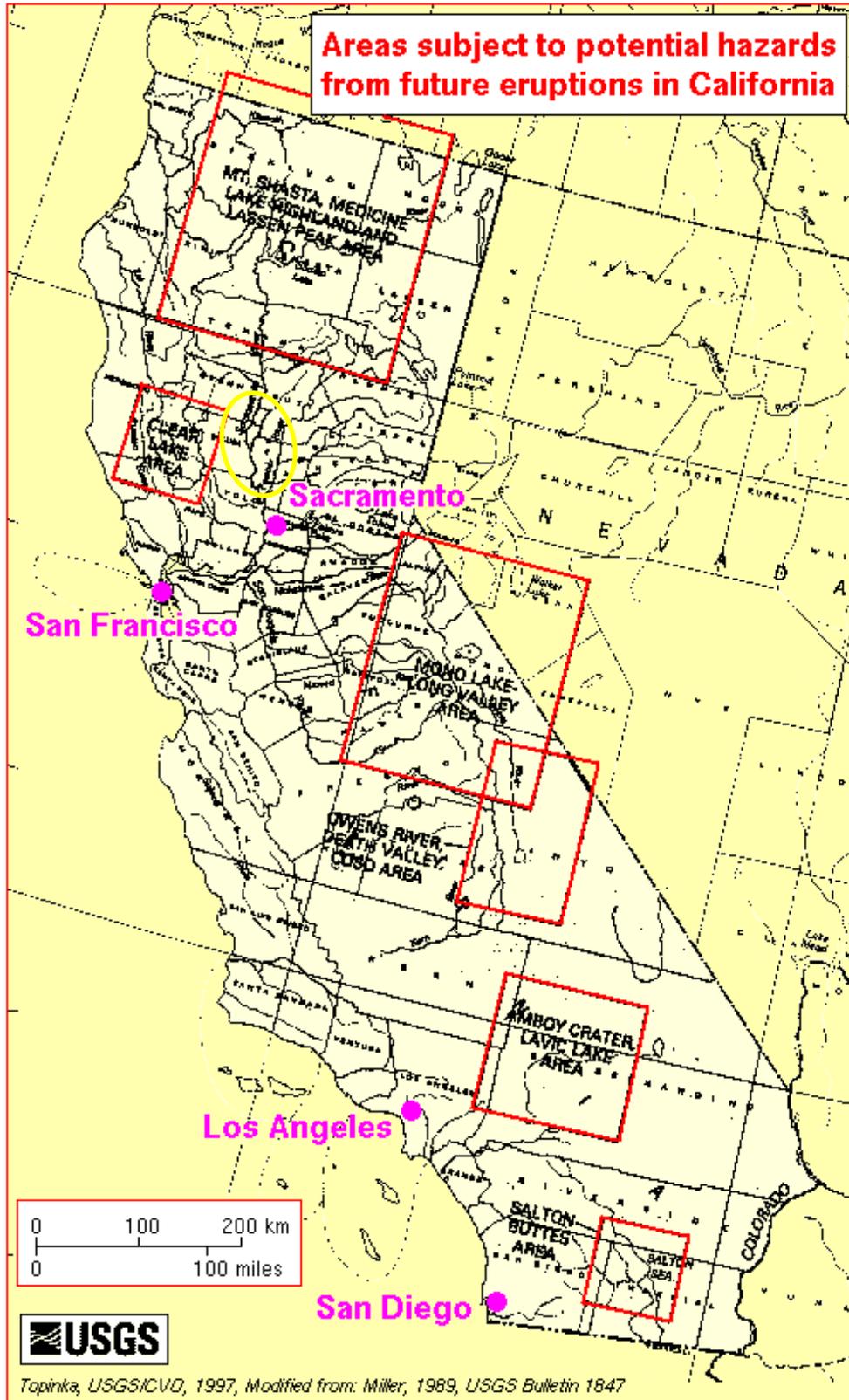


## **Past Occurrences**

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.

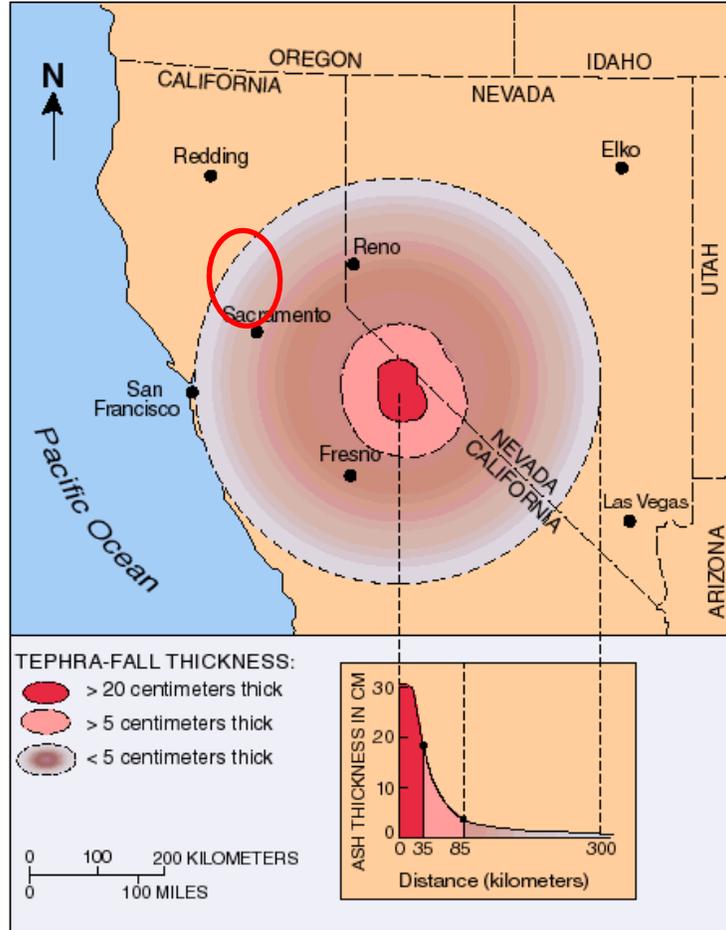
## **Likelihood of Future Occurrences**

***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](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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# Multi-Hazard Mitigation Plan

## 4.2 Vulnerability Assessment

As the second part of the risk assessment process, the HMPC conducted a vulnerability assessment to describe the impact that each hazard identified in the preceding section would have upon the Sutter County Planning Area. The vulnerability assessment was conducted, based on the best available data and significance of the hazard. This assessment is an attempt to quantify assets at risk, by jurisdiction where possible, to further define populations, buildings, and infrastructure at risk to natural hazards. The vulnerability assessment for this Countywide Multi-Hazard Mitigation Plan followed the methodology described in the FEMA publication 386-2 “*Understanding Your Risks – Identifying Hazards and Estimating Losses*” (FEMA, 2002) and addressed steps 3 and 4, where data permits, of the following four-step process:

- (1) Identify hazards
- (2) Profile hazard events
- (3) **Inventory assets and**
- (4) **Estimate losses.**

The scope of the vulnerability assessment is to describe the risks to the county as a whole. Data from each jurisdiction was also evaluated and is integrated here in the jurisdictional elements, and noted where the risk differs for a particular jurisdiction across the Planning Area.

Further, at the beginning of each of the hazard-specific sections, an estimate of the vulnerability of the Sutter County Planning Area to each significant hazard, in addition to the estimate of risk or likelihood of future occurrence, is provided.

The DMA regulations require that the HMPC evaluate the risks associated with each of the hazards identified through the planning process. However, as previously described in Section 4.1, only those risks identified as significant are further evaluated in this section. The hazards evaluated further as part of this vulnerability assessment include, in alphabetical order:

- Agricultural Hazards
- Dam Failure
- Drought
- Earthquakes
- Floods
- Severe Weather

- Extreme Temperatures
- Winterstorms: Heavy Rains/Thunderstorms/Wind/Hail/Lightning
- Soil/Geologic Hazards
  - Erosion
- West Nile Virus
- Wildfires

## SUTTER COUNTY PLANNING AREA TOTAL VULNERABILITY AND VALUES AT RISK

As a starting point for analyzing the Planning Area’s vulnerability to identified hazards, the HMPC utilized a variety of data to define a baseline against which all disaster impacts could be compared. If a catastrophic disaster were to occur in the Planning Area, this section describes significant assets at risk in the Planning Area. Data used in this baseline assessment included:

- Total Values at Risk
- Critical Facility Inventory
- Cultural and Natural Resource Inventory
- Development Trends

### **Total Values at Risk**

The following data obtained from the Sutter County Assessor’s office is based on the Certified Roll Values for 2006. This data should be used as a guideline to overall values in the county, as the information has some limitations. The most significant limitation is created by proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties within the county. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. The total 2006 Roll Values for Sutter County are provided in the following tables.

CITY OF YUBA CITY 2006 Roll Values							
Property Type	Units Improved	Total Improved Value	Total Improved Land Value	Units Unimproved	Total Unimproved Land Value	Grand Totals	
						Units	\$
Residential	15,893	\$ 2,364,181,182	\$ 720,568,875	35	\$ 4,198,380	15,928	\$ 3,088,948,437
Commercial	793	\$ 462,986,037	\$ 168,461,437	115	\$ 41,274,950	908	\$ 672,722,424
Industrial	305	\$ 98,995,131	\$ 30,322,762	88	\$ 21,859,440	393	\$ 151,177,333
Agricultural	40	\$ 4,851,612	\$ 4,525,987	14	\$ 3,168,316	54	\$ 12,545,915
Institutional	101	\$ 95,232,482	\$ 10,728,610	138	\$ 12,425,746	239	\$ 118,386,838
Other	48	\$ 6,090,314	\$ 2,115,466	945	\$ 56,343,411	993	\$ 64,549,191
<b>Total</b>	<b>17,180</b>	<b>\$ 3,032,336,758</b>	<b>\$ 936,723,137</b>	<b>1,335</b>	<b>\$ 139,270,243</b>	<b>18,515</b>	<b>\$ 4,108,330,138</b>

CITY OF LIVE OAK 2006 Roll Values							
Property Type	Units Improved	Total Improved Value	Total Improved Land Value	Units Unimproved	Total Unimproved Land Value	Grand Totals	
						Units	\$
Residential	1,790	\$ 177,821,695	\$ 65,617,918	-	\$ -	1,790	\$ 243,439,613
Commercial	61	\$ 13,866,546	\$ 3,362,066	21	\$ 734,075	82	\$ 17,962,687
Industrial	9	\$ 7,061,320	\$ 1,172,035	1	\$ 14,353	10	\$ 8,247,708
Agricultural	16	\$ 1,243,271	\$ 894,090	15	\$ 9,027,369	31	\$ 11,164,730
Institutional	29	\$ 5,577,812	\$ 748,192	46	\$ 341,800	75	\$ 6,667,804
Other	13	\$ 1,212,626	\$ 607,593	719	\$ 9,188,362	732	\$ 11,008,581
<b>Total</b>	<b>1,918</b>	<b>\$ 206,783,270</b>	<b>\$ 72,401,894</b>	<b>802</b>	<b>\$ 19,305,959</b>	<b>2,720</b>	<b>\$ 298,491,123</b>

UNINCORPORATED SUTTER COUNTY 2006 Roll Values							
Property Type	Units Improved	Total Improved Value	Total Improved Land Value	Units Unimproved	Total Unimproved Land Value	Grand Totals	
						Units	\$
Residential	4,801	\$ 534,420,864	\$ 189,438,365	8	\$ 158,065	4,809	\$ 724,017,294
Commercial	122	\$ 29,854,420	\$ 13,105,122	31	\$ 2,005,448	153	\$ 44,964,990
Industrial	129	\$ 430,677,636	\$ 22,699,038	64	\$ 2,834,424	193	\$ 456,211,098
Agricultural	3,688	\$ 354,782,090	\$ 607,557,286	2,595	\$ 420,964,402	6,283	\$ 1,383,303,778
Institutional	100	\$ 26,000,444	\$ 8,981,493	442	\$ 12,157,995	542	\$ 47,139,932
Other	52	\$ 2,476,133	\$ 2,543,252	607	\$ 9,463,670	659	\$ 14,483,055
<b>Total</b>	<b>8,892</b>	<b>\$ 1,378,211,587</b>	<b>\$ 844,324,556</b>	<b>3,747</b>	<b>\$ 447,584,004</b>	<b>12,639</b>	<b>\$ 2,670,120,147</b>

Combining the values of all properties within the incorporated and unincorporated portions of the county results in the following total values at risk:

SUTTER COUNTY 2006 Roll Values Total Values at Risk							
Property Type	Units Improved	Total Improved Value	Total Improved Land Value	Units Unimproved	Total Unimproved Land Value	Grand Totals	
						Units	\$
Yuba City	17,180	\$ 3,032,336,758	\$ 936,723,137	1,335	\$ 139,270,243	18,515	\$ 4,108,330,138
Live Oak	1,918	\$ 206,783,270	\$ 72,401,894	802	\$ 19,305,959	2,720	\$ 298,491,123
Unincorporated	8,892	\$ 1,378,211,587	\$ 844,324,556	3,747	\$ 447,584,004	12,639	\$ 2,670,120,147
<b>Total</b>	<b>27,990</b>	<b>\$ 4,617,331,615</b>	<b>\$ 1,853,449,587</b>	<b>5,884</b>	<b>\$ 606,160,206</b>	<b>33,874</b>	<b>\$ 7,076,941,408</b>

## Critical Facility Inventory

Of significant concern with respect to any disaster event is the location of critical facilities within the Planning Area. Critical facilities are often defined as,

Those services and facilities essential during a major emergency, and that if damaged would result in severe consequences to public health and safety, or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities include, but are not limited to: (1) Schools and other publicly-owned facilities, (2) Hospitals, nursing homes and housing likely to have occupants who may not be sufficiently mobile to avoid injury or death during a major disaster, (3) Police stations, fire stations, vehicle and equipment storage facilities and emergency operations centers that are needed for response activities before, during and after an event, (4) Public and private utility facilities that are vital to maintaining or restoring normal services to damaged areas before, during and after an event, and (5) Structures or facilities that produce, use or store highly volatile, flammable, explosive, toxic and/or water-reactive materials.

The Sutter County General Plan Background Report, 1996 provides some guidance on the definition of critical facilities for Sutter County,

“Critical facilities are generally defined as those providing important health and safety functions (e.g., hospitals, fire stations, etc.), having large numbers of occupants (office buildings, etc.), engaged in large scale industrial processes (manufacturing plants, mills, etc.), providing large numbers of people with critical services (electricity, gas, water, waster water, etc.) involved with the manufacturing, use, storage or distribution of toxic and hazardous materials (refineries, petrochemical plants, warehouses, etc.), having a network character upon which the community depends heavily (highways, important roads, bridges, etc.), and those whose failure threatens large numbers of people in the nearby and surrounding areas (dams, nuclear power plants, etc.).

Using mapped data from Sutter County GIS, an inventory of Critical Facilities is provided below:

<b>Unincorporated Sutter County Critical Facilities</b>	
<b>Owner</b>	<b>Critical Facility</b>
Various	Cellular Phone Tower
Verizon Wireless	Cellular Phone Tower
Airtouch	Cellular Phone Tower
AT&T	Cellular Phone Tower
Nextel	Cellular Phone Tower
Airtouch	Cellular Phone Tower
Nextel	Cellular Phone Tower
American Tower Co.	Cellular Phone Tower
American Tower Corp.	Cellular Phone Tower
Nextel	Cellular Phone Tower

## Unincorporated Sutter County Critical Facilities

Owner	Critical Facility
Airtouch & AT&T	Cellular Phone Tower
	Cellular Phone Tower
Airtouch	Cellular Phone Tower
American Tower	Cellular Phone Tower
AT&T and Sbc	Cellular Phone Tower
Sprint Pcs	Cellular Phone Tower
Nextel	Cellular Phone Tower
Rcs Wireless	Cellular Phone Tower
Airtouch And Nextel	Cellular Phone Tower
AT&T	Cellular Phone Tower
Airtouch & Nextel	Cellular Phone Tower
Cingular Wireless	Cellular Phone Tower
AT&T	Cellular Phone Tower
	Cellular Phone Tower
Sba Comm.	Cellular Phone Tower
	Cellular Phone Tower
Nextel	Cellular Phone Tower
AT&T And Nextel	Cellular Phone Tower
Nextel	Cellular Phone Tower
	Cellular Phone Tower
American Tower Corp.	Cellular Phone Tower
MCI	Cellular Phone Tower
Meridian #65	Fire Station
Sutter #6	Fire Station
Oswald-Tudor #8	Fire Station
Sutter Basin	Fire Station
Oswald Tudor #2	Fire Station
Sutter Basin	Fire Station
Sutter Basin	Fire Station
East Nicolaus #2	Fire Station
East Nicolaus #85	Fire Station
Pleasant Grove #9	Fire Station
Pleasant Grove #2	Fire Station
Brittan School	Mass Care Center
Meridian Elementary School District	Mass Care Center
Sutter High School	Mass Care Center
Sutter United Methodist Church	Mass Care Center
Sutter Youth Organization	Mass Care Center
Winship Elementary School	Mass Care Center
Encinal School	Mass Care Center
Live Oak Church Of The Brethren	Mass Care Center
Nuestro School	Mass Care Center
Adventist Christian School	Mass Care Center
Barry School	Mass Care Center

### Unincorporated Sutter County Critical Facilities

Owner	Critical Facility
Central Gaither School	Mass Care Center
Grace Baptist Church/Christian School	Mass Care Center
Lincest School	Mass Care Center
Robbins School	Mass Care Center
YC Assembly Hall Of Jehovah's Witness	Mass Care Center
Browns Elementary School District	Mass Care Center
Marcum-Illinois School District	Mass Care Center
Pleasant Grove School	Mass Care Center
Colusa County Fairgrounds	Mass Care Center
Placer County Fairgrounds	Mass Care Center
Silver Dollar Fairgrounds	Mass Care Center
Willow Glen Care Center Nursing Home	Medical Care Facility
Sungarden Rest Home Nursing Home	Medical Care Facility
Sutter County Sheriff	Police Station
Brittan Elementary School District	School
Browns Elementary School District	School
East Nicolaus Joint Union High School District	School
Marcum-Illinois Union School District	School
Franklin Elementary School District	School
Encinal Elementary School	School
Meridian Elementary School District	School
Nuestro Elementary School District	School
Pleasant Grove Joint Union School District	School
Sutter Union High School District	School
Winship Elementary School District	School
Barry Elementary School	School
Central Gaither Elementary School	School
Lincest Elementary School	School
Robbins Elementary School	School
Meridian School District	School
Grace Christian Academy And Pre-School	School
Adventist Christian School	School
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Seepage Station	Wastewater Treatment Facility
Water Tank	Wastewater Treatment Facility

### Yuba City Critical Facilities

Owner	Critical Facility
Verizon Wireless	Cellular Phone Tower
Airtouch	Cellular Phone Tower
Yuba City Fire #7	Fire Station
Yuba City Fire #2	Fire Station

## Yuba City Critical Facilities

Owner	Critical Facility
Yuba City Fire #1	Fire Station
Yuba City Fire #4	Fire Station
Yuba City Fire #3	Fire Station
Tierra Buena Elementary School	Mass Care Center
Albert Powell High School	Mass Care Center
Andros Karperos School	Mass Care Center
April Lane School	Mass Care Center
Bridge Street School	Mass Care Center
Church Of Christ	Mass Care Center
First Lutheran School	Mass Care Center
Gray Avenue Middle School	Mass Care Center
King Avenue School	Mass Care Center
St. Isidore's School	Mass Care Center
Yuba City High School	Mass Care Center
Veterans Memorial Hall	Mass Care Center
Lincoln School	Mass Care Center
Yuba/Sutter Fairgrounds	Mass Care Center
Yuba/Sutter Fairgrounds	Mass Care Center
Tierra Buena Elementary School	Mass Care Center
Fremont Hospital	Medical Care Facility
Sutter Yuba Mental Health Hospital	Medical Care Facility
North Valley Behavioral Health Hospital	Medical Care Facility
Courtyard Assisted Living Nursing Home	Medical Care Facility
Emmanuel Health Care Center Nursing Home	Medical Care Facility
Fountains Skilled Nursing Home	Medical Care Facility
Yuba City Care Center Nursing Home	Medical Care Facility
Feather River Surgery Center Surgical Center	Medical Care Facility
Sutter North Surgery Center Surgical Center	Medical Care Facility
Barreras Senior Care Nursing Home	Medical Care Facility
Creekside Country Manor Nursing Home	Medical Care Facility
Dorothy's Care Home Nursing Home	Medical Care Facility
Golden Years Residential Nursing Home	Medical Care Facility
Konda's Assisted Living Nursing Home	Medical Care Facility
Summerfield Care Center Nursing Home	Medical Care Facility
Yuba City Manor Nursing Home	Medical Care Facility
Rcca Colusa Nursing Home	Medical Care Facility
Sutter County Sheriff	Police Station
Yuba City Police Department	Police Station
Feather River Academy	School
Yuba City Unified School District	School
Gray Avenue Middle School	School

**Yuba City Critical Facilities**

<b>Owner</b>	<b>Critical Facility</b>
Albert Powell High School	School
Andros Karperos School	School
April Lane Elementary School	School
Yuba City High School	School
Bridge Street Elementary School	School
Butte Vista School	School
Child Development Programs	School
King Avenue Elementary School	School
Lincoln Elementary School	School
Park Avenue Elementary School	School
Tierra Buena Elementary School District	School
West Walton Elementary School	School
Faith Christian High School	School
Faith Christian Elementary School	School
St. Isadore's Catholic School	School
First Baptist Academy	School
First Lutheran Elementary School	School
River Valley High School	School
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
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Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Storm Lift Station	Wastewater Treatment Facility
Storm Lift Station	Wastewater Treatment Facility
Storm Lift Station	Wastewater Treatment Facility
Storm Lift Station	Wastewater Treatment Facility
Storm Lift Station	Wastewater Treatment Facility
Waste Water Treatment Plant	Wastewater Treatment Facility
Water Treatment Plant	Wastewater Treatment Facility

**Live Oak Critical Facilities**

<b>Owner</b>	<b>Critical Facility</b>
Live Oak #5	Fire Station
Church Of The Nazarene	Mass Care Center

### Live Oak Critical Facilities

Owner	Critical Facility
Live Oak Middle School	Mass Care Center
Live Oak High School	Mass Care Center
Luther Elementary School	Mass Care Center
Live Oak Manor Nursing Home	Medical Care Facility
Sutter County Sheriff	Police Station
Live Oak Unified School District	School
Live Oak High School	School
Live Oak Middle School	School
Luther Elementary School	School
Valley Oak Alternative High School	School
Sewer Lift Station	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Water Tank	Wastewater Treatment Facility
Sewage Lift Station	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Storm Water Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Storm Water Lift Station	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Storm Water Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Waste Water Treatment Plant	Wastewater Treatment Facility

Although not mapped, the HMPC also thought that churches should be included in the list of critical facilities. Churches often function as a meeting place for large numbers of people during and after disasters.

### Cultural and Natural Resource Inventory

In evaluating the vulnerability of a given area to disaster, it is important to inventory the cultural and natural resources specific to that area. Cultural and natural resources are important to identify pre-disaster for four reasons:

- First, the community may decide that these sites are worthy of a greater degree of protection than currently exists, due to their unique and irreplaceable nature;
- Second, should these resources be impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher;

- Third, the rules for repair, reconstruction, restoration, rehabilitation and/or replacement usually differ from the norm; and
- Fourth, natural resources, such as wetlands and riparian habitat, can have beneficial functions that contribute to the reduction of flood levels and damage.

## Cultural Resources

To inventory the county's cultural resources, the HMPC collected information from the following sources:

- **National Register Inventory List:** a list of properties in Sutter County which have been designated National Historic properties via the National Register maintained by the National Park Service.
- **State Historic Landmarks List:** a list of historic properties which have been designated California State Historic Landmarks maintained by the California Office of Historic Preservation in conjunction with the California Department of Parks and Recreation.
- **Historic American Building Survey List:** a list of properties which were included in a survey of historic buildings in the US. This includes historic properties in Sutter County documented during this survey as obtained from the Library of Congress website.
- **Historic Spots in California:** a list of historic settlements and towns in Sutter County which are no longer in existence.

It should be noted that these lists may not be complete, as they may not include those currently in the nomination process and not yet listed. And, as defined by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered an historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered or has been altered, the property must be evaluated under the guidelines set forth by CEQA and NEPA.

The following **National Register Historic Landmark** exists within Sutter County boundaries:

- **Live Oak Historic Commercial District** – Along Broadway between Pennington Road and Elm Street

The California Office of Historic Preservation identifies the following **State Historical Landmarks** in Sutter County:

- **No. 346 Site of Hock Farm** – This memorial is constructed of the original iron from the fort of Hock, the first non-Indian settlement in Sutter County. Established in 1841 by John Augustus Sutter, the fort and the settlement were located on the banks of the Feather River opposite this point. The Hock Farm was the first important agricultural project in this part of the state and Sutter planted grapes, pomegranates, fig trees, and the first peach tree orchard on the land as well as using it as a stock ranch.  
**Location:** Plaque located on State Highway 99 at Messick Rd; Site located at 5320 Garden Highway, 7 miles south of Yuba City.

- **No. 929 Site of Propagation of the Thompson Seedless Grape** – William Thompson and his family settled here in 1863. In 1872 he sent to New York for three cuttings called Lady de Collette and only one survived. The grape, first publicly displayed in Marysville in 1875, became known as Thompson seedless grape. Today, thousands of acres have been planted in California for the production of raisins, and bulk variety grapes.
- **Location:** 9001 Colusa Highway, State Highway 20, 8 miles west of Yuba City.

The **Historic Spots in California** list includes the following areas from Sutter County:

- Spanish Expeditions
- Sutter Buttes
- Camp Bethel
- Sutter’s Hock Farm
- Nicolaus
- Oro
- Vernon (Verona)
- Yuba City
- The Thompson Seedless Grape Site

No sites in Sutter County are included in the **Historic American Building Survey List**.

In addition to the officially designated sites listed above, the **Sutter County Historical Society** has developed a list of sites which have historical or cultural significance to the County. These sites are displayed in the table and map below. Those sites that are checked are also recognized by the California Department of Parks and Recreation Office of Historic Preservation as **Points of Historic Interest**.

Site of Historical and Cultural Significance to Sutter County			
Map ID Number	Name	Point of Historic Interest?	Description
1	774 B Street	<input checked="" type="checkbox"/>	E.G. Van Arsdale House built about 1880. Van Arsdale was an early Second Street merchant.
2	819 Shasta Street	<input checked="" type="checkbox"/>	A.C. McLaughlin Law Office relocated in 1953 from its original location across from the courthouse. It was a law office for A.C. McLaughlin and Justice of the Peace office for Judge Hugh D. Moncur and courtroom for the Justice and Municipal Courts.
3	442 B Street	<input checked="" type="checkbox"/>	Sutter County Canning/Packing Company.
4	334 C Street	<input checked="" type="checkbox"/>	The Stabler-Swinson House built in 1862. The R.C. Kells lived there from 1887 to 1899. Bennett Shilling lived there in 1902.
5	241 C Street	<input checked="" type="checkbox"/>	Butler House was built in 1973. It was owned later by Judge Coats and by Lewis Duncan, a former Yuba City Police Chief and City Clerk.
6	212 C Street	<input checked="" type="checkbox"/>	Old Harkey House built about 1870. Harkey was an early sheriff of Sutter County. The house later became the residence of Sid Smith. It is currently being used as a “bed and breakfast” facility.
7	500 2 <sup>nd</sup> Street	<input checked="" type="checkbox"/>	Sanborn Law Office built in 1870. Mr. Sanborn,

Site of Historical and Cultural Significance to Sutter County			
Map ID Number	Name	Point of Historic Interest?	Description
			Lawrence Shillig and D.A. Winship practiced law in this office. The original wooden walls were covered by stucco in 1906. In 1908, Yuba City was incorporated as a city in this building.
8/9	446 2 <sup>nd</sup> Street	<input checked="" type="checkbox"/>	Sutter County Hall of Records.
10	423 2 <sup>nd</sup> Street	<input checked="" type="checkbox"/>	Thomas D. Boyd House built about 1869. It was known as the Clark House in the 1870's.
11	422 2 <sup>nd</sup> Street	<input checked="" type="checkbox"/>	McC Campbell House was built about 1880.
12	413 2 <sup>nd</sup> Street	<input checked="" type="checkbox"/>	Rose Carpenter House built about 1880, and later owned by George Boyd.
13	379 2 <sup>nd</sup> Street	<input checked="" type="checkbox"/>	McGruder House built in 1887. Mr. McGruder was the United States Mining Inspector for hydraulic mining. It was later the home of C.F. Child.
14	360 2 <sup>nd</sup> Street	<input checked="" type="checkbox"/>	Eugene Boyd House built in 1890, by M.S. Sanborn. Mr. Boyd served as Sutter County Recorder from 1931 to 1963.
15	329 2 <sup>nd</sup> Street	<input checked="" type="checkbox"/>	William O'Banion House built in 1880.
16	Bogue Road	<input type="checkbox"/>	Named after nurseryman and orchardist J. Bogue. One-half mile to the west is Bogue Station on the Southern Pacific tracks along Railroad Avenue. To the east along the Feather River levee is the site of the 1955 flood levee break.
17	East of Garden Highway, north of Tudor	<input type="checkbox"/>	John A. Sutter's Hock Farm, built in 1841. The metal, rusted front of one of the buildings still stands. Toward the levee and to the south is the site of John A. Sutter's home (near the Holmes home). To the west on Messick Road, a short distance from the Hock Farm, is the site of the early Messick railroad shop.
18	Northeast Corner Township and O'Banion Roads	<input type="checkbox"/>	Site of Old Bailey Home.
19	Southwest Corner Garden Highway and O'Banion Road	<input type="checkbox"/>	Old C.E. Sullivan Ranch, at one time the largest single walnut grower in the world, in 1960 – 650 acres. Nuggett and Carnelo Walnuts were developed on this ranch.
20	Star Bend Road (north of Tudor)	<input type="checkbox"/>	Approximate area of the A.F. Abbott Ranch near Star Bend where the Phillips cling peach was produced and grown commercially. Developed in 1888 by nurseryman Joseph D. Phillips, the fruit, an off-shoot of the Tuscan and Orange Cling, was first propagated by J. Bogue. Near the ranch was the Abbott Station on the Southern Pacific tracks.
21	Tudor Road	<input type="checkbox"/>	Old Saunders Home, built in 1920. Located in the settlement of Tudor, another railroad station on the Southern Pacific line from the Woodland area.
22	Wilson Road	<input type="checkbox"/>	Wilson Station, site of Southern Pacific line stop, tracks and small wooden bridge remain. Two tracks are seen – one mainline track, the other a siding for handling freight, etc.
23	Kirkville Road	<input type="checkbox"/>	Chandler Station Site, Southern Pacific line stop in

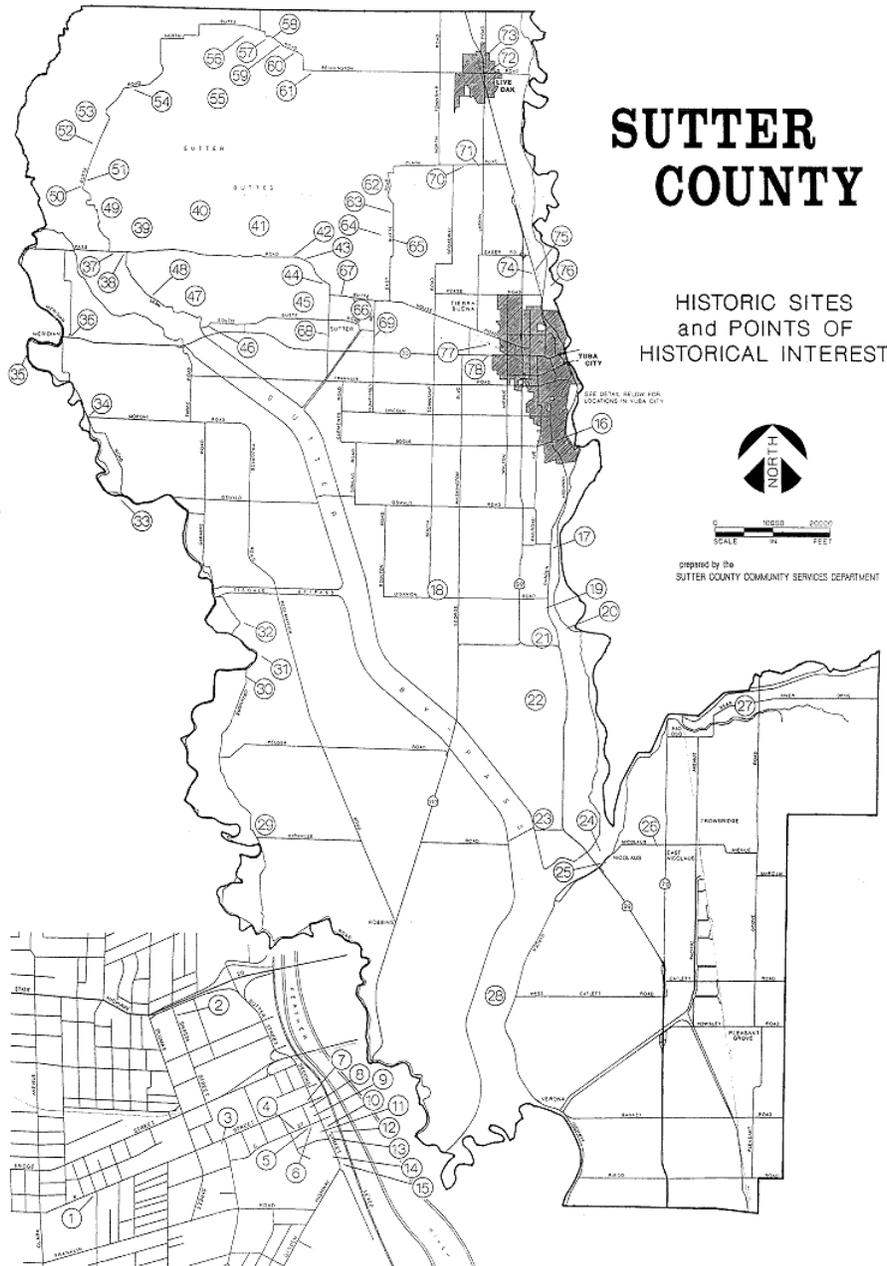
Site of Historical and Cultural Significance to Sutter County			
Map ID Number	Name	Point of Historic Interest?	Description
			the early days.
24	Nicolaus	<input type="checkbox"/>	Site of Sam Brannan's "White House" to the north of the new Nicolaus Bridge, opposite the town of Nicolaus. The home was located on two square miles of land sold to him in 1849 by John Sutter. The house had eight rooms, each with fireplaces and a winding staircase in the one and one-half story structure. This house was the scene of gala parties for people from San Francisco who arrived by riverboat. This home was last owned by Charles Tweedy of Dingville, and was moved from its original site – sold again and torn down. The lumber used for the "White House" was brought around the "Horn".
25	Nicolaus - Site of the Old Bell Hotel - Early Sutter County Courthouse - St. Boniface Catholic Church - Old Wagner Home - American Hotel Site - Main Street	<input checked="" type="checkbox"/>	To the east of the Nicolaus Bridge is the town of Nicolaus, founded in the late 1840's. Nicolaus was one of the earliest towns in Sutter County, founded by Nicolaus Allgier. The County Seat was moved from Nicolaus in 1856 to Yuba City. The Nicolaus Ferry crossed the Feather River near Nicolaus and was started in 1843 to connect New Helvetia (now Sacramento) with Sutter's Hock Farm. The original "ferry" was rowed by Indians.
26	Site of old East Nicolaus High School	<input checked="" type="checkbox"/>	On Nicolaus Avenue, east of Nicolaus and to the south of the road is the John A. Peter house built in 1881.
27	Rio Oso, Pleasant Grove, and Bear River	<input type="checkbox"/>	Near this area is the site of the town of Oro, near Barham's Crossing just south of the Bear River. Barham was a settler who came to this area in 1849 and in 1850 built a bridge at this site.
28	North of Verona	<input type="checkbox"/>	The Southern Pacific Railroad once ran through this town which was the County Seat in the early 1850's.
29	Kirkville	<input type="checkbox"/>	This townsite was located on land obtained by T.D. Kirk in 1874 from Jonas Spect (the original discoverer of gold in the Yuba River). Mr. Spect obtained the land from the estate of O.S. Colegrove, an 1851 settler who named the riverside place Colegrove Point.
30	Two miles south of Tisdale Weir on a river road named Cranmore Road	<input checked="" type="checkbox"/>	Wooley's Grave.
31	Cranmore	<input type="checkbox"/>	Located here is the large Les Butler home with its elaborate front entrance, built in 1888.
32	Tisdale Road	<input type="checkbox"/>	One mile south of this road is the Hunter burial site with marks for two Hunter children. Also present in the area is a U.S. Geological Survey Benchmark, 35 feet above sea level.
33	Grimes	<input type="checkbox"/>	Located north past the Winship Grammar School is the site of the Grimes Ferry Crossing and the town of Grimes.

Site of Historical and Cultural Significance to Sutter County			
Map ID Number	Name	Point of Historic Interest?	Description
34	Wilbur Road, Meridian	<input checked="" type="checkbox"/>	The brick house built in 1872 by Sumner Paine, a brick maker and miner who came to California from Maine in 1852. This property was later sold to the Alameda Sugar Company of San Francisco, which eventually became the Meridian Farms Land Company.
35	Sycamore	<input type="checkbox"/>	To the west of Kilgore Road is the site of the Sycamore Ferry Crossing and the town of Sycamore.
36a	State Highway 20	<input type="checkbox"/>	Site of the Old Meridian Grammar School, original structure built near here in 1875.
36b	Corner of Third and Bridge	<input type="checkbox"/>	Old Sacramento Northern Railroad Station Building.
36c	Meridian	<input type="checkbox"/>	Founded in 1852 by Lewis O'Neill who built a crude cabin to the south of what is now Main Street. In 1857 John F. Fouts came to Meridian and in 1860 started a ferry over the Sacramento River. In 1862 the settlement became known as Fout's Ferry. However, W.C. Smith arrived and the growing town was renamed Meridian, being barely ¼ mile from the Meridian Line of the U.S. Survey of California.
37/38/39	Pass Road	<input type="checkbox"/>	To the north on the slopes of the Sutter Buttes are stone fences which served two purposes: 1) cleared the land of rocks for farming and 2) utilized the rocks for fencing.
40/41	Sutter Buttes, north of Pass Road	<input type="checkbox"/>	To the north in a valley, is the Old Moore Getty House, built in 1871. The original homestead cabin is now the living room of the residence.
42	Pass Road	<input type="checkbox"/>	To the north is the house of Carl DeWitt. Part of this house is an old log cabin built in 1873, the deed of which was signed by Abraham Lincoln
43	Pass Road	<input checked="" type="checkbox"/>	Fremont Monument. General John C. Fremont is said to have camped in this area for eight days in 1846 just before the Bear Flag Revolution.
44	Pass Road	<input type="checkbox"/>	Old George E. Britton House built in 1869-1870.
45	Acacia Avenue	<input type="checkbox"/>	The entrance to the town of Sutter, formerly called South Butte, Sutter City, which was founded in 1871.
45a	Slough School	<input type="checkbox"/>	Built in 1893 and used until approximately 1960.
47	West Butte Road	<input type="checkbox"/>	Area near where William Thompson Sr. Ranch was located, on which the Thompson Seedless Grape originated.
48	West Butte Road	<input type="checkbox"/>	Fredrick Tarke House, built in 1885.
49/50	West Butte Road	<input type="checkbox"/>	Near the site of the first oil well in 1866.
51	West Butte Road	<input type="checkbox"/>	Site of residence built in 1866 by Howard Brady
52/53	West Butte Road	<input type="checkbox"/>	Site of small early settlement of Noyesburg
54	North Butte Road	<input type="checkbox"/>	Old Pierce House, built in 1879
55	West Butte Road	<input type="checkbox"/>	Abandoned titan missile site.
56	North Butte Road	<input type="checkbox"/>	Spillman Grave site, south of North Butte Road.
57	North Butte Road	<input type="checkbox"/>	Site of the early town of Pennington, called North Butte in earlier days.
58	North Butte Road	<input type="checkbox"/>	Site of North Butte School and Lodge Historical Marker.

Site of Historical and Cultural Significance to Sutter County			
Map ID Number	Name	Point of Historic Interest?	Description
59	North Butte Road	<input type="checkbox"/>	Site of Peace Valley Cemetery – Historical Monument.
60	North Butte Road	<input type="checkbox"/>	Old Cornelius Williams House, built in 1890.
61	Pennington Road	<input type="checkbox"/>	Dow Grove, site of Farm Bureau picnics in the 1920s.
62	East Butte Road	<input type="checkbox"/>	Site of Camp Bethel, built in 1862 on property of Gilbert N. Smith, ranch near Sand Creek. Although East Butte was never a town, this location near the Sutter Buttes was early settled by ranchers.
63	East Butte Road	<input type="checkbox"/>	Albert N. Smith House, built in 1888. Previous owners of the two-story wooden house on the west side of the road north of Sanders Road, were also the Burns and Langs.
64	East Butte Road	<input type="checkbox"/>	E.J. Howard House, started in 1862 with the balance of the house added between 1862-1870.
65	East Butte Road	<input type="checkbox"/>	Old Union District Grammar School site, also used as a Sunday School, was started in 1868 and continued in use until 1917.
66a	Butte House Road	<input checked="" type="checkbox"/>	Site of the “Old Butte House” which was a stage stop.
66b	2234 California Street	<input type="checkbox"/>	Old Felts Building, was an old store and early post office.
66c	Corner of California and Nelson Streets, Sutter	<input type="checkbox"/>	Native Daughters of the Golden West Hall, built in 1888 was originally designed for but never used as a bank.
67	Butte House Road	<input type="checkbox"/>	Sutter Cemetery, where once a small grammar school was located in the center of the cemetery. Whenever a funeral was held school was dismissed for the day.
68	Acacia Avenue	<input type="checkbox"/>	Old Sacramento Northern Railway Depot.
69	Humphrey Road	<input type="checkbox"/>	Site of the early Humphrey Station Stop.
70/71	Clark Road	<input type="checkbox"/>	Site of Stafford Station, Sacramento Northern Railway formerly extending to Chico through Durham.
72	Pennington Road	<input type="checkbox"/>	One of the first homes in Live Oak. Built for Louis Schnepel in 1883. In January 1924 it was moved to its present location, 2447 Pennington Road, from the site on Broadway where the Odd Fellows Hall was built in Live Oak.
73	Larkin Road	<input type="checkbox"/>	One of the first homes in Live Oak. This old residence was moved a short distance from its original site due to the construction of Highway 99, to its present location on Larkin.
74	Live Oak Highway	<input type="checkbox"/>	Sutter’s Hock Farm Historical Monument, first white settlement in Sutter County established in 1841.
75	Live Oak Highway	<input type="checkbox"/>	Site of Berg Station, Southern Pacific Railroad
76	Live Oak Highway	<input type="checkbox"/>	Site of the old Berg Ranch.
77	Harter Road	<input type="checkbox"/>	Harter House built in 1872. Harter cannery was an important early drying and canning facility.
78	2078 Colusa Highway	<input type="checkbox"/>	Jake Onstott House built in 1887 by the pioneer grain rancher.

The following figure taken from the Sutter County General Plan illustrates locations of Designated Historic Sites and Points of Historical Interest.

# Sutter County Designated Historic Sites and Points of Historical Interest



## Natural Resources

For purposes of this plan, natural resources include threatened and endangered species, sensitive habitats and other natural resources identified by the HMPC.



(Source: AMEC Earth & Environmental)

### Threatened and Endangered Species

To further evaluate the county's vulnerability in the event of a disaster, it is important to inventory key natural resources such as threatened and endangered species.

Endangered Species means any species of fish, plant life, or wildlife, which is in danger of extinction throughout all or a significant part of its range and is protected by law.

Threatened Species means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and protected by law.

The following table lists the number of plants and animals found within California or off the coast of the State that have been classified as Endangered or Threatened by the California Fish and Game Commission (state list) or by the U.S. Secretary of the Interior or the U.S. Secretary of Commerce (federal list). The State listing of plants and animals is pursuant to the California Endangered Species Act of 1984 of the Fish and Game Code. The state listing of plants is also

pursuant to the Native Plant Protection Act of 1977. The federal listing of plants and animals is pursuant with the Federal Endangered Species Acts of 1973, as amended.

<b>STATE AND FEDERALLY LISTED ENDANGERED, THREATENED, AND RARE PLANTS AND WILDLIFE OF CALIFORNIA</b>		
<b>July 2005</b>		
<b>Designation</b>	<b>Plants</b>	<b>Animals</b>
SE = State-listed as Endangered	131	47
ST = State-listed as Threatened	22	32
FE = Federally-listed as Endangered	138	84
FT = Federally-listed as Threatened	47	39
SR = State-listed Rare <sup>1</sup>	67	
SCE = State Candidate (Endangered)	1	0
SCT = State Candidate (Threatened)	0	0
FPE = Federally proposed (Endangered)	0	1
FPT = Federally proposed (Threatened)	0	2
FPD = Federally proposed (Delisting)	0	1
<b>Total number of listed</b>	<b>123</b>	<b>154</b>
Total number of candidate/proposed plants and animals for listing	0	3
Number State-listed only	67	31
Number Federally-listed only	33	69
Number listed under both State and Federal Acts	123	54

<sup>1</sup>. Plant designation only.

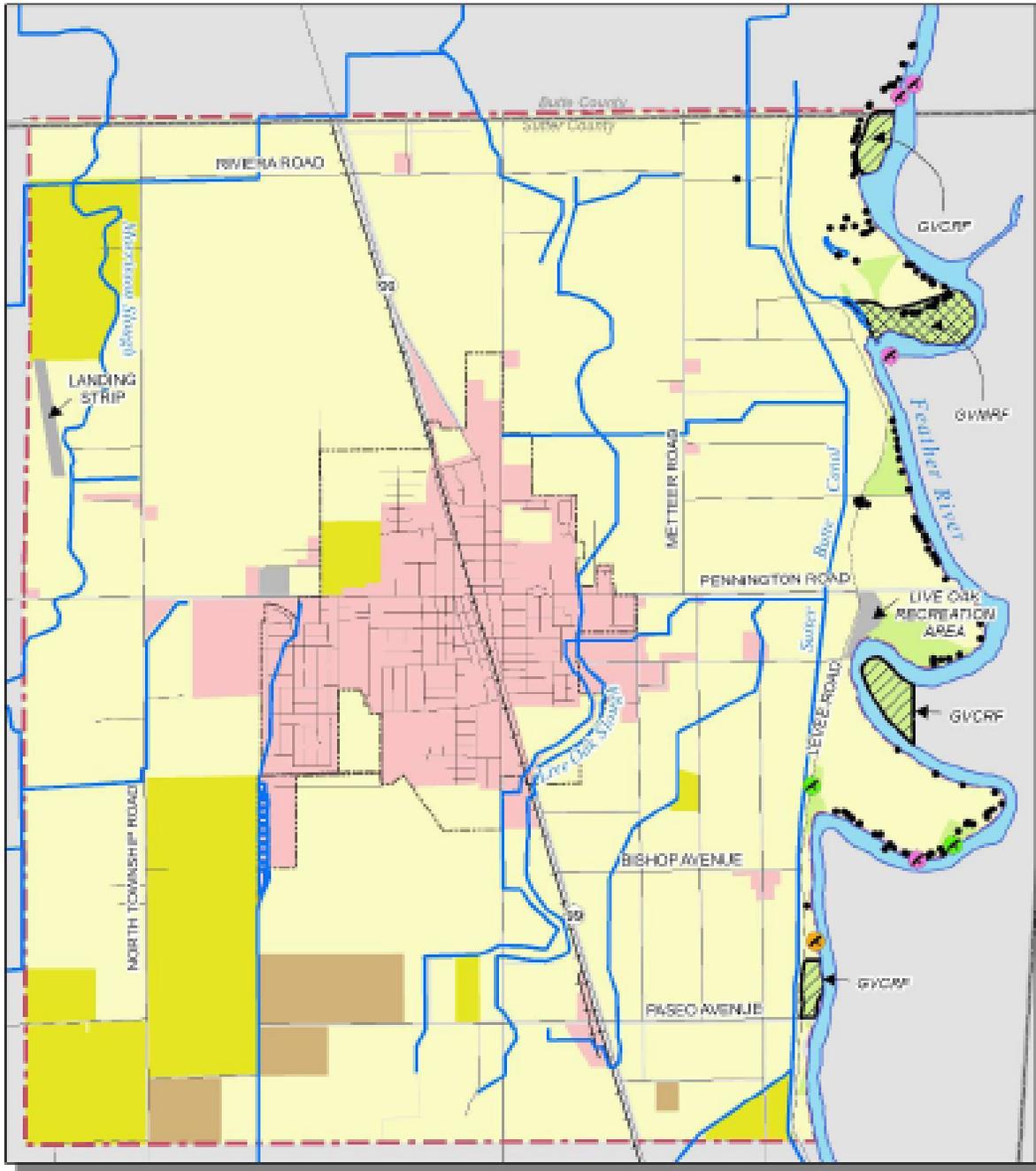
The following list includes protected plants and animals identified by the U.S. Secretary of the Interior and the California Fish and Game Commission as occurring within Sutter County. Information regarding the potential for particular species to occur in the City of Live Oak and Yuba City were provided by the respective City General Plan Natural Resources Element. The recorded presence of sensitive species in Live Oak and Yuba City are presented in the figures that follow.

Protected Plant and Wildlife Species Potentially Occurring in Sutter County					
Scientific Name	Common Name	Federal Status	State Status	Potential to Occur in Live Oak	Potential to Occur in Yuba City
<i>Layia septentrionalis</i>	Colusa layia	None	SR	Low	Low
<i>Pseudobahia bahiifolia</i>	Hartweg's golden sunburst	FE	SE	Low	High
<i>Trichocoronis wrightii</i> var. <i>wrightii</i>	Wright's trichocoronis	None	SR	Low	Low
<i>Silene verecunda</i> ssp. <i>verecunda</i>	San Francisco campion	None	SR	Low	Low
<i>Monardella douglasii</i> ssp. <i>venosa</i>	veiny monardella	None	SR	Low	Low
<i>Hibiscus lasiocarpus</i>	rose-mallow	None	SR	High	Low
<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>	Baker's navarretia	None	SR	Low	Low
<i>Ambystoma californiense</i>	California tiger salamander	FE	SC	Low	Low
<i>Rana aurora draytonii</i>	California red-legged frog	FT	None	Low	Low
<i>Nycticorax nycticorax</i>	black-crowned night heron	None	None	Low	Low
<i>Branta hutchinsii leucopareia</i>	cackling (Aleutian Canada) goose	FD	None	Low	Low
<i>Buteo swainsoni</i>	Swainson's hawk	None	ST	High	Low
<i>Coccyzus americanus occidentalis</i>	western yellow-billed cuckoo	FC	SE	Moderate/High	Moderate
<i>Haliaeetus leucocephalus</i>	bald eagle	FT	None	Low	Low
<i>Athene cunicularia</i>	burrowing owl	None	SC	Moderate	Low
<i>Riparia riparia</i>	bank swallow	None	ST	Low	Moderate
<i>Agelaius tricolor</i>	tricolored blackbird	None	SC	High	Low
<i>Carduelis lawrencei</i>	Lawrence's goldfinch	None	None	Low	Low
<i>Pogonichthys macrolepidotus</i>	Sacramento splittail	None	SC	Low	Low
<i>Antrozous pallidus</i>	pallid bat	None	SC	Low	Low
<i>Perognathus inornatus inornatus</i>	San Joaquin pocket mouse	None	None	Low	Low
<i>Dipodomys californicus eximius</i>	Marysville California kangaroo rat	None	SC	Low	Low
<i>Emys marmorata marmorata</i>	northwestern pond turtle	None	SC	Low	Low
<i>Thamnophis gigas</i>	giant garter snake	FT	ST	Moderate/High	Low
<i>Branchinecta lynchi</i>	vernal pool fairy	FT	None	Low	Low

Protected Plant and Wildlife Species Potentially Occurring in Sutter County					
Scientific Name	Common Name	Federal Status	State Status	Potential to Occur in Live Oak	Potential to Occur in Yuba City
	shrimp				
<i>Linderiella occidentalis</i>	California linderiella	None	None	Low	Low
<i>Lepidurus packardi</i>	vernal pool tadpole shrimp	FE	None	High	Low
<i>Cicindela hirticollis abrupta</i>	Sacramento Valley tiger beetle	None	None	Low	Low
<i>Desmocerus californicus dimorphus</i>	valley elderberry longhorn beetle	FT	None	High	Low
<i>Anthicus sacramento</i>	Sacramento Valley tiger beetle	None	None	Low	Low
<i>Anthicus antiochensis</i>	Antioch Dunes anthicid beetle	None	None	Low	Low
<i>Branchinecta conservatio</i>	Conservancy fairy shrimp	FE	None	Low	Low
<i>Oncorhynchus mykiss</i>	Central Valley steelhead	FT	None	Low	Low
<i>Oncorhynchus tshawytscha</i>	Central Valley spring-run salmon	FT	None	High	Low
<i>Oncorhynchus tshawytscha</i>	winter-run chinook salmon, Sacramento River	FE	None	Low	Low

Source: CDFG 2001; USFWS 2006a; City of Live Oak 2006a; City of Yuba City 2004.

## Sensitive Species Recorded in the Vicinity of Live Oak



Source: Updated from SWCA, 2001 to 2007, 2008.

### CITY OF LIVE OAK GENERAL PLAN UPDATE



## Sensitive Species in the Vicinity of Yuba City

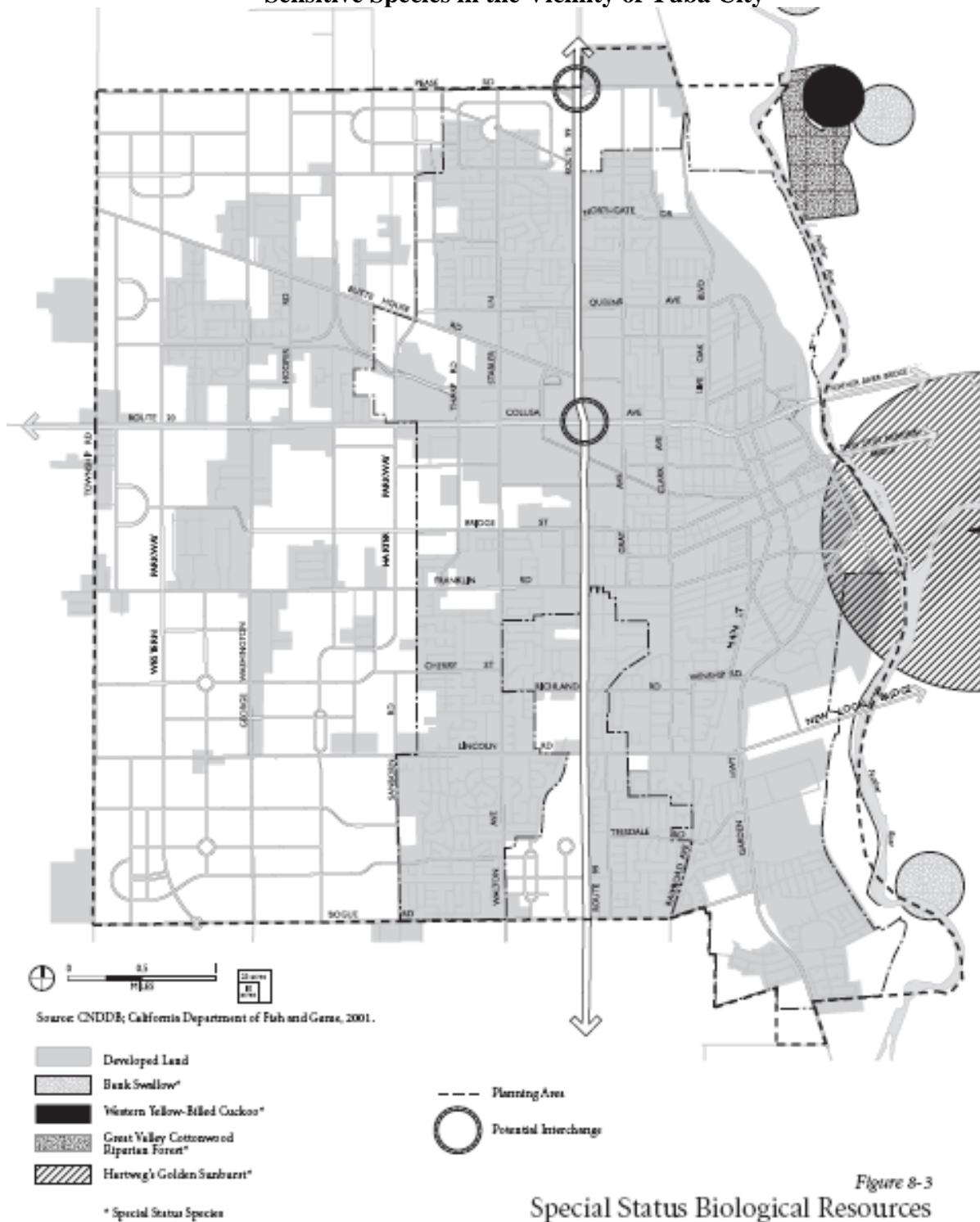


Figure 8-3  
Special Status Biological Resources

## **Sensitive Habitats**

In addition to endangered and threatened plant and animal species, five sensitive habitat types were identified by the California Department of Fish and Game Natural Diversity Database as potentially occurring in Sutter County. These habitat types are:

- Northern Hardpan Vernal Pool
- Coastal and Valley Freshwater Marsh
- Great Valley Cottonwood Riparian Forest
- Great Valley Mixed Riparian Forest
- Great Valley Willow Scrub

According to the Sutter County General Plan, recorded occurrences of the Northern Hardpan Vernal Pool are located at the north end of the Sutter Bypass and along the northern side of the Sutter Buttes. Coastal and Valley Freshwater Marsh habitats are recorded in the Butte Sink and Sutter Bypass areas. Great Valley Mixed Riparian Forest and Great Valley Cottonwood Riparian Forest are found within the riparian corridors located along the edges of streams and the Sacramento and Feather Rivers in the County. There are no recorded instances of Great Valley Willow Scrub in the County.

Within the City of Live Oak, Great Valley Cottonwood Riparian Habitat and Great Valley Mixed Riparian Habitat are both located along the west bank of the Feather River. No other identified sensitive habitats are present in the City (Live Oak 2006). Great Valley Cottonwood Riparian Habitat is present just outside the northeastern corner of the Yuba City planning area along the east bank of the Feather River. No other identified sensitive habitats are present in Yuba City (City of Yuba City 2004).

In addition, a review of the U.S. Fish and Wildlife National Wetland Inventory revealed that wetlands in the vicinity of Yuba City and the City of Live Oak are primarily associated with the Feather River. No other wetlands are mapped within Yuba City and only one 0.5-acre freshwater pond is mapped in the southwest corner of the City of Live Oak (USFWS 2006b).

## **Other Natural Resources**

Sutter County, in collaboration with Yuba County, is in the process of developing a Habitat Conservation Plan for the region. This plan would provide an inventory of other important natural resources in the area when it is completed. Until it is completed, Sutter County, Yuba City, and the City of Live Oak identify additional assets of value within the County on their websites. These assets are described below.

***Sutter Buttes*** –The Sutter Buttes are the remains of an extinct volcano which erupted between 1.6 and 1.3 million years ago. It is estimated that the Sutter Buttes were formed 1.5 million years ago. The highest point of the Buttes is 2,132 feet above mean sea level. The range is circular with a diameter of 10 miles and covers an area of approximately 75 square miles. The Buttes consist of a central volcanic core of andesite porphyry and tuff surrounded by a ring of sediments, and these sediments are embraced in turn by a ring of andesite tuff and braccia which extends to the Valley alluvium. The volcanic activity that created the Sutter Buttes appears to

have occurred in the Early to Middle Pleistocene (between 2.4 and 1.6 million years ago) and the youngest volcanic domes were emplaced by 1.6 to 1.4 million years ago.

The Buttes played an important part in the lives of the Maidu Indians, who lived in villages within site of the Buttes. They believed that their spirits went there after death (City of Yuba City 2002).

The Sutter Buttes are currently a privately-owned natural area in the county. Public access to the Buttes is provided through guided tours and hikes provided by the Middle Mountain Foundation in coordination with the Buttes land owner.

**Sutter Wildlife Reserve** – Wildlife reserve located six miles southwest of Yuba City on Oswald Road off of Highway 99 (City of Yuba City 2004).

**Bicentennial Living Witness Tree** – A valley oak (*Quercus lobata*) located off of Highway 99 in Live Oak that has been identified as being over 200 years old. The tree was dedicated on April 28, 1989, National Arbor Day, as being a Bicentennial Living Witness Tree. It is one of 35 tree identified nationwide (City of Yuba City 2002).

## **Development Trends**

Projected growth and development trends in Sutter County were taken from the 2015 Housing Element for Sutter County, the Housing Element for Yuba City, and the Housing Element for the City of Live Oak.

### **Current Status (2000 Census)**

- 37,110 individuals, or 45.5 percent, of Sutter County's residents live in the unincorporated portion of the county.
- 41,400 individuals, or 54.5 percent, of Sutter County's residents live within the County's incorporated cities.

### **Growth Rate**

- According to the Sacramento Area Council of Governments most recent projections (May 2006), the population of the county unincorporated area is decreasing annually. The largest change in population occurred between 2000 and 2002 when reorganization of the Walton Avenue area occurred and a large portion was annexed to Yuba City. Therefore, while Sutter County as a whole has grown by 2.6 percent annually, the unincorporated area has decreased by 1.6 percent.
- According to the Sacramento Area Council of Governments, Yuba City is expected to grow at an annual growth rate of 2.5 percent through 2015. Assuming the unincorporated area of the Yuba City Planning Area (sphere-of-influence) grows at the same rate, the total population of the Yuba City Planning Area is projected to reach 105,730 by 2025 (Yuba City 2004).
- Statistics illustrate that population growth for Sutter County is occurring primarily in its incorporated cities, Live Oak and Yuba City. In 2001, Yuba City completed an

annexation of the Walton area which increased the population of Yuba City by 7,000 and decreased the population of the unincorporated area of the Yuba City sphere-of-influence by the same amount.

