This document is a support annex to local Emergency Operations Plans

2023 Yolo Operational Area Multi-Jurisdictional Hazard Mitigation Plan

December 2023

ACKNOWLEDGEMENTS

The Yolo County Multi-Jurisdictional Hazard Mitigation Plan update was made possible through the dedicated efforts of each participating jurisdiction, stakeholders, members of the public, and the Yolo County Office of Emergency Services. The development of this plan was only possible with the dedication and commitment of the Hazard Mitigation Plan Steering Committee, Planning Partners, and the Community. Participants included the following:

Jurisdiction:
County of Yolo
City of Davis
City of West Sacramento
City of Winters
City of Woodland

Tribal: Yocha DeHe Winton Nations

Special Districts, Partners & County Departments:
Pacific Gas and Electric (PG&E)
In-home Support Services Advisory Committee
Madison and Knights Landing CSD
Reclamation District 307
Reclamation District 108
Reclamation District 150
Sacramento River West Side Levee District
Sutter Davis Hospital
University of California, Davis
Yolo County Administrators Office
Yolo County Commission on Aging and Adult Services
Yolo County Community Works/Public Works
Yolo County Flood Control and Water Conservation District
Yolo County Housing Authority
Yolo County Health and Human Service Agency
Yolo County Sheriff's Office

The citizens of Yolo County are commended for their participation in the outreach strategy. This outreach success will set the course for the successful implementation of this plan during the next performance period.

EXECUTIVE SUMMARY

Yolo County's 2023 Hazard Mitigation Plan update defines measures to reduce risks from natural disasters in the Yolo County planning area, including unincorporated areas, incorporated cities, and special purpose districts. The plan updates the County's previous plan, the 2018 Yolo County Multi-Hazard Mitigation Plan. It complies with federal and state hazard mitigation planning requirements to establish eligibility for funding under Federal Emergency Management Agency (FEMA) grant programs for all jurisdictions that participated as planning partners.

Yolo County is vulnerable to a wide range of natural and manmade hazards. These hazards can threaten the life and safety of residents and visitors, potentially damage or destroy public and private property and disrupt the local economy and overall quality of life. While the threats from hazard events may never be fully eliminated, there is much we can do to lessen their potential impact on our communities. By minimizing the damaging effects of hazards upon our built environment, we can prevent such events from resulting in disasters. Hazard mitigation is the concept and practice of reducing risks to people and property from known hazards. Hazard mitigation uses long-term and short-term policies, programs, projects, and other activities to alleviate the death, injury, and property damage that can result from a disaster. Yolo County and a partnership of local governments within the County have developed a hazard mitigation plan to reduce risks from natural disasters in the Yolo County Operational Area—defined as the unincorporated county and incorporated jurisdictions within the geographical boundaries of the County. The plan complies with federal and state hazard mitigation planning requirements to establish eligibility for funding under Federal Emergency Management Agency (FEMA) grant programs.

GUIDING PRINCIPAL

The following guiding principle was created and agreed upon by the participants to represent the overall intended outcome of the Plan:
Reduce the risk to life and property in Yolo County efficiently and effectively by decreasing the long-term vulnerability from hazards through coordinated planning, partnerships, capacity building, and effective risk reduction measures.

PLAN DOCUMENT DEVELOPMENT

ORGANIZATION

A core Yolo County staff planning team was assembled to facilitate this plan update. A planning partnership was formed by engaging eligible local governments and ensuring they understood

their compliance expectations under the updated plan. A steering committee was assembled to oversee the plan update, consisting of both governmental and nongovernmental stakeholders within the planning area. Coordination with other local, state, and federal agencies involved in hazard mitigation occurred throughout the plan update process. Organization efforts included reviewing the County's 2023 hazard mitigation plan, the California statewide hazard mitigation plan, and existing programs that may support hazard mitigation actions.
This plan was prepared in coordination with FEMA and the California Office of Emergency Services (Cal OES) to ensure it meets all applicable federal and state requirements.

This plan has been set up in two volumes so that jurisdiction-specific elements can easily be distinguished from those that apply to the whole County. Volume 1 includes the federally required details of a hazard mitigation plan for all participating jurisdictions. This describes the planning process, public involvement strategy, hazard risk assessments, countywide mitigation actions, and a plan maintenance strategy. Since this is a multi-jurisdictional plan, Volume 1 addresses the entirety of Yolo County, which includes all participating jurisdictions and the entire geographic boundary. Volume 2 contains the Jurisdictional Annexes, which detail the hazard mitigation planning elements specific to each participating jurisdiction in the Yolo County Joint Hazard Mitigation Plan Update and includes all federally required jurisdiction-specific features for each participating jurisdiction.

Each annex is not intended to be a standalone document but annexes to, supplements, and incorporates by reference the information contained in Volume 1 of the Plan. All information in Volume 1, including the planning process and other procedural requirements and planning elements, apply to and were met by each participating jurisdiction. The Annexes provide additional information specific to each participating jurisdiction, focusing on providing further details on the risk assessment and mitigation strategy.

All participating jurisdictions will adopt Volume 1 and their jurisdiction-specific annex in Volume 2.

PUBLIC OUTREACH

The planning team implemented a multi-media public involvement strategy utilizing the outreach capabilities of the planning partnership that the Steering Committee approved. The process included in-person public meetings, virtual public meetings, a community hazard mitigation awareness survey, a project website, and multiple print, web-based, and social media releases. Additionally, the Steering Committee comprised community-based organizations, non-profit organizations, and other agencies that helped amplify public outreach efforts to their networks.

ADOPTION

Once pre-adoption approval has been granted by the California Governor's Office of Emergency Services and FEMA, each planning partner will individually adopt the updated plan. Each partner has up to one year from FEMA approval to adopt the plan.

Risk Assessment

Risk assessment measures the potential loss of life resulting from natural hazards, personal injury, economic injury, and property damage to determine the vulnerability of people, buildings, infrastructure, and the environment to natural hazards. The Steering Committee used the risk assessment to rank risks and gauge the potential impacts of each threat of concern in the Operational Area. The risk assessment included the following:

- Hazard identification and profiling
- Assessment of the impacts on physical, social, environmental, and economic assets
- Identification of areas of vulnerability
- Estimates of the cost of potential damage

The degree of Risk and Severity is based on the likelihood of occurrence and severity of the damage using a basic scale of High, Moderate, Substantial, and Possible. Based on the risk assessment, hazards were ranked for the risk they pose to the overall Operational Area.

Table ES-1: Hazard Risk Assessment Ranking

Ranking	Hazard	Degree of Risk	Severity
1	Drought	High	Moderate
2	Earthquake	Moderate	Possible
3	Levee Failure	Moderate	High
4	Wildfire	Moderate	Moderate
5	Flooding	Substantial	High
6	Severe Weather – High Wind	Substantial	High
7	Severe Weather – Extreme Heat	Substantial	High
8	Climate Change	Substantial	High
9	Dam Failure	Possible	High
10	Landslide	Possible	Possible
11	Land Subsidence	Possible	Possible

Mitigation Strategy

The 2018 mitigation actions were reviewed, changed, updated, and revised to reflect new Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) priorities. During this update process, each of the 2018 mitigation actions was examined for relevancy and the potential for future implementation and then evaluated for potential follow-up. Some mitigation actions developed

during the 2018 Plan effort are an inherent part of the update process or needed to be more detailed for implementation at a local jurisdiction level and, thus were not included in this update. The County has made significant changes to other 2018 Mitigation Actions because of the updated risk assessment and implementation strategy to include more detail or to update based on current mitigation practices. During this MJHMP update process, the Steering Committee also decided to add countywide mitigation actions. These countywide actions were based on the highest-rated hazards of concern in the identified problem statements across the operational area. They were included to provide a high-level countywide mitigation strategy.

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SECTION 1.0: INTRODUCTION

The 2023 Yolo County Operational Area Multi-Jurisdictional Hazard Mitigation Plan (HMP) has been prepared with the intent of establishing an inter-jurisdictional process for the development and implementation of effective hazard mitigation strategies in association with identified hazards that pose real or potential threats to the Yolo Operational Area (YOA).

1.1 PURPOSE

Yolo County, four incorporated communities, Unincorporated Yolo County including all Special Districts, and The Yocha Dehe Wintun Nation prepared this Multi-jurisdictional HMP Update to the Federal Emergency Management Agency (FEMA) approved 2018 Yolo County HMP. The purpose of this plan is to guide and integrate hazard mitigation planning into the activities and programs of local jurisdictions, special districts, and all sectors, to the extent possible, in order to better protect the people and property of Yolo County from the effects of natural hazards. This HMP Update demonstrates Yolo County's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This HMP Update was also developed to ensure Yolo County and participating jurisdictions' continued eligibility for certain federal disaster assistance: specifically, the FEMA Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC), and the Flood Mitigation Assistance Program (FMA).

1.2 SCOPE

This Yolo County 2023 HMP Update is a multi-jurisdictional plan that geographically covers the entire area within Yolo County's jurisdictional boundaries (referred to as the Operational Area). The following jurisdictions participated in the planning process and are seeking FEMA approval of the HMP Update:

- The County of Yolo
- The City of Davis
- The City of West Sacramento
- The City of Winters
- The City of Woodland
- The Yocha Dehe Wintun Nation
- The Housing Authority of Yolo County
- Reclamation District 108 (including Sacramento West Side Levee District, Knights Landing Ridge Drainage District, Dunnigan Water District)
- Reclamation District 900
- University of California, Davis
- Yolo County Flood Control & Water Conservation District

The plan identifies and evaluates specific local hazard mitigation strategies to be considered by the YOA and associated planning support for those strategies developed by its political subdivisions, agencies, special districts, and organizations. The plan describes strategies that

government and private sector organizations may utilize as acceptable and effective mechanisms for mitigating those hazards, within the realistic constraints of capability and priority.

1.3 Regulatory Framework

Mitigation Act of 2000 (Public Law 106-390), is to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters. The Disaster Mitigation Act (DMA 2000) shifted the federal emphasis toward planning for disasters before they occur and requires proactive pre-disaster planning as a condition of receiving certain federal financial assistance under the Stafford Act. Regulations developed to fulfill the Disaster Mitigation Act's requirements are included in Title 44 of the Code of Federal Regulations (44 CFR). The Disaster Mitigation Act encourages state and local authorities to work together on pre-disaster planning and to assist local governments in accurately assessing mitigation needs, resulting in faster allocation of funding and more cost-effective risk reduction projects under FEMA's Hazard Mitigation Assistance program. The Disaster Mitigation Act requires the plan be updated every five years to remain in compliance with federal mitigation grant conditions. Grant compliance is contingent on meeting the plan update requirements that are contained in 44 CFR. Jurisdictions that allow a plan to expire are not able to pursue funding under the Stafford Act for which a current hazard mitigation plan is a prerequisite. Federal regulations require a plan for monitoring, evaluating, and updating hazard mitigation plans. The plan update process provides an opportunity to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies over time.

1.4 History and Overview

Yolo County was one of the original 27 counties created when California became a State in 1850. The county is located in the rich agricultural regions of California's Central Valley and the Sacramento River Delta. It is directly west of Sacramento, the State Capital of California, and northeast of the Bay Area counties of Solano and Napa (see Figure 1).

Figure 1 – Location of Yolo County in California

Yolo County is a general law county, which means that the Board of Supervisors is elected by district and that principal officers of the County are regulated by statutes that assign their duties.

The county's total size is 653,549 acres (or 1,021 square miles). This includes both the incorporated area (the cities of Davis, West Sacramento, Winters and Woodland) which totals 32,325 acres and the unincorporated area, which totals 621,224 acres.

The four cities have independent land use authority from the County. The unincorporated county contains several communities, including Capay, Clarksburg, Dunnigan, Esparto, Guinda, Knights Landing, Madison, Monument Hills, Rumsey, Yolo and Zamora. All of these unincorporated communities are under the jurisdiction of Yolo County.

There are other entities within Yolo County that have their own land use and related authority. These include UC Davis, the Yocha Dehe Wintun Nation, and in some circumstances the various school districts.

Established as the University Farm in 1906 and as a formal University in 1959, UC Davis is the largest campus in the UC system, spanning over 5,500 acres in Davis. The university is known for its agriculture, arts, humanities, life sciences, health sciences, veterinarian and engineering programs.
Although the University is not subject to this General Plan, it is located within the unincorporated area and its resident student population and on-campus housing are factored into County policy.

Yocha Dehe Wintun Nation is the only federally-recognized tribe with landholdings in Yolo County. The Yocha Dehe Wintun Nation operates the Cache Creek Casino Resort in western Yolo County and has become the County's largest private employer. Tribal trust lands are administered by the U.S. Department of the Interior, Bureau of Indian Affairs and are not subject to County jurisdiction.

The Housing Authority of Yolo County (YCH) is an independent organization whose board of directors is appointed by the Yolo County Board of Supervisors. It receives funding from a variety of public and private sources to provide affordable housing and social programs for the County. Currently, the YCH owns and manages 431 conventional housing apartments and 301 migrant farm worker units. [1]

1.4.1 DEMOGRAPHICS

Lying directly between the rapidly growing regions of Sacramento and the Bay Area, Yolo County has experienced and will continue to experience, tremendous pressures to provide additional residential, commercial and industrial development. The ease of access provided by the Sacramento International Airport, the Capitol Corridor train, the Port of Sacramento and Interstates 5, 80 and 505, have all exacerbated existing growth pressures in the county.

The County's economy is primarily based on agriculture. Yolo County has led the State in agricultural preservation practices for the last several decades, primarily by directing growth into the incorporated cities where services are available and where development can occur more efficiently. The Yolo County General Plan seeks to continue to preserve agriculture while also allowing for measured, appropriate residential and economic development focused within existing communities that will meet regional and local needs.

[1] Yolo County Housing (2023). FY Annual Agency Plan. Retrieved from Transparency & Accountability page <ych.ca.gov/about-us/#transparency>

According to the California Department of Finance, 2022 Population and Housing estimates, the county's 1,014.8 square miles of land area were home to 221,165 people and contained 81,945 housing units. The California Department of Finance population estimates for the County and incorporated jurisdictions are shown on Table 1-1. Approximately 88 percent of that population and 90 percent of the housing units lay within the four incorporated cities.

Table 1-1 Yolo County Population Estimates – Jan 1, 2022

Jurisdiction	2022	Housing Units
Davis	64,869	27,596
West Sacramento	52,837	12,788
Winters	7,422	2,754
Woodland*	60,137	22,236

**Woodland is the County seat, and is the center of the agricultural economy.*
Source: California Department of Finance, 2022 E-5 Population and Housing Estimates – Organized by Geography

Davis, has a unique university and residential community internationally known for its commitment to environmental awareness and implementing progressive and socially innovative programs. West Sacramento, sits across the Sacramento River from the State capital, Sacramento. It is home to the Port of West Sacramento, which ships out 1.3 million tons of Yolo County's many agricultural products, such as rice, wheat and safflower seed, to world-wide markets. West Sacramento is also home to a Triple-A baseball team, the Rivercats, as well as several State agencies. The City of Winters, is a small farming town nestled at the base of the Vaca Mountains and offers unique shops, renowned restaurants, galleries and regionally acclaimed live entertainment. It is also the gateway to Lake Berryessa, which offers boating, kayaking, hiking, fishing and camping. Woodland, is the County seat and is the center of the agricultural economy. It has a strong historic heritage which is reflected in an impressive stock of historic buildings in its downtown area and surrounding neighborhoods.

Approximately half of the county's unincorporated population and housing units are located within existing communities and residential neighborhoods. According to Census data[2], the largest unincorporated population is Esparto, with a population of 3,733 and 1,267 housing units in 2021, which also serves as the gateway to the Capay Valley. Monument Hills is defined by its large lot, rural residential character, with a population of 1,508 and 559 housing units in 2021. El Macero is a golf course community, adjoining the City of Davis to the east, with a population of 1,073 and 391 housing units in 2021. Knights Landing has a population of 944 and 296 housing units in 2021 and is a popular area for hunting and fishing. Dunnigan is the highway commercial center for the northern county, located at the interchange of Interstates 5 and 505 and has 1,081 residents and 501 housing units in 2021. Clarksburg is the focus of the county's

[2] U.S. Census Bureau (2021). American Community Survey 1-year estimates. Retrieved from Census Reporter Profile page for Yolo County, CA <http://censusreporter.org/profiles/05000US06113-yolo-county-ca/>

premier wine-growing region, with a population of 379 and 154 housing units in 2021. Yolo was once the County seat and currently has a population of 243 and 120 housing units in 2021. Madison has a long farming history and includes one of two Migrant Labor Camps in the county, with 478 residents and 186 housing units in 2021. Other communities include West Plainfield, Rumsey, Guinda, Capay, North Davis Meadows, Binning Farms, Willow Bank, Patwin Road, Royal Oaks, Willow Oak, West Kentucky, El Rio Villa, Zamora and the Rumsey Rancheria. UC Davis accounts for much of the remaining unincorporated population, with 8,532 students and faculty living on campus, according to the 2021 Census data. The agricultural areas are the final component, with approximately 7,000 residents and an estimated 2,350 housing units.

Select social and economic information for the County and participating jurisdictions are shown in Table 1-2.

Table 1-2 Yolo County – Select Social and Economic Statistics

Statistic	Number
Populations	
Population under 5	5.0%
Population under 18	20.4%
Population over 65	13.2%
Median Age (years)	32.7
Racial Makeup	
White alone	73.1%
Black or African American	3.2%
American Indian or Alaska Native	1.8%
Asian	15.2%
Native Hawaiian or Pacific Islander	0.6%
Hispanic or Latino	32.6%
Two or more races	6.1%
Income	
Median household income (in dollars)	$78,146
Mean income	$109,287
Poverty Rate	
All families	5.8%
All people	14.8%

Source: 2021 US Census

Approximately 66 percent of Yolo County residents live in single family houses and 34 percent live in multiple-family units.

1.4.2 COMMUNITY LIFELINES AND INFRASTRUCTURE

A lifeline enables the continuous operation of critical government and business functions and is essential to human health and safety or economic security. Lifelines are the most fundamental services in the community that, when stabilized, enable all aspects of society to function.

Commented [SH1]: Take list of Community Lifelines and spatially quantify it in GIS, then overlay it with each hazard to determine how vulnerable these critical facilities are.

Lifelines are the integrated network of assets, services, and capabilities that are used day-to-day to support recurring needs of the community. There are multiple components and subcomponents that establish the parameters of the lifeline. The table below lists the components and subcomponents of Community lifelines.

Table 1-3 Community Lifeline Components

1. Safety and Security	
Law Enforcement/Security	Government Service
Police Stations Law Enforcement Site Security Correctional Facilities	Emergency Operation Centers Essential Government Functions Government Offices Schools Public Records Historic Resources Cultural Resources
Fire Services	
Fire Stations Firefighting resources	
Search and Rescue	Community Safety
Local Search and Rescue	Flood Control Other Hazards Protective Actions
2. Food, Water, Shelter	
Food	Water
Commercial Food Distribution Commercial Food Supply Chain Food Distribution Programs (e.g, Food banks)	Drinking Water Utilities (intake, treatment, storage, and distribution) Wastewater systems Commercial Water Supply Chain
Shelter	Agriculture
Housing (e.g., homes, shelters) Commercial Facilities (e.g., hotels)	Animals and Agriculture
3. Health and Medical	
Medical Care	Medical Supply Chain
Hospitals Dialysis Pharmacies Long-Term Care Facilities VA Health System Veterinary Services Home Care	Blood/Blood Products Manufacturing - Pharmaceutical - Device - Medical Gases Distribution Critical Clinical Research Sterilization Raw Materials
Public Health	
Epidemiological Surveillance Laboratory Clinical Guidance Assessment/Interventions/Treatments Human Services Behavioral Health	
Patient Movement	Fatality Management
Emergency Medical Services	Mortuary and Post-Mortuary Services
4. Energy	
Power Grid	Fuel

Generation Systems Transmission Systems Distribution Systems	Refineries/Fuel Processing Fuel Storage Pipelines Fuel Distribution (e.g.,gas stations, fuel points) Off-shore Oil Platforms
5. Communications	
Infrastructure	Alerts, Warnings, and Messages
Wireless Cable systems and wireline Broadcast (TV and Radio) Satellite Data Centers/Internet	Local Alert/Warning Ability Access to IPAWS (WEA, EAS, NWR) NAWAS Terminals
911 & Dispatch	Finance
Public Safety Answering Points Dispatch	Banking Services Electronic Payment Processing
Responder Communications	
LMR Networks	
6. Transportation	
Highway/Roadway/Motor Vehicle	Railway
Roads Bridges	Freight Passenger
Mass Transit	Aviation
Bus Rail Ferry	Commercial (e.g., cargo/passenger) General Military
Maritime	
Waterways Ports and Port Facilities	
7. Hazardous Materials	
Facilities	HAZMAT, Pollutants, Contaminants
Oil/HAZMAT Facilities (e.g., chemical, nuclear) Oil/HAZMAT/Toxic Incidents from Facilities	Oil/HAZMAT/Toxic Incidents from Non-Fixed Facilities Radiological or Nuclear Incidents

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA's HAZUS loss estimation software uses the following three categories of critical assets (Essential Facilities, High Potential Loss Facilities and Transportation and Lifelines). Essential facilities are those that if damaged would have devastating impacts on disaster response and/or recovery. High potential loss facilities are those that would have a high loss or impact on the community. Transportation and lifeline facilities are a third category of critical assets.

The Yolo County Office of Emergency Services maintains a listing of Critical Facilities in Yolo County (including the participating jurisdictions) and the list is categorized according to FEMA's critical facility definition. Additionally, the Annexes list the critical facilities specific to each

jurisdiction. The following table (Table 1-3) lists the general categories of critical facilities in Yolo County.

Table 1-3: General Categories of Critical facilities in Yolo County

Essential Facilities	High Potential Loss Facilities	Transportation and Lifelines
• Hospitals and other Medical Facilities • Police Stations • Fire Stations • Emergency Operation Centers	• Power Plants • Dams/levees • Military installations • Hazardous Material Sites • Schools • Shelters • Day Care Centers • Nursing Homes • Main Government Buildings	• Highways, Bridges and Tunnels • Railroads and Facilities • Bus Facilities • Airports • Water Treatment Facilities • Natural Gas Facilities and Pipelines • Oil Facilities and Pipelines

For critical facilities, there are two hospitals in the County with a total bed capacity of 151 beds. There are 83 schools, 20 fire stations, five police stations, and seven Emergency Operations Centers. There are seven dams identified within the region. Of these, two of the dams are classified as 'high hazard'. There are also 1,227 hazardous material sites, zero military installations and zero nuclear power plants in Yolo County. There are several transportation systems in the County; these include highways, railways, bus routes, shipping lanes, and airport flight routes. There are over 458 kilometers of highways, 253 bridges, and 5,946 kilometers of pipeline in Yolo County. There are three bus terminals and four primary airports in the County, in addition to the Port of West Sacramento. There are six utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications.

Other facilities in the county, such as locations that hold musical concerts, sporting events, and other events that attract large numbers of people, may also be at higher risk due to concentrations of population. These include, but are not limited to, the Yolo County Fairgrounds, the Cache Creek Casino and Resort, Raley Field, University of California, Davis, high school campuses and county or city parks. Other critical facilities unique to the county, tribe and cities are located in their respective Annexes (attached).

More detailed information on damage and impact to the community as well as the overall summary of the community's vulnerability is located Section 3.0 of the HMP Base Plan.

1.4.3 NATURAL, HISTORICAL, AND CULTURAL RESOURCES

Assessing Yolo County's vulnerability to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- In the event of a disaster, an accurate inventory of natural, historical and cultural resources allows for more prudent care in the disaster's immediate aftermath when the potential for additional impacts is higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, for example, wetlands and riparian habitat which help absorb and attenuate floodwaters and thus support overall mitigation objectives.

Natural Resources

The Yolo Bypass Wildlife Area (Wildlife Area) is 16,770 acres of managed wildlife habitat and agricultural land located within the southern floodway of the Yolo Bypass. A portion of the Wildlife Area spans Interstate 80 adjacent to the Yolo Causeway, between the cities of Davis and West Sacramento. The Wildlife Area is a public and private restoration project managed by the California Department of Fish and Game (DFG) in consultation with the Yolo Basin Foundation. In 1997, the U.S. Army Corps of Engineers restored wetlands and associated habitats within the Wildlife Area. This project, originally named the Yolo Basin Wetlands, was renamed the Vic Fazio Yolo Wildlife Area. The entire wildlife area, however, is officially named the Yolo Bypass Wildlife Area.

The Blue Ridge Berryessa area consists of 785,000 acres along the spine of the western Blue Ridge Mountains in the northwestern part of Yolo County, and includes portions of Colusa, Solano, Napa and Lake Counties. The area remains primarily in private ownership and is not subject to State or federal management. The Blue Ridge Berryessa Natural Area Conservation Partnership (BRBNACP) is a collaboration involving various private land owners; businesses; local, state, and federal agencies; non-profit organizations; and supporters working to protect and enhance the 600,000 acre BRNBA. To date, 50,000 acres have been conserved through easements and purchases.

In 2015, Berryessa Snow Mountain National Monument was created. The 330,780-acre monument extends from nearly sea level on Bureau of Land Management lands around Lake Berryessa in the south, up to 7,000 feet through the northern Snow Mountain Wilderness and the eastern boundary of the Yuki Wilderness in the Mendocino National Forest. The Monument offers a wealth of natural, historical and cultural resources, as well as exciting recreation opportunities for visitors. See Figure 2 for a map of Berryessa Snow Mountain National Monument.

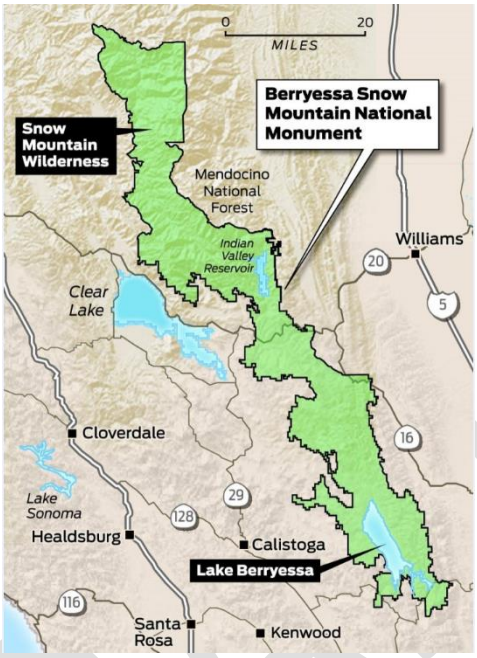

Figure 2: Berryessa Snow Mountain National Monument
Source: San Francisco Chronicle

The lower Cache Creek planning area includes over 28,000 acres of land with state designated mineral resources, which includes about 18,250 acres of known "significant" deposits. Within the Cache Creek planning area the County has designated an Open Space area of about 5,000 primarily privately owned acres which fall under the management guidance and regulation of the Cache Creek Resources Management Plan (CCRMP). As a by-product of permitted aggregate mining within the Cache Creek planning area there is an increasing acreage of dedicated land transferring into public ownership. Public access to these areas is anticipated to increase over time pursuant to the CCRMP. The CCRMP is a component of the Cache Creek Area Plan (CCAP), which is an adopted part of the county's General Plan. The focus of the CCAP is groundwater protection, agricultural preservation, restoration of Cache Creek, and limitation and regulation of mining.

The Cache Creek Wild and Scenic River Area includes 31 miles of upper Cache Creek in Lake and Yolo counties that were added to the State Wild and Scenic Rivers System in 2005. Designation of the upper reaches of the Creek as "wild and scenic" supports the creek's scenic, recreational, wildlife, and fishery values and precludes new dams and water diversions.

The federal government owns 30,225 acres and the State of California owns 17,257 acres of land in unincorporated Yolo County managed for open space purposes. Each of the four Yolo County cities also own public open space, mostly in the form of parkland within their boundaries. Notably, the City of Davis has acquired open space lands in a number of locations around its edge, and a number of open space areas are owned and managed by the University of California.

While nearly entirely altered from its native condition, agricultural lands in Yolo County continue to represent an important landscape for numerous wildlife species. Raptors, waterfowl and other water birds, a variety of songbirds, and small mammals use agricultural fields for nesting and foraging; but to large extent, the enhanced value of agricultural habitats in Yolo County is due to the integration of natural communities within the agricultural landscape. Adjacent riparian corridors, roadside trees, windbreaks, woodlots, isolated trees, and field borders provide important nesting, roosting, and cover habitat for many local and migratory species that also use the agricultural fields as foraging habitat. The retention of these adjacent habitats has greatly enhanced the wildlife value of agricultural habitats in Yolo County and their continued retention and restoration is essential in maintaining this value over time.

Approximately 21 percent of the county can be defined as natural lands. These include native oak woodlands, prairie grasslands, and chaparral communities in the western mountains and foothills, riparian woodlands, native and restored wetland communities, and remnant valley oak groves and valley oak trees on the valley floor.

Wetlands

Wetlands include permanent marsh communities that are inundated all or most of the year, and seasonal wetlands that are inundated only a part of the year, typically during winter and spring. Native seasonal wetlands are uncommon in Yolo County and include several remaining patches of alkali sink between Davis and Woodland, and vernal pools associated with the prairie grasslands near Winters. Most seasonal wetlands in Yolo County are restored and managed to provide habitat for wintering waterfowl. Significant areas of seasonal wetland and marsh communities are found primarily in the Yolo Basin, including the Yolo Bypass Wildlife Area, private lands in the southern panhandle, the Conaway Ranch north of Interstate 80, and the City of Davis Wetlands. Additional wetland habitats are found at the recently restored Roosevelt Ranch Preserve east of Zamora and in several other isolated locations throughout the central and eastern portions of the county.

Wetlands are among the most productive wildlife habitats, supporting many species of birds, mammals, reptiles, and amphibians. The presence of wetlands also enhances the biological value of the surrounding landscape because many species that find nesting and cover habitat in wetlands may forage more widely in agricultural or grassland habitats. Marsh communities, including non-tidal freshwater emergent wetland, tidal freshwater emergent wetland, and tidal

perennial aquatic wetland provide nesting and cover habitat for many wetland- and aquatic-associated species. Seasonal wetlands provide important habitat for wintering waterfowl and other water birds; and during the dry summer and fall, seasonal wetlands are used by numerous raptor and songbird species.

Riparian

Riparian refers to streamside vegetation that occurs along rivers, creeks, and sloughs. In Yolo County, riparian woodland and shrub communities occur along several natural rivers, creeks, and sloughs and constructed water delivery canals in the county, including Sacramento River, Putah Creek, Cache Creek, Oat Creek, Bird Creek, Buckeye Creek, Willow Slough, Dry Slough, Elk Slough, Sutter Slough, Tule Canal, Deep Water Ship Channel, and the Knights Landing Ridge Cut. Most of the creeks in the county drain the Interior Coast Ranges and flow west to east toward the Sacramento River basin. The sloughs are backwater drainages of the Sacramento River; and the canals were constructed for water delivery or transport purposes. The most significant riparian communities occur along Putah Creek and Cache Creek. Both support relatively dense valley oak/cottonwood riparian forest and are significant wildlife movement corridors between the Interior Coast Ranges on the west and the Sacramento River basin on the east. Smaller creeks and sloughs also support significant remaining riparian corridors that interconnect the mountainous landscape on the west with the valley floor or extend north-south through the lower elevation agricultural landscape.

Riparian vegetation is also essential in maintaining the quality of in-stream habitat by providing shade, food, and nutrients. Downed trees, willow mats, and other vegetation scour pools, form logjams and dams, and provide important habitats for fish, aquatic reptiles and amphibians, and aquatic insects, those are listed below.

- Oak Woodlands/Chaparral
- Grassland Prairies/Valley Oak Savannah
- Remnant Oak Trees, Groves, and Tree Rows

Special-Status Species

Many special-status species (including state and federal threatened and endangered species, state species of special concern and fully protected species, and plants listed by the California Native Plant Society) occur or have potential to occur in Yolo County. Special-status species occur throughout the county in all of the vegetation communities and habitats described above. However, while several species such as bald eagle, golden eagle, and Cooper's hawk are known to occur primarily in the mountainous regions on the western edge of the county, most are known to occur in the more disturbed agricultural landscape of the Central Valley.

As noted above, in many cases the retention of natural features within this landscape greatly enhances habitat conditions for species, such as the Swainson's hawk, that have successfully

adapted to an agricultural landscape. Others continue to persist in smaller patches of suitable habitat, such as the state-threatened black rail, which has been detected in the wetlands on the Yolo Bypass Wildlife Area; and the western burrowing owl, which uses remaining grasslands, roadside edges, artificial berms, and some agricultural habitats. Some species have not been detected in the county for many years, such as the western yellow-billed cuckoo, due to limited habitat availability and quality. Preservation and restoration of suitable habitats for these species is key to their continued occurrence or reestablishment in Yolo County.

The Delta Region

In the past several years, the Delta has become an area of intense interest, with numerous planning and legislative efforts looking to redefine the policy and regulatory landscape. The 1959 Delta Protection Act created the legal delta boundary in the Sacramento-San Joaquin Delta (see Figure 3). A portion of Yolo County falls within the boundary. The Regional Flood Planning Boundary includes areas of Yolo County outside of the legal delta boundary.

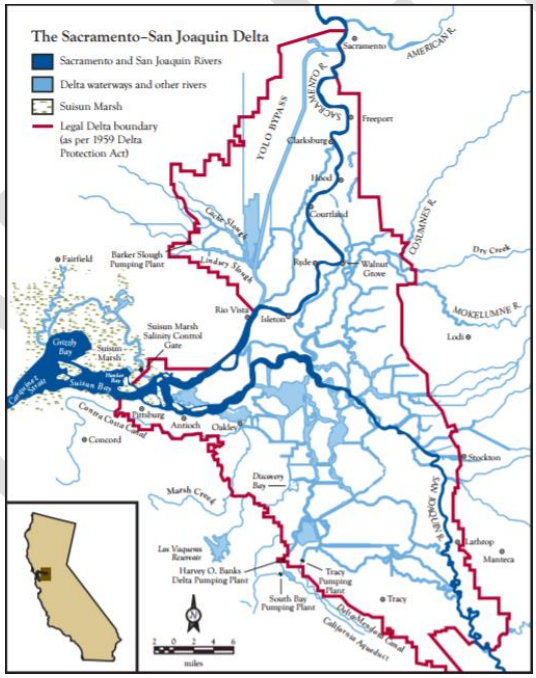

Figure 3: The Legal Delta Boundary
Source: Public Policy Institute of California

Those areas of the Yolo Bypass, the City of West Sacramento, and the unincorporated area that lie south of Interstate 80 are located within the Primary and Secondary Zones of the Sacramento-

San Joaquin Delta. Land use in these areas must be consistent with the Yolo County General Plan with the Land Use and Resource Management Plan (LURMP), as adopted by the Delta Protection Commission (DPC). In 2018, the DPC was in the process of updating the LURMP, to address a wide range of issues, including court decisions related to water export, studies that indicate serious problems with the health of the Delta ecosystem, concerns about the ability of levees to withstand significant flood and/or seismic events, and the effects of future global climate change. However this process ended up pausing and the update was never completed.

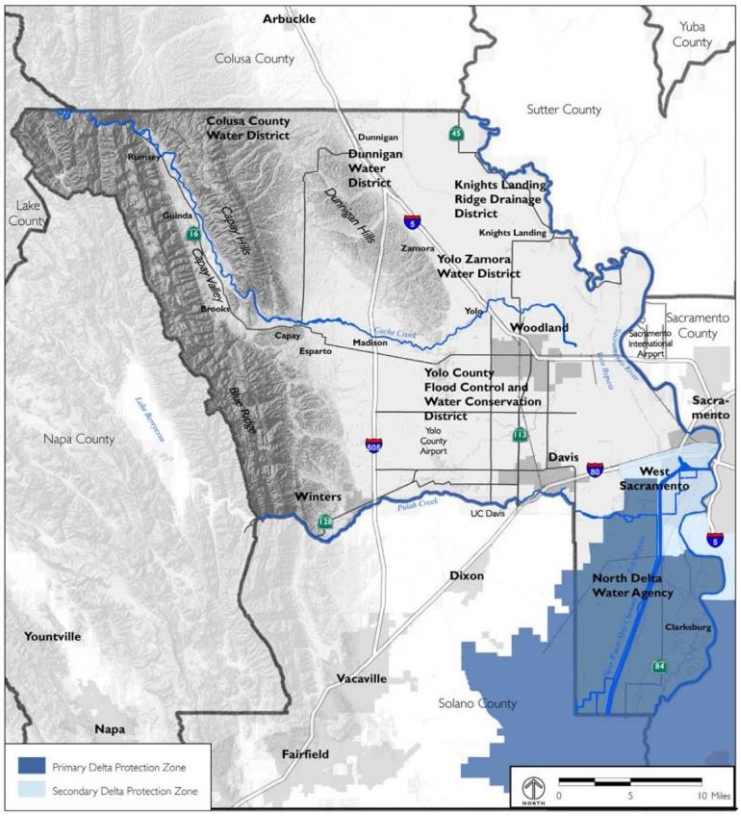

Figure 4: Delta Protection Zones in Yolo County
Source: Yolo County GIS Department

In 2006, the Governor issued an Executive Order creating the Delta Vision process. The Delta Vision Blue Ribbon Task Force (DVBRTF) is a group of public officials, experts, and stakeholders, charged with developing recommendations on the overall management and governance of the Delta, including goals related to improving safety, ensuring water supply and

water quality, expanding recreation, coordinating emergency response, and protecting infrastructure and public safety.

Historical Resources

Individuals, various community groups and local organizations throughout Yolo County preserve historical resources. These groups include the County Planning Commission/Historic Preservation Commission and various volunteer historical societies. The Planning Commission serves as the Historic Preservation Commission which is tasked with establishing criteria, guidelines and standards to pursue the goals outlined in the County's Historic Preservation Ordinance. The Commission is responsible for maintaining an inventory of all historical landmarks and districts within Yolo County and recommending future historic designations to the Board of Supervisors.

The Planning Commission decides permits for demolition and for alterations to historic structures. There are a number of repositories of historical artifacts and information in Yolo County, including the Yolo County Historical Museum, the Yolo County Archives and Record Center and the Hattie Weber Museum. The Yolo County Historical Museum is located in Woodland. The museum provides tours of the architecturally historic building and displays furnishings and artifacts from Yolo County's past, specifically between 1850 and 1930, and includes outbuildings that feature artifacts associated with the agricultural industry and farming lifestyle.

The Yolo County Archives and Record Center maintains a comprehensive archive of historical materials dating back from the County's beginnings in 1850. A broad range of materials are stored at the Archive and Record Center, including County documents, original tax records, old newspapers, probates, wills, civil and criminal cases, original maps of Mexican land grants, personal scrapbooks, video reels and a complete set of meeting notes from every meeting of the Yolo County Board of Supervisors.

Yolo County maintains its own list of local historical landmarks. There are also county listings on the National Register of Historic Places, the list of California State Historical Landmarks, and the list of California Points of Historical Interest. Please see the Yolo County Historic Preservation Annex for a complete listing of historical properties in Yolo County.

Cultural Resources

There is one tribe with registered traditional land in Yolo County, the Yocha Dehe Wintun Nation, which is a federally recognized Tribe. They are a significant landowner and employer as the operators of the Cache Creek Casino Resort in Brooks. The Yocha Dehe Wintun Nation is a recognized sovereign nation. As such, the Department of the Interior, Bureau of Indian Affairs, holds approximately 267 acres in trust for the Rumsey Tribe (the Tribe). One site contains houses for the tribal members, a community center, and the Yocha-De-He Preparatory School.

The other site is home to the Cache Creek Casino Resort. As sovereign lands, these areas are not a part of the County's General Plan. The Tribe also owns several thousand acres in and around the trust lands. More information on the Yocha Dehe Wintun Nation can be found in their Annex.

A countywide record search was conducted at the Northwest Information Center (NWIC) of California Historical Resources Information System at Sonoma State University, and additional sources were also used, to generate a list of over 1,200 recorded cultural resources within Yolo County. Of these, 270 are archeological resources. The locations of these resources have been kept confidential.

1.4.4 ECONOMICS

Yolo County has many existing characteristics that make it a competitive business environment within the Sacramento region. The County's several significant assets include the following:

- Access to regional job centers
- Visibility and easy access to Interstates 80, 5 and 505
- Airport and transit connections
- Affordable housing
- Affordable land
- Food and fiber business synergy

Economic assets at risk may include major employers or primary economic sectors, such as, agriculture, whose losses or inoperability would have severe impacts on the community and its ability to recover from disaster. After a disaster, economic vitality is the engine that drives recovery. Every community has a specific set of economic drivers, which are important to understand when planning ahead to reduce disaster impacts to the economy. When major employers are unable to return to normal operations, impacts ripple throughout the community. Major employers in the County are shown in Table 1-4.

Table 1-4: Major employers in Yolo County in 2022

Employer Name	Location	Industry
Beckman Coulter Inc	West Sacramento	Physicians & Surgeons Equip & Supls-Mfrs
Cache Creek Casino Resort	Brooks	Casinos
Capital Express Lines	West Sacramento	Trucking-Motor Freight
City of Davis – City Manager Ofc	Davis	City Government-Executive Offices
Clark Pacific	West Sacramento	Concrete Products – Except Block & brick (mfrs)
Dennis Blazona Constr Inc	West Sacramento	Construction Companies
Fedex Freight	West Sacramento	Trucking-Motor Freight
IKEA	West Sacramento	Furniture-Dealers-Retail
Mariani Nut Co	Winters	Nuts-Edible

Mcguire & Hester	West Sacramento	General Contractors
Nor-Cal Beverage Co	West Sacramento	Vending Machines – Manufacturers
Pacific Coast Producers	Woodland	Canning (mfrs)
Procurement Office	West Sacramento	State Government- General Offices
Promega Corp	Madison	Biotechnology Products & Services
Rite Aid Distribution Ctr	Woodland	Distribution Centers (whls)
Sutter Davis Hospital	Davis	Hospitals
Target Distribution Ctr	Woodland	Distribution Centers (whls)
Tony's Fine Foods	West Sacramento	Grocers-Wholesale
University of California Davis	Davis	Schools-Universities & Colleges Academic
UPS Customer Ctr	West Sacramento	Mailing & Shipping Services
Walmart Supercenter	West Sacramento	Department Stores
Woodland Healthcare	Woodland	Health Care Management
Woodland Healthcare Foundation	Woodland	Health Services
Yolo County District Attorney	Woodland	Government Offices – County
Yolo County Sheriff-Civil Div	Woodland	Government Offices – County

Source: State of California, Employment Development Department

Agriculture has been at the heart of Yolo County's identity, character, economy and way of life since the County's founding in 1850. Today, over 85 percent of county land is used for agriculture. Traditional growers on large-scale farms share the land with a growing number of diversified small farms (e.g. truck farms), as well as thriving livestock operations. Additionally, many farmers are implementing innovative new models for farm operation, crop choice and mix and marketing. Important contributors to the strength and success of agriculture in Yolo County include the County's longstanding commitment to agricultural preservation, its focus on directing growth into the existing cities and towns and the presence of UC Davis, which is an international leader in agricultural research and education.

The gross value of Yolo County's agricultural production for 2021 was $811,123,000. This represents an increase of $99,297,000 or 13.9% above 2020's value of $711,826,000. Almonds were the top commodity for 2021 with a gross value of $137,114,000, followed by tomatoes with a gross value of $136,618,000. Although there was an increase in gross crop value, 2021 was a challenging year due to water shortage. This is reflected primarily in a 45% decrease in Rice acreage. Seed crop were also down. The overall value of our primary crop increases were due to strong pricing and an increase in almond production due to maturing trees. Hay for feed reflected an increase demand again driven by drought. Table 1-5 contains a list of the top ten agricultural commodities in Yolo County for 2021 and their gross values across three years.

Table 1-5 Top 10 Commodities in Yolo County, 2019-2021

Commodity	2021	2020	2019
1. Almonds (Meats)	$137,114,000	$98,250,000	$157,776,000
2. Tomatoes, Processing	$136,618,000	$127,435,000	$107,540,000

3. Grapes, Wine (All)[1]	$116,528,000	$104,760,000	$108,143,000
4. Organic Production (All)	$56,877,000	$46,080,000	$56,902,000
5. Rice[2]	$38,791,000	$67,667,000	$57,086,000
6. Walnuts (All)	$37,526,000	$27,550,000	$35,800,000
7. Hay, Alfalfa	$34,336,000	$27,270,000	$30,492,000
8. Sunflower seed	$30,095,000	$33,422,000	$26,260,000
9. Pistachios[3]	$29,138,000	$8,569,000	$2,566,200
10. Apiary[4]	$22,085,000	$16,231,000	$14,301,000

[1] 2020 value corrected
[2] Includes USDA Support prices, does not include seed
[3] 2020 and 2019 total values corrected
[4] Includes colonies, honey, package bees, pollination, queens, and wax. 2020 value corrected

Source: Yolo County Agriculture Department, Yolo County Agricultural Crop Report

Important farmlands in Yolo County are presented on the Important Farmlands in Figure 7. The majority of the County's farmland is Prime Farmland, particularly in flat areas. Most of the County's cities and unincorporated communities are surrounded by Prime Farmland. The western foothills are predominantly classified as Grazing Land.

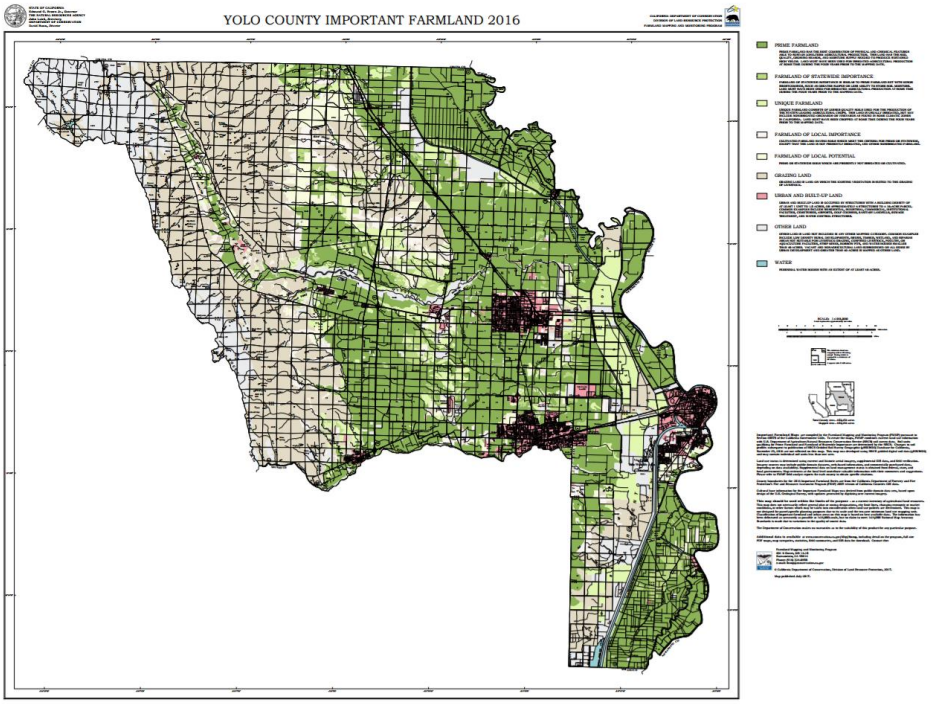

Figure 7: Important Farmland in Yolo County
Source: California Department of Conservation

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The California Land Conservation Act, better known as the Williamson Act, has been a cornerstone of the County's agricultural preservation program. As shown in Figure 7, 410,659 acres or 67 percent of Yolo County's total land area is in Williamson Act contracts. In 2005, the State honored Yolo County with an agricultural stewardship award in recognition of the County's work to preserve agricultural land through the Williamson Act. Subventions (reimbursements for lost property tax revenue resulting from Williamson Act contracts) have repeatedly been proposed for reduction or elimination by the State in recent years in order to balance the State budget. This would have a significant and adverse effect on both farmers and the County.

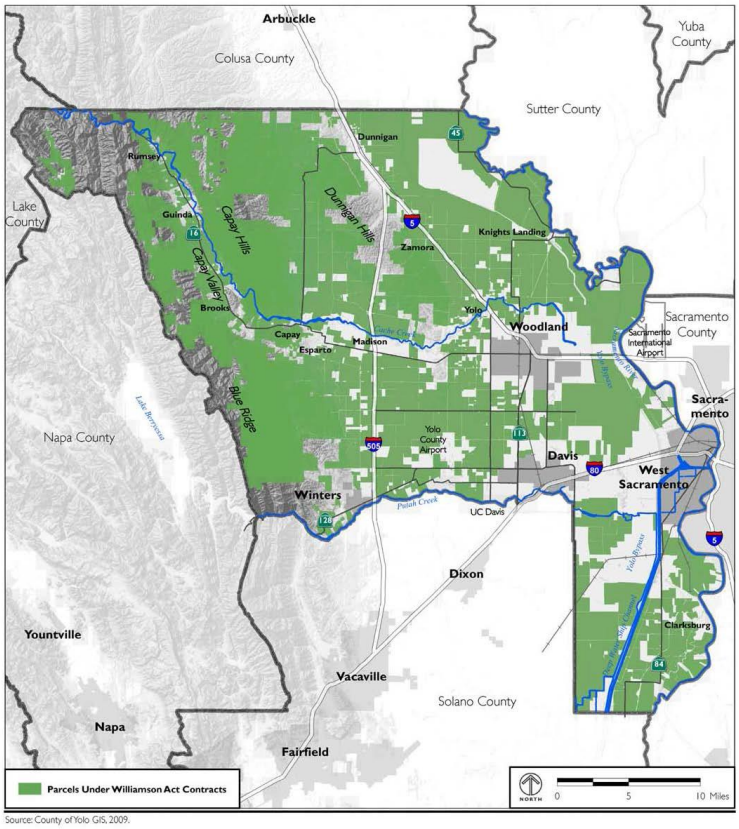

Figure 8: Williamson Act Contracts
Source: Yolo County GIS Department

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1.5 EXISTING AUTHORITIES, POLICIES, PROGRAMS, AND RESOURCES

Yolo County and its jurisdictions each has an Emergency Operations Plan, a General Plan, which includes a Safety Element, an Emergency Services Ordinance that clearly defines roles and responsibilities in accordance with state and federal guidelines. The County CAO and jurisdictional City Managers noted in this document serve as the Directors of Emergency Services for their respective areas by law, ordinance and Municipal Code. The Board of Supervisors, City Councils, Tribal Council or Special District Board of Directors serve as the administering agency and the promulgation authority for all plans, policies and procedures within Yolo County and its member jurisdictions. The county and participating jurisdictions recognizes the enhanced Hazard Mitigation Plan of the State of California, the California Emergency Services Act, and the appropriate Federal Regulations including 44 CFR 201. Yolo County is subject to the State of California Uniformed Building Code (UBC), which dictates standards on all current and future construction within Yolo County.

2030 General Plan

The Yolo County 2030 General Plan adopted in 2009 provides comprehensive and long-term policies for the physical development of the county and is often referred to as "the constitution" for local government. This is only the third time in the county's history that the General Plan has been comprehensively updated, and the first time since 1983. While the fundamental goals of promoting agriculture, enhancing open space, and creating sustainable communities are the same as they have been over the past 50 years, the circumstances facing the county have changed. Issues such as the global economy, climate change, and the role of local government create new challenges to maintaining the county's historic vision. The 2030 General Plan charts a course for the county over the next twenty years that will achieve its goals and address these concerns. The General Plan separates action items that will implement the variety of programs needed to realize the county's vision; this plan works in coordination with the 2023 revision of the HMP.

Climate Action and Adaptation Plan

Yolo County has a well-earned reputation for environmental protection and climate action. A leading advocate of ecosystem conservation, responsible growth, and agricultural lands preservation for more than 40 years, the County has also taken numerous steps to reduce emissions associated with County government operations.

In 1982, Yolo County adopted an Energy Plan, which was one of the first of its kind. In 2007, Yolo County became one of 12 charter members from throughout the country to sponsor the Cool Counties Initiative, which pledges each county collectively to reduce greenhouse gas emissions by 80% by 2050. That same year, the county organized local cities, special districts and UC Davis to form the Yolo County Climate Change Compact, providing an ongoing forum for exchanging information on how best to analyze and address greenhouse gas emissions. The 2030 General Plan, adopted in November 2009, has over 350 policies that deal with climate change.

In September 2020, the Yolo County Board of Supervisors doubled down on its commitment to climate leadership by approving a Climate Emergency Declaration (Resolution No. 20-114), which set a goal for the County to achieve a carbon negative footprint by 2030, while ensuring a just transition to an inclusive, equitable, sustainable, and resilient local economy. This goal was, and continues to be, one of the most ambitious emission reduction goals of any municipality in the Country. The Board subsequently created the Yolo County Climate Action Commission (YCCAC), an eleven-member advisory body is charged with developing and implementing a Climate Action and Adaptation Plan (CAAP) to meet the 2030 goal and ensuring vulnerable, marginalized, and historically underserved communities are centered in the process.

The CAAP and HMP overlap in that both documents address climate-related natural hazards such as wildfires and floods and propose responses in the form of policies, programs, and projects. The Climate Action and Adaptation Plan, in contrast also considers incremental or slow-onset climate change such as seasonal shifts, and the ways community members and industries need to adjust to these changing climatic conditions. Still, both documents have a goal of long-term risk reduction, and initiatives from the County's climate planning work have historically been incorporated into the HMP as mitigation projects.

The overall community-wide GHG emissions for the unincorporated County (excluding UC Davis, the Yocha Dehe Wintun Nation and special districts) was 1,082,801 metric tons (MT) of carbon dioxide equivalent (CO2e) in 2016. The largest proportion of GHG emissions in the County in 2016 came from the On-Road Transportation sector, followed by Agriculture, Energy Consumption, Off-Road Transportation, Solid Waste and Wastewater Treatment. The total GHG emissions for 2016 indicates a decrease of 96,012 MTCO2e or ~8 percent from the adjusted 2008 inventory. GHG reductions, compared to the 2008 inventory, occurred in the Energy Consumption, On-Road Transportation, Agriculture, and Wastewater Treatment sectors.

To reach net-negative emissions, the County will need to reduce emissions across all sectors, and also increase adoption of carbon sequestering practices across natural and working lands. To do this, the County has developed a Natural and Working Lands Technical Advisory Committee (NWL TAC) comprised of small and large-scale farmers and ranchers that will identify and prioritize sequestration strategies that are feasible and mutually-beneficial to Yolo County growers. The 2030 CAAP update is still in process and is expected to be completed in 2024. This update will include an updated emission inventory for the unincorporated area as well as recommendations for policies, programs, and specific sequestration and emissions reduction strategies and actions.

