



## Chapter 4 Risk Assessment

**Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.**

As defined by the Federal Emergency Management Agency (FEMA), risk is 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. The 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.

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

1. Identify Hazards;
2. Profile Hazard Events;
3. Inventory Assets; and
4. Estimate Losses.

Data collected through this process has been incorporated into the following sections of this chapter:

- **Section 4.1: Hazard Identification** identifies the natural hazards that threaten the Yuba County Planning Area and describes why some hazards have been omitted from further consideration.
- **Section 4.2: Yuba County Assets at Risk** identifies the property values; populations; critical facilities; and cultural, historical, and natural resources at risk. This information is not hazard specific and covers the entire Yuba County Planning Area.
- **Section 4.3: Hazard Profiles and Vulnerability Assessment** provides an overview of each hazard, its location and extent, and discusses the risk, vulnerability, and impacts of each natural hazard to the Yuba County Planning Area. The hazard profile also describes previous occurrences of hazard events and the likelihood of future occurrences. The vulnerability assessment evaluates the Planning Area’s and the unincorporated County’s exposure to natural hazards; considering assets at risk, populations at risk, critical facilities, future development trends, and, where possible, estimates potential hazard losses.
- **Section 4.4: Capability Assessment** inventories existing local mitigation activities and policies, regulations, plans, and projects that pertain to mitigation and can affect net vulnerability.

This risk assessment covers the entire geographical extent of the Yuba County Planning Area, including the incorporated communities and other participating jurisdictions. In accordance with FEMA requirements, this risk assessment describes how the hazards and risks vary across the Planning Area and from jurisdiction to jurisdiction. While these differences are noted in this chapter, they are expanded upon in the annexes of the participating jurisdictions. 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 Yuba County Planning Area.

This LHMP Update involved a comprehensive review and update of each section of the 2015 risk assessment. Information from the 2015 LHMP was used in this Update where valid and applicable. As part of the risk assessment update, new data was used, where available, and new analyses were conducted. Where data from existing studies and reports was used, the source is referenced throughout this risk assessment. Refinements, changes, and new methodologies used in the development of this risk assessment update are summarized in Chapter 2 What's New and are also detailed in this risk assessment portion of this Plan.

## 4.1 Hazard Identification

**Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type...of all natural hazards that can affect the jurisdiction.**

The Yuba County Hazard Mitigation Planning Committee (HMPC) conducted a hazard identification assessment to determine the hazards that threaten the Planning Area. This section details the methodology and results of this effort.

### *Data Sources*

The following data sources were used for this Hazard Identification portion of this Plan:

- California Office of Emergency Services (CAL OES)
- HMPC input
- National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) Storm Events Database
- 2007 Yuba County LHMP
- 2015 Yuba County LHMP
- 2018 State of California Hazard Mitigation Plan
- FEMA Disaster Declaration Database

### 4.1.1. Results and Methodology

Using existing hazards data and input gained through planning meetings, the HMPC agreed upon a list of hazards that could affect the Yuba County Planning Area. Hazards data from Cal OES, FEMA, the NOAA NCDC database, the existing Yuba County LHMP, and many other sources were examined to assess the significance of these hazards to the Planning Area.

The following hazards in Table 4-1, listed alphabetically, were identified and investigated for this LHMP Update. As a starting point, the 2018 California State Hazard Mitigation Plan was consulted to evaluate the applicability of hazards of concern to the State, to the Yuba County Planning Area. Building upon this effort, hazards from the 2015 Yuba County Local Hazard Mitigation Plan (LHMP) were also identified, and comments explain how hazards were updated from the 2015 Plan. All hazards from the 2015 Plan were profiled in this LHMP Update. New hazards include climate change, drought and water shortage, and pandemic.

*Table 4-1 Yuba County Hazard Identification and Comparison from 2015 LHMP*

2021 Hazards	2015 Hazards	Comment
Climate Change	–	New hazard
Dam Failure	Flood	This hazard was split out from the flood hazard. Greater analysis was performed on additional dams with detailed analysis on assets, critical facilities, populations, and future development areas at risk.
Drought & Water Shortage	–	New hazard
Earthquake	Earthquake	Greater analysis was performed. A Hazus run was performed to analyze earthquake risk in the County.
Floods: 1%/0.5%/0.2% annual chance	Flood	Greater analysis was performed on flood with detailed analysis on assets, critical facilities, populations, and future development areas at risk.
Floods: Localized Stormwater	Flood	This hazard was split out from the flood hazard. More detailed discussion was added.
Levee Failure	Flood	Greater analysis was performed on levee with detailed analysis on assets, critical facilities, populations, and future development areas at risk.
Pandemic	–	New hazard
Severe Weather: Extreme Cold and Freeze	Severe Weather	This hazard was split out to put a greater focus on the extreme cold and freeze hazard.
Severe Weather: Extreme Heat	Severe Weather	This hazard was split out to put a greater focus on the extreme heat.
Severe Weather: Heavy Rains and Storms	Severe Weather	This hazard was split out to put a greater focus on the heavy rains.
Severe Weather: High Winds and Tornadoes	Severe Weather	This hazard was split out to put a greater focus on the extreme cold and freeze hazard.
Wildfire	Wildfire	Greater analysis was performed on wildfire, with detailed analysis on assets, critical facilities, populations, and future development areas at risk.

Certain hazards were excluded from consideration for this LHMP Update. They are shown in Table 4-2.

*Table 4-2 Yuba County – Excluded Hazards*

Hazard Excluded	Why Excluded
Landslide	There are very few locations in the County at risk from landslide in populated areas. The areas at risk have little to no development in risk areas.
Volcanoes	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 excluded from consideration.
Tsunami	The County is not on the coast.
Air Pollution	The County did consider this a hazard for this Plan, it is dealt with in other planning mechanisms in the County. Smoke and air quality are discussed in the wildfire hazard.
Coastal Flooding, Erosion, and Sea Level Rise	The County is not on the coast.
Energy Shortage and Energy Resilience	The County did consider this a hazard, it is dealt with in other planning mechanisms in the County.
Natural Gas Pipeline Hazards	The County did not consider this a hazard due to the low number of gas pipelines traversing the County.
Oil Spills	The County did not consider this a hazard, as there are few pipelines or oil wells in the County.
Radiological Accidents	There are no areas in the County at risk to this hazard.
Subsidence	There are few areas of the County where subsidence is a risk. In addition, most subsidence is related to drought and water shortage, and will be discussed in that hazard profile and vulnerability assessment.
Cyber Threats	The County did consider this a hazard, but it is dealt with in other planning mechanisms in the County.
Airline Crashes	There have been few past occurrences in the County of airplane crashes. This is not a hazard to be included in the LHMP
Civil Disturbance	The County did consider this a hazard, but it is dealt with in other planning mechanisms in the County.
Well Stimulation and Hydraulic Fracking	This is not occurring in the County.

Table 4-3 was completed by the County and HMPC to identify, profile, and rate the significance of identified hazards. 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 Planning Area were determined to be of low significance and not considered a priority hazard. Significance was determined based on the hazard profile, focusing on key criteria such as frequency, extent, and resulting damage, including deaths/injuries and property, crop, and economic damage. The ability of a community to reduce losses through implementation of existing and new mitigation measures was also considered as to the significance of a hazard. This assessment was used by the HMPC to prioritize those hazards of greatest significance to the Yuba County Planning Area, enabling the County to focus resources where they are most needed.

*Table 4-3 Yuba County Hazard Assessment*

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Significant	Occasional	Critical	Medium	Medium
Drought & Water Shortage	Extensive	Likely	Critical	Medium	High
Earthquake	Extensive	Unlikely	Critical	Medium	Low
Floods: 1%/0.5%/0.2% annual chance	Limited	Unlikely	Critical	High	Medium
Floods: Localized Stormwater	Limited	Highly Likely	Limited	Medium	Medium
Levee Failure	Limited	Occasional	Limited	High	Medium
Pandemic	Extensive	Likely	Critical	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: High Winds and Tornadoes	Extensive	Highly Likely	Limited	Medium	Low
Wildfire	Significant	Likely	Critical	High	High
<b>Geographic Extent</b> Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area <b>Likelihood of Future Occurrences</b> Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.	<b>Magnitude/Severity</b> Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid <b>Significance</b> Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact <b>Climate Change Influence</b> Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact				

### 4.1.2. Disaster Declaration History

One method used to identify hazards was the researching of past events that triggered federal and/or state emergency or disaster declarations in the Yuba County Planning Area. 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. Should the disaster be 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.

Based on the disaster declaration history provided in Table 4-4, Yuba County is among the many counties in California susceptible to disaster. Details on federal and state disaster declarations were obtained by FEMA and Cal OES and compiled in chronological order in Table 4-4. A review of state declared disasters indicates that Yuba County received 24 state declarations between 1950 and 2021. Of the 24 state declarations: 16 were associated with severe winter storms, heavy rains, or flooding; 3 were from wildfire, 2 were for drought; 1 was from pandemic; 1 was for high winds, and 1 was from economic disasters. A review of federal disasters shows 26 federal disaster declarations. Of these 27 federal declarations: 15 were associated with severe winter storms, heavy rains, or flooding, 7 were from wildfire, 1 was from pandemic, 1 was from dam failure, 1 was from drought, 1 was from freeze, and 1 was for hurricane (a nationwide declaration for Katrina evacuations). A summary of these events by disaster type is shown in Table 4-5.

*Table 4-4 Yuba County State and Federal Disaster Declarations, 1950-2021*

Year	Disaster Name	Disaster Type	Disaster Cause	Disaster #	State Declaration #	Federal Declaration #
2021	California Drought	Drought	Drought	–	4/10/2021	–
2020	Wildfires	Wildfire	Wildfire	DR-4558	–	8/22/2020
2020	Covid-19	Pandemic	Pandemic	DR-4482	3/4/2020	1/20/2020
2020	Bear Fire	Wildfire	Wildfire	FM-5363	–	8/17/2020
2017	California Wildfires	Wildfire	Wildfire	DR-4344	10/9/2017	10/10/2017
2017	California Severe Winter Storms, Flooding, And Mudslides	Flood	Storms	DR-4308	3/7/2017	4/1/2017

Year	Disaster Name	Disaster Type	Disaster Cause	Disaster #	State Declaration #	Federal Declaration #
2017	California Severe Winter Storms, Flooding, And Mudslides	Flood	Storms	DR-4301	–	2/14/2017
2017	California Potential Failure Of The Emergency Spillway At Lake Oroville Dam	Dam Failure	Storms	EM-3381	–	2/14/2017
2017	Cascade Fire	Wildfire	Wildfire	FM-5216	–	10/8/2017
2014	California Drought	Drought	Drought	GP 2014-13	1/17/2014	–
2010	Yuba County Wildfires	Wildfire	Wildfire	GP-2010-08	8/28/2010	–
2009	Yuba Fire	Wildfire	Wildfire	FM-2825	–	9/15/2009
2008	2008 January Storms	Flood	Storms	GP 2008-01	1/5/2008	–
2005/2006	2005/06 Winter Storms	Flood	Storms	DR-1628	–	2/3/2006
2005	Hurricane Katrina Evacuations	Economic	Hurricane	EM-3248 2005	–	9/13/2005
2001	Energy Emergency	Economic	Greed	GP 2001	1/1/2001	–
1999	California Wildfires	Wildfire	Wildfire	EM-3140	–	9/1/1999
1998	Severe Winter Storms and Flooding	Flood	Storms	DR-1203	–	2/9/1998
1997	1997 January Floods	Flood	Storms	DR-1155	1/2/97-1/31/97	1/4/1997
1997	Fires (Yuba)	Wildfire	Wildfire	97-02	12/10/1997	–
1995	1995 Late Winter Storms	Flood	Storms	DR-1046	Proclaimed	1/10/1995
1995	1995 Severe Winter Storms	Flood	Storms	DR-1044	1/6/95-3/14/95	1/13/1995
1990/1991	Severe Freeze	Freeze	Freeze	DR-894	–	2/11/1991
1988	California Wildfires	Wildfire	Wildfire	DR-815	–	9/11/1988
1986	1986 Storms	Flood	Storms	DR-758	2/18-86-3/12/86	2/18/1986

Year	Disaster Name	Disaster Type	Disaster Cause	Disaster #	State Declaration #	Federal Declaration #
1983	High Winds	Wind	Storm	83-01	3/1983	–
1983	Winter Storms	Flood	Flood	DR-677	12/8/82-3/21/83	2/9/1983
1982	Heavy Rains and Flooding	Flood	Storms	DC 82-03	4/1/1982	–
1977	1977 Drought	Drought	Drought	EM-3023	–	1/20/1977
1973	1973 Floods and Storms	Flood	Storms	–	2/28/1973	–
1970	Severe Storms and Flooding	Flood	Storms	DR-283	–	2/16/1970
1969	1969 Storms	Flood	Storms	DR-253	1/23/69-3/12/69	1/26/1969
1964	1964 Late Winter Storms	Flood	Storms	DR-183	–	12/24/1964
1963	1963 Floods and Rains	Floods	Storms	DR-145	2/7/1963 2/26/1963 2/29/1963 4/22/1963	2/25/1963
1963	1963 Floods	Flood	Storms	–	2/14/1964	–
1962	1962 Floods and Rains	Flood	Storms	–	10/17/1962 10/25/1962 10/30/1962 11/4/1962	10/24/1962
1958	1958 February Storms and Floods	Flood	Storms	CDO 58-03	2/26/1958	–
1955	1955 Floods	Flood	Flood	DR-47	12/22/1955	12/23/1955
1950	1950 Floods	Flood	Flood	OCD 50-01	11/21/1950	–

Source: Cal OES, FEMA

*Table 4-5 Yuba County – State and Federal Disaster Declarations Summary 1950-2021*

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Dam Failure	0	–	1	2017
Drought	2	2014, 2021	1	1977
Economic	1	2001	0	–
Flood (including heavy rains and storms)	16	1950, 1955, 1958, 1962, 1963 (twice), 1969, 1973, 1982, 1983, 1986, 1995 (twice), 1997, 2008, 2017	15	1955, 1962, 1963, 1964, 1969, 1970, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (twice)
Freeze	0	–	1	1991
High Winds	1	1983	0	–

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Hurricane	0	–	1	2005
Pandemic	1	2020 (twice)	1	2020 (twice)
Wildfire	3	1997, 2010, 2017	7	1988, 1999, 2009, 2017 (twice), 2020 (twice)
<b>Totals</b>	<b>24</b>	<b>–</b>	<b>27</b>	<b>–</b>

Source: Cal OES, FEMA

### *Disasters since 2015*

As detailed above, there have been eight federal disaster declarations and three state disaster declarations since the 2015 plan:

- 2017 Dam Failure (one federal)
- 2017 Wildfires (one state and two federal)
- 2017 Floods (one state and two federal)
- 2020 Wildfires (two federal)
- 2020 Pandemic (one state and one federal)

### *USDA Disaster Declarations*

Another database of disaster declarations comes from the USDA. This database shows agricultural disasters that result from natural hazards. This database was searched from 2012 to 2021, and the results for Yuba County are shown on Table 4-6.

*Table 4-6 Yuba County – USDA Disaster Declarations 2012-2021*

Year	Declaration Number	Primary or Contiguous County	Disaster Type
2012	S3268	Primary	Drought-FAST TRACK
2012	S3379	Primary	Drought
2012	S3440	Primary	Drought-FAST TRACK
2013	S3569	Primary	Drought-FAST TRACK
2015	S3784	Primary	Drought-FAST TRACK
2016	S3952	Primary	Drought-FAST TRACK
2016	S4164	Contiguous	Severe weather including excessive rainfall and high winds
2016	S4170	Primary	Severe weather including excessive rainfall and high winds
2020	S4692	Contiguous	Drought-FAST TRACK
2020	S4697	Primary	Drought-FAST TRACK

Source: USDA

## 4.2 Yuba County Assets at Risk

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

- Values at risk;
- Critical facility inventory;
- Cultural, historical, and natural resources; and
- Growth and development trends.

### *Data Sources*

Data used to support this assessment included the sources listed below. Where data and information from these studies, plans, reports, and other data sources were used, the source is referenced as appropriate throughout this vulnerability assessment.

- CalAtlas
- California Department of Finance
- California Department of Fish and Game
- California Department of Parks and Recreation Office of Historic Preservation
- California Natural Diversity Database
- Hazus MH 4.2
- State of California Department of Conservation
- US Census Bureau

### 4.2.1. Values at Risk

#### Parcel Inventory and Assessed Values

This analysis captures the values associated with assessed values located within Yuba County. The 2020 Yuba County Parcel/Assessor’s data, obtained from Yuba County, was used for as the basis of this analysis. This data provided by Yuba County represents best available data.

Understanding the total assessed values of Yuba County is a starting point to understanding the overall value of identified values at risk in the County. When the total assessed values are combined with potential values associated with other community assets such as public and private critical infrastructure, historic and cultural resources, and natural resources, the big picture emerges as to what is potentially at risk and vulnerable to the damaging effects of natural hazards within the County.

#### Methodology

Yuba County’s 2020 Assessor Data and the County’s GIS parcel data were used as the basis for the inventory of assessed values for both improved and unimproved parcels within the County. This data provides the land and improved values assessed for each parcel, along with key information such as property

use. Other GIS data, such as jurisdictional boundaries, roads, streams, and area features, was also obtained from Yuba County and CalAtlas to support countywide mapping and analysis of values at risk.

### *Data Limitations & Notations*

Although based on best available data, the resulting information should only be used as an initial guide to overall values in the County. In the event of a disaster, structures and other infrastructure improvements are at the greatest risk of damage. Depending on the type of hazard and resulting damages, the land itself may not suffer a significant loss. For that reason, the value of structures and other infrastructure improvements are of greatest concern. As such, it is critical to note a specific limitation to the assessed values data within the County, created by Proposition 13. Instead of adjusting property values annually, no adjustments are made until a property transfer occurs. As a result, overall property value information is most likely low and may not reflect current market or true potential loss values for properties within the County.