**Table 1. Population Estimates 2000-2006**

Area	2000	2002	2005	2006
Unincorporated	35,943	28,241	23,851	23,468
Yuba City	36,758	47,221	58,516	60,507
Live Oak	6,229	6,450	6,803	7,475
<b>County Total</b>	<b>78,930</b>	<b>81,912</b>	<b>89,170</b>	<b>91,450</b>

(Source: California Department of Finance, May 2006)

**Development Trends**

- Sutter County estimates that 40,550 housing units will be necessary to fill the County’s housing needs for the planning period of 2004 to 2015. The unincorporated Sutter County is expected to need 17,597 housing units by 2015; a 28.1 percent increase over unincorporated area housing units in 2000 (See table that follows).

**Table 6. Housing Unit Estimates and Projections, Countywide, 2000-2015.**

Area	2000	2005	2010	2015
Unincorporated Area	13,735	14,735	15,918	17,597
Yuba City	13,608	15,996	18,225	20,394
Live Oak	1,734	2,009	2,284	2,559
<b>Sutter County Total</b>	<b>29,077</b>	<b>32,740</b>	<b>36,427</b>	<b>40,550</b>

Source: SACOG 3/15/01 Projection Series

- **Land Availability:** Existing vacant and underdeveloped land in Sutter County could potentially support a maximum of 4,705 residential units based on a mix of high density, medium density, and low density areas (See table below).

**Table 28. Potential Housing Units Based on Available Land, 2002-2012.**

General Plan	Density Range	Acres Available	Minimum Units	Maximum Units
HDR	25-45 Units/Acre	26.86 HDR	671	1,208
MDR	8-25 Units/Acre	23.66 MDR	189	591
LDR	2-8 Units/Acre	363.31 LDR	726	2,906
<b>TOTAL</b>		<b>415.53</b>	<b>1,586</b>	<b>4,705</b>

Source: Sutter County Community Services Department

- **Housing Costs vs. Household Income:** The average median household income in Yuba City was \$32,858 according to the 2000 Census. This was lower than the median household for Sutter County, which was reported to be \$39,633. Likewise, the median household income in Live Oak was 33 percent lower than the County at the time of the U.S. Census. Both household incomes and housing costs in Yuba City rose very slowly between 1991 and 2001. According to the Sutter-Yuba Association of Realtors, housing prices in Yuba City rose 16 percent during that time period. In contrast, housing prices in Live Oak have increased dramatically in the last ten years – by as much as 190 percent. Sutter County estimates that a moderate income household in the county earning between

\$30,900 and \$46,300 in 2001 could expect to pay between \$770 and \$1,160 in monthly housing costs (See table below). The average sale price of a home in Sutter County in 2001 was \$172,000. In Yuba City the average sale price was \$148,000 during the same year. The median sales price of a home in Live Oak in 2005 was \$230,000.

Table 3.4-2: Monthly Housing Costs by Income Category for Sutter County (2001)

<i>Income Category</i>	<i>Annual Income*</i>	<i>Maximum Monthly Housing Costs</i>
Very Low	< \$19,300	< \$480
Low	\$19,300 - \$30,900	\$480 - \$770
Moderate	\$30,900 - \$46,300	\$770 - \$1,160
Above Moderate	> \$46,300	> \$1,160

\* Based on FY 2001 Sutter County Area Median Income (AMI) of \$38,600 for a four-person household.

Note: All amounts are in 2001 dollars.

Source: California Department of Housing and Community Development, 2001 Income Limits, and Dyett & Bhatia, 2001.

- **Housing Stock:** Less than ½ percent of the county’s housing units are classified as substantially deteriorated or dilapidated; the majority of which are located in the City of Live Oak. The City of Live Oak housing survey estimates that over 15 percent of the housing stock in the city is dilapidated or in need of substantial rehabilitation. The majority of homes in Sutter County (60 percent) were constructed prior to 1975.
- **New Development Areas:** An inventory and assessment of parcels available for single and multi-family residential development is included in the table that follows. All parcels included in the inventory are within the spheres-of-influence and near the cities of Live Oak and Yuba City. In addition, Figures 4 and 6 below show the location of new development areas in Live Oak and Yuba City identified within the Sutter County General Plan.
  - New development planned in the City of Live Oak is primarily concentrated in the northeast portion of the City sphere of influence under the Sacramento Area Council of Governments (SACOG) preferred scenario (see Figure 5). Under this scenario an average of 100 new homes would be constructed each year.
  - New development areas identified in the Yuba City General Plan are located in the Harter Specific Plan area, on the north side of Shanghai Bend Road, west of Garden Highway and on the north side of Lincoln Road, east of Sanborn Road (known as the Lincoln East Specific Plan Area) (Figure 7).

<b>Parcels with Potential for Residential Development in Sutter County, 2002-2012</b>				
<b>Site</b>	<b>APN</b>	<b>General Plan/Zoning</b>	<b>Acreage</b>	<b>Distance to Sewer</b>
1	9-110-010	LDR/R-1-A	2.0	0'
2	9-110-011	LDR/R-1-A	2.30	0'
3	9-110-035	LDR/R-1-A	0.94	0'
4	9-110-036	LDR/R-1-A	0.60	150'
5	9-182-032	LDR/R-1-A	4.64	110'
6	9-182-034	LDR/R-1-A	3.25	700'
7	9-181-039	LDR/R-1-A	7.16	220'
8	9-200-004	HDR/R-4	1.24	400'
9	9-200-005	HDR/R-4	1.10	360'
10	9-221-007	LDR/R-1	22.73	1,350'
11	17-065-008	LDR/R-1-A	10.0	3,940'
12	17-114-034	MDR/R-3	7.88	2,200'
13	17-115-001	MDR/R-3	2.0	1,326'
14	17-115-002	MDR/R-3	2.05	1,480'
15	17-115-011	MDR/R-3	2.80	1,650'
16a	18-091-010	LDR/R-1-A	15.56	1,680'
16b	18-091-010	MDR/R-3	4.21	800'
17	19-060-066	HDR/R-4 (portion of)	24.52	1,340'
18	19-090-007	LDR/R-1-A	15.36	480'
19	19-090-022	LDR/R-2-PD	4.0	440'
20	19-090-023	LDR/R-1-PD	12.0	985'
21	19-090-062	LDR/R-1-A	7.99	0'
22	19-090-080	LDR/R-1	0.90	1,420'
23	19-090-081	LDR/R-1	11.20	650'
24	20-054-005	LDR/R-1-A	23.66	540'
25	20-054-021	LDR/R-1-A	0.45	0'
26	20-054-022	LDR/R-1-A	6.23	520'
27	20-054-027	LDR/R-1-A	20.92	0'
28	22-050-005	LDR/R-1	71.40	0'
29	22-060-013	LDR/R-1-A	9.54	2,000'
30	22-060-016	LDR/R-1-A	10.0	0'
31	22-060-027	LDR/R-1-A	24.01	2,210'
32	22-060-029	LDR/R-1-A	34.01	0'
33	22-060-032	LDR/R-1-A	2.54	1,150'
34	22-060-033	LDR/R-1-A, R-1	17.05	0'
35	22-060-044	LDR/R-1-A	5.81	670'
36a	22-072-043	MDR/R-3	4.72	0'
36b	22-072-043	LDR/R-1	8.01	300'
37	26-030-024	LDR/R-1	6.70	1,480'

<b>Parcels with Potential for Residential Development in Sutter County, 2002-2012</b>				
<b>Site</b>	<b>APN</b>	<b>General Plan/Zoning</b>	<b>Acreage</b>	<b>Distance to Sewer</b>
38	26-080-018	LDR/RE	2.35	0'
<b>Sub-Total HRD</b>			<b>26.86 HDR</b>	
<b>Sub-Total MDR</b>			<b>23.66 MDR</b>	
<b>Sub-Total LDR</b>			<b>363.31 LDR</b>	
<b>TOTAL</b>			<b>413.83 Acres</b>	

(Source: Sutter County 2004).



Figure 5. City of Live Oak Potential New Development Scenarios

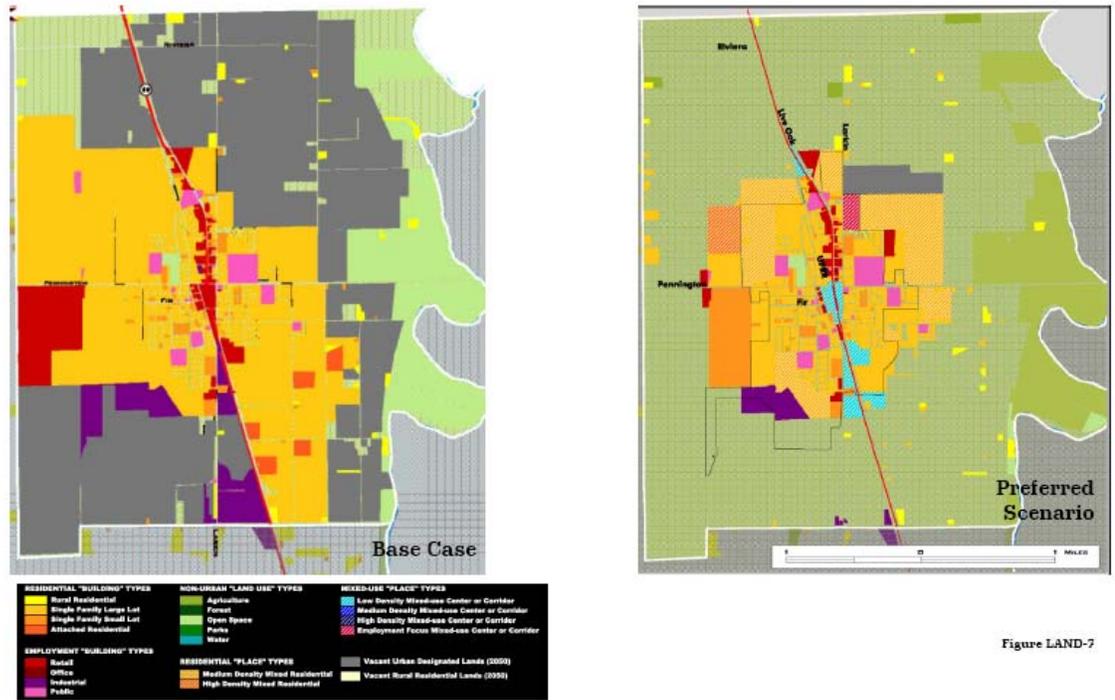
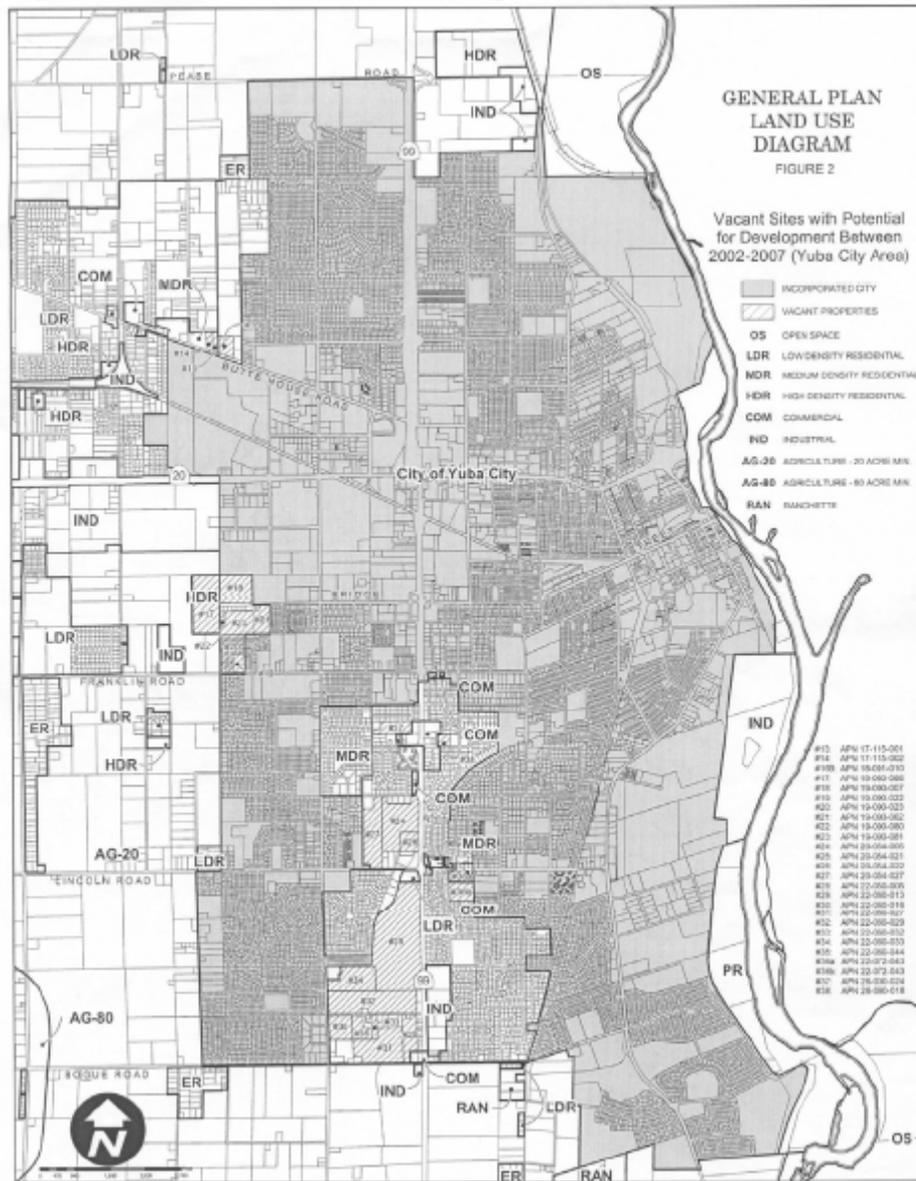


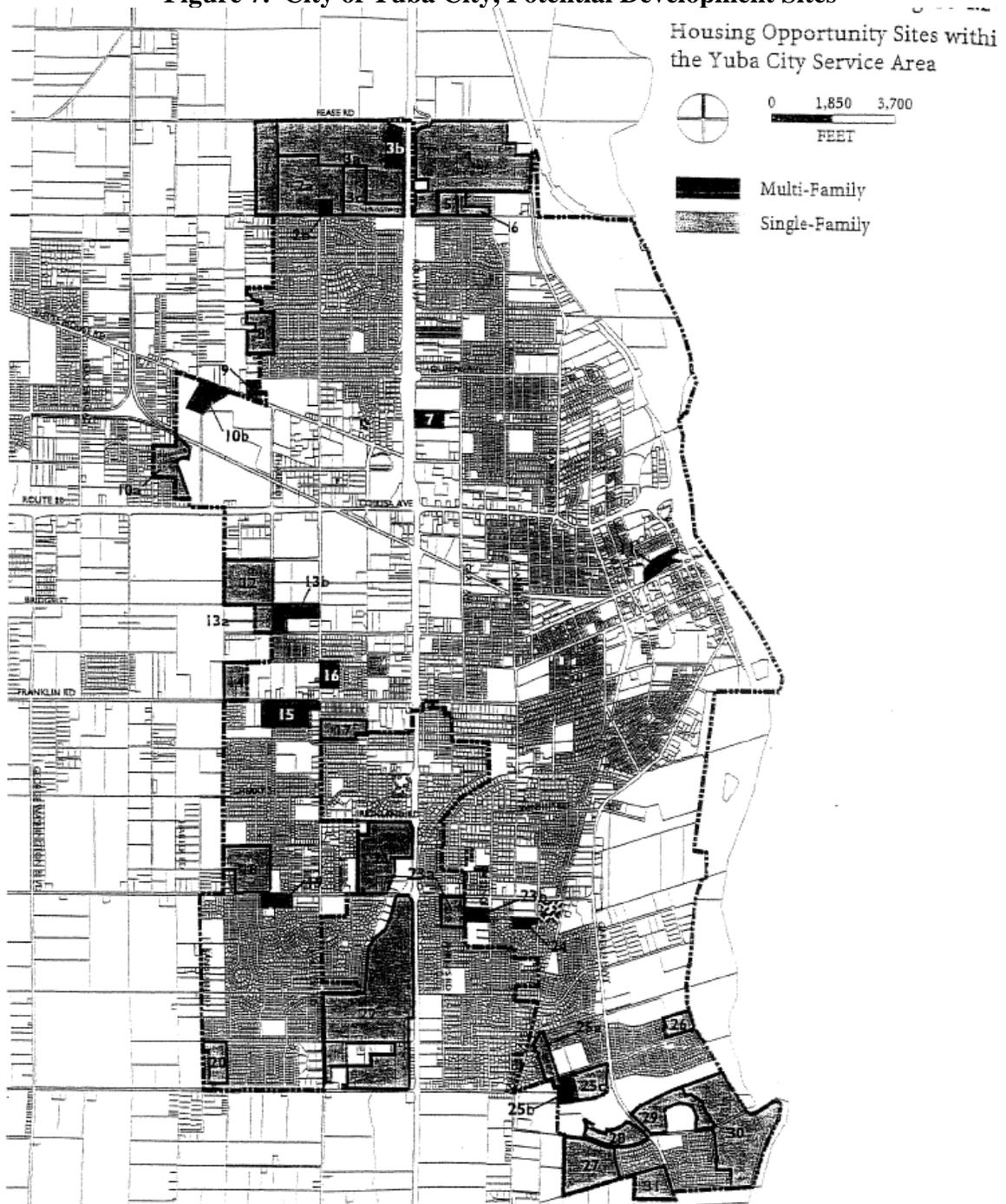
Figure LAND-7

**Figure 6. Available Sites for Development In and Around Yuba City**



- **Constraints.** The availability of vacant land does not appear to be a constraint on Sutter County. For example, one concentration of vacant land in the Yuba City limits, on either side of the Garden Highway south of Bogue Road, surrounds existing single family development and is likely to be developed as such. In addition, the price of developable land is not much of a constraint; land is much cheaper on average in Sutter County than in the rest of the State. The largest constraints on development are city and county land use regulations, the development review process, and the presence of protected agricultural lands. Sutter County has 51,267 acres of undeveloped land enrolled in Williamson Act contracts and 70 percent of the total county area is comprised of Prime Farmland or Farmland of Statewide Significance which constrains urban development in the unincorporated parts of the county.

**Figure 7. City of Yuba City, Potential Development Sites**



## VULNERABILITY OF SUTTER COUNTY PLANNING AREA TO SPECIFIC HAZARDS

Community vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Further, other information can be collected, such as the location of critical community facilities (e.g., a fire station), historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat) that are within the specific hazard area. Together, this information portrays the impact, or *vulnerability*, of that area to that hazard.

For those significant hazards identified in Section 4.1, the sections that follow present the general vulnerability analysis for all participating jurisdictions within the Sutter County Planning Area. Where specific hazard risks vary across the county and from jurisdiction to jurisdiction (as mentioned above), a more detailed evaluation is presented in the Jurisdictional Elements.

### **Identified Hazard Risk Areas: Flood and Wildfires**

The HMPC identified two hazards within the Planning Area where specific geographical hazard areas have been defined: flood and wildfires. Because the two hazards listed above have discrete hazard risk areas, the HMPC has determined that the risk of these hazards varies between jurisdictions. For these two hazards, the HMPC has inventoried the following for each community, to the extent feasible, as a means of quantifying the vulnerability within the identified hazard areas:

- General hazard-related impacts, including impacts to life, safety and health;
- Values at Risk/Assessor Data;
- Identification of Critical Facilities at risk;
- Identification of Cultural and Natural Resources at risk;
- Development trends within the identified hazard area; and
- Overall Community Impacts;

This information is provided below for the Sutter County Planning Area as a whole and in detail by jurisdiction in the Jurisdictional Elements section of this plan.

Vulnerability and potential impacts from significant hazards that do not have specific mapped areas and where the risk does not vary across the Planning Area, such as drought and severe weather, are discussed below in more general terms, based on past events.

## VULNERABILITY TO FLOODS

*100-year Flood: Risk - Occasional; Vulnerability – Extremely High*

*< 100-year Flood/Localized Flooding: Risk –Highly Likely; Vulnerability - Medium*

Historically, the Sutter County Planning Area has always been at risk to flooding during the rainy season from November through April. Normally, wintertime storm floodwaters are kept within defined limits by levees, dykes, and open lowlands and cause no damage. But, occasionally, extended heavy rains result in floodwaters exceeding normal high-water boundaries and causing damage. The big damaging floods of 1955, 1986, 1995, and 1997, were generally the result of failures of the levee systems rather than the levees being overtopped. Other lesser flooding events have also occurred in other years.

Flooding has occurred, both within the 100-year floodplain and in other localized areas. Until recently, most of the Sutter County Planning Area was considered outside of the 100-year floodplain. Recent studies and the issuance of preliminary draft DFIRMS in August of 2006 have placed (or likely will place in the future) most of the Planning Area back within the 100-year or greater floodplain. This is primarily due to the inability of the aging levee system to be certified in accordance with current FEMA standards for levee certification. As such, the levees no longer provide protection from the 100-year flood. It should, however, be noted, that the levees do provide some level of protection to the planning area and are a critical factor in floodplain management for the communities.

The risk potential or likelihood of a flood event occurring in the county increases with the annual onset of heavy rains from November through April. In addition to damages to area infrastructure, other problems associated with flooding include erosion, sedimentation, degradation of water quality, loss of environmental resources, and certain health hazards.

### **Severe Flooding**

The Sutter County Planning Area faces a risk of severe flooding for two primary reasons:

1. The cores of today's levees are often the levees built by farmers and settlers as much as 150 years ago. Early levees were not constructed to current engineering standards, and little care was given to the suitability of foundation soils. These remnants of the past make today's levee reliability uncertain.
2. The development trend in the Planning Area is steady, significant growth. Much of this growth is occurring in urban areas, which causes a significant increase in peak flow and stormwater runoff.

### **The Impact of Flood Control Upon Flood Vulnerability**

Continued reliance upon flood control structures in the Sutter County Planning Area and the Central Valley will be without reprieve. The history of the area, beginning with hydraulic mining techniques of the gold miners, through the ongoing conversion of agricultural lands to commercial and residential developments, makes it impossible to reverse the dependence upon

structural flood control protection. Levee maintenance is a continuous effort, due to erosion and scour brought on by the channelization itself.

To address this issue, the USACE is in the process of studies and reconstruction efforts along the most critical areas of the levee system. Additional improvements to strengthen the levees and make them less susceptible to seepage induced failures to reduce the risk of flooding are a priority of local and state agencies. Once these improvements have been made, certification of these levees may be possible. While these improvements may mitigate, the risk of flooding due to levee failure, the levees will remain subject to overtopping by flood events larger than their design capacity. In addition to improvements to the existing levee system, other flood control measures are also being evaluated to provide increased levels of flood protection throughout the Planning Area.

### **Values at Risk**

All incorporated communities and the unincorporated county have mapped flood hazard areas. GIS was used during this planning process to determine the possible impacts of flooding within the county and where the flood risk varies across the Planning Area. Once the flood hazard areas were mapped, the next step was to quantify the flood vulnerability by jurisdiction. The following methodology was followed in creating these flood vulnerability maps and determining values at risk to the 100-year and 500-year flood events.

### **Methodology**

The County's parcel layer was used as the basis for the inventory of developed properties. In some cases there are parcels in multiple flood zones, such as Zone A and X 500. GIS was used to create a centroid, or point, representing the center of each parcel polygon, which was overlaid on the floodplain layer. For the purposes of this analysis, the flood zone that intersected the centroid was assigned as the flood zone for the entire parcel. Another assumption with this model is that every parcel with an improved value greater than zero was assumed to be developed in some way. Only improved parcels, and the value of those improvements, were analyzed and aggregated by property type and flood zone. The parcels were segregated and analyzed for the entire county, unincorporated only, Yuba City only, and Live Oak only,. The results are summarized in the tables and maps provided within the vulnerability sections for the respective jurisdictions.

To further complicate this analysis, the southern portion of the county is in the process of having several of the paper FIRMs replaced by the new preliminary draft DFIRMs, dated August 2006, as previously described in Section 4.1 of this plan. It is anticipated that new DFIRMs for the northern portion of the county will replace the remaining paper FIRMs sometime in the next two to three years. The major change associated with these updated maps is that the new DFIRMs do not recognize the existing levee system as being certified. As a result, most of the properties designated as Zone X and Zone C (outside the floodplain) in the paper maps are being re-categorized into 100-year and 500-year flood zones.

As a result of these ongoing map changes, in order to most accurately reflect the current status of FEMA floodplain mapping within the Sutter County Planning Area, the following maps, detailed

by area, were relied on in creating vulnerability maps and determining values at risk to the 100-year and 500-year flood events.

**Flood Hazard Vulnerability Assessment  
Flood Maps used by Jurisdiction**

<b>Jurisdiction</b>	<b>Data Type</b>
Unincorporated Sutter County	FEMA Q3 data (as modified by County GIS) and proposed DFIRM data
City of Yuba City	FEMA Q3 data (as modified by County GIS) and proposed DFIRM data
City of Live Oak	FEMA Q3 data (as modified by County GIS)

A summary of the different types of flood zones included in these maps for the Sutter County Planning Area is presented in the following tables.

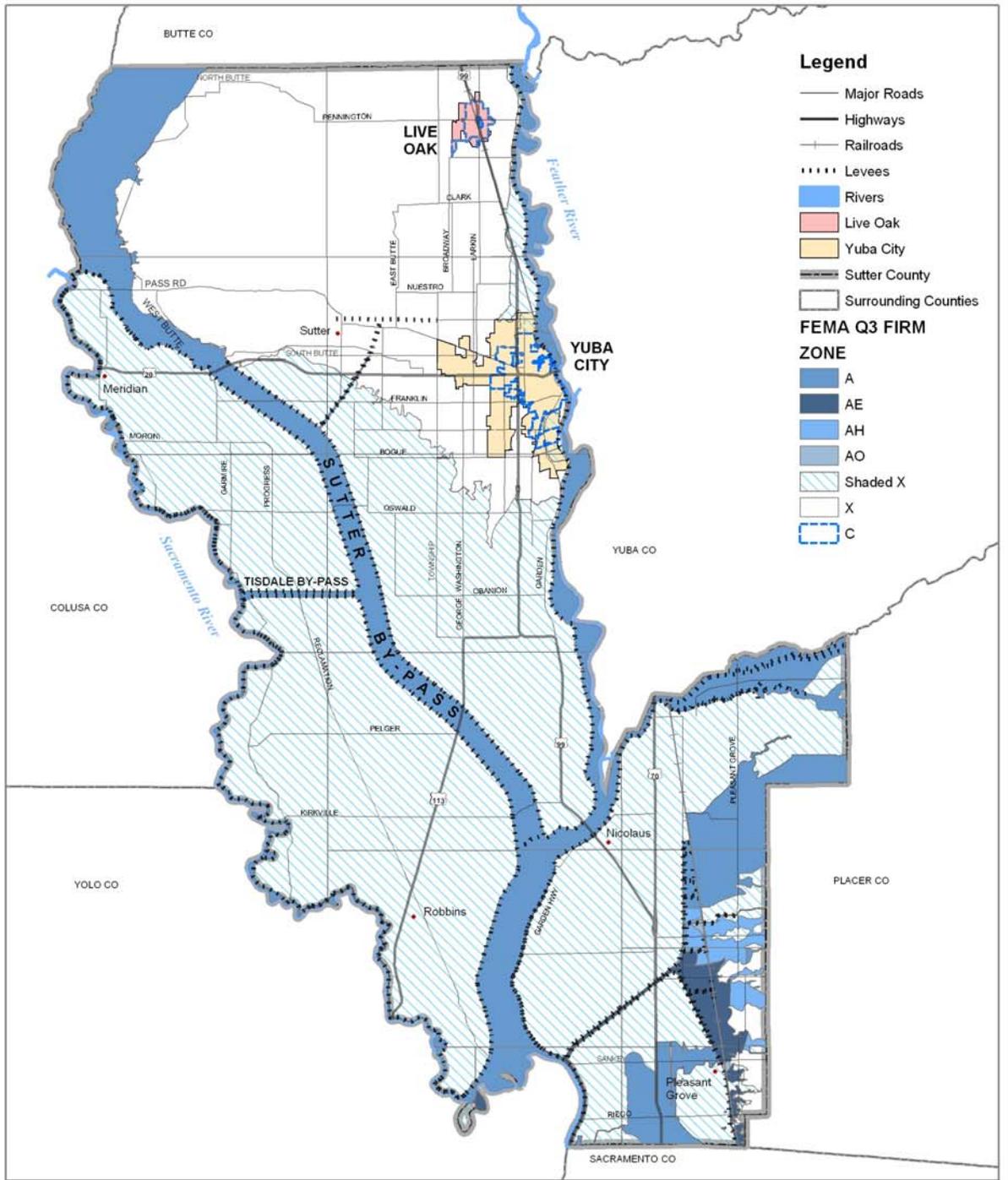
**Flood Zones Summary**

<b>Special Flood Hazard Areas (SFHAs) Subject to Inundation by the 1% Annual Chance Flood (i.e., 100-year flood)</b>	
<b>Flood Zone</b>	<b>Definition</b>
Zone A	No Base Flood Elevations determined
Zone AE	Base Flood Elevations determined
Zone AH	Flood depths of 1-3 feet (usually areas of ponding); Base Flood Elevations determined.
Zone AO	Flood depths of 1-3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
Zone AR	SFHA formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
Zone A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
<b>Other Flood Areas</b>	
Zone X (with color coding)	Areas of 0.2% annual chance flood (i.e., 500-year flood); areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
<b>Other Areas</b>	
Zone X (with no shading)	Areas determined to be outside the 0.2% annual chance floodplain.
Zone C (with no shading)	Areas of minimal flooding (from old paper maps)

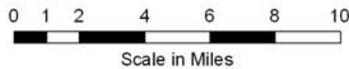
<b>Other Areas</b>	
Zone D	Areas in which flood hazards are undetermined, but possible.

Following this methodology, flood maps for the entire Sutter County Planning Area are provided below. The table that follows summarizes the values at risk in the floodplain for the entire Sutter County Planning Area. A detailed analysis by jurisdiction is provided in the Jurisdictional Elements.

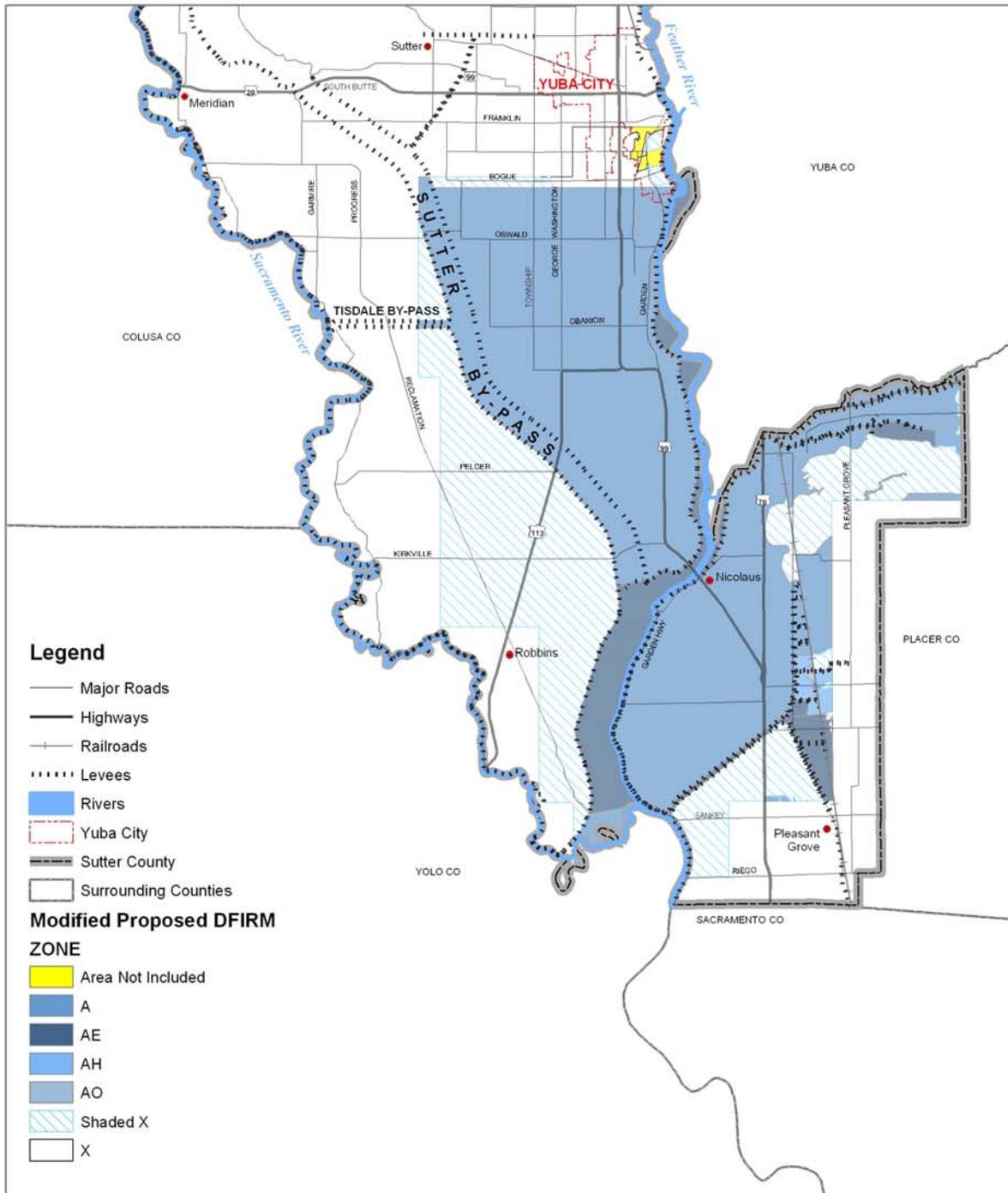
# Sutter County Flood Zones Based on Q3 Data



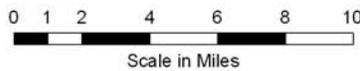
**amec**  
 Map Compilation: AMEC 10/23/06  
 Data Source: Sutter County, CA



# Sutter County Flood Zones Based on Modified Proposed DFIRM



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 Data Source: Sutter County, CA



**Sutter County Planning Area  
Flood Hazard – Improved Parcels  
Based on FEMA Q3 Data**

Sutter County								
	Zone A		Zone AE		Zone AH		Zone AO	
Property Type	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value
Residential	81	\$ 3,831,892	5	\$ 399,589	2	\$ 278,777	-	\$ -
Commercial	12	\$ 1,475,287	2	\$ 322,165	1	\$ 38,395	-	\$ -
Industrial	6	\$ 17,275,779	-	\$ -	-	\$ -	-	\$ -
Institutional	7	\$ 260,234	-	\$ -	-	\$ -	-	\$ -
Agricultural	121	\$ 8,734,100	30	\$ 2,170,036	23	\$ 2,495,715	2	\$ 120,552
Other	-	\$ -	1	\$ 10,000	-	\$ -	-	\$ -
<b>Total</b>	<b>227</b>	<b>\$ 31,577,292</b>	<b>38</b>	<b>\$ 2,901,790</b>	<b>26</b>	<b>\$ 2,812,887</b>	<b>2</b>	<b>\$ 120,552</b>

	Shaded Zone X		Zone X		Zone C		Total	
Property Type	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Parcels	Improved Value
Residential	578	\$ 81,281,027	6,802	\$ 1,062,817,417	7,417	\$ 822,093,798	14,885	\$ 1,970,702,500
Commercial	27	\$ 7,935,740	118	\$ 59,912,425	730	\$ 407,588,626	890	\$ 477,272,638
Industrial	48	\$ 40,993,097	120	\$ 38,898,689	167	\$ 80,294,784	341	\$ 177,462,349
Institutional	16	\$ 5,535,681	65	\$ 35,559,870	98	\$ 69,358,530	186	\$ 110,714,315
Agricultural	518	\$ 44,077,257	1,319	\$ 137,835,341	8	\$ 632,068	2,021	\$ 196,065,069
Other	7	\$ 326,362	54	\$ 4,947,453	25	\$ 2,162,700	87	\$ 7,446,515
<b>Total</b>	<b>1,194</b>	<b>\$ 180,149,164</b>	<b>8,478</b>	<b>\$ 1,339,971,195</b>	<b>8,445</b>	<b>\$ 1,382,130,506</b>	<b>18,410</b>	<b>\$ 2,939,663,386</b>

**Sutter County Planning Area  
Flood Hazard – Improved Parcels  
Based on Proposed DFIRM**

Sutter County								
	Zone A		Zone AE		Zone AH		Zone AO	
Property Type	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value
Residential	1,289	\$ 178,309,320	28	\$ 5,624,801	2	\$ 183,586	-	\$ -
Commercial	27	\$ 4,113,233	2	\$ 647,514	-	\$ -	-	\$ -
Industrial	33	\$ 349,657,890	-	\$ -	-	\$ -	-	\$ -
Institutional	21	\$ 1,413,474	4	\$ 159,221	-	\$ -	-	\$ -
Agricultural	1,404	\$ 138,898,509	77	\$ 4,687,515	10	\$ 759,998	1	\$ 4,162
Other	10	\$ 646,309	3	\$ 398,114	-	\$ -	-	\$ -
<b>Total</b>	<b>2,784</b>	<b>\$ 673,038,735</b>	<b>114</b>	<b>\$ 11,517,165</b>	<b>12</b>	<b>\$ 943,584</b>	<b>1</b>	<b>\$ 4,162</b>

	Shaded Zone X		Zone X		Total	
Property Type	Pcls	Improved Value	Pcls	Improved Value	Parcels	Improved Value
Residential	648	\$ 106,003,478	5,625	\$ 814,861,901	7,592	\$1,104,983,086
Commercial	2	\$ 431,951	55	\$ 24,241,667	86	\$ 29,434,365
Industrial	9	\$ 4,148,176	60	\$ 5,465,672	102	\$ 359,271,738
Institutional	4	\$ 7,919,416	15	\$ 6,604,312	44	\$ 16,096,423
Agricultural	164	\$ 11,795,898	66	\$ 8,642,498	1,722	\$ 164,788,580
Other	1	\$ 113,031	12	\$ 1,175,104	26	\$ 2,332,558
<b>Total</b>	<b>828</b>	<b>\$ 130,411,950</b>	<b>5,833</b>	<b>\$ 860,991,154</b>	<b>9,572</b>	<b>\$1,676,906,750</b>

Base on this analysis, the Sutter County Planning Area has significant assets at risk to the 100-year and greater floods. Combining both the Q3 data and the DFIRM data, 3,204 improved parcels are within the 100-year floodplain for a total value of \$ 722,916,167. 2,022 improved parcels fall within the 500-year floodplain for a total value of \$310,561,114. The total value of improved parcels outside of either floodplain is \$3,583,092,855. The valuation details for unincorporated Sutter County and the incorporated communities are broken out in the Jurisdictional Elements of this plan.

These values can be refined a step further. When a flood occurs seldom does the event cause total destruction of an area. Potential losses from flooding are related to a variety of factors including flood depth, flood velocity, building type, and construction. The percent of damage is primarily related to the flood depth. FEMA's flood benefit/cost module uses a simplified approach to model flood damage based on building type and flood depth. The values at risk in the following tables were further refined assuming an average damage estimation of 20% of the total building value. The 20% damage estimate utilized FEMA's Flood Building Loss Table based on an average flood depth of 4 feet for two-story buildings with no basement.

Application of the 20% damage estimate to the Improved Parcel Value of \$722,916,167 results in an estimated \$144,583,233 at risk to damage from a 100-year flood within the Sutter County Planning Area based on current FEMA mapping. Thus, there is a 1% chance in any given year of a 100-year flood causing \$144,583,233 in damages. While there are several limitations to this model, it does present a methodology to estimate potential damages. Note, this model may include structures located within the 100-year floodplain that are elevated at or above the level of the base flood elevation, according to local floodplain development requirements. Also, it is important to keep in mind that these assessed values are well below the actual market value of improved parcels located within the 100-year floodplain. As such, the actual value of assets at risk is significantly above those included in the above calculation and tables.

## **Cultural and Natural Resources at Risk**

The Yuba Sutter Planning Area has significant cultural and natural resources located throughout the county as previously described. Risk analysis of these resources was not possible due to data limitations. However, natural areas within the floodplain often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters.

## **Critical Facilities at Risk**

Critical facilities are those community components that are most needed to withstand the impacts of disaster. Included in this classification are police and fire stations, hospitals, schools that serve as emergency shelters, and lifeline utilities; power, water and sewer system components. Within the Planning Area many critical facilities are protected by the extensive flood control system. To additionally protect them individually from the potential failure of the structural flood control systems may be very difficult to justify on a benefit/cost ratio analysis. Still, the

impact to the community, should the statistically unlikely catastrophic flood event occur, would be astonishing if also these critical facilities are damaged or destroyed.

## **Development Trends in Hazard Area**

The development trend in the Sutter County Planning Area is steady, significant growth, especially within the existing urban areas.

The Housing Element of the Sutter County General Plan expects the population in the county to grow to 109,280 by 2015. This is an additional 30,770 people from the 2000 census estimate of 78,510. Such growth will consume acres of previously undeveloped areas and the impacts may overwhelm existing drainage and flood control facilities.

Master planning will be necessary to assure that open channel flood flow conveyances serving the smaller internal streams and drainage areas are adequately prepared to accommodate the flows. These developments can bring the revenue needed to solve existing flooding problems by constructing ecologically sensitive water conveyance areas with peak flow detention.

The potential for flooding may increase as storm water is channelized due to land development. Such changes can create localized flooding problems in and outside of natural floodplains by altering or confining natural drainage channels. Floodplain modeling and master planning should be based on the ultimate built-out land use in order to assure that all new development remains safe from future hydrologic conditions. While local floodplain management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative affects can result in floodplain impacts regardless.

The amount of growth in this and nearby communities will strain the limits of the entire water management system – which includes water supply in addition to water control. The Central Valley provides 2/3 of the water supply for southern California – so when flood control structures are overwhelmed, the result is not only severe flooding, but a significant loss to the state's water supply may also occur.

Local floodplain management ordinances require that new construction be built with the lowest floor at or above the base flood (100-year) elevation. New development that adheres to the elevation requirements in addition to other requirements for maintaining elevation certificates, implementing stormwater program elements and erosion or sediment controls for all new development in the floodplain should help protect new development from the 100-year flood event.

## **Overall Community Impact**

Floods and their impacts will vary by community and will likely only affect certain areas of the county during specific flood events. Based on the risk assessment, it is evident that flooding in some areas will have an economic impact on the community. A failure of the levee system in an exceptional flood event could have significant damage potential, posing a threat to life and property and causing significant economic injury. However, many of the floods are minor,

localized flood events creating more of a nuisance (e.g., maintenance issues and traffic disruptions) than a significant economic impact to the area. The overall impact to the community from a devastating flood includes:

- Potential for loss of life and disruption of infrastructure;
- Commercial and residential structural damage;
- Damages to road/bridges resulting in loss of mobility;
- Possible damage/loss of sewer and drinking water treatment plants;
- Significant economic impact (jobs, sales, tax revenue) upon the community with the loss of commercial structures and impacts to the larger agricultural community;
- Negative impact upon commercial and residential property values; and
- Economic impacts due to washed out or flooded roads that necessitate detours.

A more catastrophic flood, such as with a dam or levee failure, would impact all of California. Recent court decisions have determined that the state is liable for flood related damages caused by levee failures – every taxpayer will foot the bill for the disaster. A levee failure in the Central Region would disrupt water supplies to the Bay Area and Central and Southern California. Extreme water conservation measures would need to be enacted. Ground water basins could be drawn down to dangerously low levels, potentially leading to contamination. Agricultural and other industries with heavy water reliance would be threatened.

## VULNERABILITY TO WILDFIRES

*Risk – Likely; Vulnerability –Low*

Vulnerability to the Sutter County Planning Area from wildfire is low; although, there exists a limited exposure in the grass lands and shrub oaks of the Sutter Buttes and within areas in and adjacent to the grassy river bottoms. The Sutter Buttes are considered the primary concern with their limited access, steep terrain and remote location. Looking at the Planning Area as a whole, limited, fuel loads, along with the geographical and topographical features of the area, limit the potential for both natural and human-caused fires resulting in loss of life and property.

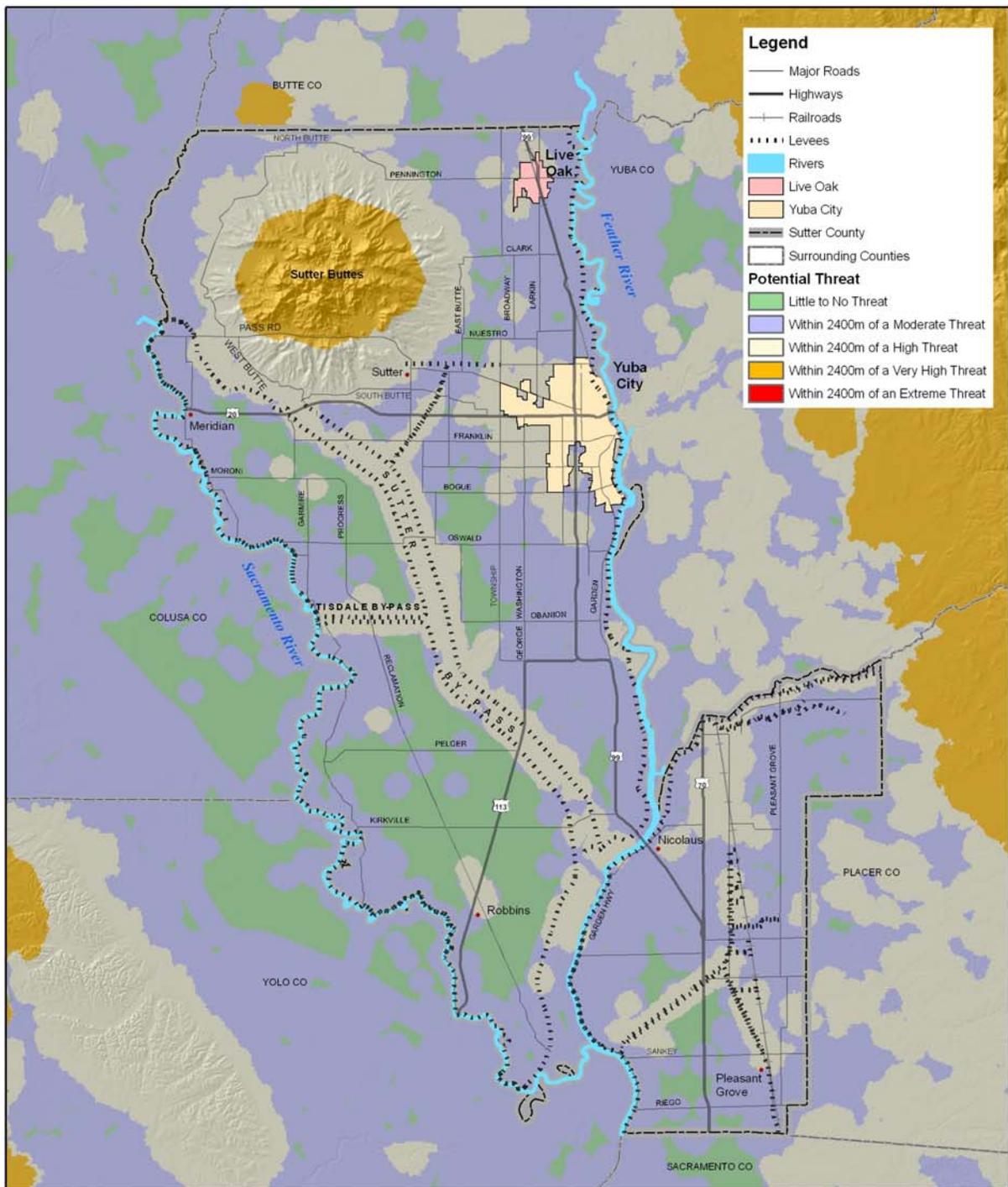
As with most wildfire vulnerability, it is the result of increased development encroaching into forested and dry grassland areas, typically referred to as the WUI. As development continues to occur throughout the Planning Area, especially in the area of the Sutter Buttes, the risk and vulnerability to wildfires will likely increase.

Any fire, once ignited, has the potential to quickly become a large, out-of-control fire, especially when combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic high wind conditions. Even the relatively flat, urbanized portion of the planning area is not immune.

## **Fire Threat**

The Wildland Fire Threat Map that follows shows the fire threat rating for areas throughout the Sutter County Planning Area. This potential wildland fire threat was analyzed using GIS data for the WUI Fire Threat developed by the CDF (2003 - edition 03\_1 with 100 m cell size). CDF calculated a numerical index of fire threat based on the combination of fuel rank and fire rotation. This threat index was then grouped into five threat classes: Extreme, Very High, High, Moderate, and Little or No Threat. CDF buffered the threat categories with a 2400 meter buffer (approx. 1.5 miles) to identify areas that include or are near very high threat areas. Each class was buffered independently and then overlaid in the following priority - Extreme, Very High, High, Moderate, Little or No Threat. Thus, areas of greater threat class take precedence over areas with lesser or no threat class. For the purposes of this plan GIS was then used to determine the improved parcel centroids that lie within the 2400 meter of a very high fire threat.

# Sutter County Potential Wildland Fire Threat Map



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 Map Compilation: AMEC 10/23/06  
 Data Source: Sutter County, CA



## **Values at Risk**

Overlaying the Fire Threat Map with the parcel layer for the county and incorporating assessor data, there are 28 improved agricultural parcels valued at \$3,970,499 located within 2,400 meters of the Sutter Buttes area identified as a Very High Threat of wildfire.

## **Cultural and Natural Resources at Risk**

The Sutter County Planning Area has substantial cultural and natural resources located throughout the county as previously described. In addition, there are other natural resources at risk when wildland-urban interface fires occur. One is the watershed and ecosystem losses that occur from wildland fires. This includes impacts to water supply and water quality. Another is the aesthetic value of the area. Major fires that result in visible damage detract from that value. The Sutter Buttes itself is an important asset to Sutter County. The loss to these natural resources would be significant.

## **Critical Facilities at Risk**

The primary area at risk to wildland fires within the Yuba City Urban Area are the riverbottoms of the West Feather River. The riverbottom area includes two significant infrastructure features that could be at risk from wildfires. These include:

- The water intake pump/lift station structure for the city's water system (the elevated pump structure is located along the west bank of the Feather River.) The pumps pull water from the river and pump it in pipes across the river-bottom area to the City's Water Treatment Plant located on the west side of the adjacent levee.
- A Union Pacific Railroad trestle that spans the width of the west Feather River riverbottom area. The subject rail line is Union Pacific's main north-south route between California and the Pacific Northwest. The trestle has caught fire in the past as a result of both grass fires and fires caused by the train operations.

## **Overall Community Impact**

The overall impact to the community from a severe wildfire includes:

- Potential for injury and loss of life;
- Commercial and residential structural damage;
- Impact on the water quality of watershed located within the county;
- Impact to natural resource habitats and other resources such as timber;
- Significant economic impact (jobs, sales, tourism, tax revenue) upon the community with the loss of commercial structures;
- Negative impact upon commercial and residential property values;
- Major wildland fires within the community would have a significant impact on the overall mental health of the community.

## Development Trends

Population growth and development in Sutter County is on the rise. Additional growth and development within the area of the Sutter Buttes and other non-urban areas would place additional assets at risk to wildfire.

## Other Identified Hazards: Agricultural Hazards, Dam Failure, Drought, Earthquakes, Severe Weather, and West Nile Virus.

For the other hazards identified as significant hazards in Section 4.1, information is available where the potential impacts can be developed or inferred, although it is not tied to a county-specific location. For these other hazards, the entire Planning Area is at risk. The following sections describe the vulnerability of the Sutter County Planning Area to these other hazards.

### VULNERABILITY TO AGRICULTURAL HAZARDS

*Risk – Likely; Vulnerability - Medium*

Given the importance of agriculture to Sutter County, agricultural disasters continue to be an ongoing concern. The primary causes of agricultural losses are severe weather events, such as drought and freeze and to a limited extent insect infestations. According to the HMPC, agricultural losses occur on an annual basis throughout the county and are usually associated with these severe weather events.

### VULNERABILITY TO DAM FAILURE

*Risk - Unlikely; Vulnerability –Extremely High*

Dam failure flooding can occur as the result of partial or complete collapse of an impoundment. Dam failures often result from prolonged rainfall and flooding. The primary danger associated with dam failure is the high velocity flooding of those properties downstream of the dam.

A dam failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to dam failures is confined to the areas subject to inundation downstream of the facility. Secondary losses would include loss of the multi-use functions of the facility, and associated revenues that accompany those functions.

According to the Sutter County EOP for floods and dam failure, of the ten dams with a potential to impact the planning area, four of these dams pose the greatest threat should a failure occur. These four dams are listed in the table that follows. The failure of any of these dams would flood downstream areas and would result in loss of life and property. According to the EOP, a catastrophic failure of any of these dams would have a significant impact on Sutter County. Complete devastation could occur in and along the river bottoms and up the banks several hundred feet above normal river levels at a point from the dams themselves down river to near the ocean where the rivers widen. Water levels could be many times higher than those recorded in the worst floods. The potential magnitude of a dam failure depends on the time of year and the base flow in the river when the failure occurs. During the winter months when the river

flows are higher, the impact to the area would be much greater and evacuation times much less. Also included in the table is the estimated warning time from dam failure until the resulting floodwaters reach a significant area of the county.

**Major Dams with Potential to Significantly Impact the Sutter County Planning Area**

Dam Name	River	Storage Capacity in Acre-Feet	Warning Time
Shasta	Sacramento	4,552,000	100 hours
Oroville	Feather	3,538,000	9 hours
Bullards Bar	Yuba	966,103	1 hour
Camp Far West	Bear	104,000	1 hour

(Source: Sutter County Operational EOP, 2006; DWR)

According to the EOP, these dams would have the greatest impact on the population of the Sutter County Planning Area should they fail. The following sections provide details of inundation areas and times in the event of a failure of these dams. This information is taken directly from the EOP as obtained from the Emergency Action Plan (EAP) on file for the respective dam facilities.

**Oroville Dam Failure**

The Oroville Dam facilities include Thermalito Diversion, Forebay, Afterbay and Lake Almanor Dams. Failures of Thermalito Diversion and Forebay Dams individually would have negligible affects due to low amounts of storage capacity. Thermalito Diversion Dam failure would cause increased flows to the convergence of Honcut Creek and Feather Rivers. The flow would then continue through the leveed portions of the Feather River. Thermalito Forebay Dam failure would be channeled into the Sutter Bypass and Feather River. Thermalito Afterbay Dam failure would also be channeled into the Sutter Bypass and Feather River. A breach in the southern side of the dam would result in flooding of Live Oak and Tierra Buena. A failure of the Lake Almanor Dam would possibly cause a failure at the Oroville Dam, causing the emergency operations team to follow the EAP for the Oroville Dam and to take appropriate actions. Provided below is an estimate of the affected areas and the flood arrival times for an Oroville Dam failure as reported by DWR.

**Estimated Flood Arrival Times for Oroville Dam Failure**

Location	Main Channel Flood Wave	Total Inundation Time
City of Live Oak	4.3 hours	11.3 hours
City of Yuba City	8.6 hours	24.8 hours
Town of Meridian	8.9 hours	28 hours
Town of Nicolaus	13.2 hours	34 hours

(Source: Sutter County Operational EOP, 2006; DWR)

**Affected Areas:** Sutter County, City of Live Oak, Town of Meridian, Town of Sutter, City of Yuba City, Town of Robbins, Town of Nicolaus

**Estimated Flood Arrival Times for Thermalito Afterbay Dam Failure**

<b>Location</b>	<b>Main Channel Flood Wave</b>	<b>Total Inundation Time</b>
City of Live Oak	12.4 hours	15.5 hours
Tierra Buena	20.6 hours	25.7 hours

(Source: Sutter County Operational EOP, 2006; DWR)

**Affected Areas:** Sutter County, City of Live Oak, Tierra Buena

**New Bullards Bar Dam Failure**

Information taken from the EAP on file for New Bullards Bar Dam describes the potential impacts as a result of a failure of the this dam. According to the EAP, failure of New Bullards Bar Dam would result in the failure of Englebright Dam causing failure/overtopping of all levees downstream. The only levees not overtopped would be the left levee of the Sutter Bypass and the north levee of the Natomas Cross Canal. Flooding would extend south to Fremont Weir. An individual failure of the Englebright Dam would most likely stay within the boundaries of the Feather River Levees causing minimal impact on Sutter County. Provided below is an estimate of the flood arrival times and affected areas for an New Bullards Bar Dam failure as reported by DWR.

**Estimated Flood Arrival Times for New Bullards Bar Dam Failure**

<b>Location</b>	<b>Main Channel Flood Wave</b>	<b>Total Inundation Time</b>
City of Yuba City	1.25 hours	2.6 hours
East Nicolaus	2.5 hours	4 hours
Town of Pleasant Grove	3 hours	4.5 hours

(Source: Sutter County Operational EOP, 2006; DWR)

**Affected Areas:** Sutter County, City of Yuba City, Town of East Nicolaus, Town of Pleasant Grove

**Estimated Flood Arrival Times for Englebright Dam Failure**

<b>Location</b>	<b>Main Channel Flood Wave</b>	<b>Total Inundation Time</b>
City of Yuba City	1 hours	N/A
East Nicolaus	2.25 hours	N/A

(Source: Sutter County Operational EOP, 2006; DWR)

**Affected Areas:** Sutter County, City of Yuba City, East Nicolaus

**Shasta Dam Failure**

Information taken from the EAP on file for Shasta Dam describes the potential impacts as a result of a failure of the Shasta Dam facilities. This includes Keswick and Spring Creek Dams. This information is extrapolated from inundation scenarios and maps provided by USBR.

### Estimated Flood Arrival Times for Shasta Dam Failure

Location	Main Channel Flood Wave	Total Inundation Time
City of Yuba City	N/A	Approx. 135 hours
Town of Meridian	Approx 100 hours	Approx. 115 hours
Town of Robbins	N/A	Approx. 147 hours

(Source: Sutter County Operational EOP, 2006; DWR)

**Affected Areas:** Sutter county, City of Yuba City, Town of Meridian, Town of Robbins

### Camp Far West Dam Failure

Information taken from the EAP on file for the Camp Far West Dam describes the potential impacts as a result of a failure of the Camp Far West Dam facilities. This includes Rollins and Combie Dams located upstream. Failure of Rollins Dam would result in the failure of both the Combie and Camp Far West Dam, and flooding east of the Feather River levees downstream. An independent failure of the Combie Dam is not expected to result in a failure of the Camp Far West Dam.

### Estimated Flood Arrival Times for Camp Far West Dam Failure

Location	Main Channel Flood Wave	Total Inundation Time
East Nicolaus	1.5 hours	2 hours
Town of Nicolaus	2.1 hours	2.75 hours
Town of Pleasant Grove	2.75 hours	3.5 hours

(Source: Sutter County Operational EOP, 2006; DWR)

Dam failure flooding and their impacts will vary by community, and will depend on the nature and extent of the dam failure and associated flooding. Based on the risk assessment, it is apparent that a dam failure would have a devastating economic impact to the Planning Area. Dam failure flooding presents a threat to life and property, including buildings, their contents, and their use. Large flood events can affect crops and livestock as well as lifeline utilities (e.g., water, sewerage, and power), transportation, jobs, tourism, the environment, and the local and regional economies. In addition to the types of community impacts described above for flood events, a dam failure flood would result in the following:

- A dam failure flood on the Feather or Sacramento Rivers could breach levees, and inundate local communities leaving tens of thousands of homes and businesses damaged;
- A dam failure flood event would have a significant impact on the overall economic health of the community; and
- A failure of the levee system in a dam failure flood could have significant damage potential including loss of critical facilities, such as, hospitals, fire/law enforcement facilities, jails, bridges, roadways, pump stations, electricity distribution and water and sewage treatment plants.

## VULNERABILITY TO DROUGHT

*Drought: Risk – Likely; Vulnerability – High*

Drought is different than many of the other natural hazards in that it is not a distinct event, and usually has a slow onset. Drought can severely impact a region both physically and economically. A drought's effects impact various sectors in different manners and with varying intensity. Adequate water is the most critical issue; Agricultural, manufacturing, tourism, recreation, and commercial and domestic use all require a constant, reliable supply of water. As the population in the area continues to grow, so will the demand for water.

Based on historic information, the occurrence of drought in California, including Sutter County, is cyclical, driven by weather patterns. Drought has occurred in the past and will continue to occur in the future. The periods of actual drought with adverse impacts can vary from short to long term; often the period between droughts is extended. Although an area may be under an extended dry period, defining when a drought occurs is a function of drought impacts to individual water users. Since 1850, there have been 11 documented droughts in California. The vulnerability to Sutter County from drought is usually county-wide and depending on the area can include reduction in water supply, agricultural losses, and an increase in dry fuels.

## VULNERABILITY TO EARTHQUAKES

*Risk – Unlikely; Vulnerability – Medium*

Earthquake vulnerability is primarily based upon population and the built environment. Urban areas in high hazard zones are the most vulnerable, while uninhabited areas are less vulnerable.

CGS and USGS have done considerable work using GIS technology to identify populations in high seismic hazard zones in each California county. According to the California Draft Multi-Hazard Mitigation Plan, 2004, zero percent of Sutter County's population is located in a High Seismic Hazard Zone.

Ground shaking, the principal cause of damage, is the major earthquake hazard. Many factors affect the potential damageability of structures and systems from earthquake-caused ground motions. Some of these factors include proximity to the fault and the direction of rupture, epicentral location and depth, magnitude, local geologic and soils conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems. Ground motions become structurally damaging when average peak accelerations reach 10 percent to 15 percent of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the Modified Mercalli Intensity Scale is about VII where:

Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving cars. (Bolt, 203)

Earthquakes can trigger secondary effects, such as dam failures, explosions, and fires that become disasters themselves. In addition to the potential for levee failures as a result of an earthquake, there is an extremely low probability of a seismic generated failure of a dam.

The Sutter County Shaking Potential map shown in Section 4.1 shows a 10 percent probability over 50 years of shaking intensity. Shaking is measured in a variety of ways, including peak ground acceleration, peak ground velocity, and spectral acceleration. This map is spectral acceleration, at one second frequency. The reason for looking at different frequencies is due to building response. In general, taller buildings may experience more damage by energy released in longer waveforms due to the harmonics of building sway, and ground shaking. Natural or artificially filled areas, such as the Marina District in San Francisco, tend to experience amplified motions, liquefaction, and associated ground failures that can cause extensive damage.

Fault rupture itself contributes very little damage unless the structure or system element crosses the active fault. In general, newer construction is more earthquake resistant than older construction because of improved building codes. Manufactured housing is very susceptible to damage because rarely are their foundation systems braced for earthquake motions. Locally generated earthquake motions, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry, such as was seen in the Oroville, Coalinga, Santa Cruz, and Paso Robles earthquakes.