1.6 New Items for the 2023 Update

The 2018 Yolo County Multi-Jurisdictional Hazard Mitigation Plan (HMP) contained descriptions of their planning process, the risk assessments of identified hazards for the Yolo

County Operational Area and mitigation strategies for reducing the risk and vulnerability from these hazards. This document is, in concept, a revision of the Yolo County Hazard Mitigation Plan, composed and approved in 2005, updated and reapproved in 2013 and 2018. As part of this 2023 HMP Update, a thorough review and update of the 2018 Yolo County HMP was conducted to ensure that this plan update reflects current community conditions and priorities in order to realign the updated mitigation strategy for the next five-year planning period. This update also represents a major refinement of the hazard mitigation planning process for Yolo County in accordance with FEMA's latest planning guidance the *Local Mitigation Planning Policy Guide* released in 2022 and implemented in 2023. This section of this HMP update includes the following:

- What's New in the Plan Update. Section 1.6.1 provides an overview of the approach to updating the Plan and identifies new analyses, data and information included in this HMP Update to reflect current community conditions. This includes a summary of new hazard and risk assessment data as it relates to the Yolo County Operational Area as well as information on how the mitigation planning process has shifted due to internal changes at Yolo County. The actual updated data, discussions, and associated analyses are contained in their respected sections within this HMP update.
- Summary of Significant changes to current conditions and Hazard Mitigation Priorities. Section 1.6.2 provides a summary of significant changes in current conditions, changes in vulnerability, and any resulting modifications to the community's mitigation program priorities.

The revision of the HMP has been a collaborative effort, involving various local and tribal government jurisdictions, public authorities, special districts, and selected community-based organizations that represent a broad composite of the operational area. Additionally, selected state agencies and organizations have also contributed to this planning effort, and are represented within the document by direct participation or supplemental reference.

The bulk of the revision was conducted as a collaborative partnership between several local and tribal government organizations, organized as the HMP Steering Committee, and coordinated and facilitated by the Yolo County Office of Emergency Services (OES). This was a major inter-organizational undertaking, requiring a commitment of staff time, organizational resources, ongoing communication, and data collection in an effort to achieve the desired hazard mitigation planning goals. The specific jurisdictions represented in the plan that will formally approve this 2018 update are as follows: Cities of Davis, Winters, West Sacramento and Woodland, the Yocha Dehe Wintun Nation; the Housing Authority of the County of Yolo; Yolo County; and all of the Reclamation Districts and Special Districts in Yolo County that wish to approve it.

In addition to governmental efforts, community involvement was a major objective of the planning process, with online and participative outreach conducted at various stages within the planning process. Although not every aspect of the broader community was directly involved in the planning process, significant effort was made to ensure that the public and non-governmental entities had a voice in the plan's development.

Completion of this HMP update further provides documentation of the Yolo County communities' continued commitment and engagement in the mitigation planning process.

1.6.1 What's New in the Plan Update

This HMP update involved a comprehensive review and update of each section of the 2018 Plan. Only the information and data still valid from the 2018 HMP was carried forward as applicable into this 2023 HMP Update.

Also to be noted, in Section 6.0 Plan Evaluation and Maintenance of this HMP Update identifies key requirements for updating future plans:

- Consider changes in vulnerability due to mitigation action 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;
- Incorporate any new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities; and
- Incorporate new action recommendations or changes in action prioritization

These requirements and others as detailed throughout this plan were addressed during this HMP Update process.

As part of the comprehensive review and update of each section of the 2018 HMP, Yolo County decided to broaden the Steering Committee Members to not only include participating jurisdictions but also selected members to represent a cross-section of views and interests within the planning area. Through this inclusion of diverse interests, the HMP Steering Committee sought to enhance the robustness of the planning effort and to build support for hazard mitigation activities across the Stakeholder groups. The Steering Committee recognized that updated data, if available, would enhance the analysis presented in the risk assessment and utilized in the development of the updated mitigation strategy. Specific data used is sourced throughout this HMP update. This new data and associated analysis provided valuable input for the development of the updated mitigation strategy presented in Section 5.0 of this HMP Update.

Highlights of new information and analyses contained in this HMP Update includes the following:

- Most natural hazards from the 2018 HMP were profiled in this 2023 HMP Update. However, the Steering Committee decided to not fully profile all Non-Natural Hazards to better focus mitigation efforts that could be funded by FEMA Mitigation grants. Non-Natural hazards will be mentioned and their effects briefly described for situation awareness purposes. Air quality is also mentioned as a sub-hazard under Wildfire due to secondary impacts from Wildfire. Natural Hazards dropped from consideration include: Haboob, land subsidence, severe weather – fog, severe weather – hail/ice/snow, space weather, tsunami, tropical storm/hurricane, volcano.
- The County created a list of critical facilities that were spatially quantified in GIS, and then overlayed on each mapped hazard.
- Disaster declarations were updated, including federal, state, and USDA disaster declarations.
- Yolo County partnered with Yolo County Climate Action and Sustainability group to better address hazards that are exacerbated by climate change and to address public comments and concerns.
- Community Lifelines were added to reflect the 2022 FEMA Local Mitigation Planning Policy Guide.
- A more detailed GIS analysis was performed for wildfire hazard, including Community Lifelines, population at risk, historic, cultural, and natural locations at risk, and general community impacts.
- An updated GIS analysis was performed for the flooding hazard for the 1%/0.2% annual chance floods, including Community Lifelines at risk, population at risk, future development, and general community impacts.
- Each risk assessment was re-evaluated for each identified hazard to reflect new information and to reflect the updated FEMA Plan review tool. This included reworking the hazard profiles such as new hazard event occurrences, and updating the vulnerability assessment based on more recent hazard data.
- Utilizing updated Community Lifelines GIS mapping for the Operational Area, an analysis was conducted to provide an updated inventory of critical facilities and those that fall within mapped hazard areas.
- Also, as required by current FEMA planning guidance, an analysis of ongoing and continued compliance with the NFIP was included in this HMP Update.

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1.6.2 Climate Change

According to the California Natural Resource Agency (CNRA), climate change is already affecting California and is projected to continue to do so well into the foreseeable future. Current and projected changes include increased temperatures, seal level rise, a reduced winter snowpack altered precipitation patterns, and more frequent storm events. Over the long term, reducing greenhouse gases can help make these changes less severe, but the changes cannot be avoided entirely. Unavoidable climate impacts result in a variety of secondary consequences

including detrimental impacts on human health and safety, economic continuity, ecosystem integrity and provision of basic services. Climate change is being profiled as it is applicable to the Natural Hazards profiled in Section 3.0. Yolo County is considering climate change issues when identifying future mitigation actions and continuing to work with the Sustainability Department on Climate Change and Adaptation plans.

1.6.3 Continued Participation in the Community Rating System Program

Yolo County has participated in the Community Rating System Program (CRS) since 2012. The CRS program is designed to recognize floodplain management activities that go above and beyond the National Flood Insurance Program's (NFIP) minimum requirements. CRS is designed to reward a community for implementing public information, mapping, regulatory, loss reduction and/or flood preparedness activities. On a scale of 10 to 1, Yolo County is currently ranked Class 8. One of the overall priorities of Yolo County is to continue in this program and improve the class ranking.

Finally, the extent to which this revised plan will or will not be a success locally is dependent upon the commitment at all levels of the designated operational area, whether it be governmental or community-based, to monitor the progress of the identified mitigation strategies, and to ensure that appropriate projects are implemented in accordance with identified need, overriding policy, and funding availability.

1.7 Hazard Mitigation Principles

- *Hazard Mitigation* is any sustained action taken to eliminate or reduce long-term risk to human life, property, and the environment posed by a hazard.
- *Hazard Mitigation Planning* is the process of making any sustained plan or course of action taken to reduce or eliminate long-term risk to people and property from both natural hazards and their effects. The planning process includes establishing goals and recommendations for mitigation strategies.
- Hazard Mitigation may occur during any phase of a threat, emergency or disaster. Mitigation can and should take place during the preparedness (before), response (during), and recovery (after) phases.
- The process of hazard mitigation involves evaluating the hazard's impact and identification and implementation of actions to minimize the impact.

1.8 Plan Organization and Structure

The Plan has been set up in two volumes so that the elements that are jurisdiction-specific can easily be distinguished from those that apply to the whole County.

Volume 1 includes the required elements of a hazard mitigation plan from FEMA's *Local Mitigation Planning Policy Guide*, dated April 19, 2022, effective April 19, 2023. This includes the planning process, public involvement strategy, hazard risk assessments, countywide mitigation actions, and a plan maintenance strategy. Since this is a multi-jurisdictional plan, Volume 1 addresses the entirety of Yolo County Operational Area, participating Jurisdictions, Special Districts, and the Unincorporated Areas.

Volume 2 contains the Jurisdictional Annexes, which detail the hazard mitigation planning elements specific to each participating Jurisdiction in Yolo County Operational Area HMP Update and includes all federally required jurisdiction-specific elements. Each Annex is not intended to be a standalone document, but annexes to, supplements, and incorporates by reference information in Volume 1 of the Plan. As such, all information in Volume 1, including the planning process and other procedural requirements and planning elements apply to the participating jurisdictions as well. The Annexes provide additional information specific to each participating jurisdiction, including additional details on the risk assessment and mitigation strategy.

SECTION 2.0: PLANNING PROCESS

This section describes each stage of the planning process used to develop the Yolo County Operational Area Multi-Jurisdictional Hazard Mitigation Plan. The planning process provides a framework for document development and follows the FEMA recommended steps as described in Table 2-1 below. The Yolo County Operational Area Multi-Hazard HMP is a community-driven, living document. The planning process encourages communities to integrate mitigation with day-to-day decision making.

Revision of the Hazard Mitigation Plan requires collaboration and partnering at a multitude of levels.

- Identifying the primary local stakeholders – Formation of inter-jurisdictional Hazard Mitigation Steering Committee and Planning Committee
- Determining how public input will be considered and incorporated in the planning process
- Establishing project goals and objectives
- Organizing the project work plan based upon identified goals and objectives
- Review of existing Hazard Mitigation Plan
- Identification and refined assessment of real or potential hazards and threat conditions
- Revision of jurisdictional demographic and organizational data, and reformatting of information presentation
- Development of prioritized hazard mitigation strategies and projects, keyed to identified hazards

When undergoing the update process for the 2018 Yolo Operational Area Hazard Mitigation plan, the lead coordinating agency recognized the need to have a specific planning committee that would be tasked with establishing a mechanism for the development and update of the Jurisdictional Annexes, formerly called Community Profiles in the 2018 update, and implementation of jurisdictional mitigation projects. Each participating local jurisdiction would undergo the same planning process prescribed by FEMA as briefly outlined in the table below.

Table 2-1: FEMA Hazard Mitigation Planning Process

Disaster Mitigation Act Regulation	FEMA Planning Process
1. Organize the Planning Process and Resources	
201.6(c)(1)	1) Organize the Planning Effort
201.6(b)(1)	2) Involve the Public
201.6(b)(2) and (3)	3) Coordinate with other Departments and agencies
2. Assess Risks and Capabilities	
201.6(c)(2)(i)	4) Identify the Hazards
201.6(c)(2)(ii)	5) Assess the Risks
3. Develop the Mitigation Strategy	

201.6(c)(3)(i)	6) Set Goals
201.6(c)(3)(ii)	7) Review Possible Mitigation Activities
201.6(c)(3)(iii)	8) Draft an Action Plan
4. Adopt and Implement the Plan, Monitor Progress	
201.6(c)(5)	9) Adopt the plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan

The planning process began with the organizational phase to establish the Hazard Mitigation Planning Committee Members comprised of all jurisdictions wishing to seek approval of the Hazard Mitigation Plan such as key County representatives, and other jurisdictional stakeholders. A Steering Committee was also established and tasked with guiding the overall plan update process. Members of the Steering Committee were selected to represent a cross-section of views and interests within the planning area.

A detailed risk assessment was conducted by participating planning jurisdictions including Yolo County, Unincorporated areas, Cities, and Special Districts. Followed by the development of a focused mitigation strategy by all participating jurisdictions. Once approved by CalOES and FEMA, this Hazard Mitigation Plan update will be adopted and implemented by the County and all jurisdictions over the next five years.

2.1 PARTICIPATING JURISDICTIONS AND ORGANIZATIONS

The representatives of the jurisdictions participating in the 2023 Yolo County Operational Area Hazard Mitigation Plan Update and seeking FEMA approval of the plan include:

The County of Yolo
Susan Hensley, Emergency Services Coordinator, Office of Emergency Services
Kristin Wevioda, Chief of Emergency Services, Office of Emergency Services
Tonia Murphy, Procurement Manager, Yolo County General Services
Jason Roberts, Emergency Preparedness Coordinator, Health and Human Services Agency
April Meneghetti, Director of Environmental Health, Community Services Department

The City of Davis
Jean Lyon, Deputy Director of Police Services
Joseph Tenney, Fire Chief

The City of West Sacramento
Brenna Howell, Emergency Services Coordinator
Bryan Johnson, Fire Marshal

The City of Winters

Jack Snyder, Fire Chief
John Miller, Police Chief

The City of Woodland
Eric Zane, Fire Chief

The Yocha Dehe Wintun Nation
Shawn Kinney, Fire Chief
Sarah Morgan, Natural Resources Manager
Sofia Ortiz, Administrative Assistant

The Housing Authority of Yolo County
Ian Evans, Executive Director

Reclamation District 108 (including Sacramento West Side Levee District, Knights Landing Ridge Drainage District, Dunnigan Water District)
Meegan Nagy, Deputy Manager
Elizabeth Ramos, Civil Engineer
William Vanderwaal, General Manager, Dunnigan Water District

Reclamation District 900
Breanna Howell, Emergency Services Coordinator, West Sacramento Fire Department

University of California, Davis
Benton Best, Campus Emergency Manger

Yolo County Flood Control & Water Conservation District
Jennifer Reed, Project Manager

During the response phase, the agencies that are charged with responsibilities in this plan focus on the following five goals:

- Mitigate hazards.
- Meet basic human needs.
- Address needs of people with disabilities and other access and functional needs.
- Restore essential services.
- Support community and economic recovery.

The Yolo County Office of Emergency Services (OES) was delegated with the role of lead agency for the coordination and facilitation of the joint multi-jurisdictional hazard mitigation

plan update. OES functioned as the central point of contact for all partnering jurisdictions and organizations, as well as the liaison between the Yolo Operational Area and the State regarding plan revision. Finally, OES performed the bulk of actual plan format and development, in conjunction with the Steering and Planning Committee members.

2.2 STEERING COMMITTEE

Yolo County decided to broaden the Steering Committee Members to include selected members to represent a cross-section of views and interests within the planning area. Email notifications were sent out to each HMP Steering Committee member to solicit their participation in the HMP Steering Committee meetings.

The HMP Steering Committee agreed to make and pass plan-based general policy recommendations by a vote of a simple majority of those members present. The Committee will also seek input on future hazard mitigation programs and strategies from a representative from each of the participating jurisdictions.

- Contact and work with each Hazard Mitigation Strategy's Lead Agency for an annual progress report on funding and implementation of the program recommended.
- Receive an annual report from each jurisdiction on the status of the strategies adopted and implemented.
- Meet annually to identify new hazard mitigation strategies to be pursued by jurisdictions, and review the progress and implementation of those programs already identified.
- Meet annually to review the progress of the Hazard Mitigation program and bring forth community input on new strategies.
- Coordinate with and support the efforts of the Yolo County Office of Emergency Services to promote and identify resources and grant money for implementation of recommended hazard mitigation Strategies within local jurisdictions and participating public agencies.

Members of the Steering Committee include:

Fire Representative
Breanna Howell, Emergency Services Coordinator, City of West Sacramento Fire Department

Flood District Representative
Kristin Sicke, General Manager, Yolo County Flood Control and Water Conservation District

Police Representative
Darren Pytel, Police Chief, City of Davis Police Department

Rural Fire Representative
David Garrison, Fire Chief, Dunnigan Fire

Sutter Davis Hospital
Vinnie Ryan, RN Nursing Supervisor

Tribal Representative, Yocha Dehe Wintun Nation
Shawn Kinney, Fire Chief, Yocha Dehe Wintun Nation Fire Department

Yolo Commission on Aging and Adult Services
Jim Bohon

Yolo County, County Administrators Office
Mark Bryan, Deputy Chief Administrative Officer

Yolo County Climate Action & Sustainability Program
Kristen, Wraithwall, Sustainability Manager

Yolo County, Health and Human Services Agency
Julie Cross, Executive Assistant, Yolo County Health and Human Services Agency

Yolo County Housing Authority
Ian Evans, Executive Director

Yolo County In-Home Support Services Advisory Committee
Kate Laddish, Chair

Yolo County Office of Education
Garth Lewis, Yolo County Superintendent of Schools

Yolo County, Office of Emergency Services
Susan Hensley, Emergency Services Coordinator

Yolo County Public Health, Emergency Medical Services Agency
Douglas Brim, Emergency Medical Services Administrator

Yolo County Sheriffs Office
Sam Machado, Sheriffs Operational Area Coordinator

The HMP Steering Committee will meet and review the mitigation recommendations and strategies identified within this plan:

- This Committee will support the recommendations adopted by each jurisdiction for implementation and coordination on a state and regional basis.
- Each jurisdiction will review and adopt, as necessary, the work of the Committee on an annual basis.

- The Committee will review the progress reports on the implementation of the adopted hazard mitigation strategies brought forth by participating local and tribal government entities within the Yolo Operational Area.
- As required under prevailing state and federal requirements, this plan will be reviewed and updated on a five-year cycle. The strategies may be updated based on changing priorities and relieved constraints as identified below.

When constituted and organized, local hazard mitigation Steering Committees or entities may perform the following mitigation functions to meet local goals and objectives:

- Continue to review and assess local hazard mitigation needs and capacities in conjunction with this plan and other supporting documents and information
- Revise key local mitigation data and information
- Receive and process supplemental and supporting hazard mitigation reference information and guidance as released by the state and/or FEMA
- Provide guidance to local emergency management in the integration of adopted risk information and adjustments to local mitigation activities
- Provide local hazard mitigation information and guidance to resident populations, inquiring organizations, vendors, and other interested parties
- Provide information and guidance to the local governing body relative to hazard mitigation issues, needs, gaps, and project activities

2.2.1 Steering Committee Tasks

Specific tasks were identified for the Steering Committee in order to ensure that project goals for the HMP revision were undertaken and completed. The following represents those primary Steering Committee tasks:

- Coordinate tasks and activities with the Office of Emergency Services to develop all-hazards disaster mitigation plan and oversee the planning process.
- Prioritize hazards vs. resources.
- Select highest and best mitigation recommendations and develop those recommendations for further action by the Yolo Operational Area.
- Review planning drafts, recommendations and updates.
- Develop and implement long and short-term goals.
- Integrate the plan with all phases of comprehensive emergency management planning.
- Provide for the implementation of committee decisions.
- Encourage, coordinate and provide a methodology for the implementation of public input.
- Provide for the implementation of committee decisions.
- Establish Hazard Mitigation Steering Committee Tasks to Include but not be limited to the following:

- Determine implementation ability and constraints for proposed Hazard Mitigation planning steps and development of strategies
- Bring forward community concerns through private and public input
- Identify implementation resources
- Evaluate and carry out mitigation activities
- Assist in implementation of funding identification and procurement
- Ensure that adjacent jurisdictions, pertinent private entities and citizens are informed of the Yolo Operational Area Hazard Mitigation Planning Process and offer each the opportunity for input into the plan.

2.2.3 Steering Committee Future Tasks

Specific future tasks were identified for the Steering Committee in order to ensure that project goals for the HMP revision were continued. The Steering Committee will continue to meet on a tri-annual meeting schedule to identify hazard priorities and review local hazard mitigation strategy recommendations. The following represents those primary Steering Committee future tasks:

- Define the mitigation constraints that the Yolo Operational Area is required to follow in implementing recommendations from the Hazard Mitigation Steering Committee.
  - Protection of sensitive information
  - Apply budget constraints to recommended hazard mitigation strategies
  - Apply state policy and legal constraints to mitigation strategies brought forward by the Steering Committee.
- Meet on an annual basis to review the work of and contribute to the Yolo Operational Area Hazard Mitigation Steering Committee activities.
- Bring forth the concerns and views of the community to the Steering Committee for consideration in the ongoing Hazard Mitigation planning process.
- Assist in informing the public and community of the Hazard Mitigation strategies recommended by both the Steering Committee and individual jurisdictional Steering Committees.
- Define the constraints for implementation of prioritized mitigation strategies within the authorities, laws, and regulations of the local and tribal government entities existing within the Yolo Operational Area.
- Carry out the goals and objectives of the Yolo Operational Area Multi- Jurisdictional Hazard Mitigation Plan.
- Support and review the input from meetings of the adjunct members with individuals, agencies and jurisdictions.
- Assure that the public is kept informed of changing strategies and implementation actions periodically.

2.3 STAKEHOLDER ENGAGEMENT

Per 44 CFR Section 201.6(b)(2), the planning process included an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved. Agencies from whom stakeholders were invited to participate in the 2023 HMP update process include:

- Yolo County Transportation District
- CalFIRE
- Pacific Gas & Electric
- Sutter Davis Hospital
- Dignity Woodland Memorial Hospital
- University of California, Davis
- Yocha Dehe Fire Department
- Winters Fire Department
- Winters Police Department
- Arbuckle Fire Department
- Capay Valley Fire Department
- Dunnigan Fire Department
- Esparto Fire Department
- Madison Fire Department
- Yolo Emergency Communications Agency
- West Plainfield Fire Department
- Zamora Fire Department
- California Highway Patrol
- American Red Cross
- Yolo County Fairgrounds
- Yolo County School District
- Esparto Community Services District
- City of Davis Fire Department
- UCDavis Fire Department
- City of Woodland Fire Department
- City of West Sacramento Fire Department
- Community Medical Centers
- Elica Health Centers
- Northern Valley Indian Health
- Yolo Commission on Aging
- Yolo Hospice
- Yolo County Sheriffs Department

During the 2023 HMP update process, stakeholders were invited via invitation email to each HMP meeting.

2.4 PUBLIC INVOLVEMENT

Due to significant staff turnover in the lead coordinating agency from 2019-2023, there were significant gaps in the HMP Process including an initial public meeting November 2018 (see Appendix A for documentation) and minor progress made in the subsequent years until 2022. No public meetings were held between 2018-2023. However, since the hiring of dedicated staff to hazard mitigation planning in 2022, there has been several opportunities for the public to comment on the planning process during the 2018 HMP update process. A plan that reflects the community's values and priorities is likely to have greater legitimacy and "buy-in" and greater success in implementing mitigation actions and projects to reduce risk. In 2022, Public surveys soliciting community input on their perceived threats, hazards, and mitigation ideas were

distributed through press releases, on social media, County Website, and through HMP Stakeholders group.

The development of the Steering Committee provided another avenue of community input as committee members would report back to their stakeholders regarding plan updates, and opportunities for feedback and input. Public meetings were held after the first plan draft was completed to solicit feedback and comments, as well as a final public meeting after public comments and feedback were incorporated prior to submission for FEMA review. Notices for these public meetings were posted on the Yolo County website, as well as media outlets and social media sources.

Public meetings were conducted at various locations and times to allow for underserved communities as well as vulnerable populations to attend and provide feedback and comments. In particular for the 2023 HMP Update, there were significant efforts to incorporate input from the aging population, those with access and functional needs, and those who reside in the unincorporated areas. We included various locations and times for the public meetings such as in an unincorporated area, senior centers during the daytime, as well as a zoom option for those who may not be able to attend an in-person meeting due to varying factors and circumstances (see appendix for more information)

2.4.1 Integration of Public Input

At the onset of the 2023 HMP Update in 2022, a Community Survey was created and distributed via press release and through existing governmental websites (see appendices) to solicit public input on the general perception of threats within their community, the importance of individual preparedness, and the level of hazard mitigation. Information collected from this survey was analyzed by the Hazard Mitigation Steering Committee and County OES staff and used to help identify public concern and perceptions on identified threats. A public facing platform was also created to highlight the public's concerns and perceptions on hazards and threats in their communities and educating the public on Hazard Mitigation efforts and opportunities.

Jurisdictions were also encouraged to solicit input in their hazard vulnerability analyses. As planning committee members developed their individual hazard prioritization matrices, the information from their respective communities was also considered in formulating the hazard list and subsequent analysis of each of those hazards. The result was a listing of High, Moderate and Low Risk Priority natural hazards that can or could impact the Yolo Operational Area. Out of that general assessment, prioritized mitigation strategies, with identified implementation projects, and was developed by inter-jurisdictional consensus. The public meetings gave the public an opportunity to learn about Hazard Mitigation, the identified hazards within their communities, and an opportunity to provide feedback into mitigation project ideas. The public was also given one month to review the draft 2023 HMP update and provide feedback to the lead coordinating agency for the 2023 HMP Update (see appendices for Public Meeting documentation). All

comments and feedback were then incorporated into the 2023 HMP Update prior to submission to FEMA for review.

2.4.2 Continued Public Involvement

The Yolo Operational Area Hazard Mitigation Steering Committee has made the commitment to periodically bring this plan before the public through public meetings and community posting so that citizens may make input as strategies and implementation actions change. Public meetings will continue to be held annually. As well as an Annual Report on Hazard Mitigation Updates will be distributed Annually to inform the public of any Hazard Mitigation project updates or Plan updates. The public will continue to be invited to public meetings via social media messaging, newspaper invitations, and through the website for each jurisdiction participating in the plan. Each jurisdiction including the Cities of Davis, West Sacramento, Winters, Woodland and the Yocha Dehe Wintun Nation is responsible for assuring that their citizenry are informed when deemed appropriate by the Steering Committee.

Yolo County Office of Emergency Services will also maintain a website to keep the public posted on plan updates, mitigation projects, and contain GIS Mapping resources for hazard mitigation awareness (see Section 6.0 for more information).

2.5 Review and Incorporation of Existing Plans

The HMP will be used to focus project prioritization. Mitigation projects will be considered for funding through federal and state grant programs, and when other funds are made available through the County and or federal government. The Yolo County OES will be the coordinating agency for informing stakeholders on any funding opportunities as well as assisting in project implementation. However, it will be the responsibility of individual jurisdictions to organize resources, prepare grant applications, and oversee project implementation, monitoring, and evaluation. Coordinating organizations may include local, county, or regional agencies that are capable of, or responsible for, implementing activities and programs.

Yolo County planning efforts are supportive of each other. Information from the Yolo County HMP is incorporated into and used to support the Yolo County General Plan, Yolo County Climate Action Plan, Yolo County Emergency Operations Plan, and the continuity plans for each County and jurisdictional department. Many of these planning efforts incorporate all Yolo County jurisdictions and special districts (i.e. flood response plans for each city and Reclamation District with their input). Yolo County coordinates emergency plans with all four cities in Yolo County, the Yocha Dehe Wintun Nation, and the Housing Authority of Yolo County; information from the HMP (including the risk assessment) is incorporated into each of their Emergency Operations Plans and accompanying annexes as well as their continuity plans. Information from several of these plans were used to support the Yolo County HMP as well.

SECTION 3.0: HAZARD IDENTIFICATION AND RISK ASSESSMENT

The Federal Emergency Management Agency (FEMA) defines risk as a combination of hazard, vulnerability, and exposure. "It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage." The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. This process allows for a better understanding of a community's potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

Yolo County is at risk from a variety of potential hazards: natural, technological and human conflict related. Many of these hazards, under the right circumstances, could result in a disastrous impact to the county. However, for the purposes of the 2023 HMP Update, the Operational Area focused this risk assessment on natural hazards and covers the entire geographical extent of the Yolo County Operational Area, including the incorporated communities, unincorporated communities, special districts, and other participating jurisdictions. This section of the HMP will look at both hazards and vulnerabilities. In accordance with FEMA requirements, this risk assessment describes how the hazards and risks vary across the Operational Area and from jurisdiction to jurisdiction. Specific hazards and risks for each jurisdiction is expanded upon in the annexes of the participating jurisdictions in Volume 2. If no additional data is provided in an annex, it should be assumed that the risk and potential impacts to the affected jurisdiction are similar to those described here for the entire Yolo County Operational Area.

This 2023 HMP Update involved a review and update of each section of the 2018 risk assessment. Information from the 2018 HMP was used in the Update where valid and applicable. As part of the risk assessment update, new data was used, where available, and new analyses were conducted where appropriate. Where data from existing studies and reports were used, the source is referenced throughout this risk assessment.

3.1 HAZARD IDENTIFICATION

The process of identifying hazards that do, or could potentially affect Yolo County at various levels was the first step in assessing overall risk. Recognizing the potential required an analysis of known, suspected, and emerging hazards existing within or directly affecting the Yolo OA. Some of the following questions were used during the analysis:

- What are the known hazards?
- What are the suspected hazards?
- What are the potentially emerging hazards?

- What are the elements of the hazard?
- What are the conditions associated with the occurrence of a hazardous event?
- What factors are required for an event to turn hazardous?

In the early meetings with Yolo County and the Steering Committee, data was reviewed from the following sources on hazards affecting the county, those sources were:

- Federal Disaster Declaration Database
- State Disaster Declaration History
- Sate of California Office of Emergency Services (CalOES)
- State of California Hazard Mitigation Plan (2018, 2023)
- National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC)
- FEMA National Risk Index
- California's Fourth Climate Change Assessment: Sacramento Valley Region Report
- CalOES Hazard Exposure and Social Vulnerability Map
- 2018 Yolo County Hazard Mitigation Plan

3.1.1 Hazard Prioritization and Risk Ranking

FEMA requires all hazard mitigation planning partners to have jurisdiction-specific mitigation actions based on local risk, vulnerability, and community priorities. This plan included a risk ranking protocol for each planning partner, in which "risk" was calculated by adding the extent of hazard, the likelihood of future occurrence, the severity, and the impact on people, property and the economy. The risk ranking was used to identify mitigation actions for hazards. The risk ranking at the planning partner scale was used to inform the action plan development process for each partner.

Planning partners were directed to identify mitigation actions addressing hazards that had a "high" and "medium" risk ranking. Those hazards identified as a high or medium significance are considered priority hazards for mitigation planning. Those hazards that occur infrequently or have little or no impact on the Operational Area were determined to be low significance and not considered a priority hazard (see Table 3-3 for omitted hazards). This assessment was used by the Planning and Steering Committees to prioritize those hazards of greatest significance to the Yolo County Operational Area, enabling the County to focus resources where they are most needed.

Variables were based on FEMA, Local Mitigation Planning Handbook. The following variables, questions, and guidance shaped the ranking on the matrices:

Geographic Extent: What geographic area is affected by this hazard?

1. Negligible: No known or negligible geographic extent

2. Limited: Less than 10% of Planning Area
3. Significant: 10-50% of Planning Area
4. Extensive: 50-100% of Planning Area

Likelihood of Future Occurrences: What is the likelihood of a hazard event occurring in a given year?

1. Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.
2. Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.
3. Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less.
4. Highly Likely: Near 100% chance of occurrence in next year or happens every year.

Magnitude/ Severity: What is the expected magnitude and severity of the hazard event based on historic events or future probability?

1. Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries treatable with first aid
2. Limited:10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries treatable do not result in permanent disability
3. Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
4. Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths

Significance: In terms of injuries, damage, or death, would you anticipate impacts to be negligible, limited, critical, or catastrophic when a significant hazard event occurs?

1. Low: minimal potential impact
2. Medium: moderate potential impact
3. High: widespread potential impact

3.1.2 RESULTS

Using existing hazards data and input gained through jurisdictional hazard vulnerability assessments, the HMP Steering Committee and Planning Committee agreed upon a list of hazards that could affect Yolo County Operational Area. Hazards data from CalOES, FEMA, the NOAA NCDC database, and many other sources were analyzed to assess the significance of these hazards to the Operational Area.

The following hazards in Table 3-1, listed alphabetically, were identified and investigated for this 2023 HMP Update. As a starting point, the 2023 California State Hazard Mitigation Plan

was consulted to evaluate the applicability of hazards of concern to the State, to the Yolo County Operational Area. Building upon this effort, hazards from the 2018 Yolo Operational Area HMP were also identified, and comments explain how hazards were updated from this 2018 HMP. Most natural hazards from the 2018 plan were profiled in this 2023 HMP Update. Hazards dropped for this 2023 Plan update include Land Subsidence, Severe weather: fog, volcano, as well as non-natural hazards. For the 2023 Plan update, Climate change impacts were also incorporated into relevant hazards rather than analyzed as a separate hazard.

Although Yolo County Operational Area recognizes that should these hazards occur, it would impact Yolo County Operational Area. They were determined to have low significant impacts and thus removed from analysis for the 2023 HMP Update.

Table 3-1: Yolo County Operational Area Hazard Identification and Comparison from 2018 HMP

2023 Hazards	2018 Hazards	Comments
-	Climate Change and sea level rise	Incorporated into relevant hazards that are affected by climate change, dropped as a standalone hazard.
Dam Failure	Dam Failure	Updated analysis was performed. Structures, populations, and critical facilities that would be impacted were analyzed.
Drought	Drought	Additional data and agricultural impacts from droughts were added.
Earthquake	Earthquake	
Flooding	Flooding	Updated analysis was performed. Structures, populations, and critical facilities that would be impacted were analyzed.
Landslide	Landslide	Similar analysis was performed
-	Land Subsidence	Due to low significance and limited mitigation actions that could be put forth, this hazard was dropped from analysis
Levee Failure	Levee Failure	Updated analysis was performed. Structures, populations, and critical facilities that would be impacted were analyzed.
Severe Weather: Extreme Heat	Severe Weather: Extreme Heat	Similar analysis was performed. Public Safety Power Shutoff information was added to this hazard.
Severe Weather: Freeze	Severe Weather: Freeze	Similar analysis was performed.
-	Severe Weather: Fog	Due to low significance and limited mitigation actions that could be put

		forth, this hazard was dropped from analysis.
Severe Weather: High wind	Severe Weather: High Wind	Similar analysis was performed. Public Safety Power Shutoff information was added to this hazard.
Severe Weather: Tornado	Severe Weather: Tornado	Similar analysis was performed.
-	Volcano	Due to the distance from volcano, the likelihood of future occurrence, and the lack of mitigation actions from the County and participating jurisdictions, this hazard was dropped from analysis.
Wildfire	Wildfire	Updated analysis was performed. Structures, populations, and critical facilities that would be impacted were analyzed.

Table 3-2: Yolo County Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Dam Failure	Extensive	Unlikely	High	High	
Drought	Significant	Likely	Moderate	High	
Earthquake	Significant	Occasional	Possible	Medium	
Flooding	Extensive	Likely	High	High	
Landslide	Limited	Likely	Possible	High	
Land Subsidence	Limited	Likely	Negligible	Low	
Levee Failure	Extensive	Likely	High	High	
Severe Weather: Extreme Heat	Extensive	Highly Likely	High*	High	
Severe Weather: Freeze	Extensive	Likely	Possible*	Medium	
Severe Weather: Fog	Significant	Highly Likely	Negligible	Low	
Severe Weather: High Wind	Extensive	Highly Likely	High	High	
Severe Weather: Tornado	Limited	Occasional	Possible	Medium	
Volcano	Negligible	Unlikely	Negligible	Low	
Wildfire	Significant	Highly Likely	Moderate	Medium	

Geographic Extent Negligible: Less than 10% of Operational Area affected Limited: 10-25% of Operational area affected Significant: Between 35-50% of Operational area affected Extensive: 50-100% of planning area affected **Likelihood of Future Occurrences** Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% change 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 internal of 11 or 100 years. Unlikely: Less than 1% chance of occurrence in the next 100 years or has recurrence internal of greater than every 100 years.	**Magnitude/Severity** High – More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. Moderate – 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illness result in permanent disability. Possible – 10-25% of property severely damaged; shut down of facilities for more than a week; and/or injuries/illnesses treatable to do not result in permanent disability. Negligible – Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illness treatable with first aid. **incorporating agriculture and farm land as property* **Significance** Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact **Climate Change Influence** Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact

Certain hazards were omitted from consideration for this 2023 HMP Update due to either their low probability of occurrence or minimal impact. They are shown in Table 3-3:

Table 3-3: Yolo County – Omitted Hazards

Hazard Excluded	Why Excluded
Haboob	Haboobs occur primarily in arid regions including parts of Arizona, New Mexico, and Texas. Yolo County does not have arid land and does not experience haboobs.
Land Subsidence	The areas most vulnerable to land subsidence are agricultural lands and cropland. However, sinkholes are not likely to form in the County. Effects of Climate change, as well as drought, and water shortages are being discussed in that hazard profile and vulnerability assessment.
Severe Weather: Fog	Although fog is most often experienced in Yolo County during winter, most common impacts are traffic accidents. There was a lack of mitigation actions from the County and participating jurisdictions, this hazard was omitted from consideration.
Severe Weather: Hail/Ice/Snow	There have been minor occurrences of hail, ice, and snow in Yolo County, but none that have had significant impacts. A significant event is not expected to occur in Yolo County due to its mild winter temperatures and climate.
Space Weather	There have been no space weather events in Yolo County. While a solar flare has the potential to disrupt communications and while an impact from a space object could cause significant loss of life and destruction, the probability of these events occurring in Yolo County is considered extremely unlikely.

Tsunami	Yolo County is not located in a tsunami inundation zone due to its distance from San Francisco Bay and the Pacific Ocean.
Tropical Storm/Hurricane	Though tropical cyclones have passed over Southern California, none have reached Yolo County due to its northern latitude and climate.
Volcano	The most likely volcanic hazard for Yolo County is the deposition of ash from an eruption in any of the volcanic areas. However due to the distance from volcanic areas, the likelihood of future occurrence, and the lack of mitigation actions from the County and participating jurisdictions, this hazard was omitted from consideration.

In the 2023 HMP Risk Assessment and Hazard Vulnerability discussions with the Planning and Steering Committee teams, it was decided to remove Non-Natural hazards from the Hazard Analysis and 2023 HMP Update. The reason for removing technological and human-caused hazards was in part to focus efforts on natural hazards and mitigation actions to reduce losses from those hazards. However, the 2023 HMP Planning and Steering Committee wanted to acknowledge the Technological and Human-caused hazards in the 2023 HMP Update without performing a full hazard analysis. The identified technological and human-caused hazards are described in Table 3-4: Technological and Human-Caused Hazards.

Table 3-4: Yolo County – Technological and Human-Caused Hazards

Hazard	Impact
Epidemic/Pandemic	Some outbreaks that have occurred in Yolo County include Norovirus, Pertussis, Measles (UCDavis 2014), COVID-19, and a small number of cases of malaria, dengue fever, legionnaire's disease, and typhoid have been found in Yolo County.
Hazmat Incidents: Radiological Incidents	The only operating nuclear plant in California is the Diablo Canyon Nuclear Power Plant in San Luis Obisbo County, over 300 miles away which is outside the Emergency Planning Zone and the Ingestion Pathway Zone for Diablo Canyon. Rancho Seco Nuclear Generating Station in Sacramento closed in 1989 but is still undergoing decommissioning as it still as spent fuel onsite.
Hazmat Incidents: Chemical Incidents	There has been no major chemical incidents in Yolo County, however due to several incidents around the area in surrounding Sacramento County, these incidents have the ability to affect residents in Yolo who live near or work in Sacramento County.
Hazmat Incidents: Biological Incidents	There has been no recorded hazmat biological incidents in and around Yolo County.
Transportation Accidents: Vehicle Accidents	There are several major highways in Yolo County including Interstate 80, State Highway 113, 16, and 84. Multi-vehicle accidents would overwhelm responding units and cause multi-jurisdictional response.
Transportation Accidents: Train Accidents	There are Class 1 railroads in Yolo County, with Amtrak and Burlington Northern and Santa Fe (BNSF) railroads operating on the Union Pacific (UP) owned line. There are no Class 2 railroads that operate in Yolo County. There are two Class 3 railroads that operate in Yolo County: Sierra Northern Railway and the California Northern Railroad. There have been no major train accidents in Yolo County with the last train derailment occurring in 1894.
Transportation Accidents: Airplane Accidents	There are several airports and heliports in Yolo County, though none of them serve commercial flights. Sacramento International Airport is located approximately one mile east of the Yolo County border, and have several flight paths over Yolo County. Aviation accidents that have occurred over the years in

	Yolo County have been due to agricultural planes, like crop dusters, or personal plane issues such as engine failure.
Transportation Accidents: Ship Accidents	Yolo County has two navigable waterways where large vessels can be found: the Sacramento River and the Sacramento Deepwater Ship Channel. The Deepwater Ship Channel connects the lower Sacramento River to the Port of West Sacramento. The only potential impacts from a ship incident in the Deepwater Ship Channel would be environmental damage due to excess ballast water or elements of the fueling system being released into the water.
Power/Utility Failure	Numerous gas pipelines as well as gas and oil storage facilities exist in and around Yolo County.
Communications/IT Failure	There have been a few instances of Comcast and fiber-optic lines being cut in 2015 which interrupted service to thousands of customers and residents.
Terrorism	There have been several terrorist incidents and threats in Yolo County and the surrounded areas of Sacramento, the latest being in 2017.
Cybersecurity	This is a new hazard that appeared on jurisdictional hazard vulnerability assessments. There has been effort to prepare for cybersecurity incidences throughout the County including increasing awareness and education on threats to cybersecurity.
Civil Disturbance	The primary concern for Yolo County is the University of California Davis and large events that occur on the campus, as well as protests that have previously occurred there. Civil Disturbances have occurred in Woodland as well as areas around Yolo County.
Urban Conflagration	There is potential for Urban Conflagration in Yolo County due to the high risk of wildfires that could spread into urban areas. Fire mitigation measures have been put in place to try to mitigate this hazard.

3.1.3 DISASTER DECLARATION HISTORY

One method to identify hazards is to look at the events that have triggered federal and/or state disaster declarations that included Yolo County. Federal and/or state disaster declarations may be granted when the severity and magnitude of an event surpasses 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. If the disaster is so severe that both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

The federal government may issue a disaster declaration through FEMA, the U.S Department of Agriculture (USDA), and/or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and without the long-term federal recovery programs of major disaster declarations. The quantity and types of damage are the determining factors.

The following table lists the disaster declarations where Yolo County was designated federal and/or state disaster declarations since 1965. Details on federal and state disaster declarations were obtained by FEMA and CalOES and compiled in chronological order in Table 3-5. The USDA Disasters below are indicated as Primary or Contiguous designations for Yolo County.

Table 3-5: Yolo County State and Federal Disaster Declarations, 1965-2023

Year	Disaster Name	Disaster Type	Disaster #	State Declaration #	Federal Declaration #
1965	Heavy rains & flooding	Flood	DR-183-CA	-	12/24/1964
1977	Drought	Drought	EM-3023-CA	-	1/20/1977
1983	Coastal storms, floods, slides & tornadoes	Coastal Storm	DR-677-CA	-	2/9/1983
1986	Severe storms & flooding	Flood	DR-758-CA	-	2/21/1986
1991	Severe freeze	Freezing	DR-894-CA	-	2/11/1991
1995	Severe winter storms, flooding landslides, mud flow	Severe Storm	DR-1046-CA	-	3/12/1995
1995	Severe winter storms, flooding, landslides, mud flows	Severe Storm	DR-1044-CA	-	1/10/1995
1997	Severe storms, flooding, mud and landslides	Severe Storm	DR-1155-CA	-	1/4/1997
1998	Severe winter storms and flooding	Severe Storm	DR-1203-CA	-	2/9/1998
2005	Hurricane Katrina evacuation	Hurricane	EM-3248-CA	-	9/13/2005
2006	Severe storms, flooding, mudslides, and landslides	Severe Storm	DR-1628-CA	-	2/3/2006
2012	Drought	Drought	USDA Primary S3452	12/19/2012	-
2013	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3569	8/21/2013	-
2014	Tree Mortality	Drought		10/30/2015	-
2014	Drought	Drought	USDA Primary S3743	9/17/2014	-
2014	Drought	Drought	USDA Contiguous S3797	2/25/2014	-
2014	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3637	1/23/2014	-
2014	Extreme Heat, High Winds, High Fire Risk	Drought- FAST TRACK	USDA Contiguous S3626	1/15/2014	-
2015	Wragg fire	Fire	FM-5091-CA	-	7/23/2015
2015	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3784	2/4/2015	
2016	Extreme Heat, High Winds, High Fire Risk	Drought- FAST TRACK	S3952	USDA Primary 2/17/2016	
2016	Severe Weather – High Winds, Excessive Rain	Severe Weather	S4164	USDA Contiguous 3/3/2016	
2017	Severe winter storms, flooding, and mudslides	Flood	DR-4308-CA	-	4/1/2017
2017	Severe winter storms, flooding, and mudslides	Flood	DR-4305-CA	-	3/16/2017
2017	Drought	Drought – FAST TRACK	S4163	USDA Primary 3/22/2017	-

2017	Severe winter storms, flooding, and mudslides	Severe Storm	DR-4301-CA	3/7/2017	2/14/2017
2019	Excessive Rain	Excessive Rain, moisture, humidity	S4656	USDA Contiguous 3/11/2020	-
2019	Severe winter storms, flooding, landslides, and mudslides	Severe Storm	DR-4431-CA	USDA Contiguous 5/1/2019	-
2019	Severe winter storms, flooding, landslides, and mudslides	Severe Storm	DR-4434-CA	USDA Primary and Contiguous 5/17/2019	5/17/2019
2020	LNU lightning fire complex	Fire	FM-5331-CA	8/18/2020	8/18/2020
2020	Wildfires	Fire	DR-4558-CA	8/22/2020	8/22/2020
2020	Wildfires	Fire	DR-4569-CA	USDA Contiguous 10/16/2020	-
2020	Drought	Drought – FAST TRACK	S4691	USDA Contiguous 6/10/2020	-
2020	Drought	Drought – FAST TRACK	S4697	USDA Primary 6/16/2020	-
2020	Covid-19	Biological	EM-3428-CA	-	3/13/2020
2020	Covid-19 pandemic	Biological	DR-4482-CA	-	3/22/2020
2021	Drought	Drought – FAST TRACK	S4916	USDA Primary 3/5/2021	-
2022	Drought	Drought-FAST TRACK	S5146	USDA Primary 4/8/2022	-
2022	Freeze	Severe weather – Freeze	S5229	USDA Primary 7/1/2022	-
2022	Freeze	Severe weather – Freeze	S5230	USDA Contiguous 7/1/2022	-
2022	Freeze	Severe weather – Freeze	S5332	USDA Primary 11/4/2022	-
2023	Severe winter storms, flooding, landslides, and mudslides	Flood	DR-4683-CA	1/4/2023	1/14/2023
2023	Severe winter storms, flooding, and mudslides	Flood	EM-3591-CA	1/4/2023	1/19/2023
2023	Severe winter storms, flooding, and mudslides	Flood	DR-4699-CA	4/20/2023	4/3/2023

3.2 HAZARD PROFILES AND VULNERABILITY ASSESSMENT

The hazards identified in Section 3.1.1 Results and Methodology, are profiled individually in this section. These Hazard Profiles set the stage for the Vulnerability Assessment, where the vulnerability is quantified for each of the hazards. The methodologies for the Hazard Profiles and the Vulnerability Assessment is presented first in this section followed by the Hazard Profiles and Vulnerability Assessment for each identified hazard.

3.2.1 HAZARD PROFILES

Each hazard is presented in the following format:

- **Hazard/Problem Description** – This section gives a description of the hazard and associated issues followed by details on the hazard specific to the Yolo County Operational Area and the unincorporated County. Where known, this includes information on the hazard type, location, extent, and any secondary effects.
- **Past Occurrences** – This section contains information on historical hazard events, including location, impacts, and damages where known. Hazard research, historical incident information, any state or federal major disaster declarations, and previous HMPs were used to capture information on past occurrences.
- **Frequency/Likelihood of Future Occurrence** – The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data. It was determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent change of the event happening in any given year (e.g., three droughts over a 30-year period equates to a 10% chance of experiencing a drought in any given year). This likelihood of future occurrences is categorized into one of the following classifications:
    - **Highly Likely –** Near 100 percent chance of occurrence in next year or happens every year.
    - **Likely –** Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.
    - **Occasional** – Between 1 and 10 percent chance of occurrence in next 100 years of has a recurrence interval of greater than every 100 years.
    - **Unlikely –** Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.
- **Climate change –** this section contains the effects of climate change (if applicable). The possible ramifications of climate change on each hazard are discussed.

3.2.2 VULNERABILITY ASSESSMENT

With Yolo County's hazards identified and profiled, a vulnerability assessment was conducted to describe the vulnerability and impact that each hazard would have on the County. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to identified hazards and estimates potential losses. This section focuses on the vulnerabilities of the Yolo County Operational Area as a whole, as well as the unincorporated Yolo County.

An estimate of the vulnerability of the Yolo County Operational Area and unincorporated Yolo County to each identified hazard provided in each of the hazard-specific vulnerability sections

that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, geographical extent, assessing the damage and casualty potential of structures, facilities, and systems that are exposed to each hazard. It is categorized into the following classifications:

- **Extremely Low** – The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **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 occurred in the past.
- **Extremely High –** Very widespread with catastrophic impact.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Other information can be collected in regard to the hazard area, such as the location of community lifelines, historic structures, and valued natural resources. Together, this information conveys the impact, or vulnerability, of the Yolo County Operational Area to that hazard.

If there was sufficient data to support a quantifiable vulnerability analysis, hazards were analyzed using GIS and County Data. If the vulnerability and potential impacts from priority hazards did not have specific mapped areas nor data to support additional vulnerability analysis, vulnerability is discussed in more general terms.

The following sections provide the hazard profile and vulnerability assessments for each of the hazards identified. Severe Weather hazards are discussed first to paint the picture of the County's climate and hazard environment, which often lead to other hazards such as flood, wildfire, and droughts. The remainder of the hazards follow alphabetically.

3.2.3 Power Shortage/Failure

An additional impact of extreme heat is power outage or power failure. Although power shortage and power failures are not a natural hazard, it has become a direct consequence of natural hazards such as extreme heat, high winds, freeze/cold weather, and wildfires. To appreciate the impacts of these natural hazards on power shortages/failures, more detail is provided in this section.

According to statistics gathered by the Department of Energy, major blackouts have impacted at least 50,000 customers in the past two decades. It's important to recognize different types of outages so that plans may be made to handle them effectively. Electric power disruptions can be generally grouped into two categories: intentional and unintentional.

INTENTIONAL DISRUPTIONS

There are four types of intentional disruptions:

- **Planned:** Some disruptions are intentional and can be scheduled based on maintenance or upgrading needs.
- **Unscheduled:** Some intentional disruptions must be done immediately in response to an emergency.
- **Demand-Side Management:** Some customers (i.e., on the demand side) have entered into an agreement with their utility provider to curtail their demand for electricity during periods of peak system loads.
- **Load Shedding:** When the power system is under extreme stress due to heavy demand and/or failure of critical components, it is sometimes necessary to intentionally interrupt the service to selected customers to prevent the entire system from collapsing, resulting in rolling blackouts.

The California Independent System Operator (CAISO) is tasked with managing the power distribution grid that supplies most of California, except in areas served by municipal utilities. CAISO is thus the entity that coordinates statewide flow of electrical supply. CAISO uses a series of stage alerts to the media based on system conditions. The alerts are:

- Stage 1 – reserve margin falls below 7 percent
- Stage 2 – reserve margin falls below 5 percent
- Stage 3 – reserve margin falls below 1.5 percent

Rotating blackouts become a possibility when Stage 3 is reached. Rotating outages and/or blackouts such as those experienced in 2000/2001 and 2006 can occur due to losses in transmission or generation and/or extremely severe temperatures that lead to heavy electric power consumption.

On January 17, 2001, CAISO declared a Stage 3 Emergency and notified the Governor's Office of Emergency Services (Cal OES) that PG&E was dropping firm load of 500 megawatts (MW) in Northern California leading to rolling black-outs. Cal OES, in turn issued an Electrical Emergency Message to all Emergency Services Agencies to prepare for rolling blackouts. This situation occurred again on January 18, 2001 and March 19, 2001.

More recently, in 2020, due to Statewide extreme heat and wildfires, the CAISO declared a Stage 3 emergency in which PG&E then initiated rotating outages in August at the request of California's grid operator. The outages impacted 220,000 customers and occurred during periods of high heat.

Unintentional Disruptions

Unintentional or unplanned disruptions are outages that occur with no advanced notice. These disruptions can be caused by:

- Accident by the utility, utility contractor, or others
- Malfunction or equipment failure
- Equipment overload (utility company or customer)
- Reduced capability
- Tree contact
- Vandalism or intentional damage
- Weather, including lightning, wind, earthquake, flood, and broken tree limbs taking down power lines
- Wildfire that damages transmission lines

Public Safety Power Shutoff (PSPS)

Since the 2018 HMP Update, a new intentional disruption type of power shortage/failure is the Public Safety Power Shutoffs. In response to several wildfires that started as a result of downed power lines or electrical equipment, California's largest energy companies, at the direction of the California Public Utilities Commission (CPUC), shut off electric power during extreme weather events in an effort to prevent a wildfire. PG&E were one of the energy companies that started to announce PSPS events whenever there were certain criteria that were met, such as:

- A Red Flag Warning declared by the National Weather Service
- Low humidity levels generally 20% and below
- Forecasted sustained winds generally above 25 mph and wind gusts in excess of approximately 45 mph, depending on location and site-specific conditions such as temperate, terrain, and local climate.
- Condition of dry fuel on the ground and live vegetation (moisture content)
- On-the-ground, real time observations from PG&E's Wildfire Safety Operations Center and field observations from PG&E crews.

Although no single factor would drive a PSPS event, these were the factors that would be considered if a PSPS event were to occur. The electric lines that would be most likely considered for shutting off for safety will be those that pass through areas that have been designated by the CPUC as at elevated (Tier 2) or extreme (Tier 3) risk for wildfire (see Figure 3-1 below). This

would include both distribution and transmission lines. The specific area and number of affected customers will depend on forecasted weather conditions and which circuits PG&E needs to turn off for public safety. Although a customer may not live or work in a high fire threat area, their power may also be shut off if their community relies on a line that passes through an area experiencing extreme fire danger conditions.

Figure 3-1: CPUC Fire Threat Map, State of California Tier 2 and 3 Areas

PG&E noted that although extreme weather threats can change quickly, whenever possible, PG&E will provide customers with advance notice prior to turning off the power, as well as updates until power is restored. Timing of notifications (when possible) are:

- Approximately 48 hours before power is turned off
- Approximately 24 hours before power is turned off
- Just before power is turned off
- During the public safety outage
- Once power has been restored

Previous PSPS events that have affected Yolo County include:
[list PSPS dates, areas of the County affected, approximately how many customers affected]

3.2.4 Climate Change

Climate change is the distinct change in measures of weather patterns over a long period of time, ranging from decades to millions of years. More specifically, it may be a change in average weather conditions such as temperature, rainfall, snow, ocean and atmospheric circulation, or in the distribution of weather around the average. While the Earth's climate has cycled over its 4.5 billion year age, these natural cycles have taken place gradually over millennia, and the Holocene, the most recent epoch in which human civilization developed, has been characterized by a highly stable climate – until recently.