The 2020 GIS parcel and Assessor data was obtained to perform the spatial analysis. GIS was used to convert the parcel polygons into centroids representing each record in the assessor database. For the purposes of this analysis, the centroids which were not coincident in locations were re-positioned to overlay on the corresponding polygons so that each assessor record (with a unique assessor parcel number) was spatially positioned on the corresponding parcel. In addition, multiple parcels polygons in the GIS data were constructed as multi-part features, of which only one centroid was representative of each parcel polygon. The position of the centroids may result in less accurate hazard analysis overlay results. The data did not contain duplicate records.

### *Property Use Categories*

Yuba County's GIS data contained land use designations which provide detailed descriptive information about how each property is generally used, such as agricultural, commercial, government, industrial, institutional, recreational, residential, and right of way. The land use codes from County assessor data were refined and categorized into six property use categories and linked back to the Yuba County Assessor data. The final property use categories for Yuba County are:

- Agricultural
- Commercial
- Government-Owned/Non-Taxable Property
- Industrial
- Miscellaneous
- Residential

Once the land use descriptions were grouped into categories, the number of total and improved parcels, as well as land, improved, and personal property values were inventoried for the County by property use.

### *Estimated Content Replacement Values*

Yuba County's assigned property use categories were used to develop estimated content replacement values (CRVs) that are potentially at loss from hazards. FEMA's standard CRV factors were utilized to develop

more accurate loss estimates for all mapped hazard analyses. FEMA’s CRV factors estimate value as a percent of improved structure value by property use. Table 4-7 shows the breakdown of the different property uses in the County and their estimated CRV factors.

*Table 4-7 Yuba County – Content Replacement Factors by Property Use*

Yuba County Property Use Categories	Hazus Property Use Categories	Hazus Content Replacement Values
Agricultural	Agricultural	100%
Commercial	Commercial	100%
Government-Owned / Non-Taxable Property	Institutional	100%
Industrial	Industrial	150%
Miscellaneous	–	100%
Residential	Residential	50%

Source: Hazus

### Yuba County Values at Risk Results

Values associated with land and improved structures were identified and summed in order to determine assessed values at risk in the Yuba County Planning Area. Together, the land and improved structure values make up the majority of assessed values associated with each identified parcel or asset. Improved parcel counts were based on the assumption that a parcel was improved if a structure value was present. Content replacement values were then added to the assessed values, as described below, to provide an estimate of values at risk in the Planning Area.

Table 4-8 shows the values or total exposure for the Yuba County Planning Area including estimated contents values (using CRV multipliers from Table 4-7). In addition, loss estimates contained in the hazard vulnerability sections of this Chapter will use calculations based on these values, including content replacement values.

*Table 4-8 Yuba County Planning Area – Values at Risk by Jurisdiction*

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
City of Marysville	4,384	3,675	\$168,881,701	\$994,666,587	\$790,354,784	\$1,953,903,072
City of Wheatland	1,432	1,166	\$85,131,232	\$226,534,990	\$125,006,550	\$436,672,772
Unincorporated Yuba County	27,432	18,802	\$1,761,125,314	\$3,453,354,566	\$1,991,951,609	\$7,206,431,489
<b>Grand Total</b>	<b>33,248</b>	<b>23,643</b>	<b>\$2,015,138,247</b>	<b>\$4,674,556,143</b>	<b>\$2,907,312,943</b>	<b>\$9,597,007,333</b>

Source: Yuba County 2020 Parcel/ Assessor’s Data

The values for unincorporated Yuba County are broken out by property use type and are provided in Table 4-9. More information on assets at risk for each jurisdiction can be found in their respective annexes.

*Table 4-9 Unincorporated Yuba County – Total Values at Risk by Property Use*

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	4,135	963	\$754,438,991	\$115,041,243	\$115,041,243	\$984,521,477
Commercial	573	354	\$102,533,450	\$195,943,241	\$195,943,241	\$494,419,932
Government-Owned / Non-Taxable Property	1,082	1	\$606,635	\$949	\$949	\$608,533
Industrial	162	111	\$37,136,909	\$109,750,523	\$164,625,784	\$311,513,216
Miscellaneous	655	1	\$243,465	\$62,437	\$62,437	\$368,339
Residential	20,825	17,372	\$866,165,864	\$3,032,556,173	\$1,516,277,955	\$5,414,999,992
<b>Unincorporated County Total</b>	<b>27,432</b>	<b>18,802</b>	<b>\$1,761,125,314</b>	<b>\$3,453,354,566</b>	<b>\$1,991,951,609</b>	<b>\$7,206,431,489</b>

Source: Yuba County 2020 Parcel/Assessor's Data

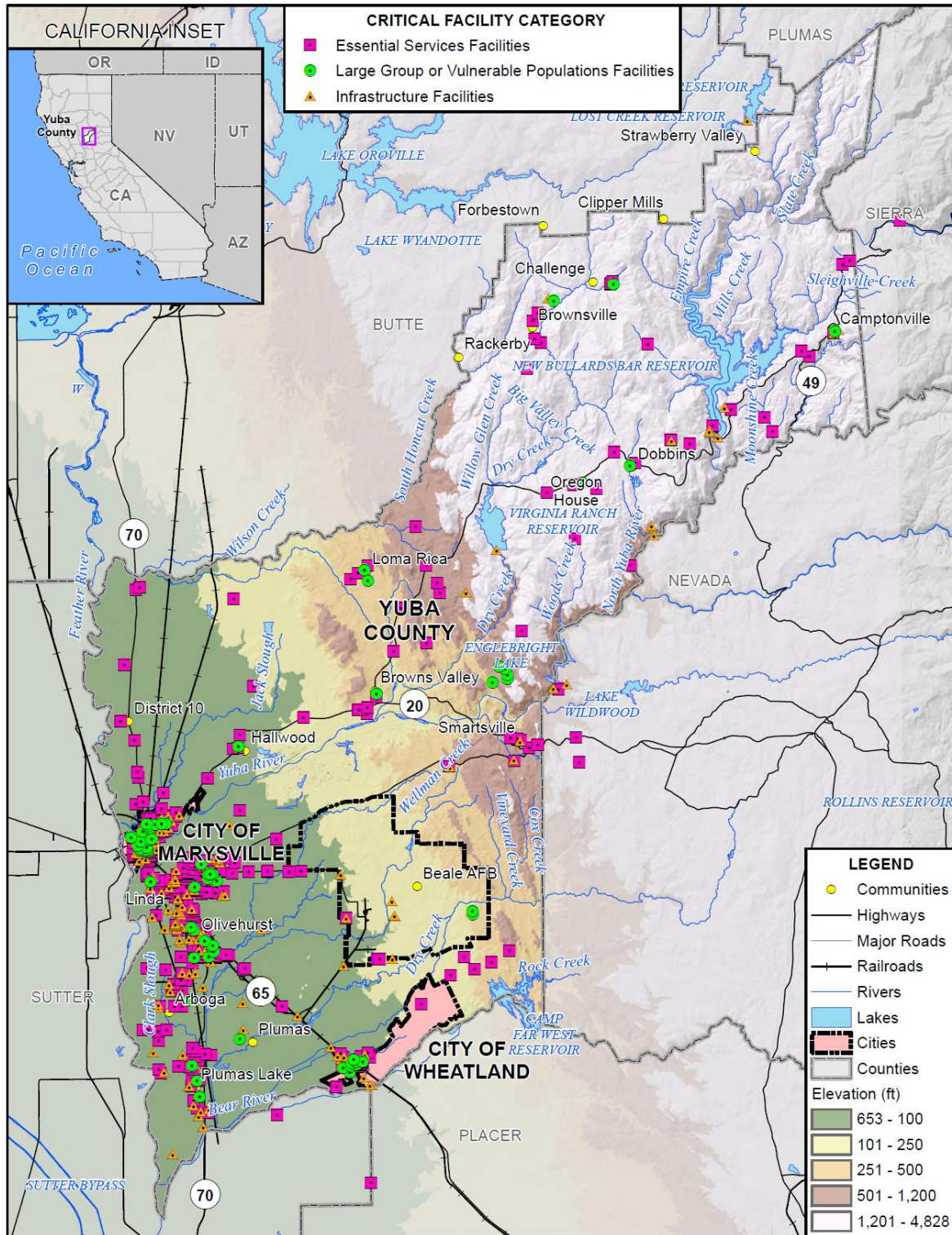
#### 4.2.2. Critical Facility Inventory

Yuba County developed a definition of critical facilities for the Yuba County Planning Area.

*For the purposes of this document Critical Infrastructure describes the physical and cyber systems and assets that are so vital to the County of Yuba that their incapacity or destruction would have a debilitating impact on our physical or economic security or public health or safety. Critical infrastructure includes any location, facility, or infrastructure that are necessary to maintain normalcy in daily life, and that are essential for the delivery of vital services and for the protection of the community. Critical Facilities are further broken out into three Categories: 1) Essential Services Facilities, 2) Large Group and Vulnerable Populations Facilities, and 3) Infrastructure Facilities.*

A summary of critical facilities in the Yuba County Planning Area can be found in Figure 4-1 and Table 4-10. Additional details of individual critical facilities can be found in Appendix F of this Plan Update.

Figure 4-1 Yuba County Planning Area – Critical Facilities



0 4.5 9 Miles

Data Source: Yuba County GIS, Cal-Atlas; Map Date: 07/15/2021.



*Table 4-10 Yuba County Planning Area – Critical Facility Summary*

Jurisdiction/Critical Facility Class	Facility Count
<b>City of Marysville</b>	
Essential Services Facilities	86
Large Group or Vulnerable Populations Facilities	20
Infrastructure Facilities	19
<b>City of Marysville Total</b>	<b>125</b>
<b>City of Wheatland</b>	
Essential Services Facilities	18
Large Group or Vulnerable Populations Facilities	9
Infrastructure Facilities	14
<b>City of Wheatland Total</b>	<b>41</b>
<b>Unincorporated Yuba County</b>	
Essential Services Facilities	266
Large Group or Vulnerable Populations Facilities	39
Infrastructure Facilities	103
<b>Unincorporated Yuba County Total</b>	<b>408</b>
<b>Outside of Unincorporated Yuba County</b>	
Essential Services Facilities	6
Large Group or Vulnerable Populations Facilities	0
Infrastructure Facilities	4
<b>Outside of Unincorporated Yuba County Total</b>	<b>10</b>
<b>Grand Total</b>	
	<b>584</b>

Source: Yuba County GIS

### 4.2.3. Cultural, Historical, and Natural Resources

Assessing Yuba County’s vulnerability to disasters also involves inventorying the cultural, historical, and natural resource assets of the area. This information 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 cultural, historical and natural 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 and sensitive habitats which help absorb and attenuate floodwaters and thus support overall mitigation objectives.

## Cultural and Historical Resources

Yuba County has a large stock of historically significant homes, public buildings, and landmarks. To inventory these resources, information was collected from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. The OHP is responsible for the administration of federally and state mandated historic preservation programs to further the identification, evaluation, registration, and protection of California’s irreplaceable archaeological and historical resources. OHP administers the National Register of Historic Places, the California Register of Historical Resources, California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements.

- The **National Register of Historic Places** is the nation’s official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.
- The **California Register of Historical Resources** program encourages public recognition and protection of resources of architectural, historical, archeological, and cultural significance and identifies historical resources for state and local planning purposes; determines eligibility for state historic preservation grant funding; and affords certain protections under the California Environmental Quality Act. The Register is the authoritative guide to the state’s significant historical and archeological resources.
- **California Historical Landmarks** are sites, buildings, features, or events that are of statewide significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value. Landmarks #770 and above are automatically listed in the California Register of Historical Resources.
- **California Points of Historical Interest** are sites, buildings, features, or events that are of local (city or county) significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value. Points designated after December 1997 and recommended by the State Historical Resources Commission are also listed in the California Register.

Historical resources included in the programs above are identified in Table 4-11.

*Table 4-11 Yuba County Planning Area – Historical Resources*

Resource Name (Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Community
Bok Kai Temple (889)	X	X			12/29/1975	Marysville
Camp Far West Cemetery (P376)				X	1/17/1975	Wheatland

Resource Name (Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Community
Chinese Cemetery and Funeral Pyre (P467)				X	12/22/1975	Wheatland
Falck House (P350)				X	9/13/1974	Challenge
Grace Episcopal Church (P377)				X	1/17/1975	Wheatland
Hart Building (N1013)	X				1/28/1982	Marysville
Johnson Ranch and Burtis Hotel Sites (N1704)	X				7/22/1991	Wheatland
Johnson's Crossing (P375)				X	1/17/1975	Wheatland
Johnson's Ranch (493)		X			10/10/1951	Wheatland
Marysville Historic Commercial District (N2058)	X				6/10/1999	Marysville
Marysville Hotel (P828)				X	5/29/1997	Marysville
Miller, Warren P., House (N2015)	X				3/12/1998	Marysville
Muck Home (P378)				X	1/17/1975	Wheatland
Oregon Creek Covered Bridge (N365)	X				5/30/1975	North San Juan
Overland Emigrant Trail (799)		X			9/16/1964	Wheatland
Packard Library (N724)	X				12/18/1978	Marysville
Parks Bar Bridge 16-11 Site (P817)				X	12/15/1995	Smartville
Ramirez Castle/The Mansion/The Castle, Ramirez Castle/Ell (P436)					8/7/1975	Marysville
Ramirez, Jose Manuel, House (N403)	X				1/17/1976	Marysville
Sacred Heart Church (P783)				X	2/16/1993	Dobbins
Site of The Wheatland Hop Riot Of 1913 (1003)		X			5/8/1991	Wheatland
Smartville (321)		X			7/12/1939	Smartville
Smartville Church of the Immaculate Conception (P740)				X	2/11/1991	Smartville
Temporary Detention Camps for Japanese Americans-Marysville Assembly Center (934)		X			5/13/1980	Marysville
Timbuctoo (320)		X			7/12/1939	Smartville
Us Post Office--Marysville Main (N1341)	X				1/11/1985	Marysville
Wheatland Masonic Temple (P379)	X			X	1/17/1975	Wheatland
Woodleaf Hotel (P351)	X			X	9/13/1974	Challenge
Yuba Power House (P841)				X	5/14/2001	Marysville

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

## Natural Resources

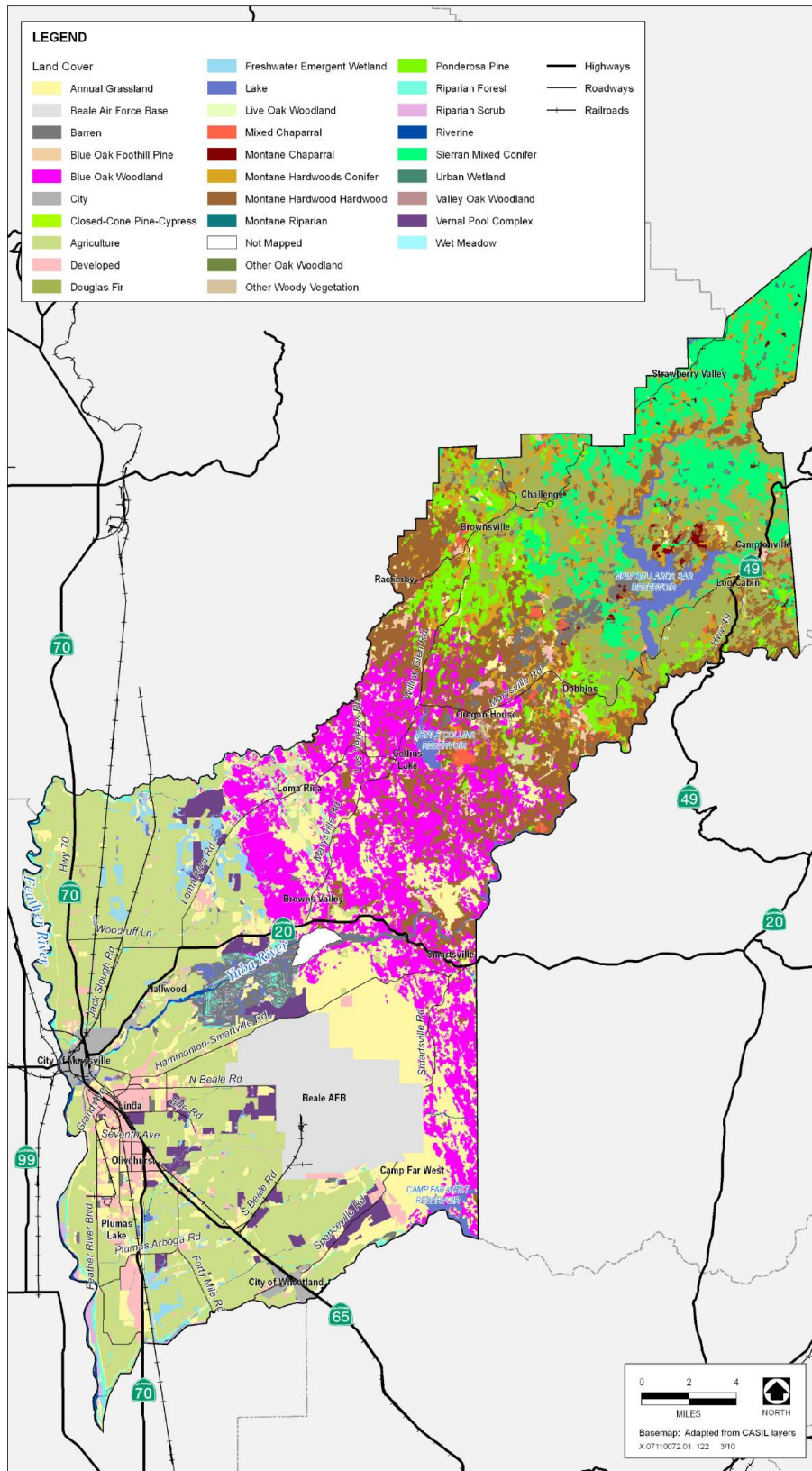
Natural resources are important to include in cost/benefit analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetland areas protects sensitive habitat as well as reducing the force of and storing floodwaters.