Lifeline systems, such as water and natural gas pipelines, highways, overpasses and bridges, rail lines, electrical and other utility services, can experience substantial damage from shaking, ground deformations, and high velocities generated below ground by earthquakes.

Common impacts from earthquakes include damages to infrastructure and buildings (e.g., unreinforced masonry [brick] crumbling; architectural facades falling; underground utilities breaking, gas-fed fires; landslides and rock falls; and road closures). Earthquakes also can trigger secondary effects, such as dam failures, explosions, and fires that become disasters themselves.

## **Estimating Potential Losses**

Earthquake losses will vary in Sutter County Planning Area depending on the source and magnitude of the event. Since there are no active faults in Sutter County, past studies of earthquake activity in the vicinity of Sutter County were reviewed and information on potential risk was used to develop HAZUS Level 1 earthquake scenarios for the county. Based on historical data, Sutter County is located within a region with faults that are capable of producing maximum credible earthquakes of up to 6.9 magnitude and peak ground acceleration at the site between 0.2g to 0.3 g. The results of the HAZUS scenarios based on these parameters is summarized below.

### **HAZUS-MH Earthquake Scenario**

FEMA's earthquake loss estimation software, HAZUS-MH MR2, was used to simulate the effects of a potential earthquake. A worst case scenario was used to model potential earthquake impacts to Sutter County. HAZUS contains a GIS database of potentially active faults in

California that includes maximum credible earthquake magnitudes associated with each fault. The Great Valley 3 fault was chosen because it lies just west of Sutter County and has the potential for a M 6.9 earthquake. The default soil classification in HAZUS was changed from 'D' for stiff soils to 'E' for soft soils to more accurately represent the river sediments deposited in the Great Valley. The possible damages based on these parameters and the M 6.9 event occurring in the middle of the fault, west of the county are shown in the following table.

**Sutter County Earthquake Scenario**

Great Valley 3 Fault  
 Probabilistic Earthquake  
 6.9 Magnitude

According to HAZUS this more probable worst-case event could induce significant economic loss in the vicinity of \$187.62 million and deaths ranging from 1 to 2 depending upon the time of day.

The following table summarizes the HAZUS results.

**HAZUS-MH Earthquake Scenario Results**

<b>Impacts/Earthquake</b>	<b>Sutter County M6.9</b>
Residential Bldgs. Damaged <i>(Based upon 21,010 buildings)</i>	None: 16,570 Slight: 3,493 Moderate: 865 Extensive: 79 Complete: 3
Casualty <i>(Based upon 2pm time of occurrence)</i>	Without requiring hospitalization: 46 Requiring hospitalization: 8 Life Threatening: 1 Fatalities: 2
Displaced Households	74
Economic Loss	Property and Lifeline Damage: \$187.62
Damage to Schools <i>(Based upon 22 schools)</i>	None with at least moderate damage
Damage to Hospital <i>(Based upon 1 hospitals)</i>	None with at least moderate damage
Damage to Transportation Systems	None with at least moderate damage
Households w/out Power & Water Service <i>(Based upon 27,033households)</i>	No loss of power Water loss @ Day 1: 1,544 Water loss @ Day 3: 42 Water loss @ Day 7: 0 Water loss @ Day 30: 0

## VULNERABILITY TO SEVERE WEATHER

*Extreme Temperatures: Risk – Highly Likely; Vulnerability - Medium*

*Winterstorms: Heavy Rains/Thunderstorms/Wind/Hail/Lightning: Risk –Highly Likely; Vulnerability - Medium*

The severe weather further evaluated further in this vulnerability assessment includes: Extreme Temperatures and Winterstorms: Heavy Rains/Thunderstorms/ Hail/Lightning /Wind

### Extreme Temperatures

Extreme temperature events occur within Sutter County on an annual basis. Given its significance to the community, the agricultural industry is most vulnerable to extreme temperatures. Historically, extreme temperatures have caused large losses to agricultural crops and have resulted in several USDA Disaster Declarations. In addition to damages caused by extreme temperatures, damages also resulted from freezing temperatures and drought.

### Winterstorms: Heavy Rains/Thunderstorms/Hail/Lightning/Wind

Looking at historical hazard data, severe weather is an annual occurrence in Sutter County. Damages and disaster declarations related to severe weather events have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrence within the county. Wind and lightning often accompany these storms and have caused damage in the past. However, actual damages associated with the primary effects of severe weather have been limited. It is the secondary effects of weather such as floods, fire, and agricultural losses that have had the greatest impact on the county. The risk and vulnerability associated with these secondary impacts are discussed in other sections.

## VULNERABILITY TO WEST NILE VIRUS

*West Nile Virus: Risk – Likely; Vulnerability - Medium*

Both the risk and vulnerability to California from WNV is limited, based on the percentage of total population that actually comes down with the disease. The first appearance of WNV in the United States occurred in 1999. As of August 2003, WNV has been documented in 46 states and the District of Columbia. In California, WNV was detected on a very limited basis in both horses and humans in 2003. In 2004, California saw more cases of WNV, including 830 human infections. To date, there have been 928 human WNV cases in California from 40 counties, with 18 WNV fatalities. Since the discovery of WNV in California in 2003, Sutter County has experienced 18 human cases.

Although the potential for exposure does exist in Sutter County, the risk and vulnerability should be considered in terms of adverse effects due to exposure. The county already has an active vector control program in place for mosquitoes. And most important, protective measures to prevent exposure are relatively simple and cost effective. Given the nature of protective measures, such as wearing long sleeved clothing and using bug spray, the responsibility for protection can and should be an individual responsibility. Sutter County's current public education program should give the community both the knowledge as well as access to resources to effectively counter the risk and impact from WNV.

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# Multi-Hazard Mitigation Plan

## 4.3 Jurisdictional Elements

Thus far, the planning process has identified the natural hazards posing a threat to the Sutter County Planning Area and described, in general terms, the vulnerability of the county and communities to these risks. DMA regulations require that the HMPC evaluate the risks associated with each of the hazards identified through the planning process. For multi-jurisdictional plans, the regulations also require that the risks be further evaluated where a jurisdiction's risks vary from the risks facing the entire planning area. This section of the plan presents a summary, where data permits, of the possible impacts of identified hazards by participating jurisdiction. Note that data is provided only where the risk or impacts vary from those previously identified as impacting the entire Planning Area. If no additional data is included, it should be assumed that the risk and impacts to the affected jurisdiction would be similar to that previously described for the county.

The HMPC has determined that the risk for the following hazards varies throughout the Planning Area:

- Flood
- Wildfire

The following sections present the jurisdictional elements for participating jurisdictions, including:

### **Unincorporated Sutter County**

#### **Incorporated Communities**

- City of Yuba City
- City of Live Oak

#### **Districts**

- Gilsizer Drainage District
- Levee District One
- RD1001
- RD1500
- RD70 & RD1660

For the unincorporated county and incorporated communities, the following information is provided:

- Jurisdictional Background data
- Hazard Summary
- Vulnerability Assessment for Mapped Hazards: Flood and Dam Failure
- Capability Assessment (i.e., in section 4.4)
- Mitigation Action Strategy Projects (i.e., in section 5.0)

Information specific to participating districts is compiled in one district section.

## UNINCORPORATED SUTTER COUNTY

**Population:** 39,890  
**Area:** 607 Square Miles  
**Elevation:** 35-2,100 feet above msl

### Community Profile

Sutter County is part of the Central Valley of California which is drained by the Sacramento and San Joaquin Rivers. The county encompasses approximately 607 square miles (388,358 acres), which can be divided into two general topographical areas: a valley area and the Sutter Buttes. State Route 20 and State Route 99 are the primary regional transportation corridors within the County. A map of Sutter County is included at the end of this section.

Geologically, the Great Valley province is characterized by a great thickness of generally flat-lying sedimentary rocks overlain by alluvial soils. The alluvial soils of the Central Valley range in thickness from a few inches near the foothills to more than 200 feet near the Sacramento River. In Sutter County, the sedimentary rocks are of both marine and continental origin frequently imbedded within tuff-braccias.

The topography of Sutter County is comprised primarily of the gentle flatlands of the Sacramento River Valley. The eastern part of the county is an alluvial terrace with elevations of 35 to 80 feet. The only prominent topographic feature within the county is the Sutter Buttes (32,000 acres), a remnant volcano with a peak elevation approximately 2,000 feet above the surrounding valley floor.

Sutter County shares the mild climate of the San Joaquin and Sacramento Valleys. Temperatures range from lows around 36 degrees Fahrenheit (°F) in January to summer month highs around 96°F. The County receives an annual average rainfall of 30 inches.

Named in honor of John Augustus Sutter, Sutter County was one of the original counties in the State of California when the State entered the Union on September 19, 1850. During the first two years of its existence the county seat went to four towns in succession: Oro, Nicolaus, Auburn, and Vernon. The first permanent settlement in the county was an adobe built by John Sutter near Hock farm in 1841. In 1849, Samuel Brannan, Pierson B. Reading, and Henry Cheever laid out Yuba City, marking the beginning of planned settlement in the county. By 1850, three towns were established in the county: Vernon, Nicolaus, and Yuba City. Sutter County remained principally an agricultural area without cities until the incorporation of Yuba City in 1908 and Live Oak in 1947. Consequently, Sutter County's population was primarily rural until the 1960's when the urban and suburban population finally exceeded the rural farm population.

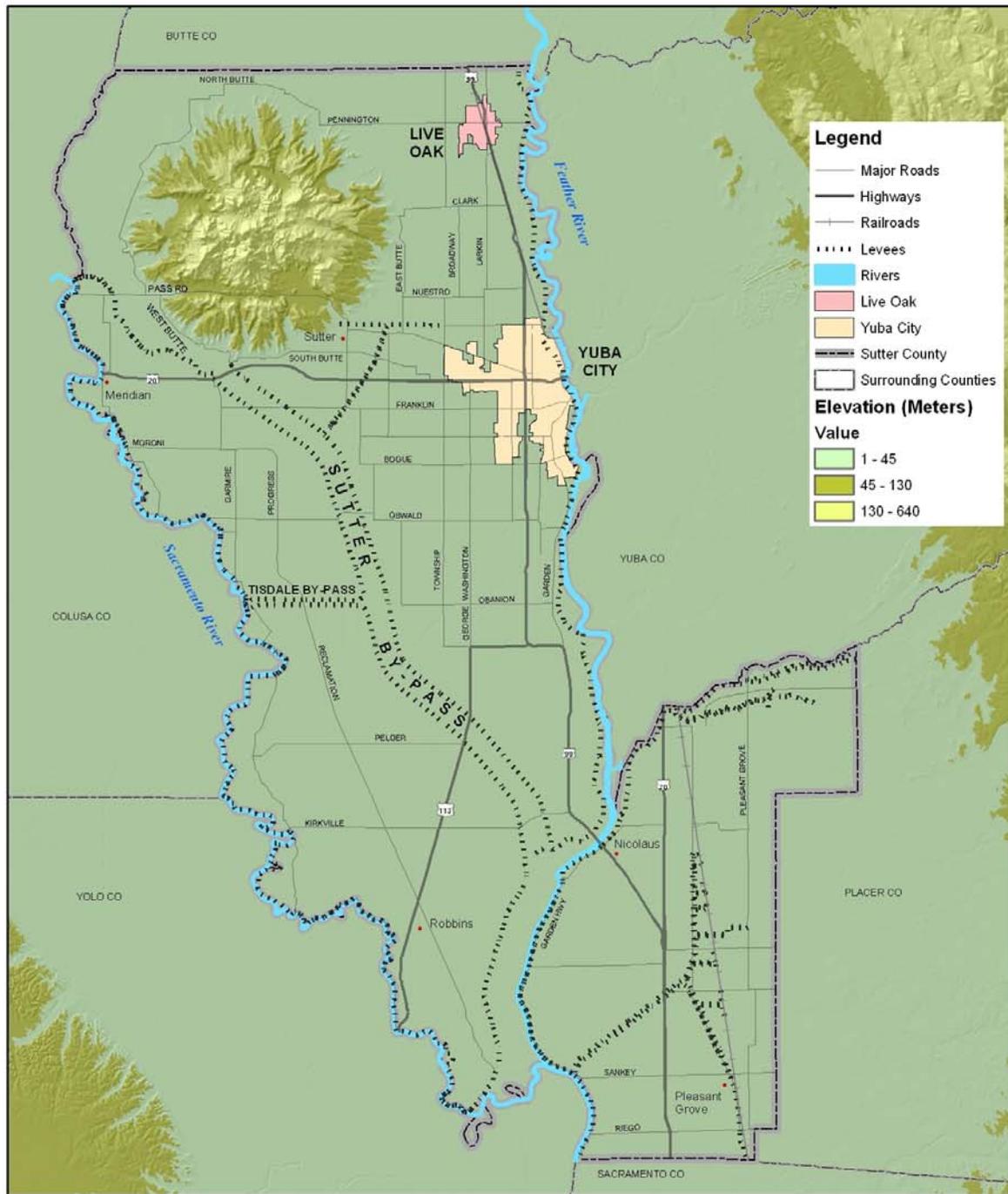
Today, Sutter County is still primarily rural, with one small, but expanding, urban center – Yuba City, the county seat. According to the 1992 Census of Agriculture, 81.9 percent of the county's

acreage is classified as being in farms. This is the third highest land percentage of all counties in California. The county is well known for its rice, walnut, peach, tomato, and prune production.

Only 4.6 percent of lands within Sutter County are owned by public agencies. This includes the following percentages (of parcels over 1 acre in size) taken from the General Plan: Federal - .81% (3,145 acres), State - 1.92% (7,460 acres), County - 1.20% (4,657 acres), Other Local Agencies - .71% (2,777 acres). The USFS is the primary federal land owner in Sutter County. State lands are primarily under the control of the DFG and the DWR.

According to the 2000 Census, Sutter County has a population of 78,510 and 88,520 was the projected population estimate for 2005. The population estimate for unincorporated Sutter County was 37,110 in 2000 and projected to be 39,890 in 2005. The County General Plan estimates a growth rate of 1.7 percent annually to 2015 with a projected future population of 109,280. The majority of the county's population resides in its two incorporated cities, Live Oak and Yuba City. The primary employment industries in Sutter County are the government, service industry, and trade jobs. Employment growth has averaged an annual 1.2 percent increase since 1990.

# Sutter County Base Map



**Legend**

- Major Roads
- Highways
- Railroads
- ..... Levees
- Blue Area: Rivers
- Pink Area: Live Oak
- Orange Area: Yuba City
- Sutter County
- Surrounding Counties

**Elevation (Meters)**

Value

- Light Green: 1 - 45
- Yellow-Green: 45 - 130
- Yellow: 130 - 640

**amec**  
 Map Compilation: AMEC 10/19/08  
 Data Source: Sutter County, CA OES



## Hazard Summary

Based on information provided by the HMPC, a hazard summary for unincorporated Sutter County is provided below.

<b>SUMMARY HAZARD ANALYSIS: UNINCORPORATED SUTTER COUNTY</b>				
<b>Hazard</b>	<b>Frequency of Occurrence</b>	<b>Spatial Extent</b>	<b>Potential Magnitude</b>	<b>Significance</b>
Agricultural Hazards				
Dam Failure				
Drought	Likely	Significant	Critical	Medium
Earthquakes				
Floods	Likely	Significant	Catastrophic	High
Landslides				
Natural Health Hazards: West Nile Virus				
Severe Weather: Extreme Temperatures				
Severe Weather: Severe Fog	Highly Likely	Significant	Limited	Medium
Severe Weather: Winterstorms	Likely	Significant	Limited	Low
Severe Weather: Tornadoes				
Soil Hazards: Erosion				
Soil Hazards: Expansive Soils				
Soil Hazards: Land Subsidence				

<b>SUMMARY HAZARD ANALYSIS: UNINCORPORATED SUTTER COUNTY</b>				
<b>Hazard</b>	<b>Frequency of Occurrence</b>	<b>Spatial Extent</b>	<b>Potential Magnitude</b>	<b>Significance</b>
Wildfires				
Volcano				
<p>Guidelines:</p> <p><b>Frequency of Occurrence</b>  <i>Highly Likely:</i> Near 100% probability in next year.  <i>Likely:</i> Between 10 and 100% probability in next year, or at least one chance in ten years.  <i>Occasional:</i> Between 1 and 10% probability in next year, or at least one chance in next 100 years.  <i>Unlikely:</i> Less than 1% probability in next 100 years.</p> <p><b>Spatial Extent</b>  <i>Limited:</i> Less than 10% of planning area  <i>Significant:</i> 10-50% of planning area  <i>Extensive:</i> 50-100% of planning area</p> <p><b>Potential Magnitude</b>  <i>Catastrophic:</i> More than 50% of area affected  <i>Critical:</i> 25 to 50%  <i>Limited:</i> 10 to 25%  <i>Negligible:</i> Less than 10%</p> <p><b>Significance</b> (Your subjective opinion)—<i>Low, Medium, High</i></p>				

Information provided by the HMPC identified the following hazard as the most significant to the County:

- Floods

## **Vulnerability Assessment**

This vulnerability assessment quantifies the vulnerability of unincorporated Sutter County in the event of a catastrophic event and also provides an assessment of the areas' vulnerability to floods and wildfire.

## **Assets and Values at Risk**

Utilizing Sutter County assessor data, the total assessed values for the unincorporated portions of Sutter County are:

UNINCORPORATED SUTTER COUNTY							
2006 Roll Values							
Property Type	Units Improved	Total Improved Value	Total Improved Land Value	Units Unimproved	Total Unimproved Land Value	Grand Totals	
						Units	\$\$
Residential	4,801	\$ 534,420,864	\$ 189,438,365	8	\$ 158,065	4,809	\$ 724,017,294
Commercial	122	\$ 29,854,420	\$ 13,105,122	31	\$ 2,005,448	153	\$ 44,964,990
Industrial	129	\$ 430,677,636	\$ 22,699,038	64	\$ 2,834,424	193	\$ 456,211,098
Agricultural	3,688	\$ 354,782,090	\$ 607,557,286	2,595	\$ 420,964,402	6,283	\$ 1,383,303,778
Institutional	100	\$ 26,000,444	\$ 8,981,493	442	\$ 12,157,995	542	\$ 47,139,932
Other	52	\$ 2,476,133	\$ 2,543,252	607	\$ 9,463,670	659	\$ 14,483,055
<b>Total</b>	<b>8,892</b>	<b>\$ 1,378,211,587</b>	<b>\$ 844,324,556</b>	<b>3,747</b>	<b>\$ 447,584,004</b>	<b>12,639</b>	<b>\$ 2,670,120,147</b>

## Critical Facilities Inventory

The critical facilities in Unincorporated Sutter County are listed below and provided in the map that follows.

Unincorporated Sutter County Critical Facilities	
Owner	Critical Facility
Various	Cellular Phone Tower
Verizon Wireless	Cellular Phone Tower
Airtouch	Cellular Phone Tower
At&T	Cellular Phone Tower
Nextel	Cellular Phone Tower
Airtouch	Cellular Phone Tower
Nextel	Cellular Phone Tower
American Tower Co.	Cellular Phone Tower
American Tower Corp.	Cellular Phone Tower
Nextel	Cellular Phone Tower
Airtouch & At&T	Cellular Phone Tower
	Cellular Phone Tower
Airtouch	Cellular Phone Tower
American Tower	Cellular Phone Tower
At&T And Sbc	Cellular Phone Tower
Sprint Pcs	Cellular Phone Tower
Nextel	Cellular Phone Tower
Rcs Wireless	Cellular Phone Tower
Airtouch And Nextel	Cellular Phone Tower
At&T	Cellular Phone Tower
Airtouch & Nextel	Cellular Phone Tower
Cingular Wireless	Cellular Phone Tower
At&T	Cellular Phone Tower
	Cellular Phone Tower
Sba Comm.	Cellular Phone Tower
	Cellular Phone Tower
Nextel	Cellular Phone Tower
At&T And Nextel	Cellular Phone Tower

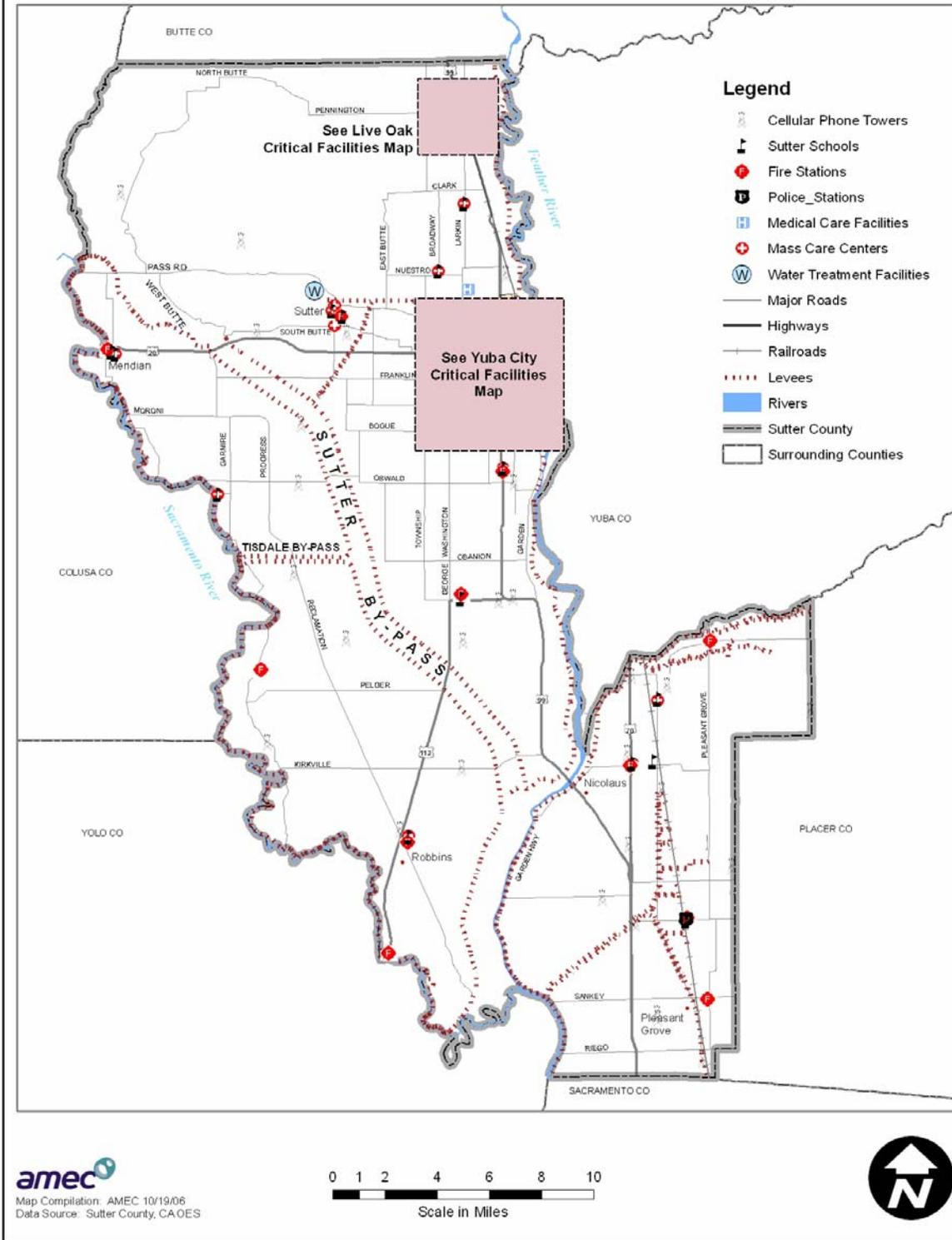
### Unincorporated Sutter County Critical Facilities

Owner	Critical Facility
Nextel	Cellular Phone Tower
	Cellular Phone Tower
American Tower Corp.	Cellular Phone Tower
Mci	Cellular Phone Tower
Meridian #65	Fire Station
Sutter #6	Fire Station
Oswald-Tudor #8	Fire Station
Sutter Basin	Fire Station
Oswald Tudor #2	Fire Station
Sutter Basin	Fire Station
Sutter Basin	Fire Station
East Nicolaus #2	Fire Station
East Nicolaus #85	Fire Station
Pleasant Grove #9	Fire Station
Pleasant Grove #2	Fire Station
Sutter County Sheriff	Police Station
Brittan School	Mass Care Center
Meridian Elementary School District	Mass Care Center
Sutter High School	Mass Care Center
Sutter United Methodist Church	Mass Care Center
Sutter Youth Organization	Mass Care Center
Winship Elementary School	Mass Care Center
Encinal School	Mass Care Center
Live Oak Church Of The Brethren	Mass Care Center
Nuestro School	Mass Care Center
Adventist Christian School	Mass Care Center
Barry School	Mass Care Center
Central Gaither School	Mass Care Center
Grace Baptist Church/Christian Sch	Mass Care Center
Lincest School	Mass Care Center
Robbins School	Mass Care Center
Yc Assembly Hall Of Jehovah'S Witn	Mass Care Center
Browns Elementary School District	Mass Care Center
Marcum-Illinois School District	Mass Care Center
Pleasant Grove School	Mass Care Center
Colusa County Fairgrounds	Mass Care Center
Placer County Fairgrounds	Mass Care Center
Silver Dollar Fairgrounds	Mass Care Center
Willow Glen Care Center Nursing Home	Medical Care Facility
Sungarden Rest Home Nursing Home	Medical Care Facility
Brittan Elementry School District	School
Browns Elementry School District	School
East Nicolaus Joint Union High School	School

**Unincorporated Sutter County Critical Facilities**

<b>Owner</b>	<b>Critical Facility</b>
District	
Marcum-Illinois Union School District	School
Franklin Elementry School District	School
Encinal Elementry School	School
Meridian Elementary School District	School
Nuestro Elementary School District	School
Pleasant Grove Joint Union School District	School
Sutter Union High School District	School
Winship Elementary School District	School
Barry Elementary School	School
Central Gaither Elementary School	School
Lincest Elementary School	School
Robbins Elementary School	School
Meridian School District	School
Grace Christian Academy And Pre-School	School
Adventist Christian School	School
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Seepage Station	Wastewater Treatment Facility
Water Tank	Wastewater Treatment Facility

# Sutter County Critical Facilities



## Cultural and Natural Resources at Risk

Cultural and natural resources in unincorporated Sutter County include those previously identified in the county inventory and as identified below:

### Cultural Resources

- State Historical Landmarks
  - Sutter Hock Farm
  - Site of Propagation of the Thompson Seedless Grape
  - Portions of Bogue Road
  - East of Garden Highway, north of Tudor – Sutter’s Hock Farm and area
  - Northeast corner Township and O’Banion Roads – Site of Old Bailey Home
  - Southwest corner Garden Highway and O’Banion Road – Old C.E. Sullivan Ranch
  - Star Bend Road (north of Tudor) – Approximate area of A.Fl Abbott Ranch
  - Tudor Road – Old Saunders Home
  - Wilson Road – Wilson Station
  - Kirkville Road – Chandler Station Site
  - Nicolaus – Site of Sam Brannan’s “White House”
  - Nicolaus – Town of Nicolaus
  - East Nicolaus – Town of East Nicolaus
  - Rio Oso, Pleasant Grove and Bear River – Scenic Drive, Towns of Rio Oso and Pleasant Grove
  - North of Verona – Drive, Town of Verona
  - Kirkville – Townsite
  - .2 miles south of Tisdale Weir on Cranmore Road - Wooley’s Grave
  - Cranmore – Townsite
  - Tisdale Road – Hunter Children burial site
  - Grimes – Grimes Ferry Crossing and Town of Brimes
  - Wilbur Road, Meridian – Brick house
  - Sycamore – Sycamore Ferry Crossing and Town of Sycamore
  - State Highway 20 – Site of Old Meridian Grammar School
  - Corner of Third and Bridge – Old Sacramento Northern Railroad Station Building
  - Meridian – Town of Meridian
  - Pass and West Butte Roads – Townsite of West Butte
  - Pass and West Butte Roads – Original West Butte School
  - Pass Road – Stone Fences
  - Sutter Buttes, north of Pass Road – Unusual rock formations and strata
  - Sutter Buttes, north of Pass Road – Old Moore Betty House
  - Pass Road – House of Carl DeWitt
  - Pass Road – Fremont Monument
  - Pass Road – Old George E. Britton House
  - Acacia Avenue – Town of Sutter
  - South Butte Road – Stohlman Cemetery
  - South Butte Road – Slough School

- West Butte Road – The Thompson Seedless Grape originated here near where the William Thompson Sr. Ranch was located
- West Butte Road – Fredrick Tarke House
- West Butte Road – Near the site of the first oil well in 1866
- West Butte Road – Rock fence on west side of road
- West Butte Road – Early settlement of Noyesburg
- West Butte Road – Farm country, hunting refuge, and Bragg Canyon
- West Butte Road – Abandoned titan missile site
- North Butte Road – Old Pierce House
- North Butte Road – Spillman Grave site
- North Butte Road – Pennington Townsite
- North Butte Road – Site of North Butte School and Lodge historical marker
- North Butte Road – Site of Peace Valley Cemetery, Historical Monument
- North Butte Road – Old Cornelius Williams House
- Pennington Road – Dow Brove, site of Farm Bureau picnics in 1920s
- East Butte Road – Site of Camp Bethel
- East Butte Road – Albert N. Smith House
- East Butte Road – E.J. Howard House
- East Butte Road – Old Union District Grammar School site
- Butte House Road – Site of Old Butte House
- 2234 California Street, Sutter – Old Felts Building
- Corner of California and Nelson Streets, Sutter, Native Daughters of the Golden West Hall, Local 226
- Butte House Road – Sutter Cemetery
- Acacia Avenue, Sutter – Old Sacramento Northern Railway Depot
- Humphrey Road – Site of early Humphrey Station Stop
- Clark Road – Old House of “Southern Style”
- Live Oak Highway – Sutter’s Hock Farm Historical Monument
- Live Oak Highway – Site of Berg station, Southern Pacific Railroad
- Live Oak Highway – Site of the old Berg Ranch

### **Natural Resources**

- Northern Hardpan Vernal Pool
- Coastal and valley Freshwater Marsh
- Great Valley Cottonwood Riparian Forest
- Great Valley Mixed Riparian Forest
- Sutter Buttes
- Sutter Wildlife Reserve
- Bicentennial Living Witness Tree

### **Development Trends**

According to the 2015 Housing Element of the Sutter County General Plan, growth in the unincorporated county continues at a steady rate. From 2000 to 2015, population is projected to grow by 10,420 from 37,110 to 47,530. This is an annual growth rate of 1.7%. In order to

accommodate this growth rate, unincorporated Sutter County is expected to need an additional 17,597 housing units by 2015. This is a 28.1% increase over unincorporated area housing units in 2000. However, potential housing based on vacant and underdeveloped land can only support a maximum of 4,705 residential units based on a mix of high density, medium density, and low density areas. Maps included on pages 147-150 provide an inventory and assessment of parcels available for single and multi-family residential development. All parcels included in the inventory are within the spheres-of-influence and near the cities of Live Oak and Yuba City.

## **Vulnerability to Flood**

### **Flood Problem Description**

Unincorporated Sutter County is susceptible to four types of floods: localized flooding, riverine (slow rise) flooding, levee failure/overtopping, and dam failure as previously described in Section 4.1 of the Risk Assessment.

### **The Sutter County Waterway System**

Positioned on an alluvial plain between the Sacramento River on the west and the Feather River on the east, the Sutter County Planning Area lies entirely within the Sacramento River watershed and within the Sutter and Butte Drainage basins. In the southeastern portion of the county lies another alluvial plain situated south of the Bear River and east of the Feather River. These alluvial plains were geologically formed by water running over the stream banks during naturally occurring historic floods.

Sutter County includes both natural and manmade waterways. In addition to the Sacramento, Feather, and Bear Rivers, natural waterways include Coon Creek, Pleasant Grove Creek, Markham and Auburn Ravines in the southeastern portion of the county, the Snake River on the east side of the Sutter Buttes, and other smaller streams and sloughs located throughout the county. Manmade waterways form an extensive network and are used for flood control as well as to convey irrigation water and to provide drainage channels from the croplands. Manmade waterways include, the Sutter and Tisdale Bypasses, the Natomas Cross Canal, the Natomas East Main Drainage Canal, Gilsizer Slough.

Drainage and stormwater runoff, in addition to natural waterways, all contribute to potential flooding in unincorporated Sutter County and are all discussed in this section.

The more notable of these features are described in further detail below.

**Sacramento River.** The Sacramento River, the largest river in the State, extends for approximately 70 miles along the western border of Sutter County. Historically, the river has carved out a wide floodplain outside of its existing banks. The river provides drainage for all of Sutter County and the Sacramento Valley through a system of levees and bypasses completed in the 1920s. The final outlet of the water is the Delta and eventually, the San Francisco Bay. The river supports various

recreational and boating activities, agricultural irrigation and diverse wildlife habitats. No communities in Sutter County use the river as a source of domestic or municipal water supply.

The State DWR established the Sacramento River Flood Control Project to implement flood protection programs for the river and its tributaries. The upper portion of the river is controlled by Shasta Dam, Whiskeytown Dam and Keswick Dam.

**Feather River.** The Feather River extends approximately 45 miles through Sutter County, forming part of the east Sutter County boundary. The Feather River reaches its confluence with the Sacramento River at the southern County boundary near Verona. Similar to the Sacramento River, the Feather River provides for recreational activities, agricultural irrigation and a diverse wildlife habitat. The river is listed as navigable below the City of Yuba City; however, due to siltation caused by past mining practices in the Sierra Foothills and lack of maintenance, only small boats can pass.

The Feather River is also part of the Sacramento River Flood Control Project managed by the State DWR. Upstream the river is controlled by the Oroville Dam in Butte County.

**Bear River.** The Bear River roughly parallels about 11 miles of the eastern County boundary, entering the County from Placer County and crossing the boundary at several points. The river flows in a south-southwest direction until it joins the Feather River about one mile north of the town of Nicolaus. Although smaller than either the Sacramento or Feather Rivers, the Bear River also provides recreational opportunities, agricultural irrigation water and a diverse wildlife habitat. River flows are controlled by the Camp Far West Reservoir in Yuba County.

**Sutter Bypass.** The Sutter bypass, part of the Sacramento Flood Control Project, is an artificial flood control corridor approximately 3/4 mile wide, bordered by two parallel channels. The Bypass extends from the Sacramento River in the northwest portion of the County, north of Pass Road, and proceeds west of the Sutter Buttes continuing generally in a south-southeast direction for approximately 27 miles where it intercepts the Feather River about three miles south of Nicolaus. The Sutter Bypass collects flood overflow water from the Sacramento River after passing through Butte Slough and the Butte Sink.

**Tisdale Bypass.** The Tisdale Bypass, another flood control corridor, extends for approximately four miles due west from the Sutter Bypass.

### **Major Sources of Flooding/Problem Areas**

Floodwaters are a common occurrence for communities adjacent to and in the lowlands of rivers in Sutter County. Normally, wintertime storm floodwaters are kept within defined limits by levees, dykes, and open lowlands and cause no damage. Dams located outside Sutter County boundaries such as Oroville, Bullards Bar, and Shasta also help control floodwaters. But, occasionally, a combination of frequent storms, extended heavy rain, and melting snow results in floodwaters exceeding normal high-water boundaries and causing damage.

Given their location relative to the county, the Feather and Sacramento Rivers and associated tributaries present the greatest flood potential to the Sutter County Planning Area including areas of the unincorporated county.

Flooding during periods of excessive rainfall can occur anytime in the Planning Area during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration. Flooding is more severe when previous rainfall has created saturated ground conditions. According to the 1998 FIS for the county, the severity of flooding is often intensified by backwater conditions between stream systems. This occurs when floodwater elevations are increased in lower portions of tributary streams due to the backwater effect from main streams reducing hydraulic gradients and flow-storage areas. The 1998 FIS identified several areas where the high flow of floodwaters cause backwater conditions on other channels:

- High flows on the Sacramento River generate backwater conditions on the lower reaches of the American River and the Cross Canal.
- The American River peak 100-year flows induce backwater conditions in the lower reach of the Natomas East Main Drainage Canal.
- High flows on the Natomas East Main Drainage Canal cause backwater conditions on the lower reaches of Arcade and Dry Creeks.
- High flows on Cross Canal create backwater conditions on Pleasant Grove Creek Canal.

Localized flooding also occurs throughout the county with several areas of primary concern. According to the Sutter County Department of Public Works, numerous roads throughout the county are subject to flooding in heavy rains. In addition to flooding, damages to these areas during heavy storms include, pavement deterioration, washouts, landslides/mudslides, debris areas, and downed trees. The amount and type of damage or flooding that occurs varies from year to year, depending on the quantity of runoff. These areas and the types of damages are presented in the following table. Photos of these areas during flood conditions are included in Appendix F.

**Unincorporated Sutter County  
Localized Flooding Areas**

No.	Road Name	Flooding	Pavement Detoriation	Washouts	Landslide Or Mudslides	Debris	Downed Trees
1	Pass Rd	x	x	x	x	x	
2	West Butte Rd.	x	x	x		x	
3	North Butte Rd.	x	x	x		x	x
4	East Butte Rd.	x	x	x		x	x
5	South Butte Rd.	x	x	x		x	x
6	Powell Rd.	x	x	x		x	x
7	Pennington Rd.	x	x	x		x	x
8	Butte House Rd.	x				x	x
9	Kellogg Rd.	x	x	x	x	x	x
10	Lower Pass Rd.	x	x	x		x	x
11	Almond Orchard Rd.	x				x	
12	Hagaman Rd.	x					
13	Metterr Rd.	x	x				
14	Fifield Rd	x		x	x	x	
15	Keyes Rd.	x	x	x			
16	Catlett Rd.	x		x		x	
17	Howsley Rd.	x	x			x	
18	Pleasant Grove Rd.	x	x	x		x	
19	Brewer Rd.	x	x	x		x	x
20	Sacramento Ave.	x	x	x		x	x
21	Reclamation Rd.		x		x		
22	Subaco Rd..		x	x	x		
23	Hicks Rd.	x	x			x	x
24	Hughes	x	x			x	x
25	Oswald	x	x			x	x

Also of concern to the county is the Live Oak Canal area between Pease Road and Schlag Road. The Live Oak canal drains approximately 1/3 of the Yuba City Area and approximately 1/2 of the Yuba City rural area. Most of the problems are caused by heavy rains combined with inadequate pipe capacity due to increased development in the Yuba City rural area.

**FEMA mapping, Insurance Coverage, Claims Paid, and Repetitive Losses**

Unincorporated Sutter County joined the NFIP on September 24, 1984. The following table identifies the existing FIRM maps for the unincorporated county.

## FEMA FIRMs

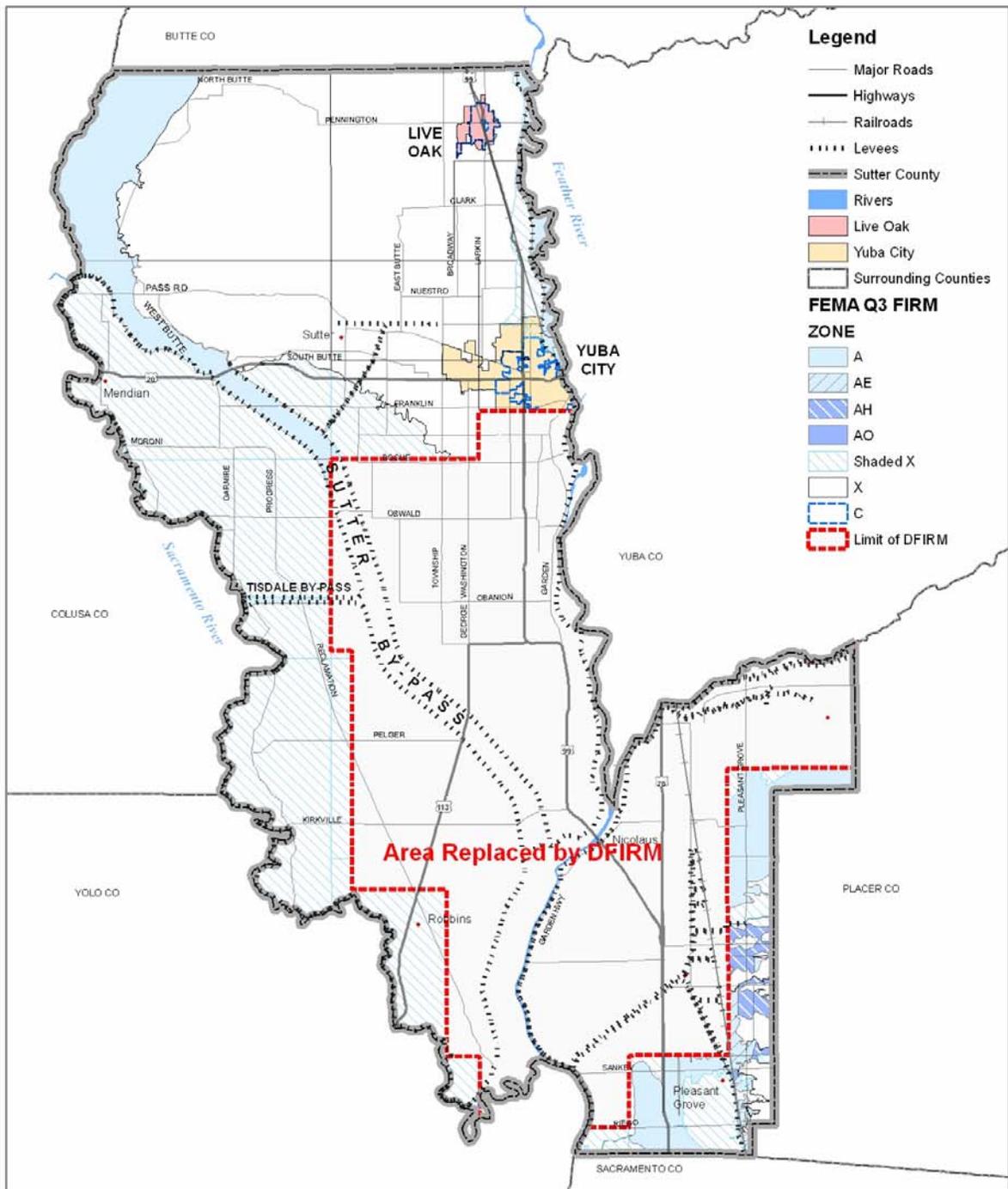
<b>UNINCORPORATED SUTTER COUNTY</b>	
<b>Map Number</b>	<b>Effective Date</b>
0603940025B	04/05/1988
0603940035B	04/05/1988
0603940045B	04/05/1988
0603940075B	04/05/1988
0603940085B	04/05/1988
0603940090B	04/05/1988
0603940095B	04/05/1988
0603940125B	04/05/1988
0603940150B	04/05/1988
0603940175B	04/05/1988
0603940200B	04/05/1988
0603940225B	04/05/1988
0603940250D	07/06/1998
0603940255B	04/05/1988
0603940265D	07/06/1998
0603940280C	07/06/1998
0603940285D	07/06/1998
0603940305D*	07/06/1998

\*LOMR-F dated 01/23/2003 exists for this map.

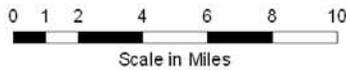
However, the southern portion of the county is in the process of having several of the FIRMs (identified above) replaced by the new preliminary draft DFIRMs, dated August 2006, as previously described in Section 4.1 of this plan. It is anticipated that new DFIRMs for the northern portion of the county will replace the remaining paper FIRMs sometime in the next two to three years. The major change associated with these updated maps is that the new DFIRMs do not recognize the existing levee system as being certified. As a result, most of the properties designated as Zone X or Zone C (outside the floodplain) in the paper maps are being re-categorized into 100-year and 500-year flood zones.

As a result of these ongoing map changes, in order to most accurately reflect the current status of FEMA floodplain mapping within the Sutter County Planning Area, the methodology previously described in the vulnerability assessment (on pages 158-164) for the entire Planning Area was followed in creating vulnerability maps and determining values at risk to the 100-year and 500-year flood events for unincorporated Sutter County. The maps on the following pages illustrate the FEMA floodplain data for the unincorporated county.

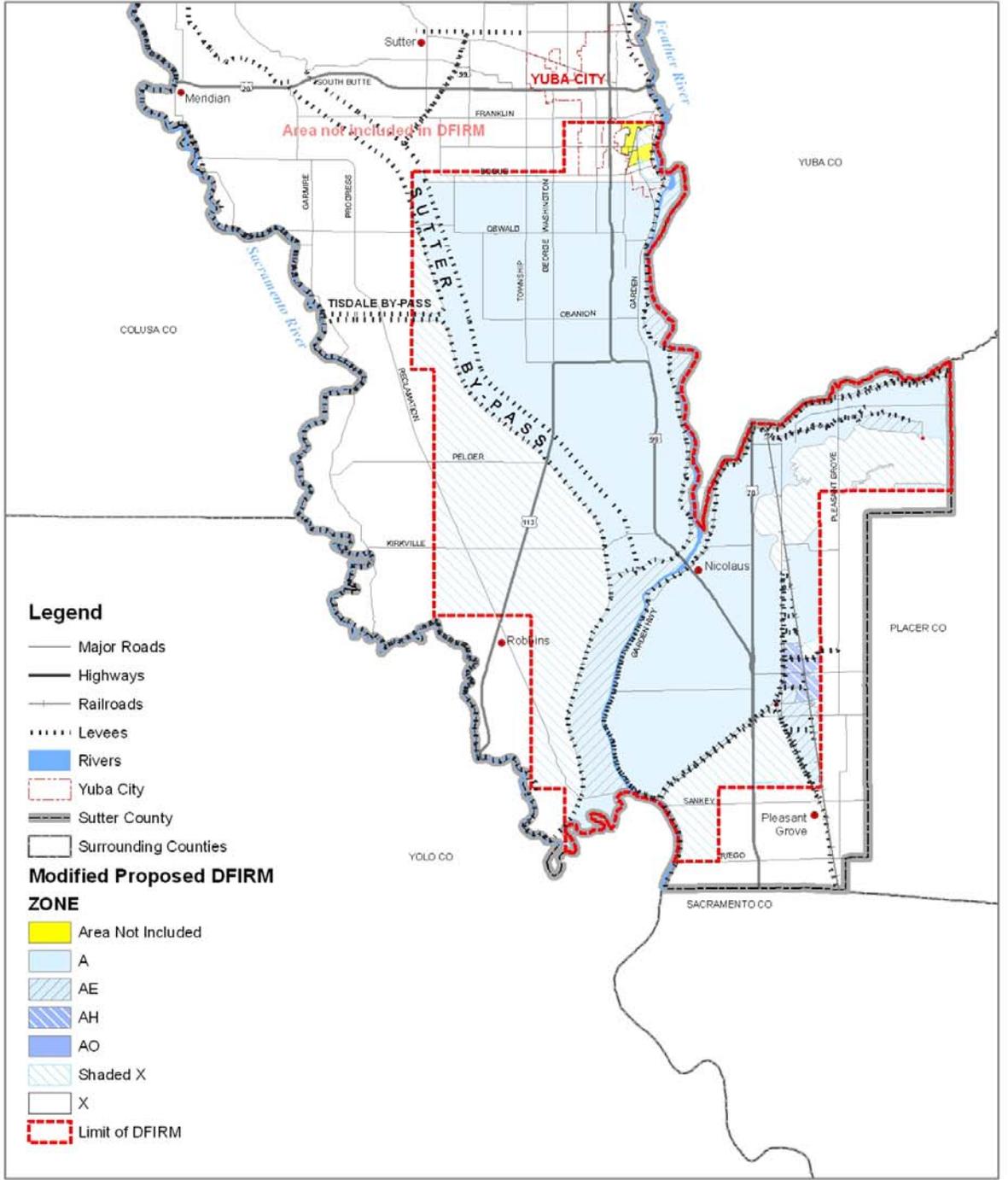
# Unincorporated Sutter County Flood Zones Based on Q3 Data



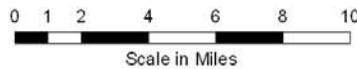
**amec**  
 Map Compilation: AMEC 10/23/06  
 Data Source: Sutter County, CA



# Unincorporated Sutter County Flood Zones Based on Modified Proposed DFIRM



amec  
 Map Compilation: AMEC 10/23/06  
 Data Source: Sutter County, CA



NFIP Insurance data indicates that as of 09/12/2006, there are 4,292 flood insurance policies in unincorporated Sutter County resulting in \$1,243,764,000 in Insurance in Force. Of these, 94 are located in the A-type Zones; 316 standard and 3,882 preferred policies are located in the B, C, & X Zones. Historically, there have been 87 claims for flood losses totaling \$2,304,245. 23 claims were for properties located within the A-type zones and 21 standard and 25 preferred policy holder claims were for properties located within the B, C & X Zone. Only seven of these claims were for Post-FIRM structures. Within the unincorporated county there are a total of three RL buildings within the 100-year floodplain, with six losses totaling \$119,096.32. Outside of the 100-year floodplain, there are a total of five RL buildings, with 11 losses totaling \$109,237.09.

### **Values at Risk**

The following paragraphs describe the values at risk within unincorporated Sutter County using various data:

- FEMA Q3 Data and Proposed DFRIM Data
- FEMA Q3 Data
- Proposed DFRIM Data

### **FEMA Q3 Data and Proposed DFRIM Data Floodplain Analysis**

After evaluating available insurance flood loss data, the next step was to quantify the flood vulnerability for the unincorporated county. The HMPC used GIS to model and quantify potential flood vulnerability to unincorporated Sutter County within the mapped floodplain areas using FEMA's Q3 and proposed DFIRM floodplain data (as shown in the above maps and described on pages 158-164) and overlaying the information on Sutter County's GIS parcel layers for improved parcels. The parcel layer was linked with the assessor's data to quantify the value of property that potentially lies in a floodplain.

The result of this flood vulnerability analysis presented on the following page summarizes the values at risk in the floodplain of the unincorporated portions of Sutter County.

**Unincorporated Sutter County  
Flood Hazard – Improved Parcels  
Based on FEMA Q3 Data**

Unincorporated Sutter County								
	Zone A		Zone AE		Zone AH		Zone AO	
Property Type	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value
Residential	8	\$ 559,777	5	\$ 399,589	2	\$ 278,777	-	\$ -
Commercial	1	\$ 58,591	2	\$ 322,165	1	\$ 38,395	-	\$ -
Industrial	5	\$ 17,240,984	-	\$ -	-	\$ -	-	\$ -
Institutional	4	\$ 71,933	-	\$ -	-	\$ -	-	\$ -
Agricultural	120	\$ 8,718,373	30	\$ 2,170,036	23	\$ 2,495,715	2	\$ 120,552
Other	-	\$ -	1	\$ 10,000	-	\$ -	-	\$ -
<b>Total</b>	<b>138</b>	<b>\$ 26,649,658</b>	<b>38</b>	<b>\$ 2,901,790</b>	<b>26</b>	<b>\$ 2,812,887</b>	<b>2</b>	<b>\$ 120,552</b>
	Shaded Zone X		Zone X		Zone C		Total	
Property Type	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Parcels	Improved Value
Residential	300	\$ 23,970,208	2,388	\$ 273,196,313	-	\$ -	2,703	\$ 298,404,664
Commercial	21	\$ 4,347,253	39	\$ 6,989,031	-	\$ -	64	\$ 11,755,435
Industrial	40	\$ 38,751,231	35	\$ 20,049,844	-	\$ -	80	\$ 76,042,059
Institutional	12	\$ 4,795,353	45	\$ 14,224,490	-	\$ -	61	\$ 19,091,776
Agricultural	516	\$ 43,907,488	1,282	\$ 134,591,314	-	\$ -	1,973	\$ 192,003,478
Other	7	\$ 326,362	29	\$ 1,331,067	-	\$ -	37	\$ 1,667,429
<b>Total</b>	<b>896</b>	<b>\$ 116,097,895</b>	<b>3,818</b>	<b>\$ 450,382,059</b>	<b>-</b>	<b>\$ -</b>	<b>4,918</b>	<b>\$ 598,964,841</b>

**Unincorporated Sutter County  
Flood Hazard – Improved Parcels  
Based on Proposed DFIRM**

Unincorporated Sutter County								
	Zone A		Zone AE		Zone AH		Zone AO	
Property Type	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value
Residential	642	\$ 62,017,725	28	\$ 5,624,801	2	\$ 183,586	-	\$ -
Commercial	27	\$ 4,113,233	2	\$ 647,514	-	\$ -	-	\$ -
Industrial	33	\$ 349,657,890	-	\$ -	-	\$ -	-	\$ -
Institutional	21	\$ 1,413,474	4	\$ 159,221	-	\$ -	-	\$ -
Agricultural	1,403	\$ 137,879,775	77	\$ 4,687,515	10	\$ 759,998	1	\$ 4,162
Other	9	\$ 396,309	3	\$ 398,114	-	\$ -	-	\$ -
<b>Total</b>	<b>2,135</b>	<b>\$ 555,478,406</b>	<b>114</b>	<b>\$ 11,517,165</b>	<b>12</b>	<b>\$ 943,584</b>	<b>1</b>	<b>\$ 4,162</b>
	Zone X 500		Zone X		Total			
Property Type	Pcls	Improved Value	Pcls	Improved Value	Parcels	Improved Value		
Residential	43	\$ 4,523,642	1,376	\$ 162,928,291	2,091	\$ 235,278,045		
Commercial	2	\$ 431,951	27	\$ 12,906,287	58	\$ 18,098,985		
Industrial	6	\$ 3,084,311	10	\$ 1,893,376	49	\$ 354,635,577		
Institutional	3	\$ 205,616	11	\$ 5,130,357	39	\$ 6,908,668		
Agricultural	164	\$ 11,795,898	59	\$ 7,627,940	1,714	\$ 162,755,288		
Other	-	\$ -	3	\$ 14,281	15	\$ 808,704		
<b>Total</b>	<b>218</b>	<b>\$ 20,041,418</b>	<b>1,486</b>	<b>\$ 190,500,532</b>	<b>3,966</b>	<b>\$ 778,485,267</b>		

Base on this analysis, unincorporated Sutter County has significant assets at risk to the 100-year and greater floods. Combining the different types of A Zones (from both tables) which all indicate a risk to the 100-year flood, results in 2,466 improved parcels for a total of \$600,303,490 located within the 100-year floodplain. There are also 1,114 improved parcels within the 500-year floodplain totaling \$136,139,313.

Comparing these numbers to the insurance data, of the 8,884 total parcels and 2,466 parcels at risk to the 100-year flood, 4,292 of those parcel owners maintain flood insurance. Of these 4,292 policy holders, based on the old FIRMs, only 94 are actually in the 100-year floodplain.

These values can be refined a step further. When a flood occurs seldom does the event cause total destruction of an area. Potential losses from flooding are related to a variety of factors including flood depth, flood velocity, building type, and construction. The percent of damage is primarily related to the flood depth. FEMA's flood benefit/cost module uses a simplified approach to model flood damage based on building type and flood depth. The values at risk in the tables above were further refined assuming an average damage estimation of 20% of the total building value. The 20% damage estimate utilized FEMA's Flood Building Loss Table based on an average flood depth of 4 feet for two-story buildings with no basement.

Application of the 20% damage estimate to the Improved Parcel Value of \$600,428,204 results in an estimated \$120,085,640 at risk to damage from a 100-year flood within the unincorporated portions of the county. Thus there is a 1% chance in any given year of a 100-year flood causing \$120,085,640 in damages. While there are several limitations to this model, it does present a methodology to estimate potential damages. Note, this model may include structures located within the 100-year floodplain that are elevated at or above the level of the base flood elevation, according to local floodplain development requirements. Also, it is important to keep in mind that these assessed values are well below the actual market value of improved parcels located within the 100-year floodplain. Thus the actual value of assets at risk is significantly above those included in the above calculation and tables.

### **FEMA Q3 Data Floodplain Analysis**

The above assessment of values at risk to the 100-year flood utilizes the FEMA Q3 data currently in force for the northern portion of the county combined with the proposed DFIRM data for the southern portion of the county. This methodology was used to best reflect the current flood risk within the Planning Area given the changing status of the FEMA flood maps during this planning process. In order to really appreciate the impact of the DFRIM process to the Planning Area, it is helpful to step back and look at the flood risk and vulnerability using only the FEMA Q3 data for the entire area. As previously described, most of the properties designated as Zone X or Zone C (outside the floodplain) in the Q3 data (paper maps) are being re-categorized into 100-year and 500-year flood zones in the new DFIRMS. As such, looking at the numbers in the DFIRM table above, a large portion of those properties falling in the collective A zones (i.e., 2262 properties) are actually outside of the 100-year floodplain in the older Q3 data. Thus, using only the Q3 data, the values at risk to the 100-year and greater flood would be much less than the \$600,428,204 (for the 2,466 located within the 100-year floodplain)

and the \$136,139,313 (for the 1,114 improved parcels within the 500-year floodplain) as detailed above.

### Proposed DFIRM Data Floodplain Analysis

The first analysis above focused on evaluating impacts to the unincorporated county based on the current (or proposed) FEMA floodplain mapping for the city which includes both the FEMA Q3 data (for most of the county) and the new Draft DFIRM mapping (for areas within the southern portion of the county). Additional DFIRMs will be developed based on the results of the Upper Feather River Study that will replace the remaining Q3 data. This analysis assumes that the resulting DFIRMs covering the remaining portion of the county will be similar in outcome to the DFIRMs generated from the Lower Feather River Study. As previously stated, the major change associated with these updated maps is that the new DFIRMs do not recognize the existing levee system as being certified. As a result, most of the properties designated as Zone X or Zone C (outside the floodplain) in the paper maps (and Q3 data) are being re-categorized into 100-year and 500-year flood zones.

Assuming that DFIRM maps apply to the entire county, county parcel and assessor data were used to provide a worst-case scenario of assets at risk to a 100-year or greater flood. The table below summarizes total assets at risk within the unincorporated county. Until the new study and maps are complete, the actual number and types of parcels falling within the 100-year and 500-year flood zones cannot be determined. As a result, it can only be assumed that the entire county is potentially at risk to flooding without the benefit of levees providing 100-year or more protection.

### Unincorporated Sutter County Total Assets at Risk to the 100-year or greater Flood (Based on proposed DFRIM mapping of entire County)

UNINCORPORATED SUTTER COUNTY							
2006 Roll Values							
Property Type	Units Improved	Total Improved Value	Total Improved Land Value	Units Unimproved	Total Unimproved Land Value	Grand Totals	
						Units	\$
Residential	4,801	\$ 534,420,864	\$ 189,438,365	8	\$ 158,065	4,809	\$ 724,017,294
Commercial	122	\$ 29,854,420	\$ 13,105,122	31	\$ 2,005,448	153	\$ 44,964,990
Industrial	129	\$ 430,677,636	\$ 22,699,038	64	\$ 2,834,424	193	\$ 456,211,098
Agricultural	3,688	\$ 354,782,090	\$ 607,557,286	2,595	\$ 420,964,402	6,283	\$ 1,383,303,778
Institutional	100	\$ 26,000,444	\$ 8,981,493	442	\$ 12,157,995	542	\$ 47,139,932
Other	52	\$ 2,476,133	\$ 2,543,252	607	\$ 9,463,670	659	\$ 14,483,055
<b>Total</b>	<b>8,892</b>	<b>\$ 1,378,211,587</b>	<b>\$ 844,324,556</b>	<b>3,747</b>	<b>\$ 447,584,004</b>	<b>12,639</b>	<b>\$ 2,670,120,147</b>

### Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster. Included in this classification are police and fire stations, hospitals, schools that serve as emergency shelters, and lifeline utilities; power, water and sewer system components. A map of the critical facilities within the unincorporated portions of the County is located on page 185. Within the Planning Area many critical facilities are protected by the extensive flood

control system. To additionally protect them individually from the potential failure of the structural flood control systems may be very difficult to justify on a benefit/cost ratio analysis. Still, the impact to the community, should the statistically unlikely catastrophic flood event occur, would be astonishing if also these critical facilities are damaged or destroyed.

### **Cultural and Natural Resources at Risk**

Sutter County has significant cultural and natural resources located throughout the county as previously described. Risk analysis of these resources was not possible due to data limitations. However, natural areas within the floodplain often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters.

### **Development Trends in Hazard Area**

The development trend in the Sutter County Planning Area is steady, significant growth, especially within the existing urban areas.

The Housing Element of the Sutter County General Plan expects the population in the unincorporated county to grow to 47,530 by 2015. This is an additional 10,420 people from the 2000 census estimate of 37,110. Such growth will consume acres of previously undeveloped areas and the impacts may overwhelm existing drainage and flood control facilities.

Master planning for stormwater runoff and adherence to floodplain management regulations for new development should help both new and existing development from the impacts of the 100-year flood.

### **Vulnerability to Wildfire**

Wildfire is primarily a concern to the unincorporated portions of Sutter County. The Sutter Buttes area is identified as a very high fire threat as shown on the map on page 164. All other areas within the county are identified as either a Little to No Threat or a Moderate Threat. Although there have been no large damaging fires in recent history within the county, the potential exists for a damaging fire to occur, especially in the Sutter Buttes and other grassland areas.

### **Assets/Values at Risk**

As previously described, 28 improved parcels valued at \$3,970,499 are located within 2,400 meters of the Sutter Buttes. The Towns of Sutter and Meridian are also in somewhat close proximity to the Sutter Buttes, and depending on the nature and extent of a fire in the area, may also be at risk.

The following inventories identify other assets at risk to the Very High Threat of wildfire in unincorporated Sutter County.

### **Critical Resources**

- Cell Towers
- Police, fire, schools, and other critical facilities located in and around the Towns of Sutter and Meridian

### **Cultural Resources**

Cultural resources at risk include those previously described for the county in and around the Sutter Buttes area.

### **Natural Resources**

- Natural resources at risk include those previously described for the county in and around the Sutter Buttes area. Of specific concern is the Sutter Buttes themselves.

### **Other Identified Hazards: Agricultural Hazards, Dam Failure, Drought, Earthquakes, Severe Weather, and West Nile Virus.**

Except for those mapped hazards, flood and wildfire, the risk assessment for this plan, as previously described, covers the entire geographical extent of the Sutter County Planning Area. Thus, the risk assessment for the Sutter County Planning Area also includes and directly corresponds to the unincorporated portions of the county and all incorporated jurisdictions.