This HMP is concerned with human-induced climate change that has been rapidly warming the Earth at rates unprecedented in the last 1,000 years. Since industrialization began, the burning of fossil fuels (coal, oil, and natural gas) at escalating quantities has released vast amounts of carbon dioxide and other greenhouse gases responsible for trapping heat in the atmosphere, increasing the average temperature of the Earth. Secondary impacts include changes in precipitation patterns, the global water cycle, melting glaciers and ice caps, and rising sea levels. According to the Intergovernmental Panel on Climate Change (IPCC), climate change will "increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems" if unchecked.

Through changes to oceanic and atmospheric circulation cycles and increasing heat, climate change affects weather systems around the world. Climate change increases the likelihood and exacerbates the severity of extreme weather – more frequent or intense storms, floods, droughts, and heat waves. Consequences for human society include loss of life and injury, damaged infrastructure, long-term health effects, loss of agricultural crops, disrupted transport and freight, and more. Climate change is not a discrete event but a long-term hazard, the effects of which communities across California are already experiencing.

Climate change adaptation is a key priority of the State of California. The 2013 State of California Multi- Hazard Mitigation Plan stated that climate change is already affecting California, and in 2015, Assembly Bill 1482 (Gordon) mandated the development of the California Climate Adaptation Strategy, a comprehensive plan linking together the state's existing and planned climate adaptation efforts, showing how they fit together to achieve California's six climate resilience priorities. According to the Strategy's 2022 Progress report, since 1895, annual average air temperatures in California have increased by about 2.5 degrees Fahrenheit (°F) and eight of the ten warmest years on record occurred between 2012 and 2022. Extreme heat events have stressed the electrical grid to its limits and have impacted human heath and wellbeing.

Sea levels have risen by as much as eight inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. A 2022 study by the National Oceanic and Atmospheric Administration estimates that California's sea level could rise by an additional 10-12 inches by 2050. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing. Data suggests that the effects of climate change have already been felt in the Sacramento region.

Anticipated climate change effects in Yolo County include temperature rise, change in precipitation patterns, impacted water resources, increased risk of wildfires, sea level rise in the Delta, and extreme weather events. There is a large scientific consensus about general categories of climate change effects and their likely consequences over continent-scale geography; however, understanding of the magnitude, timing and region-scale geographic effects and the interrelationships between them is still evolving. Adaptation measures establish a basic framework for integrating climate change risk assessment and management into current planning processes, culminating in an adaptation planning framework to guide preparation for the effects of climate change in Yolo County. Measures address agriculture, water resources, sea level rise, and health risks.

According to the 2011 Yolo County Climate Action Plan (CAP), some anticipated consequences of climate change in Yolo County include:

- Warm-season horticultural crops (e.g., tomatoes, cucumbers, sweet corn, and peppers) could be less viable by 2050. This may prompt a shift to hot-season crops such as melon and sweet potato.
- Climate change could worsen air quality by increasing emissions, accelerating chemical processes, and raising inversion temperatures during summer periods of air stagnation.
- Sea level rise is expected to exacerbate flooding in already vulnerable regions of Yolo County. Combined with increased potential for winter flooding, this could threaten the structural integrity of levee and flood control systems, which would place more people and property at risk from flooding. See Figure 54 for the areas of Yolo County within one meter of the daily tidal range:

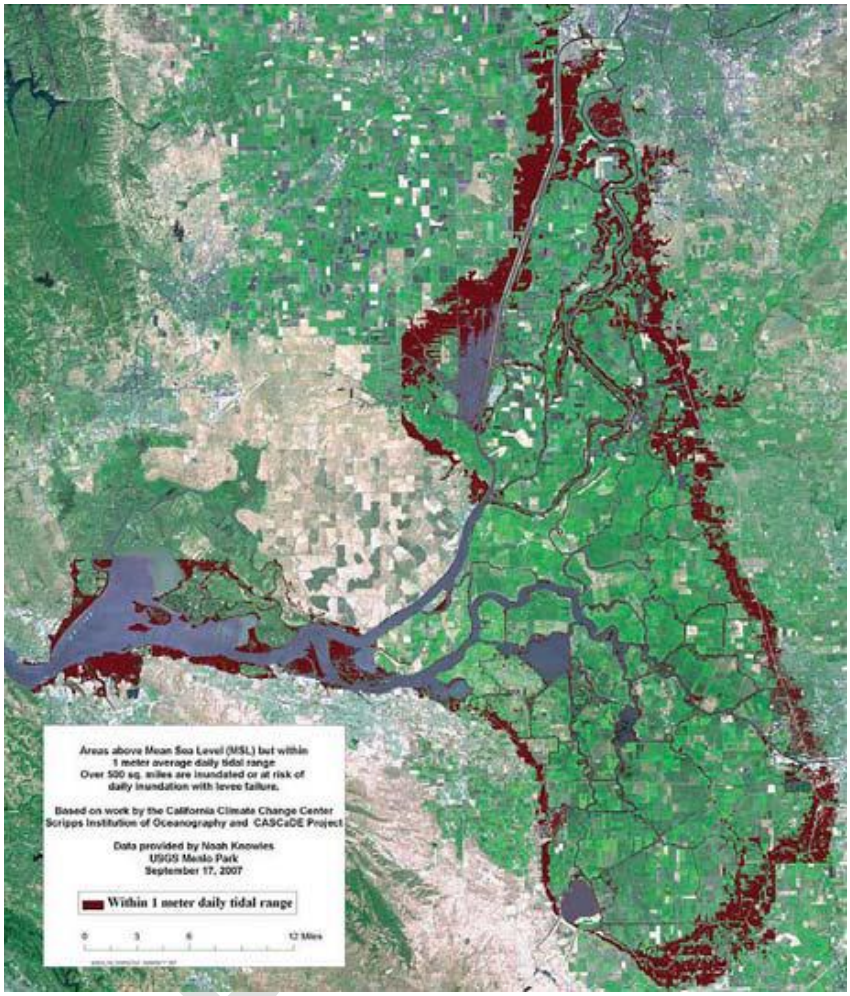


Figure 54: 1-Meter Sea Level Rise Scenario in Yolo County
Source: Yolo County General Plan - USGS

Yolo County's 2011 Climate Action Plan defined five strategies to help it reach its climate protection goals by 2030. These goals will be updated as part of the new Climate Action and Adaptation Plan, which is expected to be finalized in Summer 2024:

- Agriculture: Agriculture measures aim to reduce GHG emissions associated with nitrogen fertilizer application and the use of fossil fuels in field equipment and irrigation pumping.

The agriculture strategy also presents measures and actions to "sequester" or store carbon in agricultural and natural landscapes.

- Transportation and Land Use: The transportation and land use measures implement General Plan Land Use and Circulation policies. These measures promote sustainable development patterns and investments in alternative transportation to reduce vehicle travel and associated emissions.
- Building Energy: Building energy measures are designed to increase energy and water efficiency in existing buildings, enhance energy and water performance in new construction, and encourage installation of building-scale renewable energy systems. This strategy also proposes a community choice aggregation program that would increase the ability for residents and businesses to purchase low and carbon-free electricity from a variety of energy providers.
- Solid Waste and Wastewater: This strategy presents one measure related to the reduction of solid waste emissions. The measure calls for increasing the efficiency of the methane control system at the County landfill. Supporting measures include increasing or expanding the diversion of organic wastes, and construction and demolition wastes from disposal, as well as increased recycling services in the county. The strategy also provides supporting measures that address emissions resulting from the treatment and conveyance of sewage and storm water. Methane control systems and low-impact development techniques that treat storm water on-site are the primary approaches.
- Adaptation: Adaptation describes how the County plans to address the potential effects of climate change on the existing and planned environment. These measures direct the County to incorporate strategies into existing plans, and to develop new documents where appropriate, to ensure that Yolo County remains responsive to the challenges created by climate change. Specific attention is given to impacts related to agriculture, water resources, sea level rise, wildfires, and public health.

Location and Extent

There are numerous effects of climate change, each of way play an interconnected role in the natural hazards that Yolo County faces. Specific effects of climate change on natural hazards will be described in each hazard profile.

Past Occurrences

Climate change has never been directly linked for any declared disasters. Past flooding, wildfire, levee failure, and drought disasters may have been exacerbated by climate change, but it is impossible to make direct connections to individual events. Unlike earthquake and floods that occur over a finite time period, climate change is a slow onset, long term hazard, the effects of which some communities may already be already experiencing, but for which little empirical data exists. Further, given the science, it is likely that measurable effects may not be seriously experienced for years, decades, or may be avoided altogether by mitigation actions taken today.

Likelihood of Future Occurrence

Highly Likely – Climate change is virtually certain to continue without immediate and effective global action. According to NASA, 2017 is on track to be the hottest year on record, and 15 of the 17 hottest years ever have occurred since 2000. Without significant global action to reduce greenhouse gas emissions, the Intergovernmental Panel on Climate Change (IPCC) concludes in its Fifth Assessment Synthesis Report (2014) that average global temperatures is likely to exceed 1.5 C by the end of the 21st century, with consequences for people, assets, economies and ecosystems, including risks from heat stress, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea level rise and storm surges. The probability of future occurrences in the next 100 years is **Highly Likely:** Between 10 percent and 100 percent chance of occurrence next year or happens every year.

Climate Change and Secondary Impacts

Climate change affects many other aspects of life in Yolo County which we are calling secondary impacts. These impacts affect the quality of life and can be potential hazards to the Yolo County Operational Area.

Air Quality

Throughout California, air quality is highly impaired compared to most of the nation. While predicting the effect of climate change on air quality is difficult due to complex physical, chemical, social, and policy variables, studies indicate that climate change could further worsen air quality throughout the State, including Yolo County. Higher temperatures may lead to increased ozone formation. Emissions of methane and nitrous oxide are projected to increase global ozone concentrations by 4% to 25% by 2100. If ozone levels rise to the high end of this range, attainment of ozone air quality standards could be impaired, which would have local effects in Yolo County. Highly air quality could result in increased incidence of respiratory disease and asthma.

Vector-borne Diseases

Temperature increases also could contribute to higher populations of mosquitoes and other disease-spreading organisms, or vectors. In California, three vector-borne diseases are of particular concern: human Hantavirus cardiopulmonary syndrome, Lyme disease, and West Nile virus. Disease transmission, however, depends on additional factors such as the interaction of humidity and rainfall, the maturation cycles of both the vector and the pathogen, and human vector control activities. Yolo County's current low level of vector-borne disease is largely due to vector control measures. These measures would likely need to be enhanced and expanded, if vectors changed or risk of disease increased.

See the Yolo County Climate Action and Adaptation Plan for more information on specific climate change effects for Yolo County.

VULNERABILITY

The susceptibility of Yolo County to climate change is discussed in the applicable hazards.

3.2.5 AGRICULTURAL HAZARDS

Another impact of natural hazards is on the agricultural landscape of Yolo County Operational Area. California is the top agricultural producing state in the nation, and Yolo County is a major contributor with over 85% of County land used for Agricultural production. Significant crops include tomatoes, wine grapes, almonds, walnuts, rice, hay/alfalfa, and seed crops. Given the large source of economic revenue, as well as land coverage, agricultural hazards and the impact of natural hazards on the agricultural landscape will be discussed and analyzed further in this section, although it is not considered a natural hazard. Specific impacts of natural hazards on agriculture is also mentioned under each natural hazard.

According to the Yolo County HMP Planning and Steering Committees, agricultural losses occur on an annual basis and are usually associated with severe weather events, including heavy rains, extreme heat, freeze, droughts and floods. The 2018 State of California Multi-hazard Mitigation Plan attributes most of the agricultural disasters statewide to drought, freeze, and insect infestations. Other agricultural hazards include fires, crop and livestock disease, insects and noxious weeds.

In addition to severe weather, invasive species can affect the agricultural industry in the County. Invasive species are organisms that are introduced into an area beyond their natural range and become a pest in the new environment. This hazard addresses the issues related to invasive pests including those that pose a significant threat to the agricultural industry and are therefore a concern in the Yolo County Operational Area. This hazard does not address pests and plants that cause impacts to human health, as those issues are addressed in other plans in the County.

According to the California Department of Conservation's Farmland Mapping and Monitoring Program (FMPP), as of 2018 the County has approximately 243,961 acres of prime farmland, 19,320 farmland of statewide importance, 43,932 unique farmland, 49,731 farmland of local importance, and 165,921 grazing land. (see Table 3-6)

Table 3-6: Yolo County Farmland Inventory – 1998, 2008, 2018

Soil Category	1998 Acres	2008 Acres	2018 Acres
Prime Farmland	265,915	255,193	243,961
Farmland of Statewide Importance	18,202	16,793	19,320

Unique Farmland	55,243	45,750	43,932
Farmland of Local Importance	74,303	60,345	49,731
Grazing Land	143,385	157,963	165,921
Urban and Built-up Land	25,586	30,225	31,353
Water	7,371	7,814	4,233
Other Land	63,446	79,370	94,999
Total Area Inventoried	653,451	653,453	653,450

In Section 1.4.4 Economics, the gross value of agricultural crops and products is described.

Natural Disasters and Severe Weather

According to the USDA, every year natural disasters, such as droughts, earthquakes, extreme heat and cold, floods, fires, earthquakes, hail, landslides, and tornadoes, challenge agricultural production. Because agriculture relies on the weather, climate, and water availability to thrive, it is easily impacted by natural events and disasters. Agricultural impacts from natural events and disasters most commonly include contamination of water bodies, loss of harvest or livestock, increased susceptibility of disease, and destruction of irrigation systems and other agricultural infrastructure. These impacts can have long lasting effects on agricultural production including crops, tree growth, and arable lands, which require time to mature.

Location and Extent of Severe Weather

Severe weather events that can affect agriculture are often widespread events (droughts, wind, freeze, heavy rains, and extreme heat). The entirety of the agriculture producing areas of the County are at risk to these severe weather events. Winds, freeze, extreme heat, and heavy rains can have short onset speeds, the onset of drought is much longer. Duration of events varies as well, with longer durations possible for drought and extreme temperatures and shorter durations for winds and heavy rains.

Agricultural Pests and Diseases

Invasive and/or non-native plant species include:

- Yellow Starthistle: Yellow starthistle is a long-lived winter annual, and occasionally, a biennial broadleaf plant. It is highly competitive and often develops impenetrable stands, displacing desirable vegetation. It is common in the Sacramento Valley, including in Yolo County. In addition to being a serious rangeland weed, yellow starthistle is sometimes problematic in grain fields where it can contaminate grain harvest, lowering grain divalue and quality. The plant also contains an unidentified compound that can cause a nervous system disorder in horses. A positive quality of yellow starthistle is that bees produce flavorful, high quality honey when they forage on yellow starthistle.

- Japanese Dodder: Dodder, *Cuscuta* species, is a parasitic annual plant that infests many crops, ornamentals, native plants, and weeds. Japanese dodder, *C. japonica*, which is native to Asia, recently has been found in California attacking and covering ornamental shrubs and fruit trees, with a preference toward citrus. However, Japanese dodder also can parasitize annuals, perennials, and native trees such as oaks and willows. Impact varies from moderate to severe reductions of plant growth and, in some cases, complete loss of vigor and death. The severity of an infestation depends on the growth stage of the host plant at the time of initial dodder attachment. Japanese dodder can cover and kill most large shrubs and small trees. The weakened state of infected plants also predisposes them to diseases and insect and nematode invasions. Japanese dodder is currently under an eradication program in California and has spread to more than a dozen counties including Yolo County, where it has been found in West Sacramento and Clarksburg. See Figure 56 for a picture of Japanese Dodder on a tomato plant.

Figure 56: Japanese Dodder on a Tomato Plant
Source: UC Davis

Effective management requires control of the current population, prevention of dodder seed production, and suppression of new seedlings in subsequent years.

- Branched Broomrap: Branched broomrape is an annual and sometimes perennial parasitic plant that has no chlorophyll and lacks conspicuous leaves. It attaches to plant roots and is visible above ground only when flowering and inhabits ornamental and vegetable crop fields and margins, especially tomato fields. Branched broomrape has been associated with tomato plant die off in Yolo County in 2018. It can be treated with chemicals.

Invasive and/or non-native creatures include:

- Walnut Twig Beetle: The Walnut twig beetle (Figure 57) *Pityophthorus juglandis* is a tiny bark beetle that spreads a fungus *Geosmithia morbida*, also known as Thousand cankers disease (TCD). The disease can kill both black and English walnut trees. In California, native black walnuts (*Juglans hindsii*) infected with TCD were first confirmed in Yolo County in June 2008. Management includes installing Walnut Twig Beetle traps as well as applying insecticides and fungicides on black walnut trees.

Figure 57: Walnut Twig Beetle (expanded size for reference)

- California Ground Squirrel: Ground squirrels damage many food-bearing and ornamental plants. Particularly vulnerable plants are grains as well as nut and fruit trees such as almond, apple, apricot, orange, peach, pistachio, prune, and walnut. Ground squirrels will enter gardens and devour vegetables in the seedling stage. They can damage young shrubs, vines, and trees by gnawing bark, girdling trunks (the process of completely removing a strip of bark from a tree's outer circumference), eating twigs and leaves, and burrowing around roots. Ground squirrels can also burrow into levees, destabilizing the structure of the levee and increasing the threat of levee failure. Numerous ground squirrel burrows have been observed on the CSA #6 levee. Baiting ground squirrels with treated grain is effective in summer and fall, because squirrels primarily feed on seeds during this period. Fumigation is most effective in spring when moist soil helps seal gasses in the burrow system. Fumigating at this time also is more effective, because squirrels die before they can reproduce.

Additional pests and diseases of common crops in Yolo County include[3]:

[3] From the University of California Statewide Integrated Pest Management Program

Pests and disorders of Almonds

Invertebrates

- Ants
- Armored scales
  - San Jose scale
- Borers
  - American plum borer
  - Pacific flatheaded borer
  - Peachtree borer
  - Peach twig borer
  - Shothole borer
- Leafhoppers
- Leafrollers
- Mites
  - Brown mite
  - European red mite
  - Spider mite
- Navel orangeworm
- Nematodes
- Oriental fruit moth
- Redhumped caterpillars
- Soft scales
- Tent caterpillars

Diseases

- Armillaria root rot (Oak root fungus)
- Bacterial canker
- Bacterial leaf scorch (similar to Oleander leaf scorch)
- Brown rot
- Crown gall
- Phytophthora root and crown rot
- Scab
- Shot hole disease (Coryneum blight)
- Verticillium wilt

Environmental disorders

- Frost injury
- Poor or incomplete pollination
- Sunburn
- Wind injury

Vertebrates

Weeds

Pests and disorders of walnuts

Invasive Pests

- Thousand cankers disease
- Field ID guide: Walnut twig beetle and thousand cankers disease (560 KB, PDF)

For more information on these pests, see Exotic and Invasive Pests.

Invertebrates

- Aphids
  - Dusky-veined walnut aphid
  - Walnut aphid
- Armored scales
  - San Jose scale
  - Walnut scale
- Bark beetles and borers
  - Pacific flatheaded borer
  - Shothole borer
  - Twig beetles
- Carpenterworm
- Codling moth
- Fall webworm
- Fruittree leafroller
- Lace bugs
- Navel orangeworm
- Nematodes
- Mites
  - European red mite
  - Spider mites
- Redhumped caterpillar
- Soft scales
  - European fruit lecanium
  - Frosted scale
- Tent caterpillars
- Walnut husk fly

Diseases

- Anthracnose
- Armillaria root rot (Oak root fungus)
- Blackline
- Branch wilt
- Crown gall
- Deep bark canker
- Phytophthora root and crown rot
- Shallow bark canker
- Walnut blight
- Wood decay

Environmental disorders

- Frost damage
- Molds
- Overwatering
- Sunburn
- Wind injury

Parasitic plants

- Broadleaf mistletoe

Vertebrates

Weeds

Pests and disorders of Grapes

Invertebrates

- Aphids
- Black vine weevil
- Boxelder bug
- Branch and twig borer
- Cutworms
- Glassy-winged sharpshooter
- Grape bud beetle
- Grape leaffolder
- Grape phylloxera
- Grasshoppers
- Hoplia beetle
- Katydids
- Leafhoppers
- Mealybugs
  - Gill's mealybug
  - Grape mealybug
- Mites
  - Grape erineum mite
  - Spider mites
- Nematodes
- Omnivorous leafroller
- Saltmarsh caterpillar
- Scales
- Sphinx moths
- Thrips

Invertebrates (continued)

- Western grapeleaf skeletonizer
- Whiteflies

Diseases

- Armillaria root rot
- Bunch rots
- Crown gall
- Downy mildew
- Eutypa dieback
- Measles
- Phomopsis cane and leaf spot
- Phytophthora crown and root rot
- Pierce's disease
- Powdery mildew
- Viruses

Environmental disorders

- Herbicide injury

Vertebrates

Weeds

Pests and disorders of Tomatoes

Invertebrates

- Aphids
- Armyworms
- Buffalo treehopper
- Cutworms
- Flea beetles
- Hornworms
- Leaffooted bug
- Leafminers
- Loopers
- Lygus bugs
- Nematodes
- Potato tuberworm
- Snails/slugs
- Stink bugs
- Thrips
- Tomato fruitworm
- Tomato pinworm
- Tomato russet mite
- Vegetable weevil
- Whiteflies
- Wireworms

Diseases

- Black mold
- Curly top virus
- Damping off
- Early blight
- Fusarium wilt
- Late blight
- Phytophthora root rot
- Powdery mildew
- Tobacco mosaic virus
- Tomato spotted wilt virus
- Verticillium wilt
- White mold

Environmental disorders

- Common environmental disorders
- Blossom end rot
- Catfacing
- Fruit cracks
- Sunscald
- Tomato leaf roll

Vertebrates

Weeds

Diseases than can affect rice include the aggregate sheath spot of rice, bakanae, kernel smut, rice blast, seed rot, and stem rot. Creatures that can affect rice include the armyworm, aster leafhopper, crayfish, rice leafminer, rice seed midge, rice water weevil, and tadpole shrimp.

Past Occurrences

The agricultural lands of Yolo County have historically been affected by weather related events such as high wind, heavy rain, extreme heat, freeze, and drought. The severe weather events can have devasting effects leading to losses in yield and affecting quality. The US Farm Services Agency provided information on disaster declarations from 2012 through 2023 (the length of data available on their website). These are show in Table 3-7.

Table 3-7 Yolo County – USDA Disaster Declarations 2012-2023

Year	Declaration Number	Primary or Contiguous County	Disaster Type
2012	S3452	Primary	Drought

2013	S3569	Primary	Drought, High winds, Wildfire, Heat/Excessive heat/high temp (incl. low humidity), Insects
2014	S3626	Contiguous	Drought, High winds, Wildfire, Heat/Excessive heat/high temp (incl. low humidity), Insects
2014	S3637	Primary	Drought, High winds, Wildfire, Heat/Excessive heat/high temp (incl. low humidity), Insects
2014	S3743	Primary	Drought
2014	S3797	Contiguous	Drought
2015	S3784	Primary	Drought, High winds, Wildfire, Heat/Excessive heat/high temp (incl. low humidity), Insects
2016	S3952	Primary	Drought, High winds, Wildfire, Heat/Excessive heat/high temp (incl. low humidity), Insects
2016	S4164	Contiguous	Excessive rain/moisture/humidity, High winds
2017	S4163	Primary	Drought
2018	N/A	N/A	N/A
2019	S4656	Contiguous	Excessive rain/moisture/humidity
2020	S4691	Contiguous	Drought
2020	S4697	Primary	Drought
2021	S4916	Primary	Drought
2022	S5146	Primary	Drought
2022	S5229	Primary	Frost, Freeze
2022	S5230	Contiguous	Frost, Freeze
2022	S5332	Primary	Frost, Freeze
2023	4683	Primary	Flood/Flash Flooding, Winter Storms/Ice Storms/Snow/Blizzard, Mudslides/Debris flows/Landslides
2023	4683	Contiguous	Flood/Flash Flooding, Winter Storms/Ice Storms/Snow/Blizzard, Mudslides/Debris flows/Landslides

Likelihood of Future Occurrence

Highly Likely – As long as severe weather events, insects, pests, and diseases continue to be an ongoing concern to Yolo County Operational Area, the potential for agricultural losses remains.

Vulnerability Assessment

Vulnerability – High

Given the importance of agriculture in Yolo County, agricultural hazards continue to be an ongoing concern. The primary causes of agricultural losses are severe weather events, such as drought, freeze, extreme heat, high winds, insect/pest infestations and diseases. According to the County, agricultural losses occur on an annual basis throughout the County and are usually associated with these types of events.

According to the USDA, every year natural disasters, such as droughts, extreme heat and cold, floods, fires, hail, landslides, high winds and tornadoes, challenge agricultural production. Because agriculture relies on the weather, climate, and water availability to thrive, it is easily impacted by natural events and disasters. Agricultural impacts from natural events and disasters most commonly include contamination of water bodies, loss of harvest or livestock, increased susceptibility to disease, and destruction of irrigations systems and other agricultural infrastructure. These impacts can have long lasting effects on agricultural production including crops, forest growth, and arable lands, which require time to mature. Specific impacts by hazards are listed below:

- Drought's most severe effects on agriculture include water quality and quantity issues. Other impacts include decreased crop yields, impact to feed and forage, altered plant populations, and tree mortality.
- Earthquakes are rare in Yolo County, but can strike without warning and cause dramatic changes to the landscape. These dramatic changes could have devastating impacts on agricultural production and the environment. These impacts could include loss of harvest or livestock and destruction of irrigation systems and other agricultural infrastructure.
- Extreme cold and freeze may result in loss of livestock and increased use of generators if any power lines are downed. Though crops in Yolo County are adaptable to freeze, they can become vulnerable to prolonged periods of low temperatures. Almond production can decrease during periods of low temperatures which is a significant impact on the agricultural community in Yolo County.
- Hot weather and extreme heat can worsen ozone levels and air quality as well as leading to drought conditions. Excessive heat and prolonged dry or drought conditions can impact agriculture by creating worker safety issues for farm field workers, severely damaging crops, and reducing availability of water and food supply for livestock.
- Wildfires can spread quickly and devastate thousands of acres of land, which may include agricultural lands. This devastation could lead to large losses in crops, forestry, livestock, and agricultural infrastructure.
- Flooding causes many impacts to agricultural production, including water contamination, damage to crops, loss of livestock, increased susceptibility of livestock to disease, flooded farm machinery, and environmental damage to and from agricultural chemicals.

- Landslides and debris flow occur in all 50 states, but commonly occur in connection with other major natural disasters such as earthquakes, volcanoes, wildfires, and floods. Some of the threats from landslides and debris flow include rapidly moving water and debris that can cause trauma; broken electrical, water, gas, and sewage lines; and disrupted roadways and railways. This can lead to agricultural impacts including contamination of water, change in vegetation, and harvest and livestock losses.

In addition to threats to agriculture from weather and other natural hazard events, agriculture in the County is at risk from insects, pests, and other diseases. Establishment of an invasive species would be detrimental to the agricultural industry of Yolo County because of product losses, stringent quarantine regulations, loss of exporting opportunities and increased treatment costs. The introduction of exotic plants influences wildfire by displacing forage species, modifying habitat structure, or changing species interactions within the ecosystem. In addition, invasive plants:

- Increase wildfire potential
- Reduce water resources
- Accelerate erosion and flooding
- Threaten wildfire
- Degrade rangeland, cropland, and timberland
- Diminish outdoor recreation opportunities

Agricultural pests and diseases can occur on crops anywhere in Yolo County. Pest detection in Yolo County involves preventing the introduction and spread of injurious pests not known to occur in the county through a systematic search for such pests. This is accomplished by deploying insect traps, making visual surveys, inspecting selected hosts, and informing and educating the public.

3.3 Hazard Risk Assessment – Natural Hazards

3.3.1 Severe Weather - General

Severe weather is generally described as any destructive weather event, which in Yolo County includes high wind, fog, tornado, heavy rain, extreme heat, and freeze. For the purposes of this HMP, high rain is covered under flooding. And as mentioned previously, due to the lack of mitigation projects, and low significance, fog will not be fully profiled below.

The National Oceanic and Atmospheric Administration (NOAA)'s National Centers for Environmental Information has tracked severe weather since 1950. Their Storm Events Database contains data on the following events shown in Figure 3-2.

[Figure 3-2: NOAA NCEI Storm Database Period of Record]

The National Climatic Data Center's (NCDC) Storm Events Database contains 261 severe weather events reported between February 1, 1950 and February 23, 2023. Table 3-8 summarizes these events. This provides an overview of Yolo County's hazard environment.

Table 3-8: NCDC's Severe Weather Events for Yolo County 1950-2/23/2023*

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage
Cold/Wind Chill	13	1	0	0	0
Debris Flow	2	0	0	$757,000	0
Dense Fog	7	6	38	$2,120,000	0
Dense Smoke	1	0	0	0	0
Drought	47	0	0	0	0
Excessive Heat	16	10	2	0	0
Extreme Cold/Wind Chill	1	0	0	0	0
Flash Flood	1	0	0	0	0
Flood	37	0	0	$15,327,000	$7,800,000
Frost/Freeze	7	0	0	$200,000	$5,000,000
Funnel Cloud	4	0	0	0	0
Hail	2	0	0	$500,000	$510,000
Heat	29	0	18	0	0
Heavy Rain	6	0	0	0	0
Heavy Snow	1	0	0	0	0
High Surf	1	0	0	0	0
High Wind	31	0	0	$8,267,000	$37,000
Strong Wind	36	4	2	$3,723,400	0
Thunderstorm Wind	4	0	0	$42,000	0
Tornado	4	0	0	$3,000	$20,000
Wildfire	6	2	8	$500,000	0
Winter Storm	1	0	0	0	0
Totals:		23	68	$31,439,400	$13,367,000

**Notes: Losses reflect totals for all impacted areas, some of which are categorized as the Southern Sacramento Valley*

As previously mentioned, many of Yolo County's state and federal disaster declarations have been a result of severe weather. For this 2023 HMP Update, severe weather is discussed in the following subsections:

- Extreme Heat
- Freeze
- High Wind
- Tornadoes

CLIMATE CHANGE AND WEATHER IMPACTS

Extreme Weather Events

Climate change effects on weather patterns, storms, and extreme events in California are not well-understood at this time. Some models suggest increased variations in weather cycles and an increase in intense storms. Others point to increased potential for drought resulting from higher temperatures and evaporation with lower precipitation. Still others suggest that the west coast may have fewer extreme droughts than other areas while experiencing higher average annual rainfall. A separate study predicted higher risks of large storms and floods in California. These conflicting conclusions about climate variability and extreme weather events support the need for additional studies employing models that can provide region-scale predictions. Given uncertainties surrounding the type and extent of expected changes in climate variability and the speculative nature of predicting extreme weather events, effects of changing storm patterns and other extreme weather remain unclear.

Precipitation

Precipitation projections are more uncertain than those for temperature, because complex temporal variability is inherent in precipitation patterns. The International Panel on Climate Change (IPCC) predicts that increasing global surface temperatures are likely to result in changes in precipitation. Global climate models for a wide range of GHG emission scenarios also predict that average global precipitation will increase during the 21st century as a result of climate change. However, such models are generally not well-suited for predicting regional precipitation changes given that factors affecting precipitation vary by regional geography and meteorology. Thus, significant regional differences in precipitation trends are expected. Some recent regional modeling efforts conducted for the western United States indicate that overall precipitation will increase, but considerable uncertainty remains. Projected precipitation increases are generally centered in Northern California in the winter months. However, various California climate models provide mixed results regarding changes in total annual precipitation in the State through the end of this century. One potential scenario of concern would be longer periods of drought punctuated by more intense storms during non-drought years. An IPCC review of multiple global models identifies much of California as an area where models generally did not agree on whether annual precipitation would increase or decrease; therefore, no firm conclusion on an increase or decrease can be provided, and the California climate could be either warmer-wetter or warmer-drier. Considerable uncertainties about the precise effects of climate change on California hydrology and water resources will remain until more precise and consistent information about how precipitation patterns, timing, and intensity will change is available. Given these uncertainties, regional conclusions regarding the potential effects of climate change on precipitation are speculative. Climate change may increase the number, duration, and intensity of atmospheric river events that can cause significant flooding in Yolo

County. As temperatures warm, wetter storms will create more runoff. Increased precipitation and runoff in the mountainous areas of Yolo County can increase its susceptibility to landslides.

3.3.2 Extreme Heat

Hazard/Problem Description

According to FEMA and the National Weather Service (NWS), extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and lasts for several weeks. A heat wave is an extended period of extreme heat, often with high humidity. When relative humidity is factored in, the temperature can feel much hotter as reflected in the Heat index (see Figure 3-3).

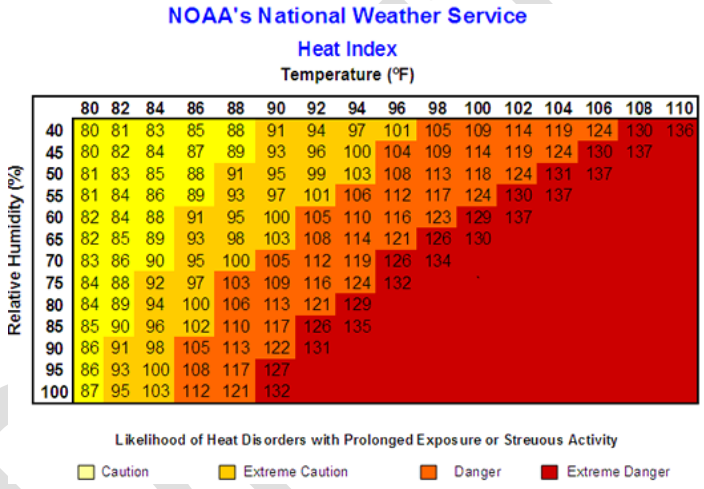


Figure 3.3 – Heat Index

Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. Among natural hazards, only cold weather 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.

Extreme heat conditions can also compound the effects of other hazards, such as drought and wildfire, can contribute to increases in tree mortality. In Yolo County, agriculture is also largely affected by extreme heat in both crop production and on field workers and farmers. During times of high heat, low humidity, and winds, PG&E can also issue a Public Safety Power Shutoff (PSPS) for the County.

A key concern of extreme heat is the effects on Vulnerable populations. Vulnerable persons as the elderly, children, those with chronic illnesses, those on certain medications and drugs, persons with weight problems, persons with substance abuse issues, those who do not have stable housing, and those whose social or physical limitations prevent them from easily accessing a cooler environment are particularly susceptible to the dangers of extreme heat situations. 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 levels at which the body can remove heat, the temperature of the body's inner core begins to rise, and heat-related illnesses may develop.

Commented [SH5]: Need Kate Laddish and Jim Bohon's feedback on this section

Location and Extent

Extreme heat has the potential to impact all areas of Yolo County, though people who live in cities can be at greater risk because concrete and asphalt store heat for longer and release it throughout the night. The geographic extent of extreme heat is **Extensive** with 50-100% of the Yolo County Operational Area affected by this hazard. According to the 2018 California State Hazard Mitigation Plan, the worst single heat wave event in California occurred in Southern California in 1955, when an eight-day heat wave resulted in 946 deaths. According to NCDC, several heat events have occurred in and around Yolo County since the last plan update in 2018:

- 8/14-8/20/2020: A prolonged and significant heat wave occurred in mid-August due to high pressure parked over California. High temperatures soared between 100 to 115 degrees for much of the Valley and lower elevation foothills, while higher elevation areas in the mountains range from the mid-80s to low 100s. Overnight lows were oppressive during this time frame as well, with Valley and foothill locations holding in the 70s to low 80s. Many emergency room visits were recorded in the Sacramento area in addition to 3 confirmed heat related deaths. One out of these deaths also involved drug use.

- 8/18-8/23/2020: A heat wave was forecast for the initial part of this event; however, with many massive wildfires over northern California, intense heating was suppressed to wildfire smoke. Temperatures still rose to the mid 90s and low 100s, which was not much of a reprieve from the previous week's temperatures. A heat related death occurred during this time frame on August 22. The decedent was doing yard work in heat and fell ill. He was taken to Kaiser and died 3 days later. In addition to lingering heat, a renewed chance of thunderstorms and fire weather concerns were forecast August 23 and 24. This generated a lot of media attention as the state just suffered from a widespread lightning event and it looked like another could form. Similar conditions were in place, with tropical moisture forecast to move over norther California; however, the system did not

produce as nearly much lightning. Strikes generally remained confined, but not limited to, the west slopes of the Sierra.

- 5/30-5/31/2021: High pressure ridging brought a heat wave to Northern California over the Memorial Day weekend holiday. Temperatures reached upwards of 20 to 25 degrees above climatology. Several new record daily high temperatures and one record monthly high temperature record were set in the area. At the peak of the heat wave on the 31st, Redding reached 109 breaking both the daily and monthly high temperature records. Red Bluff reached 108, setting a new daily high temperature record. Downtown Sacramento hit 106 tying the daily high temperature record. Sacramento Executive Airport reached 105 setting a new daily high temperature record. There were three cooling centers open in Sacramento County, one in Yolo County, one in Butte County and one in San Joaquin County.

- 6/1/2021: The first major heat event of the year brought widespread moderate to high heat risk Memorial Day weekend to Northern California. Some Valley locations reached over 100 degrees for the first time this year. Several new record daily high temperatures and one record monthly high temperature record were set in the area.

- 6/16-6/19/2021: High pressure originating from the Desert Southwest built westward into California resulting in very hot daytime temperatures across the region and warm overnight low temperatures, particularly in the thermal belts. High to very high heat risk impacted the region with a four day heatwave. Several daily high temperature records were either tied or broken on the 18th. During the event, cooling centers were made available to the public across interior Northern California. A list of the cooling centers available are as follows: five cooling centers in Sacramento County, one in Butte County, seven in Calaveras County, one in Placer County, two in San Joaquin County, two in Tuolumne County, two in Yolo County, and Solano County had two libraries available for cooling.

- 7/9-7/11/2021: High pressure originating from the four-corners region built westward into California resulting in very hot daytime temperatures and warm overnight low temperatures across interior Northern California. High to very high heat risk impacted the region with a several day heatwave. The Sacramento region saw high temperatures reach in excess of 110 degrees on the 9th and 10th. On the 9th, downtown Sacramento tied its daily high temperature record of 109 degrees and on July 10th set a new daily high temperature record of 113 degrees. During the event, cooling centers were made available to the public across interior Northern California.

- 8/14-8/15/2021: High pressure over California resulted in very hot daytime temperatures and warm overnight low temperatures across interior Northern California. High to very high heat risk impacted the region. The Sacramento region saw high temperatures reach 105 degrees. On the 14th, downtown Sacramento recorded a high temperature of 103 degrees. During the event, cooling centers were made available to the public across interior Northern California.

- 9/7-9/9/2021: High pressure over California resulted in very hot daytime temperatures and warm overnight low temperatures across interior Northern California. High to very high heat risk continues to impact the region. One daily high temperature record was broken. The Sacramento region saw high temperatures reach in excess of 105 degrees. On the 8th, downtown Sacramento reached 106 degrees. During the event, cooling centers were made available to the public across interior Northern California.

- 6/10-6/11/2022: High pressure over interior northern California brought widespread moderate to locally high heat risk to the region. Triple digit temperatures were observed across much of the Valley on June 10th and 11th with the hottest temperatures on June 10th ranging from 100 to 104 degrees in the Sacramento area. A daily high temperature record was tied in the area. Four cooling centers were open through 8:00 pm in Sacramento County.

- 9/4-9/9/2022: The Southern Sacramento Valley region saw all-time, monthly and daily record highs set, reaching up to 116 degrees during the event. On the 6th Downtown Sacramento recorded a high temperature of 116, which broke the all-time record high of 114 degrees set on July 17, 1925. This also broke the September record of 113 which was set the day before on the 5th. The previous monthly record of 109 was set on September 1, 1950, and tied on September 2, 1955 and September 6, 2020. The record of consecutive days over 110 was tied at 2. Daily highs were also set with 113 on the 5th and 8th and 109 on the 7th. The low of 80 on the 7th was the warmest on record in September and in all months was surpassed only on July 23, 2006, which had a low of 84. Sacramento International Airport set an all-time daily record high of 116 on the 5th and 6th, and also set a record of 4 consecutive days of 110 or higher. Sacramento Executive Airport set an all-time daily record high of 114 on the 5th and 6th. There was one death of an unhoused man attributed to the heat in Sacramento County.

From 1950 through 1999, there have been no noticeable heat wave sin Yolo County according to the National Climatic Data Center (NCDC); heat events were observed in 1999, 2000, 2005, 2007, 2008, 2013, 2015, 2017, and those listed above.

PAST OCCURRENCES

There has been no Federally declared extreme heat disasters, no Cal OES disasters related to extreme heat, but five USDA disaster declarations between 2013-2016 related to extreme heat, as shown on Table 3-9.

Table 3-9: Declared Disaster History (2013-2016)*

Year	Disaster Name	Disaster Type	Disaster #	State Declaration #	Federal Declaration #
2013	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3569	8/21/2013	-
2014	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3637	1/23/2014	-
2014	Extreme Heat, High Winds, High Fire Risk	Drought- FAST TRACK	USDA Contiguous S3626	1/15/2014	-
2015	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3784	2/4/2015	-
2016	Extreme Heat, High Winds, High Fire Risk	Drought- FAST TRACK	S3952	USDA Primary 2/17/2016	-

** Data from Table 3-5: Yolo County State and Federal Disaster Declarations, 1965-2023. All years that did not have Extreme heat declarations were removed*

The NCDC data showed 45 extreme heat incidents for Yolo County since 1950, This can be see in Table 3-10.

Table 3-10: NCDC Heat Events for Yolo County 1950-2023*

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage
Excessive Heat	16	10	2	0	0
Heat	29	0	18	0	0
Total:	**45**	**10**	**20**	**0**	**0**

**Data from Table 3-6: NCDC's Severe Weather Events for Yolo County 1950-2/23/2023. All other event types were removed.*

LIKELIHOOD OF FUTURE OCCURRENCE

Highly Likely - Temperature extremes are likely to continue to occur annually in Yolo County Operational Area. The probability of future occurrences in the next 100 years is Highly Likely: Near 100 percent chance of occurrence next year or happens every year.

CLIMATE CHANGE AND EXTREME HEAT

Temperature

Increased concentrations of Greenhouse Gasses in the atmosphere result in increased air, surface, and ocean temperatures. Increased temperatures, in turn, drive most other climate change effects. Most regional climate model projections predict that annual average temperatures will increase in California during the next 100 years. The California Climate Action Team projects that temperatures in California will rise between 1.8 degrees F and 5.4 degrees F by mid-century, and 3.6 degrees F and 9 degrees F by the end of the century. The exact level and timing of such a temperature increase in Yolo County is correspondingly uncertain.

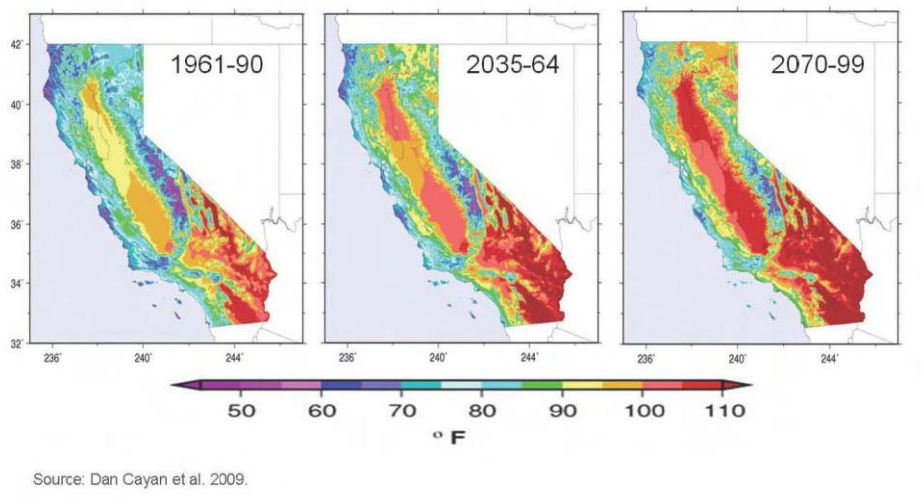


Figure 3.4: Average July Temperatures in California
Source: Yolo County Climate Action Plan - 2009 California Climate Adaptation Strategy

Heat-Related Illness

The most notable risk with heat waves is increased levels of heat stress and risk of health effects caused by extreme temperatures. This is particularly important for the elderly and infirm, as well as those with heart or respiratory problems and mental health issues. The percentage of Yolo County residents over the age of 65 was 9.6% in 2008. That number is expected to climb to 16.0% by 2030. With the prevalence of air-conditioner use during heat waves, demand for power could also increase putting more stress on power supply. The 2022 California Climate Adaptation Strategy reported that a preliminary analysis of the September 2022 heatwave showed a 5% increase in death rates statewide compared to the rest of the summer. Excess deaths were seen for heat-related illnesses, as well as cardiovascular, respiratory, endocrine, digestive, and renal diseases. In addition, rates of deaths among persons injured while at work were significantly higher during the heat wave period.

Vulnerability – High

All of Yolo County is vulnerable to high temperatures that typically plague the Central Valley of California. The effects can be felt greater in the cities, where the urban heat island effect takes over. Although extreme heat rarely affects buildings in the County, there are secondary impacts when there are PSPS events due to extreme heat which then causes power outages and affects the temperatures inside the buildings.

The greatest affect extreme heat has Yolo County Operational area is the population, as well as the County's agricultural industry. Heat can cause stress to agricultural crops and livestock in the County. Though crops in Yolo County are adaptable to heat, they can become vulnerable to prolonged periods of high temperatures. Extreme heat also dries out vegetation in the County, creating greater risks from wildfire. When combined with low humidity, extreme heat also can contribute to the start and spread of wildfires. Hot weather and extreme heat can worsen ozone levels and air quality as well as leading to drought conditions. Excessive heat and prolonged dry or drought conditions can impact agriculture by creating worker safety issues for farm field workers, severely damaging crops, and reducing availability of water and food supplies for livestock. Although extreme heat has not directly caused property or crop damage losses, the added impact it has on drought conditions, and lack of water, has affected our agricultural community economics as described in Section 1.4.

While Heat waves do not cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios, they are potentially deadlier. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly take the lives of vulnerable populations. Sickness can occur if someone has been in extreme heat for too long, or has over-exercised for his or her age or physical condition. As mentioned previously, Extreme heat can be more dangerous for vulnerable populations. Areas lacking air conditioning or electricity, including mobile home parks and rural buildings, can become susceptible to extreme heat effects.

Vulnerable populations to extreme heat include:

- Homeless or unhoused
- Infants and children under age five
- Elderly (65 and older)
- Individuals with disabilities
- Individuals dependent on medical equipment
- Individuals with impaired mobility

As the County population continues to age, and more residents become senior citizens, special attention needs to be given to those of the adult and aging population and the effects that this hazard could have on this vulnerable population. The residents of nursing homes and elder care facilities are especially vulnerable to extreme temperature events and these facilities are encouraged to have emergency plans or backup power to address power failure in times of extreme heat and PSPS events. Lower income residents, homeless or unhouse populations are also vulnerable. Cooling centers for these populations are utilized when necessary in extreme heat situations as described more fully in Yolo County's Emergency Support Function 6 Annex.

3.3.3 Freeze

Hazard/Problem Description

Freeze is defined as a period in which temperatures fall below the freezing point of 32 degrees Fahrenheit or 0 degrees Celsius. A hard freeze is a period of at least four consecutive hours of air temperature that are below 25 degrees Fahrenheit. Freeze and extreme cold often accompany a winter storm or are left in its wake. They are most likely to occur in the winter months of December, January, and February. When the wind is factored in, the temperature can feel even colder as reflected in the wind chill index (see figure 3.4). This was developed in 2001 by 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.

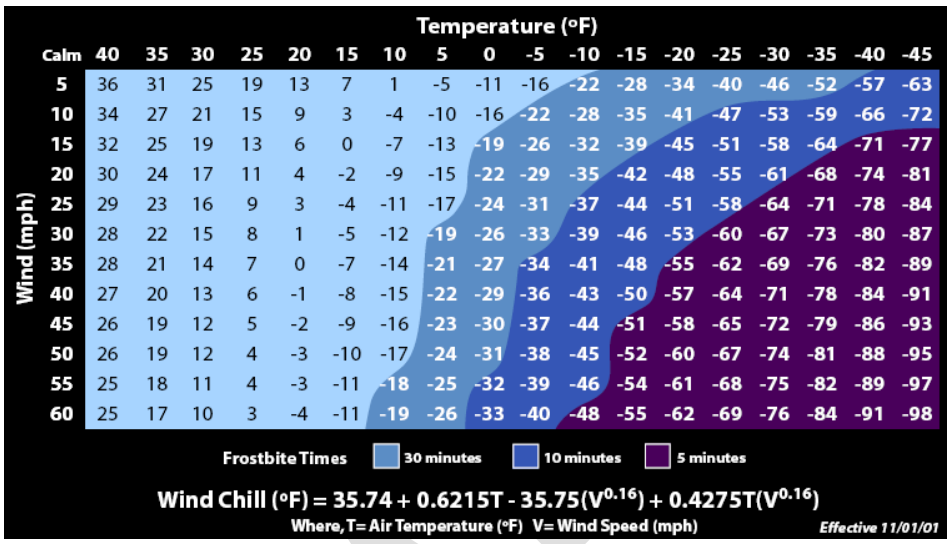


Figure 3.4: Wind Chill Index
Source: National Weather Service

LOCATION AND EXTENT:

Freeze has the potential to impact all areas of Yolo County. The geographic extent of freeze is **Extensive** with 50-100% of the Yolo County Operational Area affected by this hazard. Temperatures could potentially reach into the low 20 degrees Fahrenheit for several days, and below freezing for several weeks, as has historically occurred in the Sacramento area. According to NCDC there has been a few incidents of cold/wind chill, freeze events in Yolo County Operational Area since the last update:

- 5/15/2021: Warm weather combined with cold and fast moving area waterways lead to 5 deaths across the region in the month of May. CNRFC gauges near Rancho Cordova had water temperatures in the low to mid 60s.
- 2/24-2/25/2022: Temperatures dropped below the critical threshold of 28 degrees for several days in late February. Several locations in the region reported temperatures as low as 25 degrees during the event with subfreezing conditions persisting for several hours each day. The Sacramento executive airport set new daily minimum temperatures on the 24th and the 25th of February of 27 and 28 degrees respectively. Farmers anticipate damage to their orchards with final damage costs expected to be determined when crops are harvested. Regional agriculture was severely impacted with temperatures dipping below critical thresholds for spring buds, specifically on fruit and nut trees. Blooms were

also about 10 days sooner than average leading to greater impacts to farmers. Mitigation efforts were used to save crops, however the Colusa County Agricultural Commissioner reported as many as 5 counties were severely impacted.

The lowest temperature ever recorded in Sacramento was 17 degrees in 1932. From December 20th 1990 – January 1st 1991, Sacramento had a record number 13 consecutive days with minimum temperatures below freezing. Other notable freeze events documented in and around Yolo County occurred in 2007, 2008, and 2009.

PAST OCCURRENCES

There has been one Federally declared extreme freeze disaster in 1991, no Cal OES disasters related to freezing weather, but three USDA disaster declarations in 2022 related to freezing temperatures, as shown on Table 3-11.

Table 3-11: Declared Disaster History (1991, 2022)*

Year	Disaster Name	Disaster Type	Disaster #	State Declaration #	Federal Declaration #
1991	Severe freeze	Freezing	DR-894-CA	-	2/11/1991
2022	Freeze	Severe weather – Freeze	S5229	USDA Primary 7/1/2022	-
2022	Freeze	Severe weather – Freeze	S5230	USDA Contiguous 7/1/2022	-
2022	Freeze	Severe weather – Freeze	S5332	USDA Primary 11/4/2022	-

** Data from Table 3-5: Yolo County State and Federal Disaster Declarations, 1965-2023. All years that did not have Extreme Weather: Freeze declarations were removed*

The NCDC data showed 24 freeze-type incidents for Yolo County since 1950, This can be see in Table 3-12.

Table 3-12: NCDC Freeze Events for Yolo County 1950-2023*

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage
Cold/Wind Chill	13	1	0	0	0
Extreme Cold/Wind Chill	1	0	0	0	0
Frost/Freeze	7	0	0	$200,000	$5,000,000
Hail	2	0	0	$500,000	$510,000
Heavy Snow	1	0	0	0	0
Totals:	**24**	**1**	**0**	$700,000	$5,510,000

**Data from Table 3-6: NCDC's Severe Weather Events for Yolo County 1950-2/23/2023. All other event types were removed.*

LIKELIHOOD OF FUTURE OCCURRENCE

Likely - The probability of future occurrences in the next 100 years is **Likely**: Between 10 percent and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.

CLIMATE CHANGE AND FREEZE

Snowpack and Runoff

By delaying runoff during the winter months when precipitation is greatest, snow accumulation in the Sierra Nevada and Cascade Range to the east and the Coast Ranges and Klamath Mountains to the west of the Sacramento River acts as a massive natural reservoir for California. Snowpack typically accumulates from November through the end of March and melts from April through July. The length and timing of each year's snowpack accumulation and melting periods vary based on both temperature and precipitation. Hydrologic models indicate that higher temperatures associated with global warming would affect the timing and magnitude of both snowmelt and runoff in California. Despite uncertainties surrounding climate change precipitation effects, there is very high confidence that higher temperatures will change both snowfall and snowmelt in many watersheds. This is particularly relevant to those areas in Yolo County that are dependent on the Sacramento River. These changes could diminish water supplies, increase flooding, and reduce summer soil moisture.

VULNERABILITY ASSESSMENT

Vulnerability – Medium

All of Yolo County is vulnerable to freeze. The effects can be felt greater in the mountainous areas, where the lower temperatures occur. These areas of the County are not heavily populated. Susceptible populations include the young and elderly, as well as those without adequate heating. Though crops in Yolo County are adaptable to freeze, they can become vulnerable to prolonged periods of low temperatures. Almond production can decrease during periods of low temperatures which is a significant impact on the agricultural community in Yolo County. As mentioned in the NCDC data above, there has been significant crop damage losses due to freeze events in Yolo County.

Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities. Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening.

Vulnerable populations that are more susceptible to cold and freeze include:

- Homeless or unhoused

- Infants and children under age five
- Elderly (65 and older)
- Individuals with disabilities
- Individuals dependent on medical equipment
- Individuals with impaired mobility

Although Yolo County has not had to open Heating Centers due to Freeze events, our concern as with extreme heat events are vulnerable populations, such as the populations mentioned above and residents of nursing homes and elder care facilities who are vulnerable to extreme temperature events. In additional to vulnerable populations, pets and livestock are at risk to freeze and cold and should have emergency plans or backup power to address power failure during times of extreme cold and freeze.