Yuba County is home to a wide variety of native species of plants, animals, and natural habitats that support these species. The map in Figure 4-2 shows natural resources. These include meadows, nonnative grasslands, oak woodlands, coniferous forests, foothill and mountain hardwood forests, chaparral, freshwater wetlands and bogs, vernal pools, other riparian habitats, and natural habitats associated with various lakes in the County (lacustrine habitats). Many sensitive plant and animal species reside in the various natural areas of Yuba County, including rodents, birds (including waterfowl), frogs, snakes, insects, fish, deer, and several plant species.

Most of the land containing natural habitats in Yuba County is located in the foothill and mountain regions, as much of valley and other low lying areas of the County have been used for agriculture or are developed. Even so, there are still significant natural habitats remaining in the valley. In addition, changing agricultural practices have become an increasingly important tool to protect or re-create natural habitats while still permitting viable agriculture. Prominent examples include the flooding of rice fields in the winter to provide habitat for migratory birds and preserving riparian habitats along natural watercourses and canals in areas used for agriculture.

Yuba County contains several wildlife and refuge areas, including the Spenceville Wildlife Management and Recreation Area, the Marysville Wildlife Area, the Feather River Wildlife Area, the Daugherty Hills Wildlife Area, the Bobelaine Audubon Sanctuary, fish access areas managed by the California Department of Fish and Game, and the Sierra Foothill Research Center operated by the University of California Extension.

Figure 4-2 Habitats in Yuba County



Source: Yuba County 2030 General Plan

## Special Status Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the Planning Area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

The California Natural Diversity Database, a program that inventories the status and locations of rare plants and animals in California, was queried to create an inventory of special status species in Yuba County. A summary list of these species is found below in Table 4-12. Appendix E list the name, federal status, state status, California Department of Fish and Wildlife (USFWS) status, and the California Rare Plant rank of species in Yuba County.

*Table 4-12 Yuba County Planning Area – Summary of Special Status Species*

Type	Number
Animals - Amphibians	5
Animals - Birds	36
Animals – Crustaceans	3
Animals - Fish	12
Animals - Insects	3
Animals - Mammals	8
Animals – Mollusks	3
Animals – Reptiles	2
Community – Terrestrial	4
Plants - Bryophytes	3
Plants – Lichens	1
Plants – Vascular	39

Source: California Natural Diversity Database

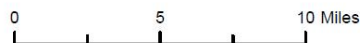
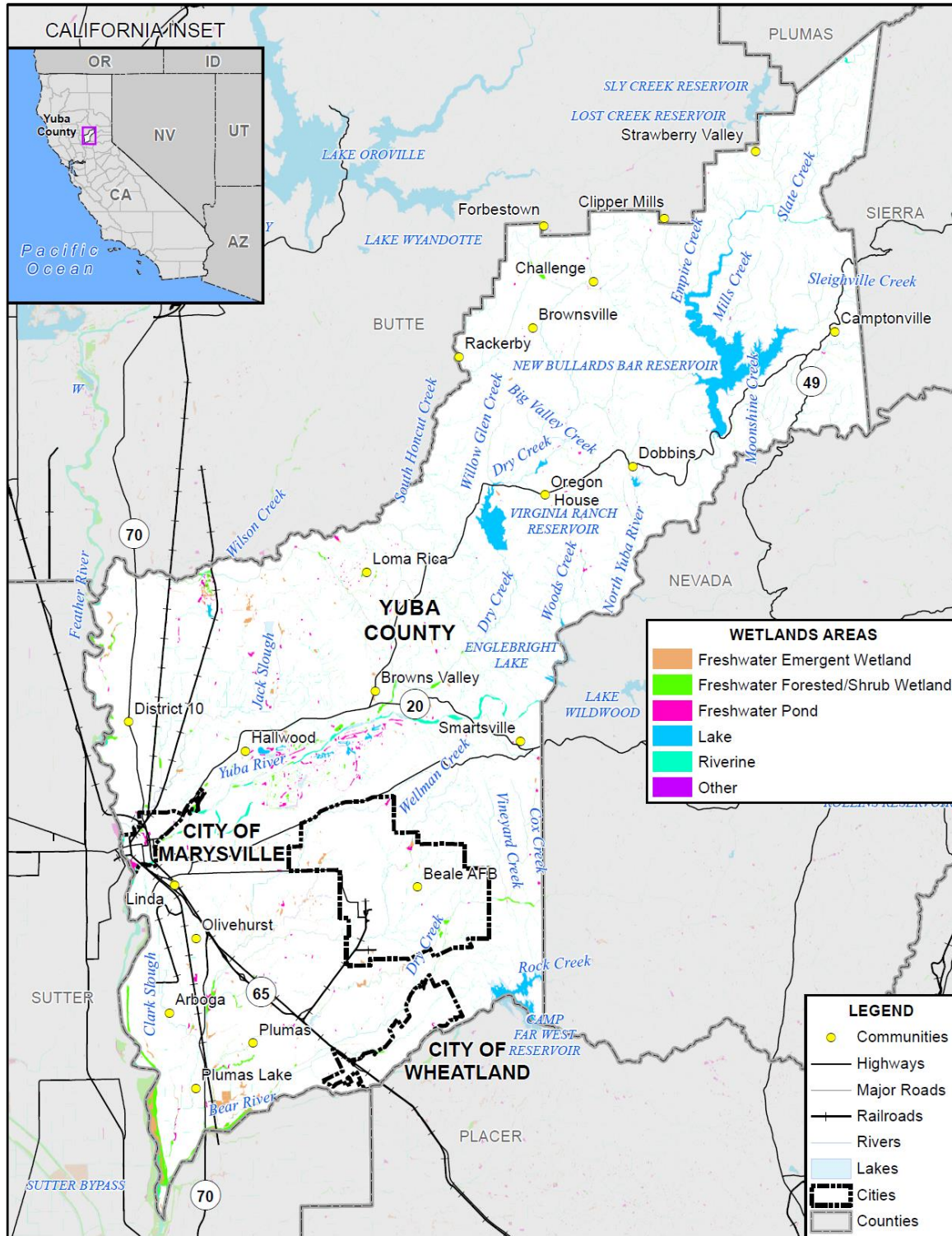
## Wetlands

Wetlands are habitats in which soils are intermittently or permanently saturated or inundated. Wetland habitats vary from rivers to seasonal ponding of alkaline flats and include swamps, bogs, marshes, vernal pools, and riparian woodlands. Wetlands are considered to be waters of the United States and are subject to the jurisdiction of the U.S. Army Corps of Engineers as well as the California Department of Fish and Wildlife. Where the waters provide habitat for federally endangered species, the USFWS may also have authority.

Wetlands are a valuable natural resource for communities providing beneficial impact to water quality, wildlife protection, recreation, and education, and play an important role in hazard mitigation. Wetlands provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation is vital, and reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water.

The US Fish and Wildlife Service has mapped wetlands areas throughout the United States. Figure 4-3 shows the wetlands areas in the County. These areas are detailed in Table 4-13 by wetland type.

Figure 4-3 Yuba County – Wetlands Areas



Data Source: U.S. Fish and Wildlife Service National Wetlands Inventory 10/2020, Yuba County GIS, Cal-Atlas; Map Date: 1/15/2021.



*Table 4-13 Yuba County Planning Area – Wetlands Areas by Area Type*

Wetlands Area Type	Wetlands Area (in Acres)
Freshwater Emergent Wetland	1,794
Freshwater Forested/Shrub Wetland	2,730
Freshwater Pond	1,166
Lake	6,393
Riverine	4,494
Non-Wetland Area	395,403
<b>Grand Total</b>	<b>411,981</b>

Source: US Fish and Wildlife Service

### Natural and Beneficial Functions

Wetlands are often found in floodplains and depressional areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flow. Wetlands perform a variety of ecosystem functions including food web support, habitat for insects and other invertebrates, fish and wildlife habitat, filtering of waterborne and dry-deposited anthropogenic pollutants, carbon storage, water flow regulation (e.g., flood abatement), groundwater recharge, and other human and economic benefits.

Wetlands, and other riparian and sensitive areas, provide habitat for insects and other invertebrates that are critical food sources to a variety of wildlife species, particularly birds. There are species that depend on these areas during all parts of their lifecycle for food, overwintering, and reproductive habitat. Other species use wetlands and riparian areas for one or two specific functions or parts of the lifecycle, most commonly for food resources. In addition, these areas produce substantial plant growth that serves as a food source to herbivores (wild and domesticated) and a secondary food source to carnivores.

Wetlands slow the flow of water through the vegetation and soil, and pollutants are often held in the soil. In addition, because the water is slowed, sediments tend to fall out, thus improving water quality and reducing turbidity downstream.

These natural floodplain functions associated with the natural or relatively undisturbed floodplain that moderates flooding, such as wetland areas, are critical for maintaining water quality, recharging groundwater, reducing erosion, redistributing sand and sediment, and providing fish and wildlife habitat. Preserving and protecting these areas and associated functions are a vital component of sound floodplain management practices for the Yuba County Planning Area.

### Farmlands

Farmlands are important considerations in rural counties in California. Agricultural Lands Yuba County contains about 643 square miles of land, of which roughly 55% (over 228,000 acres) is agricultural land. Most of Yuba County’s agricultural land (about 143,000 acres) is grazing land. The next largest category of agricultural land is “prime” farmland (farmland with the most productive soils), at nearly 42,000 acres. Prime farmland is land that has the best combination of physical, chemical, and other characteristics to produce economically sustained high yields.

Other important categories of agricultural lands include farmland of statewide importance (over 11,000 acres) and unique farmland (over 32,000 acres). Farmlands of statewide importance are those containing soils critical to agricultural production, even if they are not as productive as prime farmland. Unique farmlands are those suited to the production of specific high value crops such as, citrus, tree nuts, vine crops, and olives. Figure 4-4 shows Yuba County's important farmland.

### **Williamson Act**

The Williamson Act, also known as the California Land Conservation Act of 1965, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. When the County enters into a contract with the landowners under the Williamson Act, the landowner agrees to limit the use of the land to agriculture and compatible uses for a period of at least ten years and the County agrees to tax the land at a rate based on the agricultural production of the land rather than its real estate market value. This affects the County's overall values for assessed taxable lands. The County does not participate in the Williamson Act.

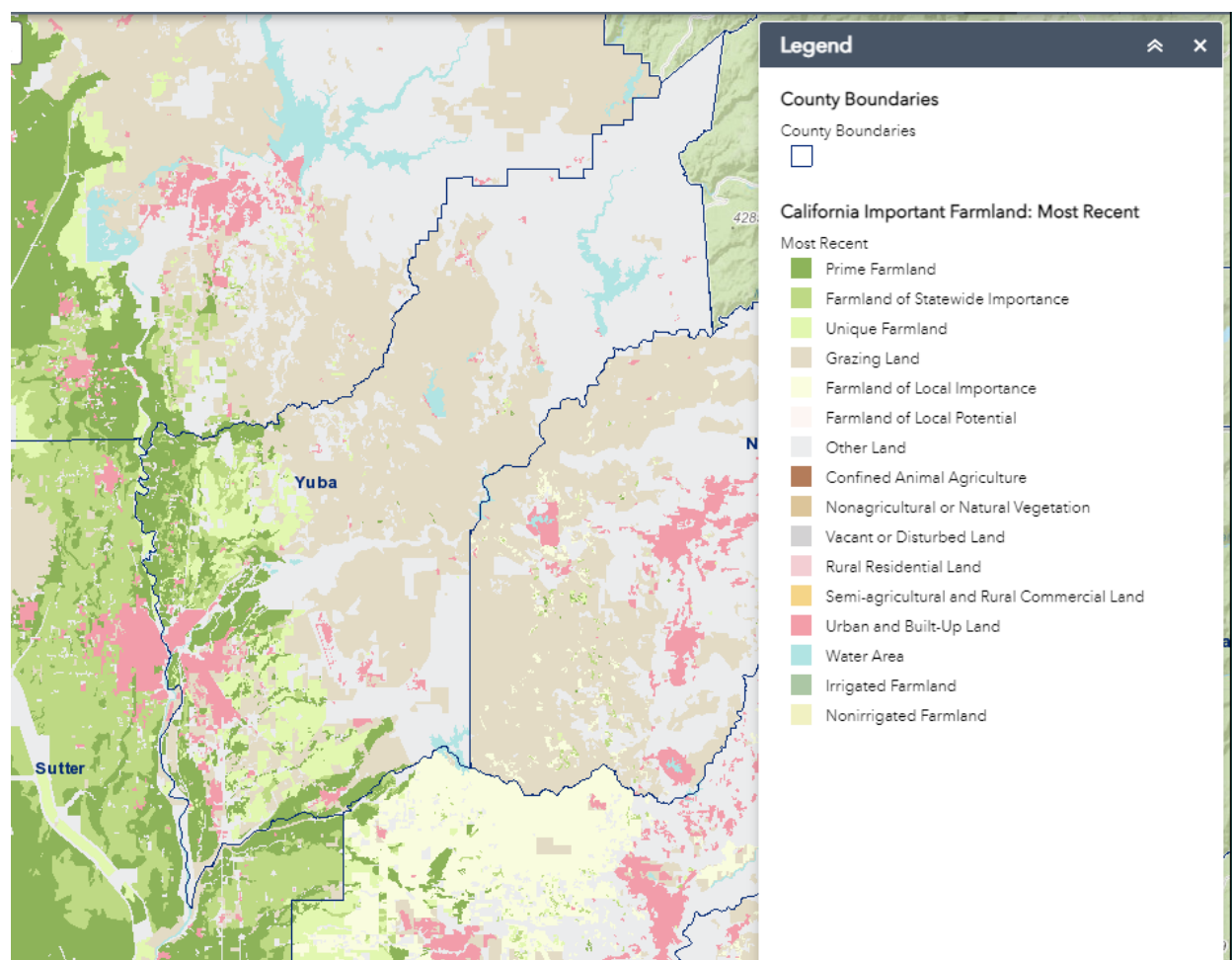
### **State Inventory of Important Farmland**

The Farmland Mapping and Monitoring Program was established in 1984 to document the location, quality, and quantity of agricultural lands and conversion of those lands over time. The program provides impartial analysis of agricultural land use changes throughout California. For inventory purposes, several categories were developed to describe the qualities of land in terms of its suitability for agricultural production. The State Department of Conservation utilizes the following classification system:

- The Prime Farmland category describes farmland with the best combination of physical and chemical features able to sustain long term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.
- Farmland of Statewide Importance is farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.
- Unique Farmland is farmland of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.
- Farmland of Local Importance is either currently producing crops or has the capability of production. This farmland category is determined by each county's board of supervisors and a local advisory committee.

The 2018 maps are the most recent versions. These lands are shown in Figure 4-4.

Figure 4-4 Yuba County – Farmland of Importance



Source: California Department of Conservation. Map date 3/8/2021.

#### 4.2.4. Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. Information from the Yuba County General Plan Housing Element, the California Department of Finance, and the US Census Bureau form the basis of this discussion.

#### Current Status and Past Populations

The estimated population of Yuba County (both incorporated communities and the unincorporated County) for January 1, 2020, was 78,887 (of which 62,822 were in the unincorporated County), representing an almost five-fold increase from 17,034 people in 1940. Table 4-14 illustrates the pace of population growth in Yuba County dating back to 1940. Growth in the County has been steady, with smaller growth coming in the last few decades. Information on the past populations in Marysville and Wheatland are contained in their respective annexes to this Plan Update.

*Table 4-14 Yuba County Planning Area - Population Growth 1940-2020*

Year	Population	Percent Increase
1940	17,034	–
1950	24,420	43.4%
1960	33,589	38.7%
1970	44,736	32.1%
1980	49,733	11.2%
1990	58,228	17.1%
2000	60,219	3.4%
2010	72,155	19.8%
2020	78,887	9.3%

Sources: California Department of Finance, US Census Bureau

## Special Populations and Disadvantaged Communities

Yuba County is a very socially and economically diverse community with a large homeless population, and many residents that are economically disadvantaged due to varying reasons within the county. Yuba County is no stranger to large natural disasters which has had a direct impact on the economics within the county. The primary language in Yuba County is English; however, there is a large representation of the Spanish, and Hmong speaking communities.