## CITY OF YUBA CITY

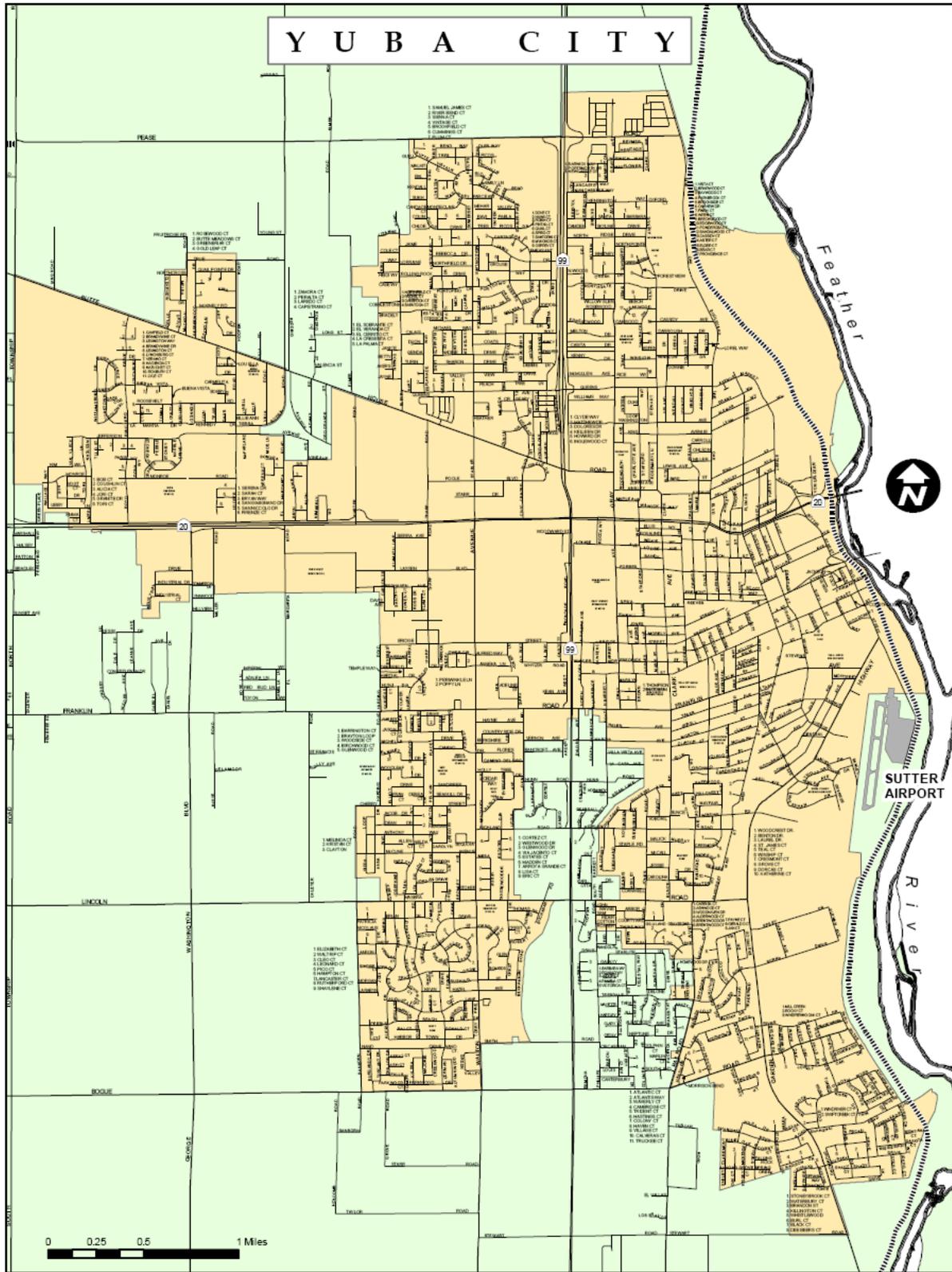
**Population:** 60,507  
**Area:** 13.887  
**Elevation:** 59 feet above msl

### Community Profile

Yuba City (see map on the following page) lies in the northern portion of California's Central Valley, situated in eastern Sutter County on the western bank of the Feather River. Primarily undeveloped agricultural land exists to the north, west, and south of the city. The Sutter Buttes are located to the northwest of the city. The primary transportation corridors are Routes 99 and Route 20. Route 99 leads due south to Sacramento and north to Oroville and Chico; Route 20 links Yuba City to Colusa and I-5 to the west and Grass Valley and the Sierra Nevada range to the east. State Routes 70 and 65 lead south from Marysville, connecting the region to Sacramento and to Sacramento's northern suburbs – Roseville and Rocklin.

On July 27, 1849, at the start of the California Gold Rush, Sam Brannan, Pierson Reading and Henry Cheever purchased land from John Sutter's vast Rancho Nuevo Helvetia holding, near Sutter's Hock Farm. The trio hoped to lay out a town (that developed into the town of Yuba City) that would become the distribution center for supplies going to the gold mines in the nearby Sierra Nevada Mountains. In September 1849 the city was laid out in blocks and squares, leveling Indian burial mounds on the site. The name of that Indian Rancheria was "Youboom". The name appearing on the earliest map was "Yubu" and later changed to Yuba. Yuba City became the county seat of Sutter County in 1856 and was officially incorporated on January 23, 1908. Following incorporation the city soon found ethnic diversity taking root. Mexican immigration to the Sutter County region began in the early 20<sup>th</sup> Century, followed by the arrival of traditionally agrarian Sikh Indian immigrants. More than a quarter of current city residents now claim either Mexican or Indian heritage.

Yuba City is the center of agricultural and commercial activities in Sutter County. Approximately 75 percent of farmland in Yuba City is classified as Farmland of Statewide Importance and another 15 percent is classified as Prime Farmland. In addition, Yuba City is currently an employment center for the Sutter County region and a bedroom community to Sacramento. However, employment growth has increased at a faster rate than population growth in the last decade and the city now contains more jobs than employed residents. According to the U.S. Census, Yuba City had a population of 36,760 in 2000; 2006 population estimates are at 60,507. Development is occurring in the city to accommodate the rapid population growth. New development is primarily occurring in the Harter Specific Plan Area and the Lincoln East area within the city sphere-of-influence just beyond the current city boundary. Yuba City's sphere-of-influence includes all of the Yuba City Urban Area including the Tierra Buena Area and the Yuba City Urban Area Fringe (approximately 19,350 acres). The boundary of this area is Pease Road to the north, Township Road to the west, Oswald Road to the south and the Feather River to the east.



(Source: Sutter County GIS)

## Hazard Summary

Based on information provided by the City of Yuba City, a hazard summary for the City is provided below.

<b>SUMMARY HAZARD ANALYSIS: CITY OF YUBA CITY</b>				
<b>Hazard</b>	<b>Frequency of Occurrence</b>	<b>Spatial Extent</b>	<b>Potential Magnitude</b>	<b>Significance</b>
Agricultural Hazards				
Dam Failure				
Drought	Likely	Significant	Critical	Medium
Earthquakes				
Floods	Likely	Significant	Catastrophic	High
Landslides				
Natural Health Hazards: West Nile Virus				
Severe Weather: Extreme Temperatures				
Severe Weather: Severe Fog	Highly Likely	Significant	Limited	Medium
Severe Weather: Winterstorms	Likely	Significant	Limited	Low
Severe Weather: Tornadoes				
Soil Hazards:Erosion				
Soil Hazards: Expansive Soils				
Soil Hazards: Land Subsidence				
Wildfires				
Volcano				

SUMMARY HAZARD ANALYSIS: CITY OF YUBA CITY				
Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
<p>Guidelines:</p> <p><b>Frequency of Occurrence</b>  <i>Highly Likely:</i> Near 100% probability in next year.  <i>Likely:</i> Between 10 and 100% probability in next year, or at least one chance in ten years.  <i>Occasional:</i> Between 1 and 10% probability in next year, or at least one chance in next 100 years.  <i>Unlikely:</i> Less than 1% probability in next 100 years.</p> <p><b>Spatial Extent</b>  <i>Limited:</i> Less than 10% of planning area  <i>Significant:</i> 10-50% of planning area  <i>Extensive:</i> 50-100% of planning area</p> <p><b>Potential Magnitude</b>  <i>Catastrophic:</i> More than 50% of area affected  <i>Critical:</i> 25 to 50%  <i>Limited:</i> 10 to 25%  <i>Negligible:</i> Less than 10%</p> <p><b>Significance</b> (Your subjective opinion)—<i>Low, Medium, High</i></p>				

Information provided by the HMPC identified the following hazard as the most significant to the City of Yuba City:

- Floods

## Vulnerability Assessment

This vulnerability assessment quantifies the vulnerability of City of Yuba City in the event of a catastrophic event and also provides an assessment of the areas vulnerability to floods and wildfire.

## Assets/Values at Risk

Utilizing Sutter County assessor data, the total assessed values for the City of Yuba City are:

CITY OF YUBA CITY 2006 Roll Values							
Property Type	Units Improved	Total Improved Value	Total Improved Land Value	Units Unimproved	Total Unimproved Land Value	Grand Totals	
						Units	\$\$
Residential	15,893	\$ 2,364,181,182	\$ 720,568,875	35	\$ 4,198,380	15,928	\$ 3,088,948,437
Commercial	793	\$ 462,986,037	\$ 168,461,437	115	\$ 41,274,950	908	\$ 672,722,424
Industrial	305	\$ 98,995,131	\$ 30,322,762	88	\$ 21,859,440	393	\$ 151,177,333
Agricultural	40	\$ 4,851,612	\$ 4,525,987	14	\$ 3,168,316	54	\$ 12,545,915
Institutional	101	\$ 95,232,482	\$ 10,728,610	138	\$ 12,425,746	239	\$ 118,386,838
Other	48	\$ 6,090,314	\$ 2,115,466	945	\$ 56,343,411	993	\$ 64,549,191
<b>Total</b>	<b>17,180</b>	<b>\$ 3,032,336,758</b>	<b>\$ 936,723,137</b>	<b>1,335</b>	<b>\$ 139,270,243</b>	<b>18,515</b>	<b>\$ 4,108,330,138</b>

## Critical Facilities Inventory

The critical facilities in the City of Yuba City are listed below and provided in the map that follows.

<b>Yuba City Critical Facilities</b>	
<b>Owner</b>	<b>Critical Facility</b>
Verizon Wireless	Cellular Phone Tower
Airtouch	Cellular Phone Tower
Yuba City Fire #7	Fire Station
Yuba City Fire #2	Fire Station
Yuba City Fire #1	Fire Station
Yuba City Fire #4	Fire Station
Yuba City Fire #3	Fire Station
California Highway Patrol Office	Law Enforcement Agency
Sutter County Sheriff's Department/County Jail	Law Enforcement Agency
Yuba City Police Department	Law Enforcement Agency
Tierra Buena Elementary School	Mass Care Center
Albert Powell High School	Mass Care Center
Andros Karperos School	Mass Care Center
April Lane School	Mass Care Center
Bridge Street School	Mass Care Center
Church Of Christ	Mass Care Center
First Lutheran School	Mass Care Center
Gray Avenue Middle School	Mass Care Center
King Avenue School	Mass Care Center
St. Isidore's School	Mass Care Center
Yuba City High School	Mass Care Center
Veterans Memorial Hall	Mass Care Center
Lincoln School	Mass Care Center
Yuba/Sutter Fairgrounds	Mass Care Center
Tierra Buena Elementary School	Mass Care Center
Sierra Vista Facility	Medical Care Facility
Fremont Hospital	Medical Care Facility
Sutter Yuba Mental Health Hospital	Medical Care Facility
North Valley Behavioral Health Hospital	Medical Care Facility
Courtyard Assisted Living Nursing Home	Medical Care Facility
Emmanuel Health Care Center Nursing Home	Medical Care Facility
Fountains Skilled Nursing Home	Medical Care Facility
Yuba City Care Center Nursing Home	Medical Care Facility
Feather River Surgery Center Surgical Center	Medical Care Facility
Sutter North Surgery Center Surgical Center	Medical Care Facility
Barreras Senior Care Nursing Home	Medical Care Facility
Creekside Country Manor Nursing Home	Medical Care Facility

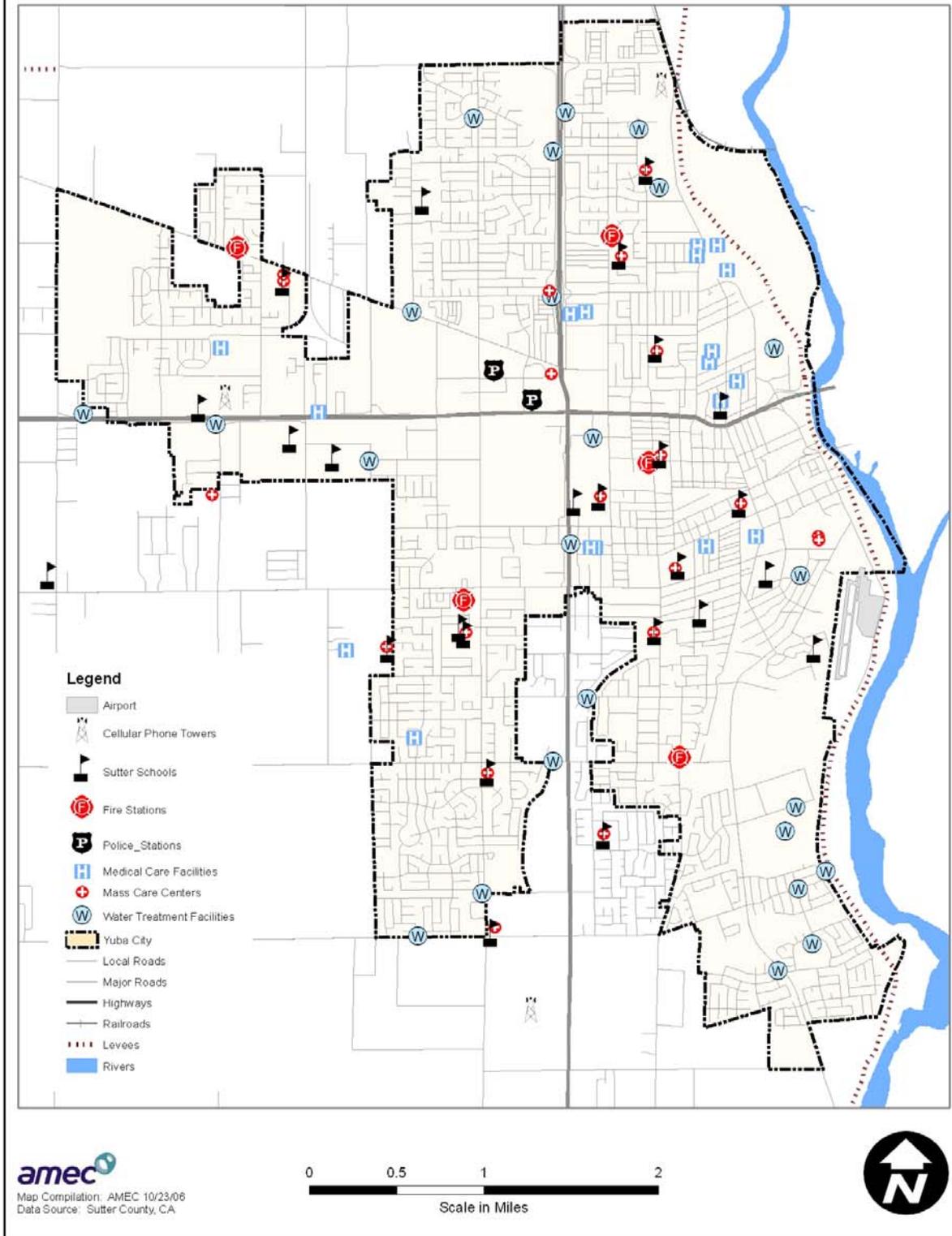
### Yuba City Critical Facilities

Owner	Critical Facility
Dorothy's Care Home Nursing Home	Medical Care Facility
Golden Years Residential Nursing Home	Medical Care Facility
Konda's Assisted Living Nursing Home	Medical Care Facility
Summerfield Care Center Nursing Home	Medical Care Facility
Yuba City Manor Nursing Home	Medical Care Facility
Rcca Colusa Nursing Home	Medical Care Facility
Sutter County Sheriff	Police Station
Yuba City Police Department	Police Station
Feather River Academy	School
Yuba City Unified School Distict	School
Gray Avenue Middle School	School
Albert Powell High School	School
Andros Karperos School	School
April Lane Elementary School	School
Yuba City High School	School
Bridge Street Elementary School	School
Butte Vista School	School
Child Development Programs	School
King Avenue Elementary School	School
Lincoln Elementary School	School
Park Avenue Elementary School	School
Tierra Buena Elementary School District	School
West Walton Elementary School	School
Faith Christian High School	School
Faith Christian Elementary School	School
St. Isadore'S Catholic School	School
First Baptist Academy	School
First Lutheran Elementary School	School
River Valley High School	School
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility

### Yuba City Critical Facilities

<b>Owner</b>	<b>Critical Facility</b>
Storm Lift Station	Wastewater Treatment Facility
Storm Lift Station	Wastewater Treatment Facility
Storm Lift Station	Wastewater Treatment Facility
Storm Lift Station	Wastewater Treatment Facility
Storm Lift Station	Wastewater Treatment Facility
Wastewater Treatment Plant	Wastewater Treatment Facility
Water Treatment Plant	Wastewater Treatment Facility

# Yuba City Critical Facilities



## **Cultural and Natural Resources at Risk**

Cultural and natural resources in City of Yuba City include those previously identified in the County inventory and as detailed below:

### **Cultural Resources**

- 774 B Street – E.G. Van Arsdale House
- 819 Shasta Street – A.C. McLaughlin Law Office
- 442 B Street – Sutter County Canning/Packing Company
- 334 C Street – The Stabler-Swinson House
- 241 C Street – Butler House
- 212 C Street – Old Harkey House
- 500 2<sup>nd</sup> Street – Sanborn Law Office
- 446 2<sup>nd</sup> Street – Sutter County Courthouse
- 446 2<sup>nd</sup> Street – Sutter County Hall of Records
- 423 2<sup>nd</sup> Street – Thomas D. Boyd House
- 422 2<sup>nd</sup> Street – McCampbell House
- 413 2<sup>nd</sup> Street – Rose Carpenter House
- 379 2<sup>nd</sup> Street – McGruder House
- 360 2<sup>nd</sup> Street – Eugene Boyd House
- 329 2<sup>nd</sup> Street – William O’Banion House
- Harter Road – Harter House
- 2078 Colusa Highway – Jake Onstott House

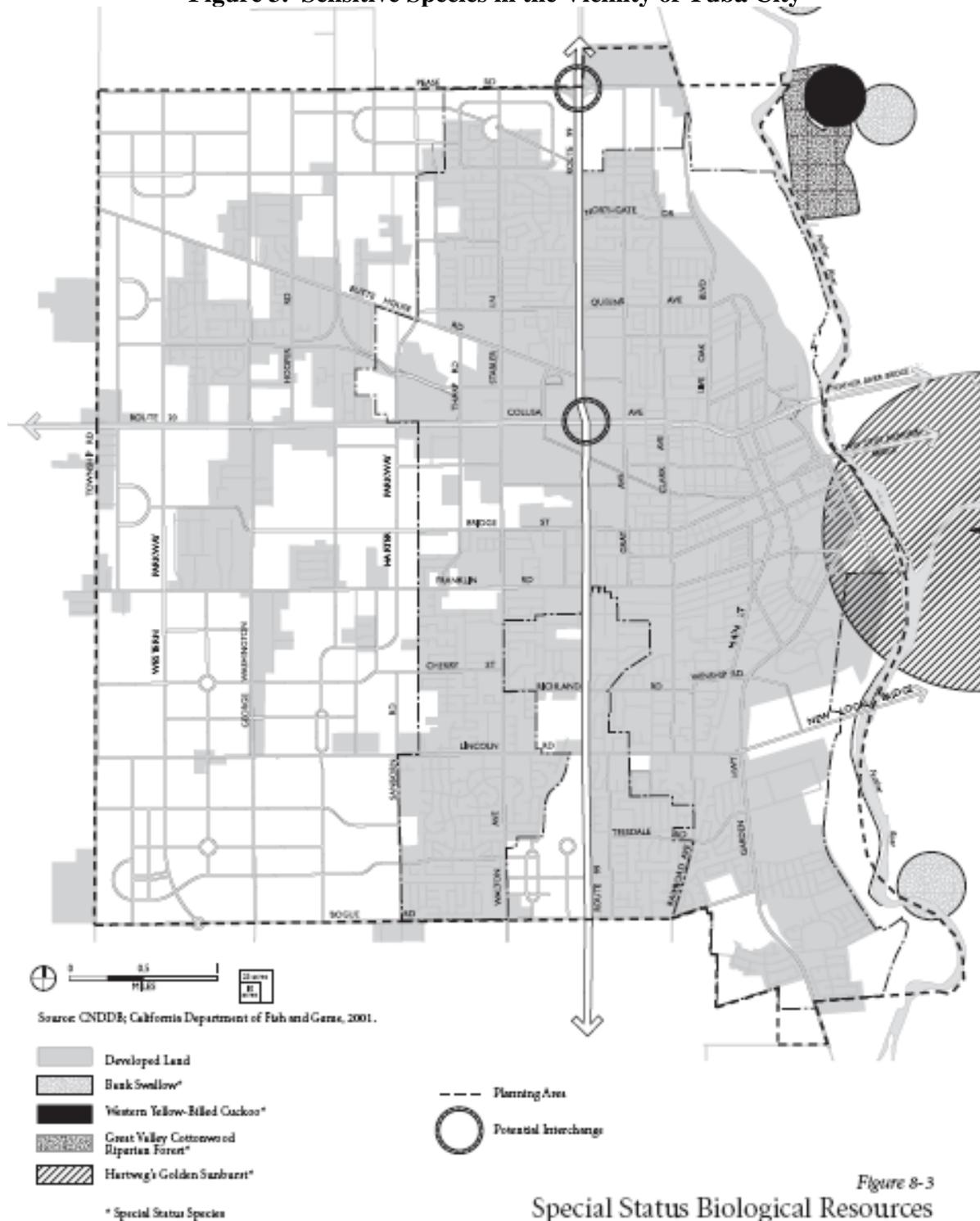
### **Natural Resources**

The list of protected plant and wildlife species previously identified in the county inventory includes information regarding the potential for a particular species to occur in the City of Yuba City. Those species with a moderate or high potential are listed below.

- Hartweg’s Golden Sunburst (High)
- Western Yellow billed cuckoo(Moderate)
- Bank swallow (Moderate)

The following map taken from the City of Yuba City General Plan Update shows the locations of sensitive species recorded in the vicinity of Yuba City.

**Figure 3. Sensitive Species in the Vicinity of Yuba City**

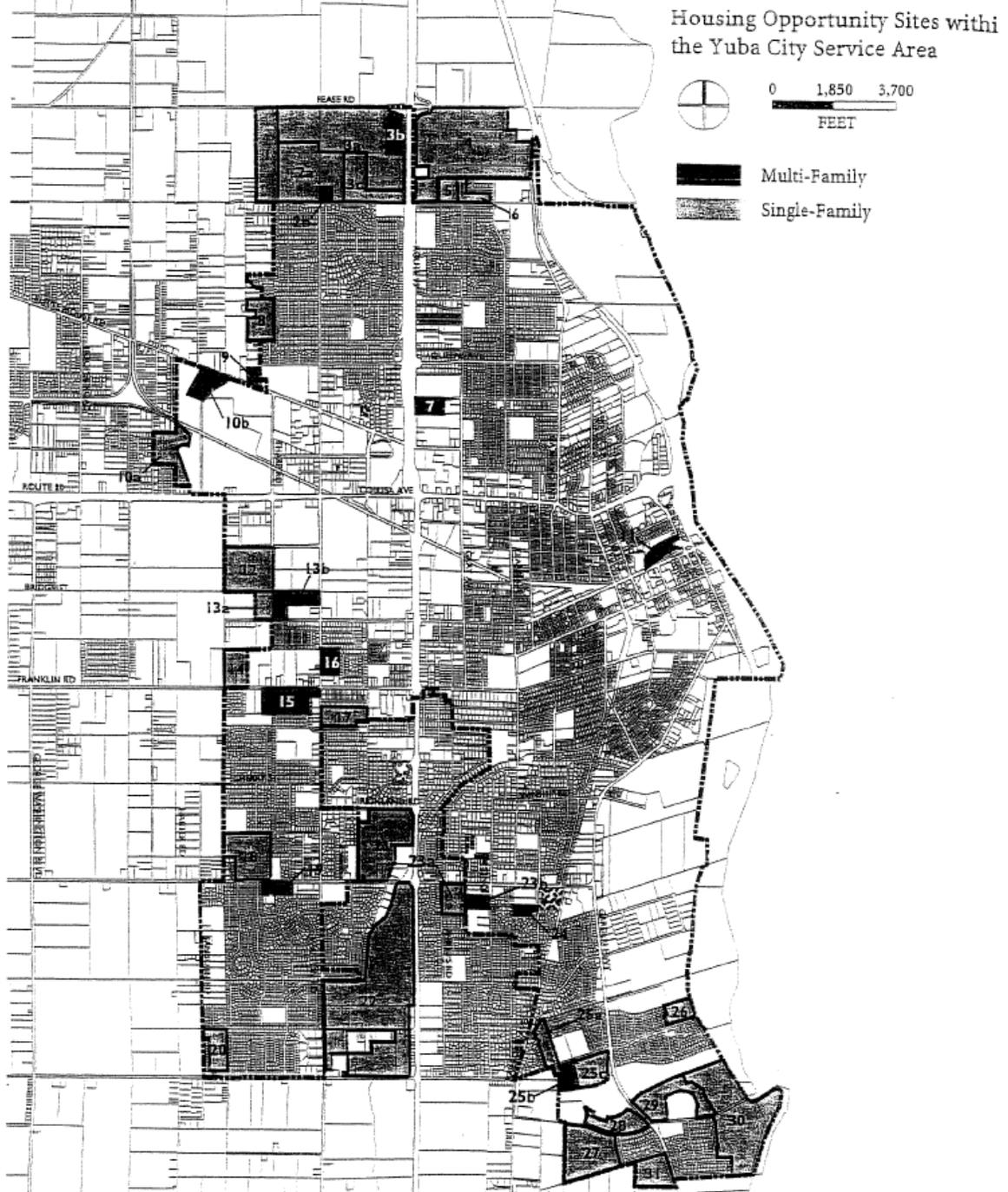


*Figure 8-3*  
**Special Status Biological Resources**

## **Development Trends**

According to the 2003 Housing Element of the City of Yuba City General Plan, growth in the city is increasing rapidly. Between 2000 and 2006, the population of the city increased from 36,760 to 60,507. New development areas identified in the Yuba City General Plan include the Harter area on the north side of Shanghai Bend Road, west of Garden Highway and the Lincoln East area on the north side of Lincoln Road, east of Sanborn Road. The following map shows these areas.

**Figure 7. City of Yuba City, Potential Development Sites**



## **Vulnerability to Flood**

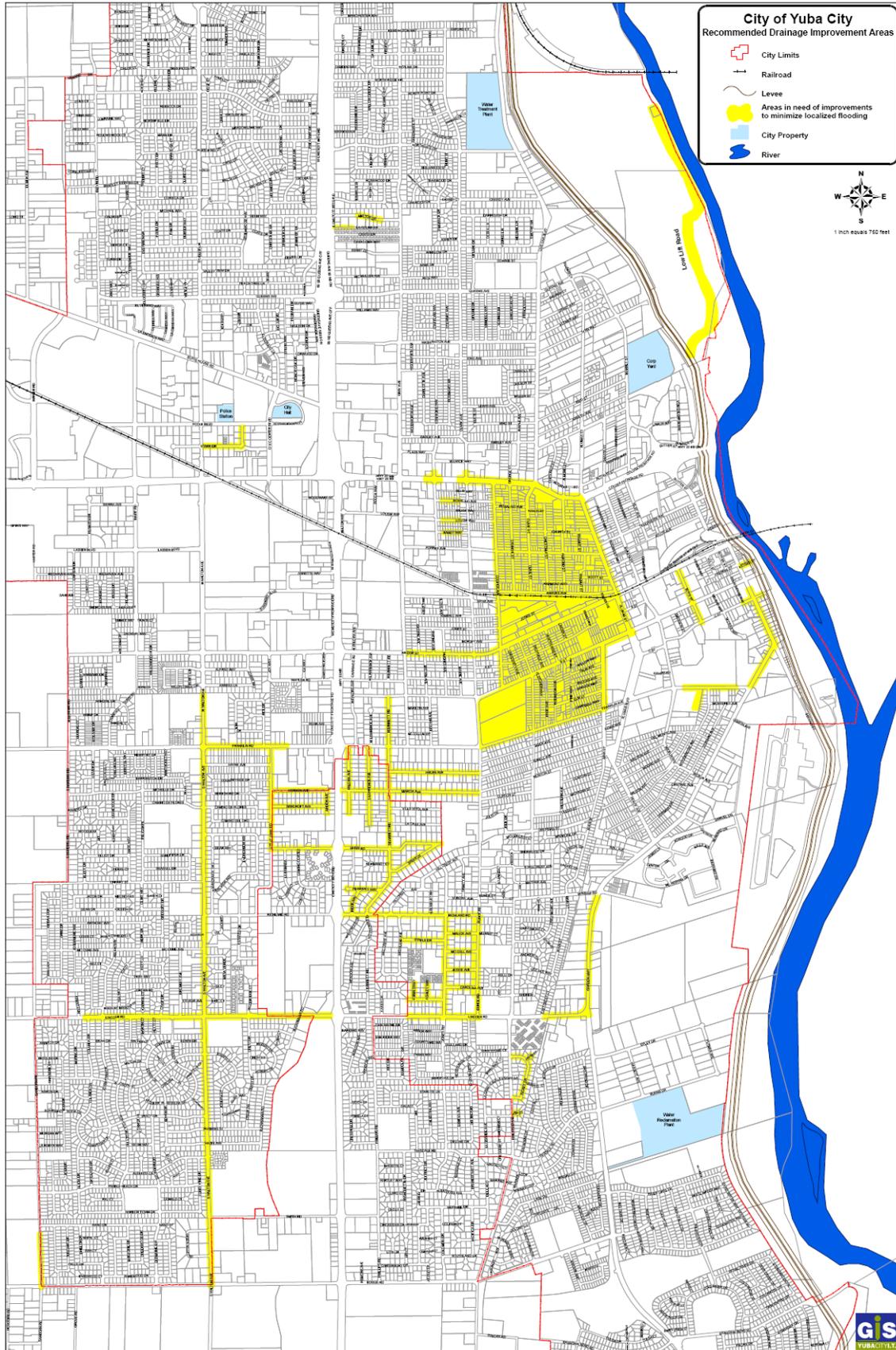
### **Flood Problem Description**

Located on the banks of the Feather River, flooding is a significant hazard to the City of Yuba City. Yuba City is susceptible to four types of floods: localized flooding, riverine (slow rise) flooding, levee/overtopping failure, and dam failure as detailed in Section 4.1 of the Risk Assessment. As previously described, structural flood control measures, including a complex system of levees, earthen embankments, bypasses and weirs, provide the primary defense against flooding in Yuba City and the county.

According to the Yuba City General Plan, the greatest potential threat to the Yuba City Urban Area is flooding resulting from failure of levees along the Feather River. At the time the plan was written, it estimates that approximately 20,000 parcels and upwards of \$1 billion in property would be impacted by a failure in the levee system. As previously described in Section 4.1, the USACE has identified several improvements for levees along the Sacramento and Feather rivers in order to increase the level of flood protection.

In addition to a damaging flood resulting from a dam or levee failure, the urban area is highly susceptible to flooding from stormwater runoff. As development continues to occur in the urban area, the increase in impervious surfaces will result in increased overall run-off at an accelerated rate. Ongoing improvements to the drainage infrastructure are being designed and constructed to accommodate this increase in run-off; however, removing run off and flood waters from the urban area does not in itself resolve drainage issues. Lack of downstream channel maintenance and limited flow capacity within the Sutter Bypass can backup flood waters and also contribute to localized flooding issues within the urban area. A map detailing Recommended Drainage Improvement Areas within the City of Yuba City is provided on the following page.

# City of Yuba City Recommended Drainage Improvement Areas



(Source: City of Yuba City, Departments of Public Works/GIS)

## The Yuba City Waterway System

The Feather River, as previously described, forms the eastern boundary of Yuba City. Drainage facilities within the Yuba City Urban Area include:

- Gilsizer Slough
- Live Oak Canal
- City Systems (facilities within or serving Yuba City)
- Local Improvements (facilities within or serving improvement districts)

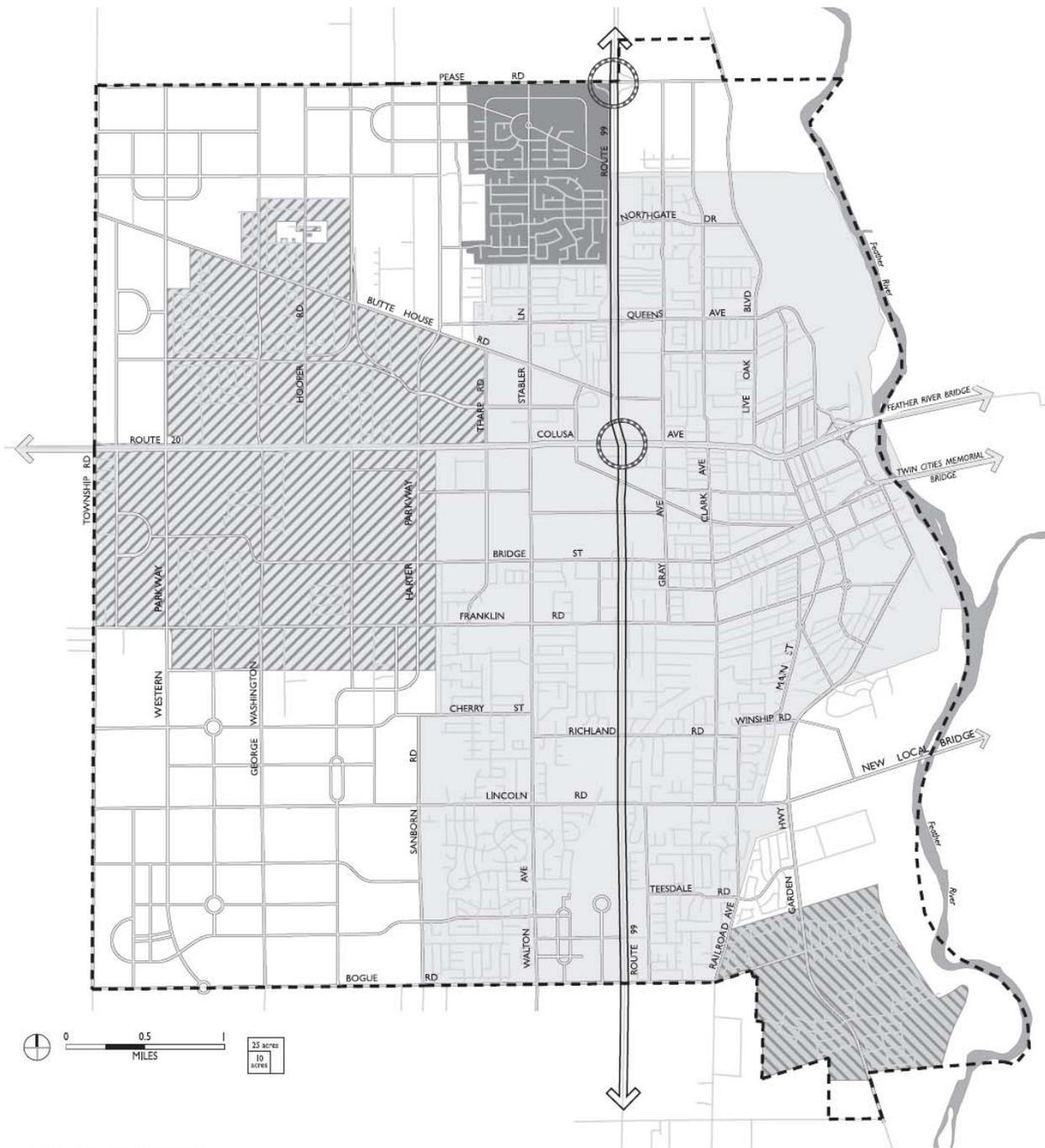
These are described in more detail below.

**Gilsizer Slough.** The Gilsizer Slough is a natural drainage channel that historically drained the Yuba City and the area south of the urban area. Originally, the Gilsizer Slough was a slough that used to be open to the Feather River in the 1800's, but was closed off to the river to be used as a drainage route for the city. Presently, the Slough discharges to the State Drain, which flows north to State Pumping Plant No. 2, and then into the Sutter Bypass. Tributaries to the Gilsizer Slough include all of Gilsizer County Drainage District, except for a small area of the city north of Colusa Highway which is pumped directly to the Feather River.

**Live Oak Canal.** The Live Oak "Canal has historically carried stormwater run-off from areas north of Pease Road in an area that is now part of the Tierra Buena County Drainage District. The area north of Pease road is now drained by the State East Interceptor Canal.

**City Facilities.** Portions of north and south Yuba City are drained to holding ponds. This water is then pumped over the levee into the Feather River. The Garden Highway/Bogue Road area is also pumped into the Feather River. Other drainage projects for the city have been planned and are included in the City's Capital Improvement Program (CIP) for 2110-2006.

A map detailing Drainage Facilities in the Yuba City Urban Area is on the following page.



Source: City of Yuba City, 2001.

- Gilsizer Drainage Area
- North Yuba Drainage Area
- South Ponds Drainage Area
- County Drainage Area

Figure 9-5  
Drainage Facilities

(Source: Yuba City General Plan 2004)

## FEMA Maps, Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Yuba City joined the NFIP on March 23, 1984. The following table identifies the existing FIRM map for the City.

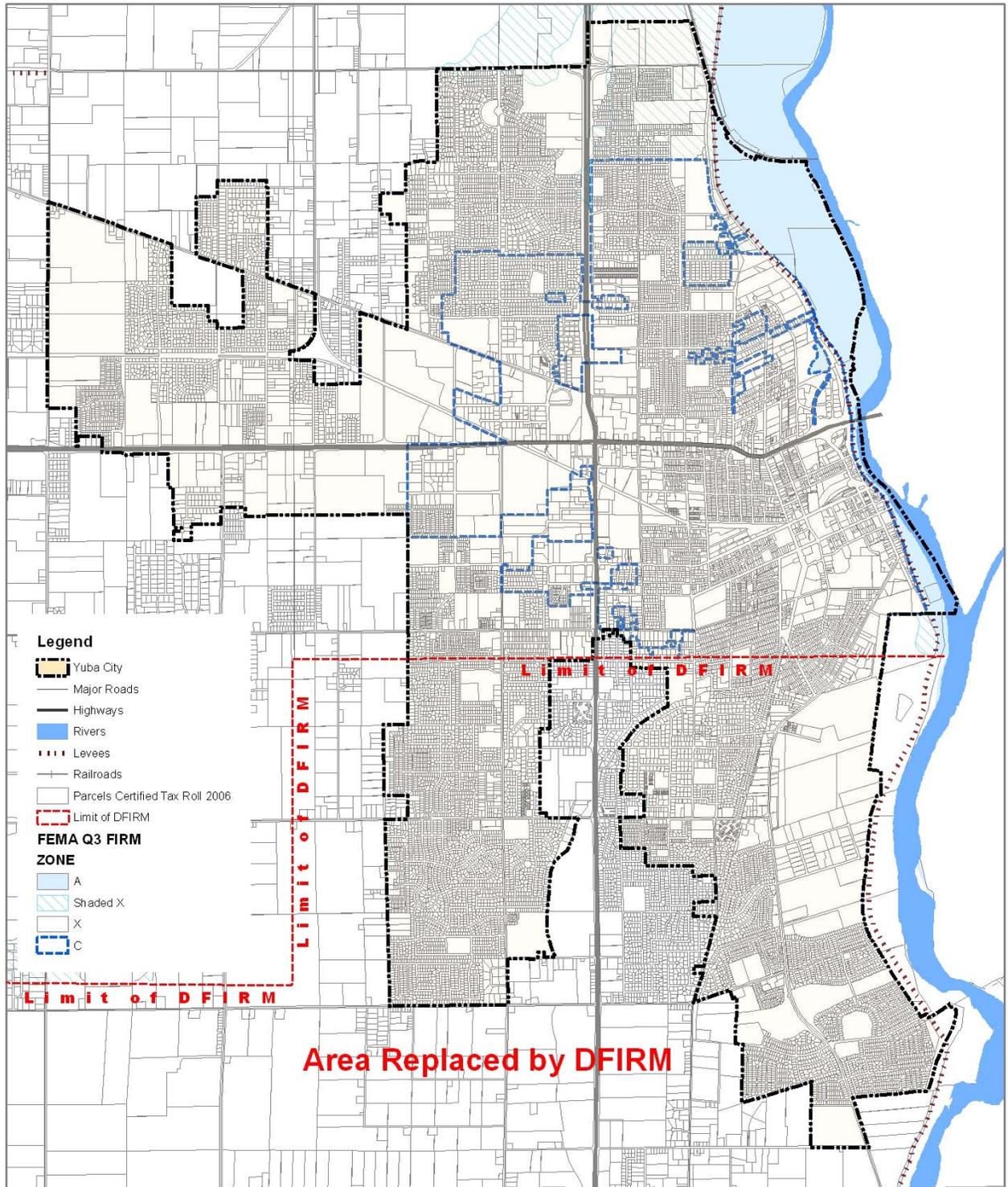
### FEMA FIRMs

CITY OF YUBA CITY	
Map Number	Effective Date
0603960005B	03/23/1984

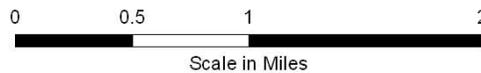
In addition, the new preliminary draft (August 2006) DFIRM resulting from the Lower Feather River Study, includes portions of Yuba City in the remap. It is anticipated the DFIRMs generated using the Upper Feather River Study will be out in the next 1-2 years. Once complete, these new DFIRMs will replace the old paper FIRMs. The major change associated with these updated maps is that the new DFIRMs do not recognize the existing levee system as being certified. As a result, most of the properties designated as Zone X or Zone C (outside the floodplain) in the paper maps are being re-categorized into 100-year and 500-year flood zones.

As a result of these ongoing map changes, in order to most accurately reflect the current status of FEMA floodplain mapping within the Sutter County Planning Area, the methodology previously described in the vulnerability assessment (on pages 158-164) for the entire Planning Area was followed in creating vulnerability maps and determining values at risk to the 100-year and 500-year flood events for the City of Yuba City. The maps on the following pages illustrate the FEMA floodplain data for the City of Yuba City.

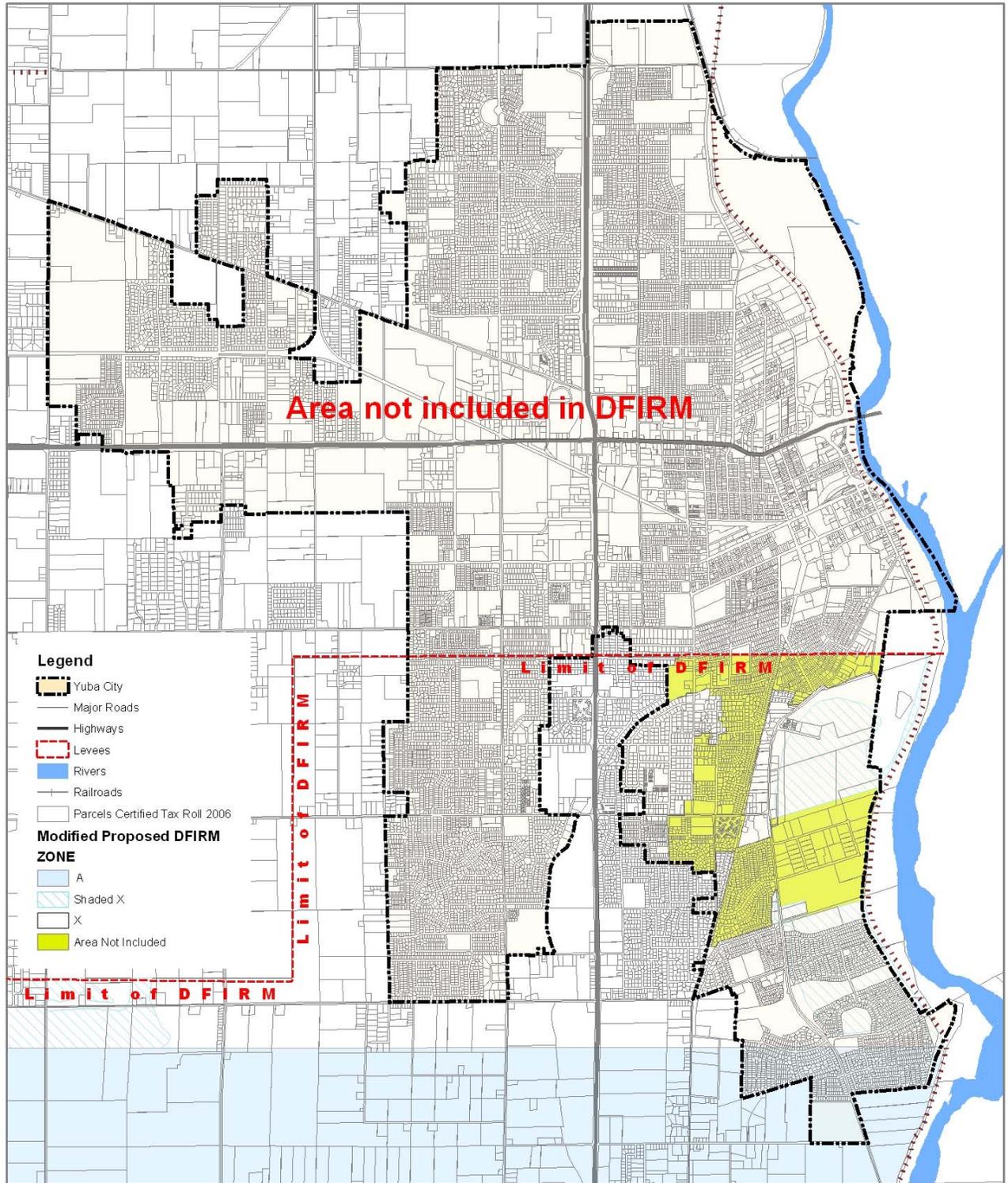
# Yuba City Flood Map / FEMA Q3 Floodplain



**amec**  
 Map Compilation: AMEC 10/23/06  
 Data Source: Sutter County, CA



# Yuba City Flood Map / Proposed DFIRM Floodplain



**amec**  
 Map Compilation: AMEC 10/23/06  
 Data Source: Sutter County, CA



NFIP Insurance data indicates that as of August 21, 2006 there are 2,753 flood insurance policies in the City of Yuba City resulting in \$727,970,500 in Insurance in Force. Of these, all are located in the B, C, & X Zones with 428 standard policies and 2,325 preferred policies.. Historically, there have been four claims for flood losses totaling \$15,571. Three claims were for Pre-FIRM structures and one claim for a Post-FIRM structure. There are no RL properties within the city limits.

### Values at Risk

The following paragraphs describe the values at risk within the City of Yuba City using various data:

- FEMA Q3 Data and Proposed DFRIM Data
- FEMA Q3 Data
- Proposed DFRIM Data

### FEMA Q3 Data and Proposed DFRIM Data Floodplain Analysis

After evaluating available insurance flood loss data, the next step was to quantify the flood vulnerability for the City of Yuba City. The HMPC used GIS to model and quantify potential flood vulnerability to the City of Yuba City within the mapped floodplain areas using FEMA's Q3 and DFIRM floodplain data (as shown on the above maps and described on pages 158-164) and overlaying the information on Sutter County's GIS parcel layers for improved parcels. The parcel layer was linked with the assessor's data to quantify the value of property that potentially lies in the floodplain.

The result of this flood vulnerability analysis summarizes the values at risk in the floodplain of the City of Yuba City as provided below.

Yuba City Q3 Zone Summary										
	Zone A		Shaded Zone X		Zone X		Zone C		Total	
Property Type	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Parcels	Improved Value
Residential	-	\$ -	278	\$ 57,310,819	3,943	\$ 717,509,599	6,171	\$ 719,655,723	10,392	\$ 1,494,476,141
Commercial	-	\$ -	6	\$ 3,588,487	79	\$ 52,923,394	680	\$ 395,138,776	765	\$ 451,650,657
Industrial	-	\$ -	8	\$ 2,241,866	85	\$ 18,848,845	159	\$ 73,268,259	252	\$ 94,358,970
Institutional	-	\$ -	4	\$ 740,328	19	\$ 21,323,080	73	\$ 63,981,319	96	\$ 86,044,727
Agricultural	1	\$ 15,727	2	\$ 169,769	29	\$ 2,632,824	-	\$ -	32	\$ 2,818,320
Other	-	\$ -	-	\$ -	22	\$ 3,245,055	15	\$ 1,321,405	37	\$ 4,566,460
<b>Total</b>	<b>1</b>	<b>\$ 15,727</b>	<b>298</b>	<b>\$ 64,051,269</b>	<b>4,177</b>	<b>\$ 816,482,797</b>	<b>7,098</b>	<b>\$ 1,253,365,482</b>	<b>11,574</b>	<b>\$ 2,133,915,275</b>

Yuba City DFRIM Zone Summary									
	Zone A		Shaded Zone X		Zone X		Total		
Property Type	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Parcels	Improved Value	
Residential	647	\$ 116,291,595	605	\$ 101,479,836	4,249	\$ 651,933,610	5,501	\$ 869,705,041	
Commercial	-		-	\$ -	28	\$ 11,335,380	28	\$ 11,335,380	
Industrial	-		3	\$ 1,063,865	50	\$ 3,572,296	53	\$ 4,636,161	
Institutional	-		1	\$ 7,713,800	4	\$ 1,473,955	5	\$ 9,187,755	
Agricultural	1	\$ 1,018,734	-	\$ -	7	\$ 1,014,558	8	\$ 2,033,292	
Other	1	\$ 250,000	1	\$ 113,031	9	\$ 1,160,823	11	\$ 1,523,854	
<b>Total</b>	<b>649</b>	<b>\$ 117,560,329</b>	<b>610</b>	<b>\$ 110,370,532</b>	<b>4,347</b>	<b>\$ 670,490,622</b>	<b>5,606</b>	<b>\$ 898,421,483</b>	

Yuba City DFRIM and Q3 Zone Summary										
	Zone A		Shaded Zone X		Zone X		Zone C		Total	
Property Type	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Parcels	Improved Value
Residential	647	\$ 116,291,595	883	\$ 158,790,655	8,192	\$ 1,369,443,209	6,171	\$ 719,655,723	15,893	\$ 2,364,181,182
Commercial	-	\$ -	6	\$ 3,588,487	107	\$ 64,258,774	680	\$ 395,138,776	793	\$ 462,986,037
Industrial	-	\$ -	11	\$ 3,305,731	135	\$ 22,421,141	159	\$ 73,268,259	305	\$ 98,995,131
Institutional	-	\$ -	5	\$ 8,454,128	23	\$ 22,797,035	73	\$ 63,981,319	101	\$ 95,232,482
Agricultural	2	\$ 1,034,461	2	\$ 169,769	36	\$ 3,647,382	-	\$ -	40	\$ 4,851,612
Other	1	\$ 250,000	1	\$ 113,031	31	\$ 4,405,878	15	\$ 1,321,405	48	\$ 6,090,314
<b>Total</b>	<b>650</b>	<b>\$ 117,576,056</b>	<b>908</b>	<b>\$ 174,421,801</b>	<b>8,524</b>	<b>\$ 1,486,973,419</b>	<b>7,098</b>	<b>\$ 1,253,365,482</b>	<b>17,180</b>	<b>\$ 3,032,336,758</b>

Base on this analysis, Yuba City has significant assets at risk to the 100-year and greater floods. Combining the different types of A Zones (from the two maps) which indicate a risk to the 100-year flood results in 650 improved parcels for a total of \$117,576,056 located within the 100-year floodplain. There are also 908 improved parcels valued at \$174,421,801 at risk to the 500-year flood.

Comparing these numbers to the insurance data, of the 15,871 total parcels and 650 parcels at risk to the 100-year flood, 2,753 of those parcel owners maintain flood insurance. Of these 2,753 policy holders, based on the old FIRMs, only 1 policy holder is considered to be in the 100-year floodplain.

Application of the 20% damage factor to the above values at risk for improved parcels of \$117,576,056, results in \$23,515,211.2 at risk of damage to the 100-year flood.

### FEMA Q3 Data Floodplain Analysis

The above assessment of values at risk to the 100-year flood utilizes the FEMA Q3 data currently in force for most of the city combined with the proposed DFIRM data for the very southern portion of the city. This methodology was used to best reflect the current flood risk within the Planning Area given the changing status of the FEMA flood maps during this planning process. In order to really appreciate the impact of the DFRIM process to the Planning Area, it is helpful to step back and look at the flood risk and vulnerability using only the FEMA Q3 data for the entire area. As previously described, most of the properties designated as Zone X or Zone C (outside the floodplain) in the Q3 data (paper maps) are being re-categorized into 100-year and 500-year flood zones in the new DFIRMS. Thus, using only the Q3 data, the values at risk to the 100-year and greater flood would include the following:

- Zone A (100-year): 1 improved parcels totaling \$15,727
- Shaded Zone X (500-year): 908 improved parcels totaling \$174,421,801
- Zone X & C (outside the floodplain): 16,721 improved parcels totaling \$4,636,870,506

Clearly, the flood risk in the city is substantially less using only FEMA Q3 data.

### Proposed DFIRM Floodplain Analysis

The first analysis above focused on evaluating impacts to the City of Yuba City based on the current FEMA floodplain mapping for the city which includes both the FEMA Q3 data (for most of the city) and the new Draft DFIRM mapping (for areas within the very southern portion of the city). Additional DFIRMS will be developed based on the results of the Upper Feather River Study that will replace the remaining Q3 data. This analysis assumes that the resulting DFIRMS covering the remaining portion of the city will be similar in outcome to the DFIRMS generated from the Lower Feather River Study. As previously stated, the major change associated with these updated maps is that the new

DFIRMs do not recognize the existing levee system as being certified. As a result, most of the properties designated as Zone X or Zone C (outside the floodplain) in the paper maps (and Q3 data) are being re-categorized into 100-year and 500-year flood zones.

Assuming that DFIRM maps apply to the entire city area, county parcel and assessor data were used to provide a worst-case scenario of assets at risk to a 100-year or greater flood. The table below summarizes total assets at risk within the City. Until the new study and maps are complete, the actual number and types of parcels falling within the 100-year and 500-year flood zones cannot be determined. As a result, it can only be assumed that the entire city is potentially at risk to flooding without the benefit of levees providing 100 year or more protection.

**City of Yuba City  
Total Assets at Risk to the 100-year or greater Flood  
(Based on proposed DFRIM mapping)**

CITY OF YUBA CITY 2006 Roll Values							
Property Type	Units Improved	Total Improved Value	Total Improved Land Value	Units Unimproved	Total Unimproved Land Value	Grand Totals	
						Units	\$\$
Residential	15,893	\$ 2,364,181,182	\$ 720,568,875	35	\$ 4,198,380	15,928	\$ 3,088,948,437
Commercial	793	\$ 462,986,037	\$ 168,461,437	115	\$ 41,274,950	908	\$ 672,722,424
Industrial	305	\$ 98,995,131	\$ 30,322,762	88	\$ 21,859,440	393	\$ 151,177,333
Agricultural	40	\$ 4,851,612	\$ 4,525,987	14	\$ 3,168,316	54	\$ 12,545,915
Institutional	101	\$ 95,232,482	\$ 10,728,610	138	\$ 12,425,746	239	\$ 118,386,838
Other	48	\$ 6,090,314	\$ 2,115,466	945	\$ 56,343,411	993	\$ 64,549,191
<b>Total</b>	<b>17,180</b>	<b>\$ 3,032,336,758</b>	<b>\$ 936,723,137</b>	<b>1,335</b>	<b>\$ 139,270,243</b>	<b>18,515</b>	<b>\$ 4,108,330,138</b>

**Critical Facilities**

Critical facilities are those community components that are most needed to withstand the impacts of disaster. Included in this classification are police and fire stations, hospitals, schools that serve as emergency shelters, and lifeline utilities; power, water and sewer system components. A map of the critical facilities within the City of Yuba City is located on page 206. Within the Planning Area many critical facilities are protected by the extensive flood control system. To additionally protect them individually from the potential failure of the structural flood control systems may be very difficult to justify on a benefit/cost ratio analysis. Still, the impact to the community, should the statistically unlikely catastrophic flood event occur, would be astonishing if also these critical facilities are damaged or destroyed.

**Cultural and Natural Resources at Risk**

Yuba City has significant cultural and natural resources located throughout its boundaries as previously described. Risk analysis of these resources was not possible due to data limitations. However, natural areas within the floodplain often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters.

**Development Trends**

The development trend in the Sutter County Planning Area is steady, significant growth, especially within the existing urban areas.

The Housing Element of the Sutter County General Plan expects the population in Yuba City to grow to 53,570 by 2015. This is an additional 17,710 people from the 2000 census estimate of 35,860. Such growth will consume acres of previously undeveloped areas and the impacts may overwhelm existing drainage and flood control facilities.

Master planning for stormwater runoff and adherence to floodplain management regulations for new development should help both new and existing development from the impacts of the 100-year flood.

### **Vulnerability to Wildfire**

Wildfire is of limited concern to Yuba City. There is no history of large, damaging fires in or around Yuba City in recent history. According to the fire threat map included on page 164, areas near the city are of moderate threat to wildfire. Based on this information, the vulnerability of the city to Wildfire is limited and no further analysis was conducted.

### **Other Identified Hazards: Agricultural Hazards, Dam Failure, Drought, Earthquakes, Severe Weather, and West Nile Virus.**

Except for those mapped hazards, flood and wildfire, the risk assessment for this plan, as previously described, covers the entire geographical extent of the Sutter County Planning Area. Thus, the risk assessment for the Sutter County Planning Area also includes and directly corresponds to the unincorporated portions of the county and all incorporated jurisdictions, including the City of Yuba City.

## CITY OF LIVE OAK

**Population:** 6,229

**Area:** 7,200 acres

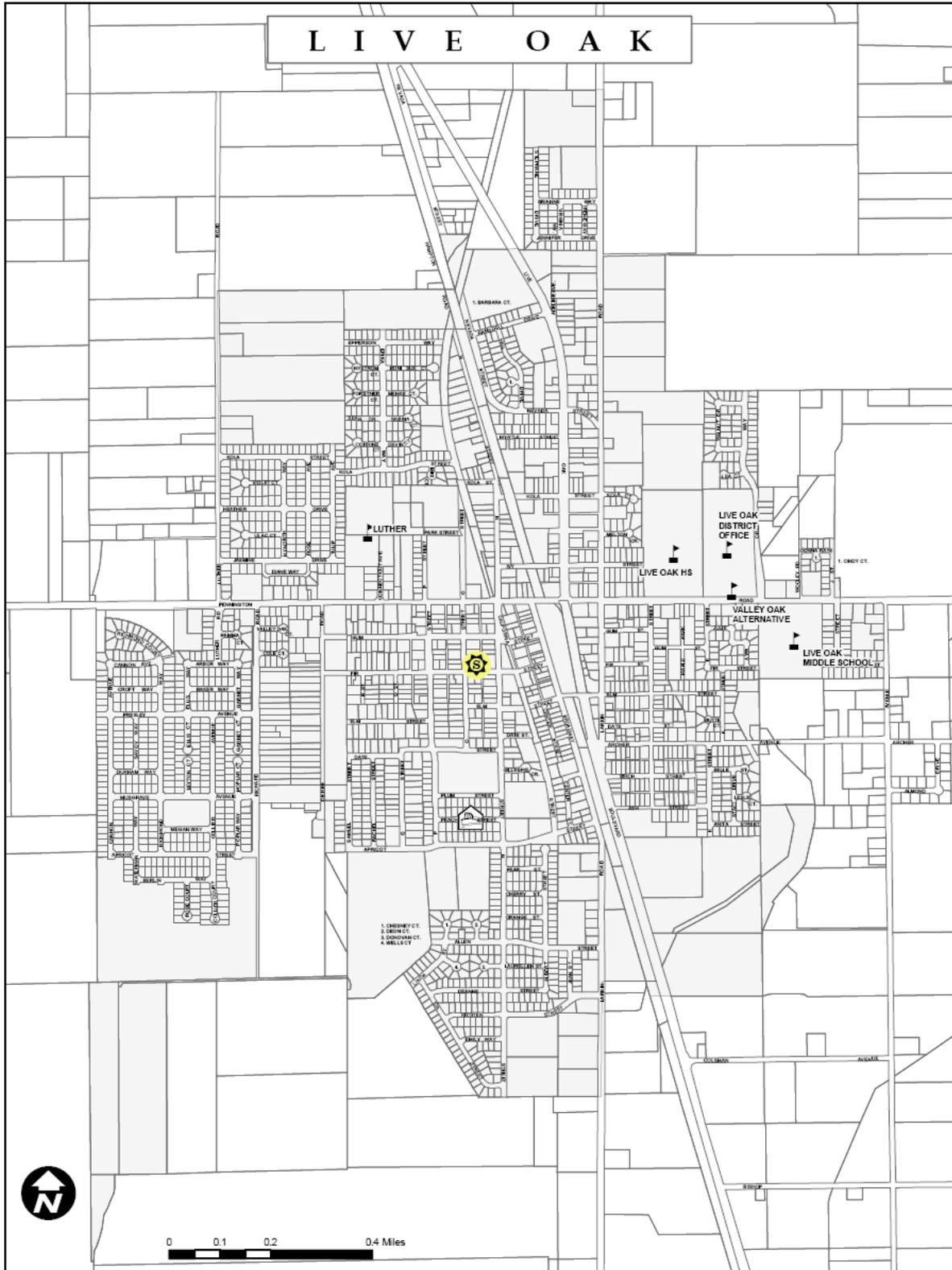
**Elevation:**

### Community Profile

Located in Sutter County, Live Oak is a small but growing city located along State Highway 99 and a mainline Union Pacific railroad line in a mostly agricultural area of the Sacramento Valley (See city map on the page that follows.) Named for the beautiful groves of live oak trees, the town was first settled in 1866 by A.M. McGrew. The town is located within a portion of the Rancho Boga Mexican land grant on the west side of the Feather River. The town grew with the advent of the California-Oregon Railroad in the 1870's and became the main point in Sutter County for shipping agricultural produce. Live Oak was the second city to be established in Sutter County and was incorporated in 1947. The City has a range of residential, commercial, industrial, civic, and other land uses. Most commercial properties are located along Highway 99, which divides the eastern portion and western portions of the community. The City is surrounded by orchards and other agricultural-related land uses.