3.3.4 High Wind

Hazard/Problem Description

High winds, often accompanying severe storms and thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High wind is defined as a one-minute average of surface winds 40 miles per hour or greater lasting for one hour or longer, or winds gusting to 58 miles per hour or greater regardless of duration that are either expected or observed over land[4]. The Beaufort scale is an empirical measure that relates wind speed to observed conditions on land and is a common measure of wind intensity (see Figure 3.5). These winds may occur as part of a seasonal climate pattern or in relation to other severe weather events such as thunderstorms.

Straight-line winds may also exacerbate existing weather conditions by increasing the effect on temperature and decreasing visibility due to the movement of particulate matters through the air, such as dust. The winds may also exacerbate fire conditions by drying out the ground cover, propelling fuel around the region, and increasing the ferocity of existing fires. These winds may also damage crops, damage roofs and structures due to downed trees, and cause secondary damage due to flying debris. When there is extreme heat, and high winds, PG&E also considers PSPS events as a possibility creating a secondary impact of power outages.

[4] NOAA.

Beaufort Number	Wind Speed (miles/hour)	Wind Speed (km/hour)	Wind Speed (knots)	Description	Wind Effects on Land
0	< 1	< 1	< 1	Calm	Calm. Smoke rises vertically.
1	1-3	1-5	1-3	Light Air	Wind motion visible in smoke.
2	4-7	6-11	4-6	Light Breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	12-19	7-12	Gentle Breeze	Leaves and smaller twigs in constant motion.
4	13-18	20-28	11-16	Moderate Breeze	Dust and loose paper are raised. Small branches begin to move.
5	19-24	29-38	17-21	Fresh Breeze	Small trees begin to sway.
6	25-31	39-49	22-27	Strong Breeze	Large branches are in motion. Whistling is heard in overhead wires. Umbrella use is difficult.
7	32-38	50-61	28-33	Near Gale	Whole trees in motion. Some difficulty experienced walking into the wind.
8	39-46	62-74	34-40	Gale	Twigs and small branches break from trees. Cars veer on road.
9	47-54	75-88	41-47	Strong Gale	Larger branches break from trees. Light structural damage.
10	55-63	89-102	48-55	Storm	Trees broken and uprooted. Considerable structural damage.
11	64-72	103-117	56-63	Violent Storm	Widespread damage to structures and vegetation.
12	> 73	> 117	> 64	Hurricane	Considerable and widespread damage to structures and vegetation. Violence.

Figure 3.5: Beaufort Wind Scale
Source: National Weather Service

LOCATION AND EXTENT

High wind has the potential to affect all areas of Yolo County, as weather patterns are only marginally predictable and long-term forecasting is only marginally effective for specific area forecasts. The geographic extent of high winds is **Extensive** with 50-100% of the Yolo County Operational Area affected by this hazard. High winds often occur with the onset of atmospheric river events. Figure 3.6 depicts wind zones for the United States. The map denotes that Yolo County falls into Zone I (indicated by the black circle), which is characterized by high winds of up to 130 mph.

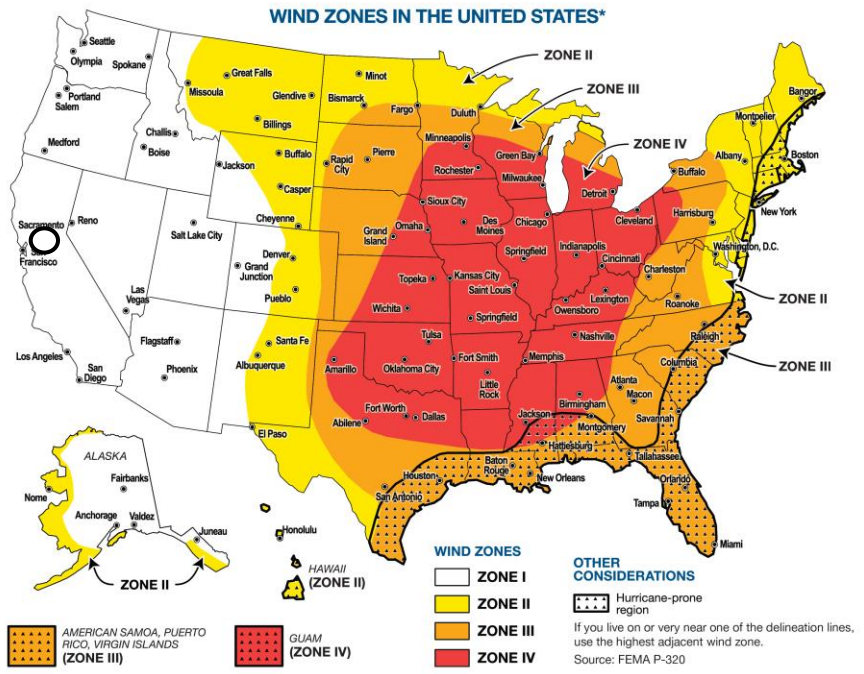


Figure 3.6: Wind Zones in the United States
Source: FEMA

The National Climatic Data Center (NCDC) provides a listing of all the high wind events to affect Yolo County since 1950. Several high wind events have occurred in and around Yolo County since the last plan update in 2018:

- 1/7/2019: High Wind: A wind gust to 60 mph was measured at McClellan Airfield. Numerous trees were reported down in the area. A cool, wet Pacific system brought hazardous driving over mountain roads, local road flooding in the Central Valley, and damaging winds.
- 2/27/2019: Strong Wind: CHP reported numerous trees down across the area due to strong winds and wet ground, causing road blockages and power outages. A gust to 49 mph was measured at Sacramento International Airport.||Examples include downed power lines in roadway which were reported.
- 10/27/2019: Strong Wind: Sacramento International Airport a non-thunderstorm related wind gust up to 55 mph. Within the zone there was at least two report of downed trees in

roadways in the Davis Sacramento metro areas. Critical fire weather conditions were forecast for Oct 23-24 and again on October 27-28 with the eastern Pacific High allowing trough to slide into the Great Basin/Nevada areas. This caused the pressure gradients to tighten over the county warning area, which lead to additional rounds of strong northerly and easterly winds. With these winds forecast, dry conditions still in place, and fuels still being primed a Red Flag Warning was issued for most of interior northern California. Fortunately no major wildfires resulted from this but utility power lines did suffer from wind and tree damage across much of northern California. Time stamps for events are based on strongest wind gusts that occurred between Oct 23-38.

- 1/18-1/19/2021: Strong Wind: Law enforcement reported multiple downed trees and powerlines across Sacramento and Yolo counties. Damage costs are estimated for this report. Wind reports across the area include: Sacramento International, Sacramento Executive, and Davis airports reporting peak wind gusts of 41, 43, and 37 mph respectively. Additional peak wind gust reports around Sacramento County varied from 30 to 43 mph and around Yolo County they varied from 35 to 59 mph. Upper level ridging combined with a series of troughs led to the tightening of pressure gradients over interior northern California. The first trough slipped down and paralleled the California coast causing the north and east pressure to develop and tighten. This brought gusty winds Sunday night into Monday. A brief reprieve in winds occurred mid-Monday, before a second shortwave further reinforced the offshore flow Monday night into Tuesday. This shortwave trough dug south from eastern Washington toward the central and southern portion of the Sierra Nevada. Strong and damaging winds developed across interior northern California resulting in power outages, downed trees, downed power lines, and several small wildfires. Peak gusts ranged from 30 to 60 mph in the Valley, and generally between 40 and 80 mph for the mountains and foothills.
- 2/23/2021: Strong Wind: Breezy winds developed across interior northern California on February 23 as a shortwave trough slid across the Pacific Northwest. High pressure was developing east of the region causing the pressure gradient to tighten over the region. Wind speeds at nearby Davis Airport, within in Yolo County, were 21.9 mph gusting to 35.7 mph at 9:55 am, 25.3 mph gusting to 38.0 mph at 10:35 am, 20.7 mph gusting to 39.1 mph at 10:55 am. Sustained winds briefly met Wind Advisory criteria at that location, but not wind gust criteria. A Wind Advisory was not in effect during that time.
- 10/10-10/11/2021: Strong north winds impacted portions of interior northern California late Sunday the 10th through Monday the 11th. CHP reported numerous down trees, tree limbs and powerlines across the region.
- 12/10/2022: Strong Wind: Sacramento International Airport reported a max gust of 52 mph. California Highway Patrol reported multiple downed trees and power lines across the Sacramento Area, resulting in 32,431 customers across the Sacramento region without power according to broadcast media. Another weekend storm delivered

widespread rain, mountain snow and gusty winds to interior NorCal. Localized flooding, downed trees, and mountain travel impacts were observed starting on 12/9/22 through early 12/12/22.

- 12/13/2021: High Wind: High winds caused a significant amount of trees and powerlines to fall across the area causing widespread power outages leading to tens of thousands of people left without power, roadways were closed and blocked, and dangerous driving conditions were observed including a vehicle struck by a powerline. Peak wind gusts reported for the zone reached 47 to 56 mph. Damage costs are estimated.
- 12/27/2022: A strong and very wet atmospheric storm brought extended periods of moderate to heavy rain and periods of strong winds to much of the region, along with heavy high-elevation snow. Precipitation totals were around 1-3 inches for the Central Valley, 3-6 inches in the foothills, and 5-8 inches of liquid equivalent in the mountains. The rain brought widespread flooding to the region. This included significant river flooding on the Cosumnes River around Wilton due to multiple levee breaks, resulting in the area being evacuated and area highways and roads being closed, including SR-99. River flooding was also reported along the Mokelumne River near Benson's Ferry and Mormon Slough at Bellota. Flooding of streams, in low areas and from clogged storm drains also closed many other roads across Northern California, with several small communities being evacuated. High winds gusting 50-65 mph in the Central Valley caused large numbers of trees to fall, bringing widespread power failures across the area, with hundreds of thousands of customers impacted. Many local roads were closed to downed trees blocking them. Trees were also reported to have fallen on homes and automobiles. The storm with flooding continued into January, with several fatalities reported due to drowning and wind-downed trees.
- 12/31/2022: High Wind: There were many reports of trees uprooted & large branches down. Over 145,000 customers were without power in the Sacramento area due to falling trees knocking down several power lines in high winds. Power was still out for 40,000+ customers as of 9:30am on 1/1/2023. Sacramento International Airport reported sustained winds above 40 mph with wind gusts above 45 to 50 mph from 6:50 pm through 9 pm with a peak gust of 61 mph at 736 pm. Sacramento Executive Airport reported wind gusts above 45 mph from 6:50 pm through 9:25 pm with a peak gust of 64 mph at 814 pm. Sustained winds exceeded 40 mph from 7:45 pm to 9 pm. McClellan Airfield Airport reported wind gusts above 45 mph from 7:15 pm through 9:15 pm with a peak gust of 60 mph at 815 pm. Sustained winds exceeded 40 mph from 7:35 pm to 8:55 pm. Many local roads were closed to downed trees blocking them. Trees were also reported to have fallen on homes and automobiles. The storm with flooding continued into January, with several fatalities reported due to drowning and wind-downed trees.
- 1/4-1/5/2023: High Wind: A powerful atmospheric river brought very strong winds with moderate to heavy rain and renewed flooding of the already elevated waterways. There

was flooding of roadways, urban areas, rivers, streams, and creeks. There were dangerous mountain travel conditions at Sierra pass levels with 6 to 18 inches of snow above 6500 feet. The warm nature of the storm limited snow amounts further down, with just a few inches of accumulation down to 6000 feet. Winds gusted up to 50-60 mph in the Valley, with gusts up to 70 to 100 mph in the mountains. There were widespread trees down, blocking roads and causing numerous power outages across the area. Rainfall amounts were 1 to 3 inches in the Central Valley and 2 to 6 inches in the foothills and mountains. There were 2 fatalities reported, one due to drowning, and the other due to a rain-related car accident.

- 1/7-1/8/2023: High Wind: A major winter storm brought strong winds with moderate to heavy rain bringing renewed flooding of already elevated waterways. There were high winds around midnight for the Sacramento metro area, bringing numerous reports of damage. There was flooding of roadways, urban areas, rivers, streams and creeks, with rockslides and mudslides also reported. There were widespread downed trees, power lines, and power outages. Winds gusted up to 60-70 mph in the Central Valley.

Other notable high wind events occurred in 2014, 2016, and 2017.

PAST OCCURRENCES

There has been no past Federally or state disaster declarations due to high winds. However, there has been several USDA disaster declarations related to high winds, as shown on Table 3-13.

Table 3-13: Declared Disaster History (2013, 2016)*

Year	Disaster Name	Disaster Type	Disaster #	State Declaration #	Federal Declaration #
2013	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3569	8/21/2013	-
2014	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3637	1/23/2014	-
2014	Extreme Heat, High Winds, High Fire Risk	Drought- FAST TRACK	USDA Contiguous S3626	1/15/2014	-
2015	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3784	2/4/2015	
2016	Extreme Heat, High Winds, High Fire Risk	Drought- FAST TRACK	S3952	USDA Primary 2/17/2016	
2016	Severe Weather – High Winds, Excessive Rain	Severe Weather	S4164	USDA Contiguous 3/3/2016	

** Data from Table 3-5: Yolo County State and Federal Disaster Declarations, 1965-2023. All years that did not have High Wind declarations were removed*

The NCDC data showed 67 High Wind incidents for Yolo County since 1950, This can be see in Table 3-14.

Table 3-14: NCDC High Wind Events for Yolo County 1950-2023*

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage
High Wind	31	0	0	$8,267,000	$37,000
Strong Wind	36	4	2	$3,723,400	0
Totals:	67	4	2	$1,990,400	$37,000

**Data from Table 3-6: NCDC's Severe Weather Events for Yolo County 1950-2/23/2023. All other event types were removed.*

Likelihood of Future Occurrence

Highly Likely - The probability of future occurrences in the next 100 years is **Highly Likely:** Near 100 percent chance of occurrence next year or happens every year.

Climate Change And High Wind

Vulnerability Assessment

Vulnerability – High

High winds can cause a wide range of damages including to mobile homes, power lines, billboards, airplanes, vehicles, roofs and other structures. Trees toppled over by high winds can fall onto power lines and rupture underground water mains, disrupting services to customers. Trees can also cause damages by falling onto structures, cars and even people. As shown in previous events in Yolo County, high winds also have the potential to cause traffic and aviation accidents, which could result in injuries and possibly even death. Based on previous data from NCDC, High wind events caused significant property and crop damage and Yolo County Operational Area has an extensive history of previous occurrences of high wind/strong wind events.

No one area of Yolo County is more vulnerable to wind than any other, though certain locations are more susceptible to damage due to building construction and the amount of tree canopy. The cities of Davis and Woodland are particularly susceptible to wind damage from fallen trees, particularly on many of their main streets. Trees can fall on power lines, causing power outages, and can also fall on people and cars. People who live in homes with large tree branches over their roofs are particularly susceptible to high winds. Mobile home parks are vulnerable to high wind due to their light frame construction. There are mobile home parks located in all four cities and in the unincorporated county. Aviation vehicles, including hot air balloons and small airplanes, are also susceptible to high winds and potential issues can arise when they are taking off and landing.

During periods of high winds and dry vegetation, wildfire risk also increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County as well. Although high winds do affect our agricultural community and has previously resulted in crop damage losses, it's greatest affect is when this hazard is compounded with extreme heat and already drought conditions which affects our agricultural community. The agricultural community is most vulnerable with this combination of extreme heat, high winds, and high fire risks as noted by the previous USDA Drought declarations.

3.3.5 TORNADO

HAZARD/PROBLEM DESCRIPTION

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, and damage paths can be in excess of one mile wide and 50 miles long. Tornadoes can affect the Yolo County area primarily during the rainy season in the late fall and early spring. The Enhanced Fujita Scale (see Figure 3.7) is commonly used to rate the intensity of tornadoes in the United States based on the damages that they cause.

Enhanced Fujita Scale	
EF–0	65–85 mph winds
EF–1	86–110 mph
EF–2	111–135 mph
EF–3	136–165 mph
EF–4	166–200 mph
EF–5	>200 mph

Figure 3.7: Enhanced Fujita Scale

LOCATION AND EXTENT

Compared to the areas east of the Rocky Mountains, tornado occurrence over the western United States is much less frequent. However, climatological studies reveal certain subregions throughout the west where there is a significant increase in tornado occurrence. Two of the regions are in California: the Los Angeles area, and the Central Valley of California comprising the Sacramento and San Joaquin Valleys. A tornado could essentially form anywhere in Yolo

County, though they are rare and often of low intensity. The geographic extent of tornado is **Limited** with 10-25% of the Yolo County Operational Area affected by this hazard. The largest recorded tornado in the Yolo County area formed in Sacramento in 1978 and registered as an EF-2, damaging an elementary school and several homes and businesses. Since the last plan update, there has been one documented accordance of a tornado in Yolo County according to NCDC:

- 9/28/2019: An unseasonably cold upper level low pressure system brought showers and thunderstorms to the Valley, which brought accumulating and damaging hail and a weak tornado to the Davis. A tornado was reported by a University of California Davis atmospheric science student. The student was reported to be east of highway 101a and highway 29 around 5:41 pm pst and filmed the tornado.

Additional historic tornado touchdowns in Yolo County include:

- 3/20/2005: An EF-0 tornado traveled through an agricultural area. Damage was caused to a property fence and to a grove of almond trees in Dunnigan.

- 2/21/2005: An EF-0 tornado touched down in the Southport neighborhood of West Sacramento. Primarily tree and fence damage occurred, though other minor damage from flying debris was noted.
- 1/28/2014: An EF-0 tornado was observed and recorded over Conaway Ranch just southeast of Woodland, touching down near County Roads 103 and 25 (see Figure 43). The tornado traveled about 100 yards before lifting up and touching down again and traveling another 100 yards. No visible damage was observed.

The geographical extent of a Tornado in the Yolo County Operational Area would be **Limited** with only 10-25% of the operational area affected. Although a tornado could be potentially experienced at any of the lower elevations of Yolo County and could potentially be an EF-2.

Past Occurrences

There has been no Federally or state disaster declarations due to tornadoes in Yolo County, according to Table 3-5.

Likelihood of Future Occurrence

Occasional - The probability of future occurrences in the next 100 years is **Occasional**: Between 1 percent and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.

Climate Change And Tornadoes

VULNERABILITY ASSESSMENT

Vulnerability – Medium

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, the majority of injuries and deaths generally result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response. Trees and other infrastructure may experience minor damage, as has occurred in the previous occurrences of tornadoes touching down in Yolo County. The potential does exist for an EF-0 or an EF-1 tornado to cause injury and death, as has occurred with other tornadoes of this intensity across the Country.

While unlikely, a stronger EF-2 tornado does have the potential to occur in Yolo County and could cause considerable damages to buildings and infrastructure. Such a tornado could destroy mobile homes, tear roofs off well-constructed houses, shift the foundations of frame houses, and lift cars off the ground.

Tornadoes are more likely to form in the valley area of Yolo County, including the four cities, than in the more mountainous areas such as the Capay Valley. As with high winds, certain locations are more susceptible to damage due to building construction and the amount of tree canopy. The Cities of Davis and Woodland are particularly susceptible to tornado damage from fallen trees, particularly on many of their main streets. Trees can fall on power lines and cause power outages, and can also fall on people and cars. Power lines, transmission lines, and radio towers are all vulnerable to a direct hit from a tornado. A greater amount of property is vulnerable to damage from a tornado than a regular wind due to the higher wind speeds of tornado. Mobile home parks are vulnerable to tornadoes due to their light frame construction, as are industrial and commercial sites with lose materials. There are mobile home parks located in all four cities and in the unincorporated county. Aviation vehicles, including hot air balloons and small airplanes, are also susceptible to tornadoes.

Similar to high winds, tornadoes could cause damage to agricultural lands from erosion (soil loss), dry land farming seed loss, windblown weeds, and downed trees. Livestock that may be contained in these structures may be injured or killed, causing economic harm to the rancher who owns both the structure and the livestock.

3.4 DAM FAILURE

Commented [SH6]: Revist this hazard – make sure all high hazard dams are accounted for and fully profiled

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually 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 prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped and fail. Overtopping is the primary cause of earthen dam failure in the United States.

Dam failure is the uncontrolled release of impounded water from behind a dam. Flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, and terrorism can all cause a dam to fail. Dam failure causes downstream flooding that can affect life and property. Dam failures can result from any one or a combination of the following causes:

- Earthquake
- Inadequate spillway capacity resulting in excess overtopping flows
- Internal erosion caused by embankment or foundation leakage, or piping or rodent activity
- Improper design
- Improper maintenance
- Negligent operation
- Failure of upstream dams on the same waterway

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Electric generating facilities and transmission lines could also be damaged and affect life support systems in communities outside the immediate hazard area. Associated water supply, water quality and health concerns could also be an issue. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

In general, there are three types of dams: concrete arch or hydraulic fill, earth and rockfill, and concrete gravity. Each type of dam has different failure characteristics. A concrete arch or hydraulic fill dam can fail almost instantaneously; the flood wave builds up rapidly to a peak then gradually declines. An earth-rockfill dam fails gradually due to erosion of the breach; a flood wave will build gradually to a peak and then decline until the reservoir is empty. And, a

concrete gravity dam can fail instantaneously or gradually with a corresponding buildup and decline of the flood wave.

The California Department of Water Resources (DWR) Division of Safety of Dams (DSOD) has jurisdiction over impoundments that meet certain capacity and height criteria. Embankments that are less than six feet high and impoundments that can store less than 15 acre-feet are non-jurisdictional. Additionally, dams that are less than 25 feet high can impound up to 50 acre-feet without being jurisdictional. The Cal DWR DSOD assigns hazard ratings to large dams within the State. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in three categories that identify the potential hazard to life and property:

- High hazard indicates that a failure would most probably result in the loss of life
- Significant hazard indicates that a failure could result in appreciable property damage
- Low hazard indicates that failure would result in only minimal property damage and loss of life is unlikely

Since 1929, the state has supervised all non-federal dams in California to prevent failure for the purpose of safeguarding life and protecting property. Supervision is carried out through the state's Dam Safety Program under the jurisdiction of DWR. The legislation requiring state supervision was passed in response to the St. Francis Dam failure and concerns about the potential risks to the general populace from a number of water storage dams. The law requires:

- Examination and approval or repair of dams completed prior to August 14, 1929, the effective date of the statute.
- Approval of plans and specifications for and supervision of construction of new dams and the enlargement, alteration, repair, or removal of existing dams.
- Supervision of maintenance and operation of all dams under the state's jurisdiction.

The 1963 failure of the Baldwin Hills Dam in Southern California led the Legislature to amend the California Water Code to include within state jurisdiction both new and existing off-stream storage facilities.

Dams and reservoirs subject to state supervision are defined in California Water Code §6002 through §6004, with exemptions defined in §6004 and §6025. In administering the Dam Safety Program, DWR must comply with the provisions of the California Environmental Quality Act (CEQA). As such, all formal dam approval and revocation actions must be preceded by appropriate environmental documentation.

In 1972, Congress moved to reduce the hazards from the 28,000 non-federal dams in the country by passing Public Law 92-367, the National Dam Inspection Act. With the passage of this law, Congress authorized the U.S. Army Corps of Engineers (USACE) to inventory dams located in

the United States. The action was spurred by two disastrous earthen dam failures during the year, in West Virginia and South Dakota that caused a total of 300 deaths.
The Water Resources Development Act of 1986 (P.L 99-662) authorized USACE to maintain and periodically publish an updated National Inventory of Dams (NID). The Water Resources Development Act of 1996 (P.L. 104-303), Section 215, re-authorized periodic updates of the NID by USACE.

LOCATION AND EXTENT

In the area around Yolo County there are six dams, of various types of construction and the failure of any one would cause some degree of flooding in Yolo County:

- Monticello Dam (Putah Creek) – U.S. Bureau of Reclamation
- Indian Valley Dam (Cache Creek) – Yolo County Flood Control and Water Conservation District
- Shasta Dam (Sacramento River) – U.S. Bureau of Reclamation
- Oroville Dam (Feather River) – California Department of Water Resources
- Folsom Dam (American River) – U.S. Bureau of Reclamation
- Nimbus Dam (American River) – U.S. Bureau of Reclamation

According to the California Department of Water Resources Division of Safety of Dams, there are Jurisdictional Dams located within Yolo County. Details on these dams are listed below in Table 3-15:

Table 3-15: Jurisdictional Dams – Dams within Jurisdiction of the State of California, Sept 2022.

Dam No.	Dam Name		Owner Name	Dam Height	Reservoir Capacity	Certified Status	Condition Assessment	County
National ID No.	Latitude	Longitude	Owner Type	Crest Length	Dam Type	Downstream Hazard	Reservoir Restrictions	Year Built
1-84	Cache Creek Settling Basin		Central Valley Flood Protection Board	29	3,800	Certified	Satisfactory	Yolo
CA01348	36.68	-121.67	State Agency	40,083	Earth	Low	No	1993
1391-3	Davis Creek		Homestake Mining Company	105	6,079	Certified	Satisfactory	Yolo
CA01223	38.86	-122.35	Private Company, Corporation, LLC, partnership	953	Earth	High	No	1985

Source: California Department of Water Resources, Division of Safety of Dams

The geographic extent of a Dam failure in Yolo County is **Extensive** with 50-100 percent of the operational area potentially being affected by a failure of any one major dam. Parts of the County would be completely inundated.

Monticello Dam

Monticello Dam is a thin arch concrete structure 270 feet high. It impounds a maximum of 1,602,300 acre-feet creating Lake Berryessa in Napa County, 10 miles west of Winters. In the event of failure, Monticello Dam presents a high hazard to downstream areas and extensive loss of life and property would likely occur. Winters and Davis are particularly vulnerable to the threat of a Monticello Dam failure, as their stormwater management systems would become inundated.

Large uncontrolled water releases into Putah Creek could occur resulting from either a major or partial dam failure, or earthen slides into Lake Berryessa, which could cause overtopping of the dam.
Seismic evaluation of Monticello Dam indicates it could withstand an earthquake of Richter magnitude 6.5 with the epicenter located 0.5 miles from the dam. Thus, the dam is considered secure from such an occurrence. The topography of the lake relative to the size of potential slides makes the possibility of dam overtopping very unlikely. Any landslide that would move into the outlet works or spillway area would be especially dangerous to the dam.

The unstable area adjacent to the dam crest at its contact with the left abutment will be closely monitored by the dam tender during the raining season and after seismic activity. Landslides into the downstream channel could impound water but releases would be expected to be gradual as the new "dam" was eroded away. Severe storms are not expected to cause rapid rises in the water surface of Lake Berryessa.

Indian Valley Dam

Indian Valley Dam is an earth-filled dam producing a lake of 359,000 acre-feet storage capacity (maximum). The dam is located in Lake County, northwest of Yolo County, on the North Fork of Cache Creek. Depending upon the rate of discharge following dam failure the area of potential inundation extends along the Cache Creek all the way to the I-80 and the Yolo Bypass. The Yocha Dehe Wintun Nation as well as unincorporated communities in the Capay Valley are vulnerable to an Indian Valley Dam failure. Tribal housing and agricultural lands are particularly susceptible, as is the State Route 16 transportation corridor.

Shasta Dam

Shasta Dam is a concrete gravity dam. The reservoir (Lake Shasta) has a maximum storage capacity of 4,552,000 acre-feet. The dam is located in Shasta County north of Summit City. Dam failure would result in varying degrees of inundation to eastern and northeastern Yolo County. Knights Landing and West Sacramento are particularly susceptible.

Oroville Dam

Oroville Dam is an earth-filled dam. The reservoir (Oroville Lake) has a maximum storage capacity of 3,500,000 acre-feet. The dam is located in Butte County, northeast of Yolo County,

above the Sacramento River. Failure of the dam would overwhelm the Yolo Bypass, where agricultural land is susceptible to flooding, and would threaten West Sacramento and the eastern side of Woodland.

Folsom Dam

Folsom Dam is a concrete and earth dam. The lake has a maximum storage capacity of 977,000 acre-feet. The dam is located in Sacramento County, east of Yolo County on the American River.

Dam failure would result in some degree of inundation to areas of Yolo County bounded by the west levee of the Yolo Bypass, on the north by a point on Old River Road one-half mile south of Kiesel Crossing and on the south by the county line. West Sacramento is vulnerable to flooding if the Sacramento River levee surround it were to fail.

Nimbus Dam

Nimbus Dam is a concrete gravity dam. The reservoir (Lake Natoma) has a maximum storage capacity of 8,760 acre-feet. The dam is located in Sacramento County, east of Yolo County. All actions relating to a failure of Nimbus Dam would be identical to those required by a failure of Folsom Dam except the resulting inundation would be less severe.

According to data provided by DWR, there are two dams in Yolo County. Of the two dams, both were not rated:

- Cache Creek Settling Basin
- Davis Creek Dam

See Figure 3.8 for a map of dams and dam inundation zones in and around Yolo County

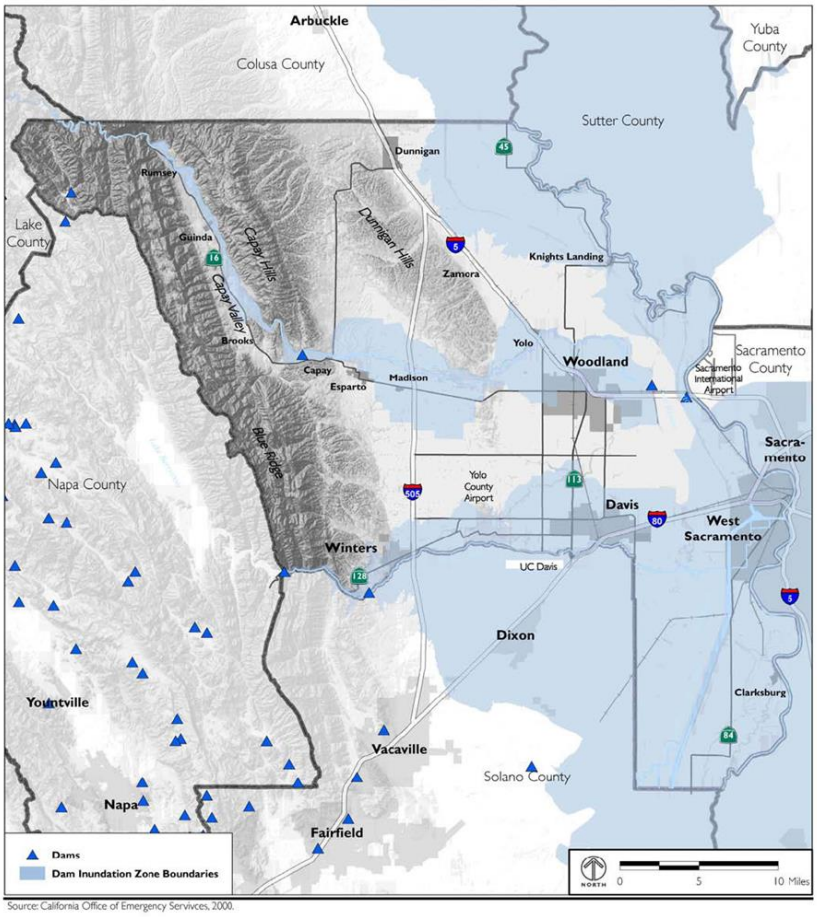


Figure 3.8: Dams and Dam Inundation Zones in and around Yolo County
Source: California Office of Emergency Services GIS Department

California has had about 45 failures of non-federal dams. The failures occurred for a variety of reasons, the most common being overtopping. Other reasons include specific shortcomings in the dams themselves or an inadequate assessment of surrounding geomorphologic characteristics.

California's first notable dam failure was in 1883 in Sierra County, while the most recent failure occurred in 1965. The most catastrophic event was the failure of William Mulholland's infamous St. Francis Dam, which failed in 1928 and killed an estimated 450 people, only slightly

fewer than the 1906 San Francisco earthquake. The actual number of dead from the St. Francis Dam failure was likely substantially higher. San Francisquito Canyon, which was flooded in the event, was home to hundreds of transients and illegal immigrants who were never accounted for in the death totals.

No previous occurrences have occurred in Yolo County, however there have been recent minor failures to dams (Folsom and Oroville Dams) located outside of Yolo County. Based on information from the Sacramento County Hazard Mitigation Plan, there have been two dam failure incidents at Folsom Dam since 1994 that could have had the potential to affect Yolo County. However, these incidents were quite limited in scope and since the incidents occurred, improvements to the Folsom Dam system have been made.

July 17, 1995 – At the Folsom Dam, a spillway gate, gate #3 of Folsom Dam failed, increasing flows into the American River significantly. The spillway was repaired and the U.S. Bureau of Reclamation carried out an investigation of the water flow patterns around the spillway using numerical modeling. No flooding occurred as a result of the partial failure, but due to the location of the dam in proximity to the City of Folsom, possible flooding was a major concern.

May 15, 1997 – Cavitation damage to river outlet works occurred at Folsom Dam. Damage was discovered just downstream of gate #3. The damage consisted of a hole in the floor of the conduit measuring approximately 42 feet long, 15 feet wide, and 6 feet deep. Subsequent inspections of the other conduits revealed similar damage downstream of gate #4. Also, the beginning of cavitation damage was found downstream of gate #2. Minor damage was found in the other five conduits. No flooding was associated with this damage

A steady barrage of storms in early 2017 resulted in serious damage to the Lake Oroville spillways. This included a concrete failure on the lower chute of the gated flood control spillway, severe erosion under the gated spillway, and erosion in the areas on the hillside beneath the emergency spillway. A mandatory evacuation was ordered in Butte, Yuba, and Sutter Counties. Yolo County acted swiftly to support the evacuees by opening a shelter located at the Yolo County Fairgrounds. The shelter was open for four days until the evacuation order was lifted.

A federal emergency declaration was declared for the Oroville Dam incident. The February storms of 2017 were exacerbated by the potential failure of the Lake Oroville Emergency Spillway and Yolo County proclaimed an emergency for the February storms (2/1 - 2/23/2017) and due to the impacts from the Oroville incident.

PAST OCCURRENCES

There has been no Federally or state disaster declarations due to dam failure in Yolo County, as shown in Table 3-5.

Likelihood of Future Occurrence

Unlikely - Yolo County remains at risk to dam breaches/failures from numerous dams under a variety of ownership and control and of varying ages and conditions. Given the number and types of dams in and around the County, the potential exists for future dam issues in Yolo County. The probability of a catastrophic dam failure that would impact Yolo County and its jurisdictions is **Unlikely:** Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.

Climate Change And Dam Failure

Increases in both precipitation and heat causing snow melt in areas upstream of dams could increase the potential for dam failure and uncontrolled releases that may affect Yolo County.

Vulnerability Assessment

Vulnerability – Medium

Portions of Yolo County are located downstream of several dams with large inundation areas. In the unlikely event that any of these dams were to fail, the inundation zones indicate areas that could potentially be flooded. If the dams at Indian Valley Reservoir, Lake Berryessa or along the Sacramento, Feather or American rivers were to fail, the cities of West Sacramento, Winters and Davis would be entirely inundated by floodwaters, as would much of the city of Woodland. The unincorporated communities of Rumsey, Capay, Madison, Knights Landing and Clarksburg and parts of Guinda, Esparto, Monument Hills and Yolo are also located entirely within dam inundation zones.

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Based on the risk assessment, it is apparent that a major dam failure could have a devastating impact. Dam failure flooding presents a threat to life and property, including buildings, their contents, and their use (such as water treatment). 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.

The failure of any of the dams previously mentioned could flood downstream areas and would result in loss of life and property. According to the jurisdictional dam response plans, a catastrophic failure of any of these dams would have a significant impact on Yolo County. Complete devastation could occur in and along the river bottoms and up the banks 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.

Vulnerability of the Yolo County Operational Area to dam failure is reflected in the profile for each dam above. See Table 3.16 for the number of parcels and structure value of properties within the indentation of four dams that can impact the Yolo County Operational Area:

Dam Inundation Zone	Parcel Count	Structure Value	Areas Affected by Dam (Inundation Area)
Folsom	16,250	$3,195,682,113	25,655 Acres
Monticello	21,347	$5,128,545,854	111,530 Acres
Indian Valley	8,238	$1,901,870,208	92,087 Acres
Shasta	930	$63,035,925	71,775 Acres
Oroville	No information available		
Nimbus	No information available		

Table 3.16: Parcel Count and Structure Value Vulnerability within Inundation Zones
Source: Yolo County Assessor's Office

3.5 DROUGHT

Drought is a gradual phenomenon. A drought is a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. It is a normal recurrent feature of climate that occurs in virtually all climate zones, from very wet to very dry. Drought is a temporary aberration from normal climatic conditions and can thus vary significantly from one region to another. Because droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. Water districts normally require at least a 10-year planning horizon to implement a multiagency improvement project to mitigate the effects of a drought and water supply shortage.

Drought is a complex issue involving many factors—it occurs when a normal amount of moisture is not available to satisfy an area's usual water-consuming activities. There are several types of drought which can often be defined regionally based on its effects:

- **Meteorological drought** is usually defined by a period of below average water supply, based on the degree of dryness (in comparison to normal or average) and the duration of the dry period. Drought onset generally occurs with a meteorological drought.
- **Agricultural 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. Agricultural

drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, soil water deficits, reduced ground water or reservoir levels needed for irrigation.

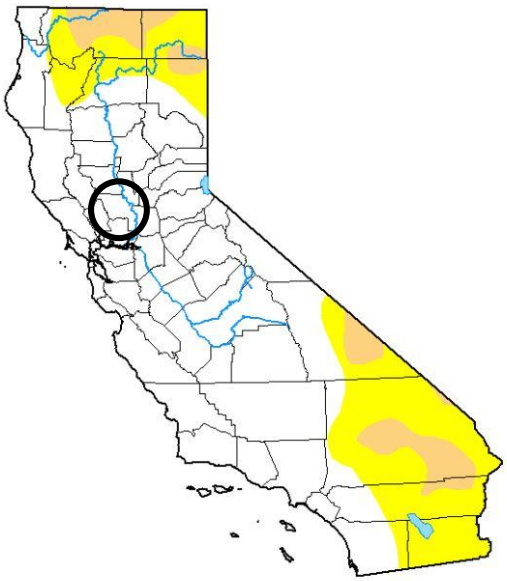
- **Hydrological drought** is defined as deficiencies in surface and subsurface water supplies. It is generally measured as stream flow, snowpack, and as lake, reservoir, and groundwater levels. Hydrological drought usually occurs following periods of extended precipitation shortfalls.
- **Socioeconomic drought** occurs when a drought impacts health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

Location and Extent

Since drought is a regional phenomenon, it affects the whole County. Speed of onset of drought is slow, while the duration varies from short (months) to long (years). Drought in the United States is monitored by the National Integrated Drought Information System (NDIS). A major component of this portal is the U.S. Drought Monitor. The Drought Monitor is a process that synthesizes multiple indices, outlooks and local impacts, into an assessment that best represents drought conditions. The final outcome of each Drought Monitor is a consensus of federal, state, and academic scientists who are familiar with the conditions in their respective regions. A snapshot of the drought conditions in California and Yolo County (May and Jan 2023) can be found in figure 3.9. Snapshots from 2018 through 2022 is shown in Figure 3.10.

U.S. Drought Monitor

California



May 2, 2023

(Released Thursday, May. 4, 2023)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	68.04	31.96	7.98	0.00	0.00	0.00
Last Week 04-25-2023	68.04	31.96	7.98	0.00	0.00	0.00
3 Months Ago 01-31-2023	0.64	99.36	89.56	32.57	0.00	0.00
Start of Calendar Year 01-03-2023	0.00	100.00	97.93	71.14	27.10	0.00
Start of Water Year 09-27-2022	0.00	100.00	99.76	94.01	40.91	16.57
One Year Ago 05-03-2022	0.00	100.00	100.00	95.18	40.51	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Brad Pugh
CPC/NOAA

droughtmonitor.unl.edu

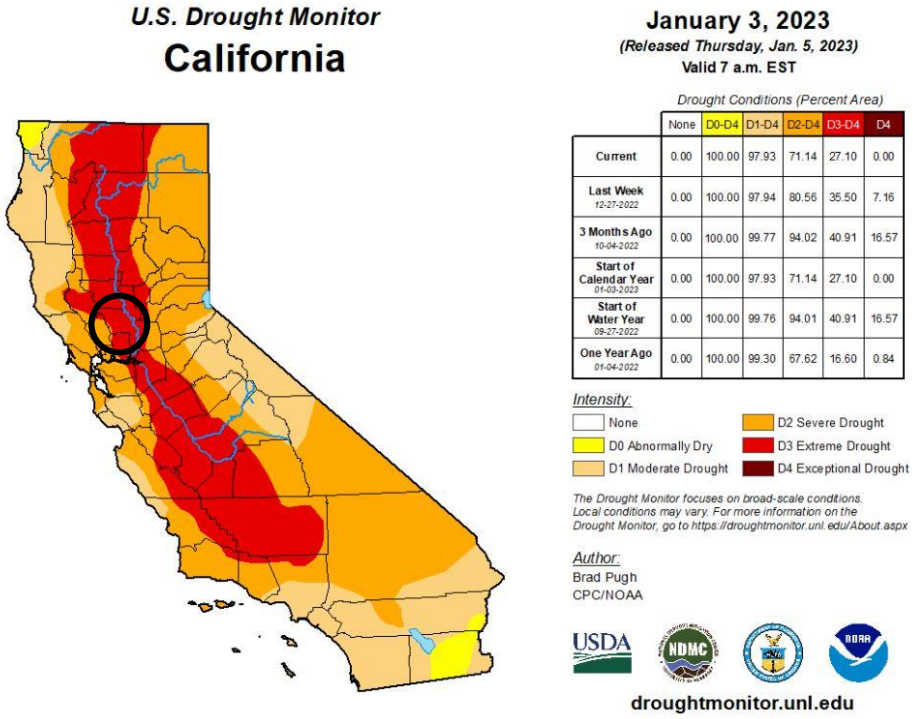


Figure 3.9: California and Yolo County – Current Drought Status (May and Jan 2023)

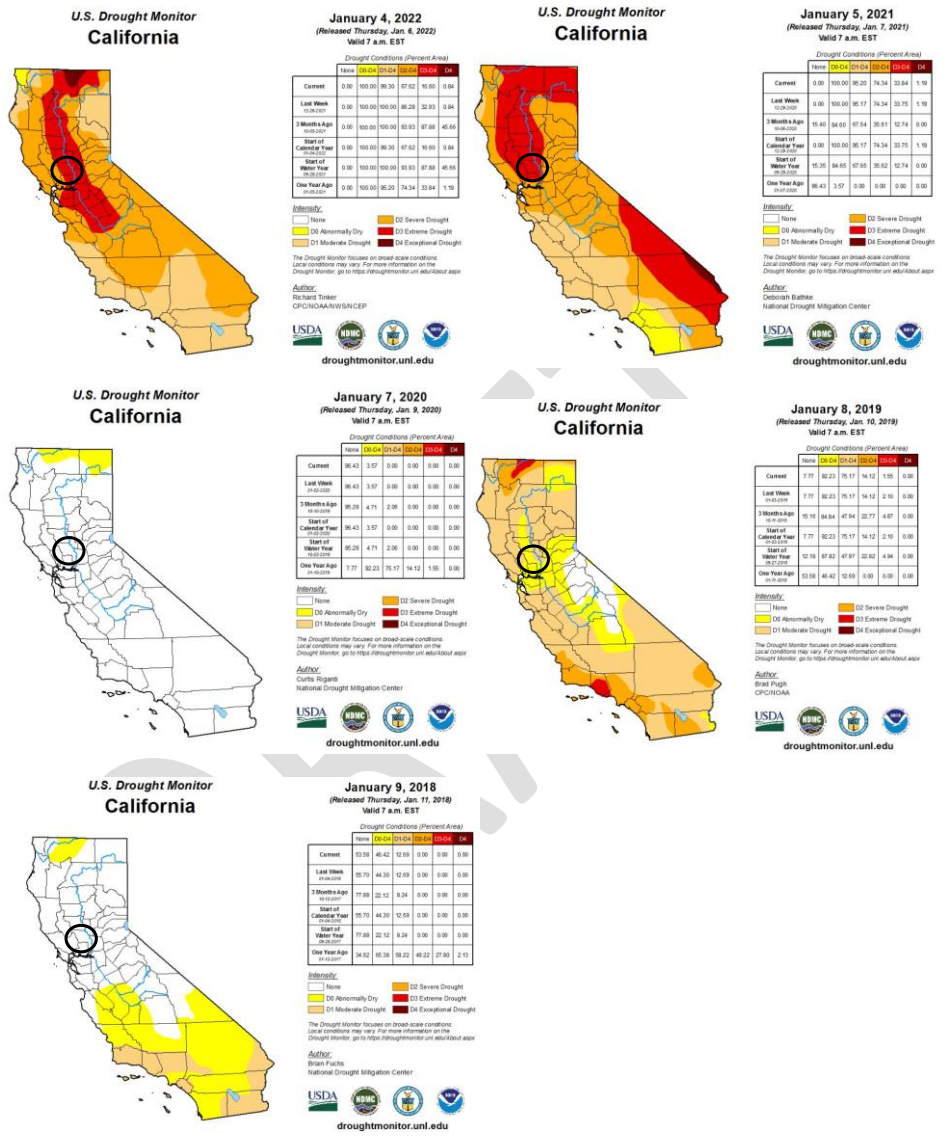


Figure 3.10: California and Yolo County Drought Status (2018-2022)

As shown in the previous figures, drought is tracked by the U.S. Drought Monitor. The Drought Monitor includes a scale to measure drought intensity:

- None

- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)

In Yolo County, the Yolo County Flood Control and Water Conservation District is the General Maintaining Agency under the Sustainable Groundwater Management Act (SGMA). Through SGMA, the groundwater user community will decide what types of rules will, or will not, be enacted to protect groundwater resources.

Drought affects all areas of Yolo County, though drought conditions can be greater in the southeastern part of the county. The geographic extent of a drought in Yolo County is **Significant** with 35-50 percent of the operational area potentially being affected by drought. Drought conditions of D4 on the U.S. Drought Monitor could cover most of Yolo County, east of the Blue Ridge Mountains.

Historically, California has experienced multiple severe droughts. According to the California Department of Water Resources (DWR), 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 driest single year of California's measured hydrologic record was 2013. A drought emergency was declared for the state in 2014, and lifted in 2017 after a series of strong winter storms. Drought also occurred throughout California in 1976-77 and in 1987-92 causing depletion of water throughout the Yolo County Operational Area but overall impacts were minimal and Yolo County did not issue a local emergency for either event.

PAST OCCURRENCES

There has been one Federal disaster related to drought in Yolo County issued in 1977. And no state disaster declarations due to drought, as shown in Table 3-17.

Table 3-17 Yolo County State and Federal Disaster Declarations, 1965-2023*

Year	Disaster Name	Disaster Type	Disaster #	State Declaration #	Federal Declaration #
1977	Drought	Drought	EM-3023-CA	-	1/20/1977

** Data from Table 3-5: Yolo County State and Federal Disaster Declarations, 1965-2023. All years that did not have Drought declarations were removed*

Another database of disaster declarations comes from the USDA. This database shows agricultural disasters that result from natural hazards like drought. This database was searched from 2012-2023, and the results for drought for Yolo County are shown in Table 3-18.

Table 3-18 Yolo County – USDA Disaster Declarations 2012-2023

Year	Declaration Number	Primary or Contiguous County	Disaster Type
2012	S3452	Primary	Drought
2013	S3569	Primary	Drought, High winds, Wildfire, Heat/Excessive heat/high temp (incl. low humidity), Insects
2014	S3626	Contiguous	Drought, High winds, Wildfire, Heat/Excessive heat/high temp (incl. low humidity), Insects
2014	S3637	Primary	Drought, High winds, Wildfire, Heat/Excessive heat/high temp (incl. low humidity), Insects
2014	S3743	Primary	Drought
2014	S3797	Contiguous	Drought
2015	S3784	Primary	Drought, High winds, Wildfire, Heat/Excessive heat/high temp (incl. low humidity), Insects
2016	S3952	Primary	Drought, High winds, Wildfire, Heat/Excessive heat/high temp (incl. low humidity), Insects
2017	S4163	Primary	Drought
2020	S4691	Contiguous	Drought
2020	S4697	Primary	Drought
2021	S4916	Primary	Drought
2022	S5146	Primary	Drought

** Data from Table 3-7: Yolo County -USDA Disaster Declarations 2012-2023. All years that did not have Drought declarations were removed.*

There have been 47 NCDC drought events in Yolo County. No deaths, injuries, property damage or crop damage were reported to the NCDC from these events.

Table 3-19: NCDC's Drought Events for Yolo County 1950-2/23/2023*

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage
Drought	47	0	0	0	0

LIKELIHOOD OF FUTURE OCCURRENCE

Likely - The probability of future occurrences in the next 100 years is **Likely:** Between 10 percent and 100 percent chance of occurrence next year or happens every year. Drought levels can be greatly reduced with a strong winter storm season, as had occurred in 2023 and previously in 2017.

CLIMATE CHANGE AND DROUGHT

Water Supply

Several recent studies have shown that Yolo County's water supply systems are sensitive to climate change. However, experts are uncertain about what the overall effects will be on water supply. Some models indicate that drier conditions will cause decreased reservoir supplies and river flows. Other models predict wetter conditions with increased reservoir inflows and storage, and increased river flows. Increased reservoir inflows can put stress on dams, increasing the susceptibility of Yolo County to dam failure. Increased river flows can put stress on levees, increasing the susceptibility of Yolo County to levee failure. Despite this uncertainty, it is still widely accepted that changes in water supply will occur and that water yields from reservoirs are expected to be unreliable. Yolo County must prepare for a future where competition for water resources between farming, cities, and the environment is greater than at the present time. Furthermore, climate change is also expected to result in more variable weather patterns, leading to longer and more severe droughts, which could lead to lower aquifer levels for those farmers dependent on groundwater. Additional groundwater pumping can increase the susceptibility of Yolo County to land subsidence.

VULNERABILITY ASSESSMENT

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 impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in Yolo County are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Also, allocations go down during a drought which results in reduced water availability. These issues become particularly evident in shallow wells, such as the ones near Capay. Voluntary conservation measures are typically implemented during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. Drought has the potential to significantly impact Yolo County's agriculture commodities, requiring changes in irrigation practices, changes in crop patters, greater reliance on groundwater, and discontinuation of certain agricultural activities. Two critical dry years (2021-2022) following a dry year (2020) resulted in declining groundwater levels. Although wet conditions of 2019 provided for 5 feet of groundwater recovery between Fall 2018 and 2019, the dry and critical conditions of 2020, 2021, and 2022 led to 4 feet, 13 feet, and 5 feet of groundwater decline. Communities that rely on well water are susceptible to drought when groundwater levels are lower, and experience dry wells from drought conditions, resulting in the County needing to provide water hauling resources to domestic well owners experiencing drought.

Agriculture throughout the County is susceptible to drought, which can cause a decrease in crop production. Crops that rely heavily on water, such as rice, are most susceptible while nut crops and vine grown fruit are least susceptible. Other impacts include impact to feed and forage, altered plant populations and tree mortality. Drought will continue to be a concern to the Operational Area.

During periods of drought, vegetation can dry out which increases fire risk. Drought that occurs during periods of extreme heat and high winds can cause PSPS events to be declared in the County. More information on power shortage and failure can be found in Section 3.2.3.

3.7 EARTHQUAKE

Earthquakes are sudden rolling or shaking events caused by movement under the earth's surface. Earthquakes happen along cracks in the earth's surface, called fault lines, and can be felt over large areas, although they usually last less than one minute. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake.

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. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the 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 groundwater, topography, and the design, type, and quality of building construction.

The amount of energy released during an earthquake is usually expressed as a magnitude, and is currently measured by seismologists on the Moment Magnitude (Mw Scale). The Mw Scale was developed to succeed the previously used Richter Scale and is measured on a scale of zero to ten with increasing values reflecting increasing intensity.

The other commonly used measure of earthquake severity is intensity, which is an expression of the amount of shaking at any given location on the ground service. Intensity is most commonly measured on the Modified Mercalli Intensity (MMI) Scale (see Figure 3.11).

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Figure 3.11: Modified Mercalli Intensity Scale

Figure 3.12 gives intensities (measured on the MMI scale) that are typically observed at locations near the epicenter or earthquakes of different magnitudes.

Magnitude	Typical Maximum Modified Mercalli Intensity
1.0 - 3.0	I
3.0 - 3.9	II - III
4.0 - 4.9	IV - V
5.0 - 5.9	VI - VII
6.0 - 6.9	VII - IX
7.0 and higher	VIII or higher

Figure 3.12: Mercalli Scale vs. Magnitude

Ground shaking

Ground shaking is motion that occurs as a result of energy release during faulting. The damage or collapse of buildings and other structures caused by ground shaking is among the most serious seismic hazards. Damage to structures from this vibration, or ground shaking, is caused by the transmission of earthquake vibrations from the ground to the structure. The intensity of shaking and its potential impact on buildings is determined by the physical characteristics of the

underlying soil and rock, building materials and workmanship, earthquake magnitude and location of epicenter, and the character and duration of ground motion.

The extent of ground shaking depends in large part on how soft the underlying soil is. Soft soils amplify ground shaking (see Figure 3.13). This was observed during the 1989 Loma Prieta Earthquake when the most significant damages experienced in San Francisco were in the Marina District, which was built on fill.

Soil type A	Vs > 1500 m/sec	Includes unweathered intrusive igneous rock. Occurs infrequently in the bay area. We consider it with type B (both A and B are represented by the color blue on the map). Soil types A and B do not contribute greatly to shaking amplification.
Soil type B	1500 m/sec > Vs > 750 m/sec	Includes volcanics, most Mesozoic bedrock, and some Franciscan bedrock. (Mesozoic rocks are between 245 and 64 million years old. The Franciscan Complex is a Mesozoic unit that is common in the Bay Area.)
Soil Type C	750 m/sec > Vs > 350 m/sec	Includes some Quaternary (less than 1.8 million years old) sands, sandstones and mudstones, some Upper Tertiary (1.8 to 24 million years old) sandstones, mudstones and limestone, some Lower Tertiary (24 to 64 million years old) mudstones and sandstones, and Franciscan melange and serpentinite.
Soil Type D	350 m/sec > Vs > 200 m/sec	Includes some Quaternary muds, sands, gravels, silts and mud. Significant amplification of shaking by these soils is generally expected.
Soil Type E	200 m/sec > Vs	Includes water-saturated mud and artificial fill. The strongest amplification of shaking due is expected for this soil type.

Figure 3.13: Soil Types

Actual ground breakage generally affects only those buildings directly over or near the fault. Ground shaking generally has a much greater impact over a greater geographical area than ground breakage. The amount of breakage and shaking is a function of earthquake magnitude, type of bedrock, depth and type of soil, general topography, and groundwater.

Seismic Structural Safety

Older buildings constructed before building codes were established, and even newer buildings constructed before earthquake-resistance provisions were included in the codes, are the most likely to be damaged during an earthquake. Buildings one or two stories high of wood-frame construction are considered to be the most structurally resistant to earthquake damage. Older masonry buildings without seismic reinforcement (unreinforced masonry buildings) and soft story buildings are generally the most susceptible to the type of structural failure that causes injury or death.