The County noted that special populations and disadvantaged communities in the County were discussed by three sources:

- CDC Social Vulnerability Index
- CA DWR Special Populations and Disadvantaged Community Mapping
- Climate Change and Health Profile Report – Yuba County Special Populations

### CDC Social Vulnerability Index

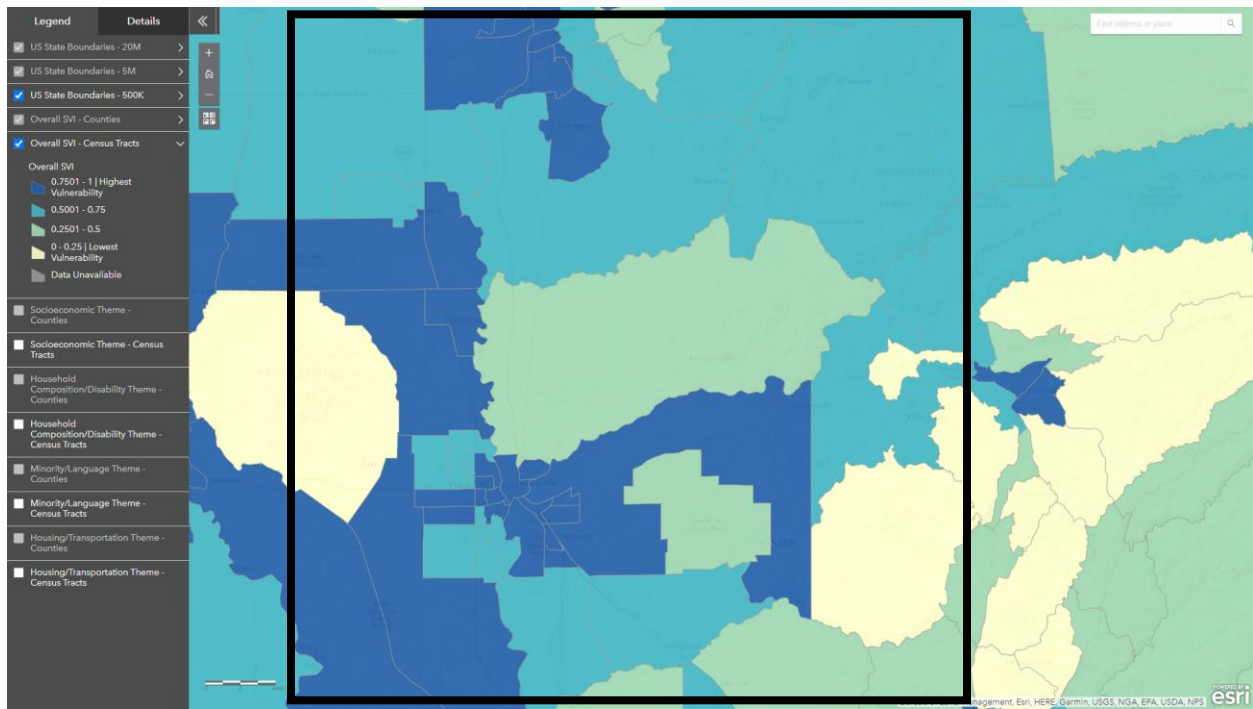
Every community must prepare for and respond to hazardous events, whether a natural disaster like a tornado or disease outbreak, or a human-made event such as a harmful chemical spill. A number of factors, including poverty, lack of access to transportation, and crowded housing may weaken a community’s ability to prevent human suffering and financial loss in a disaster. These factors are known as social vulnerability.

Social vulnerability refers to the potential negative effects on communities caused by external stresses on human health. Such stresses include natural or human-caused disasters, or disease outbreaks. Reducing social vulnerability can decrease both human suffering and economic loss. CDC Social Vulnerability Index (CDC SVI) uses 15 U.S. census variables to help local officials identify communities that may need support before, during, or after disasters.

The Agency for Toxic Substances and Disease Registry (ATSDR) Geospatial Research, Analysis & Services Program (GRASP) created databases to help emergency response planners and public health

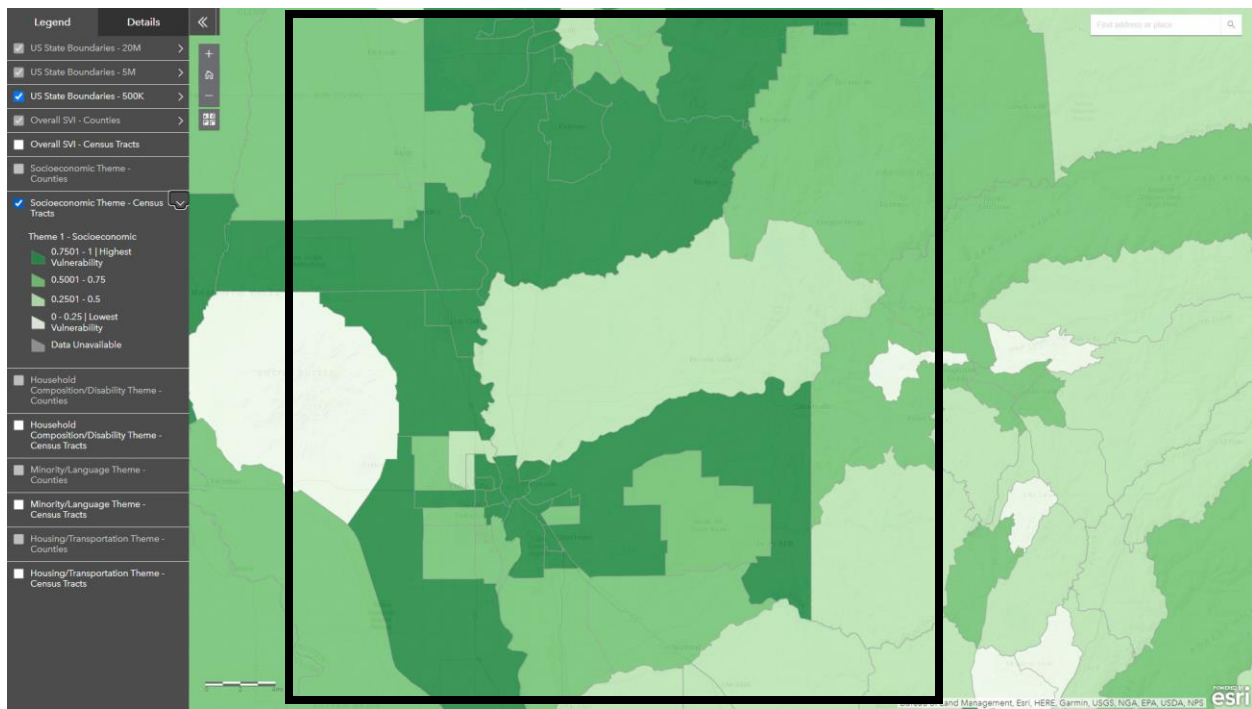
officials identify and map communities that will most likely need support before, during, and after a hazardous event. CDC SVI uses U.S. Census data to determine the social vulnerability of every census tract. Census tracts are subdivisions of counties for which the Census collects statistical data. The CDC SVI ranks each tract on 15 social factors, including poverty, lack of vehicle access, and crowded housing, and groups them into four related themes. Each tract receives a separate ranking for each of the four themes, as well as an overall ranking. Maps of the four themes are shown in the figure below. The overall SVI map is shown in Figure 4-5; the socioeconomic SVI for the County is shown in Figure 4-6; the household composition SVI for the County is shown in Figure 4-7; the minority and language SVI for the County is shown in Figure 4-8; and the housing and transportation SVI for the County is shown in Figure 4-9.

*Figure 4-5 Yuba County – Overall Social Vulnerability*



Source: CDC Social Vulnerability Index – map retrieved 02/02/2021

**Figure 4-6 Yuba County – Socioeconomic Status Vulnerability**



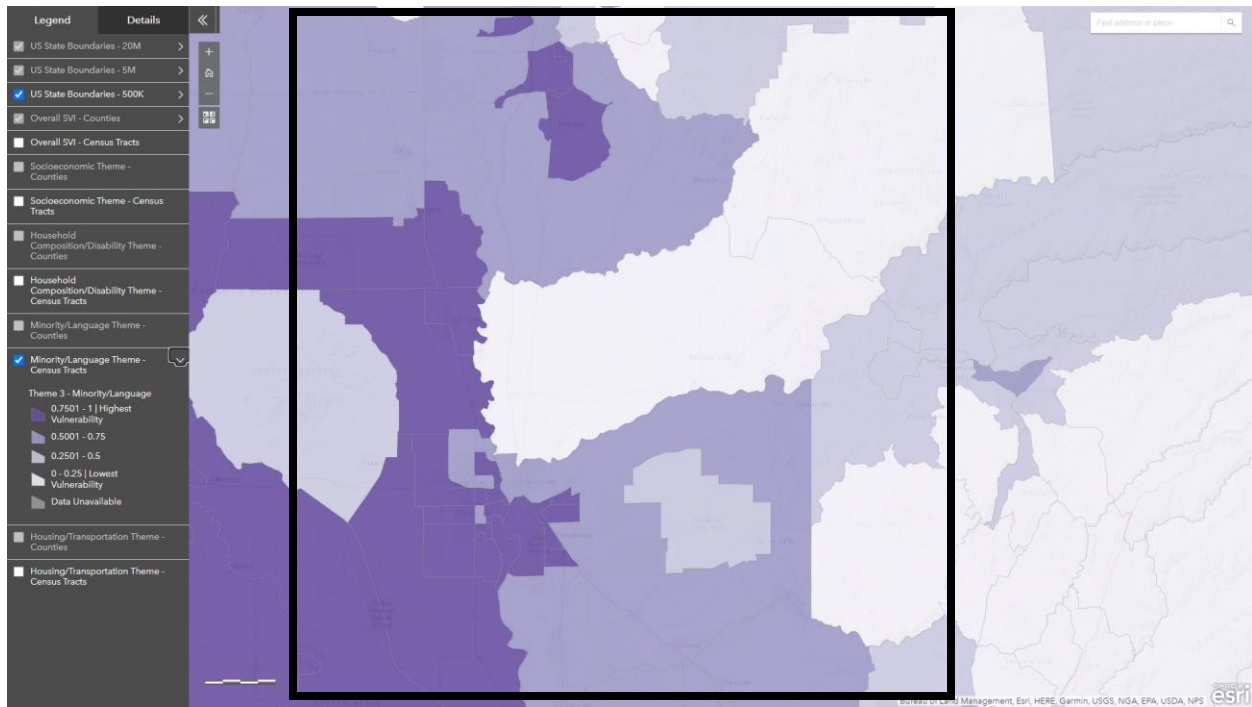
Source: CDC Social Vulnerability Index – map retrieved 02/02/2021

**Figure 4-7 Yuba County – Household Composition and Disabilities Social Vulnerability**



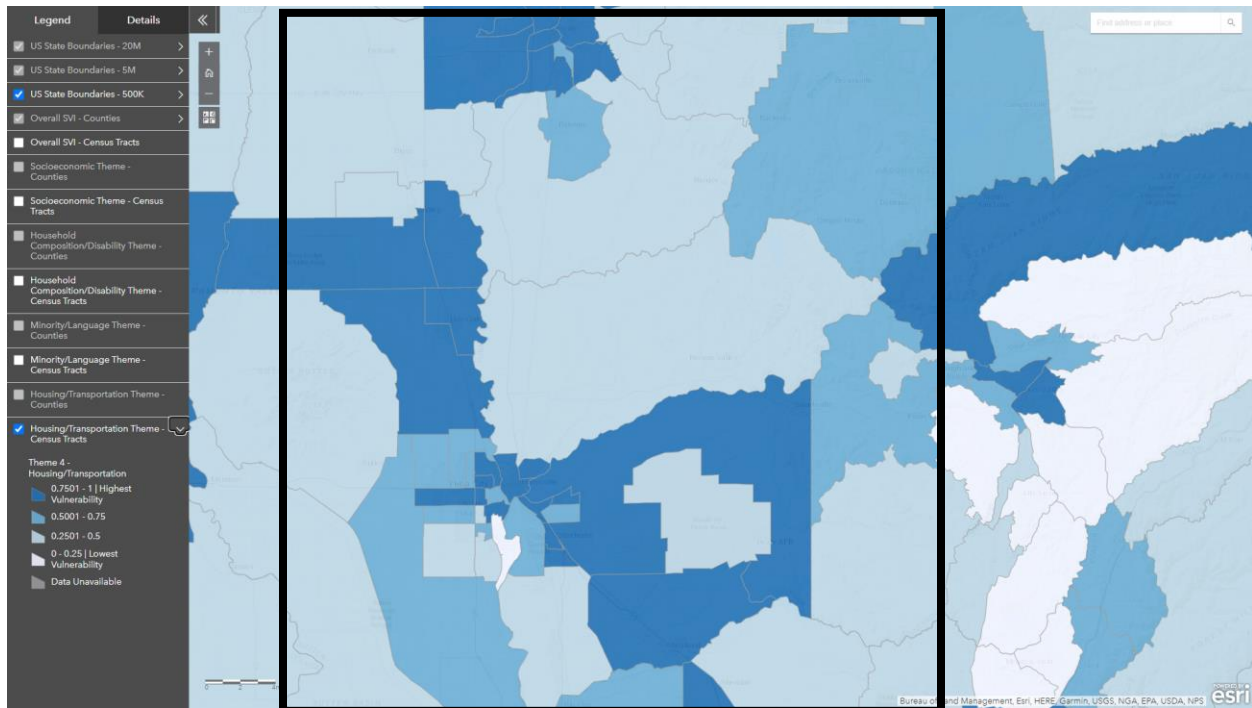
Source: CDC Social Vulnerability Index – map retrieved 02/02/2021

**Figure 4-8 Yuba County – Minority/Language Social Vulnerability**



Source: CDC Social Vulnerability Index – map retrieved 02/02/2021

**Figure 4-9 Yuba County – Housing/Transportation Social Vulnerability**



Source: CDC Social Vulnerability Index – map retrieved 02/02/2021

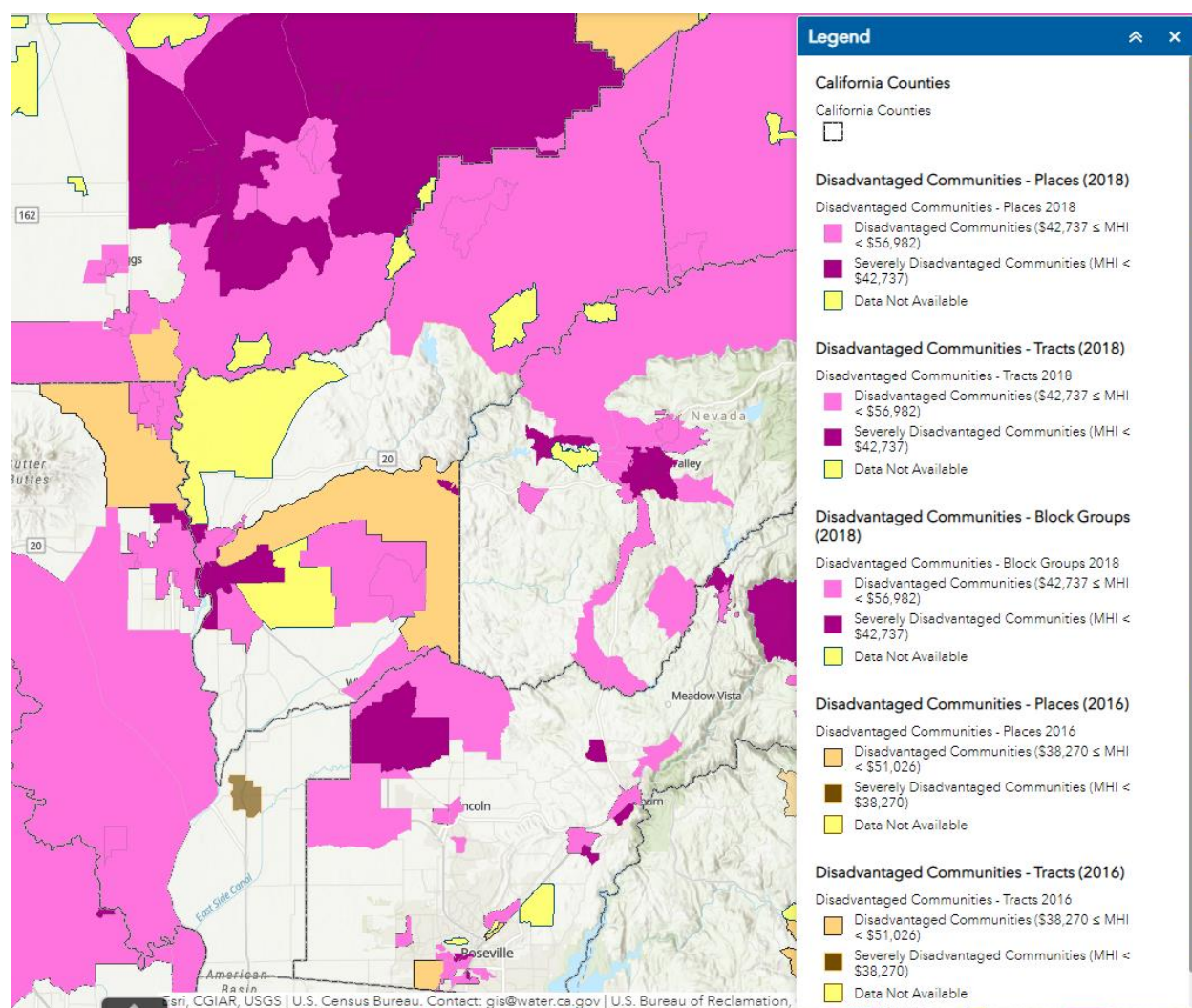
## CA DWR Special Population and Disadvantaged Community Mapping

CA DWR has developed a web-based application to assist local agencies and other interested parties in evaluating disadvantaged community (DAC) status throughout the State, using the definition provided by Proposition 84 Integrated Regional Water Management (IRWM) Guidelines (2015). The DAC Mapping Tool is an interactive map application that allows users to overlay the following three US Census geographies as separate data layers:

- Census Place
- Census Tract
- Census Block Group

Only those census geographies that meet the DAC definition are shown on the map (i.e., only those with an annual median household income (MHI) that is less than 80 percent of the Statewide annual MHI (PRC Section 75005(g)). In addition, those census geographies having an annual MHI that is less than 60 percent of the Statewide annual MHI are shown as "Severely Disadvantaged Communities" (SDAC). The DAC map for Yuba County is shown in Figure 4-10.

Figure 4-10 Yuba County – Disadvantaged Communities



Source: CA DWR – map retrieved 02/02/2021

## Climate Change and Health Profile Report – Yuba County Special Populations

The 2017 Climate Change and Health Profile Report for Yuba County was done by the California Department of Public Health and the University of California-Davis. The report noted that there are special populations in the County.