Live Oak's population has increased dramatically since 1950 (1,770 population) and was one of the fastest growing cities in the area between 1990 and 2000. According to the 2000 Census report, the population of Live Oak is 6,229. Development in the city to accommodate future growth is occurring primarily within the City sphere-of-influence, beyond the current city limits. The boundary for the sphere-of-influence is set at the Butte County line on the north, Township Road on the west, Paseo Road on the south and the Feather River on the east. Total area for the Live Oak sphere-of-influence is approximately 7,200 acres. In addition, the city is making an effort to rehabilitate existing dilapidated structures within the city limits to provide additional housing options to residents.

Topography in the City of Live Oak is very flat due to its location in the Sacramento Valley, near the Feather River. Soils in most of the City of Live Oak consist of the Conejo-Tisdale soil classification, which is deep to very deep, level to very level well-drained loam and clay loam typically found on terraces. These soils are classified as soils of statewide importance. The remaining areas of the city are comprised of Live Oak sandy clay loam and Marcum-Gridley clay loam soil complex.



(Source: Sutter County GIS)

## Hazard Summary

Based on information provided by the City of Live Oak, a hazard summary for the city is provided below.

<b>SUMMARY HAZARD ANALYSIS: CITY OF LIVE OAK</b>				
<b>Hazard</b>	<b>Frequency of Occurrence</b>	<b>Spatial Extent</b>	<b>Potential Magnitude</b>	<b>Significance</b>
Agricultural Hazards				
Dam Failure				
Drought	Likely	Significant	Critical	Medium
Earthquakes				
Floods	Likely	Significant	Catastrophic	High
Landslides				
Natural Health Hazards: West Nile Virus				
Severe Weather: Extreme Temperatures				
Severe Weather: Severe Fog	Highly Likely	Significant	Limited	Medium
Severe Weather: Winterstorms	Likely	Significant	Limited	Low
Severe Weather: Tornadoes				
Soil Hazards: Erosion				
Soil Hazards: Expansive Soils				
Soil Hazards: Land				

<b>SUMMARY HAZARD ANALYSIS: CITY OF LIVE OAK</b>				
<b>Hazard</b>	<b>Frequency of Occurrence</b>	<b>Spatial Extent</b>	<b>Potential Magnitude</b>	<b>Significance</b>
Subsidence				
Wildfires				
Volcano				
<p><b>Guidelines:</b>  <b>Frequency of Occurrence</b>  <i>Highly Likely:</i> Near 100% probability in next year.  <i>Likely:</i> Between 10 and 100% probability in next year, or at least one chance in ten years.  <i>Occasional:</i> Between 1 and 10% probability in next year, or at least one chance in next 100 years.  <i>Unlikely:</i> Less than 1% probability in next 100 years.</p> <p><b>Spatial Extent</b>  <i>Limited:</i> Less than 10% of planning area  <i>Significant:</i> 10-50% of planning area  <i>Extensive:</i> 50-100% of planning area</p> <p><b>Potential Magnitude</b>  <i>Catastrophic:</i> More than 50% of area affected  <i>Critical:</i> 25 to 50%  <i>Limited:</i> 10 to 25%  <i>Negligible:</i> Less than 10%</p> <p><b>Significance</b> (Your subjective opinion)—<i>Low, Medium, High</i></p>				

Information provided by the HMPC identified the following hazard as the most significant to the City of Live Oak:

- Floods

## **Vulnerability Assessment**

This vulnerability assessment quantifies the vulnerability of the City of Live Oak in the event of a catastrophic event and also provides an assessment of the areas vulnerability to floods and wildfire.

## **Values at Risk**

Utilizing Sutter County assessor data, the total assessed values for the City of Live Oak are:

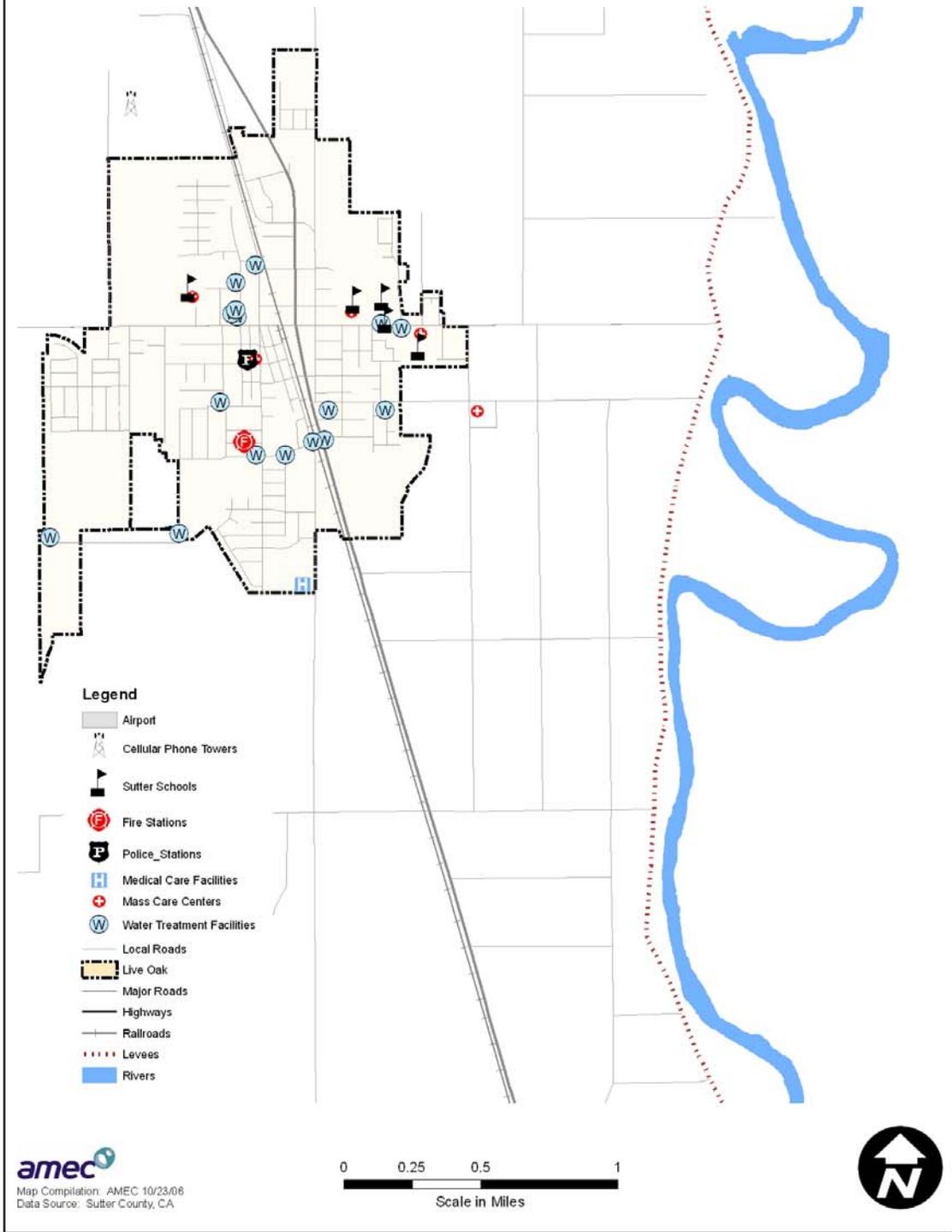
CITY OF LIVE OAK							
2006 Roll Values							
Property Type	Units	Total Improved	Total Improved	Units	Total Unimproved	Grand Totals	
	Improved	Value	Land Value	Unimproved	Land Value	Units	\$\$
Residential	1,790	\$ 177,821,695	\$ 65,617,918	-	\$ -	1,790	\$ 243,439,613
Commercial	61	\$ 13,866,546	\$ 3,362,066	21	\$ 734,075	82	\$ 17,962,687
Industrial	9	\$ 7,061,320	\$ 1,172,035	1	\$ 14,353	10	\$ 8,247,708
Agricultural	16	\$ 1,243,271	\$ 894,090	15	\$ 9,027,369	31	\$ 11,164,730
Institutional	29	\$ 5,577,812	\$ 748,192	46	\$ 341,800	75	\$ 6,667,804
Other	13	\$ 1,212,626	\$ 607,593	719	\$ 9,188,362	732	\$ 11,008,581
<b>Total</b>	<b>1,918</b>	<b>\$ 206,783,270</b>	<b>\$ 72,401,894</b>	<b>802</b>	<b>\$ 19,305,959</b>	<b>2,720</b>	<b>\$ 298,491,123</b>

## Critical Facilities Inventory

The critical facilities in the City of Live Oak are listed below and provided in the map that follows.

Live Oak Critical Facilities	
Owner	Critical Facility
Live Oak #5	Fire Station
Church Of The Nazarene	Mass Care Center
Live Oak Middle School	Mass Care Center
Live Oak High School	Mass Care Center
Luther Elementary School	Mass Care Center
Live Oak Manor Nursing Home	Medical Care Facility
Sutter County Sheriff	Police Station
Live Oak Unified School District	School
Live Oak High School	School
Live Oak Middle School	School
Luther Elementary School	School
Valley Oak Alternative High School	School
Sewer Lift Station	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Water Tank	Wastewater Treatment Facility
Sewage Lift Station	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Storm Water Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Storm Water Lift Station	Wastewater Treatment Facility
Water Well	Wastewater Treatment Facility
Storm Water Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Sewer Lift Station	Wastewater Treatment Facility
Waste Water Treatment Plant	Wastewater Treatment Facility

# Live Oak Critical Facilities



## **Cultural and Natural Resources at Risk**

Cultural and natural resources in City of Live Oak include those previously identified in the County inventory and as detailed below:

### **Cultural Resources**

- Live Oak Historic Commercial District
- Pennington Road – One of the first houses in Live Oak, built for Louis Schnepel
- Larkin Road – One of the first houses in Live Oak

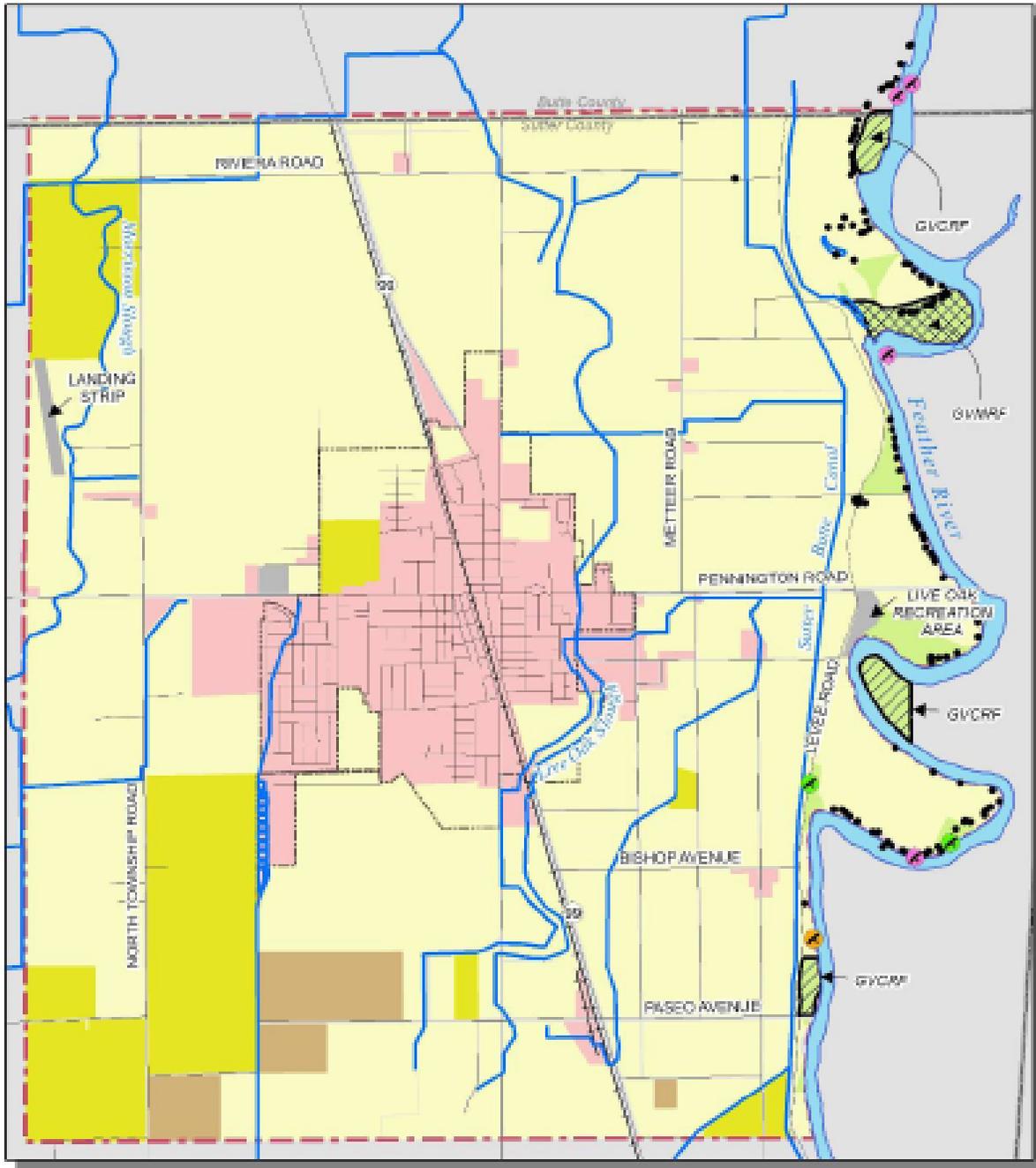
### **Natural Resources**

The list of protected plant and wildlife species previously identified in the county inventory includes information regarding the potential for a particular species to occur in the City of Live Oak. Those species with a moderate or high potential are listed below.

- Rose mallow (High)
- Swainson's hawk
- Western Yellow billed cuckoo(Moderate/High)
- Burrowing owl (Moderate)
- Tricolored blackbird (High)
- Giant garter snake (Moderate/High)
- Central Valley spring-run salmon (High)

The following map taken from the Live Oak General Plan Update shows the locations of sensitive species recorded in the vicinity of Live Oak.

Figure 2. Sensitive Species Recorded in the Vicinity of Live Oak



Source: Adapted from SWCA, 2001 and 2007, 2003.

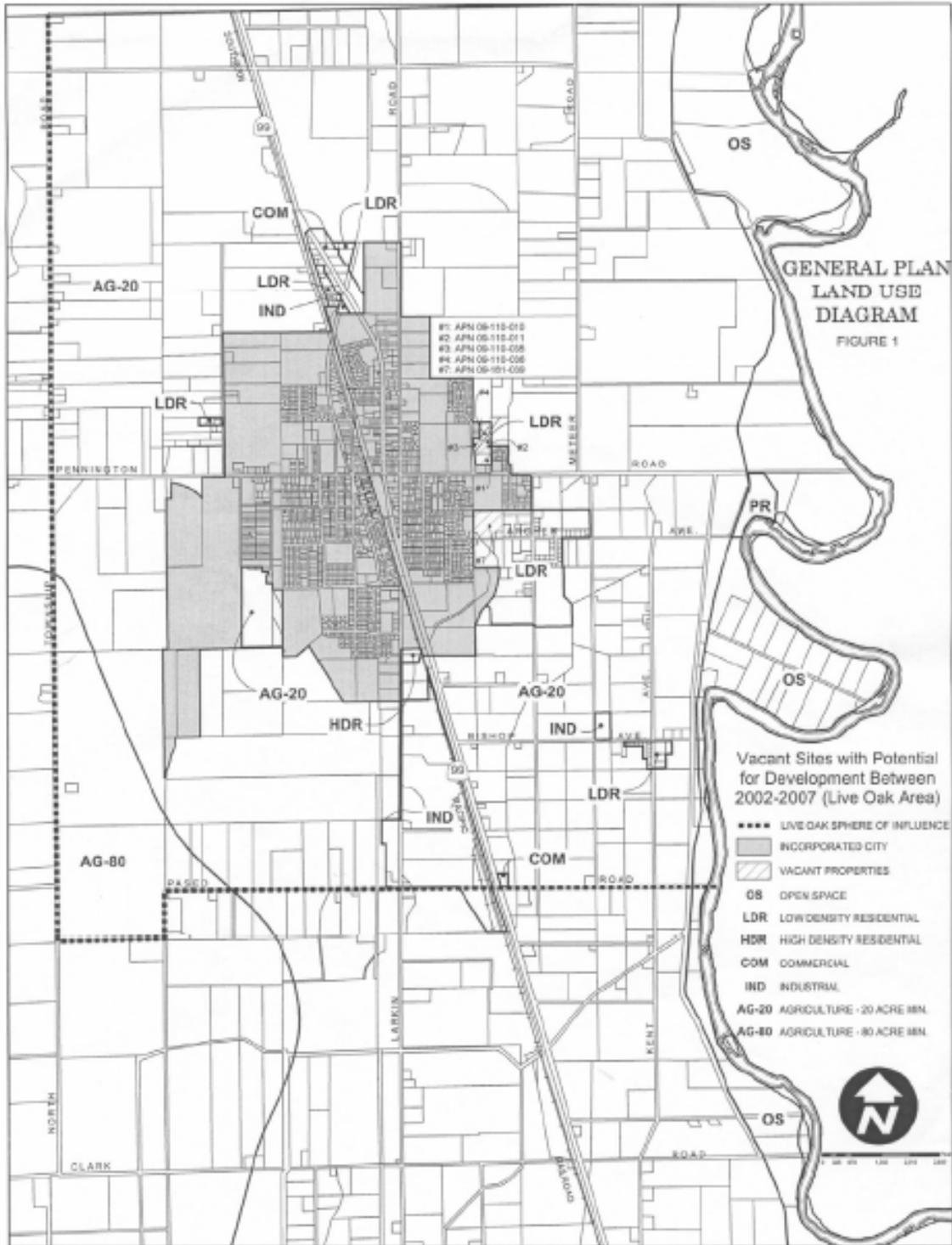
**CITY OF LIVE OAK GENERAL PLAN UPDATE**



## **Development Trends**

According to the 2006d General Plan Background Report, growth in the city is increasing. Between 2000 and 2015, the population of the city is projected to increase from 5,540 to 8,810. New development areas within the city are primarily concentrated in the northeast portion of the City sphere of influence. Under the SACOG preferred scenario for development, an average of 100 new homes would be constructed each year. The following map shows this area.

## City of Live Oak Potential Development Sites



## Vulnerability to Flood

### Flood Problem Description

Flooding is a significant concern to the City of Live Oak. The City of Live Oak is also susceptible to four types of floods: localized flooding, riverine (slow rise) flooding, levee/overtopping failure, and dam failure as previously described in Section 4.1 of the Risk Assessment.

Located in the northeast portion of the county, Live Oak is built near the Feather River which borders eastern boundary of the city. According to the City of Live Oak General Plan Background Report, other notable hydrologic features within the area include irrigation laterals, canals and sloughs that are used for water supply and flood control. These include the following:

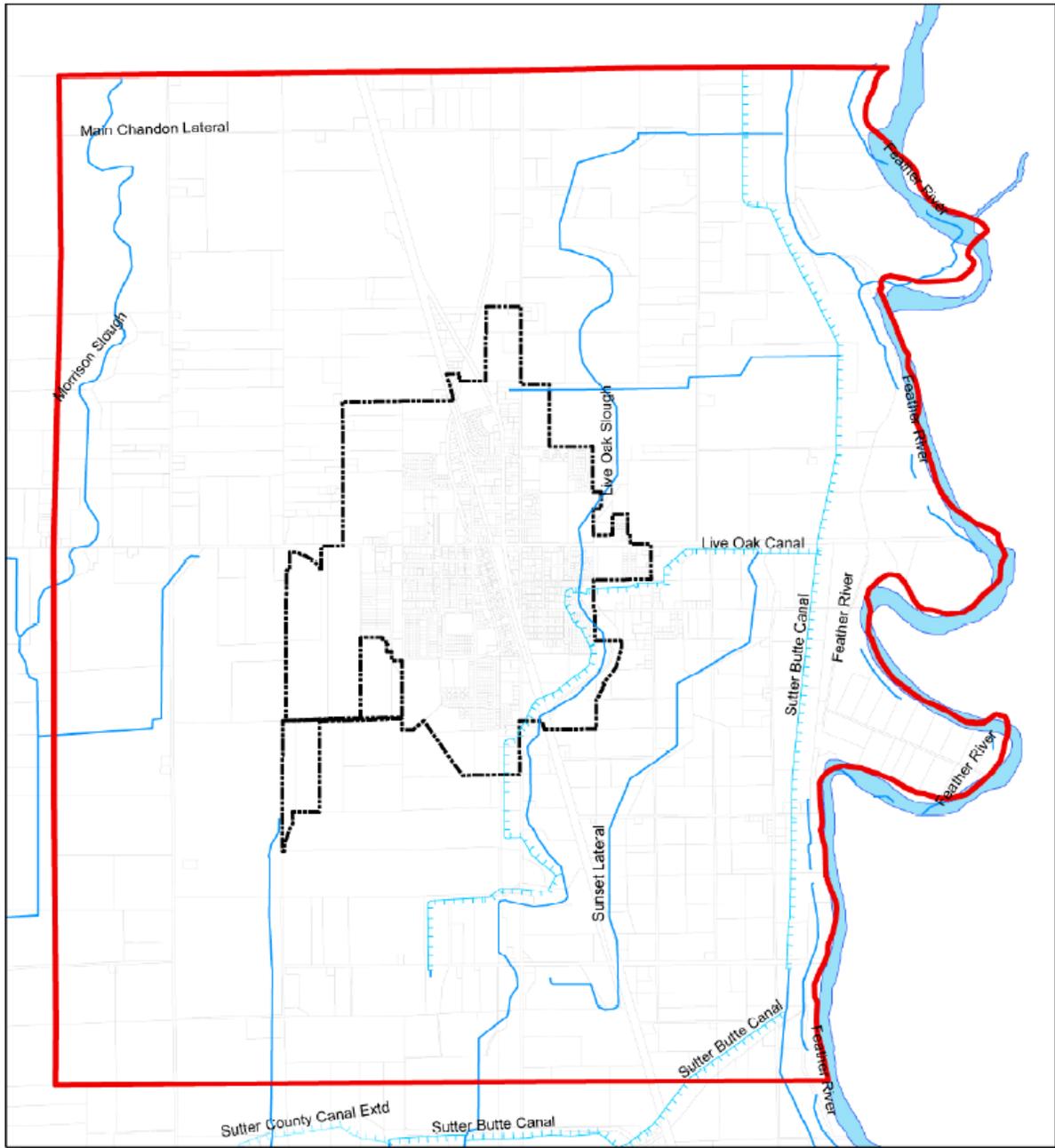
- Main Chandon Lateral
- Morrison Slough
- Live Oak Slough
- Live Oak Canal
- Sunset Lateral

A map of these drainages is provided on the following page.

Live Oak is primarily susceptible to flooding by the Live Oak Slough, which runs along the east side of the city. This water body potentially affects an area bounded by Juniper Street, Larkin Road, Pennington Road, L Street, Archer Avenue, State Highway 99, and the Southern Pacific Railroad right-of-way, which is designated as being in flood hazard zone A (100-year floodplain) on the Sutter County Flood Insurance Rate Map. The rest of the City is in area C, an area of minimal flooding and considered outside both the 100-year and 500-year floodplains

According to the Safety Element Background Report to the General Plan, the potential for a major flood event in the Live Oak area is primarily a function of the integrity of the reservoir, levee, and bypass systems that provide flood protection. Historically, damage from flooding has occurred following levee failure.

The Background Report indicates that there are no levee problem areas within the Live Oak Planning Area. However, one problem area in Sutter County close to the Live Oak Planning Area lies along the west side of the Feather River. The problem area starts approximately 0.1 miles south of the southern boundary of the Planning Area and continues for approximately 0.2 miles to the south. This area is near Koch Lane between approximate river miles 35.6 and 37.6 (levee miles 3.9 and 5.3). During high water, seepage and boils occur near the landslide levee toe. The USACE relocated an open drainage ditch away from the toe at the levee at the north end of this problem area under the Marysville/Yuba City Levee Reconstruction Project. A consultant to Levee District 9 recommended installing a previous toe drain over the entire site to control seepage, but no improvements have been made. This area is illustrated in the Levee Problem Site Map in Section 4.1.



Source: Live Oak GIS; Adapted by PWD Consultants, 2005

### CITY OF LIVE OAK - HYDROLOGY MAP

#### LEGEND

-  Feather River
-  Hydrology (Canals)
-  Hydrology (Sloughs & Laterals)
-  Planning Area Boundary
-  City Limits



## **FEMA Maps, Insurance Coverage, Claims Paid, and Repetitive Losses**

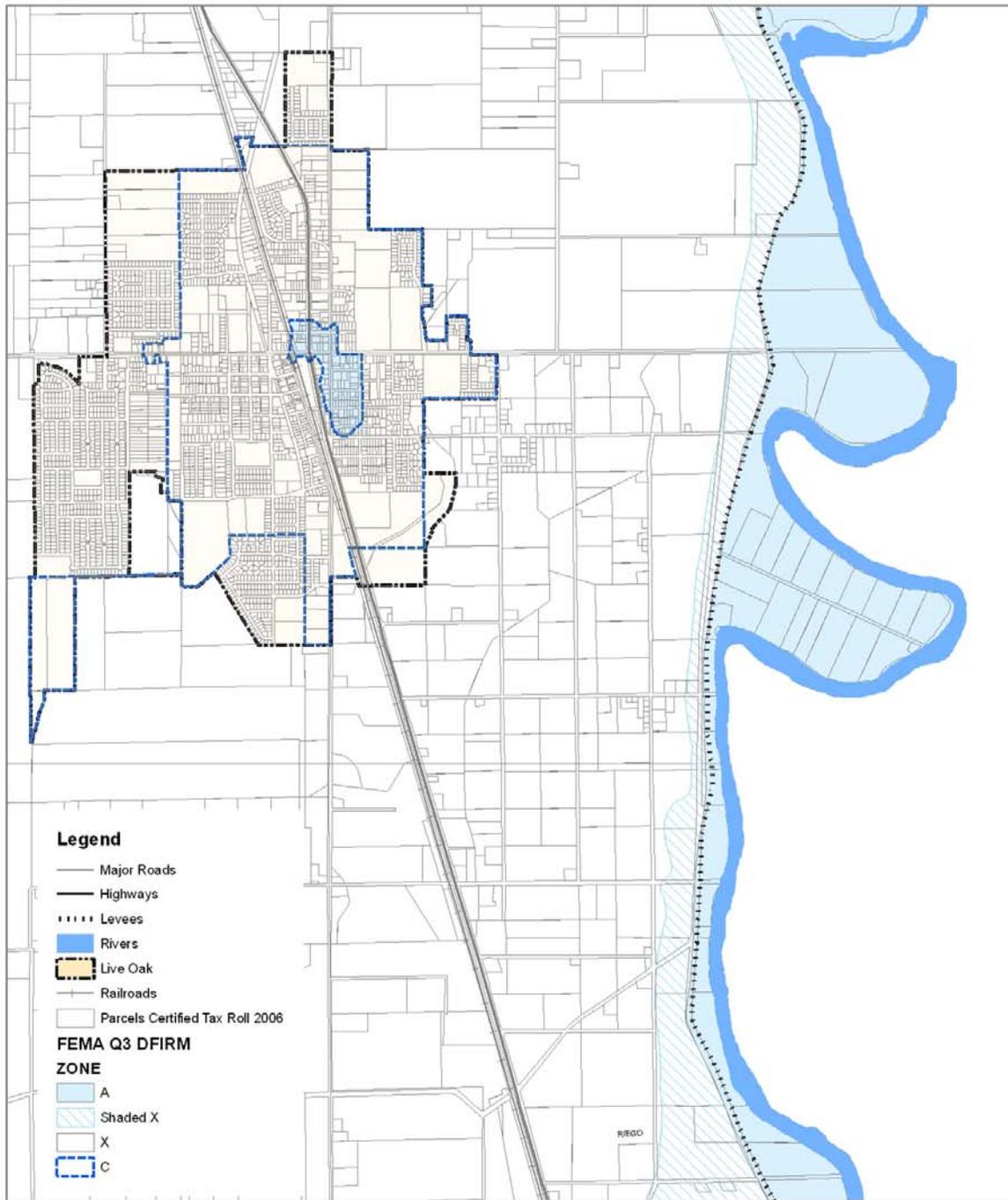
The City of Live Oak joined the NFIP on March 23, 1984. The following table identifies the existing FIRM map for the City.

<b>FEMA FIRMs</b>	
<b>CITY OF LIVE OAK</b>	
<b>Map Number</b>	<b>Effective Date</b>
0603950001C	03/23/1984

In addition, it is anticipated that the DFIRMs generated using the Upper Feather River Study will be out in the next two to three years. Once complete, these new DFIRMs will replace the old paper FIRMs for the Live Oak area. The major change associated with these updated maps is that the new DFIRMs do not recognize the existing levee system as being certified. As a result, most of the properties designated as Zone X or Zone C (outside the floodplain) in the paper maps are being re-categorized into 100-year and 500-year flood zones.

As a result of these ongoing map changes, in order to most accurately reflect the current status of FEMA floodplain mapping within the Sutter County Planning Area, the methodology previously described in the vulnerability assessment (on pages 158-164) for the entire planning area was followed in creating vulnerability maps and determining values at risk to the 100-year and 500-year flood events for the City of Live Oak. The map on the following page illustrates the FEMA floodplain data for the City of Live Oak.

# Live Oak Flood Map / FEMA Q3 Floodplain



## Legend

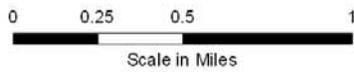
- Major Roads
- Highways
- ..... Levees
- Rivers
- ▨ Live Oak
- Railroads
- ▭ Parcels Certified Tax Roll 2006

## FEMA Q3 DFIRM

### ZONE

- A
- ▨ Shaded X
- ▭ X
- ▨ C

**amec**  
 Map Compilation: AMEC 10/23/06  
 Data Source: Sutter County, CA



NFIP Insurance data indicates that as of August 21, 2006 there are 103 flood insurance policies in the City of Live Oak resulting in \$22,550,700 in Insurance in Force. Of these, 20 are located in the A zone, and 83 are located in the B, C, & X Zones with 7 standard policies and 76 preferred policies.. Historically, there have been seven claims for flood losses totaling \$66,660. Five claims were for Pre-FIRM structures; the other two weren't accounted for. There is one RL building within the City limits, with three RL losses totaling \$30,444.53.

### Values at Risk

After evaluating available insurance flood loss data, the next step was to quantify the flood vulnerability for the City of Live Oak. The HMPC used GIS to model and quantify potential flood vulnerability to City of Live Oak within the mapped floodplain areas using FEMA's Q3 and DFIRM floodplain data and overlaying the information on Sutter County's GIS parcel layers for improved parcels. The parcel layer was linked with the assessor's data to quantify the value of property that potentially lies in a floodplain.

The result of this flood vulnerability analysis summarizes the values at risk in the floodplain of the City of Live Oak as provided below.

Live Oak								
	Zone A		Zone X		Zone C		Total	
Property Type	Pcls	Improved Value	Pcls	Improved Value	Pcls	Improved Value	Parcels	Improved Value
Residential	73	\$ 3,272,115	471	\$ 72,111,505	1,246	\$ 102,438,075	1,790	\$ 177,821,695
Commercial	11	\$ 1,416,696	-	\$ -	50	\$ 12,449,850	61	\$ 13,866,546
Industrial	1	\$ 34,795	-	\$ -	8	\$ 7,026,525	9	\$ 7,061,320
Institutional	3	\$ 188,301	1	\$ 12,300	25	\$ 5,377,211	29	\$ 5,577,812
Agricultural	-		8	\$ 611,203	8	\$ 632,068	16	\$ 1,243,271
Other	-		3	\$ 371,331	10	\$ 841,295	13	\$ 1,212,626
<b>Total</b>	<b>88</b>	<b>\$ 4,911,907</b>	<b>483</b>	<b>\$ 73,106,339</b>	<b>1,347</b>	<b>\$ 128,765,024</b>	<b>1,918</b>	<b>\$ 206,783,270</b>

Base on this analysis, the City of Live Oak has substantial assets at risk to the 100-year and greater floods. Looking at the A Zone which indicates a risk to the 100-year flood results in 88 improved parcels for a total of \$4,911,907 located within the 100-year floodplain. There are no parcels identified within the 500-year floodplain.

Comparing these numbers to the insurance data, of the 88 total parcels at risk to the 100-year flood, 20 of these parcel owners maintain flood insurance. This equates to 22.7% of people subject to the 100-year flood event as having insurance.

Further, application of the 20% damage factor to the above values at risk for improved parcels of \$4,911,907, results in \$982,381 at risk of damage to the 100-year flood.

### DFIRM Floodplain Analysis

The above analysis focused on evaluating impacts to the City of Live Oak based on the current FEMA Q3 floodplain mapping for the City. DFIRMs will be eventually developed

based on the results of the Upper Feather River Study that will replace the existing Q3 data. This analysis assumes that the new DFIRMs will be similar in outcome to the DFIRMS generated from the Lower Feather River Study, which covered portions of unincorporated Sutter County and the City of Yuba City. As previously stated, the major change associated with these new maps is that the DFIRMs do not recognize the existing levee system as being certified. As a result, most of the properties designated as Zone X or Zone C (outside the floodplain) in the paper maps (and Q3 data) are being re-categorized into 100-year and 500-year flood zones.

Assuming that new DFIRM maps apply to the City of Live Oak, county parcel and assessor data were used to provide a worst-case scenario of assets at risk to a 100-year or greater flood. The table below summarizes total assets at risk within the City. Until the new study and maps are complete, the actual number and types of parcels falling within the 100-year and 500-year flood zones cannot be determined. As a result, it can only be assumed that the entire city is potentially at risk to flooding without the benefit of the levees providing 100 year or more protection.

**City of Live Oak  
Total Assets at Risk to the 100-year or Greater Flood  
(Based on proposed DFRIM mapping)**

CITY OF LIVE OAK 2006 Roll Values							
Property Type	Units	Total Improved	Total Improved	Units	Total Unimproved	Grand Totals	
	Improved	Value	Land Value	Unimproved	Land Value	Units	\$\$
Residential	1,790	\$ 177,821,695	\$ 65,617,918	-	\$ -	1,790	\$ 243,439,613
Commercial	61	\$ 13,866,546	\$ 3,362,066	21	\$ 734,075	82	\$ 17,962,687
Industrial	9	\$ 7,061,320	\$ 1,172,035	1	\$ 14,353	10	\$ 8,247,708
Agricultural	16	\$ 1,243,271	\$ 894,090	15	\$ 9,027,369	31	\$ 11,164,730
Institutional	29	\$ 5,577,812	\$ 748,192	46	\$ 341,800	75	\$ 6,667,804
Other	13	\$ 1,212,626	\$ 607,593	719	\$ 9,188,362	732	\$ 11,008,581
<b>Total</b>	<b>1,918</b>	<b>\$ 206,783,270</b>	<b>\$ 72,401,894</b>	<b>802</b>	<b>\$ 19,305,959</b>	<b>2,720</b>	<b>\$ 298,491,123</b>

**Critical Facilities**

Critical facilities are those community components that are most needed to withstand the impacts of disaster. Included in this classification are police and fire stations, hospitals, schools that serve as emergency shelters, and lifeline utilities; power, water and sewer system components. A map of the critical facilities within the City of Live Oak is located on page 226. Within the Planning Area many critical facilities are protected by the extensive flood control system. To additionally protect them individually from the potential failure of the structural flood control systems may be very difficult to justify on a benefit/cost ratio analysis. Still, the impact to the community, should the statistically unlikely catastrophic flood event occur, would be astonishing if also these critical facilities are damaged or destroyed.

**Cultural and Natural Resources at Risk**

The City of Live Oak has significant cultural and natural resources located throughout its boundaries as previously described. Risk analysis of these resources was not possible due to data

limitations. However, natural areas within the floodplain often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters.

### **Development Trends**

The development trend in the Sutter County Planning Area is steady, significant growth, especially within the existing urban areas.

The Housing Element of the Sutter County General Plan expects the population in the City of Live Oak to grow to 8,180 by 2015. This is an additional 2,640 people from the 2000 census estimate of 5,540. Such growth will consume acres of previously undeveloped areas and the impacts may overwhelm existing drainage and flood control facilities.

Master planning for stormwater runoff and adherence to floodplain management regulations for new development should help both new and existing development from the impacts of the 100-year flood.

### **Vulnerability to Wildfire**

Wildfire is of limited concern to Live Oak. There is no history of large, damaging fires in or around the city in recent history. According to the fire threat map included on page 164, areas near the city are of moderate to somewhat high threat to wildfire. The topography of the city is nearly level and fuels are comprised of agriculture, grasslands, and the built environment. In addition, most fuels are discontinuous, broken by numerous roads and fuel type changes. According to the Safety Element Background Report to the General Plan for the city, the lack of topography and complex fuels leads to very little severe fire behavior. Most fires are characterized by smaller events lasting short periods of time.

As previously discussed, the nearby Sutter Buttes are the primary concern with respect to a wildfire hazard near the city. Of lesser concern are the areas within the levees that are left in a natural state allowing fuels to accumulate over a period of time. However, the Background Report concludes that neither the Sutter Buttes nor the river bottoms pose unreasonable fire risk to any urbanized area. As such, the wildfire hazard is not considered a significant concern to the City of Live Oak and is not discussed further.

### **Other Identified Hazards: Agricultural Hazards, Dam Failure, Drought, Earthquakes, Severe Weather, and West Nile Virus.**

Except for those mapped hazards, flood and wildfire, the risk assessment for this plan, as previously described, covers the entire geographical extent of the Sutter County Planning Area. Thus, the risk assessment for the planning area also includes and directly corresponds to the unincorporated portions of the County and all incorporated jurisdictions, including the City of Live Oak.

## SUTTER COUNTY DISTRICTS

DMA 2000 includes “Districts” in its definition of local governments subject to the requirements of multi-hazard mitigation planning. Types of Districts vary in both form and function. The Districts participating in this Multi-Hazard Mitigation Plan include:

- Gilsizer County Drainage District
- Levee District One
- Reclamation District 1001 (RD1001)
- Reclamation District 1500 (RD1500)
- Reclamation Districts 70 & 1660 (RD70 & RD1660): Meridian Basin

These Districts, some who have never received any damage from a natural hazard, disaster assistance from state or federal programs, or mitigation assistance from FEMA chose to participate in the development of this Multi-Hazard Mitigation Plan nonetheless, in order to preserve and maintain their eligibility for future mitigation assistance should the need and the opportunity arise. Thus, not every District has an individual Action Item recommended, while others have several. Each District, however, now recognizes the overall risk and vulnerability of the Sutter County Planning Area and their role in minimizing future damage and facilitating recovery. In that light, each District will participate in the overall countywide public education recommendation presented in Section 5.0, the Mitigation Strategy portion of this plan. The Districts, as all local governments, reserve their right to revise their input to this plan to reflect new threats and to propose new mitigation activities as the need and the concepts arise.

The risk assessment for this plan, as previously described, covers the entire geographical extent of the Sutter County Planning Area. Thus, the risk assessment for the Planning Area also includes and directly corresponds to the participating Districts. The following sections detailing District-specific information supplements the risk assessment for the Sutter County Planning Area and provides additional detail where the risk varies across the Planning Area.

### **Gilsizer County Drainage District**

Gilsizer County Drainage District was formed in 1963 to improve storm drainage service to the Yuba City area and to maintain Gilsizer Slough and other district drainage facilities. The District comprises 6005 acres including most of the City of Yuba City (See map that follows). The District’s major facilities are Gilsizer Slough and a pumping station near the Feather River levee north of the Tenth Street Bridge. The pumping station collects storm drainage from approximately 2500 acres of the northeasterly part of Yuba City and discharges directly into the Feather River. Most of the City and surrounding area drain to Gilsizer Slough.

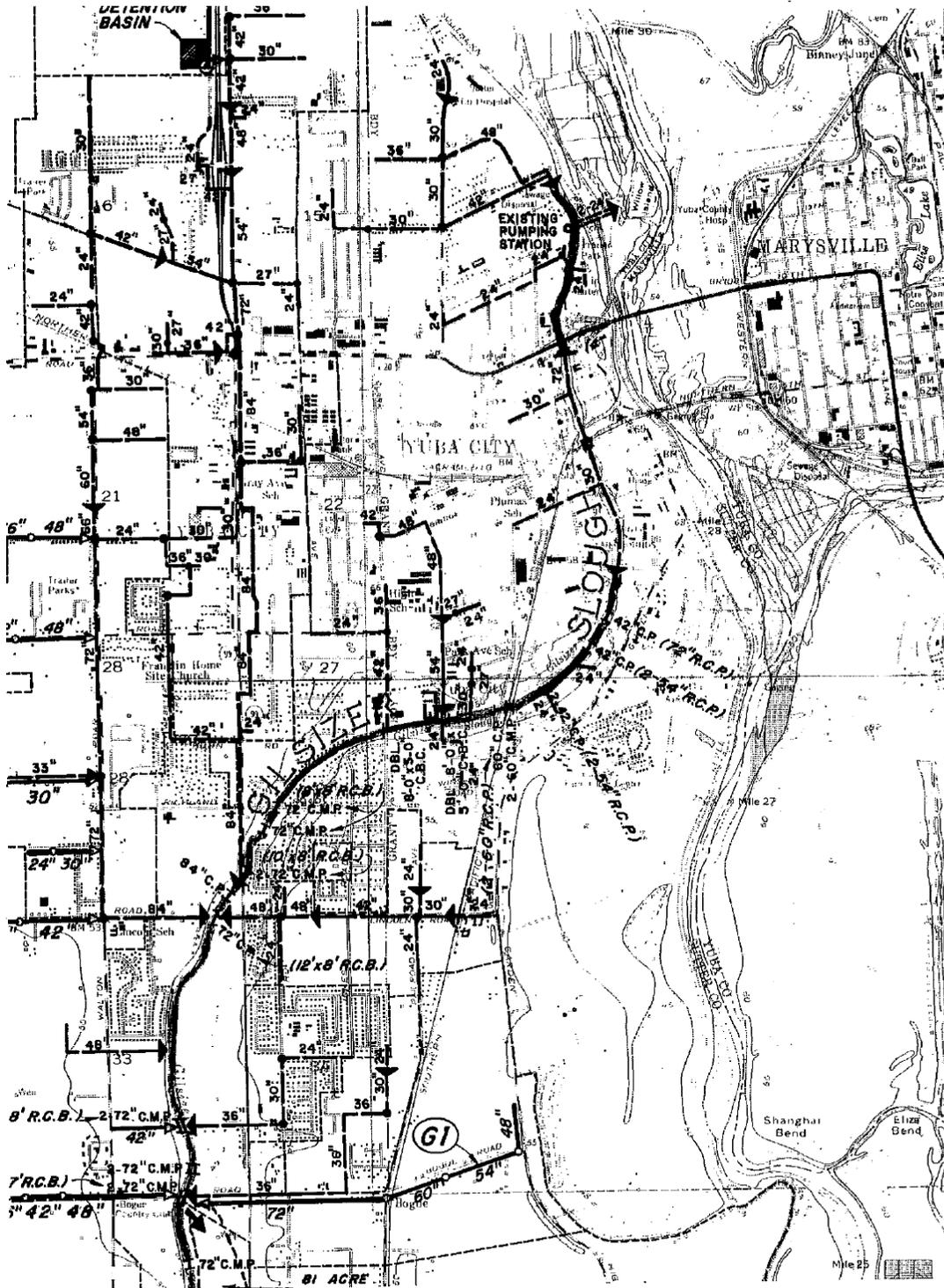
The Gilsizer County Drainage District is responsible for the operation and maintenance of drainage ditches that direct storm water runoff away from developed and improved properties in the low-lying Yuba City area of Sutter County. The ditches have been cut and channeled through native soils and backfill, with each drainage ditch having sloped banks.

According to the District, while some improvements to the system have been made to increase capacity with the expansion of the Yuba City Urban Area, some areas still need further improvements. Flooding still occurs in parts of Yuba City caused by old pipelines designed for small flows. The District will continue to make improvements to the Slough, increasing capacity as required by expanding areas of development.

### **Risk Analysis**

The two significant hazards facing the drainage district are winter storms and flooding. Typically, during large winter storm events, excessive rainwater runoff collects in and flows through the drainage ditches in the Gilsizer County Drainage District. These large volumes of high-velocity water erodes the banks of the drainage ditches and along the toes of the banks where they intercept the bottom of the ditches. Storm water runoff onto the banks of the ditches creates gullies and irregular depressions and undermine the integrity of the ditches. Damages associated with past hazard events include those detailed below:

**December 17, 2005 to January 3, 2006:** Severe storms and flooding caused excessive amounts of rainwater runoff to collect in and flow through the Gilsizer drainage ditch. Ditch slope and toe erosion to 21 areas of the ditches resulted in excess of \$313,749 in damages.



Gilsizer County Drainage District

(Source: Gilsizer County Drainage District)

## **Levee District One**

Levee District One of Sutter County was the first Levee District formed in the State of California in 1868. The District is one of two Levee Districts within the county responsible for levee maintenance. Levee District One has responsibility for 17 miles of levees along the Feather River from the north end of Yuba City (Pease Road) down river to Markuse Road.

### **Risk Analysis**

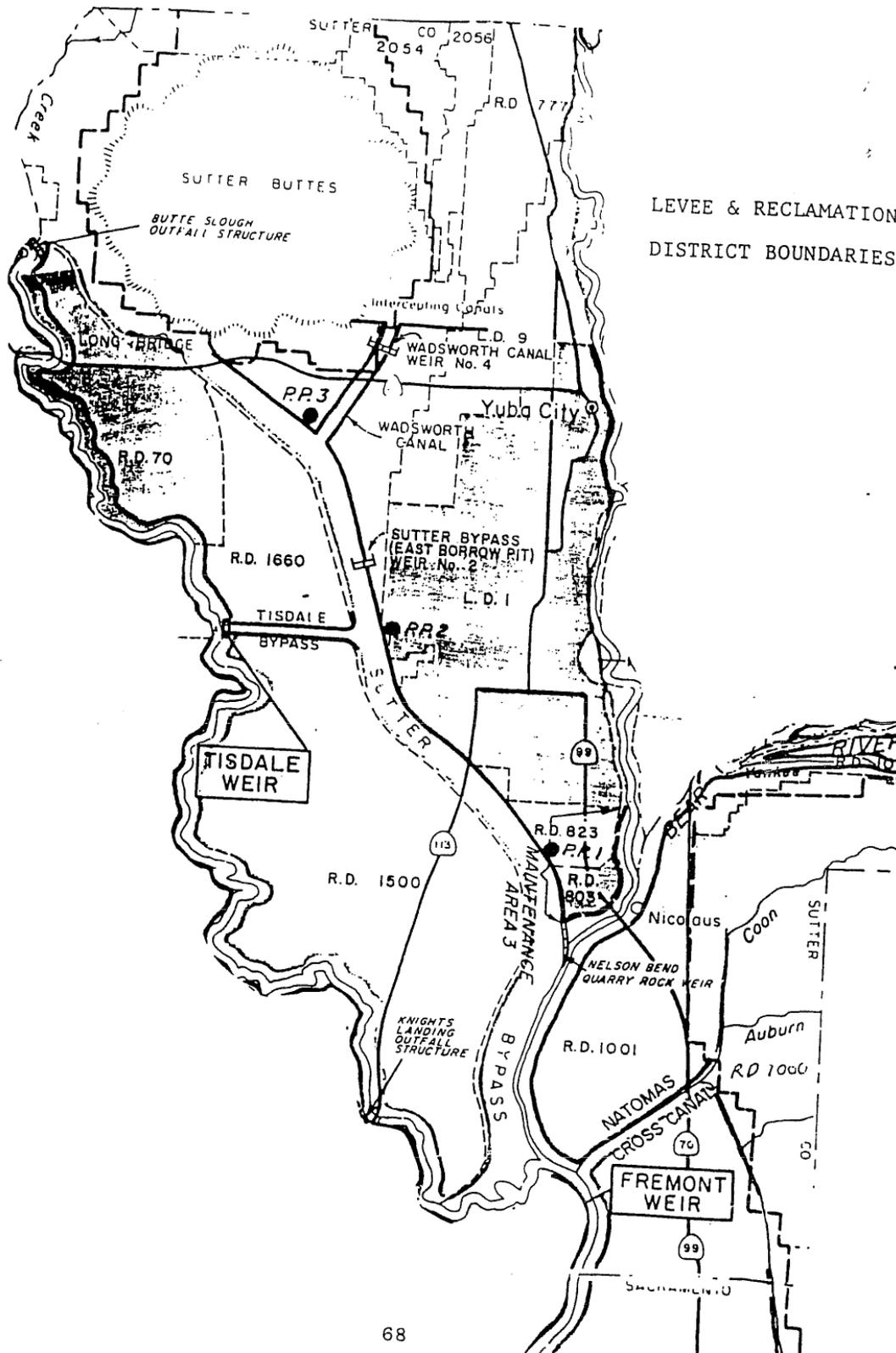
The two significant hazards facing the drainage district are winter storms and flooding. Over the years the Feather River has been eroding into the levee causing significant concern in some areas.

District assets include levees within the jurisdictional boundaries and associated support facilities.

## **Reclamation Districts**

There are 12 Reclamation Districts that are active within the boundaries of the Sutter County Planning Area. The map on the following page illustrates the boundaries for participating reclamation districts. Of these 12, the following participated in the plan development process and information specific to their districts are provided in the following sections:

- RD1001
- RD1500
- RD70 & 1660



(Source: Sutter County General Plan Background Report)

## **Reclamation District 1001**

RD1001 provides flood and drainage control, reclamation, and levee maintenance services within its district boundaries. RD1001 is located in the south eastern portion of the county; boundaries include: south of Bear River, east of Feather River, east of Sacramento River from end of Feather River, north of Natomas Cross Canal, and west of East Side Canal. The district services approximately 52 square miles within District boundaries (See map that follows). The District has jurisdiction over several waterways including: interior drains and levees along Bear River, Yankee Slough, Feather River, and the Sacramento River.

The levees within the district boundaries were built between 1912 and 1914. Recent repairs to the levees include stone protection completed on the waterside in 1997-1998 and repairs to the North Cross Canal and Bear River after the 1997 floods. Current project includes the Mid Valley Levee Rehab project for levee repairs along the Feather and Sacramento Rivers. Levees are maintained to USACE maintenance standards and inspected by DWR twice a year. The District is currently formulating a master management plan for levee maintenance and improvements. The USACE, DWR and the District's Board of Trustees are the parties responsible for levee improvements.

Other assets of RD1001 include lateral drains and a pumping facility. The pumps function to remove excess water from the District with a capacity of pumping approximately 300,000 gallons per minute. The drains are repaired on an as-needed basis. Recent repairs to the pumping facility include rebuilding two pumps (150 & 250 hsp) in 2005 and replacement of a 52 inch elbow and replacement and/or rebuild of intake and discharge pipes within the pump facility.

The District continues to work with state, federal, and local agencies to ensure levee stability. In accordance with Public Law 84-99, Standard Operating Procedures for Responding to Flood Emergencies, the District has an adopted "Slow Rise Emergency Plan".

### **Risk Analysis**

The two significant hazards facing the drainage district are winter storms and flooding.

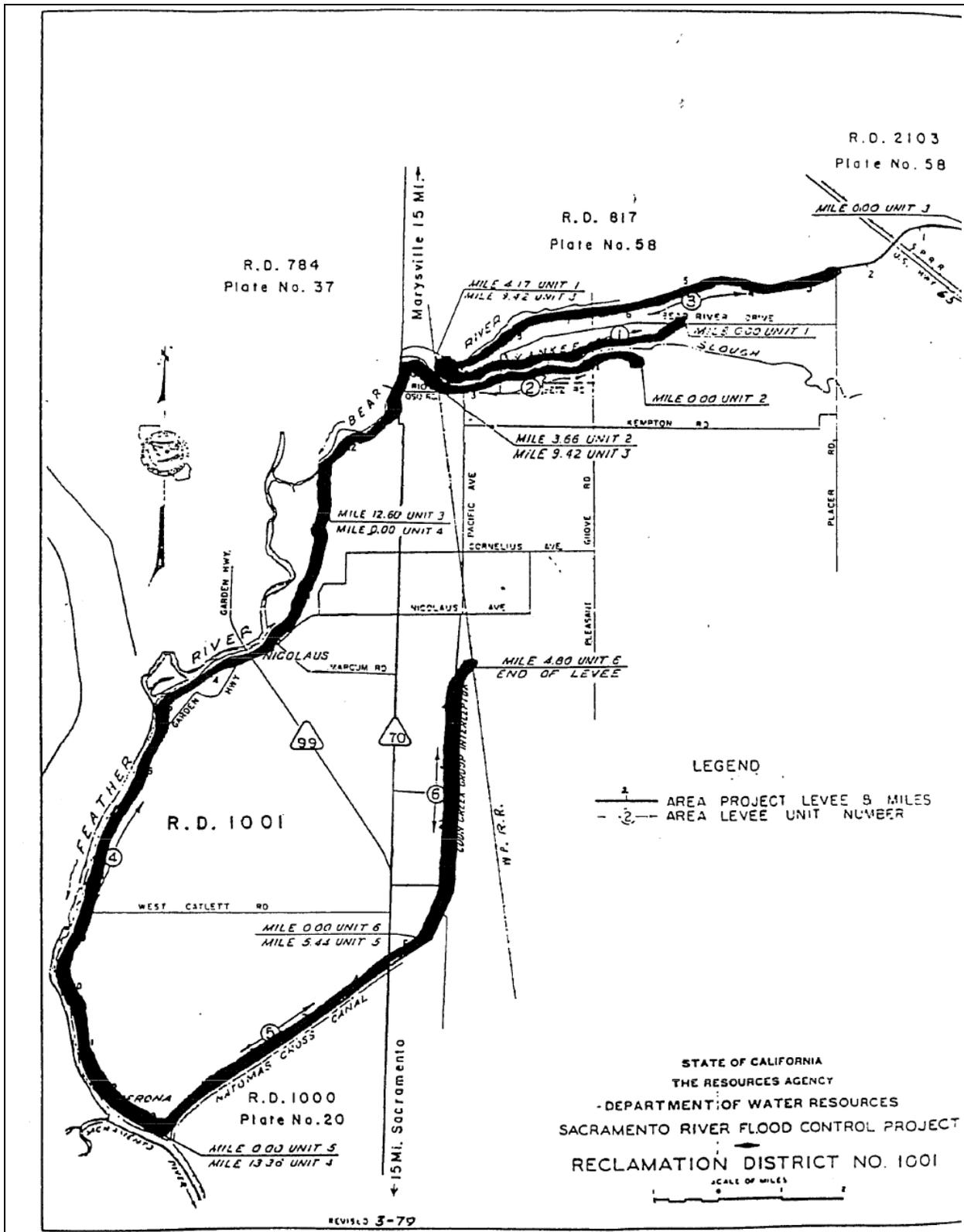
District assets include the following:

- Levees within the jurisdictional boundaries
- 140 miles of drain laterals of various sizes and ages
- Pumping facility built in 1914/1915

All assets identified above are considered critical to the operations of the District and in providing adequate flood and drainage control within its boundaries. Should any of these identified assets fail, excessive flooding will occur within the District. Depending on the location of the failure, flooding could cause a small number of residents and property to be inundated to a very large area of the District. Flood water elevations could be anywhere from one to twenty feet in depth for an undetermined amount of time.

Flooding of this magnitude would cause major loss to property owners, close two major state highways used as commuter routes to jobs in the Sacramento, destroy historical landmarks, impact local transportation, agricultural crops and public utilities.

All drainage water in the District flows mostly by gravity into drain laterals that all flow to Reclamation District 1001 Main Pumping Plant in the southern portion of the District. This pump facility pumps water into the Natomas Cross Canal one mile east of the Sacramento River. Should there be a major levee break, this facility could not handle the volume of water pouring into the District thus backing up flood water for miles.



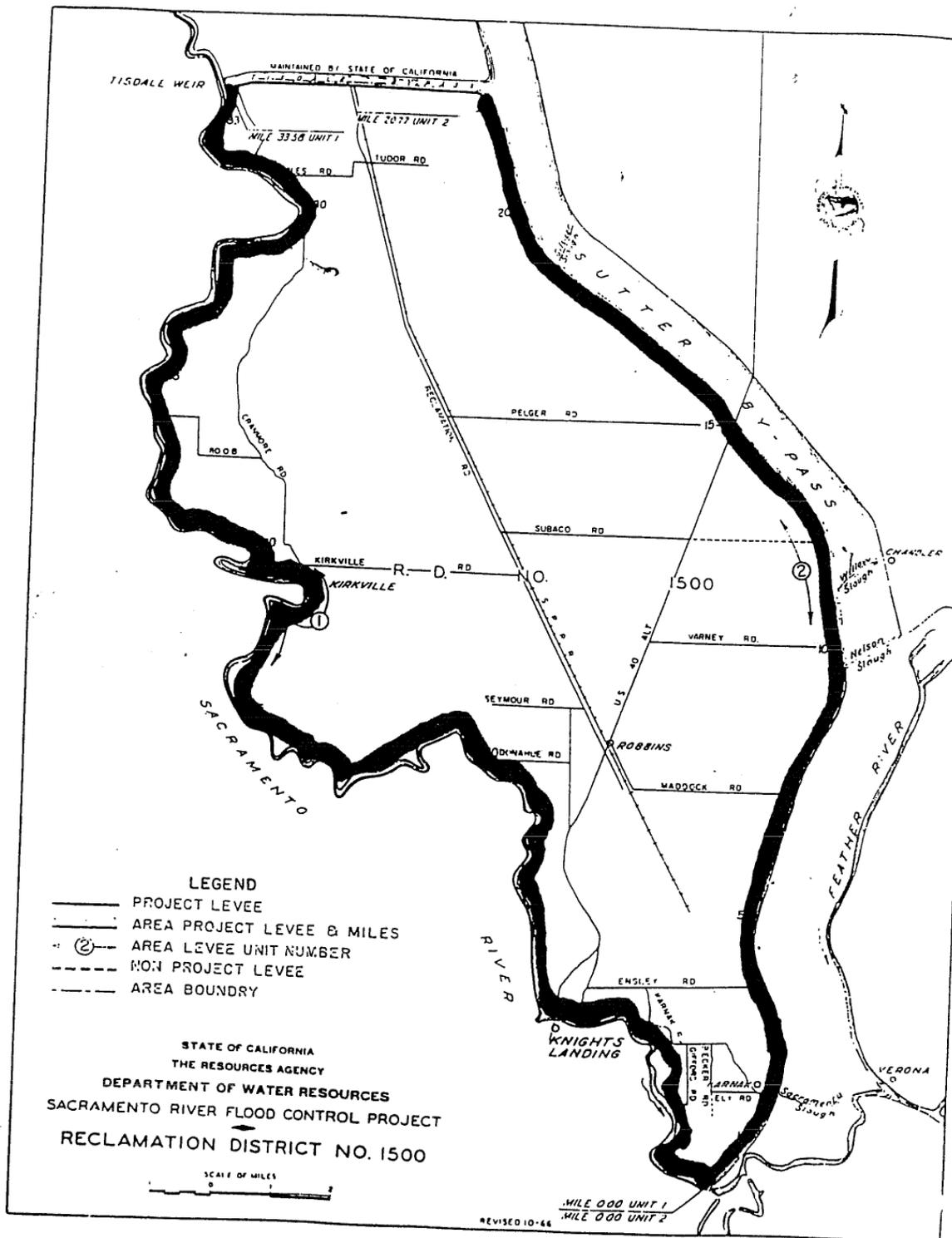
(Source: Sutter County General Plan Background Report)

### **Development Trends**

Currently, the District is located within a rural area with very little growth. Development within the district boundaries is estimated at an additional five homes per year. Although, given the growth in the county, development trends could be significant five to ten years down the road. A couple of factors influence the development trend within the district. First the rural setting of the area is attractive to new development coming from urban areas. But, secondly, the flood potential of the area acts to discourage new development.

### **Reclamation District 1500**

RD1500 provides flood and drainage control, reclamation, and levee maintenance services within its district boundaries. RD1500 is located in the south western portion of the county; boundaries include: south of Tisdale Bypass, east and north of the Sacramento River, and west of Sutter Bypass. The district services approximately 52 square miles within District boundaries (See map that follows).



(Source: Sutter County General Plan Background Report)

## Risk Analysis

The two significant hazards facing the drainage district are winter storms and flooding.

The drainage facilities under the ownership and control of the district are at risk to damage from excessive rainfall, stormwater runoff and flooding. Of greatest concern to RD1500 is excessive flooding that could occur should the Karnak Pumping Facility Fail. Sutter Basin is surrounded by levees maintained and monitored by Reclamation District 1500. All water coming into this Basin must be pumped or gravity feed out. During high water, the release of water at Oroville Dam and high Feather River water flows will not allow for gravity feed so that all water must be pumped out of the basin. If the pumps at Karnak fail, then flooding in the south end of the District will start immediately; and within 4 to 6 hours water will be in the Sutter Basin Growers Co-Op and the town of Robbins. The Co-Op's approximate annual revenue to its growers is 22 million dollars with assets valued at about 15 million dollars. Flooding the town of Robbins would cause considerable damage to its 100 residents, school and businesses. If flooding occurs in the Basin, then Hwy 113 a major north-south transportation route from Yuba City south, with a bridge over the Sutter Bypass, could close, which in the 1997 storm and flood events was one of the few emergency routes out of Yuba City that remained opened. The following photo is of the Karnak Pump Plant.



## **Reclamation Districts 70 & 1660: Meridian Basin**

RD70 & RD1660 provide flood and drainage control, reclamation, and levee maintenance services within its districts' boundaries. RD70 & RD1660 are located in the north western portion of the county; boundaries include: north of Tisdale Bypass, east of the Sacramento River, and west of Sutter Bypass. (See maps that follows).