The susceptibility of a structure to damage from ground shaking is also related to the underlying foundation material. A foundation of rock or very firm material can intensify short-period motions which affect low-rise buildings more than tall, flexible ones. A deep layer of water-logged soft alluvium can cushion low-rise buildings, but it can also accentuate the motion in tall buildings. The amplified motion resulting from softer alluvial soils can also severely damage older masonry buildings.

Other potentially dangerous conditions include, but are not limited to: building architectural features that are not firmly anchored, such as parapets and cornices; roadways, including column and pile bents and abutments for bridges and overcrossings; and above-ground storage tanks and their mounting devices. Such features could be damaged or destroyed during strong or sustained ground shaking.

Liquefaction Potential

Liquefaction, which can occur in earthquakes with strong ground shaking, is mostly found in areas with sandy soil or fill and a high-water table located 50 feet or less below the ground surface. Liquefaction can cause damage to property with the ground below structures liquefying making the structure unstable causing sinking or other 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 pressure below the surface.

Settlement

Settlement can occur in poorly consolidated soils during ground shaking. During settlement, the soil materials are physically rearranged by the shaking to result in a less stable alignment of the individual minerals. Settlement of sufficient magnitude to cause significant structural damage is normally associated with rapidly deposited alluvial soils or improperly founded or poorly compacted fill. These areas are known to undergo extensive settling with the addition of irrigation water, but evidence due to ground shaking is not available.

Other Hazards

Earthquakes can also cause seiches, landslides, and dam and levee failures. A seiche is a periodic oscillation of a body of water resulting from seismic shaking or other factors that could cause flooding. Earthquakes may cause landslides, particularly during the wet season, in areas of high water or saturated soils. Finally, earthquakes can cause dams to fail.

LOCATION AND EXTENT

California is seismically active because it sits on the boundary between two of the earth’s tectonic plates. Everything east of the San Andreas Fault- is on the North American Plate. The cities of Monterey, Santa Barbara, Los Angeles, and San Diego are on the Pacific Plate, which is constantly moving northwest past the North American Plate. The San Andreas Fault is

considered the boundary between the two plates, although some of the motion is taken up on faults as far was central Utah.

A fault is a "fracture or fracture zone in the earth's crust along which there has been displacement of the sides relative to one another. For the purpose of planning there are two types of faults, active and inactive. Active faults have experienced displacement in historic time, suggesting that future displacement may be expected. Inactive faults show no evidence of movement in recent geologic time, suggesting that these faults are dormant. This does not mean, however, that faults having no evidence of surface displacement within the last 11,000 years are necessarily inactive. For example, the 1975 Oroville earthquake, the 1983 Coalinga earthquake, and the 1987 Whittier Narrows earthquake occurred on faults not previously recognized as active. Potentially active faults are those that have shown displacement within the last 1.6 million years. An inactive fault shows no evidence of movement in historic (last 200 years) or geologic time, suggesting that these faults are dormant.

Fault creep and sudden fault displacement are two types of fault movement that are possible hazards to structures in the vicinity of the fault. Fault creep is a slow movement of one side of a fault relative to the other. It can cause cracking and buckling of the sidewalks and foundations even without perceptible ground shaking. Sudden fault displacement occurs during an earthquake event and may result in the collapse of buildings or other structures that are found along the fault zone when fault displacement exceeds an inch or two. The only protection against damage caused directly by fault displacement is to prohibit construction in the fault zone.

There are several known faults in Yolo County, the primary ones being the Hunting Creek Fault system, which includes the Wilson Fault, and the Dunnigan Hills Fault, as shown in Figure 3.14. The Geographic extent of Earthquake is rated as **Significant** with between 35-50 percent of the operational area affected. An earthquake with a magnitude as high as 6.8 on the Mercalli Scale could potentially occur in the southwestern area of the County around Winters as had occurred in 1892.

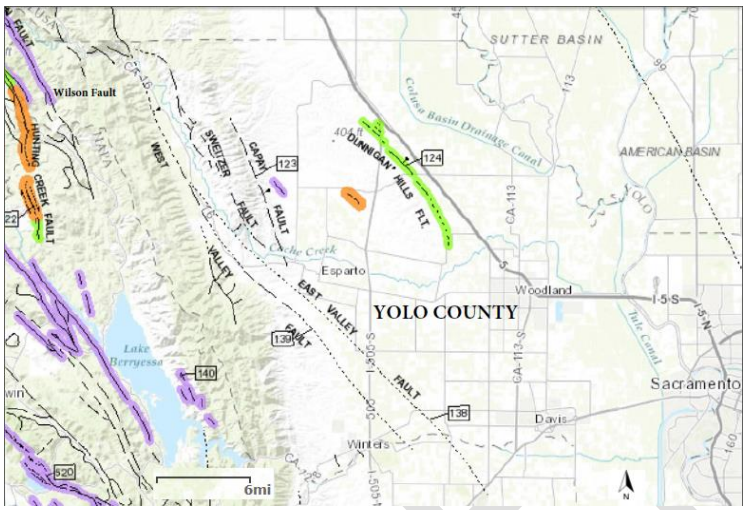


Figure 3.14: Fault Lines in Northern Yolo County
Source: USGS

The Hunting Creek Fault, part of the Hunting Creek-Berryessa fault system, is located in the far northwestern portion of the County. This is the only know active fault in the County subject to surface rupture. The Hunting Creek-Berryessa is an active (Holocene) dextral strike-slip fault system associated with the larger San Andreas fault system. The Hunting Creek-Berryessa fault system extends from the vicinity of Wilson Valley south-southeast to the Cedar Roughs area west of Lake Berryessa. In this compilation, the fault zone is divided from north to south into the Wilson, Hunting Creek, and Lake Berryessa sections. The Wilson section most likely transfers dextral slip to the Bartlett Springs fault system. The Hunting Creek-Berryessa fault system is expressed as a zone of discontinuous fault traces as much as 3.5 km wide. The Hunting Creek-Berryessa fault system locally is delineated by geomorphic evidence of Holocene dextral strike-slip displacement, predominantly along the Hunting Creek fault, which comprises the Hunting Creek section. Late Pleistocene and probable Holocene displacement has occurred along traces of the Hunting Creek fault. The late Pleistocene dextral slip occurred at a rate of 0.09–0.4 mm/yr, based on apparent vertical separation of a late Pleistocene to Holocene colluvium. The geomorphic expression of the Hunting Creek fault indicated a dextral slip rate of at least 1 mm/yr. Only a small portion of the fault lies within Yolo County, and is in an area that is sparsely populated and not planned for any growth or development other than individual farm dwellings that might be built in the future. Development near a fault subject to surface rupture is regulated by the Alquist-Priolo Act. The Act requires a detailed fault-rupture hazard investigation and prohibits development directly over any traces of the active fault line.

The other potentially active fault is the Dunnigan Hills Fault, a segment of the Hunting Creek Fault, extending west of Interstate 5 between the town of Dunnigan and northwest of the town of Yolo. This fault has been active in the last 10,000 years, but has not been active in historic times. In addition to the Hunting Creek and Dunnigan Hills faults, major faults in the Coast Ranges and in the Sierra Nevada foothills are capable of producing ground shaking that could affect Yolo County residents. See Figure 30 for a map of faults surrounding Yolo County. Most of the active fault lines lie outside of the Sacramento Valley where the most of Yolo County is located.

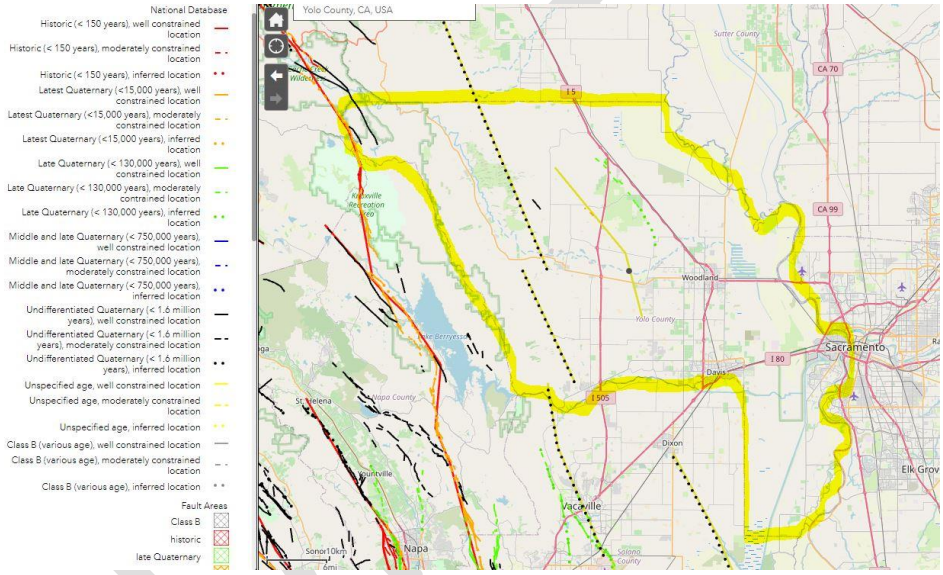


Figure 3.15: Fault Lines around Yolo County
Source: USGS

There are also several other inactive faults located in Yolo County, specifically in the Capay Valley, which itself is formed over an offset synclinal fault and is considered to be an area of seismic activity. Several inactive mapped faults, including the Sweitzer and Capay faults, pass through the Capay Valley.

The only earthquake to significantly affect Yolo County in recent history is the April 1892 Vacaville-Winters earthquake that measured 6.9 on the Richter Scale and caused severe damage to Winters and lesser damage to Davis, Woodland, and other parts of the County. It is believed to have originated from the Midland Fault (see Winters Community Profile), which is a segment of a complex zone of blind thrust faults referred to as the Coast Range-Sierran Block Boundary (CRSBB) that lie to the south of Yolo County in Solano County on the western side of the lower

Sacramento Valley. Eleven moderate earthquakes have been documented along the CRSBB zone during the last 150 years, most recently the 1983 Coalinga Earthquake which registered 6.7 on the Richter Scale and VII (Severe) on the Mercalli Intensity Scale.

A 4.2 magnitude earthquake occurred near Madison in Yolo County in 1978, but did no damage. Several minor earthquake swarms from unmapped faults occurred west of Woodland in Yolo County in 2016, but these earthquakes only caused minimal shaking and did not cause any damage.

PAST OCCURRENCES

There have been no disaster declarations in the County related to earthquakes, as shown in Table 3-5. The County had no USDA disaster declarations since 2012 related to earthquake, as shown in Table 3-7.

The United States Geologic Survey (USGS) National Earthquake information Center database contains data on earthquakes in the Yolo County area. Table 3-20 show the approximate distances earthquakes can be felt away from the epicenter.

Table 3-20: Approximate Relationships Between Earthquake Magnitude and Intensity

Richter Scale Magnitude	Maximum Expected Intensity*	Distance Felt (miles)
2.0-2.9	I-II	0
3.0-3.9	II-III	10
4.0-4.9	IV-V	50
5.0-5.9	VI-VII	90
6.0-6.9	VII-VIII	135
7.0-7.9	IX-X	240
8.0-8.9	XI-XII	365

*Modified Mercalli Intensity Scale
Source: United States Geologic Survey, Earthquake Intensity Zonation and Quaternary Deposits, Miscellaneous Field Studies Map 9093,1977.

According to the USGS data, a magnitude 5.0 earthquake could be felt up to 90 miles away. The largest earthquake within 30 miles of Yolo County was a 4.4 magnitude quake in 1978. Earthquakes that have occurred near areas of Yolo County are listed in the table below:

Table 3-21: Previous measured Earthquakes near/around Yolo County

Date	Richter Magnitude	Depth	Location
9/17/1973	4.2	2.0 mi	9 mi from Esparto
12/17/1976	3.3	2.0 mi	6 mi from Guinda
9/8/1978	4.4	18.0 mi	2 mi from Monument Hills
5/26/1985	3.1	2.0 mi	7 mi from Guinda
12/26/1991	3.8	3.0 mi	7 mi from Esparto
7/18/2002	2.9	20.1 mi	5 mi from Knights Landing

10/19/2012	1.4	4.8 mi	4 mi from Guinda
6/27/2013	2.3	2.9 mi	5 mi from Winters
6/29/2013	1.2	4.8 mi	2 mi from Winters
7/3/2013	2.0	5.1 mi	4 mi from Madison
5/23/2014	2.0	23.6 mi	10 mi from Esparto
6/20/2014	1.6	5.0 mi	8 mi from Esparto
7/7/2014	2.4	2.8 mi	4 mi from Dunnigan
7/30/2014	2.0	5.2 mi	7 mi from Winters
8/24/2014	2.3	3.1 mi	10 mi from Esparto
8/29/2014	1.8	0.0 mi	11 mi from Esparto
4/30/2015	2.4	27.0mi	14 mi from Esparto
5/8/2015	2.0	4.7 mi	2 mi from Esparto
7/15/2015	2.4	1.7 mi	7 mi from Winters
10/2/2016	2.3	13.4 mi	9 mi from Winters
10/7/2016	1.9	4.1 mi	5 mi from Esparto
11/7/2016	2.0	10.4 mi	6 mi from Woodland
11/22/2016	2.3	1.5 mi	6 mi from Woodland
12/15/2016	2.5	10.7 mi	6 mi from Woodland
5/9/2017	2.8	10.9 mi	7 mi from Woodland
5/15/2017	2.5	0.0 mi	4 mi from Dunnigan
6/7/2017	2.5	5.2 mi	7 mi from Dunnigan
7/26/2017	2.0	4.1 mi	8 mi from Dunnigan
7/27/2017	2.8	13.1 mi	7 mi from Esparto
8/20/2017	2.3	7.8 mi	8 mi from Esparto
7/22/2018	1.9	20.6 mi	10 mi from Woodland
12/21/2018	1.5	7.0 mi	12 mi from Winters
7/26/2019	1.2	4.9 mi	11 mi from Winters
10/9/2020	2.9	10.6 mi	6 mi from Esparto
10/19/2020	2.9	10.6 mi	6 mi from Esparto
10/19/2020	2.6	9.5 mi	6 mi from Esparto
7/22/2021	2.8	15.8 mi	5 mi from Dunnigan
9/14/2021	1.5	4.8 mi	6 mi from Winters
12/15/2021	1.4	7.0 mi	13 mi from Esparto
4/3/2022	1.6	2.0 mi	5 mi from Winters
4/21/2022	1.8	-0.5 mi	1 mi from Winters
9/8/2022	0.9	14.3 mi	12 mi from Esparto
10/13/2022	2.2	5.6 mi	3 mi from Davis
11/21/2022	2.5	-0.5mi	8 mi from Winters
12/31/2022	1.4	4.6 mi	6 mi from Winters

Source: HomeFacts Yolo County Earthquake Data & Risk

LIKELIHOOD OF FUTURE OCCURRENCE

Occasional - Based on the earthquake shaking potential for Yolo County, the proximity to the Bay Area, and the history of ground shaking in the area, the probability of damaging seismic ground shaking in Yolo County and its jurisdictions is **Occasional:** Between 1 percent and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.

In 2014, the USGS and the California Geological Survey (CGS) released the time-dependent version of the Uniform California Earthquake Rupture Forecast (UCERF III) model. The UCERF III results have helped to reduce the uncertainty in estimated 30-year probabilities of strong ground motions in California. The UCERF map is shown in Figure 3.16 and 3.17 and indicates that Yolo County has a low to moderate risk of earthquake occurrence, which coincides with the likelihood of future occurrence rating of occasional.

Figure 3.16: Probability of Earthquake Magnitudes Occurring in 30 Year Time Frame

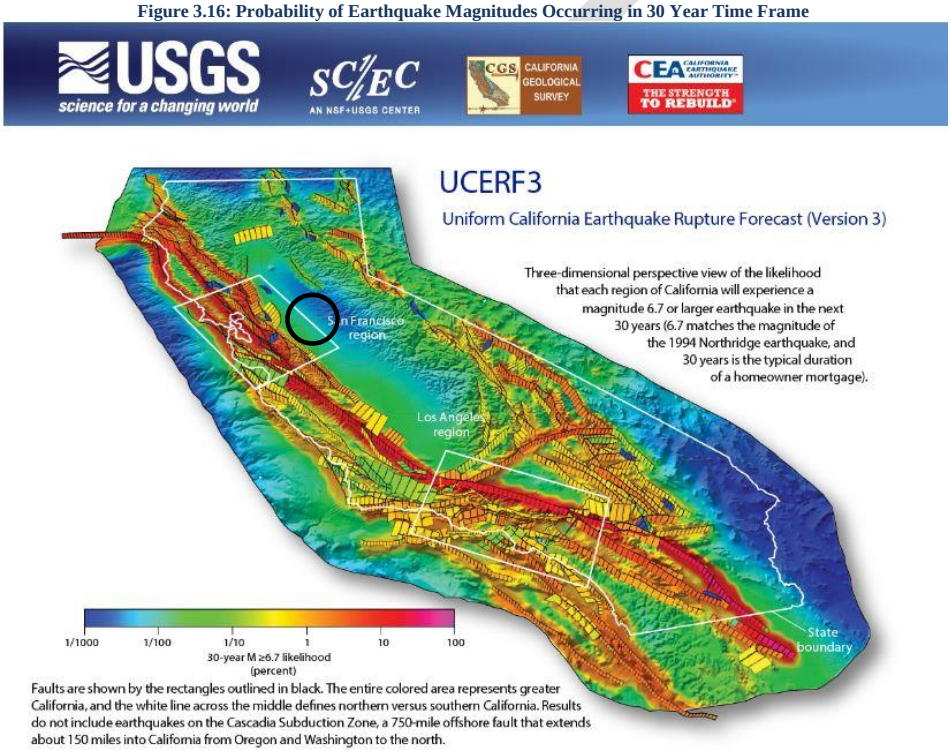


Figure 3.16 Probability of Earthquake Magnitudes Occurring in 30 Year Time Frame
Source: USGS

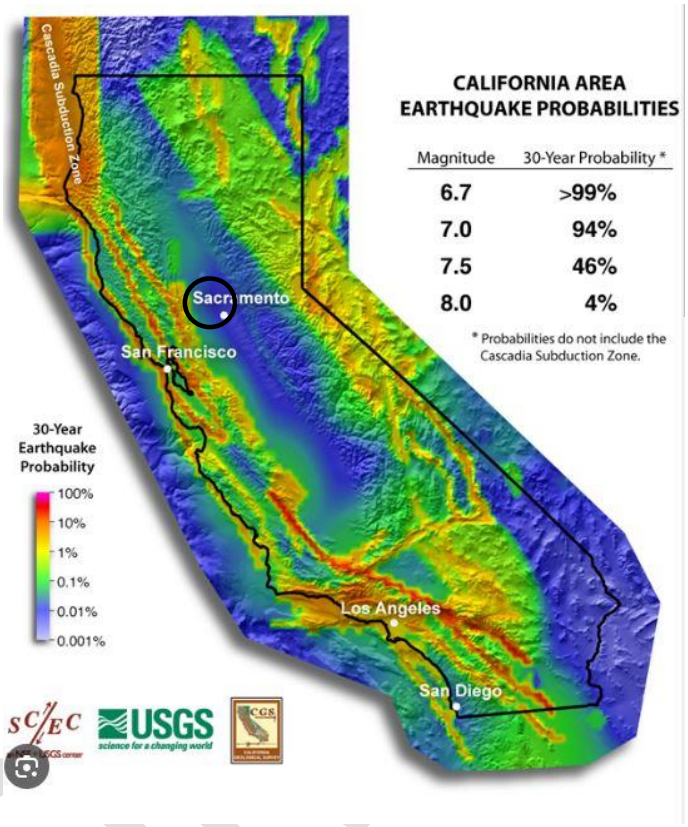


Figure 3.17 Probability of Earthquake Probabilities Occurring in 30 Year Time Frame
Source: USGS

CLIMATE CHANGE AND EARTHQUAKE

VULNERABILITY ASSESSMENT

Vulnerability – Medium

Yolo County could experience ground shaking as a result of an earthquake, including from the major regional fault lines located outside of the County. As shown in Figure 3.18, the area is subject to a range of ground shaking levels. The most significant impacts would be felt from the CRSBB zone, which is currently recognized as a potential seismic source capable of generating moderate to large earthquakes that could affect Yolo County. An earthquake of this size has the

potential to significantly affect the area around Winters as had the 1892 Vacaville-Winters Earthquake. Total damages from the 1892 Vacaville-Winters Earthquake were $225,000-$250,000 and one person was killed. Damages today from a similar magnitude earthquake in the Winters area would be exponentially greater and could significantly impact the downtown area

According to the Yolo County General Plan, the maximum expected earthquake for the Hunting Creek Fault area would be 6.9 on the Richter Scale. As the Hunting Creek fault is located in a remote corner of the County, it is expected that damages to property would be minimal. However, landslide triggered by an earthquake in the area could impact local stream flows and recreational areas.

The effects of ground shaking during a maximum intensity earthquake would likely involve structural damage to stucco, masonry walls and the chimneys of buildings, which could expose people to falling objects and possible building collapse. The degree of such hazards is controlled by the nature of the underlying soil and rock materials, the magnitude of and distance from the quake, the duration of ground motion and the structural characteristics of the building. Earthquakes can also trigger landslides, debris flows, and natural gas leaks if a pipeline is impacted.

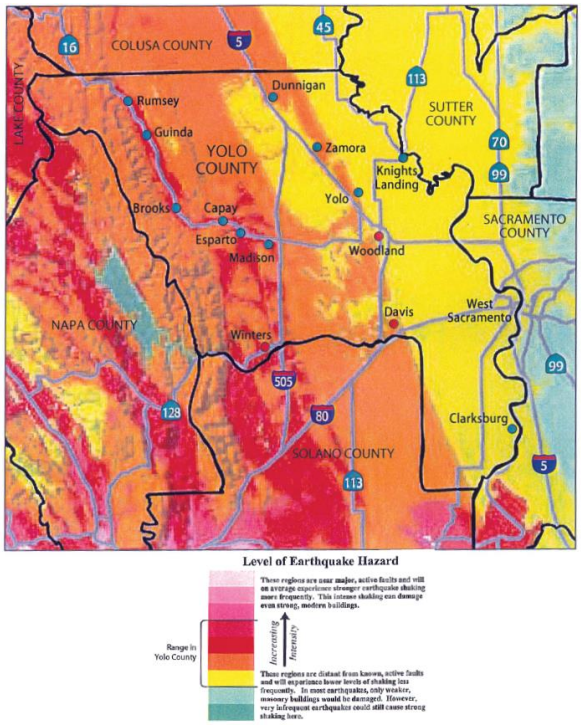


Figure 3.18: Regional Ground Shaking Hazard – Yolo County
Source: California Geological Survey

Earthquake vulnerability is based primarily upon population and the built environment. To mitigate this hazard, building codes in California have been steadily improved over the past 80 years as understanding of seismic shaking has improved. Current California building codes include provisions for considering the potential shaking from earthquakes, including stronger shaking near faults and amplification by soft soils. The building code has been the main mitigation tool for seismic shaking in most buildings, although hospitals, schools, and other critical facilities are subject to additional mitigation measures. Yolo County adheres to the Universal Building Code and the California Building Standards Code. Areas of Yolo County most susceptible to earthquake include those near active fault zones and where ground shaking is primarily with a wave velocity of 350 m/sec or lower. These areas include the western side of the County, including the City of Winters and the Capay Valley where there is numerous critical infrastructure that could experience damage. Older buildings in Winters are particularly susceptible to an earthquake.

Liquefaction may also lead to lateral spreading during an earthquake. Areas most prone to lateral spreading are those that consist of fill material that has been improperly engineered, that have steep, unstable banks, and that have high groundwater tables. The banks along the Deep Water Ship Channel and Turning Basin in West Sacramento may have such a condition. Numerous non-project levees throughout Yolo County are built on fill from the Sacramento River and are subject to liquefaction.

ESTIMATING POTENTIAL LOSSES

Commented [SH7]: Use HAZUS-MH to estimate potential losses (see page 344-350)

3.8 FLOODING

Flooding is the rising and overflowing of a body of water onto normally dry land. History clearly highlights floods as one of the most frequent natural hazard impacting Yolo County. Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floodwaters can transport large objects downstream, which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utilities lines and interrupt services. Standing water can cause damage to crops, road, foundations, and electrical circuits. Certain health hazards are also common to flood events. Standing water can also cause septic tank failure and well contamination. Standing water and wet structures can become breeding grounds 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, infections become a 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 of critical importance to reduce life and safety impacts from any type of flooding.

Certain health hazards are also common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where cattle and other livestock are kept or their wastes are stored can contribute polluted waters to the receiving streams. Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as e. coli and other disease causing agents.

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. The 200-year flood is one that has 0.5% chance of being equaled or exceeded each year. The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

Yolo County is susceptible to various types of flood events:

- Riverine 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 snowmelt and/or 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 and is often characterized by high peak flows combined with a large volume of runoff. 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 Yolo County, riverine flooding can occur anytime from November through April and is largely caused by heavy and continued rains, sometimes combined with snowmelt, increased outflows from upstream dams, and heavy flow from tributary streams. These intense storms can overwhelm the local waterways as well as the integrity of flood control structures. Flooding is more severe when antecedent rainfall has resulted in saturated ground conditions. The warning time associated with slow rise riverine floods assists in life and property protection.
- Flash flooding – Flash flooding describes localized floods of great volume and short duration. 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 and thus early threat identification and warning is critical for saving lives.
- Localized/Stormwater 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 area is also at risk to flooding resulting from levee failures and dam failures. Dam failure flooding is discussed separately in the Dam Failure Section of this document; levee failure flooding is discussed separately in the Levee Failure Section of this document.

Regardless of the type of flood, the cause is often the result of severe weather and excessive rainfall, either in the flood area or upstream reach.

A weather pattern called the "Atmospheric River" contributes to the flooding potential of the area. An Atmospheric River brings warm air and 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 used to refer to this warm, moist air as the "Pineapple Express" because it comes from around Hawaii where pineapples are grown. A diagram of an atmospheric river event is shown in Figure 3.19.

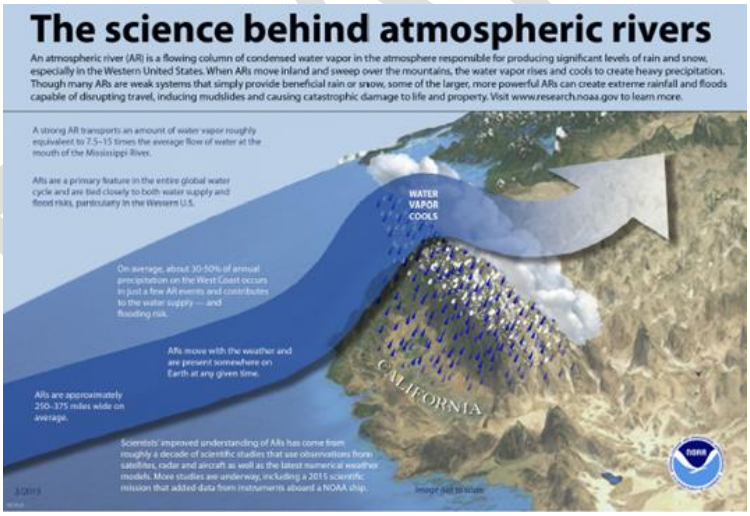


Figure 3.19: Diagram of an Atmospheric River Event
Source: NOAA

LOCATION AND EXTENT

California has 10 hydrologic regions. Yolo County sits in the Sacramento and San Joaquin hydrologic region. A map of the California's hydrological regions is provided in Figure 3.20:

Figure 3.20: California Hydrologic Regions
Source: 2018 State of California Hazard Mitigation Plan

Yolo County encompasses multiple rivers, streams, creeks, and associated watersheds. Figure 3.21 illustrates the major waterways of Yolo County.

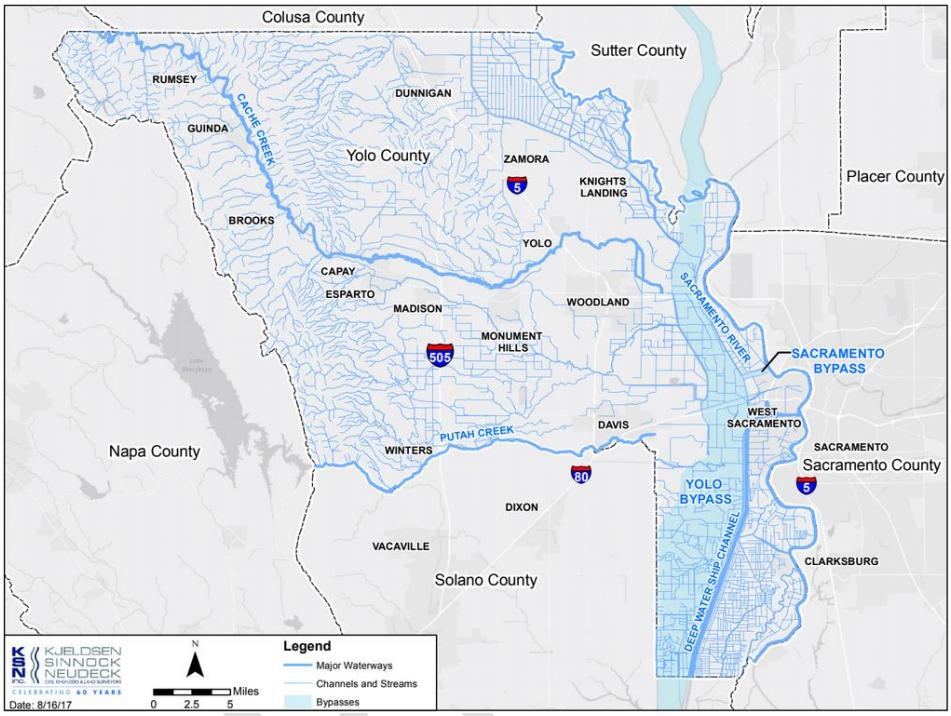


Figure 3.21: Waterways of Yolo County
Source: KSN Engineers

The following streams listed below are found in Yolo County:

- Cache Creek
- Putah Creek
- Dry Creek
- Buckeye Creek
- Oat Creek
- Bird Creek
- Willow Slough
- Cottonwood-Willow Slough
- Dry Slough
- Chickahominy Slough
- Lamb Valley Slough

The geographic extent Flooding is rated as **Extensive** with between 50-100 percent of the operational area affected by any one storm. The county itself is drained by the Sacramento River and Yolo Bypass, an integral part of the Sacramento River Flood Control Project. Two major streams, Cache Creek and Putah Creek, cross the county from west to east but drain only a small part of the county. Cache Creek originates at the outlet of Clear Lake in Lake County to the west. With its main tributaries (North Fork Cache Creek, Bear Creek, and Clear Lake), it drains 1,140 square miles, and has a maximum elevation of 6,100 feet. Putah Creek originates in the west at an elevation of 3,000 feet and drains 634 square miles in Lake, Napa, and Yolo Counties. Both Cache and Putah Creeks empty into Yolo Bypass on the eastern side of the county. Willow, Cottonwood, Chickahominy, and Dry Sloughs, located in the southern part of the county between Cache Creek and Putah Creek, drain approximately 204 square miles at the western edge of the county and convey flows to the leveed Willow Slough Bypass that drains to Yolo Bypass; maximum elevations are near 2,500 feet. The Hungry Hollow watershed, located north of Cache Creek and between the Capay and Dunnigan Hills, drains 55 square miles and is a tributary of Cache Creek.

Dry Creek, which drains an area of 22.7 square miles, flows southeasterly near the western edge of the City of Winters and joins Putah Creek south of the city. Dry Creek originates on the steep slopes of Rocky Ridge, a part of the Coast Range.

The northern part of the county is drained by intermittent streams, such as Buckeye, Oat, and Bird Creeks that flow easterly from the Dunnigan Hills to the Colusa Basin Drainage Canal. The canal drains 1,700 square miles in Glenn, Colusa, and Yolo Counties and conveys flows to the Sacramento River at Knights Landing or to Yolo Bypass via Knights Landing Ridge Cut, depending on water-surface elevations in the Sacramento River. The area between the Sacramento River and Yolo Bypass in the southeastern part of the county is drained mostly by pumping. Flows in Yolo Bypass return to the Sacramento River near Rio Vista, 10 miles south of the southern limits of Yolo County.

Cache Creek

Originating at the outlet of Clear Lake in Lake County, Cache Creek drains approximately 1,100 square miles and has an elevation drop of 6,100 feet from its headwaters to its discharge into the Yolo Bypass. The Sacramento Maintenance Yard (SMY) area of responsibility begins at 6,000 feet upstream of the California Northern Railroad on the north bank of Cache Creek and approximately 3,000 feet upstream of the same railroad on the southern bank of Cache Creek. SMY's responsibilities continue downstream until Cache Creek discharges into the Yolo Bypass. SMY is also responsible for the East Training Levee which is located along the western edge of the Cache Creek Settling Basin. Areas of the Capay Valley, particularly sections of Yocha Dehe Wintun Nation housing, are susceptible to flooding from Cache Creek where there are no levees in place.

The channel design capacity of Cache Creek is 33,000 cubic feet per second (cfs) which according to the FEMA Flood Insurance Study for Yolo County equates to approximately a 10 year flood event.
In addition to the levees there are several other flood control infrastructure; specifically the Settling Basin and the Settling Basin Overflow Weir. The Settling Basin is designed to remove excess sediment from Cache Creek before it discharges into the Yolo Bypass and has a handling capacity of 30,000 cfs. The Settling Basin Overflow Weir is the primary control structure for the Settling Basin. The Overflow Weir is currently at elevation 35 (NAVD 88) which results in the Settling Basin being able to handle a flow rate of 30,000 cfs.

The Cache Creek levees primarily protect the City of Woodland and surrounding lands. The areas of Woodland most susceptible to flooding include the industrial areas on the north side of town; these areas experienced flooding when Cache Creek overtopped its banks in 1986.

Putah Creek
Putah Creek has its headwaters on the eastside of Cobb Mountain in Lake County. From those springs, it flow to the south and east eventually into Lake Berryessa. Leaving Lake Berryessa via the Monticello Dam, it continues to flow eastward past Winters and Davis before its confluence with the Yolo Bypass/Toe Drain. Housing in Winters and Davis is particularly susceptible to flooding from Putah Creek.

SMY's responsibilities begin approximately a third of a mile upstream of Hopkins Road near the University of California Davis Airport and continue downstream on both banks of Putah Creek. The south bank levee ends approximately a quarter of a mile upstream of Road 106. The north bank levee turns towards the north approximately one mile downstream of Road 106A after which it continues north until it joins the Willow Slough south bank levee.

Monticello Dam restricts the flows on Putah Creek to well below the levee system's design capacity. Flows from Monticello Dam generally do not exceed 30,000 cfs and in general do not rise to the riverward toe of the levee.

Willow Slough Bypass
Situated between the Cache Creek and Putah Creek Watersheds, the Willow Slough Watershed drains approximately 191 square miles of primarily agricultural lands. Willow Slough Bypass is formed by an agricultural diversion weir just downstream of the California Northern Railroad. The South Fork of the Willow Slough runs to the north of Madison, and along with sheet flow contributes to much of the periodic flooding in the town. Buildings throughout Madison, including residences, local businesses, the fire station, school, and community hall are all

susceptible to flooding events. Esparto is also vulnerable to flooding as creeks and ditches can back up onto streets due to clogging from vegetation.

SMY's operations and maintenance responsibilities begin at the weir which diverts flows into the Willow Slough Bypass. The entirety of Willow Slough Bypass is leveed until it discharges into the Yolo Bypass. SMY has jurisdiction over the entire south bank levee, while it's area of responsibility on the north bank levee only extends as far downstream as the east side of the water pollution control plant. East of the water pollution control plant the Willow Slough Bypass levees are maintained by Reclamation District 2035.

The Willow Slough Bypass has a design capacity of 6,000 cfs. The Davis water pollution control plant releases effluent into the Willow Slough Bypass. Additionally water behind the levees originating from Davis Drain are pumped into the Willow Slough Bypass approximately one mile upstream of County Road 105.

The Willow Slough Bypass levees protect the City of Davis, Davis' water pollution control plant, Yolo County central landfill and agricultural land.

Yolo Bypass

The 3-mile wide, 40 mile long Yolo Bypass is a man-made leveed channel that extends from the Fremont Weir to a point above the City of Rio Vista, where it returns excess flows to the Sacramento River. The primary purpose of the Yolo Bypass is to provide flood protection to the Sacramento and West Sacramento on the Sacramento River. High water levels on the Sacramento River result in water passing into the Yolo Bypass via the Fremont Weir and Sacramento Weir (when opened).

The levees maintained by SMY within Yolo County begin at the upstream end of the Yolo Bypass at the Fremont Weir on both the east and west sides. There is a gap in coverage south of the Wallace Weir on the west side of the Yolo Bypass which is ended by the Cache Creek levees. The eastern side of the Cache Creek Settling Basin protects against backwater from the Yolo Bypass. Downstream of the Cache Creek Settling Basin, the levees are operated and maintained by Reclamation District 2035 until the south bank of Willow Slough Bypass, where SMY picks up operations and maintenance responsibilities once more. The levees maintained and operated by SMY continue along the west side of the Yolo Bypass until the north bank of Putah Creek. In addition to the levees which form the Yolo Bypass, there are several other flood control related structures.

The Fremont Weir is the upstream limit of the Yolo Bypass. High stages in the Sacramento River result in water flowing over the Fremont Weir and thus into the Yolo Bypass. By having the water leave the Sacramento River and enter into the Yolo Bypass, stress on levees

downstream on the Sacramento River are reduced and provides a flood risk reduction for the Cities of West Sacramento and Sacramento.
Much like the Fremont Weir, the Sacramento Weir is intended to relieve pressure on the Sacramento River levees by diverting flows from the Sacramento River into the Yolo Bypass. Unlike the Fremont Weir, the Sacramento Weir is only used during exceptionally high flow events. In order to allow the Sacramento Weir to pass water, each gate must be manually opened.

The Wallace Weir at the southern end of the Knights Landing Ridge Cut (KLRC) and is intended to prevent fish from entering the KLRC and becoming entrapped in either it or the Colusa Drain.
The Delta Region lies within a floodplain and is faced with a major flooding problem because of inadequate levee construction and maintenance, subsidence, seepage, erosion and seismicity. The Delta area as a whole has been reclaimed by about 1,100 miles of levees along natural and constructed waterways that segregate it into about 120 tracts locally known as islands. The entire region of approximately 700,000 acres is under the influence of the tides and a large part of the land surface is lower than the water on the opposite side of the levees. Many of the islands are 15 to 25 feet below sea level due to the subsidence of the peat land structure. The numerous waterways and channels convey runoff to lower areas of the Delta and eventually to the Pacific Ocean.

Flood fighting has occurred in some part of the Delta on the average of once every four years. While most of the Delta levees in Yolo County have stood the test of time, they defy engineering logic. Their foundations are soft and uncertain, they have a great deal of vegetation including large trees, and they suffer erosion and sloughing due to river velocity and wind wave wash. Nevertheless, they have served the county very well over many years.

The Delta Islands are subsiding due to lower groundwater, aeration of peat soils, and loss of soil to wind. While some believe, the rate has been curbed over the past years due to conservation protocols, the fact is that some islands are 15’ below sea level. The levees work much harder than they did a hundred years ago.

Some of the Delta levees essentially serve as a dam repressing hydrostatic pressure every day of the year. This leads some researchers to conclude that the potential for catastrophic failure of the Delta levees due to a seismic event has a concerning probability.

Responsibility for flood protection is distributed among many agencies at various levels of government. At the federal level the three primary agencies are the Army Corps of Engineers, FEMA, and the Bureau of Reclamation. At the state level the primary agencies are Department of Water Resources and the Central Valley Flood Protection Board. At the local level in Yolo County and the region these agencies include: the County of Yolo and several of its cities; the

Yolo County Flood Control & Water Conservation District and various Levee Maintaining Agencies.

Yolo County Flood Control and Water Conservation District

Since its creation in 1951, the Yolo County Flood Control & Water Conservation District has served the needs of the local community by managing water resources for farming while stabilizing groundwater for other uses with progressive and pro-active water planning.

Today, the District manages three dams, two hydroelectric plants, two reservoirs, more than 150 miles of canals and laterals and one of the world's longest, inflatable rubber dams. District boundaries encompass 195,000 acres of Yolo County, including the cities of Woodland, Davis and Winters, and the towns of Capay, Esparto, Madison and other small communities within Capay Valley.

Yolo County's primary source of agricultural water comes from 50 miles away in Lake County. The District obtained the rights to store water in Clear Lake in 1967 when it purchased the privately owned Clear Lake Water Company and the Cache Creek Dam. This gave the District the potential to release up to 150,000 acre-feet of water annually.

However, the District's water right to store water in Clear Lake did not provide enough water to supply farmers during dry years, therefore the District constructed the Indian Valley Dam and Reservoir in 1974-1975. - With the completion of the Indian Valley Reservoir in 1975, the District's water resources became less vulnerable to the dry years which often limit water supplies in Yolo County. The six-mile long, one-mile wide reservoir with a gross capacity of 300,600 acre feet, provides long-term irrigation storage. The District manages the water that the reservoir holds by releasing it as needed. The dam includes a hydroelectric plant. The cost of the dam and reservoir exceeded $9 million and were funded, in part by two bond issues that were retired on time leaving only a loan, originally scheduled to be retired in 2017. However, due to careful financial management, that loan was retired in 1998 making the project debt free.

The total water supply available to the District water users include surface water from Clear Lake, Indian Valley and Cache Creek, and groundwater recharged by the District's operations. In all, the District has surface water storage averaging, over a long term, nearly 200,000 acre-feet per year.

The Yolo Water and Power Company finished construction of Cache Creek Dam in 1914. It is situated five miles downstream of Clear Lake and was built to store winter water in Clear Lake that would normally run-off into the Sacramento River. Cache Creek is the outlet from Clear Lake, but a rock ledge known as the Grigsby Riffle limits rate at which water can flow past. In 1998, the spill gate of the dam was modified to increase safety and minimize damage from

floating debris.

The Capay Diversion Dam is located approximately two miles above the town of Capay on Cache Creek. This dam was built by the Yolo Water & Power Company and it serves as the headworks for the canal system. Here, the water released from Clear Lake and Indian Valley Reservoir is diverted into the West Adams and the Winters canals, which then feed the entire canal system. The Capay Dam underwent a major renovation in 1994 which included the installation of one of the longest inflatable dams in the world. The inflatable dam improves safety and the District's ability to deliver water.

Located at the base of the western foothills, north of the town of Winters, the Chapman Reservoir is a small, 280 acre-foot dual-purpose reservoir the District maintains for flood control and irrigation purposes.

Levee Maintaining Agencies

The Levee Maintaining Agencies are discussed in the Levee Failure Profile.

1. Reclamation District 150
2. Reclamation District 537
3. Reclamation District 765
4. Reclamation District 785
5. Reclamation District 827
6. Reclamation District 900
7. Reclamation District 999
8. Reclamation District 1600
9. Reclamation District 2035
10. Reclamation District 2068
11. Reclamation District 108
12. Reclamation District 787
13. Knights Landing Ridge Drainage District
14. Sacramento River Westside Levee District

Predominantly, the Delta remains agriculturally oriented, as evidenced by the fact that more than three-fourths of the entire Delta area is devoted to a wide variety of crops.

The climate in Yolo County is characterized by warm, dry summers and cool, wet winters. The average range of temperatures is between 36 degrees Fahrenheit (°F) in December and 95°F in July. Record extremes range from 11°F to 116°F. Annual rainfall ranges from 16 inches on the valley floor to 30 inches in the mountainous areas at the western edge of the county. Precipitation is primarily of frontal origin, with over 85 percent occurring from November through March. The quantity of storm runoff is greatly affected by the soil type. Soils in the

relatively flat farmlands in the eastern part of Yolo County contain appreciable amounts of clay that cause high runoff rates and flooding in the mildly sloping eastern part of the county.

Since the completion of Monticello Dam on Putah Creek (Lake Berryessa) in Napa County, flooding from Putah Creek and Cache Creek (the two largest streams flowing from west to east across the county) occurs only from Cache Creek overflow in the Capay Valley and south of Cache Creek near the City of Woodland, where flooding occurred in 1958 (FEMA, 1981). Flooding also occurs north of Cache Creek in the lowlands of the Hungry Hollow watershed, which is a tributary of Cache Creek. The largest flood in the Cache Creek drainage in recent years occurred during February 1958 and was estimated to be a 4-percent annual chance event (State of California, 1969).

In the northern part of the county, flooding occurs along the Colusa Basin Drainage Canal. Flooding results when precipitation within the basin and runoff from the foothill region to the west combine to far exceed the channel capacity of the canal. The greatest flooding in recent years was in 1958, when flooding along the canal extended 70 miles upstream from Knights Landing (State of California, 1964). Flooding also occurs in the spring and is caused by irrigation practices in the rice fields. Damage can be greater during the spring runoff because it occurs during the growing season.

Flooding frequently occurs in the Cottonwood-Willow Slough watershed south of Cache Creek and in the Dry Slough/Davis watershed north of Putah Creek. The adjacent watersheds are part of the Yolo Creek System. Flows originating in the western part of the watersheds exceed the channel capacity of Dry and Willow Sloughs and their major tributaries, Chickahominy Slough and Lamb Valley Slough, and cause flooding in the relatively flat agricultural lands in the eastern part of the county. Flooding is increased at the eastern side of the county when Sacramento River flows are diverted into Yolo Bypass and gravity flow to the bypass is eliminated. Severe flooding occurred along the Sacramento River and Yolo Bypass in February 1986. Floodwaters pond behind the Yolo Bypass and Willow Slough Bypass levees until flood flows in the bypasses recede.

Yolo County Flood Mapping

As part of the County's ongoing efforts to identify and manage their flood prone areas, Yolo County relies on a variety of different mapping efforts. A brief description of FEMA and DWR mapping efforts covering the Yolo County Operational Area will be described below.

FEMA Floodplain Mapping

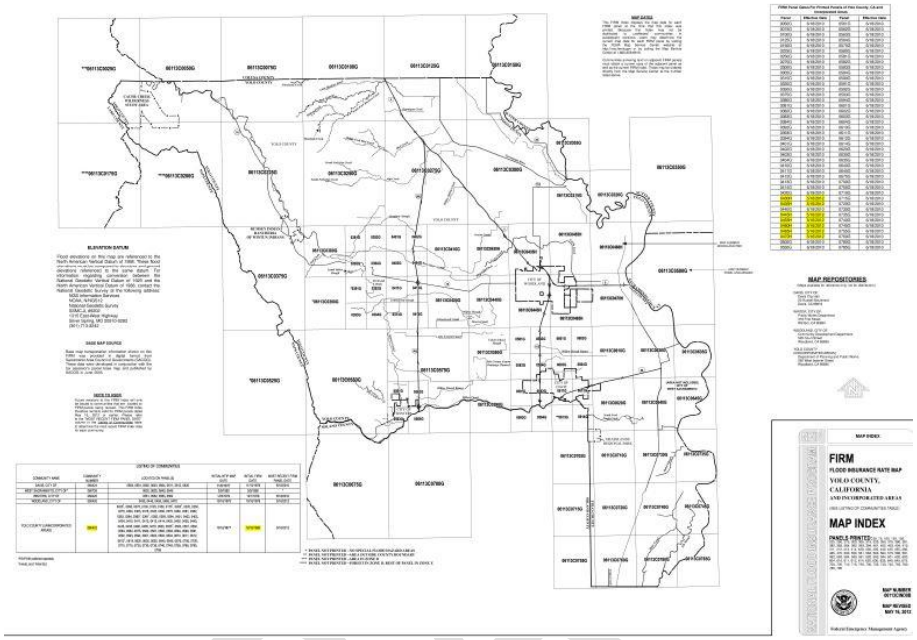
FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). The NFIP makes flood insurance available to property owners in

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. The FEMA floodplain are lands subject to the 1% annual change (100-year) flood. FEMA mapping also includes areas subject to the .02% annual change (500-year) flood. The State Senate Bill 5 (SB5) required all communities to map their communities. SB5 requires levee protection in urban areas to a 200-year (or 0.5% annual chance flood). A general overview of floodplain mapping is provided in the following paragraphs.

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 1% and 0.2% annual chancer floodplains, floodways, and the locations of selected cross sections used in the hydraulic analysis and local floodplain regulation.

Figure 3.22: Yolo County – FEMA Flood Insurance Rate Maps, 2012
Source: FEMA



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 data between periodic FEMA publications of the FIS and FIRM. Figure 3.22 shows the FIRMs being used for the flood analysis for this HMP update.

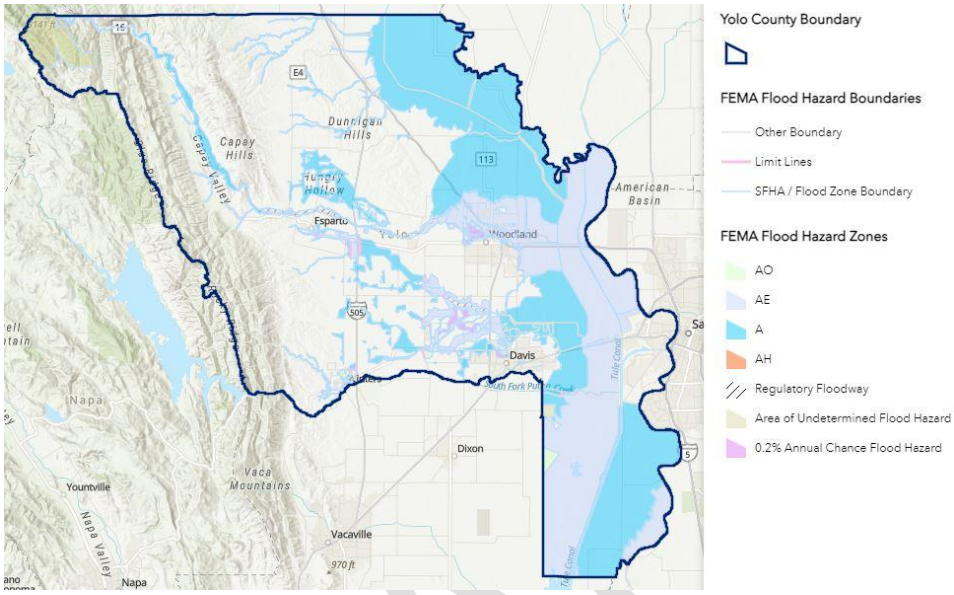


Figure 3.23: Yolo County – FEMA Flood Zones
Source: Yolo County GIS Map

California Floodplain Mapping

Also to be considered when evaluating the flood risks in Yolo County are various floodplain maps developed by the California DWR for various areas throughout California, and in the Sacramento-San Joaquin Valley cities and counties. The FEMA regulatory maps provide just one perspective on flood risks in Yolo County. SB5 enacted in 2007, authorized Cal-DWR to develop the Best Available Maps (BAM) displaying 1% and 0.5% (200-year) annual chance floodplains for areas located within the Sacramento-San Joaquin (SAC-SJ) Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 0.2% annual chance flood zones.

Different than the FEMA FIRMs which have been prepared to support the NFIP and generally reflect only the 1% and 0.2% annual chance flood risks, the BAMs are provided for informational purposes and are intended to reflect current 1%, 0.5% (200-year) as applicable, and 0.2% (500-year) annual chance flood risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 1% annual chance floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 1% annual chance flood zones. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 1%,

0.5%, and 0.2% annual chance floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may used varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the County than that provided in the FEMA FIRMs. This provides the community and residents with an additional tool for understanding potential flood hazards not currently mapped as a regulated floodplain. Improved awareness of flood risk can reduce exposure of flooding for new structures and promote increased protection for existing development. Informed land use planning will also assist in identifying levee maintenance needs and levels of protection. By including the FEMA 1% annual chance flood zone, it also supports identification of the need and requirement for flood insurance. Figure 3.24 show the BAM for Yolo County Operational Area.

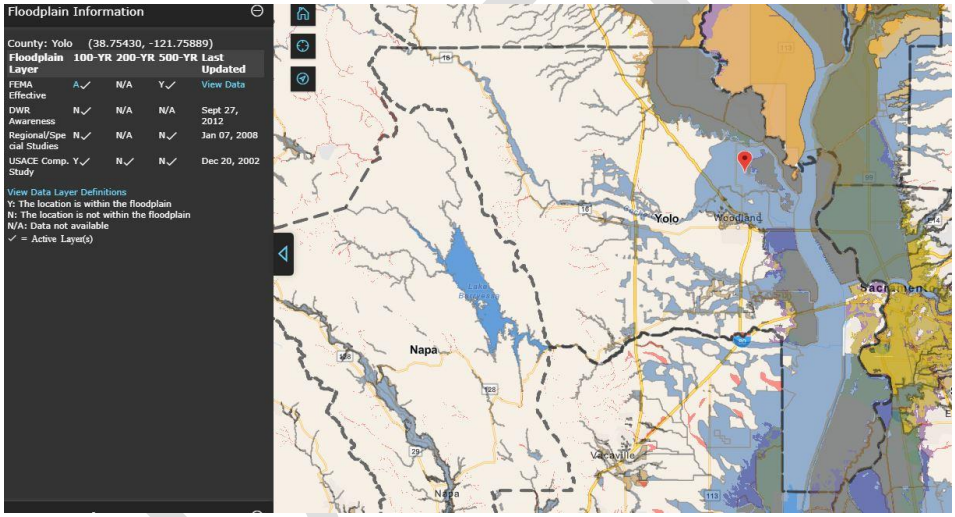


Figure 3.24: Yolo County – Flood Awareness (Best Available) Map
Source: California, DWR, Retrieved 5/30/23
Legend explanation: Blue – FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1% (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures), Pink – USACE 1%, Yellow – USACE 0.5%, Tan- FEMA 0.2%, Gray – Local 0.2% (developed from local agencies), Purple – USACE 0.2%.

PAST OCCURRENCES

Major flooding has occurred in Yolo County in 1937-38, 1940, 1943, 1950, 1955, 1958, 1963, 1967, 1973, 1975, and 1986 (U.S. Department of Agriculture, 1969; State of California, 1964; State of California, 1969; FEMA, 1981; U.S. Department of Agriculture, 1976). Flooding generally occurs in the relatively flat agricultural lands within the eastern two-thirds of the county. Yolo County received three disaster declarations for flooding in 2017 but these declarations primarily concerned levee damages. There were road damages throughout Yolo

County as a result of stopped up culverts, but flooding was minimal. There were three winter storms that hit Yolo County at the beginning of 2023, causing flooding throughout Yolo County.

There has been 15 Federal disaster related to flooding in Yolo County. And four state disaster declarations due to flooding, as shown in Table 3-22.