*In 2010, the age-adjusted death rate in Yuba County was higher than the state average. Disparities in death rates among race/ethnicity groups highlight how certain populations disproportionately experience health impacts. Within the county, the highest death rate occurred among whites and the lowest death rate occurred among Asians.*

*In 2012, nearly 48% of adults (58,152; pooled for Yuba and Sutter Counties) reported one or more chronic health conditions including heart disease,*

*diabetes, asthma, severe mental stress or high blood pressure. In 2012, 13% of adults reported having been diagnosed with asthma. In 2012, approximately 32% of adults were obese (statewide average was 25%). In 2012, nearly 16% of residents aged 5 years and older had a mental or physical disability (statewide average was 10%).*

*In 2005-2010, there was an annual average of 16 heat-related emergency room visits and an age-adjusted rate of 22 emergency room visits per 100,000 persons (the statewide age-adjusted rate was 10 emergency room visits per 100,000 persons).*

*Among climate-vulnerable groups in 2010 were 6,217 children under the age of 5 years and 7,255 adults aged 65 years and older. In 2010, there were approximately 758 people living in nursing homes, dormitories, and other group quarters where institutional authorities would need to provide transportation in the event of emergencies. Social and demographic factors and inequities affect individual and community vulnerability to the health impacts of climate change. In 2010, 7% of households (1,576) did not have a household member 14 years or older who spoke English proficiently (called linguistically isolated; statewide average was 10%).*

*In 2010, approximately 23% of adults aged 25 years and older had less than a high school education (statewide average was 19%). In 2010, 20% of the population had incomes below the poverty level (the statewide average was 14%).*

*Seventeen percent of households paid 50% or more of their annual income on rent or a home mortgage (statewide average was 22%).*

*In 2012, approximately 10,000 (44%) low-income residents reported they did not have reliable access to a sufficient amount of affordable, nutritious food (called food insecurity; statewide average was 42%).*

*In 2010, Yuba County had approximately 2,735 outdoor workers whose occupation increased their risk of heat illness. In 2010, roughly five percent of households did not own a vehicle that could be used for evacuation (statewide average was 8%).*

*In 2009, approximately 2% of households were estimated to lack air conditioning, a strategy to counter adverse effects of heat (statewide average was 36%). In 2011, tree canopy, which provides shade and other environmental benefits, was present on 12% of the county's land area (statewide average was 8%).*

## Development since 2015 Plan

The Yuba County Building Department tracks total building permits issued since 2015 for unincorporated Yuba County. A summary of this development is shown in Table 4-15. Development by known flood fire, and other hazard areas is shown in Table 4-16. All development in the identified hazard areas, including the 1% annual chance floodplains and high wildfire risk areas, were completed in accordance with all current and applicable development codes and standards and should be adequately protected. Thus, with the exception of more people living in the area potentially exposed to natural hazards, this growth should not cause a significant change in vulnerability of the County to identified priority hazards.

*Table 4-15 Yuba County Development 2015-2020 Summary*

Property Use	2015	2016	2017	2018	2019	2020
Residential	292	356	344	513	599	583
Commercial	17	17	24	36	37	15
<b>Total</b>	<b>309</b>	<b>373</b>	<b>368</b>	<b>549</b>	<b>638</b>	<b>598</b>

Source: Yuba County Building Department and Planning Department

*Table 4-16 Yuba County Development in Hazard Zones since 2015*

Property Use	1% Annual Chance Flood	Wildfire Risk Area	Other
Residential	8	0	0
Commercial	6	0	0
Industrial	1	0	0
Other (Ag Bldg)	7	0	0
<b>Total</b>	<b>22</b>	<b>0</b>	<b>0</b>

Source: Yuba County Building Department and Planning Department

## Future Development

Future development in the County is discussed in the sections below.

### Future Population Projections

As indicated in the previous section, Yuba County had been steadily growing from 1940 to 2010, with a recent slowing in population growth. Long term forecasts by the California Department of Finance project population growth in Yuba County continuing through 2060. Table 4-17 shows the population projections for the County as a whole through 2060. Based on this data, population growth continues steadily through 2060.

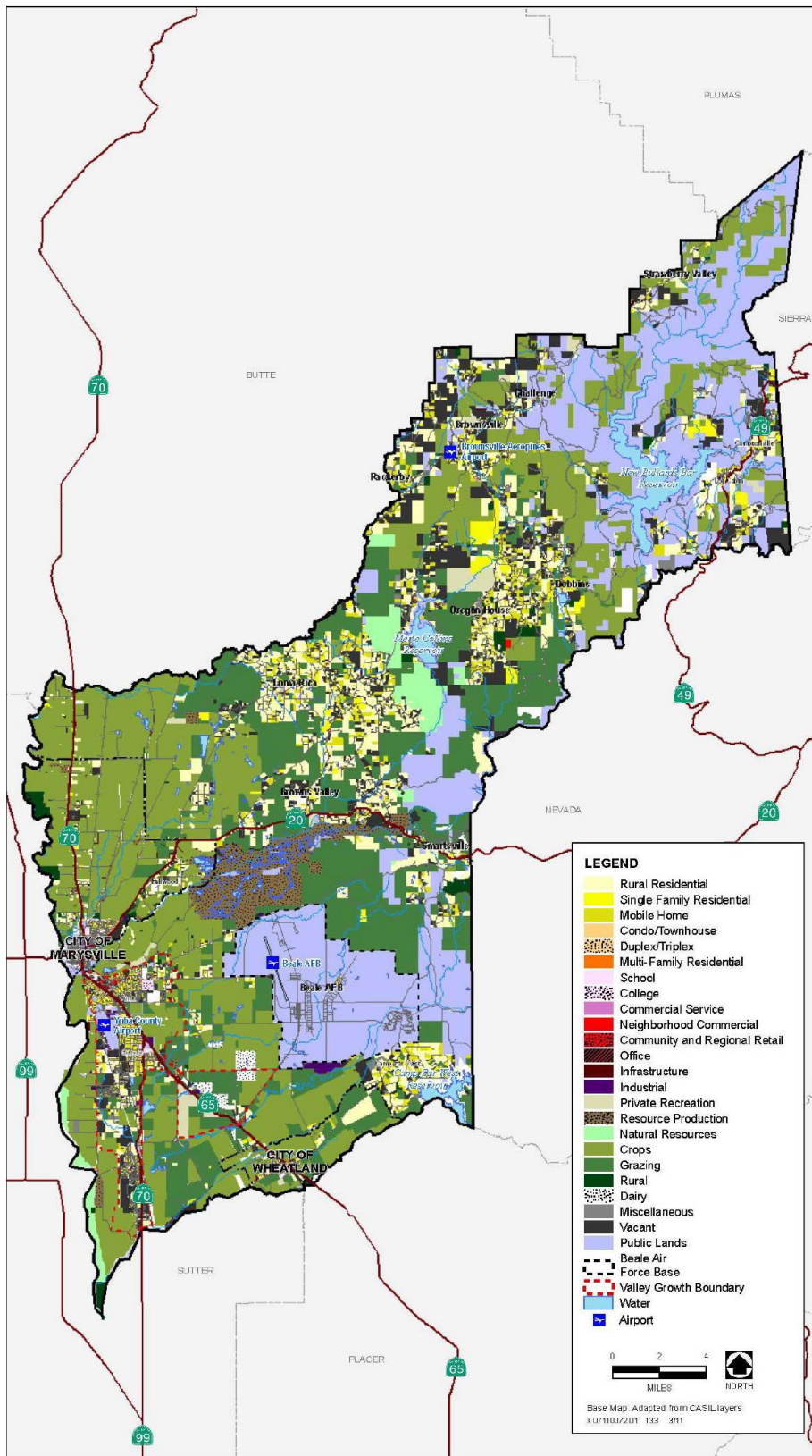
*Table 4-17 Population Projections for Yuba County (incorporated and unincorporated), 2020-2060*

	2020	2030	2040	2050	2060
Yuba County	79,089	82,698	86,321	88,176	88,592

## **Future Land Use**

The future use of land in the County is fundamental to attaining the vision of a balanced, self-sustaining community. A land use pattern which balances growth between rural and urban areas, as well as providing a balance between housing, employment, natural resources, and services in the County is a key element in maintaining the quality of life and unique character of the County. Descriptions of allowed uses for each classification are detailed in the Yuba County General Plan Land Use Element. Figure 4-11 is sourced from this section.

Figure 4-11 Yuba County General Plan Land Use

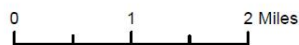
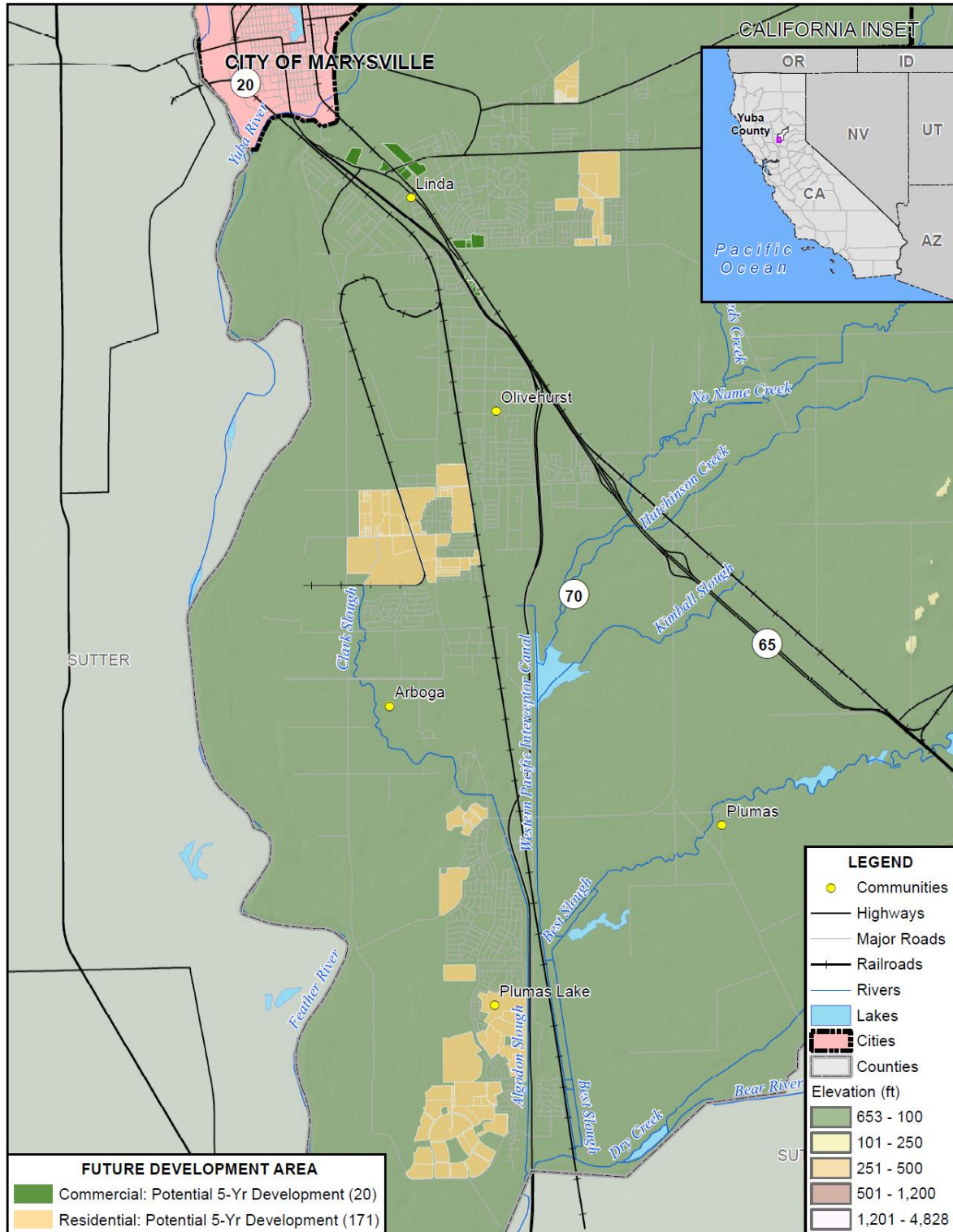


Source: Yuba County 2030 General Plan Land Use Element

## Future Development GIS Analysis

Yuba County provided future development areas that were mapped into GIS format. Using GIS, the following methodology was used in determining parcel counts and acres associated with future development in the unincorporated Yuba County Planning Area. Yuba County's 2020 Parcel/Assessor's data and data from the County planning department were used as the basis for the unincorporated County's inventory of parcels and acres of future development areas. Using the GIS parcel spatial file and the APNs, the future development projects were mapped. These areas can be seen on Figure 4-12 and detailed in Table 4-18. Analysis of future developments for Marysville and Wheatland can be found in their respective annexes to this Plan Update.

Figure 4-12 Unincorporated Yuba County – Future Development Areas



Data Source: Yuba County GIS, Cal-Atlas; Map Date: 07/15/2021.



*Table 4-18 Unincorporated Yuba County – Future Development Parcels and Acres*

Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
Commercial: Potential 5-Yr Development	20	1	89.6
Residential: Potential 5-Yr Development	171	71	1,832.3
<b>Grand Total</b>	<b>191</b>	<b>72</b>	<b>1,922.0</b>

Source: Yuba County GIS

## 4.3 Hazard Profiles and Vulnerability Assessment

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the...location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

The hazards identified in Section 4.1 Hazard Identification, 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.

### *Hazard Profiles*

Each hazard is profiled 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 Yuba County Planning Area and the unincorporated County. Where known, this includes information on the hazard location, extent, seasonal patterns, speed of onset/duration, and magnitude and/or any secondary effects.
- **Past Occurrences**—This section contains information on historical hazard events, including location, impacts, and damages where known. Hazard research, historical incident worksheets and other input from the HMPC 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 chance of the event happening in any given year (e.g., three droughts over a 30-year period equates to a 10 percent chance of experiencing a drought in any given year). The 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 the next year or has a recurrence interval of 11 to 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.

### *Vulnerability Assessment*

With Yuba 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 Yuba County Planning Area and unincorporated Yuba County.

An estimate of the vulnerability of the Yuba County Planning Area and unincorporated Yuba County to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. 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 a 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 critical community facilities, historic structures, and valued natural resources. Together, this information conveys the impact, or vulnerability, of the Yuba County Planning Area to that hazard.

The vulnerability assessment identified five hazards in the Planning Area for which specific geographical hazard areas have been defined and for which sufficient data exists to support a quantifiable vulnerability analysis. These five hazards are dam failure, earthquake, flood, levee failure, and wildfire. The

vulnerability of the flood dam failure, (1%/0.2% annual chance), levee failure, and wildfire hazards were analyzed using GIS and County parcel and assessor data.

FEMA's loss estimation software, HAZUS-MH, was used to analyze the County's vulnerability to earthquakes.

For dam failure, flood (1%/0.2% annual chance), levee failure, and wildfire, the following elements were inventoried for each community, to the extent possible, to quantify vulnerability in identified hazard areas:

- General vulnerability and hazard-related impacts, including impacts to life, safety, and health
- Values at risk (i.e., types, numbers, and value of land and improvements)
- Population at risk
- Critical facilities at risk
- Overall community impact
- Future development/development trends within the identified hazard area

The vulnerability and potential impacts from priority hazards that do not have specific mapped areas nor the data to support additional vulnerability analysis are discussed in more general terms. These include:

- Climate Change
- Drought and Water Shortage
- Flood: Localized/Stormwater
- Pandemic
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rain and Storms

The following sections provide the hazard profile and vulnerability assessments for each of the hazards identified in Section 4.1 Hazard Identification. ***The 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 and wildfire. The remainder of the hazards follow alphabetically.***

## Power Outages/Failure

An additional impact of extreme heat is power outage or power failure. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible 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 maintenance or upgrading needs
- **Unscheduled:** Some intentional disruptions must be done "on the spot." 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 then 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 scenario was repeated the following day, January 18, 2001, and again on March 19, 2001.

A July 2006 heat storm event affected the entire state as well as most of the West, producing record energy demand levels in California. The state was able to avoid rotating outages due to a combination of favorable factors that included no major transmission outages, lower than typical generator outages, significant customer response to pleas for energy conservation, high imports from the Pacific Northwest despite unusually high loads, outstanding cooperation among western control area operators, and prompt response to fires that potentially threatened major interties. However, the event brought to light the vulnerability of the electric distribution system, as over 3,500 distribution transformers failed, leaving over two million customers without power at various times over the ten-day event, many for several hours and a small minority for up to three days.

In 2020, the state battled both extreme heat and wildfires. As a result of extreme heat, the CAISO declared a Stage 3 emergency. PG&E initiated rotating outages in August at the request of California's grid operator. The outages, which impacted 220,000 customers, occurred during periods of high heat. These rolling blackouts lasted less than a week.

## Unintentional Disruptions

Unintentional or unplanned disruptions are outages that come with essentially no advance notice. This type of disruption can be the most problematic. The following are categories of unplanned disruptions:

- Accident by the utility, utility contractor, or others
- Malfunction or equipment failure
- Equipment overload (utility company or customer)
- Reduced capability (equipment that cannot operate within its design criteria)
- Tree contact other than from storms
- Vandalism or intentional damage
- Weather, including lightning, wind, earthquake, flood, and broken tree limbs taking down power lines
- Wildfire that damages transmission lines

### *Climate Change and Energy Shortage*

Changing climate is expected to bring more frequent and intense natural disasters. Key climate parameters are starting to move outside of historically observed variability at a rate that makes historical data a poor predictor of future climate. For example, the warmest years on record in California occurred in 2014, 2015, 2016, and 2019. 2020 is on pace to be a remarkably hot year as well. In addition, the 2016-2017 year broke the record as the wettest ever recorded in the northern Sierra Nevada Mountains.

Changes in temperatures, precipitation patterns, extreme events, and sea level rise have the potential to decrease the efficiency of thermal power plants and substations, decrease the capacity of transmission lines, render hydropower less reliable, spur an increase in electricity demand, and put energy infrastructure at risk of flooding.

With climate warming, higher costs from increased demand for cooling in the summer are expected to outweigh the decreases in heating costs in the cooler seasons. Hotter temperatures in California will mean more energy (typically measured in “cooling-degree days”) needed to cool homes and businesses both during heat waves and on a daily basis, during the daytime peak of the diurnal temperature cycle. During future heat waves, historically cooler coastal cities (e.g., San Francisco and Los Angeles) are projected to experience greater relative increases in temperature, such that areas that never before relied on air conditioning will experience new cooling demands.