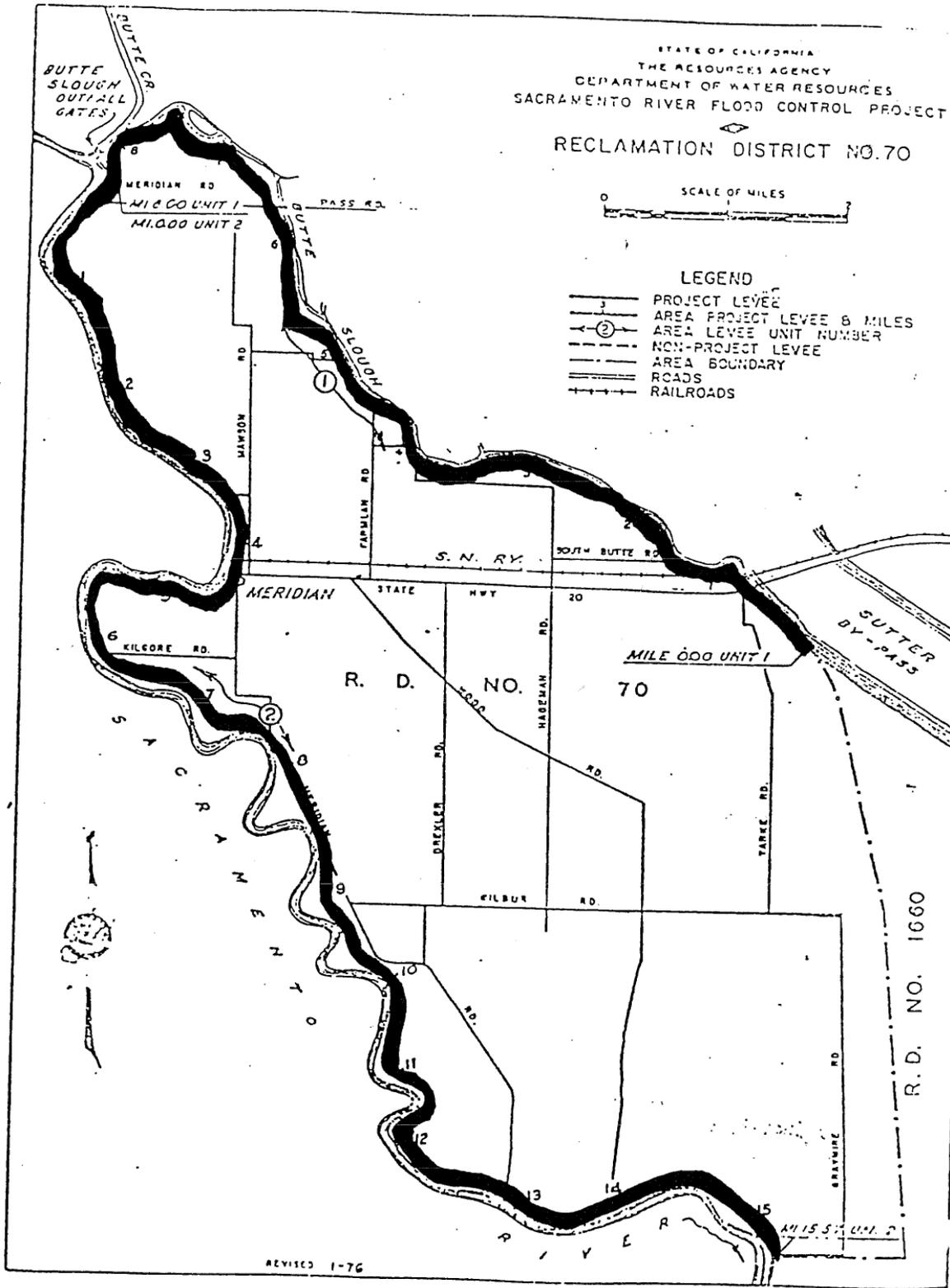
### **Risk Analysis**

The two significant hazards facing the drainage districts are winter storms and flooding. The representative for the Districts describes the potential affects of flooding within the boundaries as extensive and potentially catastrophic. Significant hazard events occurring within District boundaries include the following:

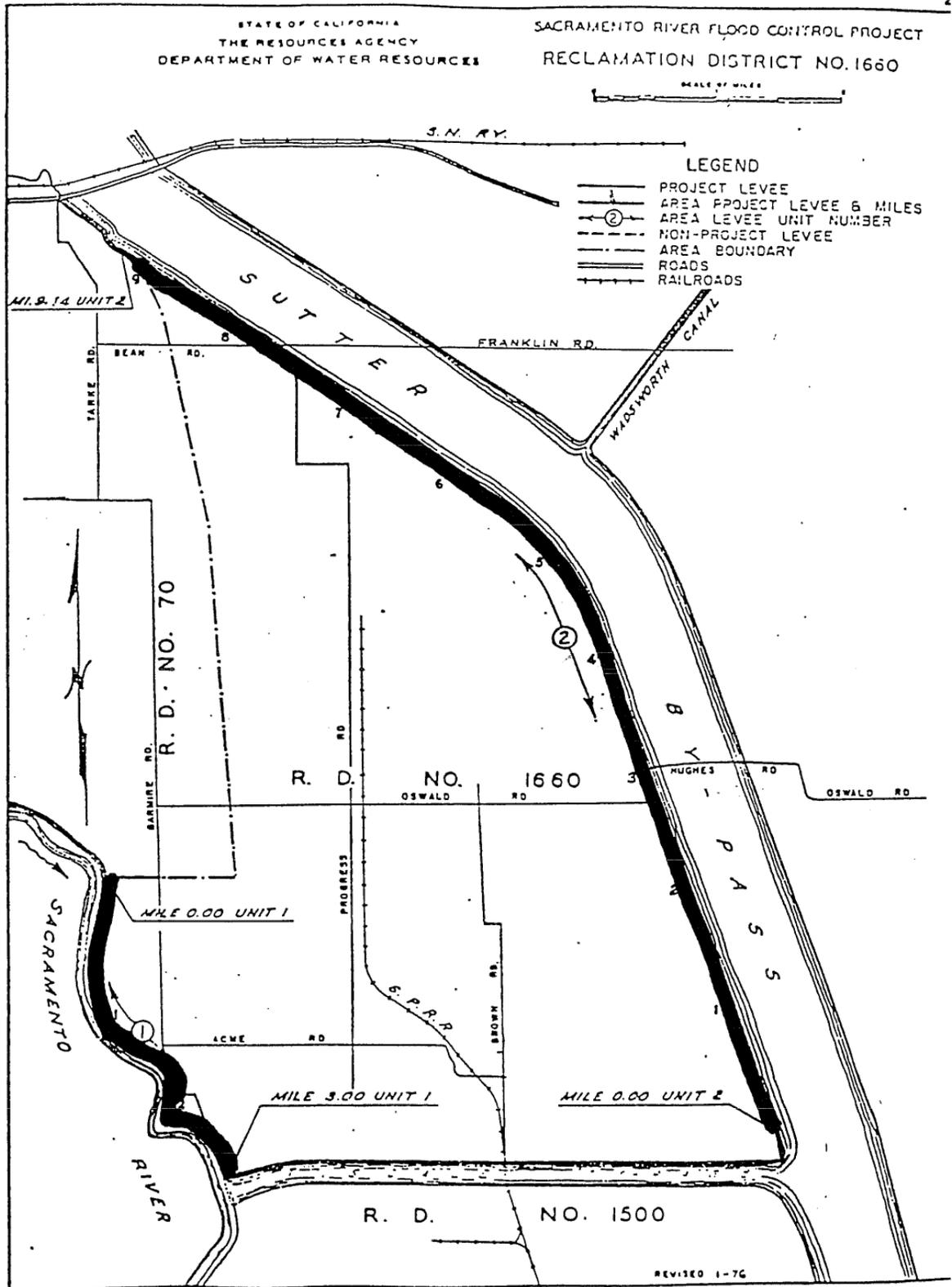
- March 1940 – Flooding occurred; no details available
- January 1997 – Levee breach on the Sutter Bypass caused flooding to approximately 75% of the Meridian Basin. Damage to property and infrastructure was I the millions. Highway 20 and county roads were closed for weeks.
- Winterstorms periodically occur that overwhelm the drainage system and pumping plants and cause local flooding.

Within the Meridian Basis, assets at risk include:

- Population of approximately 500 people
- State Highway 20
- County Roads
- District Pumping Plants
- Natural gas wells



(Source: Sutter County General Plan Background Report)



(Source: Sutter County General Plan Background Report)

# Multi-Hazard Mitigation Plan

## 4.4 Capability Assessment

Thus far, the planning process has identified the natural hazards posing a threat to the Sutter County Planning Area and described and quantified the vulnerability of the county and incorporated communities to these risks. The next step, prior to forming Goals and Objectives for improving each jurisdiction's ability to reduce the impacts of these risks, is to assess what loss prevention mechanisms are already in place. Doing so provides the "net vulnerability of the Sutter County Planning Area to natural disasters and more accurately focuses the goals, objectives and proposed actions of this plan. This part of the planning process is referred to as the "Capability Assessment."

The HMPC took two approaches in conducting this assessment. First, an inventory of existing policies, regulations and plans was made. These policy and planning documents were collected reviewed to determine if they contributed to reducing hazard related losses, or if they inadvertently contributed to increasing such losses. Second, an inventory of other mitigation activities was made through the use of a matrix. The purpose for this effort was to identify activities and actions beyond policies, regulations and plans that were either in place, needed improvement, or could be undertaken, if deemed appropriate.

A summary of each of these elements is on the pages that follow.

## UNINCORPORATED SUTTER COUNTY

Unincorporated Sutter County has several documents and activities that describe how the county manages development of hazard prone areas. A list of these programs, documents and activities follow, along with a brief summarization of the program status or document contents.

### **General Plan, 1996**

The General Plan is a document that guides the county's future development. It is a blueprint for land use in the county and provides long-term direction for the growth of Sutter County. It is a 15 to 20 year plan for the unincorporated area of the county and expresses broad community values and goals, giving a picture of the desired character and quality of development in the county and policies which outline the steps to accomplish those goals.

The Sutter County General Plan consists of two main documents: The General Plan Background Report and the General Plan Policy Document. The Background Report documents existing and projected conditions within Sutter County and provides the necessary supporting documentation for the General Plan Policy Document. The General Plan Policy Document includes findings that have been brought forward as appropriate from the Background Report, goals, policies and implementation programs. The section that follows identifies those goals, policies, and implementation programs that reflect current mitigation goals and practices for mitigating the risk and vulnerability to natural disasters within the Unincorporated portions of Sutter County.

### **Drainage**

**Goal 3.D:** To collect and dispose of stormwater in a safe and efficient manner.

#### **Policies:**

- 3.D-1: The County shall continue to require that all new development outside the Special Flood Hazard Area as defined by the Federal Emergency Management Agency (FEMA) be protected from a 50 year storm event.
- 3.D-2: The County shall require new development to adequately mitigate increases in storm water flows and/or volume and to avoid cumulative increases in downstream flows.
- 3.D-3: The County shall discourage residential development in areas which are subject to inundation by surface water.
- 3.D-4: The County shall require that new development conforms to the appropriate County requirements and standards governing drainage.
- 3.D-5: The County shall require new development projects to provide adequate drainage facilities.
- 3.D-6: The County shall restrict new development in areas prone to flooding, or that have a seasonal high water table and/or water seepage problems, in order to prevent the contamination of ground and surface water by septic systems.

### **Implementation Programs:**

- 3.9: The County shall study the feasibility and benefits of preparing County-wide or specific area drainage plans that consider both rural and urban drainage needs. (Responsibility: Public Works Department)
- 3.10: The County shall develop and adopt a drainage master plan(s) for the communities of Sutter, Trowbridge and Pleasant Grove. (Responsibility: Public Works Department)
- 3.11 The County shall develop and adopt guidelines which set forth the procedures and standards to achieve a 50 year level of protection from local drainage systems. (Responsibility: Public Works Department, Board of Supervisors)

### **Fire Protection**

**Goal 3.G:** To minimize the risk of personal injury and property damage resulting from fire and provide for emergency medical response when, and to the extent determined appropriate by the governing body.

#### **Policies:**

- 3.G-1: The County shall continue to coordinate operations between fire service agencies to provide optimum protection and utilization of all fire suppression resources.
- 3.G-2: The County will strive to ensure that all proposed development applications are reviewed for compliance with adopted fire safety standards.
- 3.G-3: The County shall continue to promote standardization of operations among fire protection agencies and improvement of fire service levels.
- 3.G-4: The County shall encourage community participation and public education programs relating to fire safety and emergency response. County participation shall be contingent upon the availability of personnel.

### **Water**

**Goal 4.A:** To preserve and protect the water resources of the County

#### **Policies:**

- 4.A-1: The County shall require development setbacks from all water courses.
- 4.A-2: The County shall strive to protect groundwater resources by:
  - Identifying and controlling sources of potential contamination.
  - Protecting groundwater recharge areas.
  - Discouraging overdraft.
  - Encouraging the preparation and implementation of groundwater management plans.
  - Encouraging regional coordination of issues related to the groundwater basins.

- 4.A-3: The County shall encourage water conservation practices, including drought-resistant landscaping, drip irrigation systems and the use of “graywater” for landscaping irrigation.
- 4.A-4: Monitoring of agricultural water runoff should be encouraged to ensure that pollutants are not being returned to the overall water system.

### **Wetland and Riparian Areas**

**Goal 4.B:** To protect wetland and riparian areas throughout Sutter County.

#### **Policies:**

- 4.B-1: The County shall require new development to fully mitigate the loss of federally regulated wetlands to achieve a “no net loss” through any combination of avoidance, minimization, or compensation.
- 4.B-2: The County shall discourage direct discharge of surface runoff into wetland areas. New development shall be designed in such a manner that pollutants and siltation will not significantly affect wetlands.

### **Fish and Wildlife Habitat**

**Goal 4.C:** To protect and enhance habitats that support fish and wildlife species

#### **Policies:**

- 4.C-1: The County shall strive to preserve those areas of wildlife habitat designated "high habitat value" as shown on the biological sensitivity map in Chapter 9 of the Background Report.
- 4.C-2: The County shall encourage preservation and proper management of those areas designated "moderate habitat value" on the biological sensitivity map in Chapter 9 of the background report.
- 4.C-3: The County shall support the preservation and re-establishment of fisheries in the rivers and streams within the County.
- 4.C-4: The County should participate in the process of developing mitigation programs for threatened and endangered species to ensure that Sutter County's agricultural, economic, fiscal, and future urbanization and natural resource goals and policies are met.
- 4.C-5: The County supports the preservation and protection of waterfowl resources and their habitat.
- 4.C-6: The County encourages the preservation of existing wildlife corridors between natural habitat areas to maintain biodiversity and prevent the creation of biological islands. This would also include promoting the re-establishment of previous corridors where feasible.
- 4.C-7: The County encourages the preservation of rare, threatened or endangered animal species.

## **Vegetation**

**Goal 4.D:** To preserve and protect the vegetation resources of Sutter County.

### **Policies:**

- 4.D-1: The County shall encourage the preservation of important areas of natural vegetation, including, but not limited to, oak woodlands, riparian areas, and vernal pools.
- 4.D-2: The County encourages the preservation of rare, threatened, or endangered plant species.
- 4.D-3: The County shall require that new development projects avoid, to the maximum extent possible, ecologically-fragile areas (e.g. areas of rare, threatened or endangered species of plants, riparian areas, vernal pools).
- 4.D-4: The County shall strive to protect major groves of native trees located in the unincorporated areas of the County.
- 4.D-5: The County shall encourage the use of native and drought tolerant plant materials in all public and private revegetation/landscaping projects.

## **Open Space for the Preservation of Natural Resource**

**Goal 4.E:** To conserve, protect and enhance open space lands and natural resources in Sutter County.

## **The Sutter Buttes**

**Goal 4.F:** To preserve the Sutter Buttes and the agricultural uses that the Buttes support.

## **Cultural Resources**

**Goal 5.B:** To identify, protect, and enhance Sutter County's important historical, archeological and cultural sites.

## **General Health and Safety**

**Goal 7.A:** To protect the health and safety of County residents.

### **Policies:**

- 7.A-1: The County shall discourage actions which aggravate or increase the threat to life or property.

## **Seismic and Geologic Hazards**

**Goal 7.B:** To minimize the risk of personal injury and property damage due to seismic and geological hazards.

### **Policies:**

- 7.B-1: Where geologic hazards exist from landslides, the County should designate the land as open space or agriculture.

- 7.B-2: The County may require the preparation of a soils engineering and/or geologic-seismic analysis prior to permitting development in areas of geologic or seismic hazards (i.e., groundshaking, landslides, liquefaction, expansive soils).

**Implementation Program:**

- 7.1: The County shall continue to enforce provisions of the Uniform Building Code which address seismic design criteria (Community Services department).

**Flood Hazards**

**Goal 7.C:** To minimize the risk of personal injury, property damage and the economic and social disruptions associated with floods.

**Policies:**

- 7.C-1: The County shall continue to participate in the Federal Flood Insurance Program.
- 7.C-2: When new development or substantial improvement of existing development occurs within a special flood hazard area, as defined by the Federal Emergency Management Agency (FEMA), the development or improvement shall comply with the County Flood Damage Prevention Regulations.
- 7.C-3: The County shall coordinate efforts with local, regional, state, and federal agencies to maintain the existing levee system to protect life and property from the Intermediate Regional Flood (100 year event).

**Implementation Programs:**

- 7.2: The County shall develop and implement a set of flood damage prevention regulations that will apply to all development and improvement activities within special flood hazard areas of the County (Responsibility: Public Works Department)
- 7.3: The County shall continue to maintain flood hazard maps and other relevant floodplain data and shall revise this information as necessary. (Responsibility: Public Works Department)
- 7.4: The County shall annually review its Dam Evacuation Plan, Slow Rise Flood Threat Plan, and applicable sections of the County Emergency Response Plan. (Responsibility: County Administrator, Community Services Department)

**Fire Hazards**

**Goal 7.D:** To minimize the risk of personal injury and property damage resulting from fire.

**Policies:**

- 7.D-1: The County will submit development proposals, in the unincorporated areas of the County, to the appropriate fire agency.
- 7.D-2: The County shall require that new development, at a minimum, meets state standards for fire protection.

### **Implementation Program:**

- 7.5: The County shall periodically evaluate fire protection services in the County to determine if fire protection resources are being effectively utilized. (Responsibility: Community Services Department)
- 7.6: The County shall submit all amendments to the General Plan to the appropriate fire agencies to identify emerging patterns of development and to obtain feedback from the fire agency as to the potential locations for new fire stations. (Responsibility: Community Services Department)
- 7.7: The County shall update its Fire Codes by implementing the mandatory portions of the most recent state and national standards (UFC, NFC and NFPA). The County shall also review and adopt, as determined appropriate by the County Board of Supervisors to meet the needs and conditions in Sutter County, the discretionary portions of the most recent state and national standards. The governing bodies of separate fire agencies may adopt the County's standards, or may adopt more or less stringent standards as determined appropriate to meet the needs and conditions unique to that agency. (Responsibility: Community Services Department, Board of Supervisors)
- 7.8: The County shall continue to require the installation and maintenance of smoke detection and sprinkler systems in all new structures within the County as required by state law or as determined appropriate by the Board of Supervisors. (Responsibility: Community Services Department)

## **Codes and Ordinances**

### **SUTTER COUNTY ZONING CODE, 2006**

#### **Chapter 15**

#### **Division 60**

#### **Sutter Buttes Overlay Zone**

#### **1500-6010 Purposes:**

The Board of Supervisors finds that the Sutter Buttes constitute a significant historic, cultural, scenic, and geographic feature of the area. Dubbed "the smallest mountain range in the world," the Sutter Buttes rise to over 2,100 feet above sea level and provide the only geographic relief in the otherwise level Sacramento Valley. This range is considered by the Maidu (a Native American people) as the spiritual center from which life originated. (See Sutter County General Plan 2015, Background Report, pp. 8-1 through 8-2.) The Sutter County General Plan recognizes that the visual quality of the natural environment contributes to the overall image of a community. The General Plan requires preservation and protection of such visual and scenic resources. (See Sutter County General Plan 2015, p. 17.) Policies of the Sutter County General Plan mandate that views of the Sutter Buttes be protected. (Sutter County General Plan 2015, p. 17.) Development in certain areas of high or critical visual sensitivities, such as on ridgelines, is particularly damaging to the Sutter Buttes' scenic and cultural qualities. It is therefore in the best interest of the residents of Sutter County, in preserving the cultural, historic, geologic, and visual values of the Sutter Buttes, that specific development standards be applied in the Sutter Buttes.

**Chapter 15**  
**Division 79**  
**Special Flood Plain Combining District (fp)**

**1500-7910 Purpose:**

To provide for the welfare of county residents by identifying those lands within Sutter County that are not protected by flood control systems and are subject to flood hazards and/or seasonal inundation that limit(s) the practical uses of the property otherwise permitted within the primary district with which the “FP” District is combined. In any such district , the regulations of Section 1500-7912 shall apply in addition to those specified for such district, provided that if conflict in regulations occurs, the regulations of Section 1500-7912 shall govern. 1500-7912 Special Provisions:

(a) No residential buildings shall be permitted on ground lower than one (1) foot above the elevation specified on the zoning map of the particular district or on the Federal Emergency Management Agency’s Flood Zone Map for 100 year storm protection.

(b) Recreational, commercial and industrial buildings and structures related directly to the harvesting and storage of agricultural products grown in the district or related to the storage or loading of agricultural or sand and gravel products for transshipment by waterborne conveyance, and heights for such buildings and structures in excess of those allowed by the base zoning district with which the FP District is combined, may be permitted upon the approval of a use permit.

**Chapter 1530**  
**Flood Damage Prevention Ordinance**  
**Division**

**Subdivision Ordinance: Section 1400**  
**1400-500 Standards and Requirements for Subdivisions**

**1400-560 Water Courses.** The subdivider shall dedicate right-of-way for storm drainage conforming substantially with the lines of any natural water course that traverses the subdivision, or at the option of the Planning Commission, the subdivider shall provide by dedication further and sufficient easements or constructions or both, to dispose of such surface and storm water.

**County of Sutter**  
**Department of Public Works**  
**Design Standards, 2006**

**Section 5**  
**Storm Drainage Design**

**5-1 Drainage Policy**

It is the policy of Sutter County to protect all new habitable structures from the 100-year (1%) flood event. It is the policy of Sutter County to protect two lanes of travel in each direction for arterial roadways from the 100-year (1%) flood event and one lane in each direction for all other public roads from the 10-year (10%) flood event.

#### **5-4 National Flood Insurance Program**

The County of Sutter is a participant in the National Flood Insurance Program, and all development in the County shall comply with the County of Sutter Flood Damage Prevention Ordinance. Amendments of the National Flood Insurance Program Flood Insurance Rate Maps may be required for developments located in a federal flood zone. Petitions for a Letter of Map Amendment (L.O.M.A.) or Letter of Map revision (L.O.M.R.), including any fee required by Federal Emergency Management Agency (F.E.M.A.), shall be submitted to the Public Works Department prior to approval of a tentative map or approval of improvement plans.

#### **5-5 Drainage Capacity Design**

All drainage systems shall be designed to accommodate the ultimate development of the entire upstream watershed.

#### **5-6 Surface Drainage Grading Design**

The engineer shall be responsible for designing a grading plan which ensures storm waters from a 100 year design storm flow through a development without flooding structures.

### **Services/Groups**

#### **Law Enforcement**

Law enforcement in Sutter County is provided by two principal separate agencies, the Sutter County Sheriff and the California Highway Patrol.

#### **Sutter County Sheriff**

The Sutter County Sheriff's Department (SCSD) is responsible for crime prevention, law enforcement, and criminal investigation in the unincorporated areas of the County and the City of Live Oak. The SCSD has its main office at the Law Enforcement Center in Yuba City, with resident deputies in Meridian, Robbins, and Pleasant Grove. The existing County jail is also located at the Law Enforcement Center.

The SCSD maintains close working relationships with other law enforcement agencies in the area and has mutual aid agreements with the California Highway Patrol, the Yuba City Police Department, the Yuba County Sheriff Department and the Marysville Police Department.

#### **The California Highway Patrol (CHP)**

The California Highway Patrol is the primary law enforcement agency for State highways and roads in the unincorporated areas of the County. Services include law enforcement, traffic control, accident investigation and management of hazardous materials spill incidents. The CHP maintains an office in Yuba City.

#### **Fire Protection**

Fire Services in Sutter County are provided through an organization of three County Service Areas and three Fire Protection Districts

Sutter County Fire Services coordinates fire protection for County Service Areas C, D, and F in the unincorporated portion of Sutter County covering approximately 360 square miles and provides fire service to the City of Live Oak through a contractual agreement. These County Service Areas maintain eight fire stations.

The Meridian Fire Protection District, with one station, covers approximately 127 square miles.. The Sutter Basin Fire Protection District, with three stations, covers approximately 127 square miles. The Walton Fire Protection District covers approximately 24 square miles.



## Gas and Electric

Pacific Gas and Electric (PG&E) provides electrical and natural gas service to Sutter County. Electrical service is provided to all areas of the County. Natural gas is provided only to the urbanized areas of Yuba City and Live Oak and to the community of Nicolaus. Most of the electrical service in the County is carried through above-ground lines. New urban development is now typically served by underground services.

## **Special Districts**

Sutter County currently has 54 special districts that provide various public services for areas within their respective service areas. These include Water Districts (7), Community Services Districts (4), County Drainage Districts (4), County Service Areas (4), Protection Districts (3), Mosquito Abatement Districts (2), Public Cemetery Districts (6), Reclamation Districts (15), Levee Districts (2), and Miscellaneous Districts (6).

## **Agricultural Department**

The County Agricultural Commissioner is responsible for the local administration of statewide agricultural enforcement programs which protect the agricultural industry and the environment of Sutter County and protects the public health and welfare of its citizens. The Agricultural Commissioner is also the County Sealer of Weights and Measures and the Director of Underground Storage of Hazardous Materials.

## **Building Inspection Services**

The Building Program is responsible for enforcement of the building, mechanical, electrical, and plumbing codes adopted by the County as control measures for public safety. The Program checks plans, issues construction permits, inspects buildings and structures at all stages of construction along with alterations and repairs for safety and conformity with State and local codes.

## **Emergency Services**

The Emergency Services Program is responsible for planning, response and recovery activities associated with natural and man-made emergencies and disasters throughout the County and coordination of those activities with Local Agencies, State OES (Office of Emergency Services) and the Federal Emergency Management Agency (FEMA).

## **Sutter County Resource Conservation District**

Formed in 1955, the Sutter County Resource Conservation District covers 363,556 of the 386,425 acres in Sutter County. Recent catastrophic flooding in the Sutter Basin and the real potential of severe flooding from future levee breaks along the Feather or Sacramento Rivers or by-pass levees are of a key issue for the district. The District supports strong measures to strengthen the levees, dredge the river channels and other flood control measures to avoid further death and destruction.

## **Community Plans/Programs/Projects**

The County also has many planned and ongoing studies and projects focused on minimizing future losses associated with identified hazards. Many of these projects are sponsored and implemented by one or more County departments and/or other state and local agencies and organizations. Key plans, studies and projects of interest include:

## **County of Sutter, Emergency Operations Plan, Sutter Operational Area**

The Sutter County Emergency Operations Plan (EOP) addresses the planned response to emergency situations associated with natural disasters, technological incidents, and national security emergencies in or affecting Sutter County. The EOP was developed to provide a comprehensive (multi-use) emergency management program for Sutter County.

### **Lower and Upper Feather River Flood Insurance Study (LFRS and UFRS)**

These two studies being conducted by the DWR and FEMA will ultimately identify current flood risks and define the floodplains within the County.

#### **Lower Feather River Study**

The Amended Draft of the Lower Feather River Floodplain Mapping Study, Revised February 17, 2005 (LFR Study), prepared by the U.S. Army Corps of Engineers (USACE) Sacramento District, was conducted, in part, to support the DFRIM mapping efforts within the Sutter County Planning Area. Generally, the LFR Study addresses flooding from the Feather River downstream of the Yuba River confluence to the mouth of the Feather River at the Sacramento River. It also addresses flooding from the Bear River downstream of Highway 65 and several tributaries to the Bear River. New hydrologic data and hydraulic models were developed as part of this study.

The LFR study was performed in compliance with current FEMA technical guidelines requiring certification of levees before crediting the levees with providing protection from the 1% annual event. FEMA levee certification requirements include evaluations of freeboard, geotechnical stability and seepage, bank erosion potential due to currents and waves, closure structures, operations and maintenance, and wind set and wave run-up. The LFR Study based on its assessment on only three of these requirements (i.e., freeboard, geotechnical stability and seepage, and bank erosion) concluded that the LFR Study does not result in the certification of any levees within the study area. As a result of this finding, the new DFIRMs developed from this LFR study do not recognize the levees as providing 100-year flood protection.

#### **Upper Feather River Study (UFR Study)**

Similar in scope to the LFR Study, the Upper Feather River Study will cover the portions of the Sutter County Planning Area, not included in the LFR Study. It is anticipated that the UFR Study will reach the same conclusions with respect the inability to certify the levees within that study area resulting in new DFIRMs that do not recognize the levees as providing 100-year flood protection. The UFR study and new DFIRMs are anticipated to be out in draft form sometime in 2007.

#### **Sutter County Feasibility Study**

The Corps of Engineers is conducting a reconnaissance study of levee improvement measures for existing levee systems and additional areas of flood protection for the Sutter Basin in California. The primary objective of the study is to restore the area to a 100-year level of protection (Phase I) and then increase it to a 200-year level of protection (Phase II). To date, 24 preliminary

alternatives were developed from the flood damage reduction management, ecosystem restoration, and recreation measures.

### **The Natural Community Conservation Planning (NCCP)**

The NCCP, a program of the California Department of Fish and Game, is an unprecedented effort by the State of California, and numerous private and public partners, that takes a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. An NCCP identifies and provides for the regional or area wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity. Sutter & Yuba counties, Caltrans, US Fish & Wildlife, CA Dept of Fish & Game, Jones & Stokes and scientists are all working together proactively, respectfully and effectively with our communities on this project.

### **Natomas Basin Habitat Conservation Plan (NBHCP)**

The NBHCP applies to the 53,341-acre interior of the Natomas Basin, located in the northern portion of Sacramento County and the southern portion of Sutter County. The purpose of the NBHCP is to promote biological conservation along with economic development and the continuation of agriculture within the Natomas Basin. The NBHCP establishes a multi-species conservation program to mitigate the expected loss of habitat values and incidental take of protected species that would result from urban development, operation of irrigation and drainage systems, and rice farming. The goal of the NBHCP is to preserve, restore, and enhance habitat values found in the Natomas Basin while allowing urban development to proceed according to local land use plans.

## **FEDERAL AND STATE CONSIDERATIONS**

There are some regional capabilities that should also be considered, and an additional layer of regulations at the state and federal level enhance these local capabilities. These include the following:

### **The United States Army Corps of Engineers (USACE)**

The USACE has authority pursuant to the Rivers and Harbors Act. Under their authority, they maintain jurisdiction over all navigable waterways (including non-navigable streams, creeks, marshes, and diked lands) and requires a permit for any work within these waterways.

### **The United States Fish and Wildlife Service (USFS)**

The USFS must be consulted on all federal projects pursuant to the Fish and Wildlife Coordination Act. The Agency comments on potential project effects on endangered or threatened plant and animal species under the Federal Endangered Species Act. In Sutter County, the USFS is the primary federal land owner. The USFS manages the Sutter National Wildlife Refuge (2,467 acres)

## **The State Department of Fish and Game (DFG)**

DFG has jurisdiction over all water of the state, including any lakes, streams or rivers containing fish or wildlife resources, such as the Sacramento Feather and Bear Rivers in Sutter County, as well as all natural streams, creeks and drainageways leading to these rivers. The DFG has also claimed authority over other local drainage facilities. DFG permitting authority includes permitting for streambed alteration agreements required for any project that alters the flow of any lake, stream or river on the state; and for suction dredging permits required for projects involving suction or vacuum dredging activities in state waters. In Sutter County, the DFG also operates the Gray Lodge Waterfowl Management Area, several units of the Feather River Management Area, and other properties in the County for the management of wildlife. The department also reviews projects and comments on potential impacts to fish and wildlife resources in general.

## **The State Department of Water Resources (DWR)**

DWR built and operates the State Water Project which delivers half of the water supply as far south as Riverside County. The DWR also coordinates CEQA and NEPA comments for many departments of the State Resources Agency. Some of the DWR's original duties have been turned over to the State Department of Fish and Game and the State Department of Parks and Recreation. These agencies cooperate with DWR as subcontractors for specialized services, in the provision of fish, wildlife, and habitat management, and recreational operations and enhancement.

## **The State Reclamation Board**

The State Reclamation Board maintains jurisdiction over all Federal Flood Control Projects and levees that are either part of such a project or that may affect such a project. The Reclamation Board is authorized to grant encroachment permits for any activity proposed along or near flood control levees, including changes in land use, construction, earthwork, or removal of vegetation.

## **The State Department of Parks and Recreation**

The State Department of Parks and Recreation reviews development projects in relation to state recreational facilities and grants for local facilities. Within the Department of Parks and Recreation, the State Office of Historic Preservation is the designated State Historic Preservation Office (SHPO) and monitors State and Federally registered historic resources, as well as carrying out other statutory responsibilities.

## **California State Dam Safety Program**

The California Water Code entrusts the regulatory Dam Safety Program to the Department of Water Resources through the Division of Safety of Dams. The principal goal of this program is to avoid dam failure and thus prevent loss of life and destruction of property. Dams under State jurisdiction are an essential element of the California infrastructure that provides constant water supply integrity.

Dams under State 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 15 acre-feet, regardless of height, is not considered jurisdictional.

The statutes governing dam safety in California (Division 3 of the Water Code), place the supervision of the safety of non-federal dams and reservoirs under the jurisdiction of the Department of Water Resources' Division of Safety of Dams.

## **California State Building Code**

The California Code of Regulations (CCR), Title 24, also known as the California Building Standards Code (CBSC), is based on the UBC 1997 Building Code, as amended, and has 11 parts. The California Building Standards Code is a compilation of three types of building standards from three different origins:

- Building standards that have been adopted by state agencies without change from building standards contained in national model codes
- Building standards that have been adopted and adapted from the national model code standards to meet California conditions and
- Building standards, authorized by the California legislature, that constitute extensive additions not covered by the model codes that have been adopted to address particular California concerns.

The national model code standards adopted into Title 24 apply to all occupancies in California except for modifications adopted by state agencies and local governing bodies. Included in the code are provisions for:

- Flood Resistant Construction
- Life-Safety Requirements for Existing Buildings Other than High-rise Buildings
- Life-Safety Requirements for Existing High-rise Buildings and
- Repair to Building and Structures Damaged by the Occurrence of a Natural Disaster.

Standard building codes provide new construction with protection against known or expected forces and include wind, seismic, fire and snow-load/ice considerations. As a practice, standard building codes include a factor of safety of up to 1.3, meaning that structures constructed in a professional manner should be able to withstand forces up to 30 percent greater than what is suggested. (Source: [www.bsc.ca.gov](http://www.bsc.ca.gov))

## **California Unreinforced Masonry Program**

Unreinforced masonry buildings (URMs), are generally brick buildings constructed prior to 1933, predating modern earthquake-resistant design. The brick is not strengthened with embedded steel bars and is therefore called unreinforced. The “URM Law” is SB 547, passed in 1986 and is section 8875 of the California Code. The State Building Code includes a map that identifies areas subject to seismic risk through Zones of increasing risk, from Zone I to Zone IV, with IV having the highest risk. URM buildings in UBC Seismic Zone IV must be inventoried and retrofitted in every jurisdiction. The communities are to adopt a loss reduction program,

and to report progress to the Seismic Safety Commission (SSC). The 2003 SSC report discusses the relative effectiveness of mandatory, voluntary, and ‘notification only’ programs. (Source: [www.quake06.org/quake06/best\\_practices](http://www.quake06.org/quake06/best_practices))

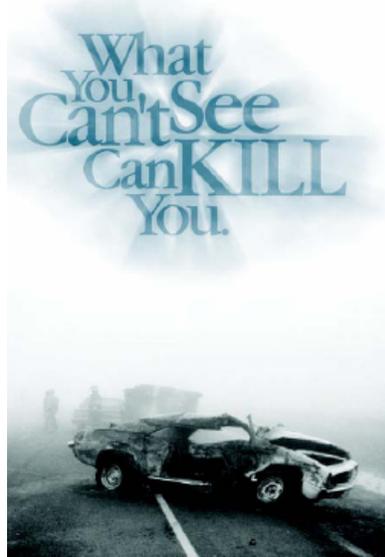
### **California Department of Transportation - Caltrans**

Caltrans is working in conjunction with CHP on the California Operation Fog Program. Caltrans is utilizing current technology such as changeable message signs, visibility sensors, and visibility signs.

CALTRANS information network: 1-800-427-ROAD.

### **California Highway Patrol: California’s Operation Fog Program.**

CHP and Caltrans has a public information brochure on fog hazards located online at [http://www.dot.ca.gov/dist6/docs/fog/fogbrochure\\_english.pdf](http://www.dot.ca.gov/dist6/docs/fog/fogbrochure_english.pdf)



When visibility is reduced to less than 500 ft., the California Highway Patrol implements their “PACE CAR” program. The CHP escorts traffic through dense fog when needed. Officers utilize their flashing lights to lead vehicles at a safe pace through areas of heavy traffic. Keeping traffic speeds at a reduced and consistent pace during these conditions will minimize accidents and maximize safe travel.

### **California Office of Emergency Services**

#### **Hazard Mitigation Section**

The Hazard Mitigation Section is responsible for administering the Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation Grant Program (PDM). The PDM program is a federally funded competitive grant program established to mitigate risks to facilities and infrastructure from future disasters. The Hazard Mitigation Section is also responsible for the development and implementation of the program which integrates both pre- and post-disaster risk management. It includes disaster prevention, hazard mitigation, hazards assessment, and vulnerability studies. The section also manages the disaster preparedness improvement grant.

**Regional support**

The State of California is partitioned into three administrative regions. Sutter County lies in the Inland administrative region. The Inland region south office is located in Fresno. Each of the three OES regions is modeled after the larger organization and includes the full complement of support programs. A primary goal of this organization is to place more emphasis on regional support of local government. The regional branches are responsible for providing planning and technical assistance to state and local agencies within their respective areas. The programs provide support to local government, schools, businesses, and the public through outreach, education, earthquake hazard mitigation, and preparedness activities. The regions are also responsible for assisting in the coordination of mutual aid, delivery of disaster assistance and training programs, and the overall management of regional emergency response activities.

## LOCAL GOVERNMENT CAPABILITY MATRIX

In addition to the assessment of community policies, regulations and plans, the HMPC also created a matrix as a way of taking inventory of additional mitigation capabilities in each community. The intent of this effort was to see if there were any similarities or gaps in community programs and tools that might indicate where some improvements could be made. The matrix and the key to the matrix labels are located on the following pages.

<b>Capability</b>	<b>Sutter County</b>	<b>City of Yuba City</b>	<b>City of Live Oak</b>
Comprehensive Plan	1995 General Plan	2004 General Plan & Area Plans	1994 General Plan update in 2007
Land Use Plan	Included in General Plan	Included in 2004 General Plan	Included in General Plan
Subdivision Ordinance	Local Ordinance & CA Map Act	Local Ordinance & CA Map Act	Local Ordinance & CA Map Act
Zoning Ordinance	Yes	Yes	Yes, very low density
Floodplain Management Ordinance	Yes	Yes	Yes
Effective Flood Insurance Rate Map Date	July 6, 1998, with revised preliminary date August 9, 2006	March 22, 1984; revised preliminary maps issued August, 2006	March 23, 1984
Substantial Damage Language	Yes, but no "substantial improvement" language	Yes	Yes
Certified Floodplain Manager	No	No	No
Number of Floodprone Buildings	>200	<5	Estimate 50
Number of NFIP policies	4,292 (as of 9/12/06)	2,753 (as of 8/21/06)	103 (as of 9/12/06)
Maintain Elevation Certificates	Yes	Yes	No
Number of Repetitive Losses	10	0	1
CRS Rating	Class 10	Class 10	Class 10
Stormwater Program	Master Plan in cooperation with Yuba City	Ordinance under development	Yes
Building Code Version Full-time Building Official	State Building Code Yes	State Building Code, Yes (position vacant 8/23/06)	State Building Code, Yes
Conduct "As-built" Inspections	Yes	Yes	Yes
BCEGS Rating	3/3		
Emergency Operations Plan	Yes, in draft form	Yes, currently revising 2002 plan	Under development
Hazard Mitigation Plan	Under development	Under development	Under development
Warning Systems in Place	Siren system in Robins	Yes; Teleminder System, AM Radio Advisory System, Cable Override, Trailer-mounted message board	
Storm Ready Certified	No	No	No
Weather Radio Reception	Yes	Yes	Yes
Outdoor Warning Sirens	Yes, for Robins only	No	No

<b>Capability</b>	<b>Sutter County</b>	<b>City of Yuba City</b>	<b>City of Live Oak</b>
Emergency Notification (R-911)	No, County relies on Yuba City's teleminer system	Yes	
other (e.g., cable override)	5 river gages, web site alerts, cable override, DMIS, EDIS	Cable override in valley, City Hall weather station link to web, storm gages on river, highway advisory radio	Storm stations, SCADA, radio data transmission and acquisition
GIS system	Yes	Yes	Yes
Hazard Data	Yes, historical flood damage and levee damage/repair, FEMA SFHAs (current and preliminary)	Water sources, storm drains, LIDAR	FEMA SFHAs, infrastructure, right of ways
Building footprints	No	Not at present	No
Tied to Assessor data	Yes	Yes	Yes
Land Use designations	Land use and zoning	Zoning and General Plan	Yes, zoning
Structural Protection Projects	\$55M in levee projects since 1998	Levee maintenance/upgrades; Improvements to Gilsizer drainage systems	Levee maintenance/upgrades
Property Owner Protection Projects	Sporadic residential protection projects	Levee District 1 review system for proposed development	Shallow wells for irrigation
Critical Facilities Protected	Berm/floodwall for county building, berm at Pleasant Grove School, in house publication and training for all county employees in conjunction with Human Resources Dept, emergency command post on high ground	Yes; emergency generators, command center relocation capability, evacuation drills with assembly points, red-tagging system for document & equipment evacuation	Community Services building and Dept of Public Works elevated
Natural Resources Inventory	Yes, soils, endangered species habitat (flora and fauna), open space	Yes, General Plan Natural Resource listing	Not at present; plans to develop inventory with General Plan updates
Cultural Resources Inventory	Yes, Historic resources	Yes, General Plan Historic Structures listing	Yes, Historic Resources
Erosion Control Procedures	Yes, through NPDES approved ordinances	Partial, Levee Board has procedures for new development	Yes, for new development
Sediment Control Procedures	Yes, through NPDES approved ordinances	Master Drainage Plan and Levee Board procedures for new development	Yes, for new development
Public Information	Several joint projects with	Yes; mailed with utility	Web site under

<b>Capability</b>	<b>Sutter County</b>	<b>City of Yuba City</b>	<b>City of Live Oak</b>
Program/Outlet	Yuba City, recovery/preparedness pamphlet for business owners, flip chart on flood preparedness, dam safety/river gage evacuation information, newspaper information, public hearings/notices	bills, special publications by Fire Dept, storm drain fliers, monthly city newsletter, water quality reports, web site, cable company public notices from Police Dept	development
Environmental Education Program	Annual contractor training and special requirements for certification, Flood forecasting briefs with NWS and DWR	Yes; storm drain outreach materials, river awareness materials	Yes, Water conservation brochures, handouts

## EXPLANATION OF CAPABILITY ASSESSMENT MATRIX

**Comp Plan:** Comprehensive Long-Term Community Growth Plan

**Land Use Plan:** Designates type of Land Use desired/required – Comprised of Zoning

**Subdivision Ordinance:** Dictates lot sizes, density, setbacks, and construction type.

**Zoning Ordinance:** Dictates type of Use and Occupancy, Implements Land Use Plan

**NFIP/FPM Ord:** Floodplain Management Ordinance: Directs development in identified Flood Hazard Areas. Required for Participation in NFIP and Availability of Flood Insurance

**Sub. Damage:** Does your FPM Ordinance contain language on Substantial Damage/Improvements? (50% rule)

**Administrator:** Do you have a Floodplain Management Administrator (someone with the responsibility of enforcing the ordinance and providing ancillary services (map reading, public education on floods, etc.)

**# of FP Bldgs:** How many buildings are in the Floodplain?

**# of policies?:** How many buildings are insured against flood through the NFIP?

**# of RL's:** # of Repetitive Losses: Paid more than \$1,000, twice in the past 10 years

**CRS Rating:** Are you in the Community Rating System of the NFIP, and if so, what's your rating?

**BCEGS:** Building Code Effectiveness Grading System Rating

**LEOP:** Do you have a Local Emergency Operations Plan – a Disaster RESPONSE Plan?

**HM Plan:** Do you have a Hazard Mitigation Plan?

**Warning:** Do you have any type of system, such as “Storm Ready” Certification from the National Weather Service, NOAA Weather Radio reception, Sirens, Cable (TV) Override, “Reverse 911”?

**GIS:** Geographic Information System

**Structural Protection Projects:** Levees, drainage facilities, detention/retention basins

**Property Protection Projects:** Buy-outs, elevation of structures, floodproofing, small "residential" levees or berms/floodwalls

**Critical Facility Protection:** For example, protection of power substations, sewage lift stations, water-supply sources, the EOC, police/fire stations, medical facilities that are at risk, e.g., in the floodplain.

**Natural And Cultural Inventory:** Do you have an inventory of resources, maps, or special regulations within the community? (wetlands and historic structures/districts, etc.)

**Erosion Or Sediment Control:** Do you have any projects or regulations in place?

**Public Information And/Or Environmental Education Program:** Do you have an ongoing program even if its primary focus is not hazards? Examples would be "regular" flyers included in city utility billings, a website, or an environmental education program for kids in conjunction with Parks & Recreation?

## CITY OF YUBA CITY

The City of Yuba City has several documents and activities that describe how the City manages development of hazard prone areas. A list of these programs, documents and activities follow, along with a brief summarization of the program status or document contents.

### **General Plan Update, 2004**

The General Plan is a document that guides the City's future development. It is a blueprint for land use in the City and provides long-term direction for the growth of the City. It is a 15 to 20 year plan for the unincorporated area of the City and expresses broad community values and goals, giving a picture of the desired character and quality of development in the City and policies which outline the steps to accomplish those goals.

The City of Yuba City General Plan Update includes the seven elements required by State Law (Land Use, Housing, Circulation, Open Space, Conservation, Safety, and Noise) and four other elements that address local concerns (Growth & Economic Development, Community Design, Public Utilities, and Parks, Schools and Community Facilities). Each chapter includes brief background information and recommended policies stating the City's goals, philosophy, and implementation measures. The section that follows identifies those both guiding policies, and implementation policies that reflect current mitigation goals and practices for mitigating the risk and vulnerability to natural disasters within the City.

### **Water Supply**

#### **Guiding Policies:**

- 7.1-G-1: Ensure that an adequate supply of water is available to serve existing and future needs of the City.
- 7.1-G-2: Ensure that necessary water supply infrastructure and storage facilities are in place prior to construction of new development.
- 7.1-G-4: Encourage water conservation with incentives for decreased water use and active public education programs.

#### **Implementing Policies**

- 7.1-I-1 Evaluate the adequacy of water infrastructure in areas where intensification of land use is anticipated to occur, and develop a strategy to implement projects in the Water Supply Master Plan to offset deficiencies in capacity.
- 7.1-I-2 Coordinate capital improvements planning for all municipal water service infrastructure with the direction, extent, and timing of growth.
- 7.1-I-3 Decline requests for extension of water beyond the SOI, except in cases of existing documented health hazards and in areas where the City has agreements to provide services.
- 7.1-I-4 Establish equitable methods for distributing costs associated with providing water service to development, including impact mitigation fees where warranted.
- 7.1-I-5 Explore ways to encourage use of reclaimed water for irrigation and landscaping purposes. Utilizing reclaimed water is currently not cost-effective. Should the costs of

reclaimed water become more attractive, the City should define a program for encouraging reclaimed water use.

- 7.1-I-6 Establish guidelines and standards for water conservation and actively promote use of water-conserving devices and practices in both new construction and major alterations and additions to existing buildings.

## **Historic and Archaeological Resources**

### **Guiding Policy**

- 8.3-G-1 Identify and preserve the archaeological, paleontological, and historic resources that are found within the Yuba City Planning Area.

## **Biological Resources**

### **Special Status Species & Habitats**

#### **Guiding Policies**

- 8.4-G-1: Protect special status species, in accordance with State regulatory requirements.
- 8.4-G-2: Protect and enhance the natural habitat features of the Feather River and new open space corridors within and around the urban growth area.
- 8.4-G-3: Preserve and enhance heritage oaks in the Planning Area.

#### **Implementing Policies**

- 8.4-I-1: Require protection of sensitive habitat areas and special status species in new development site designs in the following order: 1) avoidance; 2) onsite mitigation, and 3) offsite mitigation. Require assessments of biological resources prior to approval of any development within 300 feet of any creeks, sensitive habitat areas, or areas of potential sensitive status species.
- 8.4-I-2: Require preservation of oak trees and other native trees that are of a significant size, by requiring site designs to incorporate these trees to the maximum extent feasible.
- 8.4-I-3: Require, to the extent feasible, use of drought tolerant plants in landscaping for new development, including private and public projects.
- 8.4-I-4: Require measures, as part of the Feather River Parkway Plan, to protect and enhance riparian zones, natural areas and wildlife habitat qualities; and establish and maintain a protection zone along the river where development shall not occur, except as part of the parkway enhancement (e.g., trails and bikeways). For park improvements, require a buffer zone along the river in which no grading or construction activities will occur, except as needed for shoreline uses such as boat docks.

## **Seismic and Geologic Hazards**

### **Guiding Policy**

- 9.2-G-1: Minimize risks of property damage and personal injury posed by geologic and seismic hazards.

## Implementing Policies

- 9.2-I-1: Review proposed development sites at the earliest stage of the planning process to locate any potential geologic or seismic hazards. Following receipt of a development proposal, engineering staff shall review the plans to determine whether a geotechnical review is required. If the review is required, then the applicant shall be referred to geotechnical experts for further evaluation.
- 9.2-I-2: Prohibit structures intended for human occupancy within 50 feet of an active fault trace. Although no active faults are located within the Planning Area, this policy would apply if a new fault was discovered. It is also the City's intent to discourage homes, offices, hospitals, public buildings, and other similar structures over the trace of an inactive fault and to allow uses within setback areas that could experience displacement without undue risk to people and property.
- 9.2-I-3: Require comprehensive geologic and engineering studies of critical structures regardless of location. Critical structures are those most needed following a disaster or those that could pose hazards of their own if damaged. They include utility centers and substations, water reservoirs, hospitals, fire stations, police and emergency communications facilities, and bridges and overpasses.
- 9.2-I-4: Require preparation of a soils report as part of the development review and/or building permit process for development proposed in the area depicted with expansive soils. The southwest corner of the City is underlain by expansive soils that must be taken into account during building design if cracking and settling of structures are to be minimized. The report would not be necessary when soil characteristics are known, and the City's Building Official or Public Works Director determines it is not needed.
- 9.2-I-5: Provide information for property owners to rehabilitate existing buildings using construction techniques to protect against seismic hazards. The City-adopted Uniform Building Code specifies seismic standards for new construction, as well as for additions or expansions to buildings. It is in the community's best interest to do all that is necessary to ensure that all structures meet current seismic standards.
- 9.2-I-6: Control erosion of graded areas with revegetation or other acceptable methods. Plant materials for revegetation should not be limited to hydro-seeding and mulching with annual grasses. Trees add structure to the soil and take up moisture while adding color and diversity.
- 9.2-I-7: Maintain and update, as appropriate, the City's emergency preparedness programs, plans, and procedures to ensure the health and safety of the community in the event of an earthquake or other disaster. The City shall inform community and business leaders and residents regarding all aspects of disaster preparedness, including plans for evacuation and alternative access routes and provisions. The City shall also provide a coordinated emergency response in the event of any local or regional, natural or man-made disaster. This shall be supported by ongoing awareness and training programs in disaster planning and response.
- 9.2-I-8: Encourage the purchase of earthquake insurance. Earthquake insurance provides a public benefit in that financial aid is often provided swiftly, allowing repair and rebuilding to proceed quickly and uniformly across the City.

## **Drainage, Stormwater, and Flooding**

### **Guiding Policies**

- 9.3-G-1: Protect the community from risks to lives and property posed by flooding and stormwater runoff.
- 9.3-G-2: Collect and dispose of storm water in a safe and efficient manner.
- 9.3-G-3: Ensure that dams and levees are properly maintained for long-term flood protection.

### **Implementing Policies**

- 9.3-I-1: Implement the drainage improvements identified in the City's Capital Improvement Program.
- 9.3-I-2: Continue to work with the U.S. Army Corps of Engineers to implement levee improvements on the Feather River. Incorporate features in the levee system to ensure flood protection and at the same time improve the connection between the city and the river.
- 9.3-I-3: When necessary, require new development to prepare hydrologic studies to assess storm runoff impacts on the local and subregional storm drainage systems and, if warranted, require new development to provide adequate drainage facilities and to mitigate increases in storm water flows and/or volume to avoid cumulative increases in downstream flows. Developers shall provide an assessment of a project's potential impacts on the local and subregional storm drainage systems, so that the City can determine appropriate mitigation to ensure that system capacity and peak flow restrictions are not exceeded.
- 9.3-I-4: Restrict new development in areas subject to 100 year flooding, as shown in Figure 9-6 of the General Plan.
- 9.3-I-5: Provide information to property owners about the availability of flood insurance. This policy can be implemented with counter handouts and stories in the City's newsletter and pages on the City's website.
- 9.3-I-6: As new development occurs, work with Sutter County to establish drainage areas that serve the entire Planning Area. A new drainage study may be appropriate to determine the best means to establish drainage areas that would safely channel runoff and provide protection from flooding.
- 9.3-I-7: Utilize parks for the secondary purpose of storm water storage.

## **Emergency Response**

### **Guiding Policies**

- 9.4-G-1: Ensure continued adequate law enforcement capabilities.
- 9.4-G-2: Minimize the risk of personal injury, property damage, and environmental damage from fire, hazardous chemicals releases, natural and human made disasters.
- 9.4-G-3: Maintain current police and fire response times and staffing ratios.

## **Implementing Policies**

- 9.4-I-1: Maintain the Fire Department performance objectives and response standards set forth in Table 9-6 of the General Plan.
- 9.4-I-2: Prepare and disseminate information, including a page on the City's website, about emergency preparedness. This information should describe how emergency response will be coordinated and where residents can obtain emergency information.
- 9.4-I-3: Conduct periodic emergency management exercises with City personnel and surrounding jurisdictions.
- 9.4-I-4: Require adequate access for emergency vehicles, including adequate street width and vertical clearance on new streets.
- 9.4-I-5: Continue implementation of the City Sprinkler Ordinance throughout the Planning Area.
- 9.4-I-6: Review proposed development applications for compliance with adopted fire safety standards and staffing ratios. Construction of a new fire station in the southwest section of the City will be required to maintain standards. Construction of this facility will take place in conjunction with new development in the southwest area.
- 9.4-I-7: Continue to conduct building and fire code enforcement to ensure safe structures. The City has an active program for both building and fire code enforcement. The program is delivered by building inspectors, fire inspectors and code enforcement officer(s).
- 9.4-I-8: Extend water distribution pipes, as needed, to maintain and improve fire water flows.
- 9.4-I-9: Support community training and volunteer programs to enhance emergency preparedness.

## **Housing Element**

Environmental phenomena such as flooding and seismicity present a minor constant risk to Yuba City, but are not considered constraints to housing development. Nowhere in the City is development precluded; environmental constraints can be mitigated through appropriate residential design.

## **Codes and Ordinances**

### **Chapter 9. Flood Damage Prevention**

#### **Article 1. Authorization; Findings; Purpose and Objectives**

##### **Sec. 6-9.102. Findings of fact.**

(a) The flood hazard areas of the City of Yuba City are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare.

(b) These flood losses are caused by the cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities, and when inadequately anchored,

damage uses in other areas. Uses that are inadequately floodproofed, elevated or otherwise protected from flood damage also contribute to the flood loss.

**Sec. 6-9.103. Statement of purpose.**

It is the purpose of this chapter to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed:

- (a) To protect human life and health;
- (b) To minimize expenditure of public money for costly flood control projects;
- (c) To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- (d) To minimize prolonged business interruptions;
- (e) To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;
- (f) To help maintain a stable tax base by providing for the second use and development of areas of special flood hazard so as to minimize future blight areas;
- (g) To insure that potential buyers are notified that property is in an area of special flood hazard; and
- (h) To insure that those who occupy the areas of special flood hazard assume responsibility for their actions.

**Sec. 6-9.104. Methods of reducing flood losses.**

In order to accomplish its purposes, this chapter includes methods and provisions for:

- (a) Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
- (b) Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- (c) Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;
- (d) Controlling, filling, grading, dredging, and other development which may increase flood damage; and
- (e) Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas.

**Sec. 6-9.501. Standards of construction**

***(c) Elevation and floodproofing.***

(1) New construction and substantial improvement of any structure shall have the lowest floor, including basement, elevated to or above the base flood elevation. Nonresidential structures may meet the standards in Section 6-9.501(c)(3) below. Upon the completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered professional engineer or surveyor, or verified by the community building inspector to be properly elevated. Such certification or verification shall be provided to the Public Works Director.

(2) New construction and substantial improvement of any structure in Zone AO shall have the lowest floor, including basement, elevated above the highest adjacent grade at least as high as the depth number specified in feet on the FIRM, or at least two (2) feet if no depth number is specified. Nonresidential structures may meet the standards in Section 6-9.501(c)(3) below. Upon the completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered professional engineer or surveyor, or verified by the community building inspector to be properly elevated. Such certification or verification shall be provided to the Public Works Director.

(3) Nonresidential construction shall either be elevated in conformance with the above paragraphs or together with attendant utility and sanitary facilities:

(i) Be floodproofed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water;

(ii) Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and

(iii) Be certified by a registered professional engineer or architect that the standards of this subsection are satisfied. Such certifications shall be provided to the Public Works Director.

**Sec. 6-9.503 Standards for subdivisions.**

(a) All preliminary subdivision proposals shall identify the flood hazard area and the elevation of the base flood.

(b) All final subdivision plans will provide the elevation of proposed structure(s), pads, and adjacent grade. If the site is filled above the base flood, the final pad elevation shall be certified by a registered professional engineer or surveyor and provided to the Public Works Director.

(c) All subdivision proposals shall be consistent with the need to minimize flood damage.

(d) All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage.

(e) All subdivision proposals shall have adequate drainage provided to reduce exposure to flood hazards.

**Sec. 6-9.505 Floodways.**

Located within areas of special flood hazard established in Section 6-9.302 are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

(a) Prohibit encroachments, including fill, new construction, substantial improvements, and other development unless certification by a registered professional engineer or architect is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

(b) If the above is satisfied, all new construction and substantial improvements shall comply with all other applicable flood hazard reduction provisions of this article.

(c) All subdivision proposals shall be consistent with the need to minimize flood damage.

(d) All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage.

(e) All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage as set forth in Section 6-9.403(a)(1). Certification of compliance shall be required of the developer.

**Chapter 5 Fire Prevention**

**Sec. 4-5.01. Adoption of the California Fire Code.**

(a) There is hereby adopted by the City of Yuba City for the purpose of prescribing regulations governing conditions hazardous to life and property from fire or explosion that certain code and standards known as the California Fire Code (hereinafter sometimes referred to as the "Fire Code"), including Appendix Chapters I-A, I-B, I-C, II-A, II-B, II-C, II-D, II-E, II-F II-H, II-I, II-K, III-A, III-AA, III-B, III-BB, III-C, III-D, IV-A, IV-B, VI-A, VI-B, VI-C, VI-D, VI-E, VI-G, VI-H, VI-I, VI-J, VI-K and the Uniform Fire Code Standards, as published by the Western Fire Chiefs Association, being particularly the 2000 Edition of the Uniform Fire Code, including the 2001 California Fire Code and amendments thereof, and the whole thereof, save and except such portions as are deleted, modified or amended by the provisions of this Chapter, and said Fire Code and Standards are hereby adopted and incorporated as fully as if set out at length therein and from and after January 1, 2003, the provisions of said Code shall be controlling within the City of Yuba City.

#### **Sec. 4-5.01.1. Findings of fact.**

The City Council finds that the following regulations as contained in this Chapter are necessary to mitigate unique local climatic conditions and impose substantially the same requirements as are contained in the uniform model industry codes. The unique local conditions as found and determined are as follows:

Yuba City is located in the northern portion of the Central Valley. The area is bounded to the north by the Siskiyou mountains, the west by the Coastal mountains, the east by the Sierra Nevada mountains, and the south by the Delta region. These geographical factors, and the area's proximity to the Pacific Ocean, combine to determine weather and wind conditions that influence the area and can create a particularly hazardous fire situation.

Four (4) weather conditions routinely present themselves which can result in extremely dangerous fire situations that could result in widespread conflagration. The four (4) conditions are temperature, relative humidity, wind and fog.

Temperatures in the Yuba City area during the summer months are in the ninety (90) degree Fahrenheit range with high temperatures of one hundred (100) degrees being very common.

Low relative humidity is a very important weather condition that can intensify fire behavior. When relative humidities fall below thirty (30%) percent, the potential for fire spread is significantly increased. A recent review of data available from the National Weather Service of a recent thirty-eight (38) month period revealed that the Yuba City area experienced four hundred three (403) days when the relative humidity was recorded at or below thirty (30%) percent.

Wind velocity directly contributes to flame spread and the potential for conflagration. Winds, in combination with relative humidities below thirty (30%) percent contributes to "drying out" fuels. The Yuba City area is subject to strong north winds which are usually very drying in nature. A review was made of the days with relative humidity at or below thirty (30%) percent and winds of ten (10) miles per hour or more using the same thirty-eight (38) month period as was previously mentioned. Of the four hundred three (403) days of thirty (30%) percent or below relative humidity, one hundred ninety-seven (197) days also had winds that equaled or exceeded ten (10) miles per hour.

The weather conditions described above have a direct influence on fire behavior. High temperatures, low humidities and wind, singularly and in combination, produce a potentially explosive fire situation.

In addition to the weather conditions described above, the Yuba City area also experiences very dense fog conditions in the wintertime. The presence of dense fog poses significant response problems to emergency response vehicles. Obviously, if dense fog is present, response speeds must be reduced. This reduction in response speed results in longer response times. The longer it takes the fire department to arrive, the larger the fire grows. Research, using the same thirty-eight (38) month period mentioned above, was done to determine how many days of heavy fog the Yuba City area experienced. Heavy fog was defined as one-fourth (1/4) of a mile visibility or

less. The data revealed that during the thirty-eight (38) months reviewed, heavy fog occurred on one hundred three (103) days. It is important to note that the fog prone months of November and December were missing for two (2) of the three (3) years reviewed.