Table 3-22 Yolo County State and Federal Disaster Declarations, 1965-2023*

Year	Disaster Name	Disaster Type	Disaster #	State Declaration #	Federal Declaration #
1965	Heavy rains & flooding	Flood	DR-183-CA	-	12/24/1964
1983	Coastal storms, floods, slides & tornadoes	Coastal Storm	DR-677-CA	-	2/9/1983
1986	Severe storms & flooding	Flood	DR-758-CA	-	2/21/1986
1995	Severe winter storms, flooding landslides, mud flow	Severe Storm	DR-1046-CA	-	3/12/1995
1995	Severe winter storms, flooding, landslides, mud flows	Severe Storm	DR-1044-CA	-	1/10/1995
1997	Severe storms, flooding, mud and landslides	Severe Storm	DR-1155-CA	-	1/4/1997
1998	Severe winter storms and flooding	Severe Storm	DR-1203-CA	-	2/9/1998
2006	Severe storms, flooding, mudslides, and landslides	Severe Storm	DR-1628-CA	-	2/3/2006
2017	Severe winter storms, flooding, and mudslides	Flood	DR-4308-CA	-	4/1/2017
2017	Severe winter storms, flooding, and mudslides	Flood	DR-4305-CA	-	3/16/2017
2017	Severe winter storms, flooding, and mudslides	Severe Storm	DR-4301-CA	3/7/2017	2/14/2017
2019	Severe winter storms, flooding, landslides, and mudslides	Severe Storm	DR-4431-CA	USDA Contiguous 5/1/2019	-
2019	Severe winter storms, flooding, landslides, and mudslides	Severe Storm	DR-4434-CA	USDA Primary and Contiguous 5/17/2019	5/17/2019
2023	Severe winter storms, flooding, landslides, and mudslides	Flood	DR-4683-CA	1/4/2023	1/14/2023
2023	Severe winter storms, flooding, and mudslides	Flood	EM-3591-CA	1/4/2023	1/19/2023
2023	Severe winter storms, flooding, and mudslides	Flood	DR-4699-CA	4/20/2023	4/3/2023

** Data from Table 3-5: Yolo County State and Federal Disaster Declarations, 1965-2023. All years that did not have flooding declarations were removed.*

There have been 38 NCDC flood events in Yolo County. No deaths or injuries, $15,327,000 in property damage and $7,800,000 in crop damage due to flood events.

Table 3-23: NCDC's Flood Events for Yolo County 1950-2/23/2023*

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage
Flash Flood	1	0	0	0	0
Flood	37	0	0	$15,327,000	$7,800,000
Totals:	38	0	0	$15,327,000	$7,800,000

**Data from Table 3-6: NCDC's Flood Events for Yolo County 1950-2/23/2023. All other event types were removed.*

LIKELIHOOD OF FUTURE OCCURRENCE

Likely- Based on previous occurrences of flooding, the probability in Yolo County and its jurisdictions is **Likely:** Between 10 percent and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.

CLIMATE CHANGE AND FLOODING

Sea Level Rise

Worldwide average sea level appears to have risen about six to eight inches over the past century. Various tidal gauge stations along California's coast show a similar trend (seven to eight inches). Rising average sea level over the past century has primarily been attributed to warming oceans and related thermal expansion, and the addition of water from melting land-based glaciers and polar ice. Yolo County's location (more than 50 miles inland from the mouth of the Golden Gate) precludes significant effects from coastal processes, such as wave action. However, low-lying communities in or near the Delta, such as Clarksburg and Elkhorn (with elevation as low as five feet above sea level), would be more susceptible to flooding as sea level rise continues. Rising sea levels affecting the San Francisco Bay along the Napa, Solano, and Contra Costa County boarders may also worsen flooding in Yolo County and expand the county's floodplains. It is also possible that sea level rise could reduce the effectiveness of Delta and river levees within the county (reducing the levee freeboard and increasing levee stresses as a result of the rise in the base level of the adjacent water).

VULNERABILITY ASSESSMENT

Vulnerability – High

The impact from any flooding event will vary based upon a number of factors: source of the water; location of water flow; duration of rainfall or source release; topography; presence and/or effectiveness of flood control systems; changes in land use and vegetation; and emergency response preparedness and action. Resulting damage could include the following:

- Injury and death associated with people being trapped in rapidly moving waterways or caught unaware during slow rise conditions

- Injury and death for individuals attempting to walk or drive across flooded roadways
- Damage to critical infrastructure and essential services through inundation
- Damage to roadways, bridges, and other transportation structures affecting mobility and the ability for people to evacuate flooded areas
- Release of hazardous materials and starting of fires within damaged or affected structures
- Damage to buildings and structures in the pathway of rising flood waters
- Public health hazards from contamination of potable water sources; damage to sanitation systems; long term presence of standing water; vector infestation; and introduction of hazardous materials contaminants
- Loss of agricultural products and crops from inundation
- Impact to local economy stemming from loss in agricultural, industrial, and commercial productivity
- Societal impacts involving long-term interruption of normal activity

The risk of localized flooding to future development can be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater or choosing not to develop in areas that often are subject to localized flooding will reduce future risks of losses due to localized flooding.

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 effects can result in floodplain impacts regardless.

Additional growth in or around the cities and in the unincorporated areas of the County could contribute to increased flooding in the county. Many historic and cultural resources are located in the mapped flood zones.

Health hazards and property damage may occur at residential dwellings and businesses in the affected areas if proper flood clean–up actions are not conducted immediately. Contamination due to flooded sewage systems will pose a risk to health and safety of persons in the affected areas. The continued impedance of floodway maintenance from governmental regulators that often delay, increase the cost of, restrict, and in some cases stop, will continue to place Yolo County residents at risk to flooding from internal drainage as well as from levee failure.

The impact of damage resulting from the flooding hazard, as mentioned, can be extremely

variable. Nevertheless, most damage results from rising water that inundates residences and buildings, damage to infrastructure and critical facilities, and loss of ingress and egress by the population in the affected areas and the inability of the jurisdictions emergency response capabilities. Damage from flooding can range from minimal, where the damage to an individual home can be on the order of a few thousand dollars to the complete loss of a building or loss of life from the inability to evacuate from the rising floodwaters.

Historically, Yolo County has always been vulnerable to flooding because of its relatively flat terrain and the number of water courses that traverse the County. Flood zones in Yolo County are quite extensive. Several areas of the County are subject to flooding by the overtopping of rivers and creeks, levee failures, and the failure of urban drainage systems that cannot accommodate large volumes of water during severe rainstorms.

Based on FEMA guidance, contents value is estimated at 50 percent of the improved value. Estimated losses assume that a flood is unlikely to cause total destruction. Losses are related to a variety of factors, including flood depth, flood velocity, building type and construction. Using FEMA's recommendations, average damage is estimated to be 20 percent of the total building value.

The loss estimates for this assessment should be used for flood risk mitigation, emergency preparedness, and response and recovery only. Uncertainties are inherent in any loss estimation methodology and losses will vary depending on the magnitude of the flood event. Other limitations may include incomplete or inaccurate inventories of the built environment. The assessed values, for example, are well below the actual market values; thus, the actual value of assets at risk may be significantly higher than those included therein. Also, this loss estimation assumes no mitigation and does not account for buildings that may have been elevated above the 1% annual chance event according to local floodplain management regulations. See Table 3.24 for estimated flood losses in Yolo County by jurisdiction:

Jurisdiction	Parcel Count	Structure Value	Est. Contents Value	Total Value	Loss Estimate
Davis	1,050	$551,081,152	$275,540,576	$826,621,728	$165,324,346
West Sacramento	16,444	$3,267,659,420	$1,633,829,710	$4,901,489,130	$4,980,297,826
Winters	181	$30,379,717	$15,189,859	$45,569,576	$9,113,915
Woodland	907	$623,011,224	$311,505,612	$934,516836	$186,903367
Yocha Dehe Wintun Nation	5	$14,454,667	$7,227,334	$21,682,001	$4,336,400
Unincorporated Yolo County	5,086	$576,148,561	$288,074,281	$864,222,842	$172,844,568

Table 3.24: Yolo County 100-Year Flood Loss Estimates by Jurisdiction
Source: Yolo County Assessor's Office

Specific areas of flooding vulnerability are mentioned in the narrative above for each waterway.

3.9 LANDSLIDE

A landside is the breaking away and gravity-driven downward movement of hill slope materials, which can travel at speeds ranging from fractions of an inch per year to tens of miles per hour depending on the slope steepness and water content of the rock/soil mass. Landslides range from the size of an automobile to a mile or more in length and width and, due to their sheer weight and speed, can cause serious damage and loss of life. The rate of a landslide is affected by the type and extent of vegetation, slope angle, degree of water saturation, strength of the rocks, and the mass and thickness of the deposit. Some of the natural causes of this instability are earthquakes, weak materials, stream and coastal erosion, and heavy rainfall. In addition, certain human activities tend to make the earth materials less stable and increase the chance of ground failure. These activities include extensive irrigation, poor drainage or groundwater withdrawal, removal of stabilizing vegetation and over-steepening of slopes by undercutting them or overloading them with artificial fill. These activities can cause slope failure, which normally produce landslides.

Landslide material types are often broadly categorized as either rock or soil, or a combination of the two for complex movements. Rock refers to hard or firm bedrock that was intact and in place prior to slope movement. Soil, either residual or transported material, means unconsolidated particles. The distinction between rock and soil is most often based on interpretation of geomorphic characteristics within landslide deposits, but can also be inferred from geologic characteristics of the parent material described on maps or in the field. Landslide movements are also based on the geomorphic expression of the landslide deposit and source area, and are categorized as falls, topples, spreads, slides, or flows. Falls are masses of soil or rock that dislodge from steep slopes and free fall. Topples move by the forward pivoting of a mass around an axis below the displaced mass. Lateral spreads move by horizontal extension and shear or tensile fractures. Slides displace masses of material along one or more discrete planes and can either be rotational or transitional. Flows mobilize as a deforming, viscous mass without a discrete failure plane.

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

LOCATION AND EXTENT

The California Geologic Survey has created maps showing areas of landslide susceptibility. According to the CGS, risk is a combination of slope class and rock strength. This can be seen in Figure 3.25. A measure of risk is show in the legend, while areal extents for Yolo County are shown as well.

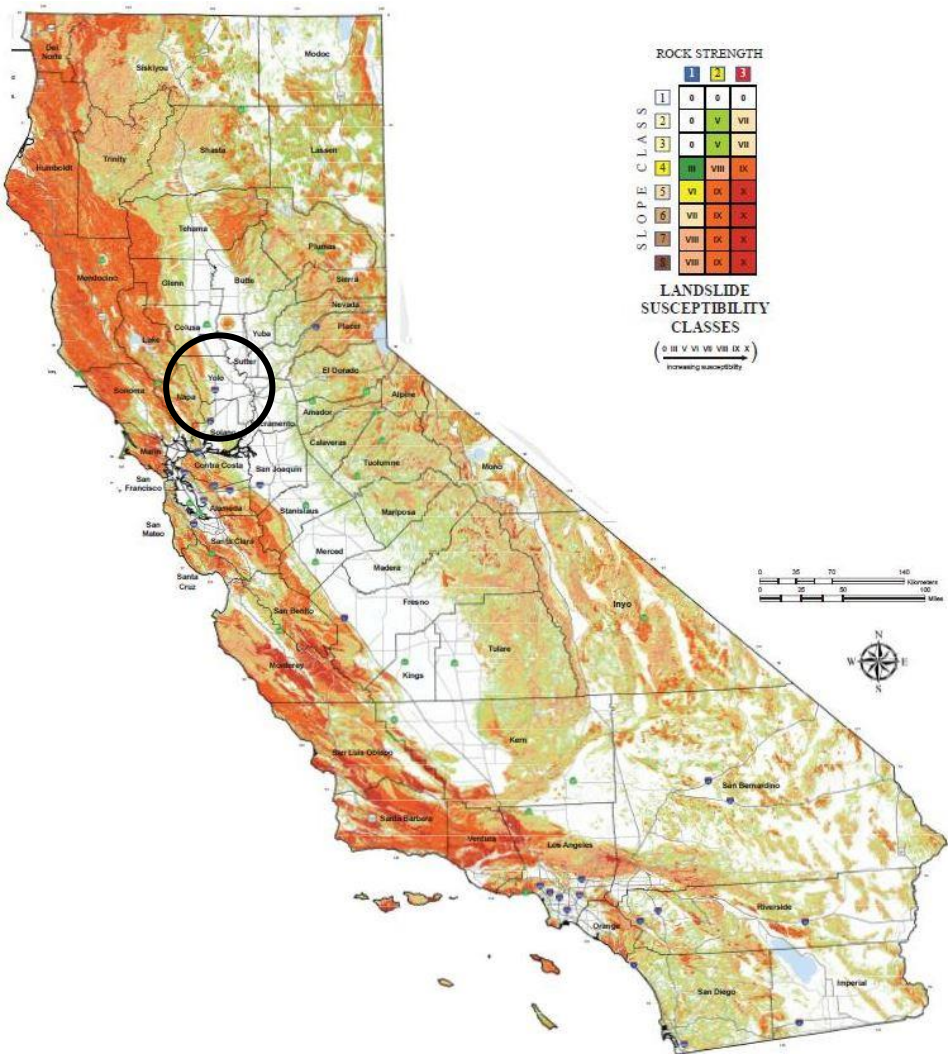


Figure 3.25: Susceptibility to Deep-seated landslides in California
Source: California Geological Survey

The extent of a landslide could range from several small rocks falling to a full mass movement of land that blocks a road or dams a stream. Due its low area of occurrence, the geographic extent of landslides is rated as **Limited** with between 10-25 percent of the operational area affected. Landslides are most pervasive in mountainous terrain, where they occur more often in Yolo

County. The Capay Valley area is particularly susceptible, as it is composed of poorly consolidated marine sediments on either side of a rapidly moving watercourse (Cache Creek) with significant uncontrolled flood volumes. The main area of concern in this region includes the State Highway 16 corridor along Cache Creek through the Cache Creek Canyon between Rumsey and the Colusa County line (see Figure 3.26 – grey areas represent historic landslide locations).

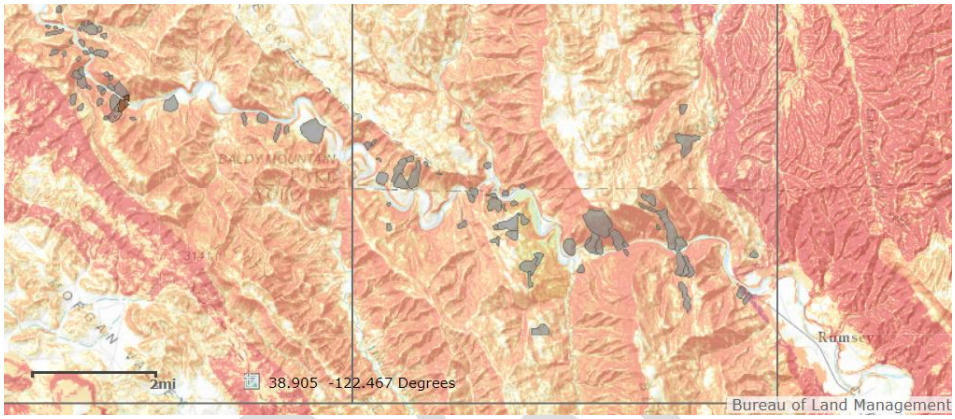


Figure 3.26: Historic Landslide Locations and Landslide Susceptibility in Northern Yolo County
Source: California Department of Conservation

On May 1, 1906, a landslide in this area north of Rumsey that was caused by the 1906 San Francisco earthquake formed a dam across Cache Creek and a subsequent four mile long lake behind it. When the dam eventually broke, the excess water severely flooded the town and damaged several buildings including the railroad depot that existed at the time.

Periodic landslides occur during every winter storm season along State Highway 16 in the Cache Creek Canyon, and CalTrans has the authority to close the highway from a gate north of Rumsey to a gate just south of the Highway 20 intersection in Colusa County. In 2017, several landslides occurred in this area due to a series of unusually strong winter storms and the highway was closed through the Canyon for several months. Another area of concern for landslides in Yolo County is State Highway 128 between Pleasant Valley Road and the Solano County line. A rockslide in 2017 closed a five mile stretch of this road. Elsewhere in the County, landslides are generally not a significant hazard. Figure 3.27 identifies areas with higher potential for landslides, based on soil stability characteristics.

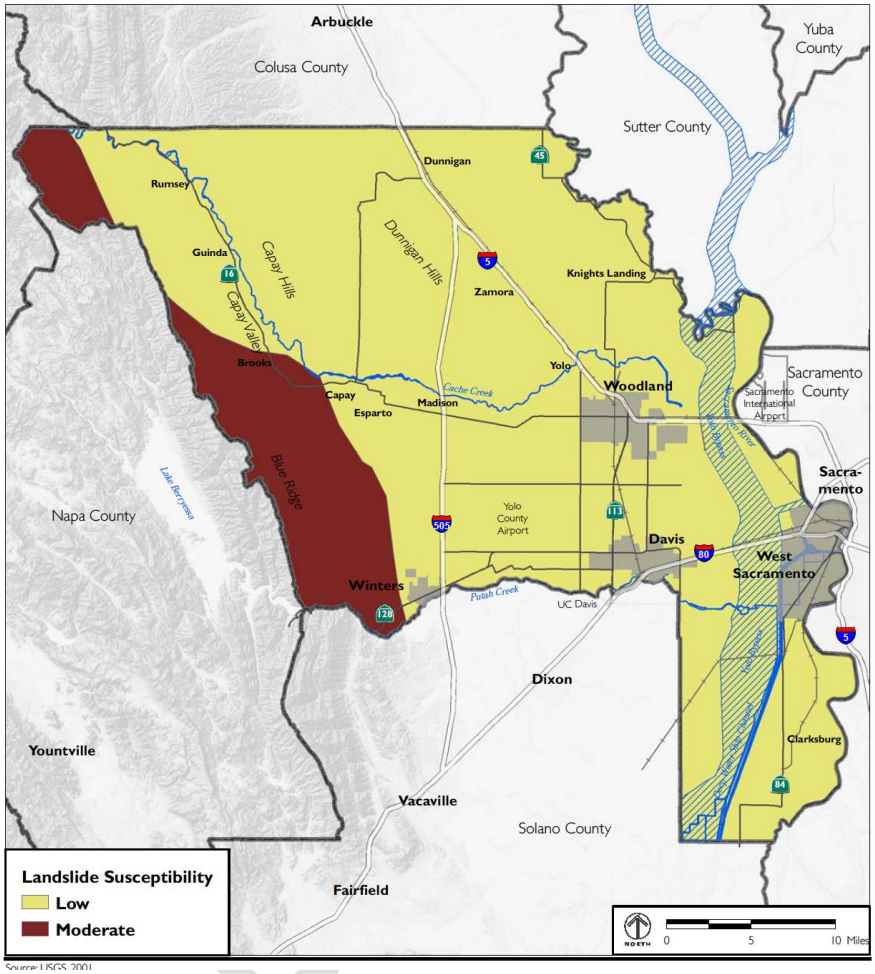


Figure 3.27: Landslide Susceptibility in Yolo County
Source: USGS

PAST OCCURRENCES

There has been 11 Federal disaster related to landslides in Yolo County. And four state disaster declarations due to landslides, as shown in Table 3-25. There are no NCDC records for landslides in Yolo County.

Table 3-25 Yolo County State and Federal Disaster Declarations, 1965-2023*

Year	Disaster Name	Disaster Type	Disaster #	State Declaration #	Federal Declaration #
1995	Severe winter storms, flooding landslides, mud flow	Severe Storm	DR-1046-CA	-	3/12/1995
1995	Severe winter storms, flooding, landslides, mud flows	Severe Storm	DR-1044-CA	-	1/10/1995
1997	Severe storms, flooding, mud and landslides	Severe Storm	DR-1155-CA	-	1/4/1997
2006	Severe storms, flooding, mudslides, and landslides	Severe Storm	DR-1628-CA	-	2/3/2006
2017	Severe winter storms, flooding, and mudslides	Flood	DR-4308-CA	-	4/1/2017
2017	Severe winter storms, flooding, and mudslides	Flood	DR-4305-CA	-	3/16/2017
2017	Severe winter storms, flooding, and mudslides	Severe Storm	DR-4301-CA	3/7/2017	2/14/2017
2019	Severe winter storms, flooding, landslides, and mudslides	Severe Storm	DR-4431-CA	USDA Contiguous 5/1/2019	-
2019	Severe winter storms, flooding, landslides, and mudslides	Severe Storm	DR-4434-CA	USDA Primary and Contiguous 5/17/2019	5/17/2019
2023	Severe winter storms, flooding, landslides, and mudslides	Flood	DR-4683-CA	1/4/2023	1/14/2023
2023	Severe winter storms, flooding, and mudslides	Flood	EM-3591-CA	1/4/2023	1/19/2023
2023	Severe winter storms, flooding, and mudslides	Flood	DR-4699-CA	4/20/2023	4/3/2023

** Data from Table 3-5: Yolo County State and Federal Disaster Declarations, 1965-2023. All years that did not have landslide declarations were removed.*

Likelihood of Future Occurrence

Likely - The probability of a landslide occurring in Yolo County is **Likely:** Between 10 percent and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less. The probability can greatly increase after wetter storm seasons due to the higher presence of water that can displace rock and dirt, as well as after an earthquake as occurred in 1906.

Climate Change And Landslide

Vulnerability Assessment

Vulnerability – Low

The mountainous areas of Yolo County are susceptible to landslide. The Cache Creek Canyon experiences numerous landslides every winter, which presents a threat to State Route 16 and the accompanying road infrastructure. The road is often closed during the winter storm season from north of Rumsey to the Colusa County line. Landslides along Road 40 can also limit access to emergency vehicles in this area. The other area of vulnerability in Yolo County is along state Route 128 between Winters and the Solano County line, where a landslide can wash out the road and potentially threaten power lines.

Impacts from landslides in Yolo County can vary greatly. In unpopulated areas, landslides have little effect except to the extent they fill in waterways and create flooding issues, water conveyance, and introduce contaminants. Landslides can affect ingress and egress routes. Both State Highways 128 and 16 are significant travel routes and the possibility exists for a landslide to cause injury and death to any persons caught in the path of one. Cutting off one of these routes can cause multiple issues, from issues with elderly and those who are sick, to limited emergency response to hazards from police, fire, and other County entities. Landslides can also directly impact facilities and infrastructure, including to roads, power lines, and any buildings located downslope of a landslide prone area. While it remains likely that a large landslide could again block Cache Creek, the impacts downstream would likely be minimized due quicker response time as well as enhanced technology that can be used to help evacuate local citizens. The impact of any landslide event depends on several factors including the amount of land moved, the amount of traffic or buildings present, and the volume of water in any affected stream systems.

3.10 Levee Failure

A levee is a raised area that runs along the bank of a stream or canal. Levees reinforce banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower stream channel, levees can also increase the speed of the water. Levees can be natural or manmade.

Levee failure flooding can occur as the result of partial or complete collapse or underseepage of an impoundment, and often results from prolonged rainfall and flooding. The primary danger associated with dam or levee failure is the high velocity flooding of those properties downstream of the breach.
A levee failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to levee failures is generally 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.

Approximately 150 years ago, the levees of the Sacramento-San Joaquin Delta were raised to prevent flooding on what remains some of the most fertile farmland in the nation. While the peat

soils were excellent for agriculture, they were not the best choice to create strong foundations for levee barriers meant to contain a constant flow of river water. Nevertheless, it was these native soils that were primarily used to create the levee system.

Levee failure flooding would vary in the County depending on which structure fails and the nature and extent of the failure and associated flooding. This flooding presents a threat to life and property, including buildings, their contents, and their use. Large flood events can affect lifeline utilities (e.g., water, sewerage, and power), transportation, jobs, tourism, the environment, agricultural industry, and the local and regional economies.

Lands within the Levee Flood Protection Zones may be subject to flooding due to various factors, including the failure or overtopping of project or non-project levees, flows that exceed the design capacity of project or non-project levees, and flows from water sources not specifically protected against by project levees. Project levees are part of the Federal Flood Control Project and are built to higher standards that comply with U.S. Army Corps of Engineers guidelines. Lands not mapped within a Levee Flood Protection Zone are not invulnerable to flood risk, and some may also experience flooding from these or other related events.

Characteristics of Primary Waterways

The Sacramento River runs along the east side of the Colusa Basin and Knights Landing Basin in a single meandering channel. In general, the ground elevation descends from the Sacramento River southwestward toward the Colusa Basin Drain and the Yolo Bypass in the west. Floodwaters from a breach along the Sacramento River levees will, therefore, flow generally southwest or southeast toward the Knights Landing Ridge Cut and the Yolo Bypass rather than directly parallel along the river. One relief structure, the Fremont Weir connects the Sacramento River with the Yolo Bypass. The Fremont Weir is intended to remove water from the Sacramento River in order to lower water elevations downstream. On the north side of the Town of Knights Landing, the Knights Landing Outfall Gates and channel allows water to pass between the Sacramento River and the Colusa Drain. These gates protect the lower Colusa Drainage Basin from backwater of the Sacramento River and assist with agricultural irrigation operations during the dry season. High flows from the American River at its confluence with Sacramento River in Sacramento can cause the Sacramento River to flow backwards.

The Colusa Drain runs along the western side of the Knights Landing Ridge Drainage District Levee and receives water flows from streams and creeks originating in the Coast Range along with local drainage from the north. Flood waters in the Colusa Drain are contained by levees on its east side maintained from north to south by Maintenance Area 12, Reclamation District 108, and Reclamation District 787. At the south end of the Drain, flood waters pool at the Knights Landing Ridge and flow through the Knights Landing Ridge Cut into the Yolo Bypass. The

Knights Landing Outfall Structure and channel connects the Colusa Drain with the Sacramento River at this point to allow controlled water flow between those two waterways.

The Yolo Bypass runs along the western side of the Elkhorn basin and the boundaries of all districts with the exception of the section of RD537 north of the Sacramento Weir. The Yolo Bypass receives water from the Colusa Drain, the Sacramento and Feather Rivers, the Sutter Bypass, and streams and creeks along its west side. At the northern end of the Bypass and the junction of the primary waterways mentioned, the Fremont Weir controls the entry of water into the Bypass.

The Sacramento Bypass runs along the south end of the Elkhorn Basin District along the southern boundary of RD785 and RD537. The Sacramento Weir relieves flow from the Sacramento River and American River into the Yolo Bypass. Sacramento Bypass levees are maintained by the Department of Water Resources as State Maintained Area 8. The 1,920 ft. long weir consists of 48 gates that divert Sacramento River (and American River) floodwaters west down the mile-long Sacramento Bypass and discharges them into the Yolo Bypass. Reclamation District No. 150 – Merritt Island maintains levees surrounding Merritt Island, protecting 4,740 acres of mostly agricultural land (vineyards and orchards) and approximately 238 residents. The District is located within Yolo County and is bounded by Elk Slough and on the east, the Sacramento River on the west, and Sutter Slough on the South (see Figure 3.28). Elk Slough has a water control structure and earthen levee across the mouth of the slough on the Sacramento River. The water control structure is operated by RD999 during periods of high flows to prevent flow from the slough on the upstream end. The structure also limits flows based on the lower water end elevations and flows from Sutter Slough.

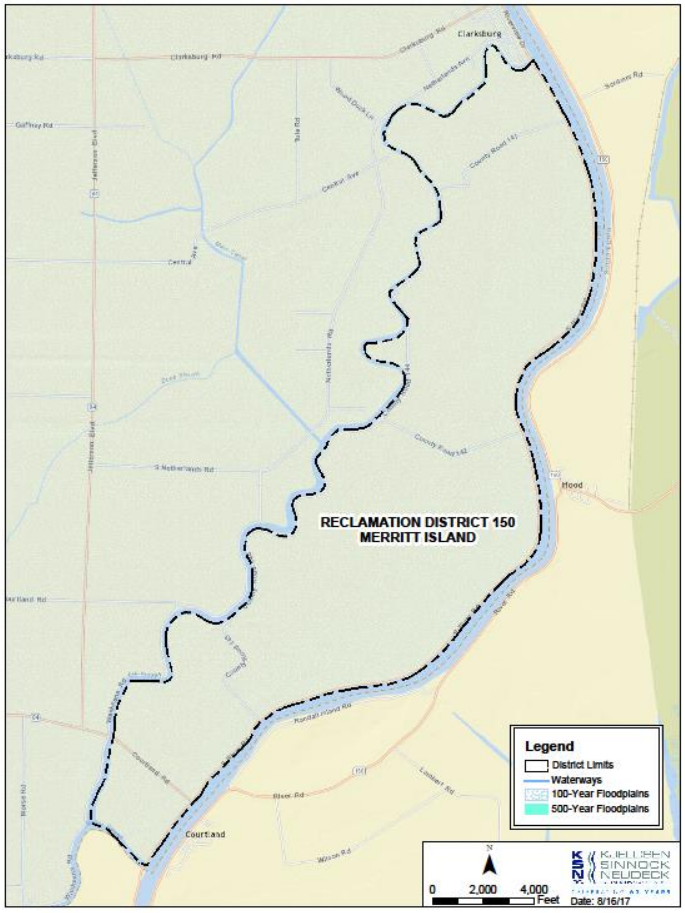


Figure 3.28: Reclamation District 150
Source: KSN Engineers

District levees are vulnerable to wave wash and erosion on the east levee along the Sacramento River. Additional areas of levee vulnerability include:

- At the Courtland Road (Elk Slough to Road 143) there are seepage issues which were fixed 15 years ago and the toe was rebuilt; however, there are multiple boils and the underseepage issues continue.
- Along the water side of the levee from Elk Slough to Clarksburg there is a vertical drop, likely due to erosion, down to the water. During high water events this is an area where

rock has to be added. The worst seepage area is a 2-mile stretch from Road 143 toward Road 142.

- Seepage along the north end of the Sacramento River. There is erosion along the waterside as well.
- The levee along Sutter Slough is built on top of pure sand and there are underseepage issues.

Agricultural land, including vineyards and orchards, would be susceptible to a levee failure in RD and economic losses would be prevalent.

Reclamation District (RD) 307 provides water drainage and flood control services within its gross service area of 6,000 acres. The District and its sphere of influence are located within Yolo County on the west bank of the Sacramento River approximately 5 miles south of the City of West Sacramento (see Figure 3.29). The District's topography is relatively flat and is confined by the following surface water features and engineered channels: the Sacramento River, the Babel Slough, and Winchester Lake. The Sacramento River has a design capacity of 100,000 cfs along RD307 levees on that waterway.

The District is in the "flood plain" but no portion of the District is within a floodway. The District maintains 6.59 miles of levees that run adjacent to the Sacramento River. Small non-project levees run along Winchester Lake on the south side of the District and along Babel Slough on the west side. The entire District is within the legal Sacramento-San Joaquin Delta District and within the scope of the Sacramento River Flood Control Project, as approved by the US Army Corps of Engineers (USACE), Department of Water Resources (DWR) and the Central Valley Flood Protection Board (CVFPB).

In addition to its levees, District-maintained infrastructure includes a main District pump station and approximately 136,900 feet of drainage canals, ditches, and laterals. The District pump system discharges internal drainage into waterways and moves irrigation water from waterways into the District irrigation system. The District is in a rural setting with a nominal growth rate. The current population is approximately 73 permanent residents. Most of the land in the District is in agricultural use, primarily grapes, vegetables, and grain production that would be vulnerable to a levee failure.

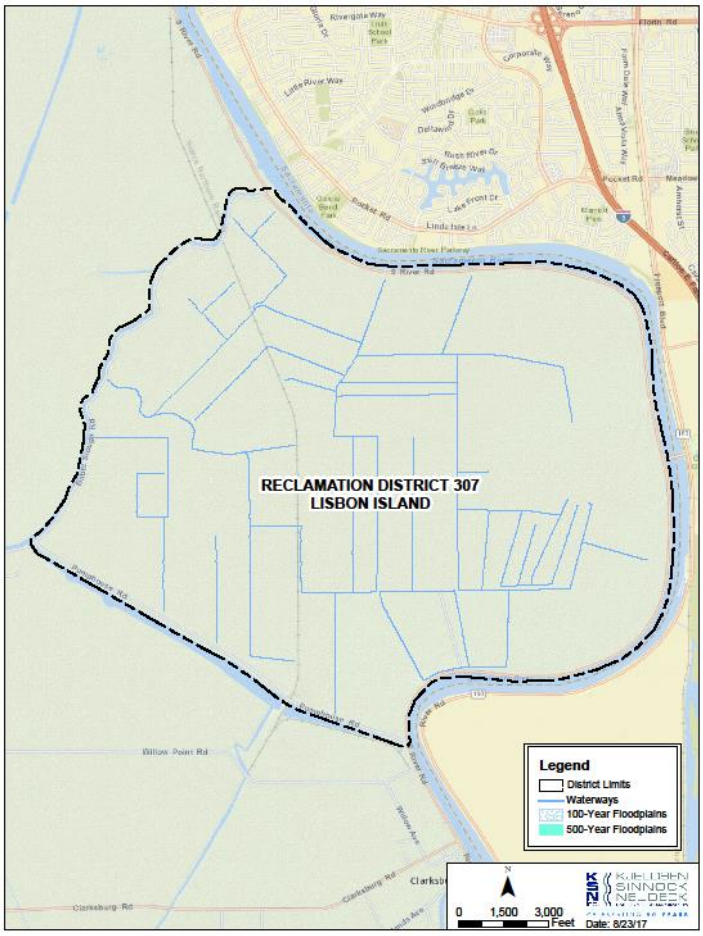


Figure 3.29: Reclamation District 307
Source: KSN Engineers

Reclamation District (RD) 999 provides water drainage, flood control, and irrigation services within its gross service area of 22,000 acres. The District and its sphere of influence are located within Yolo and Solano Counties, beginning approximately 5 miles south of the City of West Sacramento (see Figure 3.30). The District's topography is relatively flat and is confined by the following surface water features and engineered channels: the Sacramento River, the Yolo Bypass/Deep Water Ship Channel, Minor Slough, Sutter Slough, and Elk Slough. The

Sacramento River has a design capacity of 100,000 cfs along RD999 levees on that waterway. The Deep Water Ship Channel contains backwater from the Yolo Bypass and Sacramento River at Cache Slough and has no current, but is susceptible to tidal flows.

The District is in the "flood plain" but no portion of the District is within a floodway. The District maintains 33 miles of levees. District levees run adjacent to the Sacramento River along approximately 1.22 miles, adjacent to the Deep Water Ship Channel along approximately 15.43 miles, adjacent to Minor Slough along approximately 2.32 miles, adjacent to Sutter Slough along approximately 3.74 miles, and adjacent to Elk Slough along approximately 9.66 miles. The entire District is within the legal Sacramento-San Joaquin Delta District and within the scope of the Sacramento River Flood Control Project, as approved by the Army Corps of Engineers (USACE), Department of Water Resources (DWR) and the Central Valley Flood Protection Board (CVFPB).

In addition to its levees, District-maintained infrastructure includes 13 drainage pumping facilities, approximately 260 miles of drainage canals, ditches, and laterals. The District pump system discharges internal drainage into waterways and moves irrigation water from waterways into the District irrigation system. The District is in a rural setting with a nominal growth rate, and there are numerous vulnerabilities to the area from the threat of levee failure. The current population is approximately 1,500 permanent residents primarily in the Town of Clarksburg. There are also several large winery events that take place in Clarksburg and may attribute to an increase in persons at certain times of the year. A levee threat could require a large-scale evacuation, particularly when a large event is going on. Most of the land in the District is in agricultural use and is susceptible to flooding from a potential levee failure; these areas consist primarily of grapes, vegetables, and grain production. Numerous ag-related businesses operate in the District and several commercial businesses, including the Old Sugar Mill, operate in and around Clarksburg and could be threatened from inundation caused by a levee failure. The Clarksburg area has not flooded since the original levee system was completed. Downtown Clarksburg is at a higher elevation than the rest of the district. However, only about 1/3 of the Clarksburg District population lives in town, 2/3 live outside in surrounding areas.

Specific areas of levee vulnerability include:

- If the levee on the north side of Prospect Island fails it will pass water onto weaker, smaller levees, starting a chain reaction that could cause flooding of the entire District.
- On the Miner's Slough project levee, the waterside berms are gone.
- On Ryer Island, at the bridge crossing, the USACE raised the RD 999 levee to increase the freeboard, but they were not able to complete coordination with Caltrans so there is a 3 foot drop in the RD 999 levee which is 150 feet wide.

- There is erosion along approximately one mile of Unit 3 of Sutter Slough. Additionally, the top of the levee is covered in elderberry bushes making the mitigation cost for addressing the erosion far too expensive.
- The levee at Elk Slough failed the USACE inspection due to inadequate cross section geometry.
- There are erosion and underseepage problems in the levee at center of Clarksburg (end of Netherlands Ave/Road 154). The USACE had a project designed to address this. However, it has not been constructed.
- There is subsidence approximately 10-15 feet from the toe of the levee at Miner's Slough Corner.
- There are multiple encroachment problems that include approximately 130 separate pipes through the levees.

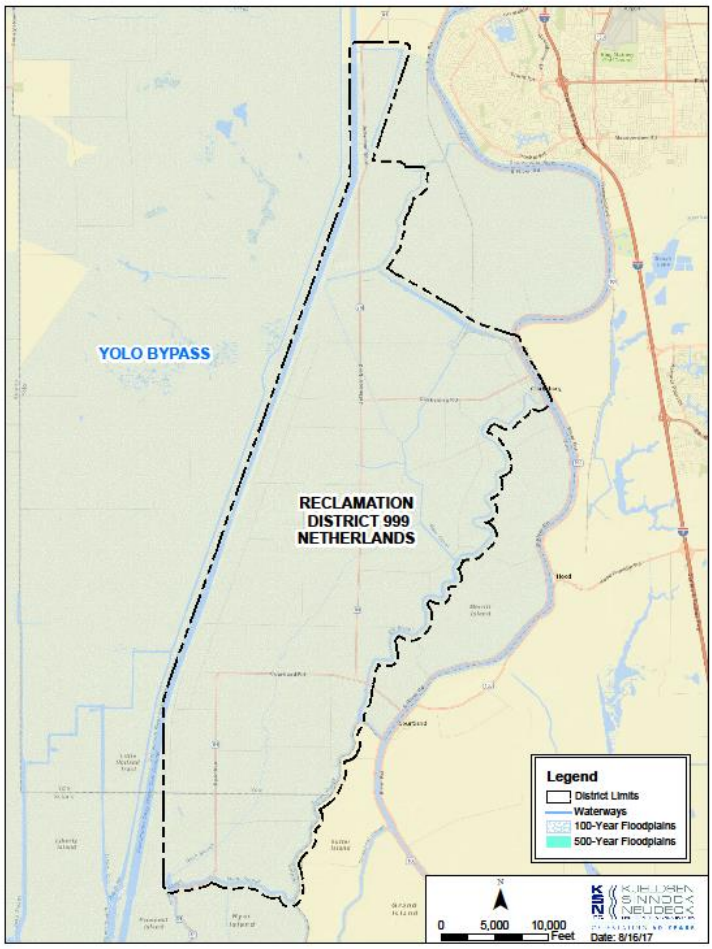


Figure 3.30: Reclamation District 999
Source: KSN Engineers

Reclamation District 900 is an independent special district that maintains the majority of the levees that surround West Sacramento. The District overlies approximately two-thirds of the City and has an estimated population of 40,000 people that would be vulnerable to a levee failure. This area includes several city fire stations and schools as well as the city police station and the Port of West Sacramento. RD 900 is bound by the Southern Pacific Railroad embankment on the north, the Sacramento River on the east, Shangri-La Slough on the south, and the Deep Water

Ship Channel (DWSC) on the west (see Figure 3.31). The DWSC also bisects RD 900 into two district areas.

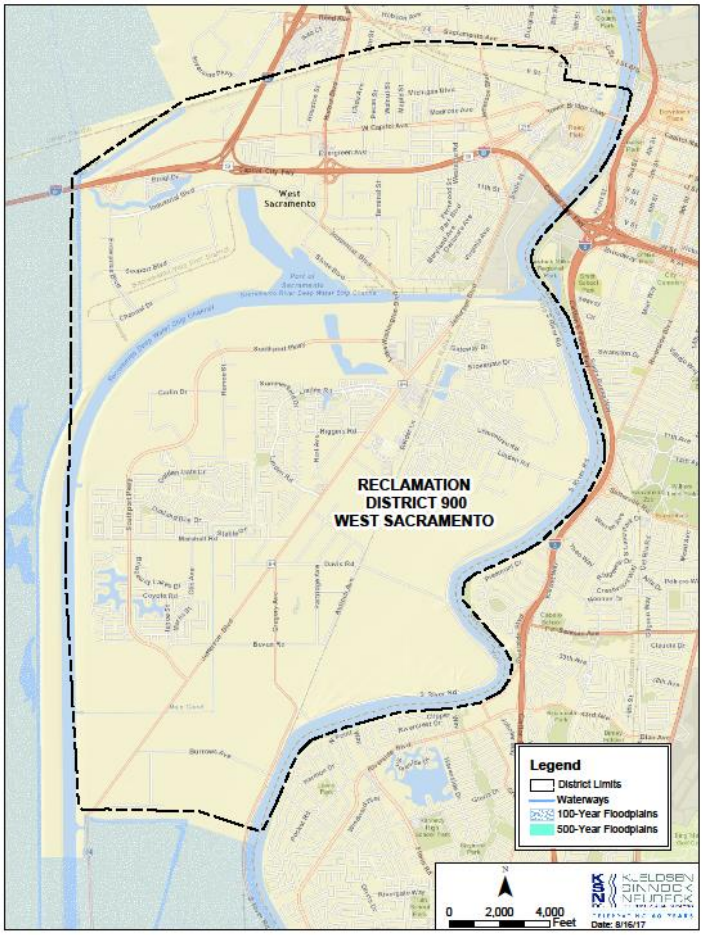


Figure 3.31: Reclamation District 900
Source: KSN Engineers

Reclamation District 2035 – Conaway Tract comprises 12.1 miles of levee. The District is responsible for the levee maintenance and drainage services for approximately 20,500 acres of privately owned agricultural land. The Tract is located adjacent to the Yolo Bypass on the east

and receives some inflow from the Cache Creek Settling Basin (CCSB) on the north (see Figure 3.32).

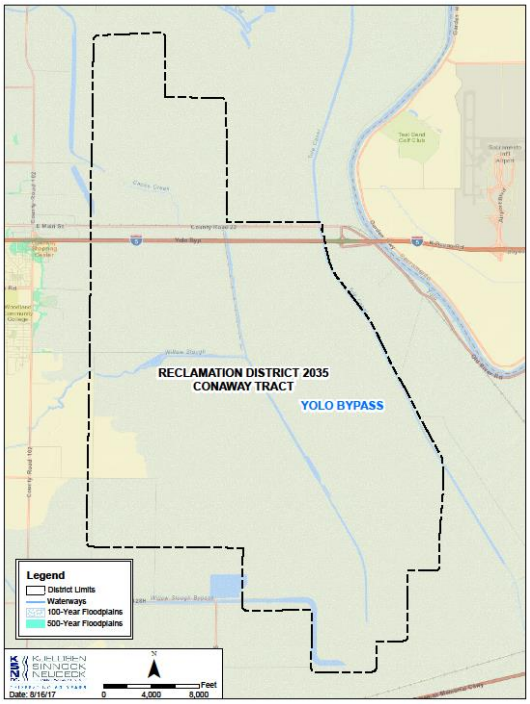


Figure 3.32: RD 2035
Source: KSN Engineers

The District works in partnership with the City of Woodland to address flood issues that could impact the southwestern periphery of the City of Woodland, where industrial centers and shopping areas are most susceptible. A breach on the northern segments of the Tract (north of County Road 25) may encroach on the south east end of the City of Woodland, but is not expected to have severe impacts west of County Road 102. Floodwaters will generally flow southeast and may begin to expand and backup against the southern Bypass levees near the junction with County Road 29. While a breach of the West Bypass Levee would not directly threaten the City of Davis, the City of Davis Wastewater Treatment Plant is particularly vulnerable. The plant is located less than a mile from the levee and is currently not protected by a berm, as the City of Woodland Wastewater Treatment Plant is. Inundation of the City of Davis Wastewater Treatment Plant would result in the loss of wastewater services for the City of Davis for several weeks.

Reclamation District No. 2068 (District) – Yolano was formed in April 1924 to provide retail water supply, flood protection, and drainage to agricultural producers within the district boundary. This now includes the district maintenance responsibilities of their portion of the SRFCP levees in, and adjacent to, the Yolo Bypass.

The District is located in the northwest Delta near the City of Dixon. The District is located in both Solano County (over 11,000 acres), and Yolo County (just under 2,000 acres); 1,280 acres of which lies within the Yolo Bypass (see Figure 3.33). The levee is 8.8 miles long, of which 5.5 miles is along the west bank of the Yolo Bypass, and 3.23 miles is on the back levee. The entire levee system is part of the Sacramento River Flood Control Project, Unit 109, west levee of Yolo Bypass and the east levee of Cache Slough, lying north of the same project levees under the jurisdiction of Reclamation District 2098.

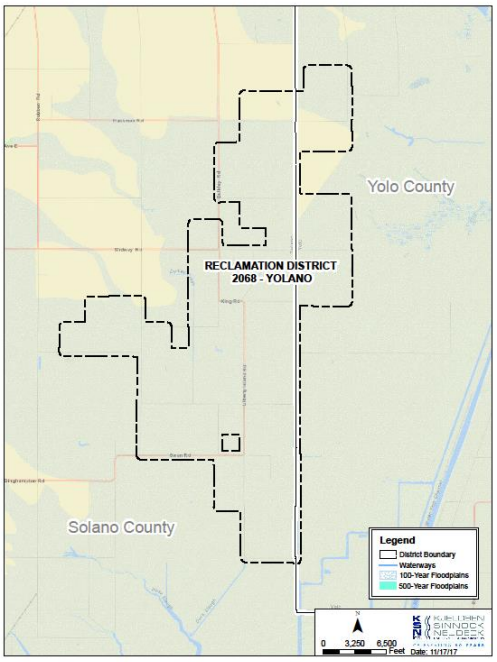


Figure 3.33: Reclamation District 2068
Source: KSN Engineers

Land use is primarily agricultural, which presents the most significant vulnerability to a levee threat. Pastureland use dominates for livestock; alfalfa, grain, and miscellaneous row crops are

also grown. The District plans no major land use changes, although there are statewide planning efforts that, if carried out, could affect land use change, and aspects of the District operation and maintenance of the levee and drainage system.

Reclamation Districts (RD); RD1600, RD827, RD785, and RD537 maintain The Elkhorn Basin, which encompasses approximately 16,549 acres protected by an interdependent levee system (see Figures 3.34-3.37). The Elkhorn Basin RDs are facing many of the same infrastructure, funding, O&M, institutional, emergency response, environmental, agricultural sustainability, and climate change problems as the rest of the region. Levees were constructed in the early 1900s and they do not meet current design standards. Additionally, all levees along the Sacramento River within this basin have elderberry bushes which restrict inspection and maintenance. The protected area is primarily agricultural farmland with a limited number of residences, other structures, and transportation systems. The primary vulnerabilities would be the loss of cropland. County Road 22, which serves as major transportation corridor between West Sacramento and Woodland, traverses the lower half of this area along the Sacramento River Levee and is particularly susceptible to a failure of that levee. There are several spots along the Sacramento River Levee in these districts that have experienced damage during previous storms and are susceptible to future events.

Transportation systems in the Elkhorn Basin include Interstate 5 which crosses the basin from east to west. The Elkhorn Basin is bounded by three distinct waterways: the Yolo Bypass on the west, the Sacramento River on the east, and the Sacramento Bypass on the South.

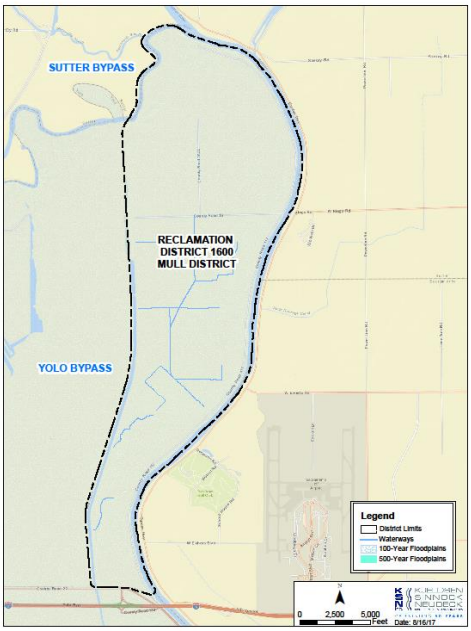


Figure 3.34: Reclamation District 1600
Source: KSN Engineers

Specific areas of levee vulnerability for RD 1600 include:

- Along the Sacramento River west levee, 8 miles north of Road 117 and Old River Road, there are three large, deep scour holes approximately 6ft off the waterside toe.
- Along the landward side of the Sacramento River levee, 1000 ft north of the Fremont Weir and running for 1.6 miles, the levee side slope is approximately 1:1. This area is part of the Mid Valley project and RD 1600 has been paying DWR $5,000 per year ($150,000 over 30 years) to repair this levee and bring the side slope to 3:1, but there have been no repairs yet.
- On the Yolo Bypass levee starting 2 miles south of the Fremont Weir and running for 2.3 miles, the levee crown road needs an additional 5-6 inches of base and gravel added to ensure the ability to safely drive the road during patrols in wet weather and high water events as this road surface gets extremely muddy and deeply rutted. Also, on the landward side of this levee, there have been slope stability issues during each of the previous high water events. And, this levee's side slope is extremely steep and needs soil to be added to give a 3:1 slope. A half-mile stretch of this levee is eight tenths of a foot under the 1957 profile.

- On the Yolo Bypass levee starting 3-4 miles south of the Fremont Weir, there is erosion on the bypass side from wave wash. The erosion extends down the entire side slope into the Tule Canal. The canal is approximately 80 ft wide and there is no road at the levee toe. With no road it is difficult to access these erosion sites to repair them and maintain them.

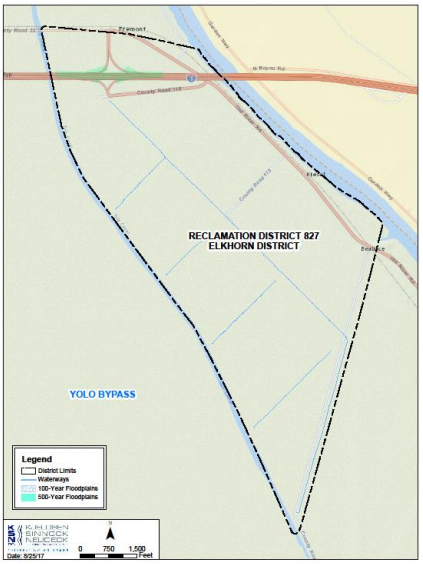


Figure 3.35: Reclamation District 827
Source: KSN Engineers

Approximately 2 miles of the Yolo Bypass levee in RD 785 were never completed when constructed. The levee slope on the bypass side was never rip-rapped as originally designed and the levee needs rock placed onto the crown to allow for winter patrol access and emergency access during flood warning times.

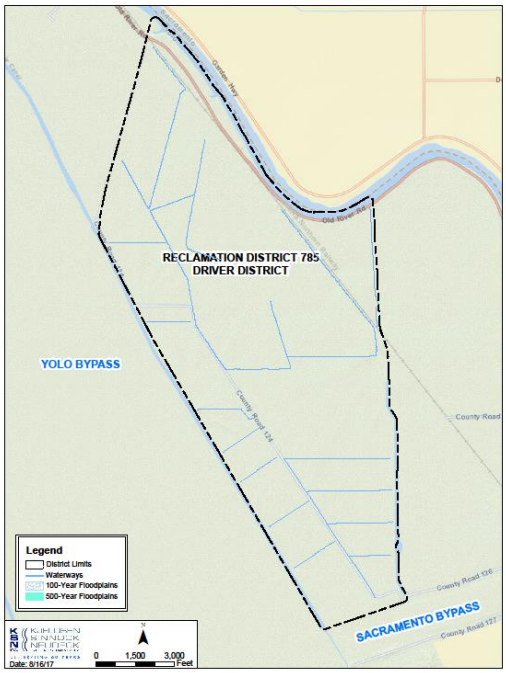


Figure 3.36: Reclamation District 785
Source: KSN Engineers

RD537 is composed of two disparate sections separated by the Sacramento Bypass: the northern portion of RD537 is rural, while the southern portion is developed industrialized land. Areas of levee vulnerability include:

- The crown of the levee on the north side of the Sacramento weir is collapsing due to both underseepage and stability problems.
- The levee along Old River Road around Monument Bend has no berm on the river side.
- At Monument Bend, RD 537 constructed an oxbow levee (an interior levee) in 1965 to protect against failure of the Sacramento River levee. During a high water event RD 537 maintains this oxbow levee which puts the responsibility on DWR and Yolo County to maintain the river levee and the Old River Road. This will create problems for emergency evacuation.

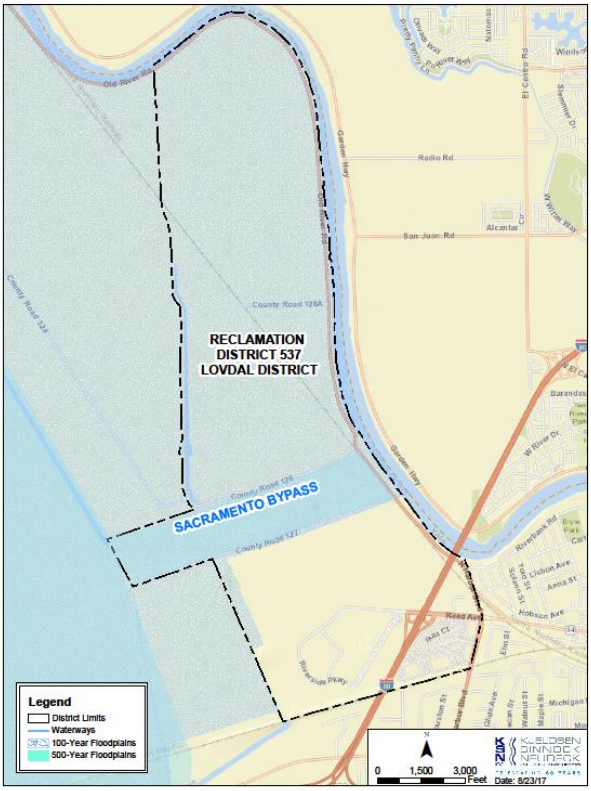


Figure 3.37: Reclamation District 537
Source: KSN Engineers

Reclamation District (RD) 108 is located along the western edge of the Sacramento River and delivers water to nearly 48,000 acres of farmland within southern Colusa County and northern Yolo County. RD 108 receives water from the Sacramento River under riparian water rights, licenses for appropriation of surface water, and a Settlement Contract with the US Bureau of Reclamation. The first irrigated crops were grains, mostly barley but today include rice, wheat, corn, safflower, tomatoes, beans, vineseeds, cotton, walnuts and fruit.