Secondary impacts of energy shortages are most often felt by vulnerable populations. For example, those who rely on electric power for life-saving medical equipment, such as respirators, are extremely vulnerable to power outages. Also, during periods of extreme heat emergencies, the elderly and the very young are more vulnerable to the loss of cooling systems requiring power sources.

Additional impacts from a power disruption affect remote areas. This includes evacuation messaging and coordination difficulties, and a reduction in firefighting capabilities due to lack of water access in more remote areas (especially for those on wells).

### **Public Safety Power Shutoff (PSPS)**

A new intentional disruption type of power shortage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California’s three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help

protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a Public Safety Power Shutoff (PSPS).

PSPS events have occurred in the County on June 8-9 of 2019; August 23-25 of 2019; September 23-24 of 2019; October 26, 2019, October 29, 2019; and November 20, 2019, 07/12/2020, 09/26/2020, 10/12/2020, 10/14/2020, 10/21/2020, and 10/25/2020. PG&E has made an effort to reduce the number of events and customers impacted by PSPS events; however with the implementation in 2021 of new criteria there is an anticipated increase in the frequency, duration, and number of customers impacted by PSPS events in Yuba County

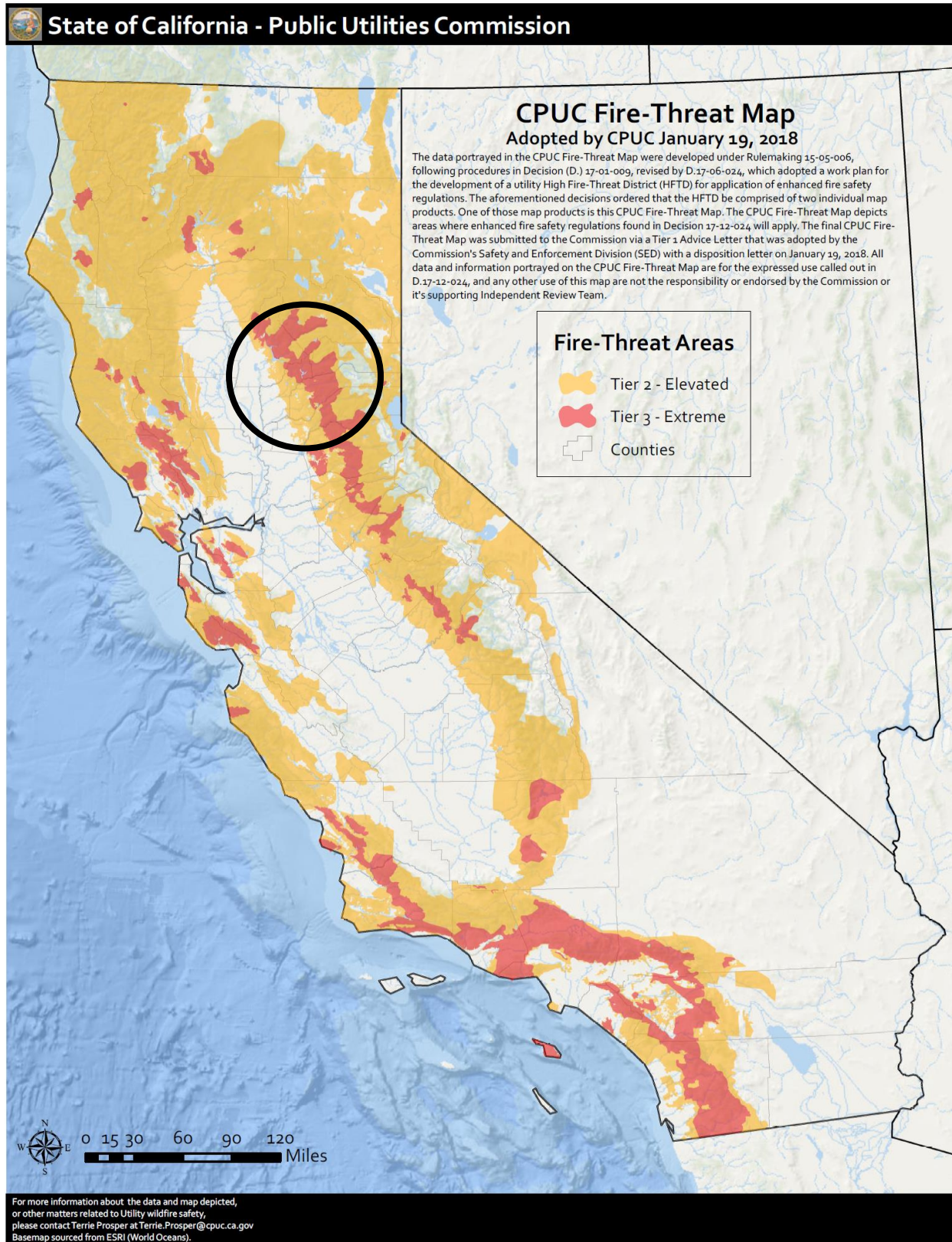
### *Public Safety Power Shutoff Criteria*

The Wildfire Safety Operations Center (WSOC) monitors fire danger conditions across PG&E service area and PSPS, some factors include:

- 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 temperature, 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 WSOC and field observations from PG&E crews

The most likely electric lines to be 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 (seen on Figure 4-13). This includes 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 upon a line that passes through an area experiencing extreme fire danger conditions. This means that any customer who receives electric service from PG&E should be prepared for a possible PSPS. As seen on Figure 4-13, the County has areas inside the Tier 2 and Tier 3 areas, as well as areas outside of them.

Figure 4-13 State of California Tier 2 and 3 Areas



PG&E noted that extreme weather threats can change quickly. When 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

### *Data Sources*

In general, information provided by the County and HMPC members is integrated into this section with information from other data sources. The data sources listed below formed the basis for this Hazard Profiles and Vulnerability section of this Plan. Where data and information from these studies, plans, reports, and other data sources were used, the source is referenced as appropriate throughout this risk assessment.

- 2018 California State Hazard Mitigation Plan
- ArkStorm at Tahoe – Stakeholder Perspectives on Vulnerabilities and Preparedness for an Extreme Storm Event in the Greater Lake Tahoe, Reno and Carson City Region. 2014.
- Bureau of Land Management
- CA DWR Best Available Maps
- CAL FIRE GIS datasets
- Cal OES
- Cal-Adapt
- Cal-Adapt – Annual Average of Acres Burned
- Cal Adapt – Extended Drought Scenarios
- Cal-Adapt – Number of Extreme Heat Days by Year
- Cal-Adapt – Precipitation: Decadal Averages Map
- California Adaptation Planning Guide
- California Climate Adaptation Strategy (CAS) – 2014
- California Department of Water Resources
- California Department of Water Resources (CA DWR) Division of Safety of Dams
- California Department of Water Resources Best Available Maps
- California Department of Water Resources Division of Safety of Dams
- California Division of Mines and Geology
- California Geological Survey
- California Office of Emergency Services – Dam Inundation Data
- California’s Drought of 2007-2009, An Overview. State of California Natural Resources Agency, California Department of Water Resources.
- Climate Change and Health Profile Report – Yuba County
- County staff
- Existing plans and studies
- FEMA
- FEMA: Building Performance Assessment: Oklahoma and Kansas Tornadoes

- FEMA’s HAZUS-MH 4.2 GIS-based inventory data
- Integrated Regional Water Management Plan
- IPCC Fifth Assessment Synthesis Report (2014)
- Kenward, Alyson PhD, Adams-Smith, Dennis, and Raja, Urooj. Wildfires and Air Pollution – The Hidden Health Hazards of Climate Change. Climate Central. 2013.
- Levees in History: The Levee Challenge. Dr. Gerald E. Galloway, Jr., P.E., Ph.D., Water Policy Collaborative, University of Maryland, Visiting Scholar, USACE, IWR.
- Liu, J.C., Mickley, L.J., Sulprizio, M.P. et al. Climatic Change. 138: 655. doi:10.1007/s10584-016-1762-6. 2016.
- Multi-Hazard Identification and Risk Assessment, FEMA 1997
- National Drought Mitigation Center
- National Drought Mitigation Center – Drought Impact Reporter
- National Integrated Drought Information System
- National Levee Database
- National Oceanic and Atmospheric Administration’s National Climatic Data Center
- National Weather Service
- Natural Resource and Conservation Service
- NOAA Storm Prediction Center
- Pacific Gas and Electric Company
- Personal interviews with planning team members and staff from the County
- Proceedings of the National Academy of Sciences
- Public Health Alliance of Southern California
- Public Policy Institute of California
- Science Magazine
- Statewide GIS datasets from other agencies such as Cal OES, FEMA, USGS, CGS, Cal Atlas, and others
- U.S. Census Bureau 2010 Household Population Estimates
- U.S. Fish and Wildlife Service
- U.S. Fish and Wildlife Service’s National Wetlands Inventory maps
- U.S. Forest Service GIS datasets
- U.S. Geological Survey
- U.S. Occupational Safety and Health Administration
- United States Geological Survey Open File Report 2015-3009
- University of California
- US Army Corps of Engineers
- US Department of Agriculture
- US Farm Service Agency
- US Fish and Wildlife Service
- USDA Forest Service Region 5
- USGS Bulletin 1847
- USGS National Earthquake Information Center
- USGS Publication 2014-3120
- Vaisala National Lightning Detection Network
- Western Regional Climate Center
- World Health Organization
- Written descriptions of inventory and risks provided by Yuba County

- Yuba County Community Wildfire Protection Plan
- Yuba County 2015 Emergency Operations Plan
- Yuba County 2030 General Plan

### 4.3.1. Severe Weather: General

Severe weather is generally any destructive weather event, but usually occurs throughout the Yuba County Planning Area as localized storms that bring heavy rains and floods; severe cold, snow, and winter weather; extreme heat, and strong winds. The NOAA’s NCDC has been tracking severe weather since 1950. Their Storm Events Database contains data on the following events shown on Figure 4-14.

*Figure 4-14 NCDC Storm Events Database Period of Record*

**Event Types Available:**



**Event Types Available:**

Add more info about event types here. Link to collections page/tab when referencing data collection source.

1. Tornado: From 1950 through 1954, only tornado events were recorded.

2. Tornado, Thunderstorm Wind and Hail: From 1955 through 1992, only tornado, thunderstorm wind and hail events were keyed from the paper publications into digital data. From 1993 to 1995, only tornado, thunderstorm wind and hail events have been extracted from the [Unformatted Text Files](#).

3. All Event Types (48 from Directive 10-1605): From 1996 to present, 48 event types are recorded as defined in [NWS Directive 10-1605](#).

Source: NCDC

The NCDC’s Storm Events Database contains data on the following: all weather events from 1993 to current (except from 6/1993-7/1993); and additional data from the Storm Prediction Center, which includes tornadoes (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). This database contains 237 severe weather events that occurred in Yuba County between January 1, 1950, and July 31, 2020. Table 4-19 summarizes these events.

*Table 4-19 NCDC Severe Weather Events for Yuba County 1950-7/31/2020\**

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage	Deaths (indirect)	Injuries (indirect)
Astronomical Low Tide	1	0	0	\$0	\$0	0	0
Avalanche	4	2	3	\$0	\$0	0	0
Blizzard	1	0	0	\$0	\$0	0	0
Cold/Wind Chill	10	1	0	\$0	\$2,400,000	2	10
Dense Fog	3	0	0	\$200,000	\$0	0	2
Drought	38	0	0	\$0	\$0	0	0
Excessive Heat	2	2	2	\$0	\$0	0	0
Flash Flood	1	0	0	\$0	\$0	0	0
Flood	20	2	0	\$5,965,000	\$0	0	0
Frost/Freeze	6	0	0	\$0	\$0	0	0
Funnel Cloud	7	0	0	\$0	\$0	0	0
Hail	1	0	0	\$0	\$0	0	0
Heat	12	1	0	\$0	\$0	0	0
Heavy Rain	4	0	0	\$0	\$0	0	0
Heavy Snow	103	1	2	\$1,125,000	\$0	1	3
High Surf	1	0	0	\$0	\$0	0	0
High Wind	45	2	3	\$10,458,000	\$30,011,000	0	0
Landslide	1	0	1	\$2,000	\$0	0	0
Strong Wind	16	0	0	\$1,892,000	\$0	0	0
Thunderstorm Wind	3	0	0	\$10,000	\$0	0	0
Tornado	4	0	0	\$26,000	\$0	0	0
Wildfire	33	7	47	\$18,525,000	\$0	28	0
Winter Storm	195	1	3	\$190,000	\$0	1	1
Winter Weather	74	1	0	\$0	\$0	0	3
<b>Total</b>	<b>585</b>	<b>20</b>	<b>61</b>	<b>\$37,269,125</b>	<b>\$32,411,000</b>	<b>32</b>	<b>19</b>

Source: NCDC

\*Note: Losses reflect totals for all impacted areas, some of which fell outside of Yuba County

The NCDC table above summarize severe weather events that occurred in Yuba County. Only a few of the events actually resulted in state and federal disaster declarations. It is further interesting to note that different data sources capture different events during the same time period, and often display different information specific to the same events. The value in this data is that it provides data depicting the County’s “big picture” hazard environment.

As previously mentioned, many of Yuba County’s state and federal disaster declarations have been a result of severe weather. For this Plan, severe weather is discussed in the following subsections:

- Extreme Cold and Freeze
- Extreme Heat
- Heavy Rains and Storms
- High Winds and Tornadoes

For purposes of this Plan, the Marysville co-op weather station (elevation: 70 feet above mean sea level (msl)) was used to illustrate and inform the severe weather hazards. This station was chosen due to its length of record (1897 to 2007).

### **4.3.2. Severe Weather: Extreme Cold and Freeze**

#### *Hazard Profile*

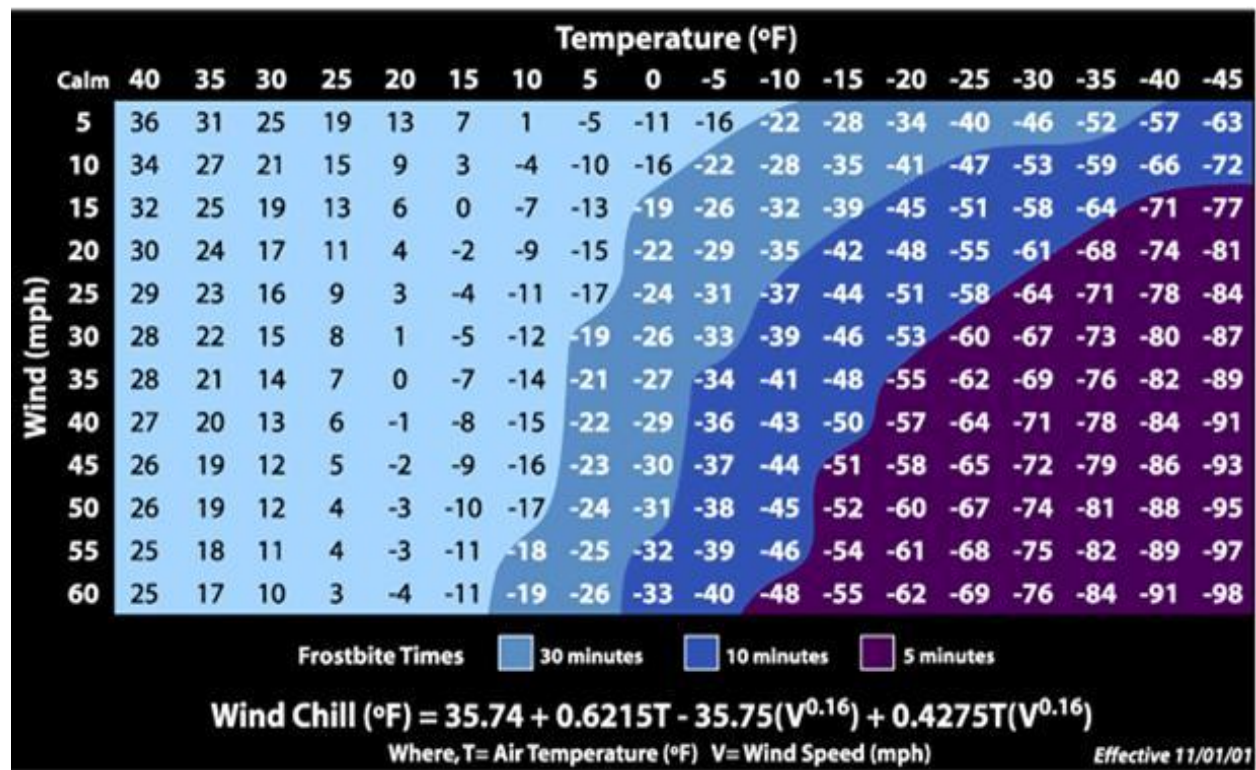
This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

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

According to the National Weather Service (NWS) and the Western Regional Climate Center (WRCC), extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to cold can cause frostbite or hypothermia and can be life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Freezing temperatures can cause significant damage to the agricultural industry.