As a result of these findings of fact on local climatic conditions within the Yuba City area, the City Council finds that the fire code provisions and the automatic sprinkler requirements herein established by this Chapter are considered "reasonable and necessary modifications" as provided for in California Health and Safety Code sections 18941.5(c) and 17958 et seq. Because of these serious concerns as reflected in the foregoing findings of fact, it is important that for the effective protection of the citizenry and property within the City limits of the City of Yuba City from the ravages of fire and the reduction of the potential for community-wide conflagration that this ordinance be enacted. Only with the enactment of these regulations can the reduction of the potential for community-wide conflagration and the protection of the citizenry and property within this jurisdiction be realized.

## **Services/Groups**

### **Building Department**

The function and purpose of the Building Division is to protect the health and safety of citizens through the enforcement of current building codes in order to ensure that structures built and existing within the City limits meet minimum safety standards. Our Division issues building permits for new construction, repairs or alterations to existing structures, as well as electrical, plumbing and mechanical permits.

### **Planning**

The Planning Division strives to create a distinctive and livable community through quality design, use of good site development and building standards, and use of land and services. In doing so provide everyone with professional and courteous service in a fair and timely manner.

### **Public Works**

The Public Works Department provides construction, operation, and maintenance services to the City's infrastructure system to include streets, water, sewer, and storm drainage systems.

## **Community Plans/Programs/Projects**

### **Storm Water Management & Industrial Pretreatment Programs**

The City of Yuba City has a National Pollution Discharge Elimination System (NPDES) permit and Storm Water Management Program. Both control mechanisms are required by State (Porter-Cologne Water Quality Control Act) and Federal law (Clean Water Act) and guide the City in its mission to prevent water pollution.

The City has a single water distribution system that brings drinking (domestic supply) water to all homes and businesses. Many people are unaware there are two separate collection systems for transporting wastewater and storm water throughout the City. The sanitary sewer (wastewater collection system) takes sewage and wastewater from homes and businesses within the City limits and transports it to the Wastewater Treatment Facility on Burns Drive. It then undergoes treatment (cleaning) before disposal. Water that falls as rain (storm water) flows from driveways, parking lots, exterior storage areas, roads and other locations into the storm water collection system and then into the Feather River. There is no treatment/cleaning provided for storm water. Pollution prevention for storm water is based on good housekeeping and best management practices (BMPs) which prevent contaminants from accessing storm water run-off.

### **2004 Water Master Plan Update Report**

The 2004 Water Master Plan Update Report evaluated the existing and future water needs for the City and the City's Sphere of Influence (SOI), including the former Hillcrest Water Company groundwater regions acquired by the City in May 2001. The result of this evaluation was the proposed Capital Improvement Program (CIP) for the City's water distribution system and Surface Water Treatment Plant (SWTP). The CIP identified improvements needed to meet the projected growth and water demand in the City, former Hillcrest Regions, and future developments in the SOI. The Executive Summary provides a brief overview of the update study's purpose, objectives, findings and recommendations, and the recommended CIP

### **2005 Urban Water Management Plan**

Urban water suppliers are required by the Urban Water Management Planning Act to update their Urban Water Management Plan every five years. The UWMP is a planning tool for both the City of Yuba City and California Department of Water Resources. The main functions include:

- Consolidation of water agency information by DWR,
- Planning tool for future water demand,
- Improve statewide planning,
- Encourage public input and information,
- Provides information to DWR, who in turn prepares a statewide report to the state legislature.

### **West Yuba City Area Master Drainage Study**

Yuba City recently approved a new General Plan (adopted on April 8, 2004) that provides a vision for future development within the City's boundary and within its sphere of influence (SOI) through 2025. The SOI is essentially consistent with the urban growth boundary (UGB), and it is anticipated that the lands within the SOI/UGB will be developed over the next 20 years and will be annexed into Yuba City.

A critical element for the planning of new growth is determining infrastructure needs and funding mechanisms to pay for the required infrastructure. Development of agricultural lands results in constructing buildings and pavement, which greatly increases the runoff rate and total

volume of runoff. Consequently, new drainage facilities, including storm drain collection systems, open channels, detention basins, and pump stations, are needed to manage the increased runoff and prevent flooding. The purpose of this MDS is to ensure that the required drainage infrastructure is constructed when it is needed to allow for the development identified in the General Plan.

### **Flood Management Facilities: Planned Improvements**

According to the City's General Plan, Capital Improvement Program (CIP for the 2006-2010 timeframe includes nine planned drainage improvements listed below:

- Onstott Drainage Improvements
- Forbes Street storm Drain: Clark to Olive
- Richland and Jones Road Storm Drain
- B Street Storm Drain: Boyd to Courthouse
- B Street Storm Drain: Courthouse to 2nd

Planned Improvements to Levee Reaches from Yuba City include:

- Feather River upstream from Honcut Creek
- Feather River between Honcut Creek and Jack Slough
- Feather River between Jack Slough and Yuba River
- Feather River between Yuba River and Bear River

# CITY OF LIVE OAK

The City of Live Oak has several documents and activities that describe how the City manages development of hazard prone areas. A list of these programs, documents and activities follow, along with a brief summarization of the program status and document contents.

## **General Plan, 1992**

The General Plan is a document that guides the City’s future development. It is a blueprint for land use in the City and provides long-term direction for the growth of the City. It is a 15 to 20 year plan for the City and expresses broad community values and goals, giving a picture of the desired character and quality of development in the City and policies which outline the steps to accomplish those goals.

## **General Plan Update**

The City of Live Oak is its General Plan in an effort to reflect the current state of the city and to plan for the future. A General Plan is a state mandated planning document which addresses present and future land use, transportation, housing, historic preservation, open space and other important community components. The Live Oak General Plan was last updated in the early 1990’s and does not adequately reflect what is happening both in and around the city. The following section reflects the current goals and policies from their 1992 General Plan.

### **Land Use Element**

#### **Goal:**

- Conserve natural resources in and around the City.

#### **Policies:**

- Existing trees shall be preserved in the City.
- Preserve and rehabilitate any continuous riparian corridors and adjacent habitat along existing waterways.

### **Housing Element**

#### **Goal:**

- Promote the construction of a variety of housing types that meet safe standards with minimal environmental impact and provide a choice location, preserve existing neighborhoods, and have adequate public services for the residents of the City of Live Oak.

#### **Policies:**

- Ensure that all residential development meets or exceeds current state energy efficiency and water conservation standards and encourage retrofitting of existing development to improve energy efficiency and water conservation.

## Codes and Ordinances

### Chapter 8.08 Fire Prevention Code

#### 8.08 .010 Adoption.

Pursuant to the provisions of Article 2 of Chapter 1 of Part 1 of Division I of Title 5 (Section 50020 et seq.) of the Government Code, there is adopted and there shall be enforced, in the incorporated territory of the city, the Fire Prevention Code, and Appendices A and B, the latest edition thereof, as amended, hereinafter called the “primary code” and any and all writings, things, and matters incorporated therein by reference, hereinafter called the “secondary codes,” promulgated, published and recommended by the National Board of Fire Under writers, whose address is 465 California Street, San Francisco 4, California, which is a nationally recognized and approved publication and compilation of proposed rules, regulations or standards of a private organization or institution, which has been in existence for a period of at least three years. (Ord. 131 § 1, 1965)

#### 8.08.060 Section 28.1 amended—Bonfires and outdoor rubbish fires.

Section 28.1 of the primary code is amended to read as follows:

“Section 28.1—BONFIRES AND OUTDOOR RUBBISH FIRES.

“A. PERMIT REQUIRED.

“1. No person shall kindle or maintain any bonfire or rubbish fire or authorize any such fire to be kindled or maintained on or in any public street, alley, road or other public ground without a permit or other proper authorization.

“3. The City Council shall by resolution annually determine and establish fire hazard seasons during various portions of the year in various geographical areas of the city. Said resolution shall be published at least once in the Live Oak Acorn, a newspaper of general circulation printed and published in the City of Live Oak, State of California, eight (8) days prior to the effective date of said resolution. During said fire hazard season designated by resolution, burning permits shall be required for the following:

“(a.) Disposal of waste materials or rubbish from the construction or demolition of buildings or other structure where said burning is to be made either on the premises or in the immediate vicinity of the buildings or structures being constructed or demolished.

“B. LOCATION RESTRICTED.

No person shall kindle or maintain any bonfire or rubbish fire or authorize any such fires to be kindled or maintained on any private lands unless; (1) the location is not less than 10 feet from any structure and adequate provision is made to prevent fire from spreading to within 10 feet of any structure, or; (2) the fire is contained within an approved type of incinerator with a closed, approved type spark arrester, located safely not less than five feet from any other flammable material.

**8.08.070 Dry and combustible materials near buildings.**

Dry and combustible materials, including dry weeds, grass and general growth, and trash and rubbish shall be kept cleared for a minimum distance of fifteen feet around buildings at all times. (Ord. 131 § 7. 1965)

**Chapter 13.36 - DRAINAGE IMPROVEMENT FACILITIES**

**13.36.010 Declaration.**

The city council of the city finds and declares that new building and improvement projects greatly heighten and increase stormwater runoff; that there is certain flooding and the potential for flooding in certain areas of the city; and that in the best interests of the citizens of the city and to promote and protect the health and welfare of the residents of the city it is necessary for persons who carry out such projects within those areas to pay a reasonable fee to control and prevent such flooding. (Ord. 263 § 1, 1981)

**TITLE 15 - BUILDINGS AND CONSTRUCTION\***

**Chapter 15.01 - BUILDING CODES**

**Subchapter 10- UNIFORM FIRE CODE**

**15.01.910 Adoption of the Uniform Fire Code.**

There is adopted by the city, for the purpose of prescribing regulations and governing conditions that are hazardous to life and property from fire or explosion, that certain code and standards known as the Uniform Fire Code, including all Appendices and the Uniform Fire Code Standards published by the Western Fire chiefs Association and the International Conference of Building Officials, being particularly the 1997 edition thereof and the whole thereof, save and except such portions as are hereinafter deleted, modified or amended by the provisions of this article, of which code not less than three copies have been and are now on file in the office of the City Clerk and said code and standards are adopted and incorporated as fully as if set out at length herein and from and after the date on which the ordinance codified in this article shall take effect the provisions thereof shall be controlling within the city.

**Chapter 15.21 - FLOOD DAMAGE PREVENTION**

**15.21.020 Findings of fact.**

A. The flood hazard areas of the city are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base all of which adversely affect the public health, safety and general welfare.

B. These flood losses are caused by the cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities, and when inadequately anchored, damage uses in other areas. Uses that are inadequately floodproofed, elevated or otherwise protected from flood damage also contribute to the flood loss. (Ord. 318 § I (part), 1988)

### **15.21.030 Statement of purpose**

It is the purpose of this chapter to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed:

- A. To protect human life and health;
- B. To minimize expenditure of public money for costly flood-control projects;
- C. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- D. To minimize prolonged business interruptions;
- E. To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;
- F. To help maintain a stable tax base by providing for the second use and development of areas of special flood hazard so as to minimize future flood blight areas;
- G. To ensure that potential buyers are notified that property is in an area of special flood hazard; and
- H. To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions. (Ord. 318 § 1(part), 1988)

### **15.21.040 Methods of reducing flood losses.**

In order to accomplish its purposes, this chapter includes methods and provisions for:

- A. Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
- B. Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- C. Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;
- D. Controlling, filling, grading, dredging, and other development which may increase flood damage; and
- E. Preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas. (Ord. 318 § I (part), 1988)

### **15.21.081 Standards of construction.**

In all areas of special flood hazards the following standards are required:

#### **C. Elevation and Floodproofing.**

1. New construction and substantial improvement of any structure shall have the lowest floor, including basement, elevated to or above the base flood elevation. Nonresidential structures may meet the standards in subdivision 3 of this subsection C. Upon the 405 completion of the structure the elevation of the lowest floor including basement shall be certified by a registered professional engineer or surveyor or verified by the community building inspector to be properly elevated. Such certification or verification shall be provided to the floodplain administrator;
2. New construction and substantial improvement of any structure shall have the lowest floor, including basement, elevated above the highest adjacent grade at least as high as the depth number specified in feet on the FIRM; or at least two feet if no depth number is specified. Nonresidential structures may meet the standards in subdivision 3 of this subsection

C. Upon the completion of the structure the elevation of the lowest floor including basement shall be certified by a registered professional engineer or surveyor or verified by the community building inspector to be properly elevated. Such certification or verification shall be provided to the floodplain administrator;

3. Nonresidential construction shall either be elevated in conformance with subdivisions 1 or 2 of this subsection C, or together with attendant utility and sanitary facilities:

a. Be floodproofed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water,

b. Have structural components capable for resisting hydrostatic loads and effects of buoyancy, and

c. Be certified by a registered professional engineer or architect that the standards of this subdivision 3 are satisfied. Such certifications shall be provided to the floodplain administrator;

## **Services/Groups**

### **Public Works**

The Public Works Department provides engineering, construction, operation, and maintenance services to the City's infrastructure system to include streets, water, sewer, and storm drainage systems.

### **Fire Department**

The mission of the City of Live Oak Fire Department is to protect life, property, and the environment, through the delivery of innovative and efficient quality emergency management services in our community. The Fire Department provides responses to fire, medical, and other emergencies (e.g. toxic cleanup). Also, the department is actively involved in educating the public through various prevention programs designed to minimize the loss of life and property as well as the prevention of injury.

## **Community Plans/Programs/Projects**

### **Water Tank**

A 1.4 million gallon storage tank is being installed at Live Oak Park to provide better water service for the existing residents of Live Oak, as well as for future development. Due to new regulations for drinking water, the water tank area is being designed to accommodate a treatment facility on-site to filter the water to insure that it meets all of the upcoming quality standards imposed by the Federal government. The tank will be painted beige with the City of Live Oak insignia in green.

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# Multi-Hazard Mitigation Plan

## 5.0 Mitigation Strategy

**44 CFR Requirement 201.6(c)(3):** *The plan shall include a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

This section describes the mitigation strategy process and mitigation action plan for this Sutter County Multi-Hazard Mitigation Plan. This section describes how the County accomplished Step 3 of FEMA’s 4 Step guidance: “Developing the Mitigation Plan” and includes the following CRS steps from the older 10-step guidance:

- Step 6: Set Planning Goals
- Step 7: Review Possible Activities
- Step 8: Draft an Action Plan

### 5.1 GOALS AND OBJECTIVES

Up to this point in the planning process, the HMPC has organized resources, assessed natural hazards and risks, and documented mitigation capabilities within the county and participating jurisdictions. A profile of Sutter County’s vulnerability to natural hazards resulted from this effort, which is documented in the preceding chapters of this plan. The resulting goals, objectives, and mitigation actions were developed based on this profile. The HMPC developed this section of the plan with a series of meetings and exercises designed to achieve a collaborative mitigation planning effort as described further in this section.

During the initial goal setting meeting, AMEC reviewed the results of the hazard identification, vulnerability assessment and capability assessment with the HMPC. This analysis of the risk assessment identified areas where improvements could be made, providing the framework for the HMPC to formulate planning goals, objectives and the ultimate mitigation strategy for the Sutter County Planning Area.

Goals were defined for the purpose of this mitigation plan as broad based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and

- Are time-independent, in that they are not scheduled events.

Goals are stated without regard for implementation, that is, implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that the goals are not dependent on the means of achievement. Goals statements form the basis for objectives and measures that will be used as means to achieve the goals. Objectives define strategies to attain the goals, and are more specific and measurable.

Team members were given a list of sample goals to consider. The HMPC was instructed that they could use, combine or revise the statements they were provided or develop new ones on their own, keeping the risk assessment in mind. Team members were provided two index cards each and asked to write a goal statement on each card. Goal statements were collected and grouped into similar themes and pasted onto the wall of the meeting room. The goal statements were then attached to the meeting-room wall, and grouped into similar topics. New goals that represented the team's input were written until consensus was formed amongst the team. Some of the statements were determined to be better suited as objectives or actual mitigation projects, and were set aside for later use. Using this information, objectives were then developed, based on the team's input that summarizes strategies to achieve each goal. Initial mitigation recommendations that were developed by the HMPC are listed under the appropriate Goal and Objective. As part of the prioritization process described later in this section, prioritized mitigation measures were further developed into projects as part of the overall mitigation strategy for this plan.

Based upon the risk assessment review and goal setting process, the HMPC developed the following goals with several objectives and associated mitigation measures. The group also developed a Master Goal/Mission Statement that captured the overall intent of identified goals and objectives. In addition to the goals and objectives developed for the entire Planning Area, two participating jurisdictions also identified goals and/or objectives specific to their jurisdiction. These goals and objectives provide the direction for reducing future hazard-related losses within the Sutter County Planning Area.

## **Sutter County Planning Area Master Goal/Mission Statement**

*To develop sustainable communities to preserve life, protect property, the environment, and the economy from natural hazards by improving the communities' capabilities to prevent losses*

**GOAL 1: Improve community awareness about hazards that threaten our communities and identify appropriate actions to minimize their impacts upon people and property.**

*Objective 1.1: Increase public awareness about the nature and extent of hazards they are exposed to, where they occur, and recommend responses to identified hazards (create/continue an outreach program, provide educational resources and training)*

1.1.1 Provide information regarding sheltering options

- 1.1.2 Provide information regarding data sites where the hazard progression can be tracked (e.g., websites, brochures)
- 1.1.3 Provide information on flood preparedness
  - 1.1.3.1 Supplies
  - 1.1.3.2 When and how to evacuate
  - 1.1.3.3 Designated TV/Radio channels for Public Information

**GOAL 2: Minimize Risk and Vulnerability to Flood Hazards**

*Objective 2.1: Improve the integrity of the levees to at least 100-year flood protection*

*Objective 2.2: Eliminate open drainage ditches within 20' of traveled roadways within urbanized areas*

*Objective 2.3: Minimize damage/loss to roads*

*Objective 2.4: Identify/Protect evacuation routes*

*Objective 2.5: Reduce localized flooding from storm events*

*Objective 2.6: Provide Protection for community critical facilities*

**GOAL 3: Reduce Agricultural Losses**

*Objective 3.1: Noxious weed abatement*

**GOAL 4: Maintain Coordination of Disaster Plans with other Community Plans**

*Objective 4.1: Coordinate with changing DHS needs*

- 4.1.1 NIMS
- 4.1.2 DMA planning
- 4.1.3 Emergency Operations Plans

*Objective 4.2 Coordinate with Community Plans*

- 4.2.1 Community General Plans
- 4.2.2 Master Drainage Studies
- 4.2.3 Intergovernmental Agency Disaster Planning
  - 4.2.3.1 Duty Roster
  - 4.2.3.2 Available Equipment (e.g., sandbags, pumps)

*Objective 4.3 Coordinate with other counties and inter-county coordination among districts*

## City of Live Oak

### **Planning Area Goal 2: Minimize Risk and Vulnerability to Flood Hazards**

*Objective 2.1: Ensure that all future development be constructed above the 100-year flood level*

*Objective 2.2: Improve digital mapping accuracy*

*Objective 2.3: Increase drainage flow and stability on major canals*

*Objective 2.4: Preserve power supply for Gilsizer and Live Oak Canal pumps*

*Objective 2.5: Maintain duty lists and call-down phone tree numbers*

*Objective 2.6: Provide for safe and efficient collection and removal of stormwater*

## Reclamation District 1500

### **Planning Area Goal 2: Minimize Risk and Vulnerability to Flood Hazards**

*Objective 2.2: Protect the Sutter Basin during high water, specifically the Town of Robbins*

2.2.1 Provide an alternate power supply to the Karnack Pumping Plan that dewater the Sutter Basin from High Water

## Gilsizer County Drainage District

**GOAL 1: Reduce the frequency of emergency incidents**

**GOAL 2: Reduce risk from hazards**

**GOAL 3: Collect and dispose of stormwater in a safe and efficient manner**

## 5. 2 IDENTIFIED MITIGATION MEASURES AND ALTERNATIVES

In order to identify and select mitigation measures to support the mitigation goals, each hazard identified in Section 4.1 was evaluated. Only those hazards that pose a threat to the community were considered further in the development of hazard specific mitigation measures. These hazards include:

- Dam Failure
- Floods
- Wildfire
- Agricultural Hazards
- Severe Weather
  - Winterstorms: Heavy Rains/thunderstorms/Wind/Hail/Lightning

The HMPC eliminated the hazards identified below from further consideration in the development of mitigation measures, either because the risk of the hazard occurring within the Sutter County Planning Area is unlikely or non-existent or if they do occur, the vulnerability of the area is low or existing capability measures were in place to mitigate the affects of these hazards. The eliminated hazards include:

- Avalanche
- Drought
- Earthquakes
- Landslides and Rockfalls
- West Nile Virus
- Severe Weather
  - Extreme Temperatures
  - Fog
  - Snow
  - Tornadoes
- Soil Hazards
  - Erosion
  - Expansive Soils
  - Land Subsidence
- West Nile Virus
- Volcanic Eruption

It is important to note, however, that all above identified hazards are included in the County-wide Multi-Hazard Public Awareness measure.

Once it was determined which hazards warranted the development of specific mitigation measures, the HMPC analyzed a set of viable mitigation alternatives that would support identified goals and objectives. Each HMPC member was provided with the following list of categories of mitigation measures that are based on the six CRS categories:

- Prevention,
- Property Protection,
- Structural Projects,
- Natural Resource Protection,
- Emergency Services, and
- Public Information.

The HMPC members were also provided with several lists of alternative multi-hazard mitigation actions for each of the above categories. A facilitated discussion then took place to examine and analyze the alternatives. With an understanding of the alternatives, a brainstorming session was conducted to generate a list of preferred mitigation actions to be recommended.

## **Prioritization Process**

Once the initial list of mitigation actions were identified, the HMPC members were provided with several sets of decision-making tools, including FEMA's recommended STAPLE/E set, Sustainable Disaster Recovery criteria, Smart Growth principles, and "Others" to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. In accordance with the DMA requirements, an emphasis was placed on the importance of a cost-benefit analysis in determining project priority. The lists of mitigation categories, multi-hazard measures, and criteria sets are included in Appendix C.

With these criteria in mind, team members were asked to assign a High, Medium and Low priority to each mitigation action identified. After much discussion, the HMPC decidedly chose not to prioritize the recommended actions - for two reasons. First, the HMPC did not want to rank apples and oranges between communities and departments. Each community has their own recommended actions in their own section and will have to determine how to identify their own priorities. The priority assigned for each recommendation in the plan is an indication of how the project ranks in priority within the community making the recommendation. Second, the CA-OES state Hazard Mitigation Plan states their own criteria for funding local projects, so the HMPC ranking holds little weight compared to the state's. The DMA regulations state that benefit-cost is the #1 method by which projects should be prioritized. In the state ranking, the B/C criteria are one of 10, and while they do not state what their overall priority is, B/C is listed last.

Recognizing the DMA regulatory requirement to prioritize by benefit-cost and the need for any publicly funded project to be cost-effective, the HMPC decided to pursue implementation according to when and where damages occur, available funding, individual community priority, and priorities identified in the State Mitigation Plan. This process drove the development of a prioritized action plan for the Sutter County Planning Area. Cost effectiveness will be considered in additional detail when seeking FEMA mitigation grant funding for eligible projects associated with this plan.

## 5.3 THE MITIGATION STRATEGY

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation measures, and the hard work of the HMPC led to the Action Plan that follows. The process also helped the HMPC clearly comprehend and identify the overall mitigation strategy that will lead to the implementation of the Action Plan. Taking all of the above into consideration, the HMPC has developed this **overall mitigation strategy**:

- **COMMUNICATE** the hazard information collected and analyzed through this planning process so that the community better understands what can happen where, and what they can do themselves to be better prepared. Also, publicize the “success stories” that are achieved through the HMPC’s ongoing efforts,
- **IMPLEMENT** the Action Plan recommendations of this plan;
- **UTILIZE** existing rules, regulations, policies and procedures already in existence. Communities can reduce future losses not only by pursuing new programs and projects, but also by more stringent attention to what’s already “on the books”. Given the flood hazard in the Planning Area, an emphasis should be placed on continued compliance with the NFIP and participation in the CRS by all communities; and
- **MOM** - ardently monitor “Multi-Objective Management” opportunities, so that funding opportunities may be shared and “packaged” and broader constituent support may be garnered.

## 5.4 MITIGATION ACTION PLAN

This Action Plan was developed to present the recommendations developed by the HMPC for how the Sutter County Planning Area can lessen the vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. The Action Plan is summarized in a table format followed by more detailed project worksheets. The Action Plan summarizes who is responsible for implementing each of the prioritized strategies determined in the previous step, as well as when and how the actions will be implemented. The recommended mitigation actions that follow are organized by jurisdiction. Each recommendation also includes a discussion of the benefit-cost to meet the regulatory requirements of DMA.

*It is important to note that the Sutter County Planning Area has numerous existing, detailed project descriptions, including cost estimates and benefits, in other planning and identified in Capital Improvement Budgets and Reports. These projects are considered to be part of this plan and the details, to avoid duplication, should be referenced in their original source document. Sutter County also realizes that new project needs and priorities may arise as a result of a disaster or other circumstances, and reserves the right to support these projects, as necessary, as long as they conform to the overall goals of this plan.*

### **Sutter County Planning Area Mitigation Action Plan**

<b>Mitigation Type and Action #</b>	<b>Mitigation Action Title</b>	<b>Priority</b>	<b>Responsible Office</b>
<b>COUNTYWIDE RECOMMENDED MITIGATION ACTIONS</b>			
<b>Emergency Services Measures</b>			
Action #1	Multi-Hazard Public Awareness Program	Medium	Sutter County OES, American Red Cross, City of Yuba City, City of Live Oak
<b>Flood Measures</b>			
Action #1	Sutter Basin Feasibility Study and Improvements	High	USACE Sacramento District, California Reclamation Board, Sutter County
Action #2	O'Banion Road DWR Pump Station Improvements	High	State Department of Water Resources
<b>Agricultural Measures</b>			
Action #3	Noxious Terrestrial Weed Control Project	High	Sutter County Department of Agriculture
Action #4	Aquatic Weed Elimination Project	High	Sutter County Department of Agriculture
<b>UNINCORPORATED SUTTER COUNTY</b>			
<b>Flood Measures</b>			
Action #1	Road Projects to Improve Right of Passage and to Decrease Localized Flooding	Medium	Sutter County Department of Public Works
Action #2	Bypass Crossing @Sacramento Ave.	Medium	Sutter County Department of Public Works
Action #3	Live Oak Canal Constriction Removal	High	Sutter County Water Agency
Action #4	Bogue Road Flood Water Diversion Berm	High	Sutter County Water Agency

Mitigation Type and Action #	Mitigation Action Title	Priority	Responsible Office
<b>CITY OF YUBA CITY</b>			
<b>Emergency Services Measures</b>			
Action #1	Emergency Communications Improvements	High	City of Yuba City Police and Fire Department
<b>Flood Measures</b>			
Action #2	Various Street Improvements to Decrease Localized Flooding	Medium	City of Yuba City Department of Public Works
Action #3	Low Lift Pump Access Road Improvements	Medium	City of Yuba City Department of Public Works
Action #4	Relocation of Wastewater Effluent Discharge Ponds	High	City of Yuba City Department of Utilities
Action #5	East and West Feather River Bank Stabilization	High	City of Yuba City Department of Utilities
Action #6	Gilsizer Slough Weir at Bogue Road	High	City of Yuba City Department of Utilities
Action #7	Comprehensive Flood Management Plan	High	City of Yuba City Department of Public Works
Action #8	Implementation of Additional CRS Activities	High	City of Yuba City Department of Public Works
Action #9	Floodplain Management Planning Outreach	High	City of Yuba City Department of Public Works
<b>Wildfire Measures</b>			
Action #10	Fire Flow Improvements for Groundwater Regions 1, 2 and 3	Medium	City of Yuba City Department of Utilities
<b>CITY OF LIVE OAK</b>			
<b>Flood Measures</b>			
Action #1	Road Projects to Improve Right of Passage and to Decrease Localized Flooding	Medium	City of Live Oak Department of Public Works
Action #2	Lift Pump Back Up Generator Improvements	Medium	City of Live Oak Department of Public Works
<b>GILSIZER COUNTY DRAINAGE DISTRICT</b>			
<b>Flood Measures</b>			
Action #1	Revetment of Slough Channel/Headwalls at Road Crossing	High	Gilsizer County Drainage District

<b>Mitigation Type and Action #</b>	<b>Mitigation Action Title</b>	<b>Priority</b>	<b>Responsible Office</b>
<b>LEVEE DISTRICT ONE</b>			
<b>Flood Measures</b>			
Action #1	Bank Erosion Repairs To Levees in Several Areas	Medium - High	Levee District One
Action #2	Star Bend Set Back Levee	High	Levee District One
Action #3	Relief Well Location (N. Star Bend)	High	Levee District One
<b>RECLAMATION DISTRICT 1001</b>			
<b>Flood Measures</b>			
Action #1	Unit 2 LB Yankee Slough Levee Repairs	Medium	RD1001
Action #2	Feather River/Sacramento River Landslide Stability Berm	High	RD1001
Action #3	North Levee of Natomas Cross Canal Repairs	Medium	RD1001
Action #4	Infrastructure Improvements – District-wide and Main Pumping Facility	High	RD1001
<b>RECLAMATION DISTRICT 1500</b>			
<b>Flood Measures</b>			
Action #1	Karnak Pump Plant Renovation	High	RD1500
<b>RECLAMATION DISTRICT 70</b>			
<b>Flood Measures</b>			
Action #1	Pumping Plant Project	Medium	RD70
<b>RECLAMATION DISTRICT 1660</b>			
<b>Flood Measures</b>			
<b>Action #1</b>	Sutter By-Pass Project	High	RD1660

# SUTTER COUNTY PLANNING AREA: COUNTYWIDE RECOMMENDED MITIGATION ACTIONS

## EMERGENCY SERVICES MITIGATION ACTIONS

### **ACTION #1: DEVELOP AND CONDUCT A MULTI-HAZARD SEASONAL PUBLIC AWARENESS PROGRAM PROVIDING CITIZENS AND BUSINESS WITH ACCURATE INFORMATION DESCRIBING RISK AND VULNERABILITY TO NATURAL HAZARDS, IMPLEMENTED ON AN ANNUAL BASIS**

**Issue/Background:** Sutter County is subject to several natural hazards, each which pose a different degree of risk and associated vulnerability. Some hazards have a combination of attributes, including a high likelihood of occurrence, a specific location that would likely be impacted, and proven approaches that can reduce the impact, such that the HMPC has recommended specific actions be taken. For other hazards, where either the likelihood of occurrence is very low, or the area of likely impact is not specifically known, or there is very little that can be done to reduce the impacts, the HMPC has determined that the best approach would simply be public awareness. People should know what the HMPC knows: information describing historical events and losses, the likelihood of future occurrences, the range of possible impacts, appropriate actions to save lives and minimize property damage and where additional information can be found. Any information provided through this effort should be accurate, specific, timely and consistent with current and accepted local emergency management procedures as promoted by the California State Office of Emergency Services, and the American Red Cross. This public outreach effort should include the following elements:

- Utilize a variety of information outlets including local news media, creating and printing of brochures and leaflets, water bill inserts, websites and public service announcements. Current brochures and flyers should be put on display in county and city office buildings, libraries and other public places.
- Develop public-private partnerships and incentives to support public education activities.

**Other Alternatives:** Continue public information activities currently in place

**Responsible Office:** Sutter County Office of Emergency Services, American Red Cross, Chamber of Commerce, City of Yuba City, City of Live Oak

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** \$5-20,000 annually depending upon printing and mailing costs, level of volunteer participation, and scope and frequency of events.

**Benefits (avoided Losses):** Life safety, reduction in property losses, relatively low cost.

**Potential funding:** HMPG, PDM, Sutter County Funds

**Schedule:** Part of seasonal multi-hazard public awareness campaign

## **FLOOD MITIGATION ACTIONS**

### **ACTION #2: SUTTER BASIN FEASIBILITY STUDY AND IMPROVEMENTS**

**Issue/Background:** The Corps of Engineers has initiated a feasibility study to identify measures for flood damage reduction, ecosystem restoration, and recreation in the Sutter Basin Feasibility Study Area. The Study Area includes the Sutter Bypass-Feather River Basin and the Sutter Basin. This study was initiated, in part, as a result of geotechnical and hydraulic analyses conducted by the Corps which found that the existing Feather River and Sutter Bypass levees have less than 100-year level of flood protection as originally assumed. Initial studies of this area began in 1999. Currently, the major study scope is focused on providing major flood damage reduction to the urban areas of Yuba City and Live Oak and developing flood warning coordination plans for outlying areas. Other project objectives include ecosystem restoration and recreation. The overall objective of the Study is to restore the levee system to a 100-year level of protection (Phase I) and then increase to a 200-year or higher level of protection (Phase II). This Feasibility Study, which will include an EIS/EIR component will result in one or more construction projects.

As of October 2006, 20 measures were retained for further study and combined into 24 different alternatives for further evaluation. The 20 measures retained included a wide variety of solutions from the following categories:

- Flood Damage Reduction – Nonstructural Measures
- Flood Damage Reduction – Structural Measures
- Flood Damage Reduction – Reservoir Reoperation
- Ecosystem Restoration Measures
- Recreation Measures

Once the study is complete, the preferred alternative will be designed and constructed. For more details on this study, the Corps of Engineers is producing a variety of documents which should be referred to.

(Source: Sutter Basin Feasibility Study, October 2006)

**Other Alternatives:** All alternatives are being evaluated.

**Responsible Office:** US Army Corps of Engineers, Sacramento District; State of California, Reclamation Board, Sutter County

**Priority (High, Medium, Low):** High

**Cost Estimate:** Feasibility Study: \$11,000,000  
Preferred Alternative Implementation: Project costs will depend on alternative selected.

**Benefits (avoided Losses):** Life-Safety, Property Protection, Preservation of Economic Vitality of Planning Area. A 905(B) analysis of the water resource related problems and potential solutions conducted by the Corps in July of 1999 revealed the following findings:

- Several miles of levees along the Feather River upstream of Yuba City protect close to 30,000 residential home, 1500 commercial structures, 620 farm house and buildings, and 120 semi-public structures from devastating floods. The estimated value of the structures and contents at risk was determined to be in excess of \$5 billion. This has since drastically increase as evidenced by the flood – assets at risk analysis included in this plan.
- “A flood damage reduction project will enhance the public health, safety and welfare by eliminating damages to single family residences, interruptions to interstate commerce and reducing the impacts to agriculture thereby promoting a safe environment for the residents of Sutter County and the economy throughout California and the surrounding areas”

**Potential funding:** Federal Appropriations and Grants, State Funds & Grants, Local Funds

**Schedule:** Feasibility Study: 2006-2009  
Phase 1 Design, EIR, R/W: 2007-2010  
Phase 1 Construction: 2010-2012  
Phase 2 Design, EIS, R/W: 2009-2012  
Phase 2 Construction: 2012-????

### **ACTION #3: O'BANION ROAD DWR PUMP STATION IMPROVEMENTS**

**Issue/Background:** This DWR pump station is responsible for moving the water from the Gilsizer Slough and Live Oak Canal into the Sutter Bypass. If this water is not sufficiently pumped over the levee into the Sutter Bypass during a storm, flood waters will back up into Yuba City and cause flood damage. Improvements need to be made to the pump station to ensure continued operations during flood events.

**Other Alternatives:** No Action

**Responsible Office:** State Department of Water Resources

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$2.5 million

**Benefits (avoided Losses):** Life safety and property loss (including agricultural, public and private)

**Potential funding:** HMPG, PDM, FMA, State and Local Funds

**Schedule:** Part of seasonal multi-hazard public awareness campaign

## **AGRICULTURAL MITIGATION ACTIONS**

### **ACTION #4: NOXIOUS TERRESTRIAL WEED CONTROL PROJECT**

**Issue/Background:** Noxious weeds are any species of non-native plants which are detrimental to agriculture, threaten public safety or displace native species. They are often difficult to eradicate due to their aggressive nature and lack of natural controls. The Yuba/Sutter Weed Management Area was created to bring public and private stakeholders together to consolidate efforts to detect, control, suppress and eradicate noxious weeds. The group used AB 1740 funds to create an informational brochure entitled “Yuba/Sutter Weed Management Area’s Dirty Dozen,” a list of weeds of special concern in our area. Some of the listed dozen are of particular concern and, as such, are the focus of this project:

**Yellow Starthistle, *Centaurea solstitialis*,** infests cultivated fields, pastures and wastelands. It causes “Chewing disease” in horses and decreases infested rangeland’s grazing capacity.

**Saltcedar, *Tamarix ramosissima*,** an escaped ornamental inhabits streamside areas, canals and reservoirs and disrupts the structure and stability of native plant communities, degrading native wildlife habitat by outcompeting and replacing native plant species, monopolizing limited sources of moisture, and increasing the frequency, intensity and effect of fires and floods.

**Puncturevine, *Tribulus terrestris*,** is a low-growing weed with sharp seeds capable of, as the name implies, puncturing tires. It invades cultivated fields, roadsides, yards, fencerows, and walkways. Its seed can remain dormant in the soil for four to five years, making eradication difficult.

**Himalaya Blackberry, *Rubus discolor*,** thrives along ditchbanks and riversides and is becoming a troublesome, persistent weed in orchards, vineyards and forests. It may grow to several meters in height and its thorny canes impede access and make removal difficult.

**Rush Skeletonweed, *Chondrilla juncea*,** a Eurasian species infesting roadsides, rangelands, grain fields, and pastures. The extensive root systems mean it can outcompete native rangeland plants and also make control extremely difficult.

**Perennial Pepperweed, *Lepidium latifolium*,** distributed along roadsides, ditchbanks, fencerows, and waste areas. May become a pest in orchards and cultivated annual crops.

**Johnsongrass, *Sorghum halapense*,** may grow to 8 feet tall and obstruct roadways and intersection visibility. May be toxic to livestock.

**Russian Thistle**, *Salsola iberica*, Also known as tumbleweeds, mature plants break off and may drift across roadways, obscuring visibility. Found in disturbed areas, may be found in cropland.

**Responsible Office:** Sutter County Department of Agriculture

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$75,000/year for management to upwards of \$1M for complete eradication of a single species

**Potential Losses:** Loss of wildlife habitat and reduced wildlife population  
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  
Public safety hazard due to decreased roadway visibility

**Potential funding:** Limited County, State and Federal Funds

**Schedule:** Continuous monitoring for prevalence of these species. Eradication/management projects as funding allows.

## **ACTION #5: AQUATIC WEED ELIMINATION PROJECT**

**Issue/Background:** Agriculture is the economic base of Sutter County. The irrigation and drainage canal system that supports the county's croplands covers approximately 1,300 miles<sup>1</sup>. Many of these canals and natural waterways throughout the county are already infested with **Parrotfeather**, *Myriophyllum aquaticum*, and **Water primrose**, *Ludwigia* complex, two highly invasive, noxious aquatic weeds. It is estimated that Parrotfeather infests more than 50 miles of Sutter County waterways and Water Primrose more than 60<sup>2</sup> miles. These weeds root and grow between the ditchbanks, building thick, impenetrable mats and causing the water to be carried higher in the ditch. This displaced water increases the risk of bank failure and subsequent flooding. These aquatic weeds also clog irrigation pumps and impede the movement of water, reducing the ability to drain arable lands and remove flood waters away from urban areas. In natural water systems, they out-compete natural vegetation. Natural enemies of Mosquito larvae may be excluded by the thick mass of vegetation and roots, leading to an upsurge in the Mosquito population.

**Giant Reed**, *Arundo donax*, is often found growing on the ditchbanks to several meters in height. It creates a problem when the water undercuts its dense root masses and the weed (and ditchbank) fall into the water. **Arundo** has been known to obstruct culverts and cause flooding. Sutter County has approximately 23 miles of *Arundo* infesting its water conveyance systems.

These drainage systems are controlled by a myriad of public agencies including drainage districts, reclamation districts and irrigation districts. These agencies have had difficulty with treating the aquatic weed infestations and often have reactionary strategies (mechanical removal), which cause temporary relief of the infestation, but lead to further problems such as ditchbank sloughing and downstream infestations. For any project to have success, it must be at least countywide, as reinfestation will be swift otherwise. Ideally, the project would be conducted in conjunction with Sutter County's upstream neighbors (Butte County, Placer County), eliminating the weeds in the entire watershed.

**Responsible Office:** Sutter County Department of Agriculture

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$75,000/year for management to upwards of \$1M for complete eradication of a single species.

**Benefits (avoided Losses):** Averted damage to grower's irrigation equipment; significantly reduced risk of flooding due to ditchbank failure and water conveyance system blockage; increased biological diversity in natural areas.

**Potential funding:** Limited County, State and Federal Funds

**Schedule:** Any elimination efforts must be sustained over several years to have significant effect. Immediate eradication of some species is not possible due to water holding requirements of certain aquatic herbicides. Treatment strategies may be affected by water use objectives and the controlling agency.

#### **Footnotes**

<sup>1</sup> 1357 miles-Census 2000 TIGER/Line Data. Currently, a coordinated project is underway between Ducks Unlimited and Sutter County Department of Agriculture to improve the accuracy of the aquatic data layers (GIS) used by public agencies to perform risk assessments such as this.

<sup>2</sup> Parrotfeather (50.89 miles), Water primrose (62.16 miles), Arundo (23.7 miles). Reliability of data is tied to survey thoroughness. Not all 1357 miles of Sutter County waterways have been surveyed, so total infestation could be considerably higher than given figures, but are unlikely to be any less.

# UNINCORPORATED SUTTER COUNTY RECOMMENDED MITIGATION ACTIONS

## FLOOD MITIGATION ACTIONS

### **ACTION #1: VARIOUS ROAD PROJECTS TO IMPROVE RIGHT OF PASSAGE AND TO DECREASE LOCALIZED FLOODING**

**Issue/Background:** Localized flooding throughout the County occurs during storm events due to lack of drainage capacities. Drainage problems have arisen, due to an increase in the requested capacity of these systems from less wettable surface areas (i.e., areas where there were orchards or farm land that could soak the water into the ground.) This has been due to area growth have been that has led to localized flooding of streets and low lying properties. The existing infrastructure of the Live Oak Canal is not sized to provide adequate drainage when surrounding areas were developed.

**Other Alternatives:** No Action - Continue to allow localized flooding during storm events

**Responsible Office:** County of Sutter Public Works Director

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** \$3 million

**Benefits (avoided Losses):** Reduce damage to homes and property loss. Reduce the possibility of safety hazards associated with flooded streets, public property, and systems.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds; Private Funds

**Schedule:** 3-5 years

### **ACTION #2: BYPASS CROSSING @ SACRAMENTO AVE.**

**Issue/Background:** Due to high water events within the levees of the Sacramento River the Bypass takes water from the river at a set level and diverts the water through the Bypass to alleviate some of the pressure on the Sacramento River Levees. This leads to several county roads that traverse the Bypass being closed for the time that the rivers continue to flow at this capacity. Multiple times a year county maintenance crews must repair the road after the water subsides to provide safe access for farmers and commuters that use these thoroughfares daily. Project scope would include providing concrete box culverts under the roadway to prevent washouts. A lime treatment on the sub soils, a rock and rip rap barrier on the north and south sides of the roadway to prevent under washing of the base rock. Overlay the Area with 1/2 AC material.

**Other Alternatives:** No Action

**Responsible Office:** County of Sutter Public Works Director

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** \$2 million

**Benefits (avoided Losses):** By maintaining the roadway with this type of preventive maintenance, the county will be able to reduce costs associated with maintaining and repairing the roadway after each high water event. These events can and have occurred several times during each winter season.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds; Private Funds

**Schedule:** 3-5 years

### **ACTION #3: LIVE OAK CANAL CONSTRICTION REMOVAL**

**Issue/Background:** The Live Oak Canal is a county maintained interior drainage canal supporting west Yuba City and county area within the Yuba City sphere of influence. Its capacity is hampered by undersized pipes and culverts at numerous road intersections.

**Other Alternatives:** Restrict additional flows to the canal.  
Enlarge canal.  
Construct connecting detention ponds.

**Responsible Office:** Sutter County Water Agency

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$150,000

**Benefits (avoided Losses):** Prevent canal overflow and local drainage back up. Roadway and landscape damage in city subdivisions. First floor structural and water damage to facilities/residences in county areas. Costs estimated in excess of three million dollars.

**Potential funding:** Water Agency assessments, HMGP, PDM, FMA; Local Funds

**Schedule:** Five locations have been designed for culvert/pipe replacement. Construction start not yet determined, but estimated in the next 1-3 years.

#### **ACTION #4: BOGUE ROAD FLOOD WATER DIVERSION BERM**

**Issue/Background:** Inundation studies for the Yuba City Basin (Levee breaks on both the Sutter Bypass and Feather River) indicate a slow rise of flood water filling the basin to the south of Yuba City and eventually inundating by several feet of water, populated areas north of Bogue Road (southern boundary of Yuba City sphere of influence). A diversion earthen berm approximately four feet in height could contain the flood waters to the southern portion of the Basin. Numerous openings would have to be provided for traffic circulation and interior drainage (Gilsizer). This would require gate structures or emergency closure means. The berm length is estimated at six miles with possibly as many as 30 openings.

**Other Alternatives:** Diversion ditches to new pumping facilities at the Sutter Bypass.  
Elevate hundreds of structures.  
Install an overflow weir at the south end of Basin.

**Responsible Office:** Sutter County Water Agency

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$2.5 million

**Benefits (avoided Losses):** Flood damage to land crops and residences north of Bogue Road.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants, Local Funds

**Schedule:** Feasibility Study ongoing.

# CITY OF YUBA CITY RECOMMENDED MITIGATION ACTIONS

## EMERGENCY SERVICES MITIGATION ACTION

### **ACTION #1: EMERGENCY COMMUNICATION IMPROVEMENTS**

**Issue/Background:** Currently, there are some areas countywide that do not have radio signals. During an emergency, additional resources are needed to communicate within these areas. This usually involves additional people to act as relays across these areas. Additional communication structures need to be established.

**Other Alternatives:** No Action

**Responsible Office:** City of Yuba City Police and Fire Department

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$1-2 million

**Benefits (avoided Losses):** Life safety, Property loss

**Potential funding:** Federal and state funding/grants, Local Funds – CIP budgets,

**Schedule:** 2008 to 2011

## FLOOD MITIGATION ACTIONS

### **ACTION #2: VARIOUS STREETS: PROJECT IMPROVEMENTS TO DECREASE LOCALIZED FLOODING**

**Issue/Background:** Localized flooding throughout the city occurs during storm events due to lack of infrastructure and drainage problems. As the City has grown and annexed rural areas, drainage problems have arisen that have led to localized flooding of streets and low lying property. The existing infrastructure in critical areas either does not exist or is not sized to provide adequate drainage when surrounding areas were developed.

See the “City of Yuba City Recommended Drainage Improvement Areas” on page 212 for project areas as well as projects identified in the City’s 2007 Capital Improvement Program.

**Other Alternatives:** Continue to allow localized flooding during storm events

**Responsible Office:** City of Yuba City Public Works Director

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** \$10 million

**Benefits (avoided Losses):** Reduce damage to homeowners and property loss. Reduce the possibility of safety hazards associated with flooded streets, public property, and systems. Prevent oils and foreign material from entering waterways and groundwater. Labor and associated costs of cleaning up after flooding would be reduced or eliminated

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds; Private Funds

**Schedule:** 1-5 years depending on funding; localized flooding projects are budgeted for annually.

### **ACTION #3: LOW LIFT PUMP ACCESS ROAD IMPROVEMENTS**

**Issue/Background:** Due to high water events within the levees of the Feather River the access road to the City of Yuba City's low lift intake structure becomes impassable by vehicle. Water rises and washes out the roadway at existing culverts multiple times a year creating access and maintenance problems. The low lift pump must be checked two times a day for proper operation. A majority of the City of Yuba City's water supply is taken in at this site. Multiple times a year maintenance crews must repair the travel way to provide access for water operators and maintenance workers to check and serve the intake pump daily. Project scope would include providing concrete box culverts under the roadway to prevent washouts.

See the "City of Yuba City Localized Flooding Map" for project area location

**Other Alternatives:** Relocate Pump

**Responsible Office:** City of Yuba City Public Works Director

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** \$1 million

**Benefits (avoided Losses):** By maintaining access to Low Lift Pump, which provides water for the City of Yuba City residents, the possibility of pump problems and water shortages if failure occurred are greatly reduced. Reduce costs associated with maintaining and repairing the roadway.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds; Private Funds

**Schedule:** 3-5 years

#### **ACTION #4: RELOCATION OF WASTEWATER EFFLUENT DISCHARGE PONDS**

**Issue/Background:** During the 1986, 1996, and 2006 storm events, major storm damage occurred to the six wastewater effluent ponds. Damage that occurred included erosion of access roads, damage to concrete spillway structures, deposition of soil into the ponds, and damage to existing riprap. FEMA and OES have funded reconstruction of the ponds after each of the three storm events. This project entails moving the ponds out of the floodway onto the landside of the floodway either on the east or west side of the Feather River.

**Other Alternatives:** No Action

**Responsible Office:** City of Yuba City Department of Utilities

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$20 million

**Benefits (avoided Losses):** Future mitigation and reconstruction costs of rebuilding the ponds after a major storm event.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds

**Schedule:** 1-5 years as funding is available

#### **ACTION #5: EAST AND WEST FEATHER RIVER BANK STABILIZATION**

**Issue/Background:** The Feather River floodway between Yuba City and Marysville is bounded by east and west levee structures. However, within the floodway, the main Feather River has eroded its banks in two areas accessed by Yuba City. One area is on the west side of the wastewater effluent ponds and another area is on the east side of the water supply intake access road. This project entails installing rip rap and stabilizing the river bank.

**Other Alternatives:** Relocating water supply access road and wastewater effluent ponds.  
No Action

**Responsible Office:** City of Yuba City Department of Utilities

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$1-2 million

**Benefits (avoided Losses):** Property damage – Adequate bank stabilization would avoid the need to relocate water supply access road and wastewater effluent ponds.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds

**Schedule:** 1-5 years as funding is available

#### **ACTION #6: GILSIZER SLOUGH WEIR AT BOGUE ROAD**

**Issue/Background:** Gilsizer Slough is the main channel which runs through Yuba City transferring the drainage runoff generated by the majority of the City to the Sutter By-Pass. In the flood of 1955, the flood water backed into the City through the Gilsizer Slough flooding several properties. In order to prevent such occurrences from happening in the future, the slough will need to be “blocked” in case of a levee break in the Yuba City Basin. Blocking the slough cannot be achieved after a break occurs because of the time it will take to construct a structure to block the slough. Constructing a weir that blocks the natural channel of the Gilsizer Slough will provide a structure in place to be utilized in preventing the flood water from backing into the city caused by a levee break.

**Other Alternatives:** No Action

**Responsible Office:** City of Yuba City Public Works Department

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$3 million

**Benefits (avoided Losses):** The backing up of flood water into Yuba City would cause billions of dollars in damage to properties and economic impacts to the entire Planning Area.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds

**Schedule:** 1-5 years as funding is available

#### **ACTION #7: COMPREHENSIVE FLOOD MANAGEMENT PLAN**

**Issue/Background:** Yuba City has completed a risk assessment for the city within the Multi-Hazard Mitigation Plan and needs to develop a comprehensive flood management plan that includes an assessment of existing data, future data needed, and projects to provide 200-year level of flood protection for the city.

**Other Alternatives:** No Action

**Responsible Office:** City of Yuba City Department of Public Works

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$1 million

**Benefits (avoided Losses):** Life Safety, Property damage

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds

**Schedule:** 1-3 years

#### **ACTION #8: IMPLEMENTATION OF ADDITIONAL CRS ACTIVITIES**

**Issue/Background:** The CRS program reduces the flood insurance premiums for city residents. The City has qualified for a Level 8 that provides a 5% discount for preferred insurance customers and 10% for mandatory flood insurance customers. The City can work towards a Level 1 that would reduce mandatory flood insurance by 45% and reduce preferred insurance rates to 10%. Funding and implementing additional activities will allow the City to increase their rating.

**Other Alternatives:** No Action

**Responsible Office:** City of Yuba City Department of Public Works

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$500 thousand to \$1.5 million

**Benefits (avoided Losses):** Life Safety, Property damage

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds

**Schedule:** 1-3 years

#### **ACTION #9: FLOODPLAIN MANAGEMENT PLANNING OUTREACH PROJECT**

**Issue/Background:** Outreach to the community is essential during development of a comprehensive flood management plan. The outreach will be conducted and input used during development and implementation of the plan.

**Other Alternatives:** No Action

**Responsible Office:** City of Yuba City Department of Public Works

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$250 thousand to \$1 million

**Benefits (avoided Losses):** Life Safety, Property damage

**Potential funding:** Local Funds – CIP budgets, federal and state grants

**Schedule:** 2007 to 2010

## **WILDFIRE MITIGATION ACTIONS**

### **ACTION #10: FIRE FLOW IMPROVEMENTS FOR GROUNDWATER REGIONS 1,2, AND 3 INCLUDING AREAS SERVED BY SURFACE WATER.**

**Issue/Background:** These regions were annexed from the county and do not meet city standards to meet fire flows and provide adequate water pressure.

**Other Alternatives:** No Action

**Responsible Office:** City of Yuba City Department of Utilities

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** \$25 million

**Benefits (avoided Losses):** Life safety, Property loss

**Potential funding:** Federal and state funding, Local Funds – CIP budgets, Grant funds

**Schedule:** Future project 2013 contingent on funding.

# CITY OF LIVE OAK RECOMMENDED MITIGATION ACTIONS

## FLOOD MITIGATION ACTIONS

### **ACTION #1: VARIOUS ROAD PROJECTS TO IMPROVE RIGHT OF PASSAGE AND TO DECREASE LOCALIZED FLOODING**

**Issue/Background:** Localized flooding at various locations in the City occurs during storm events due to lack of drainage capacities. Drainage problems have arisen, due to a lack of storm drainage infrastructure such as curbs, gutters and sidewalks on many older streets. As the City transitions from a semi-rural setting to an urban one, the older, less developed areas drainage problems are more apparent. The existing infrastructure of Live Oak is not sized to provide adequate drainage when surrounding areas are developed.

**Other Alternatives:** No Action - Continue to allow localized flooding during storm events

**Responsible Office:** Live Oak Public Works Director

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** \$3-5 million

**Benefits (avoided Losses):** Reduce damage to homes and property loss. Reduce the possibility of safety hazards associated with flooded streets, public property, and systems.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds; Private Funds

**Schedule:** 5-7 years

### **ACTION #2: LIFT PUMP BACK UP GENERATOR IMPROVEMENTS**

**Issue/Background:** Due to high water events within the City of Live Oak, the lift pump must be checked at least two times a day for proper operation. If there is a power failure, water will not be pumped out of the stations resulting in localized flooding. Water operators and maintenance workers must check and serve the intake pump daily when in use. Project scope would include providing back up generators on multiple sites and/or portable generators that could be used when mechanical problems incapacitate an existing generator.

**Other Alternatives:** Allow localized flooding

**Responsible Office:** Live Oak Public Works Director

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** \$400,000

**Benefits (avoided Losses):** Reduce damage to homes and property loss. Reduce the possibility of safety hazards associated with flooded streets, public property, and systems.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds; Private Funds

**Schedule:** 3-5 years

# SUTTER COUNTY DISTRICTS RECOMMENDED MITIGATION ACTIONS

## FLOOD MITIGATION ACTIONS

### GILSIZER COUNTY DRAINAGE DISTRICT

#### **ACTION #1: REVETMENT OF SLOUGH CHANNEL/HEADWALLS AT ROAD CROSSINGS**

**Issue/Background:** During periods of highwater, high-velocity water in slough causes ditch erosion and bank failure. This project proposes using an interlocking concrete block system to prevent future bank erosion and failure.

**Other Alternatives:** Concrete ditch banks/Box culverts at public road crossings.

**Responsible Office:** Gilsizer County Drainage District

**Priority (High, Medium, Low):** High

**Cost Estimate:** To be determined.

**Benefits:** Prevent future erosion to levee slope. Reduce risk of flooding thereby reducing damage to homeowners and property loss.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds

**Schedule:** 1-5 years

## LEVEE DISTRICT ONE

### **ACTION #1: BANK EROSION REPAIRS TO LEVEES IN SEVERAL AREAS:**

- **AREA 1: 1/5 MILE SOUTH OF BOYDES PUMP BOAT RAMP**
- **AREA 2: ONE MILE SOUTH OF STEWART ROAD**
- **AREA 3: BEHIND COURTHOUSE BUILDING IN YUBA CITY**

**Issue/Background:** High water and rapid flows have caused erosion of the levee slope in several areas. In Area 1, the river has eroded into the toe of the levee. In Area 2, the river has eroded into the bank close to the toe of the levee for about ¼ of a mile. In both of these areas, the district is working with the USACE and the state to rock the bank along the eroded areas. In Area 3, the river has been eroding into the levee over the years, now causing significant concern. The District is working with the USACE and the state to rebuild the levee toe and then rocking the bank.

**Other Alternatives:** Leave as is and monitor.

**Responsible Office:** Levee District One

**Priority (High, Medium, Low):** Medium-High

**Cost Estimate:** Area 1: \$3 million  
Area 2: \$2 million  
Area 3: \$5 million

**Benefits:** Life Safety and property loss. Prevent future erosion to levee slope and limit potential for a levee breaks in these areas. Should a break occur in the area behind the courthouse, downtown Yuba City would be inundated.

**Potential funding:** USACE, State DWR, HMGP, PDM, FMA; Local Funds

**Schedule:** 1-3 years

### **ACTION #2: STAR BEND SET BACK LEVEE**

**Issue/Background:** The Star Bend area of the levee has been an ongoing concern to the levee district due to the sharp bend in the levee combined with an under seepage problem. A grant is being applied for from the State's Proposition 1-E funds to build a set back levee. The funds have been set aside for this project.

**Other Alternatives:** Repair old levee in place and monitor the pressure on the levee

**Responsible Office:** Levee District One

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$20 million

**Benefits:** Life Safety and property loss. Should a break occur in this area, ½ of the Yuba City Bowl would be under water.

**Potential funding:** State Prop. 1-E: \$17 million  
Local Share: \$3 million

**Schedule:** 1-3 years

### **ACTION #3: RELIEF WELL LOCATION (N. STAR BEND)**

**Issue/Background:** An area of heavy under seepage that was repaired by the USACE (1997) is again of concern. The relief wells in this area failed to work during the high water of 2006 allowing boils to occur. The District is currently working with the USACE, State Reclamation Board, and locals to identify the best solution. The best solution likely includes construction of a slurry wall in place of the relief wells.

**Other Alternatives:** Construct a set back levee (although, likely not feasible)

**Responsible Office:** Levee District One

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$10 million

**Benefits:** Life Safety and property loss. Should a break occur in this area, ½ of the Yuba City Bowl would be under water.

**Potential funding:** USACE, State DWR, HMGP, PDM, FMA; Local Funds

**Schedule:** 1 year

## RECLAMATION DISTRICT 1001

### **ACTION #1: UNIT 2 LB YANKEE SLOUGH LEVEE REPAIRS EAST OF SWANSON ROAD**

**Issue/Background:** High water and rapid flows in the Yankee Slough have caused erosion of the levee slope. High water of 2005/2006 worsened erosion of levee slope whereby cutting into the slope of the levee. PL 84-89 repairs to be fixed to predisaster design are Order 3.

**Other Alternatives:** Excavate areas of erosion, replace material lost and place large rock revetment to keep bank from further erosion.

**Responsible Office:** Reclamation District 1001

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** \$1 million

**Benefits:** Prevent future erosion to levee slope. Reduce risk of flooding thereby reducing damage to homeowners and property loss.

**Potential funding:** HMGP, PDM, FMA; State Funds & Grants; Local Funds; Private Funds

**Schedule:** 2008-2009

### **ACTION #2: FEATHER RIVER/SACRAMENTO RIVER LANDSLIDE STABILITY BERM**

**Issue/Background:** Frequent flooding characterized by large flows has plagued the Sacramento River Basin which includes the left bank of the Feather and Sacramento Rivers in Reclamation District 1001. In order to reduce flood risk due to under seepage, studies were conducted on ways to prevent seepage from undermining the levee structure. In 1996 Mid Valley Levee Rehab Phase III started the process through analysis of the system to develop a project design. Numerous projects were considered with the final design as a landside seepage berm four feet high. ( 4 areas totaling 6,410LF)

**Other Alternatives:** deep slurry wall, landside toe drain

**Responsible Office:** Reclamation District 1001

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$6 ½ million

**Benefits:** Landside berm would provide the necessary stability for the levee. Reduce the risk of flooding from under seepage-issues. Reduce damage to homeowners and property loss caused by flooding

**Potential funding:** State Funds (Bond), Grants and Local Funds  
Mid Valley Levee Rehab Phase III Funding (if reinstated)

**Schedule:** Project design is in place needing final environmental assessment and funding.

### **ACTION #3: NORTH LEVEE OF NATOMAS CROSS CANAL REPAIRS**

**Issue/Background:** Due to high water, heavy rains and severe winds in January 2006, the north levee of the Natomas Cross began to erode from wave wash action. Emergency wave wash repairs were done by the placing of sand bags and plastic on the damaged portion of the levee to prevent further damage.

There was similar wave wash damage from the storms 1996/97. Corp fixed damage hauling in material and compacting it in place only to fail again.

**Other Alternatives:** Reshape landside slope and place a rock layer (10" - 12" minus) to prevent this type of erosion in the future.

**Responsible Office:** Reclamation District 1001

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** TBD

**Benefits:** Prevent future damage from wave wash. Maintain the integrity of the levee to prevent flooding and loss to homeowners and property.

**Potential funding:** State Bond Funds; Grants: PDM, HMGP, FMA; Local Funds

**Schedule:** 2008-2009

### **ACTION #4: INFRASTRUCTURE IMPROVEMENTS - DISTRICT-WIDE AND MAIN PUMPING FACILITY**

**Issue/Background:** District's infrastructure is very old. The main pumping plant was constructed in the early 1900s along with most of the pipelines for drainage. RD 1001 staff is currently undertaking a flood control system-wide analysis of needed repair and/or replacement of essential infrastructure. (i.e., Main pump facility & pipes that facilitate drainage of District's 32,000 acres.)

Internal inspection of pipelines will be needed, possibly using closed circuit television inspection equipment. Repairs to the inspected pipelines could be achieved using the following methods:

- 1) Plastic pipe insert supported by grout substance.
- 2) Cured in-place- pipe application.

**Other Alternatives:** Removal and replacement of pipes by excavating portions of the levee to remove and replace pipe; thereby possibly disturbing the environment.