The district was formed in 1870 under the Reclamation District Law of 1868 for the purpose of forming a district to build levees and "reclaim" land subject to periodic overflow from neighboring rivers and water bodies. At this time the Government was promoting reclamation to develop swamp lands for the improvement and cultivation of the thousands of acres in

California. On October 4, 1870 the landowners submitted a petition to the Colusa and Yolo County Boards of Supervisors authorizing the formation of a new Reclamation District and assigned it the number 108.

RD 108 is surrounded on three sides by levees, that include the west-side levees from Colusa to Knights Landing along the Sacramento River, a Back Levee along the District's western boundary to prevent flooding from the Colusa Basin, and then along the slough in the South that at one time took drainage water from the Colusa Basin back to the Sacramento River (see Figure 3.38). The district works in coordination with the Sacramento River West Side Levee District and the Knights Landing Ridge Drainage District to provide maintenance to over 90 miles of levees. All of the levees were originally built by the local landowners using whatever materials available and whatever criteria they chose, but have since become part of the federally sponsored Sacramento River Flood Control Project. The levees protect the rural communities in Yolo and Colusa Counties. These levees are integral to the system-wide performance of the Sacramento River Flood Control Project and provide indirect protection to the cities of Sacramento and West Sacramento. Since formation of the levee districts, Sacramento River West Side Levee District, Knights Landing Ridge Drainage District have shared management, personnel and equipment with RD 108. The flood control districts reimburse RD 108 for management and work performed.

Sacramento River West Side Levee District (SRWSLD) - The levees south of Colusa were initially maintained by Reclamation District 108, but the costs for levee construction and maintenance were high and borne by few landowners whereas the benefits of flood protection extended beyond RD 108 boundaries. In 1915 the legislature created the SRWSLD to more accurately reflect the lands benefited. All of the levees were originally built by landowners and have become part of the federally authorized Sacramento River Flood Control Project. The levee system protects the City of Colusa, town of Grimes while also protecting approximately 194,000 acres of farmland.

Knights Landing Ridge Drainage District (KLRDD) - In 1913 the legislature created the KLRDD. The KLRDD is protected by an interdependent levee system, is approximately 4000 acres, and is managed by RD 108 staff. This interdependent system is an integral part of the Sacramento River Flood Control Project and provides protection to the Town of Knights Landing, which is the community most vulnerable to a levee threat along the Sacramento River in this area. The Knights Landing Levee System is bounded by three major waterways: the Sacramento River on the east, the Yolo Bypass on the southeast, and the Colusa Drain on the west (see Figure 3.39). The basin protected by this levee system is primarily agricultural with one rural community, the Town of Knights Landing. The protected area is within Yolo County.

The KLRDD also contains a portion of County Service Area (CSA) #6, a roughly six mile stretch of levee along the Sacramento River that extends from Knights Landing to the Fremont Weir and is maintained by Yolo County. There are numerous erosion sites located along the levee.

Reclamation District (RD) 787 is located along the western edge of the Sacramento River and services 15.8 square miles of land with 4.4 miles of levee. The District provides levee maintenance, drainage, and irrigation.

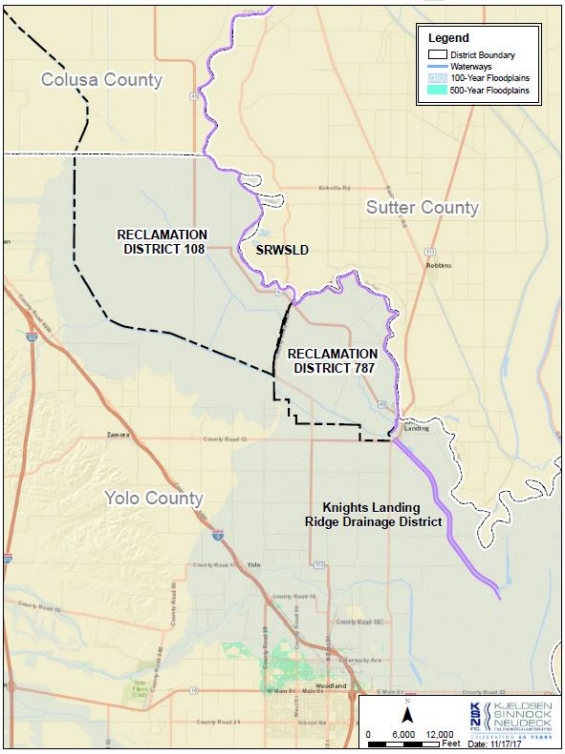


Figure 3.38: RD 108, Sacramento River West Side Levee District, Knight Landing Ridge Drainage District, and RD787
Source: KSN Engineers

Reclamation District (RD) 765 provides water drainage and flood control services within its gross service area of 1,400 acres (see Figure 3.39). The District and its sphere of influence are located within Yolo County on the west bank of the Sacramento River approximately 4 miles south of the City of West Sacramento. The District's topography is relatively flat and is confined by the following surface water features and engineered channels: the Sacramento River

and Babel Slough. The Sacramento River has a design capacity of 100,000 cfs along RD 765 levees on that waterway.

The District is in the "flood plain" but no portion of the District is within a floodway. The District maintains 1.7 miles of levees. District levees run adjacent to the Sacramento River. The entire District is within the legal Sacramento-San Joaquin Delta District and within the scope of the Sacramento River Flood Control Project, as approved by the US Army Corps of Engineers (USACE), Department of Water Resources (DWR) and the Central Valley Flood Protection Board (CVFPB).

The District pump system discharges internal drainage into the Deep Water Ship Channel and moves irrigation tailwater from waterways into the District irrigation system. The District is mostly agricultural. Most of the land in the District is primarily for row crop production. A marina with several businesses is also located on the Sacramento River side of the District.

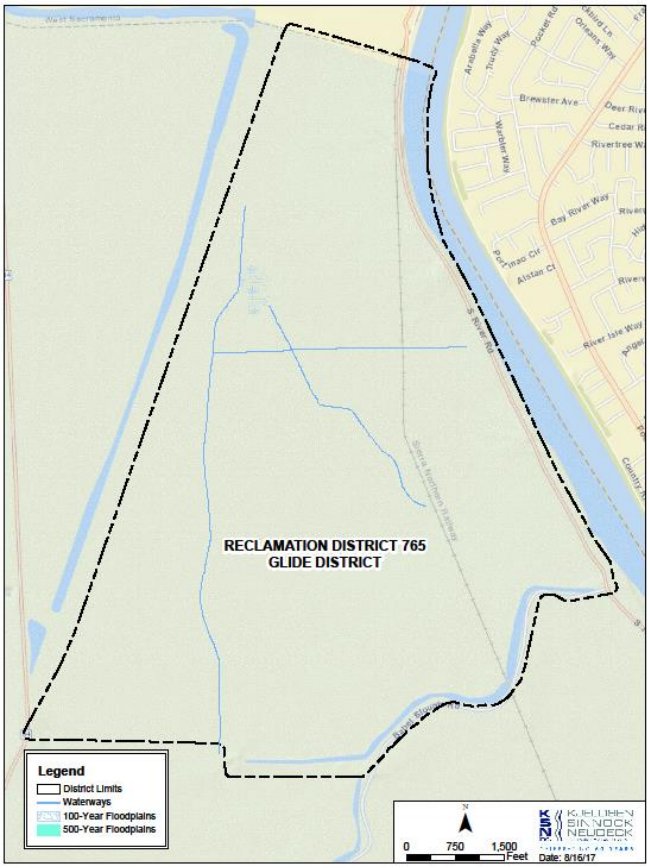


Figure 3.39: Reclamation District 765
Source: KSN Engineers

The South River Pump Station is located at the northern end of the District and is vulnerable to a levee failure. This station services areas in the City of Sacramento, the City of Citrus Heights, the City of West Sacramento, and unincorporated areas in the County of Sacramento. A project to construct a new 200-year flood protection levee around the pump station is estimated to begin in summer 2016.

Sacramento Maintenance Yard (SMY) is part of the California Department of Water Resources' Flood Maintenance Office and is charged with the maintenance and flood fight of State Maintenance Area and State-Maintained levee systems within its area of operations. While the

SMY is physically located in Sacramento, it maintains discrete levee systems in Sutter, Sacramento, and Yolo Counties. Within Yolo County, SMY maintains and operates levees along Cache Creek, Putah Creek, Willow Slough Bypass, and the Yolo Bypass. A summary of the different creek and bypasses and their associated flood protection systems follows.

Huff's Corner - The Huff's Corner Levee (along the south side of Cache Creek) is 0.29 miles long, but the county is not resourced for O&M. Yolo County has no funding for O&M of the Huff's Corner Levee. The State owns and maintains the levee on either side of this 0.29 mile segment, but provides no resources to the County for O&M of Huff's Corner. There has been some discussion between Yolo County and DWR about the State possibly taking over O&M. Rate increase associated with the NFIP will most likely affect residents of Knights Landing within the next year. These increases can be an economic hardship on the rural areas and small communities in Yolo County, many of which are economically disadvantaged.

LOCATION AND EXTENT

California has over 13,000 miles of levees that protect residential and agricultural lands. The levee failures resulting from Hurricane Katrina prompted the State and the Department of Water Resources (DWR) to initiate development of a state-of-the-art California Levee Database (CLD) for the purpose of better understanding and managing levees in California. The CLD is an efficient tool for assessing levee reliability risk factors using a GIS-enabled geospatial database.

Starting in 2005, partnering with the Federal Emergency Management Agency (FEMA) under the auspices of FEMA's Map Modernization Management Support program, DWR has started assembling critically needed levee information on ownership, location, and risk assessment factors for all the levees in California. Recognizing that other agencies are engaged in similar efforts, DWR is actively participating on national committees organized by the Federal Emergency Management Agency (FEMA) and the U.S. Army Corps of Engineers (USACE) to ensure compatibility and coordination with other national efforts. Currently, the California Levee Database has location information for more than 10,000 miles of levees and flood control structures throughout California. In addition to the database above, the Yolo County Flood Insurance Study dated 5/16/2012 lists the levees in Yolo County and are detailed below.

Community	Flood Source	Levee Inventory Identification #	USACE Levee
Yolo County (Unincorporated Areas)	Buckeye Creek	Not specified	No
City of Woodland	Cache Creek	52, 53, 55, and 81	Yes
Yolo County (Unincorporated Areas)			
City of Woodland	Colusa Basin	94, 95, and 163	Yes

Community	Flood Source	Levee Inventory Identification #	USACE Levee
Yolo County (Unincorporated Areas)	Drainage Canal		
Yolo County (Unincorporated Areas)	Knights Landing Ridge Cut	83, 84, 120, 121, and 162	Yes
City of Woodland Yolo County (Unincorporated Areas)	Old River	85, 118, and 119	No
City of West Sacramento Yolo County (Unincorporated Areas)	Sacramento River	11, 17, 86, 93, 122, 133 through 142, 147, 151, 152, 157, and 168 through 171	Yes
City of West Sacramento Yolo County (Unincorporated Areas)	Sacramento River Toe Drain	148 and 149	Yes
City of Davis Yolo County (Unincorporated Areas)	South Fork Putah Creek	29, 30, 105, and 106	Yes
Yolo County (Unincorporated Areas)	Unnamed Canal between Colusa Basin Drainage Canal and Sacramento River near El Dorado Bend	123 and 124	No
Yolo County (Unincorporated Areas)	Willow Slough	36	No
City of Davis Yolo County (Unincorporated Areas)	Willow Slough Bypass	34 and 35	Yes
City of Davis Yolo County (Unincorporated Areas)	Yolo Bypass	28, 82, 116, 117, 128, and 132	Yes
Yolo County (Unincorporated Areas)	Yolo Bypass	5	No

Table 3.26 – Levees in Yolo County
Source: Yolo County Flood Insurance Study 2012

Yolo County has approximately 215 miles of project levees, managed by various agencies, including the County, 13 reclamation districts, one levee district, one drainage district, and DWR. These

levees provide flood protection to West Sacramento, Woodland, Knights Landing, Clarksburg, Davis and important agricultural lands. In addition, the Yolo Bypass, the Sacramento Weir, and the Fremont Weir help protect Sacramento and other urban communities in the region from flooding by the Sacramento River. Some levees, particularly the project levees that protect parts of the City of Woodland and unincorporated Yolo County, the vicinity of Cache Creek and the town of Yolo only provide a 10-year level of flood protection rather than the 100-year federal standard. Without work to improve these levees, additional development in Yolo County's floodplain could put more residents at risk of flooding hazards. The geographic extent of a Levee failure is **Extensive** with more than 50 percent of the operational area potentially being affected by a failure of any major levee. Parts of the County would be completely inundated.

The local levees have been assumed to provide adequate protection since their acceptance into the Sacramento River Flood Control Project in 1917, with the levees being modified over the decades. Recently, where insufficient geotechnical information exists to evaluate the integrity of the levees, DWR has taken the position, in conjunction with FEMA that levees are not certified. DWR has completed geotechnical evaluations of the urban Sacramento River Flood Control Project levees within the county, and has proposed to do additional evaluations of non-urban levees in the coming years.

Figure 3.39 shows the extent of those areas that are protected by decertified levees and are currently subject to flooding. This map uses the best available information to identify those areas where flooding would be more than three feet deep if a project levee were to fail, assuming maximum capacity flows. Not surprisingly, levee flood protection zones are concentrated in eastern Yolo County, in areas adjoining levees for lower Cache Creek, Putah Creek, the Colusa Basin Drain, the Yolo Bypass, and the Sacramento River. Affected communities include Clarksburg, Davis, Knights Landing, West Sacramento, Woodland, and Yolo.

Also as part of FEMA's Map Modernization program, FEMA is mapping levees within communities, with a primary focus on maps determined to provide a 100-year level of flood protection.

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 can 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. Generally, these 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 wet and wave

run-up. In short, these guidelines require certification of levees before crediting any levee with providing protection from the 1 percent annual event (e.g., the 100-year flood).

In Yolo County, similar to other locations in California, levees and flood control facilities have been built and are maintained variously by public and private entities, including water, irrigation and flood control districts, other state and local agencies, and private interests. Some of these facilities were constructed with flood control as secondary or incidental to their primary purpose, so are not considered as providing protection from the 100-year or greater flood. Levees in the County are discussed in the Levee Section of this plan.

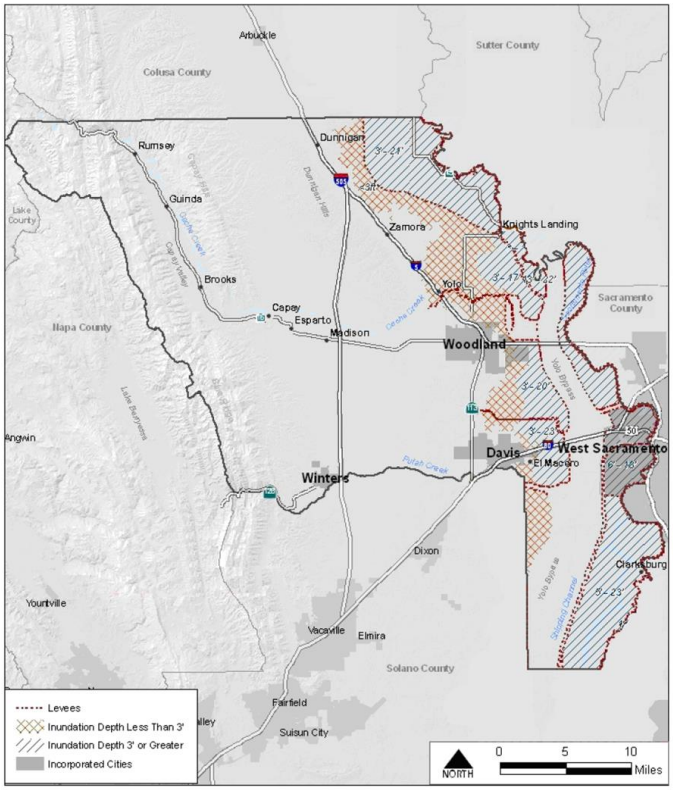


Figure 3.39: Levee Protection Zones in Yolo County
Source: Yolo County General Plan

In the winter of 2017, a series of severe winter storms and the subsequent releases of water from dams upstream of Yolo County caused a number of damages throughout levees in the Yolo County Operational Area. Though no levees failed, there was significant sloughing and erosion to levees along the Sacramento River (including RD 1600, 827, 108, and CSA 6), Yolo Bypass

(RD 2035), the Deepwater Ship Channel (RD 900), and Elk Slough (RD 150). Two disaster declarations were issued for Yolo County due to these storms.

Past Occurrences

There have been no disaster declarations related to levee failure in Yolo County, as shown on Table 3-5. The County had no USDA disaster declarations since 2012 related to levee failure, as shown on Table 3-7. There have been no NCDC levee failure events in Yolo County.

Likelihood of Future Occurrence

Likely - Yolo County remains at risk to levee breaches/failures from numerous levees under a variety of ownership and control and of varying ages and conditions. Given the number and types of levees in and around the County, the potential exists for future levee issues in Yolo County. Due to deteriorating conditions on several levees in Yolo County, the probability of a catastrophic levee failure that would impact Yolo County and its jurisdictions is **Likely**: Between 10 percent and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.

Climate Change and Levee Failure

In general, increased flood frequency in California is a predicted consequence of climate change. Mechanisms whereby climate change leads to an elevated flood risk include more extreme precipitation events and shifts in the seasonal timing of river flows. This threat may be particularly significant because recent estimates indicate the additional force exerted upon the levees is equivalent to the square of the water level rise. These extremes are most likely to occur during storm events, leading to more severe damage from waves and floods.

Vulnerability Assessment

Vulnerability – Medium

Levee failure flooding can occur as a result of partial or complete collapse of an impoundment, and often results from prolonged rainfall and flooding. The primary danger associated with dam or levee failure is the high velocity flooding of those properties downstream of the breach. Impacts from this include property damage, critical facility damage, and life safety issues. A levee failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to levee failure is generally 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. Numerous areas of Yolo County are susceptible to levee failure depending on where a breach were to occur. These vulnerabilities are mentioned in the profiles above for each Reclamation District and Local Maintaining Agency.

Levee failure flooding would vary depending on which structure fails and the nature and extent of the failure and associated flooding. This flooding presents a threat to life and property, including buildings, their contents, and their use. Large flood events can affect lifeline utilities (e.g., water, sewerage, and power), transportation, jobs, tourism, the environment, agricultural industry, and the local and regional economies.

The overall impact to the community from levee breach or failure includes:

- Injury and loss of life;
- Commercial and residential structural damage;
- Disruption of and damage to public infrastructure;
- Health hazards associated with mold and mildew;
- Damage to roads/bridges resulting in loss of mobility;
- Negative impact on commercial and residential property values;
- Long dewatering periods;
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.

3.11 WILDFIRE

Although wildfires can occur in any state, they are most common in the Western states including California where heat, drought, and thunderstorms create perfect wildfire conditions. California is recognized as one of the most fire-prone and consequently fire-adapted landscapes in the world. The combination of complex terrain, Mediterranean climate, and productive natural plant communities, along with ample natural and aboriginal ignition sources, has created conditions for extensive wildfires. A wildfire is a fire that occurs in an area of combustible vegetation. The three conditions necessary for a wildfire to burn are fuel, heat, and oxygen. Fuel is any flammable material that can burn, including vegetation, structures, and cars. The more fuel that exists and the drier that fuel is, the more intense the fire can be. Wildland fire is an ongoing concern for the Yolo County Operational Area. Generally, the fire season extends from June through October of each year during the hot, dry months; however, recently the fire season has been nearly year round. Fire conditions arise from a combination of high temperatures, an accumulation of vegetation, low humidity, and high winds. Wildland fires that burn in natural settings with little or no development are part of a natural ecological cycle and may actually be beneficial to the landscape.

Wildfires can be started naturally through lighting or combustion, or can be set by humans. There are many sources of human-caused wildfires including arson, power lines, a burning campfire, an idling vehicle, trains, and escaped controlled burns. On average, four out of five wildfires are started by humans. Uncontrolled wildfires fueled by wind and weather can burn acres of land and everything in their path in mere minutes, and can reach speeds up to 15 miles

per hour. On average, more than 100,000 wildfires burn 4 to 5 million acres of land in the United States every year.

Wildfires are of primary concern when they occur in the Wildland Urban Interface (WUI), which is defined as areas where homes are built near or among lands prone to wildfire. Most structures in the WUI are not destroyed from direct flame impingement, but from embers carried by wind. With continued growth in the WUI throughout California, wildfire risk will only increase.

LOCATION AND EXTENT

Wildfire danger varies throughout Yolo County. The County is characterized by relatively level valley floor landscapes to the south and east; this lack of topography and complex fuels leads to very little severe fire behavior. In the increasingly hilly landscapes rising to the north and west, the rugged topography creates a landscape where fires can spread rapidly upslope and access for suppression equipment is limited. The geographic extent of Wildfires is **Significant** with between 35-50 percent of the operational area potentially affected. A wildfire of 25,000 acres could occur in Yolo County.

To quantify the potential risk from wildfires, the California Department of Forestry and Fire Protection (Cal Fire) has developed a Fire Hazard Severity Scale which uses three criteria in order to evaluate and designate potential fire hazards in wildland areas. The criteria are fuel loading (vegetation), fire weather (winds, temperatures, humidity levels and fuel moisture contents) and topography (degree of slope). According to the Cal Fire wildfire severity map for Yolo County (see Figure 3.40), the western portion of the county, west of Esparto and Winters, is designated as a Very High Fire Severity Zone (VHFSZ).

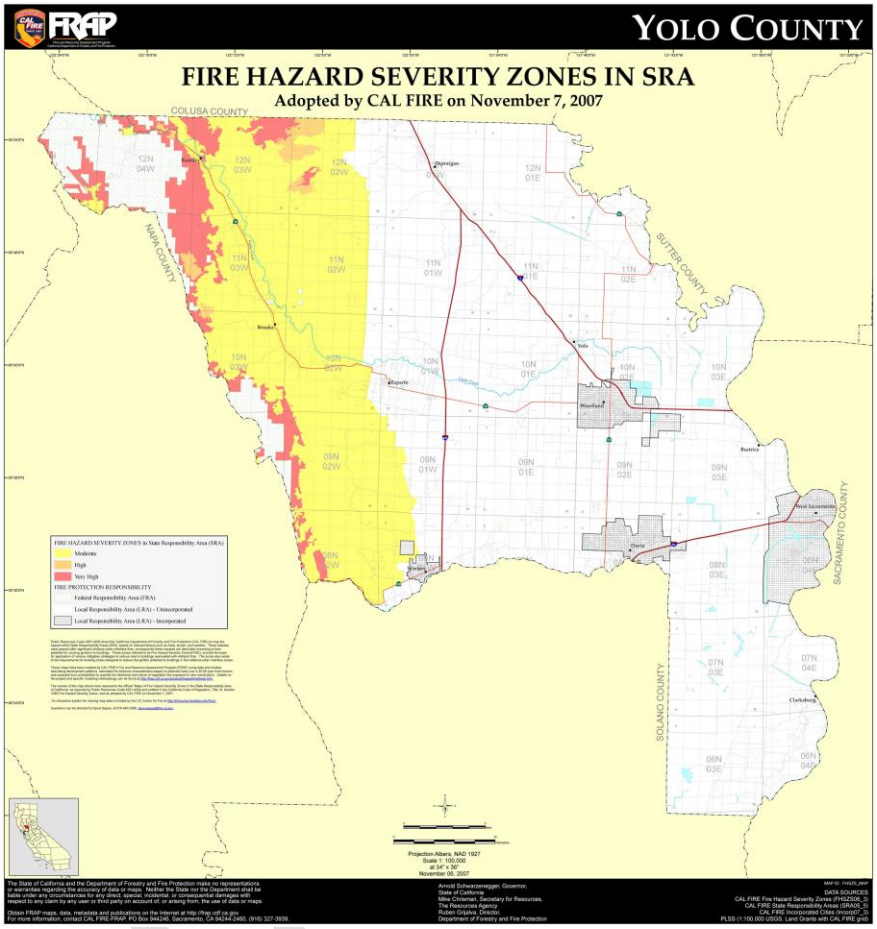


Figure 3.40 – Fire Hazard Severity Zones in Yolo County
Source: CalFire

The VHFSZ in Yolo County is in a State Responsibility Area (SRA), meaning that fire suppression is under the control of the State Department of Forestry and Fire protection (Cal Fire). The U.S.G.S. has also designated these areas as having high wildfire potential (see Figure 3.41) as of 2014. Areas with higher wildfire potential values represent fuels with a higher probability of experiencing extreme fire behavior under conducive weather conditions.

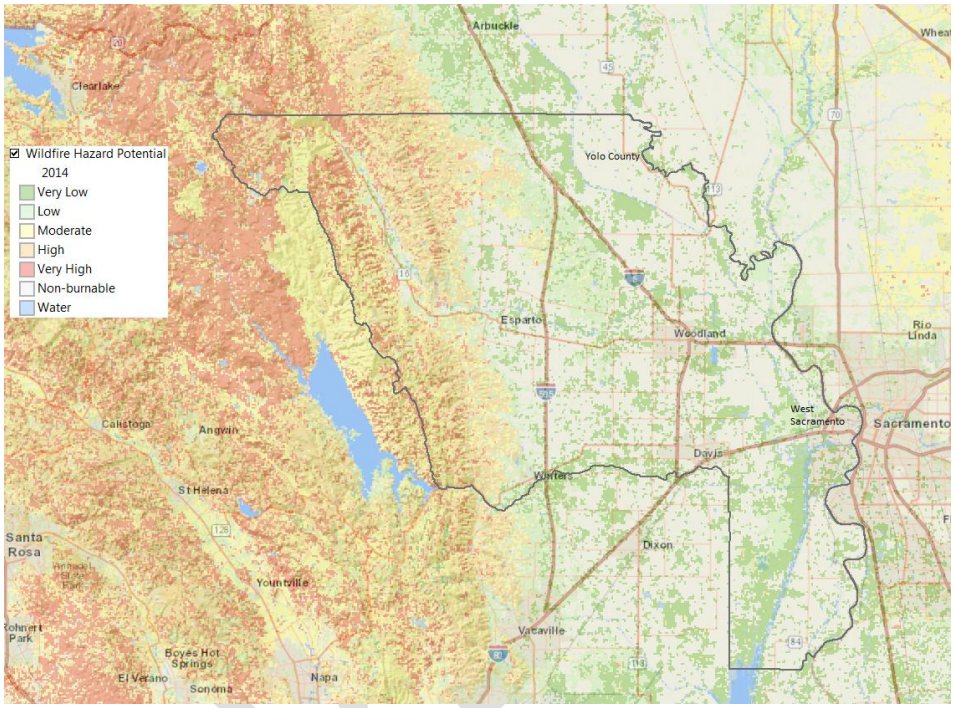


Figure 3.41: Wildfire Potential in Yolo County
Source: USGS

The County and its municipalities fight a large number of vegetation fires, particularly during the summer. These fires tend to occur along major highways and railroads, and usually do not damage structures. However, fires can be exacerbated by hot north winds during periods of extremely low humidity. In addition, if they are fed by dry grass and vegetation they can easily grow out of control. Wildfire can damage structures and facilities, and the County must be prepared for protection from dangerous wildfires, especially in the WUI where urban and non-urban landscapes meet.

Yolo County is located in the Sonoma-Lake-Napa Unit (LNU), one of twenty one (21) California Department of Forestry and Fire Protection (CAL FIRE) administrative units. The Unit was created in 1996 with a merger of the then Sonoma Ranger Unit, and the Lake-Napa Unit. It is comprised of the six counties of Sonoma, Lake, Napa, Yolo, Colusa, and Solano. LNU has primary responsibility for more than 2.3 million acres of CAL FIRE Direct Protection Area (DPA) lands, more than any other unit. It has the third largest population living within CAL FIRE DPA, and ranks the third in average number of annual fires. The Unit is divided into four

divisions and ten field battalions. The boundaries of Sonoma County define the West Division with four battalions. The South Division is defined by Napa County and has three battalions. The North Division encompasses Lake County and has two battalions. The East Division consists of Yolo, Solano, and Colusa Counties and has two battalions.

There are a wide range of fuels in the East Division. Fuels range from agricultural farmland (wheat, safflower, cut stubble), annual grasses, oak woodland, 15 – 50 year old chaparral, large stands of decadent brush and timber in the higher elevations of the battalion. Due to aggressive fire suppression tactics and lack of aggressive wildland fuels management, both the vertical arrangement and horizontal continuity of fuels, have and will promote rapid fire growth. These same conditions will also hinder conventional fire suppression tactics. Critical concerns are when the chaparral dead-to-live ratio exceeds 50%, and live fuel moisture approaches 60% in late summer and early fall. Ten hour fuel moistures average from 4-7, dropping to 3 quite often.

The weather is generally warm and dry in this area during the day with a slight relative humidity recovery at night. If a critical weather pattern exists such as a Foehn North Wind, or a cold front passage, the daily diurnal weather variation will be subdued. If these critical weather patterns align with the topography, expect extreme rates of spread, especially along exposed ridges and through constricted areas. Peak summer day temperatures in Yolo County are generally 95°-105°F, cooling to 50°-60°F at night, with relative humidity ranging between 20% – 35% or less. Gradient winds are generally out of the N/NW 5-10 mph, strengthening in the afternoon with a 10-15 mph wind in the late afternoon diminishing by dark. Strong evening (2100- 0200) winds do occur occasionally in the Capay Valley with normal winds (down slope/down valley) after dark as the flow reverses. There is a Remote Automated Weather Station (Brooks RAWS) located at Brooks Fire Station. The station gives a good indication of current weather conditions. It can be accessed at http://raws.wrh.noaa.gov/roman/.

Elevation within the East Division ranges from 250’ to 3000’ with slopes ranging from 0 – 80%. There are two dominate North/South orientated ridges; Blue Ridge, running from the Yolo/Solano County line north to Rumsey Canyon and Walker Ridge, running from Hwy 20 to central Colusa County. These main ridges keep the coastal influence weather from being a factor. There are also two smaller ridges that can play a significant role to fire spread; Capay Hills and Cortina Ridge. Farmlands, ranches, rural and major roads along with other manmade features provide a network of barriers that will need to be connected to create an effective fire line. Capay Valley and Bear Valley are wide valleys that provide the opportunity for wind to be funneled even under local wind conditions; this situation will be compounded during critical weather conditions.

Most wildfires in Yolo County are quickly contained due to rapid reporting and response, but if this first effort fails, a wild fire can get very big very fast. Such fires can require extensive

firebreaks and/or a weather change for containment. There have been several notable wildfires in Yolo County, particularly since the last plan update. See the Unincorporated Yolo County Community Profile for a map of historical wildfires in Yolo County.

- 09/28-09/30/1999 - The Rumsey Incident was responsible for burning 3,015 acres. Fire suppression costs approached 1 million dollars. Six injuries and zero deaths were reported. The fire threatened structures and closed Highway 16 from Rumsey to Highway 20. Erratic winds and steep terrain prolonged the control process.

- 07/04-07/12/2014 – Monticello Fire: The Monticello Fire was started by fireworks on the southeast shore of Lake Berryessa and burned 6,488 acres before it was fully contained. Five firefighters suffered minor injuries, including heat exhaustion, while fighting the blaze. Erratic wind shifts led to extreme fire behavior during the first few days of the fire, prompting evacuation orders for 40 homes in Golden Bear Estates near Winters. No structures were lost in the fire.

- 07/22-08/05/2015 – Wragg Fire: The Wragg Fire was started by an idling car on State Route 128 near Lake Berryessa. The fire burned 8,051 acres and destroyed two buildings. Parts of Interstate 505 in Yolo County were closed during the fire. Mandatory evacuations were ordered for 136 homes, including Golden Bear Estates near Winters. No injuries were reported.

- 07/29-09/14/2015 – Rocky Fire: The Rocky Fire was started by a faulty gas-powered water heater inside an outbuilding being used for an illegal marijuana grow in Lake County. The fire burned 69,438 acres in Yolo, Lake, and Colusa Counties and destroyed 43 homes and 53 outbuildings. Several hundred people were evacuated in Lake County, but no injuries were reported. Yolo County was considering evacuating the Capay Valley if the fire crested the Blue Ridge Mountains, but it did not. The Rocky Fire eventually merged with the Jerusalem Fire (see below).

- 08/09-08/25/2015 – Jerusalem Fire: The Jerusalem Fire was human caused and burned 25,118 acres in Lake County on the outskirts of Yolo County before it merged with the Rocky Fire. The fire destroyed six homes and 21 outbuildings. Evacuations were ordered in Lake County, but no injuries were reported.

- 08/02-08/11/2016 – Cold Fire: The Cold Fire was a human caused wildfire that burned 5,371 in Yolo County near Lake Berryessa (see Figure 3.42). The fire destroyed two buildings and caused an estimated $100,000 in damage. The Cold Fire burned primarily

in the footprint of the Monticello Fire (see Figure 51). Mandatory evacuations were ordered for Canyon Creek Campground and Golden Bear Estates near Winters.

Figure 3.42: The 2016 Cold Fire
Source: CalFire - NBC Bay Area

- 07/06-07/11/2017 – Winters Fire: The Winters Fire was a human caused wildfire that burned roughly 2,300 acres in the Cold Fire footprint north of State Route 128. The fire did not damage any structures but one firefighter was injured and Golden Bear estates was evacuated for the fourth year in a row.

- 06/08-06/17/2019 - On June 8, conditions were favorable for wildfire growth as relative humidity values fell into the teens and northerly winds gusted up to 25-45 mph. Prior to the start of this event, the local utility company decided to de-energize power lines per CA Public Utility Commissions (CPUC) Public Safety Power Shutoff (PSPS) guidelines. Eventually, a fire did start at 1350PST in Yolo County, which became known as the Sand Fire. There were 2512 acres of land burned over a period of 8 days, along with 7 structures destroyed. The fire also led to road closures from Highway 16 to Highway 20 to the town Brooks in addition to the evacuation of residents living along County Road 41.

- 08/17-08/31/2020 - During mid August, moisture from tropical storm Fausto moved along the coast of southern CA and made landfall over central and northern California. This system, combined with the an oppressive high pressure system that had predominately dry air, caused widespread dry thunderstorms to develop. Thousands of lightning strikes occurred overnight, which combined with the critical dry fuels, led to massive wildfire development. The August, the North, the LNU, and SCU Complexes all

started between August 15 and 17. The LNU Complex started on August 17 and will eventually become contained on October 2, 2020. This fire ends up burning a total of 363, 220 acres, destroying 1491 structures, including an NWS COOP site, and damaging 232 structures, the largest fire recorded in California history. Many evacuations occurred, including larger sized populations such as Fairfield, Vacaville, and Travis Air force Base. Yolo County was also affected by the fires and had evacuations and road closures. Multiple road closures happened as well, including Interstate 80 for a brief period. Per the last CalFire incident update, 6 injuries occurred, 4 were first responder and 2 were civilian. The fires burned caused significant damage over the area. The SCU Complex finally becomes fully contained on October 1, 2020

Though larger wildfires occur in the mountainous terrain of Yolo County, grass fires in the valley are more common and can cause significant damages to structures and agricultural lands:

On November 4th, 2013, a 200 acre grass fire burned near Esparto causing concern for local residents but no structures were destroyed.

On August 14th, 2014, a 369 acre grass fire burned near Winters after a car crashed into a field. No structures were threatened and no evacuations were ordered.

A grass fire that occurred in Duningan on June 20, 2016, destroyed a home and burned property near a vineyard. A grass fire in Woodland on the same day burned several hay bales.

The most destructive wildfire in Yolo County occurred in October 2006 when 11,000 acres of rangeland burned, destroying six vehicles, and damaging three to four houses plus 15 barns and outbuildings. More than 300 animals, mainly sheep, had to be put down as a result of injuries suffered when the fire roared across their pasture. The total animal death toll is estimated to top 500. No human lives were lost.

PAST OCCURRENCES

Yolo County has had three Federal and two state disaster declarations from fire events and fire risk events, as shown in Table 3-27. The County has also had six USDA disaster declarations since 2012 related to wildfire and high fire risks.

Table 3-27: Yolo County State and Federal Disaster Declarations, 1965-2023

Year	Disaster Name	Disaster Type	Disaster #	State Declaration #	Federal Declaration #
2013	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3569	8/21/2013	-
2014	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3637	1/23/2014	-

2014	Extreme Heat, High Winds, High Fire Risk	Drought- FAST TRACK	USDA Contiguous S3626	1/15/2014	-
2015	Wragg fire	Fire	FM-5091-CA	-	7/23/2015
2015	Extreme Heat, High Winds, High Fire Risk	Drought – FAST TRACK	USDA Primary S3784	2/4/2015	
2016	Extreme Heat, High Winds, High Fire Risk	Drought- FAST TRACK	S3952	USDA Primary 2/17/2016	
2020	LNU lightning fire complex	Fire	FM-5331-CA	8/18/2020	8/18/2020
2020	Wildfires	Fire	DR-4558-CA	8/22/2020	8/22/2020
2020	Wildfires	Fire	DR-4569-CA	USDA Contiguous 10/16/2020	-

** Data from Table 3-5: Yolo County State and Federal Disaster Declarations, 1965-2023. All years that did not have wildfire or high fire risk declarations were removed.*

The NCDC data showed 6 wildfire events for Yolo County since 1950, with two deaths, eight individuals injured and $500,000 in property damage. (see Table 3-28 below).

Table 3-28: NCDC's Severe Weather Events for Yolo County 1950-2/23/2023*

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage
Wildfire	6	2	8	$500,000	$0
Totals:	6	2	8	$500,000	$0

**Data from Table 3-6: NCDC's Wildfire events for Yolo County 1950-2/23/2023. All other event types were removed.*

LIKELIHOOD OF FUTURE OCCURRENCE

Highly Likely - The probability of future occurrences in the next 100 years is **Highly Likely:** Near 100 percent chance of occurrence next year or happens every year**.** Wildfires have a higher chance of occurrence from May to October when the weather is warmer and drier.

CLIMATE CHANGE AND WILDFIRE

Warmer temperatures cause early runoff, which leads to longer and drier summer conditions, thus resulting in wildfires of greater frequency and duration. Hotter weather increases the incidence of lightning, which is the primary cause of wildfires in the United States. In addition, the increased prevalence of dry conditions provides greater opportunities for arson, which is another source of wildfire. Much of the coast range hills of Yolo County are considered to have a moderate to high risk of wildfire. Wildfire is a potentially significant risk to public health and safety. In addition to direct safety risks, wildfires can lead to immediate and long- term adverse public health problems due to smoke exposure. During wildfires, large populations can be exposed to a complex mixture of pollutant gases and particles, which can have both acute and

chronic health effects. Smoke can irritate the eyes, harm the respiratory system, and worsen chronic heart and lung diseases, including asthma. People with existing cardiopulmonary diseases are generally at the greatest risk from smoke inhalation, with age being a complicating risk factor for the exposed population.

VULNERABILITY ASSESSMENT

Vulnerability – High

The mountainous areas of the County are most vulnerable to a large wildfire. While these areas are mostly unpopulated, the Capay Valley and the City of Winters are susceptible. Highway infrastructure, power lines, and public use facilities (including campgrounds) along State Routes 16 and 128 are vulnerable to a wildfire. Cities and communities throughout the valley portion of the County can become susceptible to large grass fires, which can burn homes and businesses. Populated highway corridors, particularly State Route 113 in Davis, are vulnerable to a grass fire.

In Yolo County, there are very few homes and structures located in the mountainous areas where large wildfires typically occur. The primary impacts in these areas would be to outbuildings, campgrounds and day use areas along State Route 16 in the Cache Creek Canyon as well as along State Route 128. There are several small communities in Yolo County located in the WUI, including the Capay Valley towns of Rumsey, Guinda, Brooks, and Capay. Should a wildfire start in the Blue Ridge Mountains, these areas could potentially be impacted and evacuations may be required. Homes and businesses could be lost, and there could be damages to vineyards and other agricultural areas. The City of Winters is also located close to the WUI. With the right wind conditions, a wildfire could potentially impact residents on the western side of the city and result in damaged or destroyed structures and evacuations. The business district of the city is located well enough away from the WUI that it should not be impacted. The community of Golden Bear Estates, which has been evacuated in three previous wildfires, is located directly in the WUI. A wildfire could burn through this area and result in the loss of homes and property. A grass fire located in the valley of Yolo County could burn through agricultural land, and could affect crops as well as animals. Grass fires also have the potential to destroy homes and other structures, as has occurred previously in Yolo County. Impacts to infrastructure from a wildfire in Yolo County would consist mainly of damage to power lines. A secondary impact from wildfires is smoke, which could affect breathing of certain at risk populations throughout the County.

Smoke and air pollution from wildfires can be a severe health hazard. Significant wildfires occurring in nearby counties since the 2018 HMP have created significant air pollution affecting area residents. County residents have had to breathe wildfire smoke, from fires both within and

outside of the County. Smoke from wildfires is made up of gas and particulate matter, which can be easily observed in the air. Air quality standards have been established to protect human health with the pollutant referred to as PM2.5 which consists of particles 2.5 microns or less in diameter. These smaller sizes of particles are responsible for adverse health effects because of their ability to reach the lower regions of the respiratory tract.

Wildfire and Power Shortage/PSPS

During periods of wildfire (or during periods of elevated risk due to high temperatures, low humidity, and high winds), PSPS events may be declared in the County. More information and power shortage and failure can be found at the beginning of Section 3.2.3.

3.12 PARTICIPATION IN THE NATIONAL FLOOD INSURANCE PROGRAM

Commented [SH8]: Needs to get updated

Despite the construction of massive and relatively effective flood control projects, California remains vulnerable to flooding. A rise in population and development contribute to increased flood risk throughout the state. Yolo County (including all special districts) and the cities of Davis, Winters, West Sacramento and Woodland participate in the program. Yolo County has 434 square miles, 256,571 acres and 5,423 individual parcels of floodplain defined by the Federal Emergency Management Agency (FEMA) and the County of Yolo. The regulated floodplain areas are subject to flooding during severe storms. The Yolo County Flood Insurance Rate Maps (FIRM) was first published in 1980 and has been revised over time, mapping Special Flood Hazard Areas (SFHA). Yolo County also has an adopted comprehensive Floodplain Management Program. The jurisdictions participation in the National Flood Insurance Program (NFIP) is shown in the table below.

To address participation and continued compliance with the NFIP the participating jurisdictions will continue to enforce and adopt floodplain management requirements, regulate new construction in special flood hazard areas, update maps for better identification of floodplains and floodplain management programs and activities.

Table 3-29: Yolo County Communities Participating in the National Flood Insurance Program

CID#	Community Name	FHBM Identified	FIRM Identified	Current Effective Map Date	Reg-Emer Date	Tribal
060424	City of Davis	11/08/77	11/15/79	06/18/10	11/15/79	No
060728	City of West Sacramento	-	03/05/90	01/19/95	03/13/90	No
060425	City of Winters	01/23/74	12/01/78	06/18/10	12/01/78	No
060426	City of Woodland	02/01/74	10/16/79	05/16/12	10/16/70	No
060423	Yolo County	10/18/77	12/16/80	05/16/12	12/16/80	No

Source: Data obtained from FEMA Community Status Book Report: fema.gov/cis/CA.html

Given the flood hazard throughout Yolo County, an emphasis will be placed on continued compliance with the NFIP and participation by Yolo County and the City of West Sacramento in the Community Rating System. Other cities are encouraged to begin participating in the CRS. Detailed below is a description of the County's flood management program to ensure continued compliance with the NFIP. Also to be considered are the numerous flood mitigation actions contained in this plan that support the ongoing efforts by the county and the cities to minimize the risk and vulnerability of the community to the flood hazard and to enhance their overall floodplain management programs.

Yolo County has participated in the NFIP since December 16, 1980. Since then, the County has administered floodplain management regulations that meet the minimum requirements of the NFIP. Under that arrangement, residents and businesses paid the same flood insurance premium rates as most other communities in the country. In compliance with the NFIP, Yolo County adopted a Floodplain Management Ordinance (Title 8 Land Development & Zoning, Chapter 3 Flood Damage Prevention). Yolo County has participated in CRS since 2012. The activities credited by the CRS provide direct benefits to Yolo County and its residents, including:

- Enhanced public safety
- A reduction in damage to property and public infrastructure
- Avoidance of economic disruption and losses
- Reduction of human suffering
- Protection of the environment

Contained in the table below is the NFIP policy and claims statistics for Yolo County as of March 2013. The NFIP claims statistics are historical back to 1982/1983 when NFIP started collecting this data.

Table 3-30: Yolo County NFIP Claims Statistics, March 2013

Community	Total Premium	Current Policies	Total Coverage	Flood Losses	Dollars Paid Historical
Davis	$234,692	304	$94,104	11	$189,021
West Sacramento	$1,125,568	2,117	$678,840	35	$28,179
Winters	$27,315	26	$7,891	5	$8,844
Woodland	$1,412,284	1,233	$346,208	5	$67,520
Unincorporated Areas	$966,689	1,112	$273,037	194	$2,275,154
Totals	**$3,766,548**	**4,792**	**$1,400,080**	**250**	**$2,568,718**

City of Davis

In compliance with the NFIP, the City of Davis adopted Article 8.05 FLOOD PREVENTION of the City of Davis Municipal Code. An emphasis in future planning and mitigation actions will be placed on continued compliance with the NFIP.

City of West Sacramento

The City of West Sacramento has been in the NFIP since the City incorporated in 1987, and prior to incorporation was in the NFIP as part of Yolo County. The City began participation in the CRS in 2010, receiving a Class 8 rating in 2011. The City maintains a Class 6 rating today. An emphasis in future planning and mitigation actions will be placed on continued compliance with the NFIP as well as the CRS

City of Winters

The City of Winters participates in the NFIP. The intent of the program is to reduce future flood losses through local floodplain management and to provide protection for property owners against potential losses through flood insurance. As part of the agreement for making flood insurance available in the community, the NFIP required the City of Winters to adopt a floodplain management ordinance containing certain minimum requirements intended to reduce future flood losses.

On March 1, 1994, the City Council of the City of Winters adopted Ordinance 94-04, which included floodplain management regulations. Specifically, the purpose of the ordinance was to promote the public health, safety, and general welfare, and to minimize public and private losses to flood conditions in specific areas of the City.

On September 28, 2009, Winters city staff met with a representative from the Federal Emergency Management Agency (FEMA) for a "Community Assistance Visit." The purpose of the meeting was to provide City staff with the most current information on the NFIP, give staff an opportunity to discuss concerns regarding floodplain management, and assess the City's enforcement of the local floodplain management ordinance that was adopted to meet the requirements of the NFIP.

The FEMA visit resulted in the determination that it was necessary to amend the City's Flood Damage Protection chapter of the municipal code to reflect changes to the NFIP and to clarify some of the requirements. To bring the City into compliance with the NFIP the City Council of the City of Winters adopted Ordinance 2010-03 on March 31, 2010 amending Chapter 15.64 of the Winters Municipal Code regarding flood damage protection.

City of Woodland

The City of Woodland continues to enforce the compliance with the NFIP through their Flood Plain Management Ordinance. However, as in much of California, FEMA is working with local

governments to refine and remap the floodplains. These changes to flood mapping and zoning in Woodland may result in additional properties needing to be insured and evaluated in future plans.

3.13 Repetitive Loss and Severe Repetitive Loss Properties

Commented [SH9]: Update

Table 3-31 shows the Repetitive Loss and Severe Repetitive Loss Properties in Yolo County including the cities as of 2017. There are a total of **32** properties and of these properties countywide, all are residential.

Yolo County RL and SRL Property Information*				
Jurisdiction	Number of RLP's	RLP Total Payouts	Number of SRL's	SRL Total Payouts
Yolo County**	34	$1,432,329.80	0	$0
Davis, City of	3	$80,350.20	0	$0
West Sac, City of	1	$3,759.64	0	$0
Winters, City of	0	$0	0	$0
Woodland, City of	0	$0	2	$219,546.40

Table 3-31: Repetitive and Severe Repetitive Loss Properties in Yolo County

SECTION 4.0 CAPABILITY ASSESSMENT

The planning process identifies the hazards prosing a threat to Yolo County Operational area and described, in general, the vulnerability of the Operational area to these risks. The next step is to assess what loss prevention mechanisms are in place, through the hazard mitigation Capability Assessment. The Capability Assessment helps determine the ability of a jurisdiction to implement a comprehensive mitigation strategy, and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects. As in any planning process, it is important to establish the feasible goals and actions, based on an understanding of the organizational capacity of the agencies or departments tasked with their implementation.

The Capability Assessment is a tool used in determining which mitigation actions are practical and likely to be implemented over time based on local government's existing authorities, policies, programs, and resources available to support such implementation. The combination of the hazard risk assessment with the capability assessment results in the Operational-area's vulnerability to disasters, and more accurately focuses the goals, objectives, and proposed actions of this plan. The capability assessment has three parts:

1. Analysis of federal and state laws, ordinances, plans, and programs that can support or impact hazard mitigation actions
2. An inventory of jurisdictional plans, ordinances, programs, technical studies, or activities already in place and their relevancy to hazard mitigation
3. An analysis of a jurisdiction's current capacity and resources to carry out relevant plans, ordinances, programs, and activities related to hazard mitigation.

The capability assessment helps to detect existing gaps, shortfalls, or weaknesses that could hinder proposed mitigation activities or exacerbate hazard vulnerability. The Capability Assessment also highlights any mitigation measures already in place or being implemented at the local government level, which should be leveraged, and continue to be supported and enhanced, through applicable future mitigation efforts.

The capability assessment serves as a critical part of the planning process and helps identify and target meaningful mitigation actions for incorporation into the Mitigation strategy. It helps establish the operational-area and jurisdiction-specific mitigation goals and ensures that the goals and mitigation actions that follow are realistically achievable given current local conditions.

4.1 INCORPORATION OF EXISTING PLANS, STUDIES, REPORTS, AND TECHNICAL INFORMATION

Existing laws, ordinances, plans and programs at the federal, state, and local level can support or impact hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and

technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). The following federal and state programs have been identified as programs that may interface with the actions identified in this plan. Each program enhances capabilities to implement mitigation actions or has a nexus with a mitigation action in this plan. Information presented in this section can be used in review local capabilities to implement the actions found in the jurisdictional annexes.

Each planning partner individually reviews existing local plans, studies, reports, and technical information in it's jurisdictional annex.

4.1.1 FEDERAL

Disaster Mitigation Act

The DMA is the current federal legislation addressing hazard mitigation planning. It emphasizes planning for disasters before they occur. It specifically addresses planning at the local level, requiring plans to be in place before Hazard Mitigation Assistance grant funds are available to communities. This plan is designed to meet the requirements of DMA, improving eligibility for future hazard mitigation funds.

National Incident Management System

The National Incident Management System (NIMS) is a systematic approach for government, nongovernmental organizations, and the private sector to work together to manage incidents involving hazards. The NIMS provides a flexible but standardized set of incident management practices. Incidents typically begin and end locally, and they are managed at the lowest possible geographical, organizational, and jurisdictional level. In some cases, success depends on the involvement of multiple jurisdictions, levels of government, functional agencies, and emergency responder disciplines. These cases necessitate coordination across a spectrum of organizations.

Communities using NIMS follow a comprehensive national approach that improves the effectiveness of emergency management and response personnel across the full spectrum of potential hazards (including natural hazards, terrorist activities, and other human-caused disasters) regardless of size or complexity. Although participation is voluntary, Federal departments and agencies are required to make adoption of NIMS by local and state jurisdictions a condition to receive Federal Preparedness grants and awards.

Community Development Block Grant Disaster Resilience Program

In response to disasters, Congress may appropriate additional funding for the US Department of Housing and Urban Development Community Development Block Grant programs to be distributed as Disaster Recovery grants (CDBG-DR). These grants can be used to rebuild affected areas and provide seed money to start the recovery process. CDBG-DR assistance may fund a broad range of recovery activities, helping communities that otherwise might not recover due to limited resources. CDBG-DR grants often supplement disaster programs of the Federal

Emergency Management Agency, the Small Business Administration, and the US Army Corps. Housing and Urban Development generally awards noncompetitive, nonrecurring CDBG-DR grants by a formula that considers disaster recovery needs unmet by other disaster assistance programs. CDGB-DR funding is a potential alternative source of funding for actions identified in this plan.

To be eligible for CDBG-DR funds, projects must meet the following criteria:

- Address a disaster-related impact (direct or indirect) in a presidentially declared county for the covered disaster
- Be a CDBG-eligible activity (according to regulations and waivers)
- Meet a national objective. Incorporating preparedness and mitigation into these actions is encouraged, as the goal is to rebuild in ways that are safer and stronger.

Emergency Watershed Program

The USDA Natural Resources Conservation Service (NRCS) administers the Emergency Watershed Protection (EWP) Program, which responds to emergencies created by natural disasters. Eligibility for assistance is not dependent on a national emergency declaration. The program is designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences. EWP is an emergency recovery program. This federal program could be a possible funding source for actions identified in this plan. Financial and technical assistance are available for the following activities:

- Removing debris from stream channels, road culverts, and bridges
- Reshaping and protect eroded banks
- Correcting damaged drainage facilities
- Establishing cover on critically eroding lands
- Repairing levees and structures
- Repairing conservation practices

Emergency Relief for Federally Owned Roads Program

The US Forest Service's Emergency Relief for Federally Owned Roads Program was established to assist federal agencies with repair or reconstruction of tribal transportation facilities, federal lands transportation facilities, and other federally owned roads that are open to public travel and have suffered serious damage by a natural disaster over a wide area or by a catastrophic failure. The program funds both emergency and permanent repairs. Eligible activities under this program meet some of the goals and objectives for this plan and the program is a possible funding source for actions identified in this plan.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) provides federally backed flood insurance in exchange for communities enacting floodplain regulations. Participation and good standing under NFIP are prerequisites to grant funding eligibility under the Robert T. Stafford Act. Monterey County and all of the municipal planning partners participate in the NFIP and have adopted regulations that meet the NFIP requirements. At the time of the preparation of this plan, all participating jurisdictions were in good standing with NFIP requirements. Full compliance and good standing under the NFIP are application prerequisites for all FEMA grant programs for which participating jurisdictions are eligible under this plan.

Presidential Executive Orders 11988 and 13690

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. It requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values of floodplains. The requirements apply to the following activities:

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

Executive Order 13690 expands Executive Order 11988 and acknowledges that the impacts of flooding are anticipated to increase over time due to the effects of climate change and other threats. It mandates a federal flood risk management standard to increase resilience against flooding and help preserve the natural values of floodplains. This standard expands management of flood issues from the current base flood level to a higher vertical elevation and corresponding horizontal floodplain. The goal is to address current and future flood risk and ensure that projects funded with taxpayer dollars last as long as intended. All actions identified in this plan will seek full compliance with all applicable presidential executive orders.

The Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs over the last decade has included a shift from a program-byprogram, source-by-source, and pollutant-by-pollutant approach to more holistic watershedbased strategies. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues is addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

The CWA is important to hazard mitigation in several ways. There are often permitting requirements for any construction within 200 feet of water of the United States, which may have implications for mitigation projects identified by a local jurisdiction. Additionally, CWA requirements apply to wetlands, which serve important functions related to preserving and protecting the natural and beneficial functions of floodplains and are linked with a community's floodplain management program.

Finally, the National Pollutant Discharge Elimination System is part of the CWA and addresses local stormwater management programs. Stormwater management plays a critical role in hazard mitigation by addressing urban drainage or localized flooding issues within jurisdictions. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Presidential Executive Order 11990

Executive Order 11990 requires federal agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. The requirements apply to the following activities:

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing. All actions identified in this plan will seek full compliance with all applicable presidential executive orders.

Endangered Species Act

The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered.

Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species and contains exceptions and exemptions. It is the enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Criminal and civil penalties are provided for violations of the ESA and the Convention. Federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the ESA's purposes.

The ESA defines three fundamental terms:

- Endangered means that a species of fish, animal or plant is "in danger of extinction throughout all or a significant portion of its range." (For salmon and other vertebrate species, this may include subspecies and distinct population segments.)
- Threatened means that a species "is likely to become endangered within the foreseeable future." Regulations may be less restrictive for threatened species than for endangered species.
- Critical habitat means "specific geographic areas that are essential for the conservation and management of a listed species, whether occupied by the species or not."

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires federal agencies to consider the environmental impacts of proposed actions and reasonable alternatives to those actions, alongside technical and economic considerations. NEPA established the Council on Environmental Quality (CEQ), whose regulations (40 CFR Parts 1500-1508) set standards for NEPA compliance. Consideration and decision-making regarding environmental impacts must be documented in an environmental impact statement or environmental assessment.

Environmental impact assessment requires the evaluation of reasonable alternatives to a proposed action, solicitation of input from organizations and individuals that could be affected, and an unbiased presentation of direct, indirect, and cumulative environmental impacts. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) seeks to prevent discrimination against people with disabilities in employment, transportation, public accommodation, communications, and government activities. Title II of the ADA deals with compliance with the Act in emergency

management and disaster-related programs, services, and activities. It applies to state and local governments as well as third parties, including religious entities and private nonprofit organizations.

The ADA has implications for sheltering requirements and public notifications. During an emergency alert, officials must use a combination of warning methods to ensure that all residents have all necessary information. Those with hearing impairments may not hear radio, television, sirens, or other audible alerts, while those with visual impairments may not see flashing lights or other visual alerts. Two technical documents for shelter operators address physical accessibility needs of people with disabilities, as well as medical needs and service animals. The ADA intersects with disaster preparedness programs in regard to transportation, social services, temporary housing, and rebuilding. Persons with disabilities may require additional assistance in evacuation and transit (e.g., vehicles with wheelchair lifts or paratransit buses).

Evacuation and other response plans should address the unique needs of residents. Local governments may be interested in implementing a special-needs registry to identify the home addresses, contact information, and needs for residents who may require more assistance. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Civil Rights Act of 1964

The Civil Rights Act of 1964 prohibits discrimination based on race, color, religion, sex, or nation origin and requires equal access to public places and employment. The Act is relevant to emergency management and hazard mitigation in that it prohibits local governments from favoring the needs of one population group over another. Local government and emergency response must ensure the continued safety and well-being of all residents equally, to the extent possible. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Army Corps of Engineers Programs

The US Army Corps of Engineers has several civil works authorities and programs related to flood risk and flood hazard management. The Floodplain Management Services program offers 100-% federally funded technical services such as development and interpretation of site-specific data related to the extent, duration, and frequency of flooding. Special studies may be conducted to help a community understand and respond to flood risk. These may include flood hazard evaluation, flood warning and preparedness, or flood modeling.

For more extensive studies, the Army Corps offers a cost-shared program called Planning Assistance to States and Tribes. Studies under this program generally range from $25,000 to

$100,000 with the local jurisdiction providing 50% of the cost. The Army Corps has several costshared programs (typically 65% federal and 35% non-federal) aimed at developing, evaluating, and implementing structural and non-structural capital projects to address flood risks at specific locations or within a specific watershed, including:

- The Continuing Authorities Program for smaller-scale projects includes Section 205 for Flood Control, with a $7 million federal limit and Section 14 for Emergency Streambank Protection with a $1.5 million federal limit. These can be implemented without specific authorization from Congress.
- Larger scale studies, referred to as General Investigations, and projects for flood risk management, for ecosystem restoration or to address other water resource issues, can be pursued through a specific authorization from Congress and are cost-shared, typically at 65% federal and 35% nonfederal.
- Watershed management planning studies can be specifically authorized and are cost-shared at 50% federal and 50% non-federal.

The Army Corps also provides emergency response assistance during and following natural disasters. Public Law 84-99 enables the Corps to assist state and local authorities in flood fight activities and cost share in the repair of flood protective structures. The Flood Control and Coastal Emergency Act establishes an emergency fund for preparedness for emergency response to natural disasters; for flood fighting and rescue operations; for rehabilitation of flood control and hurricane protection structures. Funding for the Army Corps emergency response under this authority is provided by Congress through the annual Energy and Water Development Appropriation Act. Disaster preparedness activities include coordination, planning, training and conduct of response exercises with local, state, and federal agencies.

Under PL 84-99, the Army Corps can supplement state and local entities in flood fighting urban and other non-agricultural areas under certain conditions (Engineering Regulation 500-1-1 provides specific details). All flood fight efforts require a project cooperation agreement signed by the public sponsor and the sponsor must remove all flood fight material after the flood has receded. PL 84-99 also authorizes emergency water support and drought assistance in certain situations and allows for “advance measures” assistance to prevent or reduce flood damage conditions of imminent threat of unusual flooding.

Under PL 84-99, an eligible flood protection system can be rehabilitated if damaged by a flood event. The flood system would be restored to its pre-disaster status at no cost to the federal system owner, and at 20% cost to the eligible non-federal system owner. All systems considered eligible for PL 84-99 rehabilitation assistance have to be in the Rehabilitation and Inspection Program prior to the flood event. Acceptable operation and maintenance by the public levee sponsor are verified by levee inspections conducted by the Corps on a regular basis. The Corps has the responsibility to coordinate levee repair issues with interested federal, state, and local

agencies following natural disaster events where flood control works are damaged. All of these authorities and programs are available to the planning partners to support any intersecting mitigation actions.

4.1.2 STATE

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was enacted in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. The Alquist-Priolo Earthquake Fault Zoning Acts main purpose is to prevent construction of buildings used for human occupancy on the surface trace of active faults. Before a new project is permitted, cities and counties require a geologic investigation to demonstrate that proposed buildings will not be constructed on active faults. The act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards, such as liquefaction or seismically induced landslides.

The law requires the State of California Geologist to establish regulatory zones around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. All seismic hazard mitigation actions identified in this plan will seek full compliance with the Alquist-Priolo Earthquake Fault Zoning Act.

California General Planning Law

California state law requires that every county and city prepare and adopt a comprehensive long-range plan to serve as a guide for community development. The general plan expresses the community's goals, visions, and policies relative to future land uses, both public and private. The general plan is mandated and prescribed by state law (Cal. Gov. Code §65300 et seq.) and forms the basis for most local government land use decision-making.

The plan must consist of an integrated and internally consistent set of goals, policies, and implementation measures. In addition, the plan must focus on issues of the greatest concern to the community and be written in a clear and concise manner. City and county actions, such as those relating to land use allocations, annexations, zoning, subdivision and design review, redevelopment, and capital improvements, must be consistent with the plan. All municipal planning partners to this plan have general plans that are currently compliant with this law and have committed to integrating this mitigation plan with their general plans through provisions referenced below (AB-2140 and SB-379).

California Environmental Quality Act

The California Environmental Quality Act (CEQA) was passed in 1970, shortly after the federal government enacted the National Environmental Policy Act, to institute a statewide policy of

environmental protection. CEQA requires state and local agencies in California to follow a protocol of analysis and public disclosure of the potential environmental impacts of development projects. CEQA makes environmental protection a mandatory part of every California state and local agency's decision-making process.

CEQA establishes a statewide environmental policy and mandates actions all state and local agencies must take to advance the policy. Jurisdictions conduct analysis of the project to determine if there are potentially significant environmental impacts, identify mitigation measures, and possible project alternatives by preparing environmental reports for projects that requires CEQA review. This environmental review is required before an agency acts on any policy, program, or project.

Yolo County has determined that this plan update is categorically exempt from the formal CEQA protocol. The County will initiate the formal CEQA protocol on any project recommended in this plan that requires adherence to this protocol at the initiation of the project. Any project action identified in this plan will seek full CEQA compliance upon implementation.

California Disaster Assistance Act

The California Disaster Assistance Act (CDAA) authorizes the Director of the California Governor's Office of Emergency Services (Cal OES) to administer a disaster assistance program that provides financial assistance from the state for costs incurred by local governments as a result of a disaster event. Funding for the repair, restoration, or replacement of public real property damaged or destroyed by a disaster is made available when the Director concurs with a local emergency proclamation requesting state disaster assistance.

The program also provides for the reimbursement of local government costs associated with certain emergency activities undertaken in response to a state of emergency proclaimed by the Governor. In addition, the program may provide matching fund assistance for cost sharing required under federal public assistance programs in response to a Presidential Major Disaster or Emergency Declaration. The implementing regulations for CDAA can be found in Title 19 of the California Code of Regulations, Chapter 6.

Assembly Bill 162: Flood Planning

This California State Assembly Bill passed in 2007 requires cities and counties to address flood-related matters in the land use, conservation, and safety and housing elements of their general plans. The land use element must identify and annually review the areas covered by the general plan that are subject to flooding as identified in floodplain mapping by either FEMA or the state Department of Water Resources (DWR). During the next revision of the housing element on or after January 1, 2009, the conservation element of the general plan must identify rivers, creeks,

streams, flood corridors, riparian habitat, and land that may accommodate floodwater for the purpose of groundwater recharge and stormwater management.

The safety element must identify information regarding flood hazards, including:

- Flood hazard zones
- Maps published by FEMA, DWR, the US Army Corps of Engineers, the Central Valley Flood Protection Board, and the Governor's Office of Emergency Services (Cal OES)
- Historical data on flooding
- Existing and planned development in flood hazard zones

The general plan must establish goals, policies, and objectives to protect from unreasonable flooding risks, including:

- Avoiding or minimizing the risks of flooding new development
- Evaluating whether new development should be located in flood hazard zones
- Identifying construction methods to minimize damage

AB 162 establishes goals, policies, and objectives to protect from unreasonable flooding risks. It establishes procedures for the determination of available land suitable for urban development, which may exclude lands where FEMA or DWR has concluded that the flood management infrastructure is not adequate to avoid the risk of flooding.

Assembly Bill 2140: General Plans—Safety Element

This bill provides that the state may allow for more than 75% of public assistance funding under the California Disaster Assistance Act only if the local agency is in a jurisdiction that has adopted a local hazard mitigation plan as part of the safety element of its general plan. The local hazard mitigation plan needs to include elements specified in this legislation. In addition, this bill requires Cal OES to give preference for federal mitigation funding to cities and counties that have adopted local hazard mitigation plans. The intent of the bill is to encourage cities and counties to create and adopt hazard mitigation plans.

Assembly Bill 70: Flood Liability

This bill provides that a city or county may be required to contribute a fair and reasonable share to compensate for property damage caused by a flood to the extent that it has increased the state's exposure to liability for property damage by unreasonably approving new development in a previously undeveloped area that is protected by a state flood control project, unless the city or county meets specified requirements.

Assembly Bill 32: The California Global Warming Solutions Act

This bill identifies the following potential adverse impacts of global warming:

- Exacerbation of air quality problems

- Reduction in the quality and supply of water to the state from the Sierra snowpack
- A rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment
- An increase in the incidences of infectious diseases, asthma, and other human health-related problems

AB 32 establishes a state goal of reducing greenhouse gas emissions to 1990 levels by 2020 (a reduction of approximately 25% from forecast emission levels), with further reductions to follow. The law requires the state Air Resources Board to establish a program to track and report greenhouse gas emissions, approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions from sources of greenhouse gas emissions, adopt early reduction measures to begin moving forward, and adopt, implement, and enforce regulations, including market mechanisms such as "cap and-trade" programs, to ensure that the required reductions occur. The Air Resources Board has adopted a statewide greenhouse gas emissions limit and an emissions inventory, along with requirements to measure, track, and report greenhouse gas emissions by the industries it determined to be significant sources of greenhouse gas emissions.

Senate Bill 97: Guidelines for Greenhouse Gas Emissions

Senate Bill 97, enacted in 2007, amends CEQA to clearly establish that greenhouse gas emissions and the effects of greenhouse gas emissions are appropriate subjects for CEQA analysis. It directs the Governor's Office of Planning and Research to develop draft CEQA guidelines for the mitigation of greenhouse gas emissions or their effects by July 2009 and directs the California Natural Resources Agency to certify and adopt the CEQA Guidelines by January 1, 2010.

Senate Bill 1241: General Plans: Safety Element—Fire Hazard Impacts

In 2012, Senate Bill 1241 was enacted, requiring that all future General Plans address fire risk in state responsibility areas and very high fire hazard severity zones in their safety element. In addition, the bill requires cities and counties to make certain findings regarding available fire protection and suppression services before approving a tentative map or parcel map.

Senate Bill 1000: General Plan Amendments—Safety and Environmental Justice Elements

In 2016, Senate Bill 1000 amended California's Planning and Zoning Law in two ways. The original law established requirements for initial revisions of general plan safety elements to address flooding, fire, and climate adaptation and resilience. It also required subsequent review and revision as necessary based on new information. Senate Bill 1000 specifies that the subsequent reviews and revision based on new information are required to address only flooding and fires (not climate adaptation and resilience).

Additionally, Senate Bill 1000 adds a requirement that, upon adoption or revision of any two other general plan elements on or after January 1, 2018, an environmental justice element be adopted for the general plan or environmental justice goals, policies and objectives be incorporated into other elements of the plan.

Senate Bill 379: General Plans: Safety Element—Climate Adaptation

Senate Bill 379 builds upon the flood planning inclusions into the safety and housing elements and the hazard mitigation planning safety element inclusions in general plans outlined in AB 162 and AB 2140, respectively. SB 379 focuses on a new requirement that cities and counties include climate adaptation and resiliency strategies in the safety element of their general plans beginning January 1, 2017. In addition, this bill requires general plans to include a set of goals, policies and objectives, and specified implementation measures based on the conclusions drawn from climate adaptation research and recommendations.

This update process for this hazard mitigation plan was conducted with the intention of full compliance with this bill. However, at the time of the update, there was no clear guidance from the state on what constitutes full compliance or what protocol is to be used to determine compliance. When such guidance has been established, the planning partners will submit this plan or its subsequent updates to the state for review and approval.

California State Building Code California Code of Regulations

Title 24 (CCR Title 24), also known as the California Building Standards Code, is a compilation of building standards from three sources:

- 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
- Building standards authorized by the California legislature that constitute extensive additions not covered by the model codes adopted to address particular California concerns.

The state Building Standards Commission is authorized by California Building Standards Law (Health and Safety Code Sections 18901 through 18949.6) to administer the processes related to the adoption, approval, publication, and implementation of California's building codes. These building codes serve as the basis for the design and construction of buildings in California. 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. Since 1989, the Building Standards Commission has published new editions of Title 24 every three years.

Standardized Emergency Management System

CCR Title 19 establishes the Standardized Emergency Management System (SEMS) to standardize the response to emergencies involving multiple jurisdictions. SEMS is intended to be flexible and adaptable to the needs of all emergency responders in California. It requires emergency response agencies to use basic principles and components of emergency management. Local governments must use SEMS by December 1, 1996, to be eligible for state funding of response-related personnel costs under CCR Title 19 (Sections 2920, 2925 and 2930). The roles and responsibilities of Individual agencies contained in existing laws, or the state emergency plan are not superseded by these regulations. This hazard mitigation plan is considered to be a support document for all phases of emergency management, including those associated with SEMS.

State of California State Hazard Mitigation Plan (SHMP)

Under the DMA, California must adopt a federally approved state multi-hazard mitigation plan to be eligible for certain disaster assistance and mitigation funding. The intent of the State of California Hazard Mitigation Plan is to reduce or prevent injury and damage from hazards in the state through the following:

- Documenting statewide hazard mitigation planning in California
- Describing strategies and priorities for future mitigation activities
- Facilitating the integration of local and tribal hazard mitigation planning activities into statewide efforts
- Meeting state and federal statutory and regulatory requirements

The plan is an annex to the State Emergency Plan, and it identifies past and present mitigation activities, current policies and programs, and mitigation strategies for the future. It also establishes hazard mitigation goals and objectives. The plan will be reviewed and updated annually to reflect changing conditions and new information, especially information on local planning activities. Under 44 CFR Section 201.6, local hazard mitigation plans must be consistent with their state's hazard mitigation plan. In updating this plan, the Steering Committee reviewed the California State Hazard Mitigation Plan to identify key relevant state plan elements.

California Adaptation Planning Guide

The California Adaptation Planning Guide (APG), updated in 2020, is designed to support local government, regional organizations, and climate collaborative groups to integrate best practices and current science into their adaptation planning efforts. The APG provides helpful resources to local governments as they comply with state requirements for local adaptation planning and provides recommendations and advice on community-level climate change adaptation planning.

Safeguarding California Plan

The Safeguarding California Plan– California's Climate Adaptation Strategy was updated in 2018. The update is the State's roadmap for the strategies that will be used by state agencies to

protect communities, infrastructure, services, and the natural environment from climate change impacts. This holistic strategy primarily covers state agencies' programmatic and policy responses across different policy areas, but it also discusses the ongoing related work to with coordinated local and regional adaptation action and developments in climate impact science.

Governor's Executive Order S-13-08

Governor's Executive Order S-13-08 enhances the state's management of climate impacts from sea level rise, increased temperatures, shifting precipitation and extreme weather events. There are four key actions in the executive order:

- Initiate California's first statewide climate change adaptation strategy to assess expected climate change impacts, identify where California is most vulnerable, and recommend adaptation policies. This effort will improve coordination within state government so that better planning can more effectively address climate impacts on human health, the environment, the state's water supply and the economy.
- Request that the National Academy of Science establish an expert panel to report on sea level rise impacts in California, to inform state planning and development efforts.
- Issue interim guidance to state agencies for how to plan for sea level rise in designated coastal and floodplain areas for new projects.
- Initiate a report on critical infrastructure projects vulnerable to sea level rise.

Senate Bill 99 General Plans: Safety Element: Emergency Evacuation Routes

SB 99 requires that, upon the next revision of the housing element on or after January 1, 2020, local governments to review and update the safety element of their General Plan to include information identifying residential developments in hazard areas that do not have at least 2 emergency evacuation routes.

Assembly Bill 747 Planning and Zoning: General Plan: Safety Element

AB 747 requires, that upon the next revision of a local hazard mitigation plan on or after January 1, 2022, the safety element to be reviewed and updated as necessary to identify evacuation routes and their capacity, safety, and viability under a range of emergency scenarios. The bill authorizes a city or county that has adopted a local hazard mitigation plan, emergency operations plan, or other document that fulfills commensurate goals and objectives to use that information in the safety element to comply with this requirement by summarizing and incorporating by reference that other plan or document in the safety element.

Strategic Fire Plan for California

The Strategic Fire Plan for California is the state's road map for reducing the risk of wildfire. The Fire Plan is a cooperative effort between the State Board of Forestry and Fire Protection and the California Department of Forestry and Fire Protection. The 2018 update reflects a focus on (1) fire prevention and suppression activities to protect lives, property, and ecosystem services, and

(2) natural resource management to maintain the state's forests as a resilient carbon sink to meet California's climate change goals and to serve as important habitat for adaptation and mitigation. By placing the emphasis on what needs to be done long before a fire starts, the Strategic Fire Plan looks to reduce firefighting costs and property losses, increase firefighter safety, and contribute to overall ecosystem health.

Fire Hazard Planning: General Plan Technical Advice Series
CA Governor's Office of Planning and Research (OPR) Fire Hazard Planning technical advisory provides guidance on those policies and programs and is also intended to assist city and county planners in discussions with professionals from fire hazard prevention and mitigation, disaster preparedness, and emergency response and recovery agencies as they work together to develop effective fire hazard policies for the general plan. The 2020 update includes specific land use strategies to reduce fire risk to buildings, infrastructure, and communities and was prepared in consultation with the Department of Forestry and Fire Protection, the State Board of Forestry and Fire Protection, and other fire and safety experts.

4.1.2 Local Capability Assessment

NFIP

Planning and Regulatory Capability

Hazard mitigation planning must include review and incorporation, if appropriate, of existing plans, studies, reports, and technical information (44 CFR, Section 201.6(b)(3)). Additionally, per 44 CFR Section 201.6(c)(3), the plan must include a mitigation strategy based on existing authorities, policies, programs, and resources, therefore each jurisdiction undertook a review of their current capabilities to implement hazard mitigation actions.

The Capability Assessment Survey requested information on a variety of "capability indicators" such as existing local plans, policies, programs, or ordinances that may reduce, or in some circumstances, increase the community's hazard vulnerability. Other indicators included information related to each jurisdiction's fiscal, administrative, and technical capabilities such as access to local budgetary and personnel resources necessary to implement hazard mitigation measures. Survey respondents were also asked to comment on existing activities or capabilities to conduct public education and outreach, as well as the current political climate in their jurisdiction to implement hazard mitigation actions. The Survey was based on the FEMA recommended tool and included a summary of a jurisdiction's overall capability in the following four different types of capabilities as defined by FEMA. 91 91 Local Mitigation Planning Handbook, Worksheet 4.1: Capability Assessment Worksheet, FEMA (March 2013)

- Planning and Regulatory Capabilities: capabilities based on the jurisdiction's implementation of ordinances, policies, local laws, and State statutes, and plans and programs that relate to guiding and managing growth and development.
- Administrative and Technical Capabilities: capabilities associated with the jurisdiction's staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.
- Fiscal Capabilities: refers to the fiscal resources that a jurisdiction has access to or is eligible to use to fund mitigation actions.
- Education and Outreach Capabilities: refers to education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information.

The analyzing these capabilities helps to accurately assess each jurisdiction's degree of local capability, but also serves as a source of introspection for jurisdictions to assess their capability and recast identified gaps, weaknesses, or conflicts as opportunities to be addressed in the development of new mitigation actions. The documents and resources included and assessed under each capability category is summarized in the Table below.

Table 4-1: Documents and Resources in Yolo County Operational Area Assessed

Planning and Regulatory Capability	
Planning Documents	
General Plan Capital Improvement Plan Floodplain Management Plan Climate Action & Adaptation Plan (Any other plans?)	Emergency Operations Plan Continuity of Operations Plan Wildfire Protection Plan Historic Preservation Plan Disaster Recovery Plan Economic Development Plan
Code, Ordinance, or Requirements	
Floodplain Ordinance Zoning Ordinance Building Code Fire Prevention Code	
Administrative and Technical Capability	
Planner or engineer with knowledge of land development and land management practices	
Engineer or professional trained in construction practices related to buildings and/or infrastructure	
Planner or engineer with understanding of manmade or natural hazards	
Building inspector Floodplain manager Staff with education/expertise to assess community's vulnerability to hazards Maintenance programs to reduce risk	Emergency Manager Land Surveyors Public Information Officer Personnel skilled in Geographic Information Systems (GIS) Warning Systems/services

	Mutual Aid Agreements
Fiscal Capabilities	
Funds and Taxes: General Funds Capital Improvement Project Funding	Fees? Bonds and Grants?
Education & Outreach Capabilities	
Local Citizen or non-profit groups focused on environmental protection, emergency preparedness, access and functional needs populations, etc. Ongoing public education or information program (fire safety, preparedness, etc) Natural disaster or safety related school programs Public-private partnership initiatives addressing disaster-related issues ?	

Additionally, classifications under various community mitigation programs were included. Other programs, such as the Community Rating System, Storm Ready, and Firewise USA, can enhance a jurisdiction's ability to mitigate, prepare for, and respond to natural hazards. These programs indicate a jurisdiction's desire to go beyond minimum requirements set forth by local, state, and federal regulations in order to create a more resilient community. These programs complement each other by focusing on communication, mitigation, and community preparedness to save lives and minimize the impact of natural hazards on a community

SECTION 5.0 MITIGATION STRATEGY

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6(c)(3)(1)). The mitigation strategy section is a blueprint for Yolo County to follow to become less vulnerable to the negative effects of the hazards identified and addressed in this Plan. The Steering Committee established guiding principles and goals for this plan based on data from the risk assessments, stakeholder input, and public involvement results.

The mitigation strategy intends to provide Yolo County with a vision and overall goals that will serve as guiding principles for future mitigation policy and project administration, along with an analysis of mitigation techniques deemed available to meet those goals and reduce the impact of identified hazards.

5.1 GUIDING PRINCIPLES

A guiding principle focuses on the range of objectives and actions to be considered. The purpose of the guiding principle is to represent the overall intended outcome of the Joint Hazard Mitigation Plan. The guiding principle for this hazard mitigation plan is as follows:

Reducing the risk of life and property to Yolo County efficiently and effectively by decreasing the long-term vulnerability from hazards through coordinated planning, partnerships, capacity building, and implementing effective risk reduction measures.

5.2 MITIGATION GOALS

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 C.F.R. 201.6(c)(3)(i)). Mitigation goals represent broad statements that are achieved through the implementation of more specific mitigation actions. Each goal, purposefully broad in nature, establishes parameters used to review and update existing mitigation actions and to aid in formulating new ones.

The goals discussed in this section describe what actions should occur. Specific, measurable mitigation actions explain how to accomplish the goals. The goals from the basis for the development of Mitigation Action Strategy and specific mitigation projects. The effectiveness of a mitigation strategy is assessed by determining how well these goals are achieved. Continually implementing mitigation actions over time will ensure these mitigation goals are achieved.

Mitigation for this plan update includes:

Goal 1: Protect life
1.1 Identify and protect vulnerable populations
1.2 Reduce public health risk from hazards
1.3 Improve and promote systems that provide early warning communications

Goal 2: Protect property and infrastructure

2.1 Strengthen and enforce government codes to reduce vulnerability
2.2 Consider known hazards when identifying sites for new facilities, substantial retrofits, and utility systems.
2.3 Adopt and enforce public policies to promote resilient development and enhance safe construction in high hazard areas.
2.4 Integrate new hazard and risk information into building codes and land use planning mechanisms.
2.5 Encourage the development and incorporation of innovative technological solutions without compromising neighborhood or building character.
2.6 Incorporate effective mitigation strategies into governmental capital improvement projects.
2.7 Implement mitigation programs that promote reliability of lifeline systems to minimize impacts from, and expedite recovery in, an emergency.
2.8 Improve/create redundancies for critical networks such as water, transportation, energy, sewer, digital, data and power, and communications.
2.9 Advocate for appropriate mitigation of all public and private property

Goal 3: Foster an economy that promotes mitigation and recovery

3.1 Develop plans that restore critical business operations post disaster.
3.2 Form partnerships to leverage and share resources.
3.3 Educate businesses about contingency planning, targeting small businesses and those located in high-risk areas.
3.4 Encourage federal/state/local government partners to provide more funding opportunities for mitigation strategy investment.

Goal 4: Promote a healthy and equitable environment

4.1 Advance understanding about the relationship between climate change and natural hazards.
4.2 Improve knowledge of current and future climate-related hazards
4.3 Promote community-based mitigation strategies.
4.4 Develop hazard mitigation and climate change adaptation policies that prevent long-term negative effects on the environment.
4.5 Encourage mitigation strategies in socially (e.g., age, poverty, race, disability) vulnerable populations and physically (floodplain) vulnerable neighborhoods.

Goal 5: Promote public awareness of hazard risk and mitigation

5.1 Support improved community engagement and outreach to vulnerable populations.
5.2 Improve access to hazard information, data, and maps.

5.3 Improve public knowledge of natural and non-natural hazards and protective measures.
5.4 Encourage creation of searchable databases and data visualizations using available evidence and scientific analysis on hazards, risks and vulnerabilities.
5.5 Partner with private sector to promote hazard mitigation as part of standard business practices.
5.6 Educate public officials, developers, realtors, contractors, building owners and the general public
about hazard risks and building requirements.
5.7 Promote employee and employer education about disaster preparedness at work and at home.

5.3 IDENTIFICATION OF MITIGATION ACTIONS

In formulating the mitigation strategy, a wide range of actions was considered to help achieve the established mitigation goals and address any specific hazard concerns. These activities were discussed during the planning team meetings. All activities the Planning Team considers can be classified under one of the following five broad categories of mitigation techniques: local plans and regulation, structured infrastructure projects, natural system protection, education and outreach, and emergency preparedness.

Local Plans and Regulations

Mitigation actions that fall under this category include government authorities, policies, or codes that influence how land and buildings are developed.
Examples of these types include:

- Comprehensive and General Plans
- Climate Action and Adaptation Plans
- Land Use Ordinances and Subdivisions Regulations
- Zoning and Building Codes Updates
- Capital Improvement Plans, Stormwater Management Regulations, and Master Plans

Structure and Infrastructure Projects

Mitigation actions that fall under this category involve modifying existing structures and infrastructures to protect them from a hazard or remove them from a hazardous area. This could apply to public and private structures, critical facilities, and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.
Examples of these types of actions include:

- Elevation of Flood-Prone Structures
- Utility Undergrounding
- Structural Retrofits
- Stormwater System Upgrades

Natural System Protection

Mitigation actions under this category minimize damage and losses and preserve or restore natural systems' functions.
Examples of these types of actions include:

- Stream Corridor and Wetland Restoration
- Sediment and Erosion Control
- Forest and Vegetation Management
- Conservation Easements and Open Space Preservation

Education and Outreach
Mitigation actions under this category inform and educate the public, elected officials, and property owners about hazards and potential ways to mitigate them. Although this type of mitigation reduces risk less directly than structural projects or regulations, it is an important foundation. A greater understanding and awareness of hazards and risks among local officials, stakeholders, and the public is more likely to lead to direct actions.
Examples of these types of actions include:

- Risk Communication and Education Programs
- Real Estate Disclosures
- Participation in StormReady or other programs

Emergency Preparedness and Response
Though emergency preparedness and response activities do not always fall under hazard mitigation, stakeholders in Yolo County believe this an incredibly important category of strategies for reducing the risk of life and property posed by the hazards in this Joint Hazard Mitigation Plan.

Examples of these types of actions include:

- Warning Systems
- Emergency Operation Center Improvements
- Emergency Operations Plan Updates
- Community Emergency Response Teams/Programs
- Communication Enhancements
- Emergency Response Training and Exercises
- Evacuation Planning
- Sandbagging for Flood Protection

5.4 Mitigation Action Prioritization

Multiple factors were considered to determine the mitigation priorities for the next five-year implantation period and which mitigation actions should be prioritized for implementation. FEMA's recommended prioritization criteria, **STAPLEE**, assisted in deciding why one

recommended action might be more important, more effective, or more likely to be implemented than another.

STAPLEE stands for the following:

- **Social**: Does the measure treat people fairly? Does it consider social equity, disadvantaged communities, or vulnerable populations?
- **Technical**: Will it work? Is the action feasible? Does it solve the problem?
- **Administrative**: Is there a capacity to implement and manage the project? Is there adequate staffing, funding, and other capabilities to implement the project?
- **Political**: Who are the stakeholders? Did they get to participate? Will there be adequate political and public support for the project?
- **Legal**: Does the jurisdiction have the legal authority to implement the action? Is it Legal? Are there liability implications?
- **Economic**: Is there action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- **Environmental**: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

Following the Disaster Mitigation Act requirements, an emphasis was placed on the importance of benefit-cost analysis in determining action priority (44 CFR, Section 201.6(c)(3)(iii)). The benefits of proposed actions were weighed against the estimated cost as part of the prioritization process. This is not the detailed level of benefit/cost analysis required for some FEMA hazard related grant programs. A less formal approach was used because the associated costs and benefits could change from year-to-year. Such analysis would be performed at the time a given action is being submitted for grant funding. Therefore, a review of the apparent benefits versus the apparent costs of each project was performed instead. Parameters established for assigning subjective ratings are defined below:

Cost ratings were defined as follows:

- High: existing funding will not cover the project's cost; implementation would require new revenue through an alternative source.
- Medium: The project could be implemented with existing funding but would require a budget re-apportion or a budget amendment, or the project cost would have to be spread over multiple years.
- Low: The project could be funded under the existing budget. The project is part of can be part of an ongoing existing program.

Benefit ratings were defined as follows:

- High: The project will immediately reduce risk exposure for life and property.

- Medium: The project will have a long-term impact on reducing risk exposure for life property, or the project will provide an immediate reduction in the risk exposure for property.
- Low: Long-term project benefits are difficult to quantify in the short term.

Using this approach, projects with a positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-beneficial and are prioritized accordingly. To assign priorities, each action with a benefit rating equal to or higher than its cost rating (such as high benefit/medium cost, medium benefit/medium cost, medium benefit/low cost, etc.) was considered to be cost-beneficial.

We also analyzed mitigation projects based on implementation priorities. Implementation priority ratings were assigned as follows:

- High Priority—An action that meets multiple objectives, has benefits that exceed costs, and has a secured source of funding. Action can be completed in the short term (1 to 5 years).
- Medium Priority—An action that meets multiple objectives, has benefits that exceed costs, and is eligible for funding though no funding has yet been secured for it. Action can be completed in Recommended Planning-Area-Wide Actions in the short term (1 to 5 years), once funding is secured. Medium-priority actions become high priority actions once funding is secured.
- Low Priority—An action that will mitigate the risk of a hazard, has benefits that do not exceed the costs or are difficult to quantify, has no secured source of funding, and is not eligible for any known grant funding. Action can be completed in the long term (1 to 10 years). Low-priority actions may be eligible for grant funding from programs that have not yet been identified.

Grant pursuit priorities will also be assigned to mitigation projects when grant opportunities become available . Grant pursuit priority ratings were assigned as follows:

- High Priority—An action that meets identified grant eligibility requirements, has high benefits, and is listed as high or medium implementation priority; local funding options are unavailable or available local funds could be used instead for actions that are not eligible for grant funding.
- Medium Priority—An action that meets identified grant eligibility requirements, has medium or low benefits, and is listed as medium or low implementation priority; local funding options are unavailable.
- Low Priority—An action that has not been identified as meeting any grant eligibility requirements.

Based on all of the above factors, mitigation actions are prioritized and implemented when funding is available.

4.4.1 Mitigation Alternatives

In compliance with 44 CFR: A section is included that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

5.5 Hazard Prioritization

As described previously, hazards were criticized using historical data, local knowledge, and consensus options to produce a matrix illustrating each profiled hazard's risk.

Table 4.1: Highest-ranking hazards from the prioritization process

Ranking	Hazard	Degree of Risk	Cost Rating	Benefit Rating
1	Severe Weather			
2	Dam Failure			
3	Drought			
4	Earthquake			
5	Flooding			
6	Landslide			
7	Levee Failure			
8	Wildfire			

*Hazard ranking data from Yolo County 2022 Hazard Vulnerability Assessment (see Appendix)

5.5.1 Yolo County Operational-Area Problem Statements

Problem Statements are statements of particular interest regarding primary hazards, geographic areas of concern, or vulnerable community assets. As part of the planning process, the Steering Committee identified key vulnerabilities and hazards of concern applicable to the entire County. Hazard Problem Statements helped the Steering Committee identify common issues and weaknesses, determine appropriate mitigation strategies, and understand the resources needed.

The Countywide Hazard Problem Statements were based on risk assessments, risk prioritization processes, vulnerability analysis, local knowledge, jurisdiction-specific problem statements, and community and stakeholder input. While only risks ranked as High were prioritized for mitigation actions in individual annexes, for the countywide plan, High and Substantial risk hazards were included in problem statements and countywide mitigation actions. For simplicity, the Hazard Problem Statement for Pandemic and Epidemic were combined. Countywide Hazard Problem Statements are identified below:

Drought & Water Shortage

In Yolo County, water supply is extremely limited during non-drought years. As such, droughts are a serious threat in the County and could devastate the agricultural industry, a major economic driver and job provider. Additionally, prolonged periods of drought can reduce water available

for residential users and increase water prices. Governing authorities have been established to limit water use and protect water supply. Water credits/rights procurement may limit new development necessary to meet increasing housing demands. Periods of drought also lead to increased pumping of groundwater wells, which can exacerbate seawater intrusion into the aquifer, increase land subsidence risks, and affect water quality. Contamination of drinking water, though unlikely, could be catastrophic. Drought conditions are likely to increase in future climate change scenarios.

Earthquake

Yolo County has several fault systems. Due to the location of population centers and building history in the County, any large earthquake will likely impact people, property, and critical infrastructure, including water systems, telecommunications infrastructure, roads, bridges, healthcare systems, and utilities. Damages and debris could isolate large populations from these critical lifelines. Older unreinforced-masonry structures in the County are particularly vulnerable to earthquake risk. An earthquake can also produce cascading impacts due to urban conflagration, wildfires, seiches, landslides, dam, and levee failure.

Wildfire

California, and subsequently Yolo County, is in a cycle of extreme heat, drought, and fire, all amplified by climate change. Wildfires are a natural part of the California environment; however, fire behavior has increased in frequency, size, and impact from longer wildfire "seasons." Deferred vegetation management and population sprawl in the wildland-urban interface and intermix have increased the probability and impact of wildfires.

Utility Interruption/ PSPS

Heat-related equipment failures and electrical infrastructure igniting wildfires have resulted in unintentional and intentional rolling blackouts and power shutoffs throughout the County. Public Safety/ Utility Initiated Power Shut Offs to prevent wildfire ignition can have notably significant impacts due to the length of disruption time, limited efficacy of the strategy, and the effect on first responder capabilities. Extreme and prolonged heat waves across the state increase the demand for the aging electrical grid, significantly depleting electricity reserves and resulting in blackouts. Heatwaves are expected to increase in intensity and magnitude due to climate change, likely exacerbating this problem. Traditional energy sources increase climate change risk and fail more consistently, but alternative energy technology cannot meet current nighttime demand. Additionally, Yolo County has limited microgrids, and reliance on the macrogrid makes the County vulnerable to rolling and prolonged power outages. Over the last decade, Yolo County residents have begun adjusting to the increasing unreliability of macro utilities. Loss of power for more than a few hours can result in large economic losses, specifically related to food and agriculture. More vulnerable populations in isolated areas or who rely on medical devices are at increased risk during prolonged power outages.

Flooding

Localized flooding has the potential to significantly impact people, property, and critical infrastructure in the County. Undersized and aging drainage infrastructure, deferred maintenance, increased run-off due to drought conditions, the built environment and trends in precipitation and weather can all increase the risk of localized stormwater flooding. Climate change will likely exacerbate the intensity and magnitude of precipitation events, increasing the risk associated with localized stormwater flooding and causing drainage infrastructure to be undersized in increasingly more common events.

Additionally, unhoused residents living in stormwater drainage areas can increase flood risk due to accumulated debris and trash, complicating flood response and mitigation activities.

Severe Winter Storms

Severe winter storms have been increasing in intensity, magnitude, and severity in Yolo County and are associated with various hazards in this Plan. Severe winter storms and heavy rain can have significant impacts, including flash flooding, localized stormwater flooding, mudslides, and landslides. Secondary hazards can cause immobility and loss of utilities. Roads may become impassable due to flooding, downed trees, or landslides. Power lines may be down due to high winds, and services such as water or telecommunications infrastructure may be unable to operate without power.

Stormwater runoff from heavy rains can also impair water quality by washing pollutants into water bodies. Severe winter storms can also cause large storm surges and wave action along the coastline, flooding low-lying areas and causing dramatic erosion. Coastal bluff and cliff failure due to erosion can create hazardous conditions due to roadway collapse, undermined home foundations, and damage to utilities. Additionally, future sea level rise scenarios will likely exacerbate coastal and inland flood risks during winter storms.

Road Infrastructure

The occurrence of any hazard profiled in this Plan, in combination with aging and limited road infrastructure, can result in limited egress of evacuees and minimal ingress of first responders. Roadways can be compromised in severe weather incidents, further limiting road capacity. Road infrastructure needs to develop at a rate commensurate with the rate at the population, and housing is expanding. Further, the topography of the County limits where new roads can be built.

5.6 Yolo County Operational-Area Mitigation Action Plan

The Steering Committee reviewed the catalogs of hazard mitigation alternatives and selected area-wide actions to be included in a hazard mitigation action plan. The area-wide actions were selected based on the risk assessment of identified hazards of concern and the defined hazard mitigation goals and objectives.

Hazard	Mitigation Action
Drought	Provide public information on water conservation and assess the potential for community-wide water conservation programs.
Earthquake	Provide information on earthquake risk and preparedness to the public. Continue to adopt and implement current earthquake building standards and upgrade, remove, or replace unreinforced masonry buildings as feasible.
Wildfire	Continue collaborating across the operational area with all jurisdictions with fire protection and suppression responsibility on wildfire mitigation efforts.
Utility Interruption	Encourage the development of and use of microgrids and the hardening of the utility of infrastructure, where possible. Provide backup generators for critical infrastructure and facilities.
Flooding	Maintain a good standing in the National Flood Insurance Program and encourage coordination on drainage system maintenance.
Severe Storms	Maintain StormReady and other applications.
Climate	Support, encourage, and implement countywide climate action, adaptation, and resiliency initiatives when feasible.
All Hazard	Incorporate and make consistent other planning documents with appropriate goals, policies, and objectives to address hazards identified within the Multi-Jurisdictional Hazard Mitigation Plan.

5.6.1 Recommended Mitigation Actions for All Partners

The Steering Committee reviewed the catalogs of hazard mitigation alternatives and selected planning-area-wide actions to be included in a hazard mitigation action plan for all planning partners. The selection of area-wide actions was based on the risk assessment of identified hazards of concern and the defined hazard mitigation goals and objectives. The below table (Table 4-2), list the recommended hazard mitigation actions that each Jurisdiction will continue to implement, in addition to their jurisdiction-specific action plans.

The timeframe indicated in the table is defined as follows:

- Short Term = to be completed in 1 to 6 years
- Long Term = to be completed in greater than 5 years
- Ongoing = currently being funded implement under existing programs

Additional jurisdiction-specific actions plans for each planning partner are included in the Jurisdictional annexes of this hazard mitigation plan.

Table 4-2: Recommended Yolo County Operational Area Hazard Mitigation Actions

County Mitigation Incentives							
New/ Existing	Project	Goals	Hazard	Lead Agency	Support Agency	Timeline	Funding
New	Continue to maintain a website that will house the multi-jurisdictional hazard mitigation plan and any amendments adopted during the next 5-year period to provide the planning partners and the public with ongoing access to the plan and its implementation.	1, 2, 3, 4, 5	All Hazard	Yolo County OES	Planning Partners	Short-term, ongoing	General Funds
New	Continue to provide a virtual hub for sharing information on hazard mitigation resources on the yolocounty.org/OES website that will support mitigation efforts and awareness of grant funding opportunities to the planning partnership.	5	All Hazard	Yolo County OES	Planning Partners	Short-term, ongoing	General Funds
New	Continue to leverage/support/enhance ongoing public education and awareness programs to educate the public on risk, risk reduction, and community resilience.	5	All Hazard	Yolo County OES	Planning Partners	Long-term, ongoing	Cost sharing with partners General Funds
New/ Existing	Provide technical support and coordination for available grant funding opportunities to the planning partnership.	1, 2, 3, 4, 5	All Hazard	Yolo County OES	Planning Partners	Long-term, ongoing	General Funds
New/ Existing	Develop a standardized GIS dataset for modeling hazards and impacts for regional and jurisdictional assessment purposes. Implement a program to digitally map historical and future hazard events and impacts (for example, new fire hazard severity mapping and social vulnerability data produced by federal, state, or local sources that would apply to the entire planning area).	2, 3, 4	All Hazard	Yolo County OES	Planning Partners	Short-term	General Funds
New	Develop a multilingual and culturally appropriate business outreach program, in concert with existing business organizations and planning partners, to educate businesses on risk and risk reduction and to identify policies and programs to help businesses become more resilient.	1, 5	All Hazard	Yolo County OES	Planning Partners	Short-term	General Funds

5.6.2 Prioritization Summary for Yolo County Operational-Area Actions

Table lists the priority of each action.

5.7 Classification of Area-Wide Mitigation Actions

Each recommended action was classified based on the hazard it addresses and the type of mitigation it involves. Table shows these classifications. Mitigation types used for this categorization are as follows:

- Prevention—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- Property Protection—Modifying buildings or structures to protect them from a hazard or removing structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- Public Education and Awareness—Actions to inform community members and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- Natural Resource Protection—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, wetland restoration and preservation, and green infrastructure.
- Emergency Services—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- Structural Projects—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.
- Climate Resiliency—Actions that incorporate methods to mitigate and/or adapt to the impacts of climate change. Includes aquifer storage and recovery activities, incorporating future conditions projections in project design or planning, or actions that specifically address jurisdiction-specific climate change risks, such as sea level rise or urban heat island effect.
- Community Capacity Building—Actions that increase or enhance local capabilities to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. Includes staff training, memorandums of understanding, development of plans and studies, and monitoring programs.

SECTION 6.0: PLAN ADOPTION, MAINTENANCE, AND EVALUATION

6.1 PLAN ADOPTION

A hazard mitigation plan must document that it has been formally adopted by the governing bodies of the jurisdictions requesting federal approval of the plan (44 CFR Section 201.6(c)(5)). For multijurisdictional plans, each jurisdiction requesting approval must document that is has been formally adopted. This plan will be submitted for a pre-adoption review to Cal OES and FEMA Region IX prior to adoption. Once pre-adoption approval has been provided, all planning partners will formally adopt the plan. DMA compliance and its benefits cannot be achieved until the plan is adopted. Copies of the resolutions adopting this plan for all planning partners can be found in Appendix G of this volume.

6.2 PLAN MAINTENANCE

Plan maintenance is the formal process for achieving the following:

- Ensuring that the hazard mitigation plan remains an active and relevant document and that the planning partnership maintains its eligibility for applicable funding sources
- Monitoring and evaluating the plan annually and producing an updated plan every five years
- Integrating public participation throughout the plan maintenance and implementation process
- Incorporating the mitigation strategies outlined in the plan into existing planning mechanisms and programs, such as any relevant comprehensive land-use planning process, capital improvement planning process, and building code enforcement and implementation.

To achieve these ends, a hazard mitigation plan must present a plan maintenance process that includes the following (44 CFR Section 201.6(c)(4)):

- A method and schedule for monitoring, evaluating, and updating the mitigation plan within a 5-year cycle
- An approach for how the community will continue public participation in the plan maintenance process.
- A process by which local governments will incorporate the requirements of the mitigation plan into other planning mechanisms when appropriate

Table 6-1 Summarizes the plan maintenance strategy.

Plan Maintenance Matrix

Task	Approach	Timeline	Lead	Support
Monitoring	Prepare status updates and action implementation tracking for annual progress reporting. As grant opportunities present themselves, consider options to pursue grants to fund actions identified in this plan.	Annually after the adoption and final approval of the plan by FEMA. As grants become available.	Yolo County OES	Designated point of contact for each planning partner
Annual Progress Reporting	Review the status of previous actions submitted by the planning lead and assess the plan's effectiveness; compile the annual progress report' to assess appropriate action for preparing the next hazard mitigation plan update.	Annually after the final plan is approved by FEMA, or upon a major disaster or a comprehensive update to a general plan.	Yolo OES and all planning partners	Designated point of contact for each planning partner.
Plan Update	Reconvene the planning partners, at a minimum, every five years to guide a comprehensive update and review and revise the plan.	Every five years or upon comprehensive update to the general plan or major disaster.	The governing body for all planning partners covered by this plan.	Designated point of contact for each planning partner.
Continuing Public Involvement	Provide the public access to the implementation of this plan, principally through the plan website www.yolocounty.org/oes.	Annually	Yolo County OES	All planning partners will provide a link to County Hazards Mitigation Plan website on their website.
Plan Integration	Integrate relevant information from the hazard mitigation plan into other plans and programs where viable as opportunities arise.	Ongoing	The governing body for all planning partners covered by this plan.	Designated point of contact for each planning partner.

6.3 Plan Implementation and Monitoring

Yolo County Office of Emergency Services will be the agency responsible for monitoring the plan, and each partner will track the status of all mitigation actions in its own action plan. Staff or departments with primary responsibility are identified in each jurisdictional annex (volume 2).

6.4 Annual Progress Report

A Maintenance Working Group will be created that consists of participating planning partners. The Maintenance Working Group will convene a bi-annual meeting to evaluate the progress of

the action plan over a six-month and 12-month performance period. This review will include items such as the following:

- Summary of any hazard events that occurred during the performance period and impact of these events on the planning area
- Review of mitigation success stories
- Review of continued public involvement
- Brief discussions about why targeted strategies were not completed
- Reevaluation of the action plan to establish if the timeline for projects needs to be amended
- Recommendations for new projects
- Changes in or potential for new funding options
- The impact of any other planning programs or initiatives that involve hazard mitigation

Participating partners will be responsible for forwarding this information for the Maintenance Working Group to include in a formal report on the plan's progress. The Maintenance Working Group will prepare a progress report during the 2023-2024 planning period. This report will be retained by the County OES, with copies forwarded to planning partners, Cal OES, and jurisdictions. This report should be used as follows:

- The reporting period will cover a 12-month period from FEMA's approval
- Annually every year following.
- Only four annual progress reports will be prepared; an updated plan will be prepared for the fifth year, rather than a progress report.
- The plan implementation lead (OES) will send out reminder emails to all planning partners no later than three months before the due date. Planning partners will submit their status updates and sections of the annual report no later than one month prior to the due date.
- The plan maintenance lead will prepare the annual report, including planning partner information, no later than one month following the progress reporting due date.
- OES will ensure the report is posted to the County's hazard mitigation website.
- The report will describe public outreach and engagement made during the reporting period.
- The Maintenance Working Group will use the information in the annual report to identify projects of interest for the following year and to apply for mitigation or resiliency grants.
- The Maintenance Working Group will present to the County Board of Supervisors. It will provide the information to the planning partners for them to provide to their governing bodies to inform them of the progress of mitigation and resiliency efforts implemented during the reporting period.

Annual progress is not a requirement of 44 CFR, but it may enhance the planning partners' opportunity for grant funding. Failure to implement this component of the plan maintenance strategy will not jeopardize a planning partner's compliance under the DMA; it may jeopardize its opportunity to partner and leverage funding opportunities with other planning partners. The Maintenance Working Group will follow up with planning partners that do not participate in the annual reporting as deemed necessary by the Yolo County OES.

6.5 Plan Update

The plan maintenance process includes a schedule for monitoring and producing an updated plan every five years. Local hazard mitigation plans must be reviewed, revised if appropriate, and resubmitted for approval to remain eligible for benefits under the DMA (44 CFR, Section 201.6.d.3). The planning partnership intends to update the hazard mitigation plan on a 5-year cycle from the date of initial plan adoption. This cycle may be accelerated to less than 5 years based on the following triggers:

- A presidential disaster declaration that impacts the planning area
- A hazard event that causes loss of life
- An update of the County or participating city's general plan

This plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current. It will not be the intent of future updates to develop a completely new hazard mitigation plan for the planning area. To avoid expiration, the partnership will strive to initiate the plan update process with sufficient time to complete the update before the plan expires; the process is recommended to begin a year and a half before the expiration date). The update will, at a minimum, include the following elements:

- The update process will be convened through a steering committee.
- The hazard risk assessment will be reviewed and, if necessary, updated using best available information and technologies.
- The action plans will be reviewed and revised to account for any actions completed, dropped, or changed and to account for changes in the risk assessment or new partnership policies identified under other planning mechanisms (such as the general plan).
- The draft update will be sent to appropriate agencies and organizations for comment.
- The public will be given an opportunity to comment on the update prior to adoption.
- Planning partners' governing bodies will adopt their portions of the updated plan.

6.6 Continuing Public Involvement

The public will continue to be apprised of the plan's progress through the Yolo County OES website, including providing copies of annual progress reports on the website. All planning partners have agreed to provide links to the County hazard mitigation plan website on their

individual jurisdictional websites to increase avenues of public access to the plan. The County has agreed to maintain the hazard mitigation plan website. This site will house the final plan and serve as a one-stop site for information regarding the plan, the partnership and plan implementation. Upon initiation of future update processes, a new public involvement strategy will be initiated based on guidance from a new steering committee. This strategy will be based on the needs and capabilities of the planning partnership at the time of the update. At a minimum, this strategy will include the use of local media outlets within the planning area.

StoryMap

ArcGIS StoryMaps are a story authoring web-based application for sharing maps in the context of narrative text and other multimedia content. They allow the public to interface with property-specific information on risk identified by a local hazard mitigation plan. A StoryMap that was constructed during the course of this plan update process will be used to support the implementation of the plan by providing the public continuing access to the plan and its maintenance process. The StoryMap will remain with the County and continue as a template to support visual and data-based communication about the hazards relevant to Yolo County. Following the completion of the plan update process, the Story Map will be released to the public and promoted through social media and the project website. It will include risk assessment results for all relevant hazards, an interactive hazard mapping tool, and a report function to produce comprehensive hazard exposure summaries for any given property, block, or defined area. The Story Map expanded opportunities for public outreach and the ways in which members of the public could interact with hazard data as the hazard mitigation plan update was underway.

6.7 Incorporation into Other Planning Mechanisms

The mitigation actions recommended in this plan will be incorporated into existing planning mechanisms and programs, such as comprehensive land-use planning processes, capital improvement planning, and building code enforcement and implementation. The information on hazard, risk, vulnerability, and mitigation contained in this plan is based on the best science and technology available at the time this update was prepared. The general plans of the County and the city planning partners are considered to be integral parts of this plan. The County and partner cities, through adoption of general plans and zoning ordinances, have planned for the impact of natural hazards. The hazard mitigation plan update provided the County and the cities with an opportunity to reviand on policies contained within these planning mechanisms. The planning partners used their general plans and the hazard mitigation plan as complementary documents that work together to achieve the goal of reducing risk exposure to the community members of the Yolo County. An update to a general plan may trigger an update to the hazard mitigation plan. All municipal planning partners support the creation of a linkage between the hazard mitigation plan and their individual general plans by identifying a mitigation action as such and giving that action a high priority. Other planning processes and programs to be coordinated with the recommendations of the hazard mitigation plan may include the following:

- Emergency response plans
- Training and exercise of emergency response plans
- Debris management plans
- Recovery plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Community wildfire protection plans
- Comprehensive flood hazard management plans
- Resiliency plans
- Community Development Block Grant Disaster Recovery action plans
- Public information/education plans.

Some action items do not need to be implemented through regulation. Instead, they can be implemented through the creation of new educational programs, continued interagency coordination, or improved public participation. As information becomes available from other planning mechanisms that can enhance this plan, that information will be incorporated via the update process.