In 2001, the NWS implemented an updated Wind Chill Temperature index (shown in Figure 4-15), which is reproduced below. This index was developed 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 4-15 Wind Chill Temperature Chart



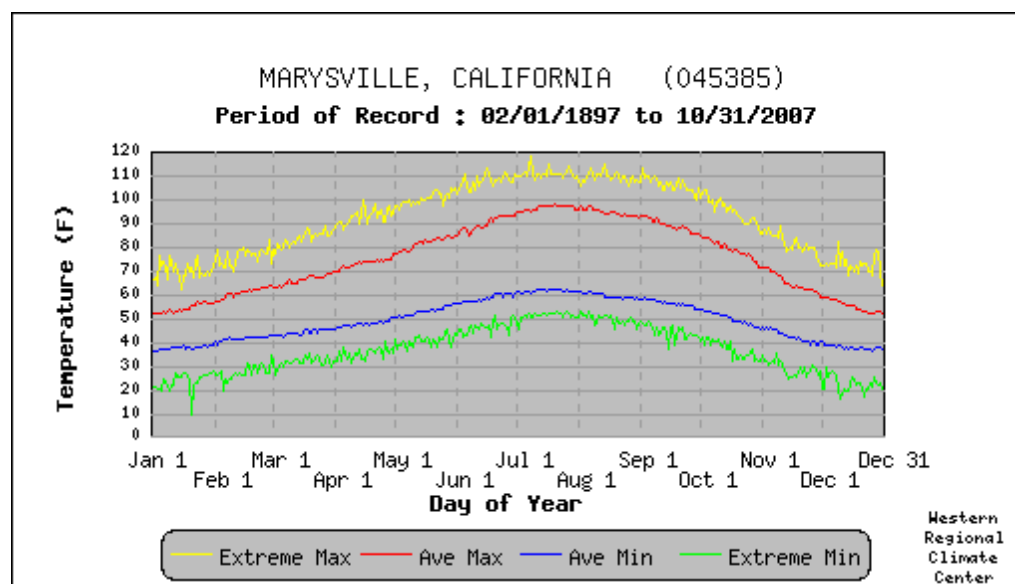
Source: National Weather Service

Information on extreme cold and freeze from the WRCC coop station for the County is shown below.

**Yuba County— Marysville Weather Station, Period of Record 1897 to 2007**

According to the WRCC, in Yuba County monthly average minimum temperatures from November through April range from the upper-30s to upper-40s. The lowest recorded daily extreme was 9°F on January 20, 1907. In a typical year, minimum temperatures fall below 32°F on 18.3 days with 0 days falling below 0°F. Table 4-20 shows the record low temperatures by month for Yuba County. Average daily temperatures for Yuba County are shown in Figure 4-16.

Figure 4-16 Yuba County— Daily Temperature Averages and Extremes



Source: Western Regional Climate Center

Table 4-20 Yuba County – Record Low Temperatures 1897 to 2007

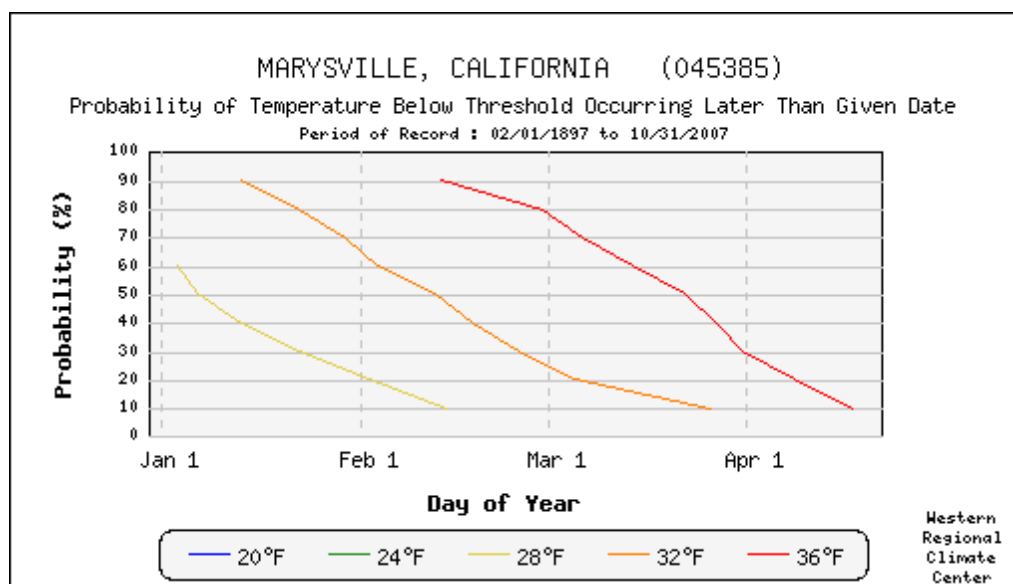
Month	Record Low	Date	Month	Record Low	Date
January	9°	1/20/1907	July	45°	7/2/1956
February	19°	2/5/1910	August	45°	8/30/1912
March	26°	3/2/1971	September	37°	9/15/1911
April	30°	4/28/1934	October	32°	10/17/1905
May	36°	5/7/1916	November	24°	11/14/1916
June	41°	6/28/1934	December	16°	12/10/1932

Source: Western Regional Climate Center

## Location and Extent

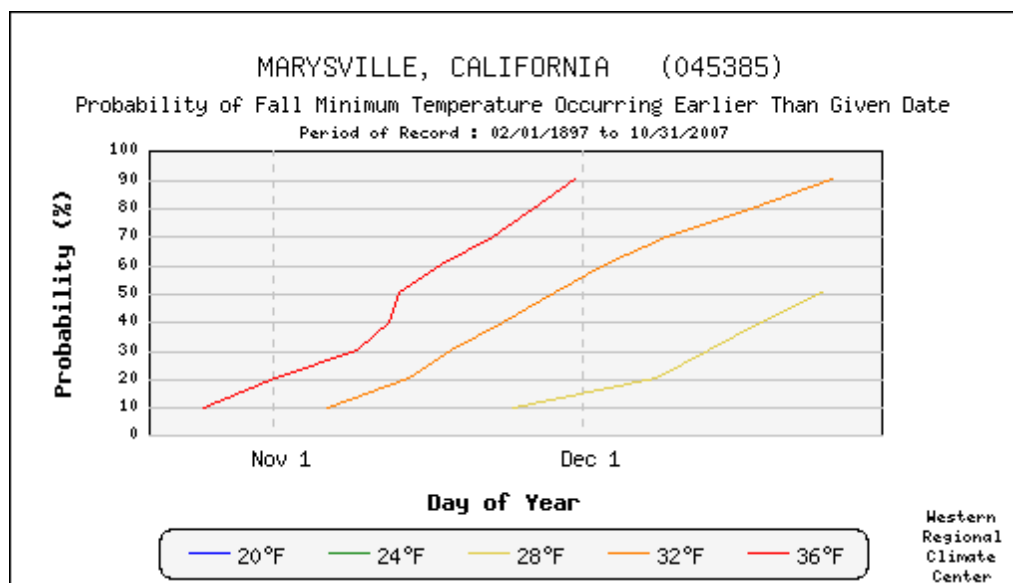
Extreme cold and freeze events occur on a regional basis. Extreme cold can occur in any location of the County. All portions of the County are at risk to extreme cold. While there is no scale (i.e. Richter, Enhanced Fujita) to measure the effects of freeze, temperature data from the County from the WRCC indicates that there are 18.3 days that fall below 32°F. Freeze has a slow onset and can generally be predicted in advance for the County. Freeze events can last for hours (in a cold overnight), or for days to weeks at a time. Figure 4-17 and Figure 4-18 show the probabilities in the County of freeze for both spring and fall.

Figure 4-17 Yuba County – Spring Freeze Probabilities



Source: Western Regional Climate Center

Figure 4-18 Yuba County – Fall Freeze Probabilities



Source: Western Regional Climate Center

## Past Occurrences

### Disaster Declaration History

The County has had one past federal and no state disaster declarations for extreme cold and freeze, as shown on Table 4-21. The County had no USDA disaster declarations since 2012 related to freeze, as shown on Table 4-6.

*Table 4-21 Yuba County – Disaster Declarations from Freeze 1950-2021*

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Freeze	0	–	1	1991

Source: Cal OES, FEMA

## NCDC Events

The NCDC reports 389 events of past extreme cold and freeze for Yuba County since 1996 as shown on Table 4-22.

*Table 4-22 NCDC Extreme Cold and Freeze Events for Yuba County 1996 – 7/31/2020\**

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage	Deaths (indirect)	Injuries (indirect)
Blizzard	1	0	0	\$0	\$0	0	0
Cold/Wind Chill	10	1	0	\$0	\$2,400,000	2	10
Frost/Freeze	6	0	0	\$0	\$0	0	0
Heavy Snow	103	1	2	\$1,125,000	\$0	1	3
Winter Storm	195	1	3	\$190,000	\$0	1	1
Winter Weather	74	1	0	\$0	\$0	0	3
<b>Total</b>	<b>389</b>	<b>4</b>	<b>5</b>	<b>\$191,125</b>	<b>\$2,400,000</b>	<b>4</b>	<b>17</b>

Source: NCDC

\*Note: Losses reflect totals for all impacted areas, some of which fell outside of Yuba County

## Hazard Mitigation Planning Committee Events

The HMPC noted that while extreme cold and freeze are annual events, dates where specific damages, injuries, or deaths occurred could not be recalled.

## Likelihood of Future Occurrence

**Highly Likely**—Extreme cold and freeze are likely to continue to occur annually in the Yuba County Planning Area. In a typical year, minimum temperatures fall below 32°F on 18.3 days in the County. This equates to a likelihood of future occurrences being considered highly likely.

## Climate Change and Freeze

According to the 2014 California Climate Adaptation Study (CAS), freezing spells are likely to become less frequent in California as climate temperatures increase; if emissions increase, freezing events could occur only once per decade in large portion of the State by the second half of the 21<sup>st</sup> century. According to a California Natural Resources Report in 2014, it was determined that while fewer freezing spells would decrease cold related health effects, too few freezes could lead to increased incidence of disease as vectors and pathogens do not die off.

## *Vulnerability Assessment*

### **Vulnerability—Medium**

Extreme cold and freeze events happen in Yuba County each year. It can impact both structures and populations in Yuba County. Like most weather events, periods of freeze occur on an annual basis in the higher elevations of the County.

### **Vulnerability to and Impacts from Extreme Cold and Freeze**

Extreme cold and freeze events happen in Yuba County each year. Extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to cold can cause frostbite or hypothermia and can be life-threatening. Vulnerable populations to cold and freeze include:

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

Of significant concern is the impact to populations with special needs such as the elderly and those requiring the use of medical equipment. The residents of nursing homes and elder care facilities are especially vulnerable to extreme temperature events. It is encouraged that such facilities have emergency plans or backup power to address power failure during times of extreme cold and freeze. Other vulnerable populations potentially at risk include low income and homeless populations that may have limited resources. In addition to vulnerable populations, pets and livestock are at risk to freeze and cold.

Other impacts to the County as a result of extreme cold and freeze include damage to infrastructure, utility outages, road closures, traffic accidents, and interruption in business and school activities. Delays in emergency response services can be of significant concern. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Freezing temperatures and ice can cause accidents and road closures and can cause significant damage to the agricultural industry. Extreme cold can affect agricultural products and cattle in the County. Freeze damages reduce the values of agricultural crops.

### *Future Development*

Future development built to code should be able to withstand extreme cold and freeze. Pipes at risk of freezing should be mitigated by either burying or insulating them from freeze as new facilities are improved or added. Current County codes provide such provisions for new construction. Vulnerability to extreme cold will increase as the average age of the population in the County shifts resulting in a larger number of senior citizens in the Planning Area.

### 4.3.3. Severe Weather: Extreme Heat

#### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

#### Hazard/Problem Description

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. 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 and can contribute to increases in tree mortality. Extreme heat can also affect agriculture in Yuba County. During times of high heat, low humidity, and winds, PG&E can issue a Public Safety Power Shutdown (PSPS) for the County.

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 a level at which the body can remove it, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise, and heat-related illness may develop. Elderly persons, small children, chronic invalids, those on certain medications or drugs, and persons with weight and alcohol problems are particularly susceptible to heat reactions.

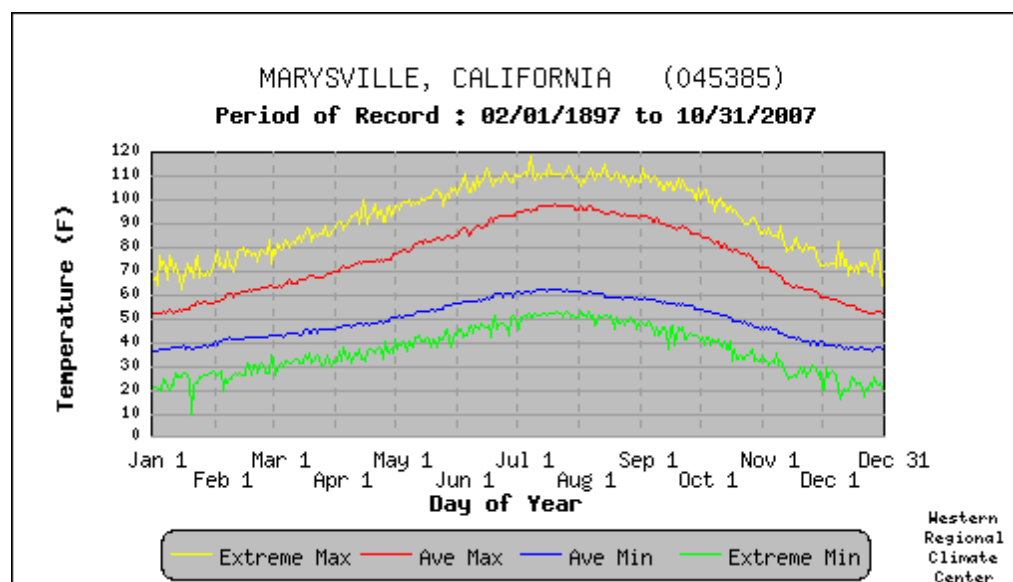
#### Location and Extent

Extreme heat events occur on a regional basis. Extreme heat can occur in any location of the County. All portions of the County are at some risk to extreme heat. Extreme heat occurs throughout the Planning Area primarily during the summer months. The WRCC maintains data on weather normal and extremes in the western United States. Information from the representative weather station introduced in Section 4.3.1 is summarized below.

#### **Marysville Weather Station, Period of Record 1897 to 2007 (Elevation of 70 feet above msl)**

According to the WRCC, in Yuba County, monthly average maximum temperatures in the warmest months (May through October) range from the low-80s to the mid-90s. The highest recorded daily extreme was 118°F on July 8, 1908. In a typical year, maximum temperatures exceed 90°F on 91.5 days. Figure 4-19 shows the average daily high temperatures and extremes for the County. Table 4-23 shows the record high temperatures by month for the County.

Figure 4-19 Yuba County—Daily Temperature Averages and Extremes



Source: Western Regional Climate Center, [www.wrcc.dri.edu/](http://www.wrcc.dri.edu/)

Table 4-23 Yuba County – Record High Temperatures

Month	Record High	Date	Month	Record High	Date
January	96°	1/16/1907	July	118°	7/08/1905
February	83°	2/28/1985	August	115°	8/14/1933
March	89°	3/27/1988	September	113°	9/2/1950
April	100°	4/15/1947	October	104°	10/3/2001
May	105°	5/29/1910	November	89°	11/10/1955
June	113°	6/16/1961	December	82°	12/9/1909

Source: Western Regional Climate Center

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. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more “typical” disaster scenarios. While heat waves are obviously less dramatic, they are potentially deadlier. 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.

The NWS has in place a system or scale to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Table 4-24.

*Table 4-24 National Weather Service HeatRisk Categories*

Category	Level	Meaning
Green	0	No Elevated Risk
Yellow	1	Low Risk for those extremely sensitive to heat, especially those without effective cooling and/or adequate hydration
Orange	2	Moderate Risk for those who are sensitive to heat, especially those without effective cooling and/or adequate hydration
Red	3	High Risk for much of the population, especially those who are heat sensitive and those without effective cooling and/or adequate hydration
Magenta	4	Very High Risk for entire population due to long duration heat, with little to no relief overnight

Source: National Weather Service

The NWS office in Sacramento can issue the following heat-related advisory as conditions warrant.

- **Heat Advisories** are issued during events where the HeatRisk is on the Orange/Red threshold (Orange will not always trigger an advisory)
- **Excessive Heat Watches/Warnings** are issued during events where the HeatRisk is in the Red/Magenta output

### Past Occurrences

#### Disaster Declaration History

There have been no FEMA or Cal OES disasters related to extreme heat, as shown in Table 4-4. The County had no USDA disaster declarations since 2012 related to extreme heat, as shown on Table 4-6.

#### NCDC Events

The NCDC data showed 14 extreme heat incidents for Yuba County since 1993.

*Table 4-25 NCDC Heat Events for Yuba County 1950-7/31/2020\**

Event Type	Number of Events	Deaths**	Deaths** (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Excessive Heat	2	2	2	\$0	\$0	0	0
Heat	12	1	0	\$0	\$0	0	0
<b>Total</b>	<b>14</b>	<b>3</b>	<b>2</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$ 0</b>	<b>\$ 0</b>

Source: NCDC

\*Note: Losses reflect totals for all impacted areas, some of which fell outside of Yuba County

\*\*Due to the regional nature of reporting of extreme heat type events, all of these deaths occurred outside of Yuba County

#### Hazard Mitigation Planning Committee Events

Yuba County experienced an excessive heat event resulting in the activation of cooling centers on 07/09/2021 – 07/11/2021 no losses, or significant impacts were noted as a result of this event.

## Likelihood of Future Occurrence

**Highly Likely**—Temperature extremes are likely to continue to occur annually in the Yuba County Planning Area. Temperatures at or above 90°F are common most summer days in the County.