**Responsible Office:** Reclamation District 1001

**Priority (High, Medium, Low):** High

**Cost Estimate:** TBD

**Benefits:** Avoid loss due to flooding of drainage pipe and pump facility failure.

**Potential funding:** Grants: PDM, HMGP, FMA; Local Funds: RD1001 Operation and Maintenance Assessments

**Schedule:** 2007-2009

### ACTION #1: KARNAK PUMP PLANT RENOVATION



**Karnak Pump Plant**

**Issue/Background:** Karnak Pump Plant 1 was built in 1914. It consisted of 6- 800 horsepower 50” centrifugal pumps, housed in a block building. In 1952 Pump Plant 3 was built. It consisted of 4- 700 horsepower 48” vertical pumps and is housed in a steel building next to pump plant 1. The pumps and electrical equipment have been maintained, upgraded and modernized as money is available and wear and tear dictates.

The plant has a single source of commercial electrical power, that being from PG&E. The power is supplied from a transfer station south of Knights Landing California. The main power supply lines come from two directions into this transfer station then is routed overhead across the Sacramento River to our pumping station at Karnak. We are very vulnerable to power interruptions. In 1997 the power coming into the transfer station south of Knights Landing failed and our pump plant was without power for approximately six hours causing flooding in the town of Robbins. The water covered the streets and was at the foundations of many homes. During the winter of 2005/06 there was a power interruption causing high voltage on one side of the Sacramento River and low voltage on our side of the River. This low voltage situation cost the

District over \$100,000 in damages to the electrical system. Because of the overhead power lines, power can be interrupted for various reasons such as high winds knocking down the power lines or poles, electrical storms knocking out power switches or various problems relating to PG&E's operations. Over the years the District has had close calls with all these types of problems. Due to the fact that there is only one source of power from south of Knights Landing to our pumping plants at Karnak, which is about 5 miles away if anything happens and these power lines fail our pumps will stop. If this failure is during a critical storm such as last winter, then the entire town of Robbins, California, Highway 113, and surrounding agriculture farmland and farm industry support facilities will be at great risk of flooding.

An alternative power supply would make the system more stable and prevent potentially severe flooding impacts as a result of loss of power.



### **Power Leading to Karnak**

**Other alternatives:** No Action

**Responsible Office:** RD1500

**Priority (High, Medium, Low):** High

**Cost Estimate:** To be determined

**Benefit:** Life safety, reduction in economic and property impacts.

Sutter Basin is surrounded by levees maintained and monitored by Reclamation District 1500. All water coming into this Basin must be pumped or gravity feed out. During high water, the release of water at Oroville Dam and high Feather River water flows will not allow for gravity feed so that all water must be pumped out of the basin. If the pumps at Karnak fail, then flooding in the south end of the District will start immediately; and within 4 to 6 hours water will be in the Sutter Basin Growers Co-Op and the town of Robbins. The Co-Op's approximate annual revenue to its growers is 22 million dollars with assets valued at about 15 million dollars. Flooding the town of Robbins would cause considerable damage to its 100 residents, school and businesses. If flooding occurs in the Basin, then Hwy 113 a major north-south transportation route from Yuba City south, with a bridge over the Sutter Bypass, could close, which in the 1997 storm and flood events was one of the few emergency routes out of Yuba City that remained opened.

**Potential funding:** PDM, HMGP, FMA

**Schedule:** To be determined.

## RECLAMATION DISTRICT 70

### **ACTION #1: PUMPING PLANT PROJECT**

**Issue/Background:** During times of heavy storms and high water in the Sacramento River and Sutter By-Pass, there is some localized flooding within the District. One proposal is to increase the pumping capacity at our Main Pumping Plant to over come the localized flooding.

**Other Alternatives:** Install a pumping system at a location other than the Main Pumping Plant such as mid way in the District to capture the water before it overtops the District canals.

**Responsible Office:** Reclamation District 70

**Priority (High, Medium, Low):** Medium

**Cost Estimate:** \$100,000

**Benefits:** Prevent short term flooding of county roadways and flooding of private property.

**Potential funding:** HMGP, Local funds, private funds.

**Schedule:** 2008

## RECLAMATION DISTRICT 1660

### **ACTION #1: SUTTER BY-PASS PROJECT**

**Issue/Background:** During high flows in the Sutter By-Pass, the levee system just north of McClatchy Road is subject to major seepage, and at one location at pumping plant # 3 has a direct flow of water under the levee into the drainage ditch.

**Other Alternatives:** To install either a French drain or a slurry wall for several hundred feet in this area to relieve the pressure on this site.

**Responsible Office:** Reclamation District 1660

**Priority (High, Medium, Low):** High

**Cost Estimate:** \$100,000

**Benefits:** Without repair this could cause a major levee failure in the Meridian basin.

**Potential funding:** HMGP, Corp of Engineers, Local funds.

**Schedule:** 2008-2009

# Multi-Hazard Mitigation Plan

## 6.0 Plan Adoption

*44 CFR requirement 201.6(c)(5): “{The local hazard mitigation plan shall include} documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).”*



The purpose of formally adopting this plan is to secure buy-in from participating jurisdictions, raise awareness of the plan, and formalize the plan’s implementation. The adoption of this plan completes Step 9 of the Plan Development Process: Formal Plan Adoption. The governing board for each participating jurisdiction have adopted this Multi-Hazard Mitigation Plan by passing a resolution. A copy of the generic resolution and the executed copy is included in Appendix D.

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# Multi-Hazard Mitigation Plan

## 7.0 Plan Implementation and Maintenance

*44 CFR Requirement 201.6(c)(4): “{The plan maintenance process shall include a} section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.”*

Implementation and Maintenance of the plan is critical to the overall success of Hazard Mitigation Planning. This is Step 10 of the 10 step Plan Development Process.

### Implementation

Upon adoption, the plan faces the truest test of its worth: implementation. Implementation implies two concepts: action and priority. These are closely related. While this plan puts forth many worthwhile and high priority recommendations, the decision about which action to undertake first will be the first task facing the HMPC. Fortunately, there are two factors that help make that decision. First, there are high priority items and second, funding is always an issue. Thus, pursuing low or no-cost high-priority recommendations will have the greatest likelihood of success.

Another important implementation mechanism that is highly effective and low-cost, is to incorporate the Hazard Mitigation Plan recommendations and their underlying principles of this into other community plans and mechanisms, such as the General Plan, Drainage Plans, and capital improvement budgeting. The County and participating jurisdictions have and continue to implement policies and programs to reduce losses to life and property from natural hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs, and recommends implementing projects, where possible, through these other program mechanisms. **Mitigation is most successful when it is incorporated within the day-to-day functions and priorities of government and development.** This integration is accomplished by constant, pervasive and energetic efforts to network, identify and highlight the multi-objective, win-win benefits to each program, the Sutter County community, and its stakeholders. This effort is achieved through the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community.

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how any required local match or participation requirement can be met. When funding does become available, the HMPC will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, special district budgeted funds, state or federal earmarked funds, and grant programs including those that can serve or support multi-objective applications.

Additional mitigation strategies could include consistent and ongoing enforcement of existing policies, and vigilant review of county-wide programs for coordination and identification of multi-objective opportunities.

## **Mitigation Coordinating Committee (HMPC)**

With adoption of this plan, the HMPC will be tasked with plan implementation and maintenance. This Mitigation Coordinating Committee (i.e., HMPC), led by the Sutter County Office of Emergency Services, agrees to:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high priority, low/no-cost recommended actions;
- Keep the concept of mitigation in the forefront of community decision-making by identifying plan recommendations when other community goals, plans and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to assist the community in implementing the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update this plan;
- Report on plan progress and recommended changes to the governing boards for the communities; and
- Inform and solicit input from the public.

The Committee will not have any powers over county or city staff; it will be purely an advisory body. Its primary duty is to see the plan successfully carried out and to report to the community governing boards and the public on the status of plan implementation and mitigation opportunities for the Sutter County Planning Area. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the county and city websites.

## **Maintenance**

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation, and to update the plan as progress, roadblocks or changing circumstances are recognized.

### **Maintenance Schedule**

In order to track progress and update the Mitigation Strategies identified in the Action Plan the County will revisit the Multi Hazard Mitigation Plan annually, or after a hazard event. The Sutter County Office of Emergency Services is responsible for initiating this review and will consult with members of the HMPC. This monitoring and updating will take place through a semi-annual review by the Sutter County Office of Emergency Services, an annual review through the HMPC, and a 5-year written update to be submitted to the state and FEMA Region

IX, unless disaster or other circumstances (e.g., changing regulations) lead to a different time frame.

### **Maintenance Evaluation Process**

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the Plan. Changes in vulnerability can be identified by noting:

- Lessened vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions, and/or
- Increased vulnerability as a result of new development (and/or annexation).

Updates to this plan will consider:

- Changes in vulnerability due to project implementation
- Document success stories where mitigation efforts have proven effective
- Document areas where mitigation actions were not effective
- Document any new hazards that may arise or were previously overlooked
- Incorporating new data or studies on hazards and risks
- Incorporate new capabilities or changes in capabilities
- Incorporate growth and development-related changes to Planning Area inventories
- Incorporate new project recommendations or changes in project prioritization

In order to best evaluate any changes in vulnerability as a result of plan implementation, the HMPC will follow the following process:

- A representative from the responsible office identified in each mitigation measure will be responsible for tracking and reporting on an annual basis to the HMPC on the status of a given project and provide input on whether the project as implemented meets the defined objectives and is likely to be successful in reducing vulnerabilities; and
- If the project does not meet identified objectives, the HMPC will determine what additional measures may be implemented and an assigned individual will be responsible for defining project scope, implementing project, monitoring success of project, and making any required modifications to the plan.

Changes should be made to the plan to accommodate projects that have failed or are not considered feasible after a review for their consistency with established criteria, the time frame, community priorities, and funding resources. Priorities that were not ranked high, but identified as potential mitigation strategies, should be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan will be by written changes and submissions, as the HMPC deems appropriate and necessary, and as approved by the governing board of each participating jurisdiction. In keeping with the process of adopting the plan, a public involvement process to receive public comment on plan maintenance and updating should be held during the annual review period, and the final product adopted by the governing boards, appropriately.

## **Incorporation into Existing Planning Mechanisms**

The Mitigation Strategy listed in Section 5.3 of this plan recommends utilizing existing plans and/or programs to implement hazard mitigation in the Sutter County Planning Area, where possible. This point is also emphasized previously in this Implementation and Maintenance section. Based on this plan's capability assessment, the Planning Area has and continues to implement policies and programs to reduce losses to life and property from natural hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs, and recommends implementing projects, where possible, through the following mechanisms:

- Sutter County General Plan
- Yuba City General Plan
- City of Live Oak General Plan
- Harter Specific Plan
- Lincoln East Specific Plan
- West Yuba Drainage Study
- Urban Water Management Plan
- County Code of Building Regulations
- City Ordinances
- Capital Facilities Plans and Budgets
- Other plans, regulations, and practices outlined within the Capability Assessment section of this plan and/or those developed or under development by participating jurisdictions.

## **Continued Public Involvement**

Continued public involvement is also imperative to the overall success of the plan and implementation of the mitigation strategy. The update process provides an opportunity to publicize success stories from the plan's implementation, and seek additional public comment. A public hearing(s) to receive public comment on plan maintenance and updating should be held during the update period. When the HMPC reconvenes for the update they will coordinate with all stakeholders participating in the planning process – or that have joined the Committee since inception of the planning process – to update and revise the plan. Public notice will be posted and public participation will be invited, at a minimum, through available web postings and press releases to the local media outlets, primarily newspapers and AM radio stations.

# Multi-Hazard Mitigation Plan

## Appendix A

### Acronyms and Abbreviations Used in this Plan

AMEC	AMEC Earth & Environmental
ARES	Amateur Radio Emergency Services
BLM	Bureau of Land Management
BMPs	Best Management Practices
BOR	Bureau of Reclamation
CA-DWR	California Department of Water Resources
Caltrans	California Department of Transportation
CA-OES	California Office of Emergency Services
CCR	California Code of Regulations
CDBG	Community Development Block Grants
CDF	California Department of Forestry
CEQA	California Environmental Quality Act
CERES	California Environmental Resources Evaluation System
CERT	Citizen Emergency Response Team
CFS	Cubic Foot per Second
CGS	California Geological Survey
CRCV	Coast Range Central Valley
CRS	Community Rating System
CWA	Clean Water Act
DHS	Department of Homeland Security

DMA	Disaster Mitigation Act
EIR	Environmental Impact Report
FEMA	Federal Emergency Management Agency (technically the Emergency Preparedness and Response (EP&R) within the Department of Homeland Security [DHS])
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FTP	File Transfer Protocol
FWS	Fish and Wildlife Service
GIS	Geographical Information System
HAZUS	FEMA's Loss Estimation Software Program
HI	Heat Index
HMGP	Hazard Mitigation Grant Program
HMPC	Hazard Mitigation Planning Committee
HUD	Housing and Urban Development
ISO	Insurance Services Office
Km	Kilometer
LHMP	Local Hazard Mitigation Plan
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
LOMR	Letter of Map Revision
MCE	Maximum Credible Earthquake
MMI	Modified Mercalli Intensity scale

MPE	Maximum Probable Earthquake
NCDC	National Climatic Data Center
NEPA	National Environmental Quality Act
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
OES	Office of Emergency Services
PDM	Pre-Disaster Mitigation (Grant Program)
PG&E	Pacific Gas & Electric
PHGA	Peak Horizontal Ground Acceleration
POR	Period of Record
RL	Repetitive Loss
SEMS	State Emergency Management System
SUP	Special Use Permit
UBC	Uniform Building Code
URM	Unreinforced Masonry (e.g., brick buildings, most prone to earthquake damage)
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WUI	Wildland Urban Interface
WNV	West Nile Virus

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# Multi-Hazard Mitigation Plan Appendix B

## Data Collection Guide

### **MULTI-HAZARD MITIGATION PLAN DATA COLLECTION GUIDE**

**For**

**YUBA-SUTTER  
HAZARD MITIGATION PLANNING COMMITTEE (HMPC)**

**Prepared by**

**AMEC Earth and Environmental, Inc.**

**July, 2006**

## **OVERVIEW**

The contents of this workbook have been designed to assist the Yuba-Sutter Planning Area, including all participating jurisdictions, (collectively referred to as Yuba-Sutter) in collecting necessary background information to support the hazard mitigation planning process pursuant to the Federal Disaster Mitigation Act (DMA) of 2000. This includes a hazard identification and vulnerability assessment, an assessment of Yuba-Sutter's current hazard mitigation capabilities, and an identification of potential mitigation projects that, if undertaken, could prevent or reduce future losses.

The essential information needed to support the planning process includes background information about Yuba-Sutter; plans, technical studies, and data related to hazards and risks; current governing codes, ordinances, regulations, and procedures whose intent is to minimize future losses; and some indication of Yuba-Sutter's technical and organizational capabilities to perform hazard mitigation/loss prevention functions. It is important that the plan shows what Yuba-Sutter is doing now to limit future disaster losses.

The planning process is heavily dependent on existing data to be supplied by each of the participants represented on the Hazard Mitigation Planning Committee (HMPC). The DMA plan development process does not require the development of new data, but requires *existing data only*.

The information collected provides the basis for the action plan that contains goals for the future; identifies mitigation issues and actions that are important to each participant; and assigns priorities and responsibilities for their adoption and implementation. The goal of this process is to produce a hazard mitigation plan that meets Yuba-Sutter's needs, as well as the requirements of DMA 2000 and that contains a list of projects that may be eligible for streamlined federal mitigation funding pre or post disaster.

## **PARTICIPATION**

The DMA planning regulations and guidance stress that each entity seeking the required FEMA approval of their mitigation plan must:

- Participate in the process;
- Detail areas within the planning area where the risk differs from that facing the entire area;
- Identify specific projects to be eligible for funding; and
- Have the governing board formally adopt the plan.

For HMPC members, 'participation' means the planning committee representatives will:

- Attend and participate in HMPC meetings;
- Provide available data that is requested of the HMPC coordinator;
- Review and provide/coordinate comments on the draft plans;
- Advertise, coordinate and participate in the public input process; and
- Coordinate the formal adoption of the plan by the governing board.

## DATA COLLECTION GUIDE

This guide contains an explanation of the types of hazard mitigation/loss prevention data that is needed for the hazard mitigation planning process. This guide identifies specific requirements for the Risk Assessment Process, which includes the Hazard Identification, Vulnerability, and Capability Assessments and requirements for development of the Mitigation Strategy

AMEC has learned some valuable lessons about how to make the data collection process well organized and effective. Some ways of organizing the data collection process include: (1) the “circuit riding” HMPC member who contacts everyone individually in his/her jurisdiction or area of expertise and assembles the information; (2) the committee approach wherein a “mini-HMPC” is formed within the jurisdiction to collectively compile the needed data; and (3) a “network” based on existing relationships is used to funnel data to the HMPC representative (seems especially useful for widely dispersed types of organizations that have common functions, such as school districts and fire districts). Regardless, it is important to contact and involve those persons whose responsibilities include activities for avoiding future losses.

Some lessons about effective data collection include: (1) being inclusive; that is, collecting all of the potentially useful information one time so time-consuming follow-up work is minimized, (2) following this guidance carefully, and (3) asking questions of the consultants before great effort is expended.

The worksheets at the end of this guide have been developed to assist with the data collection. These need to be completed by each participating entity and will serve two purposes:

- 1) they will help facilitate the collection of the necessary information, and
- 2) they will function as evidence of “participation” in the planning process.

### **The Risk Assessment Process**

The risk assessment process includes three components: 1) Hazard Identification, 2) Vulnerability Assessment, and 3) Capability Assessment. Data needs for each of the plan components are described in the following pages.

***Hazard Identification Data*** for the following hazards:

- Avalanche
- Dam failure
- Drought
- Earthquakes
- Floods
- Landslides
- Natural health hazards

- West Nile Virus
- Rabies
- Other?
- Severe weather
  - Dust storms
  - Extreme temperatures
  - Fog
  - Hailstorm
  - Heavy rains/storms
  - Lightning
  - Tornadoes
  - Windstorm
  - Winter Storms
- Soil Hazards
  - Land subsidence
  - Expansive soils
  - Erosion
  - Soil liquefaction
- Volcanoes
- Wildfires

*Specifically*, we need the following types of data to construct a good historical summary of each hazard as it impacts Yuba-Sutter:

- What type of hazard event?
- Brief description of the nature and magnitude of the event
- Where did the event occur?
  - County, City, area/facilities affected, physical location/boundaries on map
- When did it occur – date?
- Type of damage?
  - Personal injury/death
  - Damage to infrastructure/personal property
  - Damage to crops
  - Lost business or work
  - Road/School/other closures
- Approximate dollar amount of damage?
- Percentage of costs covered by insurance? Other?
- Opinion as to whether this is likely to occur again, either in the planning area in general and/or in the location of the previous occurrence.
- Dollars received from federal/state disaster declarations in each community

A summary Hazard Identification Worksheet (**Worksheet 1**) and Historic Hazard Event Data Collection Sheet (**Worksheet 2**) are included at the end of this workbook to help collect this information. It is also very useful to provide backup data that supports the information provided in the worksheets. Types of backup data include news articles and reports, interagency memos, and copies of pertinent information from technical reports, plans and studies.

## ***Vulnerability Data***

For each identified hazard, we need to determine the vulnerability of Yuba-Sutter as follows:

- Do any of the hazards occur repeatedly in a given area or areas to create a hazard map? Provide existing hazard map or identify hazard risk areas on a base map.
- Inventorying each mapped risk area (hazard by hazard, where different):
  - Total Values at Risk (i.e., types, numbers, and value of improvements)
  - Building Counts, by type of use, occupancy, construction
  - Estimated Values of those structures
  - Past Loss Data, as an indication of potential future losses
  - Insurance Data – coverage, claims paid, and repetitive losses
  - Identification of critical facilities at risk and provide estimated values (See list below)
  - Identification of natural resources at risk- wetlands, threatened & endangered species, others
  - Identification of cultural resources at risk – state & federal listed historic sites
  - Identification of impact to the community
  - Describe development trends within risk area
- Identify the above items for risk areas that can't be specifically mapped (likely a total listing of all above items on a community by community basis)
- County Abstract of assessed valuations or insured values
- Flood risk areas and floodplain inventory on a community by community basis (# of buildings and # of Repetitive Losses)
- National Flood Insurance Program (NFIP) insurance data (# of policies, number/date/dollars of claims paid)
- Average depth of 100-year floodplain in communities

***A critical facility*** is often defined as one that is essential in providing utility or direction either: 1) during the response to an emergency; or 2) during the recovery operation. Some critical facilities are likely located in identified risk areas of the County and communities, potentially rendering them inoperable in an emergency. Critical facilities can also include those facilities that may require additional attention during an emergency such as daycares and nursing homes. Examples of critical facilities include:

- |   |                                  |
|---|----------------------------------|
| ▪ Main County Office Building/Municipal Buildings | ▪ Police Stations                |
| ▪ Water pumping and disinfection stations         | ▪ Fire Stations                  |
| ▪ Airports  | ▪ Emergency Operations Center(s) |
| ▪ Wellheads and water towers and tanks            | ▪ Key Access Roads               |
| ▪ Power Substations                               | ▪ Hospitals                      |
| ▪ Sewage Lift Stations                            | ▪ Schools                        |
| ▪ Aboveground pipeline (gas) facilities           | ▪ Shelters                       |
|   | ▪ Day Cares                      |
|   | ▪ Nursing Homes                  |

A Vulnerability Worksheet (**Worksheet 3**) is included at the end of this workbook.

## *Capability Data*

This section describes the type of required information for documenting Yuba-Sutter's existing capabilities for reducing future disaster losses. A matrix (**Worksheet 4**), included at the end of this workbook, can be used as a checklist for collecting this information.

Capabilities are methods that the participating jurisdiction currently uses to reduce hazard impacts. A capability matrix is provided to help identify the usual methods that communities follow to mitigate hazards. Please err on the side of generosity so the planning team has the most complete relevant information available to it to support the planning process. Please complete the matrix and provide supporting documentation regarding:

- ID and provide other programs/projects underway for hazard mitigation
- ID and provide other community plans and goals
- ID and provide existing policy/program guidance
  - General Plan/safety elements/natural environment elements
  - Zoning/Flood Plain Management Ordinances
  - Building Codes (Seismic, Wildfire, BCEGS rating?)
  - Existing Emergency Management (i.e., Warning, Evacuation, EOC, LEPC, Utilities Response Plan)
- Other existing capabilities that mitigate the risk and vulnerability of a community to a given hazard?
- Listing of GIS Data available for each community: Floodplain maps, Floodplain Building/parcel inventory, Building type? Critical facility inventory [Police, Fire, Power, Water, Sewer, Drainage pumps], repetitive loss *areas*, completed/underway mitigation project areas (elevation/acquisition), land use, building types (URM, manufactured housing parks), soils map, vegetation types, natural/cultural resource areas, dam-failure inundation maps, levee failure inundation maps, existing hazard maps)
- Response and evacuation plans for Dams

## **The Mitigation Strategy**

One of the planning process' last activities will be for HMPC members to prepare brief descriptions of proposed mitigation projects that would effectively reduce future disaster losses. It is very important that potential projects start being identified very early so the information needed to describe them and to assign priorities is developed during the entire process, leaving only "final tinkering" for the final phase of work.

This section provides guidance on the categories of mitigation measures to be considered and a mitigation project outline with two example projects. Two Mitigation Worksheets (**Worksheets 5 and 6**) are included at the end of this workbook. **Worksheet 5** provides a form for brainstorming potential projects to address identified issues. **Worksheet 6**

provides the format for writing up potential projects to be included in the mitigation strategy.

### **Categories of Mitigation Measures**

**PREVENTION:** Preventive measures are designed to keep the problem from occurring or getting worse. Their objective is to ensure that future development is not exposed to damage and does not increase damage to other properties.

- ***Planning***
- ***Zoning***
- ***Open Space Preservation***
- ***Land Development Regulations***
  - ***Subdivision regulations***
  - ***Building Codes***
    - ***Fire-Wise Construction***
  - ***Floodplain development regulations***
  - ***Geologic Hazard Areas development regulations (for roads too!)***
- ***Storm Water Management***
- ***Fuels Management, Fire-Breaks***

**EMERGENCY SERVICES** measures protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- ***Warning*** (flooding, tornadoes, winter storms, geologic hazards, fire)
  - NOAA Weather Radio
  - Sirens
  - “Reverse 911” (Emergency Notification System)
- ***Emergency Response***
  - ***Evacuation & Sheltering***
  - ***Communications***
  - ***Emergency Planning***
    - Activating the EOC (emergency management)
    - Closing streets or bridges (police or public works)
    - Shutting off power to threatened areas (utility company)
    - Holding/releasing children at school (school district)
    - Passing out sand and sandbags (public works)
    - Ordering an evacuation (mayor)
    - Opening emergency shelters (Red Cross)
    - Monitoring water levels (engineering)
    - Security and other protection measures (police)
- ***Critical Facilities Protection (Buildings or locations vital to the response and recovery effort, such as police/fire stations, hospitals, sewage treatment plants/lift stations, power substations)***
  - Buildings or locations that, if damaged, would create secondary disasters, such as hazardous materials facilities and nursing homes
  - Lifeline Utilities Protection
- ***Post-Disaster Mitigation***

- Building Inspections
- ID mitigation opportunities & funding before reconstruction

**PROPERTY PROTECTION:** Property protection measures are used to modify buildings subject to damage rather than to keep the hazard away. A community may find these to be inexpensive measures because often they are implemented by or cost-shared with property owners. Many of the measures do not affect the appearance or use of a building, which makes them particularly appropriate for historical sites and landmarks.

- ***Retrofitting/disaster proofing***
  - ***Floods***
    - Wet/Dry floodproofing (barriers, shields, backflow valves)
    - Relocation/Elevation
    - Acquisition
    - Retrofitting
  - ***High Winds/Tornadoes***
    - Safe Rooms
    - Securing roofs and foundations with fasteners and tie-downs
    - Strengthening garage doors and other large openings
  - ***Winter Storms***
    - Immediate snow/ice removal from roofs, tree limbs
    - “Living” snow fences
  - ***Geologic Hazards (Landslides, earthquakes, sinkholes)***
    - Anchoring, bracing, shear walls
    - Dewatering sites, agricultural practices
    - Catch basins
  - ***Drought***
    - Improve water supply (transport/storage/conservation)
    - Remove moisture competitive plants (Tamarisk/Salt Cedar)
    - Water Restrictions/Water Saver Sprinklers/Appliances
    - Grazing on CRP lands (no overgrazing-see Noxious Weeds)
    - Create incentives to consolidate/connect water services
    - Recycled wastewater on golf courses
  - ***Wildfire, Grassfires***
    - Replacing building components with fireproof materials
      - Roofing, screening
    - Create “Defensible Space”
    - Installing spark arrestors
    - Fuels Modification
  - ***Noxious Weeds/Insects***
    - Mowing
    - Spraying
    - Replacement planting
    - Stop overgrazing

- Introduce natural predators

- *Insurance*

**NATURAL RESOURCE PROTECTION:** Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. These natural and beneficial floodplain functions include the following:

- storage of floodwaters
- absorption of flood energy
- reduction in flood scour
- infiltration that absorbs overland flood flow
- groundwater recharge
- removal/filtering of excess nutrients, pollutants, and sediments from floodwaters
- habitat for flora and fauna
- recreational and aesthetic opportunities

Methods of protecting natural resources include:

- *Wetlands Protection*
- *Riparian Area/Habitat Protection/Threatened-Endangered Species*
- *Erosion & Sediment Control*
- *Best Management Practices*

Best management practices (“BMPs”) are measures that reduce nonpoint source pollutants that enter the waterways. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground’s surface by stormwater and flushed into receiving storm sewers, ditches and streams. BMPs can be implemented during construction and as part of a project’s design to permanently address nonpoint source pollutants. There are three general categories of BMPs:

1. Avoidance: setting construction projects back from the stream.
  2. Reduction: Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.
  3. Cleanse: Stopping pollutants after they are en route to a stream, such as using grass drainageways that filter the water and retention and detention basins that let pollutants settle to the bottom before they are drained
- *Dumping Regulations*
  - *Set-back regulations/buffers*
  - *Fuels Management*

- *Water Use Restrictions*
- *Landscape Management*
- *Weather Modification*

**STRUCTURAL PROJECTS** have traditionally been used by communities to control flows and water surface elevations. Structural projects keep flood waters away from an area. They are usually designed by engineers and managed or maintained by public works staff. These measures are popular with many because they “stop” flooding problems. However, structural projects have several important shortcomings that need to be kept in mind when considering them for flood hazard mitigation:

- They are expensive, sometimes requiring capital bond issues and/or cost sharing with Federal agencies, such as the U.S. Army Corps of Engineers or the Natural Resources Conservation Service.
- They disturb the land and disrupt natural water flows, often destroying habitats or requiring Environmental Assessments.
- They are built to a certain flood protection level that can be exceeded by a larger flood, causing extensive damage.
- They can create a false sense of security when people protected by a structure believe that no flood can ever reach them.
- They require regular maintenance to ensure that they continue to provide their design protection level.

Structural measures include:

- *Detention/Retention structures*
- *Erosion and Sediment Control*
- *Basins/Low-head Weirs*
- *Channel Modifications*
- *Culvert resizing/replacement/Maintenance*
- *Levees and Floodwalls*
- *Anchoring, grading, debris basins (for landslides)*
- *Fencing (for snow, sand, wind)*
- *Drainage System Maintenance*
- *Reservoirs(for flood control, water storage, recreation, agriculture)*
- *Diversions*
- *Storm Sewers*

**PUBLIC INFORMATION:** A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. These activities can motivate people to take protection

- *Hazard Maps and Data*
- *Outreach Projects* (mailings, media, web, speakers bureau, displays)
- *Library Resources*
- *Real Estate Disclosure*
- *Environmental Education*

### **Example Project Description**

Each project description for each jurisdiction should conform to the following format:

**TITLE**  
**Issue/Background**  
**Other Alternatives**  
**Responsible Office**  
**Priority (H,M,L)**

**Cost Estimate**  
**Benefits**  
**Potential funding**  
**Schedule**

This Mitigation Project Description Worksheet (**Worksheet 6**) is included at the end of this workbook to record potential projects during the planning process.

The following are two examples taken from other DMA 2000 qualifying plans.

## **Sample ACTION #12: ELEVATE REMAINING 95 HOMES IN THE DRY CREEK WATERSHED**

**Issue/Background:** Historically, flooding in the Dry Creek watershed has been a major concern. The February 1986 flood caused widespread damage in most of the Dry Creek watershed. Nearly all bridges and culverts were overtopped, with 30 sustaining embankment damages and one crossing washing out; two bridges over Dry Creek were damaged, street cave-ins occurred at a number of locations, and over 125 homes flooded. Of the 145 homes subject to historical flooding within the Watershed, 95 structures remain non-elevated. Of these 95 remaining homes, 25-30 declined initial grant money for elevation as did the three repetitive loss structures. Placer County is not only concerned with existing flooding problems, but with future problems resulting from increased growth and development in the area. According to the 1992 Dry Creek Watershed, Flood Control Plan, substantial flood damages will occur with the 100-year flood under existing conditions. Areas with the most extensive and frequent damages include areas in the location of the 95 homes. The report indicates that some of these areas are susceptible to flooding from storms as frequent as the 10-year storm. Elevating the remaining 95 homes will reduce future flood-related losses.

**Other Alternatives:** No Action

**Responsible Office:** Placer County Flood Control and Water Conservation District, in conjunction with its member agencies including the cities of Rocklin, Loomis, and Roseville.

**Priority (H, M, L):** Medium

**Cost Estimate:** The cost to elevate is estimated at \$40 per square foot. Homes need to be elevated anywhere from one to six feet. Of the 95 homes where elevating is feasible, it is estimated to cost \$6 million or \$50 to \$60 K per home.

**Benefit:** Life Safety; Reduction in Property Loss.

**Potential Funding:** HGMP, PDM, Dry Creek Trust Fund

**Schedule:** Within three years

## **Sample ACTION #4: TODD VALLEY SHADED FUEL BREAK**

**Issue/Background:** Saving lives and property along with rapid containment of wildfires and structure fires are a high priority for the Foresthill Fire Protection District (FFPD) and Foresthill Fire Safe Council (FFSC). The Todd Valley Subdivision is a neighborhood of about 1,100 homes located southeast of Foresthill, CA in rural Placer County. Encompassing some 1,500 acres, and 45 miles of roadways, with only two main exits to Foresthill Rd. The southern boundary of the 25-year-old subdivision directly intersects the steep cliffs of the Middle Fork of the American River. Lot sizes are all one acre or more. To the 3,000 people who live there, Todd Valley appears to be an isolated enclave, sheltered by towering oaks and pine trees. Many homes are shielded from neighbor's views by a quarter-century accumulation of dense brush and impenetrable vegetation under story. The calculations for fire travel from the Middle Fork American River to this subdivision in the middle of summer on the right day is 15 minutes.

A Shaded Fuel Break at the top of the ridge of the Middle Fork American River Canyon would give firefighters a place to make a stand and allow an area for the fire to slow and drop to the ground where it can be managed. This would also give Sheriffs and Firefighters a better chance to evacuate the area.

**Other Alternatives:** If you look at the fire history on the Foresthill Divide its not a question of IF but WHEN will we have a devastating wildfire. To do nothing in the Todd Valley area would leave the residents open to a devastating firestorm. The Placer County Chipper Program has been used very successfully in this area, but is still far from making a significant continuous connected Shaded Fuel Break. Continuous public education is also an alternative.

**Responsible Office:** Luana R. Dowling: FFSC Chairman

**Priority (H, M, L):** High

**Cost Estimate:** Approximately \$1,200 per acre. 50/50 match with property owners and a Federal Grant. The Property in the canyon is State Recreation area owned by Bureau of Reclamation (BOR). This recreation area has been the area of several fire starts in the past. It's only a matter of time.

**Benefit:** Benefit to the 3,000 residents of Todd Valley is their lives as well as their homes. At the current County median value per home of over \$400,000 per home, the 1,100 homes in Todd Valley are valued at \$440,000,000. Having a strategically planned shaded fuel break will not only save lives, but also assist firefighters in gaining timely access to protect homes.

**Potential Funding:** Grants, loans and subsidies available for such projects.

**Schedule:** Completed by the end of 2008

## **WORKSHEETS**

## Worksheet 1 Hazard Identification Worksheet

**Purpose:** Use this worksheet to identify the possible hazards that may impact your jurisdiction. This worksheet will be used to support the hazard identification and risk assessment. Use the Hazard Event worksheet to provide evidence to justify your conclusions.

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance	Risk Map Avail. Source/scale	
					GIS	Hard Copy
Avalanches						
Dam Failure						
Drought						
Earthquakes						
Floods						
Hail						
Heavy Rains/Lightning						
High Winds						
Landslides						
Natural Health Hazards						
Tornados						
Wildfires						
Winter Storms						

**Guidelines**

**Frequency of Occurrence:**

*Highly Likely:* Near 100% probability in next year.

*Likely:* Between 10 and 100% probability in next year, or at least one chance in ten years.

*Occasional:* Between 1 and 10% probability in next year, or at least one chance in next 100 years.

*Unlikely:* Less than 1% probability in next 100 years.

**Spatial Extent**

*Limited:* Less than 10% of planning area

*Significant:* 10-50% of planning area

*Extensive:* 50-100% of planning area

Significance (Your subjective opinion)

**Low Medium High**

**Potential Magnitude**

*Catastrophic:* More than 50% of area affected

*Critical:* 25 to 50%

*Limited:* 10 to 25%

*Negligible:* Less than 10

**Contact information**

**Filled out by:**

**Address:**

**Phone:**

## Worksheet 2

### Historic Hazard Event Data Collection Sheet

Instructions: Please fill out one sheet for each event with as much detail as possible. Attach supporting documentation, photocopies of newspaper articles or other original sources.

<b>Type of natural hazard event</b>	
<b>Date of Event</b>	
<b>Description of the nature and magnitude of the event</b>	
<b>Location (community or description with map)</b>	
<b>Injuries</b>	
<b>Deaths</b>	
<b>Property damage</b>	
<b>Infrastructure damage</b>	
<b>Crop damage</b>	
<b>Business/Economic Impact</b>	
<b>Road/School/Other Closures</b>	
<b>Other damage</b>	
<b>Total damages</b>	
<b>Insured losses</b>	
<b>Fed/State Disaster relief funding \$</b>	
<b>Opinion on likelihood of occurring again</b>	
<b>Source of information</b>	
<b>Comments</b>	

**Contact information**

**Name of jurisdiction:**

**Filled out by:**

**Address:**

**Phone:**

**Worksheet 3**  
**Vulnerability Assessment**

Instructions: Please complete to the extent possible the vulnerable buildings, populations, critical facilities and infrastructure for each hazard that affects your jurisdiction. This information will be used to estimate disaster losses, which can then be used to gauge potential benefits of mitigation measures. Attach supporting documentation, photocopies of engineering reports or other sources.

**Jurisdiction:**

**Hazard type, location and description of potential impact:**

Building Inventory

	count	Estimated value
Residential		
Comments		
	count	Estimated value
Commercial		
Comments		

	count	Estimated value
Industrial		
Comments		
	count	Estimated value
Agricultural		
Comments		

	count	Estimated value
Other (Define, e.g., gov.)		
Comments		

**Critical facilities** (List, describe type, number, estimated value/replacement cost):

**Infrastructure** (roads, bridges, lifelines, utilities, etc. estimated value/ replacement cost):

**Affected Population estimate:**

Comments (i.e. special needs populations, residents serviced, etc.):

**Historic/cultural resources affected:**

**Natural resources affected:**

**Other Community Impacts:**

**Development trends/constraints in hazard area:**

**Existing or potential mitigation actions:**

**Source and method of information collection:**

**Contact information**

**Filled out by:**

**Address:**

**Phone:**

### Worksheet 4: Capability Matrix

Jurisdiction:	Y/N other	Comments
Comp Plan/General Plan		
Subdivision Ordinance		
Zoning Ordinance		
NFIP/FPM Ordinance		
- Substantial Damage language?		
- Administrator/Certified Floodplain Manager?		
- # of Flood threatened Buildings?		
- # of flood insurance policies		
- # of Repetitive Losses?		
- Maintain Elevation Certificates?		
CRS Rating, if applicable		
Stormwater Program?		
Erosion or Sediment controls		
# of unreinforced masonry buildings		
Hospitals built before 1973 (for HSSA)		
Alquist-Priolo Special Studies Zones Act		
Building Code Version		
Full-time Building Official?		
Conduct "as-built" Inspections?		
BCEGS Rating		
Local Emergency Operations Plan		
Fire Department ISO Rating		
Fire Safe Programs		
Warning Systems/Services		
- Storm Ready Certified?		
- Weather Radio reception?		
- Outdoor Warning Sirens?		
- Emergency Notification (R-911)?		
- Other? (e.g., cable over-ride)		
GIS System?		
- Hazard Data?		
- Building footprints?		
- Links to Assessor data?		
- Land-Use designations?		
Structural Protection Projects		
Property Protection Projects		
Critical Facilities Protected?		
Natural/Cultural Resources Inventory?		
Public Information Program/Outlet		
Environmental Education Program?		

## **EXPLANATION OF CAPABILITY ASSESSMENT MATRIX**

The following definitions are designed to help each HMPC member complete an assessment of his or hers current capabilities. This list is not exhaustive, and the amount of information available locally can vary greatly between jurisdictions.

[Accompanying matrix entries: Y=yes, N=no, ? = uncertain or item unclear.]

**Comprehensive, General, or Land Use Plan:** Comprehensive (general, land use) long-term community growth management plan; in CA especially need copies of policy section, safety and public facilities elements, and any parts that mention public safety programs, hazards of any kind, and emergency services;

**Special Plans:** Also need similar information from any related “special plans” for limited areas (e.g., new developments, downtown renewals that might require special codes, wildland fire fuels management plans, etc.).

**Subdivision Ordinance:** Dictates lot sizes, densities, set-backs, construction type; need copy.

**Zoning Ordinance:** Dictates type of use and occupancy; implements Land Use Plan; need copy.

**NFIP & FPM Ordinances:** National Flood Insurance Program (NFIP) and Floodplain Management ordinances (FPM): govern development in identified Flood Hazard Areas, and are required for participation in NFIP and Floodplain Mitigation programs. Do not need floodplain maps, but do need related recent (within last 10 years) documents, special studies, program summaries, etc.

**Substantial Damage Language:** FPM ordinance language on Substantial Damage/Improvements (“50% rule”); copy needed if yes.

**Administrator/Certified Floodplain Manager:** Name and contact information needed for Floodplain Management Administrator (someone with the responsibility of enforcing the ordinance and providing ancillary services {e.g., map reading, public education on floods, etc.}, need to know if CFM).

**# of flood threatened buildings:** Need total number of buildings by community that are in the floodplains.

**# of flood insurance policies:** Need total number of buildings by community that are insured against floods through the NFIP.

**# of Repetitive Flood Losses:** Need number of repetitive losses properties (usually on a parcel basis); and for which NFIP/FEMA has paid more than \$1,000 twice in the past 10 years.

**Maintain Elevation Certificates:** The Elevation Certificate documents the lowest floor elevation of any new building or substantial improvement built in the Special Flood Hazard Area. How does the jurisdiction maintain these?

**Community Rating System (CRS) Rating:** NFIP’s: participation (yes or no), and if yes, need the rating.

**Stormwater program:** Need documentation of any existing stormwater management programs.

**Erosion or Sediment Controls:** Need summary information any projects or regulations.

**# of unreinforced masonry buildings:** Need number of URMs reported to state and any mitigation plan or risk reduction program information.

**Hospitals built before 1973 - Hospital Seismic Safety Act:** Need number of hospital buildings governed by HSSA that were built prior to 1973 and which are governed by 1994 legislation that calls for their replacement or change of use.

**Alquist-Priolo Special Studies Zones Act:** Need information about Act’s local implementation regarding geologic studies, report reviews, development controls across defined active faults, etc.

**Building Code Version:** Need the date of most recent UBC adoption (do not need the code itself). Also need to know if the jurisdiction has a full-time inspector and if “as-built” inspections are conducted.

**Building Code Effectiveness Grading System (BCEGS):** rating information; need at least the rating and date of it; and could use back-up documentation showing ratings of various items, and need to know if not rated.

**Local Emergency Operations Plan:** Local Emergency Operations Plan (EOP; a disaster or multi-hazard functional response plan); and any directly related contingency plans (e.g., terrorism response, hazardous materials response, dam failure evacuation {and maps}). Do not need copies of full plans, but do need any hazard assessments/summaries from them and brief information about the compliance with CA’s Standardized Emergency Management System (SEMS), recent or planned updates, training, exercises, etc.

**Fire Department ISO Rating:** Need at least the rating and date of it; and could use back-up documentation showing ratings of various items, especially fire prevention measures and programs, including date of most recent UFC adoption (do not need the code itself).

**Fire Safe Programs:** Need summary information about local fire-safe programs and extent of participation.

**Hazard Mitigation Plans:** Need existing Hazard Mitigation Plans that were for recent past disasters or that were prepared for other reasons. Also need related grant information: purpose of application (e.g., replace earthquake vulnerable communications center), amount requested, and whether approved or not.

**Warning Systems/Services:** Do not need technical information, but do need to know if communities have any types of systems, such as: “Storm Ready” Certification from the National Weather Service, NOAA’s Weather Radio reception, sirens, cable (TV) override, “Reverse 911,” etc.

**GIS and HAZUS Capabilities:** Geographic Information System capabilities and hazards layers and applications, including uses of federally-funded loss estimation software (HAZUS) for earthquakes, floods, and high winds. If yes, need summary information on hazards related layers (e.g., floodplains, ground motion contours) and how used (e.g., to estimate post-earthquake debris, zoning decisions).

**Structural Protection Projects:** Need summary information about proposed or planned projects (e.g., levees, drainage facilities, detention/retention basins, seismic retrofits).

**Property Protection Projects:** Need summary information about proposed or planned projects (e.g., buy-outs, elevation of structures, floodproofing, small "residential" levees or berms/floodwalls, non-structural measures for buildings).

**Critical Facility Protection:** Need summary information about proposed or planned projects (e.g., protection of power substations, sewage lift stations, water-supply sources, the EOC, police/fire stations, medical facilities) that are at risk from the area’s hazards.

**Natural And Cultural Inventories:** Inventories of resources, maps, or special regulations within the community (e.g., wetlands, Native American sites, historic structures/districts, etc.); need only summary information.

**Public Information And/Or Environmental Education Program:** Do not need documents; need only summary information about ongoing programs even if their primary foci are not hazards (e.g., "regular" flyers included in utility billings, a website, or environmental education programs in conjunction with parks and recreational activities).

## Worksheet 5 Mitigation Strategy

Date: \_\_\_\_\_ Identify Mitigation Actions

Instructions: For each type of loss identified on previous worksheets, determine possible actions. Record information below.

Hazard \_\_\_\_\_

Priority	Possible Actions (include location)	Sources of Information (include sources you reference and documentation)	Comments (Note any initial issues you may want to discuss or research further)	Planning Reference (Determine into which pre-existing planning suggested projects can be integrated)

**Contact information**  
**Name of jurisdiction:**  
**Filled out by:**  
**Address:**  
**Phone:**

**Worksheet 6**  
**Mitigation Project Description Worksheet**

**Instructions:** Use this guide to record potential mitigation projects (1 or more pages per project) identified during the planning process. Provide as much detail as possible and use additional pages as necessary. These will be collected following HMPC meetings on mitigation goals and measures and included in the plan.

**Jurisdiction:**

**Mitigation Project Title:**

**Issue/Background:**

**Other Alternatives:**

**Responsible Office:**

**Priority (High, Medium, Low):**

**Cost Estimate:**

**Benefits (avoided Losses):**

**Potential funding:**

**Schedule:**

**Worksheet Completed by**

**Name and Title:**

**Phone:**

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# Multi-Hazard Mitigation Plan

## Appendix C

### Mitigation Categories, Alternatives and Selection Criteria

#### **CATEGORIES OF MITIGATION MEASURES CONSIDERED**

(from CRS, with some multi-hazard examples added)

- **Prevention**
  - Planning & Zoning
  - Open Space Preservation
  - Land Development Regulations
  - Storm Water Management
  - Fuels Management
  
- **Property Protection**
  - Fire-Wise Construction
  - Defensible Space/Fuels Modification
  - Water Supply
  - Flood Protection
  
- **Natural Resource Protection**
  - Erosion & Sediment Control
  - Wetlands Protection
  - Threatened & Endangered Species Protection
  - Fuels Management
  
- **Emergency Services**
  - Warning & Evacuation
  - Communications
  - Critical Facilities Protection
  - Lifeline Utilities Protection
  - Health & Safety Maintenance
  
- **Structural Projects**
  - Detention/Retention structures
  - Sediment Basins/Low-head Weirs
  - Channel Modifications
  - Culvert resizing/replacement/Maintenance
  - Floodwalls
  
- **Public Information**
  - Hazard Maps
  - Outreach Programs (mailings, media, web, speakers bureau)
  - Education Program (Children/Adults)

## ALTERNATIVE MITIGATION MEASURES WITHIN EACH CATEGORY

**PREVENTION:** Preventive measures are designed to keep the problem from occurring or getting worse. Their objective is to ensure that future development is not exposed to damage and does not increase damage to other properties.

- o *Planning*
- o *Zoning*
- o *Open Space Preservation*
- o *Land Development Regulations*
  - *Subdivision regulations*
  - *floodplain development regulations*
- o *Storm Water Management*
- o *Fuels Management, Fire-Breaks*
- o *Building Codes*
  - *Fire-Wise Construction*
- o *(See Property Protection also)*

**EMERGENCY SERVICES** measures protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- o *Warning* (floods, tornadoes, ice storms, hail storms, dam failures)
  - NOAA Weather Radio
  - Sirens
  - Reverse 911
- o *Evacuation & Sheltering*
- o *Communications*
- o *Emergency Planning*
  - Activating the emergency operations room (emergency management)
  - Closing streets or bridges (police or public works)
  - Shutting off power to threatened areas (utility company)
  - Holding children at school/releasing children from school (school district)
  - Passing out sand and sandbags (public works)
  - Ordering an evacuation (mayor)
  - Opening evacuation shelters (Red Cross)
  - Monitoring water levels (engineering)
  - Security and other protection measures (police)
- o *Monitoring of Conditions (dams)*
- o *Critical Facilities Protection (Buildings or locations vital to the response and recovery effort, such as police/fire stations, hospitals, sewage treatment plants/lift stations, power substations)*
  - Buildings or locations that, if damaged, would create secondary disasters, such as hazardous materials facilities and nursing homes
  - Lifeline Utilities Protection
  - Health & Safety Maintenance

**PROPERTY PROTECTION:** Property protection measures are used to modify buildings subject to damage rather than to keep the hazard away. A community may find these to be inexpensive measures because often they are implemented by or cost-shared with property owners. Many of the measures do not affect the appearance or use of a building, which makes them particularly appropriate for historical sites and landmarks.

- o ***Retrofitting/disaster proofing***
  - ***Floods***
    - Wet/Dry floodproofing (barriers, shields, backflow valves)
    - Relocation
    - Acquisition
  - ***Tornadoes***
    - Safe Rooms
    - Securing roofs and foundations with fasteners and tie-downs
    - Strengthening garage doors and other large openings
  - ***Drought***
    - Improve water supply (transport/storage/conservation)
    - Remove moisture competitive plants (Tamarisk/Salt Cedar)
    - Water Restrictions/Water Saver Sprinklers/Appliances
    - Grazing on CRP lands (no overgrazing-see Noxious Weeds)
    - Create incentives to consolidate/connect water services
    - Recycled wastewater on golf courses
  - ***Earthquakes***
    - Removing masonry overhangs, bracing other parts.
    - Tying down appliances, water heaters, bookcases and fragile furniture so they won't fall over during a quake.
    - Installing flexible utility connections that won't break during shaking (pipelines too!)
  - ***Wildfire, Grassfires***
    - Replacing building components with fireproof materials
      - Roofing, screening
    - Create "Defensible Space"
    - Installing spark arrestors
    - Fuels Modification
  - ***Noxious Weeds/Insects***
    - Mowing
    - Spraying
    - Replacement planting
    - Stop overgrazing
    - Introduce natural predators
- o ***Insurance***

**NATURAL RESOURCE PROTECTION:** Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. These natural and beneficial floodplain functions include the following:

- storage of floodwaters
- absorption of flood energy
- reduction in flood scour
- infiltration that absorbs overland flood flow
- groundwater recharge
- removal/filtering of excess nutrients, pollutants, and sediments from floodwaters
- habitat for flora and fauna
- recreational and aesthetic opportunities

Methods of protecting natural resources include:

- o *Erosion & Sediment Control*
- o *Wetlands Protection*
- o *Riparian Area/Habitat Protection*
- o *Threatened & Endangered Species Protection*
- o *Fuels Management*
- o *Set-back regulations/buffers*
- o *Best Management Practices*

Best management practices (“BMPs”) are measures that reduce nonpoint source pollutants that enter the waterways. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground’s surface by stormwater and flushed into receiving storm sewers, ditches and streams. BMPs can be implemented during construction and as part of a project’s design to permanently address nonpoint source pollutants. There are three general categories of BMPs:

4. Avoidance: setting construction projects back from the stream.
5. Reduction: Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.
6. Cleanse: Stopping pollutants after they are en route to a stream, such as using grass drainageways that filter the water and retention and detention basins that let pollutants settle to the bottom before they are drained
  - o *Dumping Regulations*
  - o *Water Use Restrictions*
  - o *Weather Modification*
  - o *Landscape Management*

**STRUCTURAL PROJECTS** have traditionally been used by communities to control flows and water surface elevations. Structural projects keep flood waters away from an area. They are usually designed by engineers and managed or maintained by public works staff. These measures are popular with many because they “stop” flooding problems. However, structural projects have several important shortcomings that need to be kept in mind when considering them for flood hazard mitigation:

- They are expensive, sometimes requiring capital bond issues and/or cost sharing with Federal agencies, such as the U.S. Army Corps of Engineers or the Natural Resources Conservation Service.
- They disturb the land and disrupt natural water flows, often destroying habitats.
- They are built to a certain flood protection level that can be exceeded by a larger flood, causing extensive damage.
- They can create a false sense of security when people protected by a structure believe that no flood can ever reach them.
- They require regular maintenance to ensure that they continue to provide their design protection level.

Structural measures include:

- o *Detention/Retention structures*
- o *Erosion and Sediment Control*
- o *Basins/Low-head Weirs*
- o *Channel Modifications*
- o *Culvert resizing/replacement/Maintenance*
- o *Levees and Floodwalls*
- o *Fencing (for snow, sand, wind)*
- o *Drainage System Maintenance*
- o *Reservoirs(for flood control, water storage, recreation, agriculture)*
- o *Diversions*
- o *Storm Sewers*

**PUBLIC INFORMATION:** A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. These activities can motivate people to take protection

- o *Hazard Maps and Data*
- o *Outreach Projects*
- o (mailings, media, web, speakers bureau)
- o *Library Resources*
- o *Real Estate Disclosure*
- o *Environmental Education*
- o *Technical Assistance*

**MITIGATION ALTERNATIVE SELECTION CRITERIA**  
For use in selecting and prioritizing Proposed Mitigation Measures

**1. STAPLE**

Social: Does the measure treat people fairly? (different groups, different generations)

Technical: Will it work? (Does it solve the problem? Is it feasible?)

Administrative: Do you have the capacity to implement & manage project?

Political: Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support?

Legal: Does your organization have the authority to implement? Is it legal? Are there liability implications?

Economic: Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?

Environmental: Does it comply with Environmental regulations?

**2. SUSTAINABLE DISASTER RECOVERY**

- Quality of Life
- Social Equity
- Hazard Mitigation
- Economic Development
- Environmental Protection/Enhancement
- Community Participation

### **3. SMART GROWTH PRINCIPLES**

- Infill versus Sprawl
- Efficient Use of Land Resources
- Full Use of Urban Resources
- Mixed Uses of Land
- Transportation Options
- Detailed, Human-Scale Design

### **4. OTHER**

- Does measure address area with highest risk?
- Does measure protect ...
  - The largest # of people exposed to risk?
  - The largest # of buildings?
  - The largest # of jobs?
  - The largest tax income?
  - The largest average annual loss potential?
  - The area impacted most frequently?
  - Critical Infrastructure (access, power, water, gas, telecommunications)
- Timing of Available funding
- Visibility of Project
- Community Credibility

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# Multi-Hazard Mitigation Plan

## Appendix D

### Community Adoption

Note to Reviewers: When this plan has been reviewed and approved pending adoption by FEMA Region IX, the adoption resolutions will be scanned and put on the document CD which will contain the adoptions, as Appendix D. A Model resolution is provided below:

Resolution # \_\_\_\_\_

#### *Adopting the Yuba City-Sutter County, California*

#### *Multi-Hazard Mitigation Plan*

**Whereas, (Name of Government/District/Organization seeking FEMA approval of Hazard Mitigation Plan)** recognizes the threat that natural hazards pose to people and property within our community; and

**Whereas,** undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

**Whereas,** an adopted Multi-Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**Whereas, (Name of Government/District/Organization)** fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

**Whereas,** the California Office of Emergency Services and Federal Emergency Management Agency, Region IX officials have reviewed the “Yuba City-Sutter County, California Multi-Hazard Mitigation Plan” ( ) and approved it ( ) contingent upon this official adoption of the participating governing body;

**Now, therefore, be it resolved,** that the **(Name of Government/District/Organization)** adopts the “Yuba City-Sutter County, California Multi-Hazard Mitigation Plan” as an official plan; and

**Be it further resolved, (Name of Government/District/Organization)** will submit this Adoption Resolution to the California Office of Emergency Services and Federal Emergency Management Agency, Region IX officials to enable the Plan’s final approval.

Passed: \_\_\_\_\_ (date)

\_\_\_\_\_  
Certifying Official

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# Multi-Hazard Mitigation Plan

## Appendix E

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# Multi-Hazard Mitigation Plan

## Appendix F

### Sutter County Localized Flooding Problems

Provided in this Appendix F is a list of roads that were either flooded this past winter (2005-2006) or roads that flood every year. All of these samples take water on them with hard rains. The amount of damage or flooding that's occurs depends of course on the quantity flow of the runoff, these samples however are average of what will occur year to year.

The Live Oak canal plan was prepared by our drainage foreman. The L/O canal drains approx 1/3 of the Yuba City Area and Approx. 1/2 of the Yuba City rural area. Most of his plan is for an increase in the capacity of the system, to handle the increases due to development in the Yuba City Rural area.

County of Sutter  
Public Works

## **Flood Prevention Plan - Live Oak Canal Pease Rd. – Schlag Rd.**

True Road @ Live Oak Canal Pipe Crossing Replacement.

**Reason:** There is now a pipe of unknown size that filters threw large rock, and should be replaced with two 36” pipes approximately 60’ long for the new development in the area.

Lincoln Road @ Live Oak Canal Pipe Crossing Replacement.

**Reason:** There are three pipes that are under size that just handle the flow now. And should be replaced with two 60” pipes approximately 60’ long for the new development in the area.

Bogue Road @ Live Oak Canal Pipe Crossing Replacement.

**Reason:** There are three pipes that are under size that just handle the flow now. And should be replaced with two 60” pipes approximately 60’ long for the new development in the area.

Bike Path @ Live Oak Canal Pipe Crossing Replacement.

**Reason:** There are two pipes that are under size that just handle the flow now. And should be replaced with two 48” pipes approximately 80’ long for new development in the area.

Jefferson @ Live Oak Canal Pipe Crossing Replacement.

**Reason:** There is one pipe that is under size that just handles the flow now. And should be replaced with two 48” pipes approximately 60’ long for new development in the area.

Industrial Dr. @ Live Oak Canal Pipe Crossing Replacement.

**Reason:** There is one pipe at each crossing that is under size now that just handle the flow now. And should be replaced with two 48” pipes approximately 80’ long for new development in the area.

George Washington @ Live Oak Canal Pipe Crossing Replacement.

**Reason:** There is two businesses & one Church with two crossings that is under size now that just handle the flow. And should be replaced with 2- 60” pipes approximately 60’ long each for new development in the area.

South of Bogue Road @ Live Oak Canal pipe Crossings Replacement.

**Reason:** There is one house and four field crossing that is under size now that now run at maximum flow, and should be replaced with 2 -60” pipes approximately 60’ long to handle the development from north end of the canal.

Roosevelt Road @ Live Oak Canal Pipe Crossing Replacement.

**Reason:** There is one pipe that is under size now that just handle the flow now. And should be replaced with a 60” pipe approximately 60’ long for new development in the area.

La Mantia Dr. @ Live Oak Canal Pipe Crossing Replacement.

**Reason:** There is one pipe that under size now that just handle the flow now. And should be replaced with a 60” pipe approximately 60’ long for new development in the area.

Monroe Dr. @ Live Oak Canal pipe Crossing Replacement.

**Reason:** there is one pipe that is under size now that just the flow now. This should be replaced with a 60” pipe approximately 60’ long for new development in the area.

El Margarita Pump

**Reason:** The pump has been repaired every three years and needs to be up dated with a new system. In addition to install a back up pump and a generator when power is down to keep streets passable and water out of homes.

No.	Road Name	Flooding	Pavement Detoriation	Washouts	Landslide Or Mudslides	Debris	Downed Trees
1	Pass Rd	x	x	x	x	x	
2	West Butte Rd.	x	x	x		x	
3	North Butte Rd.	x	x	x		x	x
4	East Butte Rd.	x	x	x		x	x
5	South Butte Rd.	x	x	x		x	x
6	Powell Rd.	x	x	x		x	x
7	Pennington Rd.	x	x	x		x	x
8	Butte House Rd.	x				x	x
9	Kellogg Rd.	x	x	x	x	x	x
10	Lower Pass Rd.	x	x	x		x	x
11	Almond Orchard Rd.	x				x	
12	Hagaman Rd.	x					
13	Metterr Rd.	x	x				
14	Fifield Rd	x		x	x	x	
15	Keyes Rd.	x	x	x			
16	Catlett Rd.	x		x		x	
17	Howsley Rd.	x	x			x	
18	Pleasant Grove Rd.	x	x	x		x	
19	Brewer Rd.	x	x	x		x	x
20	Sacramento Ave.	x	x	x		x	x
21	Reclamation Rd.		x		x		
22	Subaco Rd..		x	x	x		
23	Hicks Rd.	x	x			x	x
24	Hughes	x	x			x	x
25	Oswald	x	x			x	x
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*Site #1 Sacramento Ave.*



Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006



*Site #2 Keys @ Natomas Levee Rd.*



Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan



Low water Crossing

*Site #3 Fifield Rd.*



Fifield  
Bridge.

Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006



*Site 5 Catlett Rd.*



Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006



*Site 6 & 7 Pleasant Grove Rd.*



Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006



*Site #8 Nicolaus Rd*



Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006



*Site 9 Hicks / Brewer Rds.*



38deg.56.033N/ 121deg.27.074

Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006



*Site 10 Subaco Rd.*



Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006



*Site 11. Pennington Rd. @ Powell Rd.*



*39 deg 16.523 N / 112 deg.45.898 W*

Photo courtesy of Sutter County Dept. of Public Works.

Sutter County Flood Mitigation Plan

Dec. 2006



*Site 13 West Butte Rd. @ North Butte Rd.*



*39deg. 17.05 N / 121deg.51.32 W*

Photo courtesy of Sutter County Dept. of Public Works.

Sutter County Flood Mitigation Plan

Dec. 2006



**Site 13 A West Butte Rd.** (North of Pass Rd.)



**39deg. 15.036 N /121deg. 53.04W**

Photo's courtesy of Sutter County Dept. of Public Works.

Sutter County Flood Mitigation Plan

Dec. 2006



*Site 14 Kellogg Rd.*



*39deg. 12.077 N 121deg.47.15 W*

Photo's courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006



*Site 15 Pass Rd. @ Kellogg Rd.*



Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006



*Site 16 Pass Rd*



Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006



*Site 17 Pass Rd. (West of North West Butte Rd.)*



*39deg. 11.13.92N / 121deg.53.27.58W*

Photo courtesy of Sutter County Dept. of Public Works.

Sutter County Flood Mitigation Plan  
Dec. 2006



*Site 18 West Butte Rd.. (South of Pass Rd.)*



*39deg.10.18.00N / 121deg.52.15.27W*

Photo courtesy of Sutter County Dept. of Public Works.

Sutter County Flood Mitigation Plan  
Dec. 2006



*Hughes / Oswald Rds.*



Photo courtesy of Sutter County Dept. of Public Works.  
Sutter County Flood Mitigation Plan  
Dec. 2006