## Climate Change and Extreme Heat

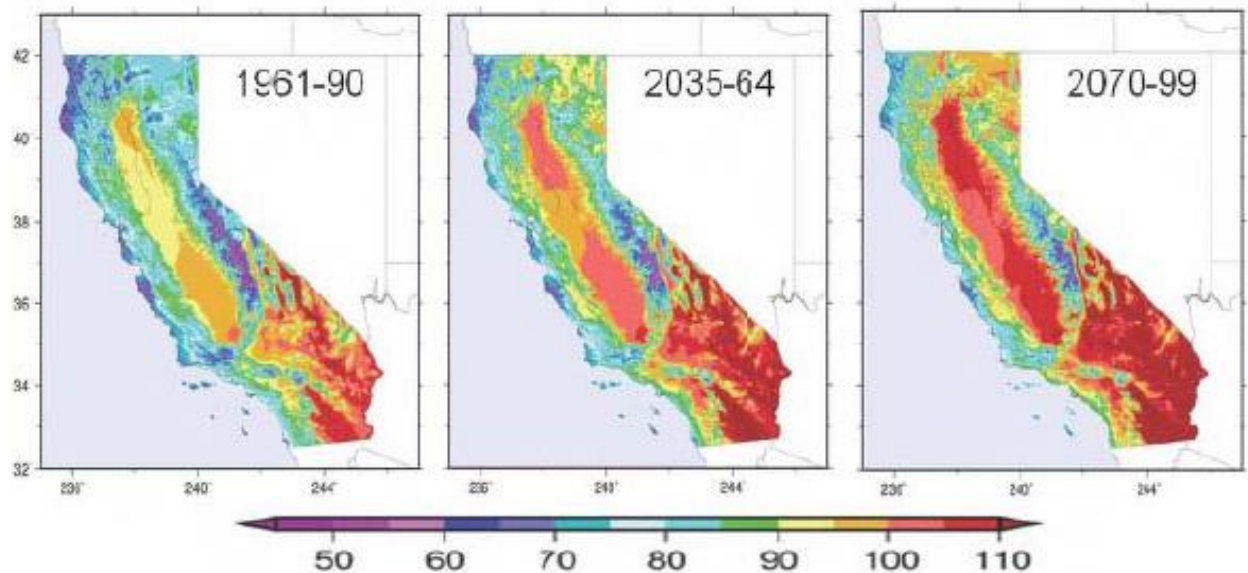
Climate change and its effect on extreme heat in the County has been discussed utilizing three sources:

- California Climate Adaptation Strategy (CAS) – 2014
- Climate Change and Health Profile Report (CCHPR) - 2017 – Yuba County
- Cal-Adapt

## Climate Adaptation Strategy

The CAS, citing a California Energy Commission study, states that “over the past 15 years, heat waves have claimed more lives in California than all other declared disaster events combined.” This study shows that California is getting warmer, leading to an increased frequency, magnitude, and duration of heat waves. These factors may lead to increased mortality from excessive heat, as shown in Figure 4-20.

*Figure 4-20 California Historical and Projected Temperature Increases – 1961 to 2099*



Source: Dan Cayan; California Climate Adaptation Strategy

As temperatures increase, California and Yuba County will face increased risk of death from dehydration, heat stroke, heat exhaustion, heart attack, stroke and respiratory distress caused by extreme heat. According to the 2014 CAS report and the 2018 State of California Hazard Mitigation Plan, by 2100, hotter temperatures are expected throughout the state, with projected increases of 3-5.5°F (under a lower emissions scenario) to 8-10.5°F (under a higher emissions scenario). These changes could lead to an increase in deaths related to extreme heat in Yuba County.

## Climate Change and Health Profile Report – Yuba County

The Climate Change and Health Profile Report (CCHPR) noted for Yuba County that increased temperatures manifested as heat waves and sustained high heat days directly harm human health through heat-related illnesses (mild heat stress to fatal heat stroke) and the exacerbation of pre-existing conditions in the medically fragile, chronically ill, and vulnerable. Increased heat also intensifies the photochemical reactions that produce smog and ground level ozone and fine particulates (PM2.5), which contribute to and exacerbate respiratory disease in children and adults. Increased heat and carbon dioxide enhance the growth of plants that produce pollen, which are associated with allergies. Increased temperatures also add to the heat load of buildings in urban areas and exacerbate existing urban heat islands adding to the risk of high ambient temperatures.

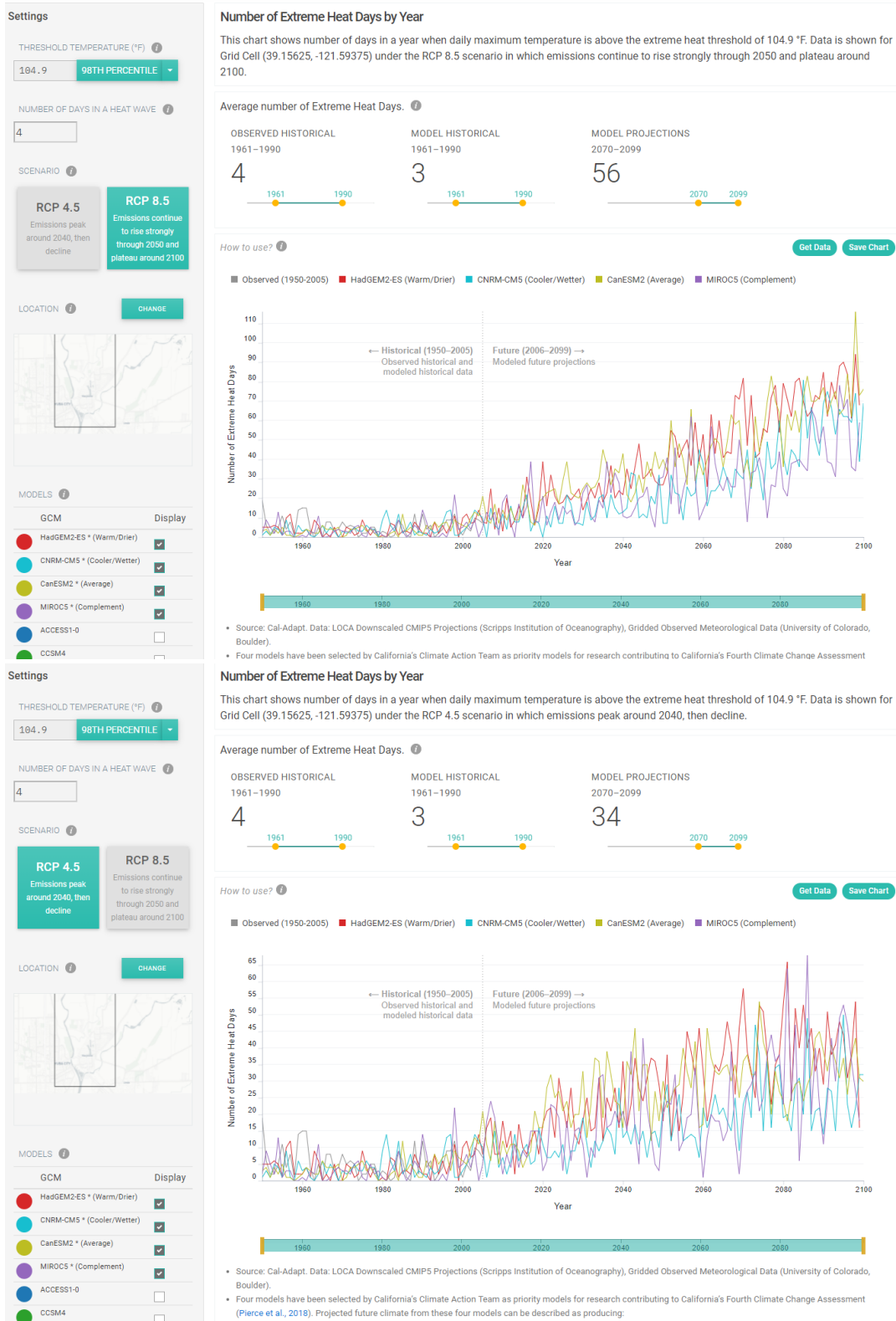
### Cal-Adapt

Cal Adapt also noted that overall temperatures are expected to rise substantially throughout this century. During the next few decades, scenarios project average temperature to rise between 1 and 2.3°F; however, the projected temperature increases begin to diverge at mid-century so that, by the end of the century, the temperature increases projected in the higher emissions scenario (Representative Concentration Pathways (RCP) 8.5) are approximately twice as high as those projected in the lower emissions scenario (RCP 4.5).

These projections also differ depending on the time of year and the type of measurement (highs vs. lows), all of which have different potential effects to the state's ecosystem health, agricultural production, water use and availability, and energy demand. Future temperature estimates from Cal-Adapt for the Yuba County Planning (using the quad that contains Marysville) are shown in Figure 4-21. It shows the following:

- The upper chart shows number of days in a year when daily maximum temperature is above the extreme heat threshold of 90.0°F. Data is shown for Yuba County under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100.
- The lower chart shows number of days in a year when daily maximum temperature is above the extreme heat threshold of 90.0 °F. Data is shown for Yuba County under the RCP 4.5 scenario in which emissions peak around 2040, then decline.

**Figure 4-21 Yuba County – Future Temperature Estimates in Low and High Emission Scenarios**



Source: Cal-Adapt – Number of Extreme Heat Days by Year – retrieved on 1/20/2021

## Vulnerability Assessment

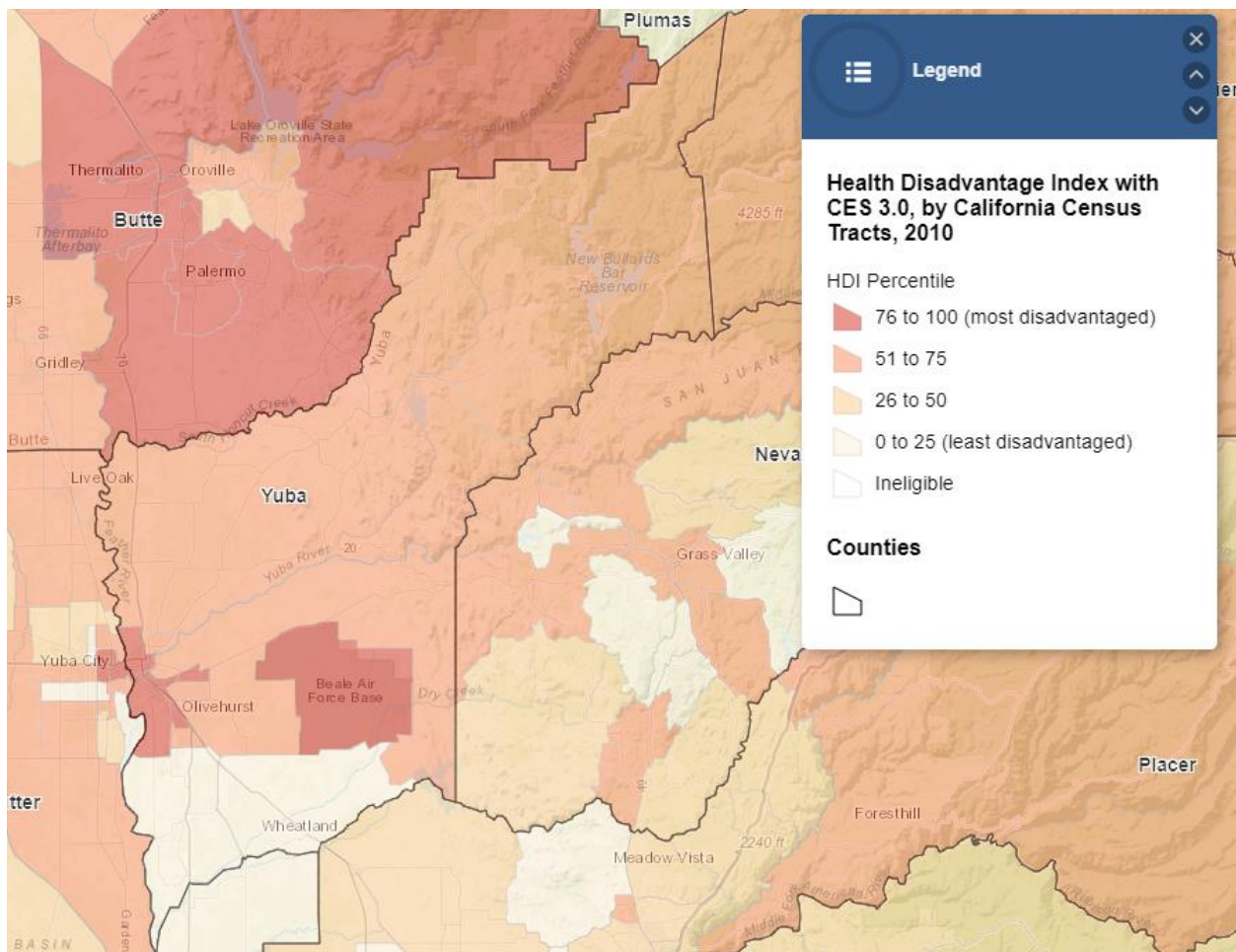
### Vulnerability—Medium

Extreme heat happens in Yuba County each year. Extreme heat rarely affects buildings in the County, but affects the population inside the County as well as the County’s agricultural industry. Heat can cause stress to agricultural crops and livestock in the County. Extreme heat dries out vegetation in the County, creating greater risks from wildfires. Heat, combined with low humidity and high winds, can cause PG&E to issue a PSPS event for the County.

### Vulnerability to and Impacts from Extreme Heat

Vulnerable populations are at the greatest risk to the effects of extreme heat. The Public Health Alliance has developed a composite index to identify cumulative health disadvantage in California. Factors such as those bulleted above were combined to show what areas are at greater risk to hazards like extreme heat. This is shown on Figure 4-22.

*Figure 4-22 Health Disadvantage Index by California Census Tract*



Source: Public Health Alliance of Southern California – Map retrieved 3/17/2021

Vulnerable populations to extreme heat include:

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

In addition to vulnerable populations, heat can cause stress to agricultural crops and livestock in the County. 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. Hot weather and extreme heat can worsen ozone levels and air quality as well as leading to drought conditions. Extreme heat dries out vegetation in the County, creating greater risks from wildfires, which is discussed in Section 4.3.14.

### *Future Development*

As the County shifts in demographics, more residents will become senior citizens. The residents of nursing homes and elder care facilities are especially vulnerable to extreme temperature events. It is encouraged that such facilities have emergency plans or backup power to address power failure during times of extreme heat and in the event of a PSPS. Low income residents and homeless populations are also vulnerable. Cooling centers for these populations should be utilized when necessary. (discussed in more detail in 4.3.14).

## **4.3.4. Severe Weather: Heavy Rains and Storms**

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

### **Hazard/Problem Description**

Storms in the Yuba County Planning Area are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. In the upper elevations, these storms can drop large amounts of snow (discussed in Section 4.3.2). Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado (winds and tornadoes are discussed in Section 4.3.5). Heavy precipitation in the Yuba County area falls mainly in the fall, winter, and spring months.

The severe weather hazard is broken down in the following sections into:

- Heavy Rain and Storms

- Hail
- Lightning

## Heavy Rain and Storms

The NWS reports that storms and thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of greater than 35,000 ft. As the rising air reaches its dew point, water droplets and ice form and begin falling the long distance through the clouds towards earth's surface. As the droplets fall, they collide with other droplets and become larger. The falling droplets create a downdraft of air that spreads out at Earth's surface and causes strong winds associated with thunderstorms.

Cloudburst storms can sometimes be expected in the spring, summer, and fall. Cloudburst storms, sometimes lasting as long as 6 hours in the study areas, are high intensity storms that can produce floods characterized by high peak flows, short-duration flood flows, and small runoff volume.

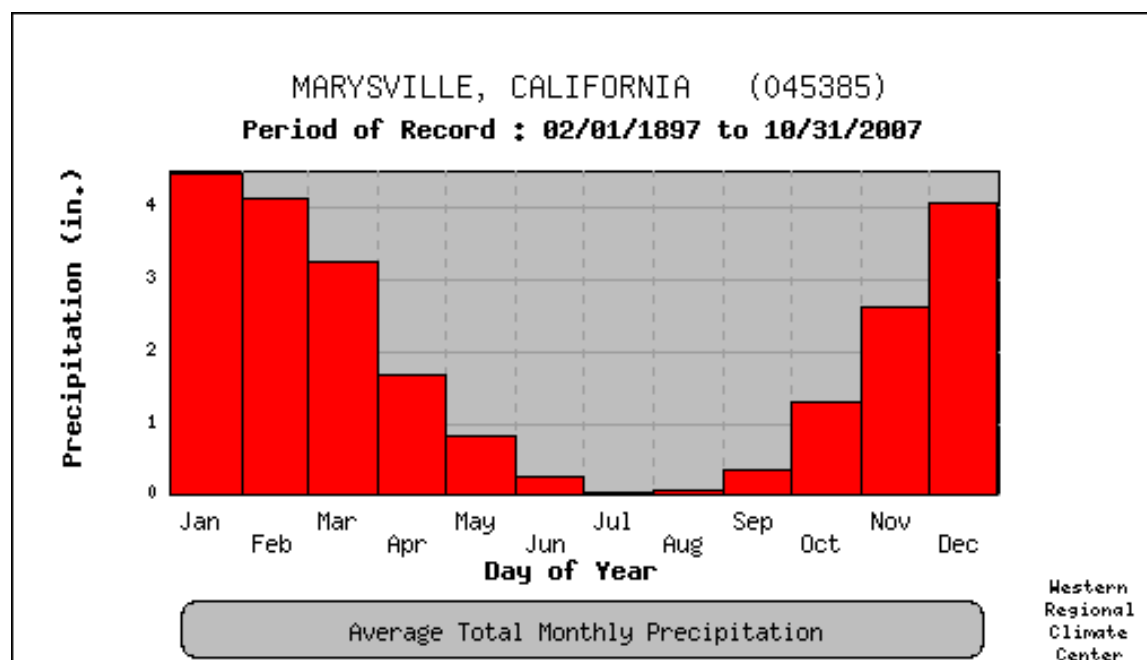
### *Location and Extent*

Heavy rains in Yuba County vary by season and location, but generally occur during the late fall, winter, and early spring months. There is no scale by which heavy rains are measured – usually it is measured in terms of rainfall amounts. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of thunderstorms in California is often short, ranging from minutes to hours. Information from the WRCC weather station in Yuba County previously discussed in Section 4.3.1 is summarized below.

### *Yuba County—Marysville Weather Station, Period of Record 1897 to 2007*

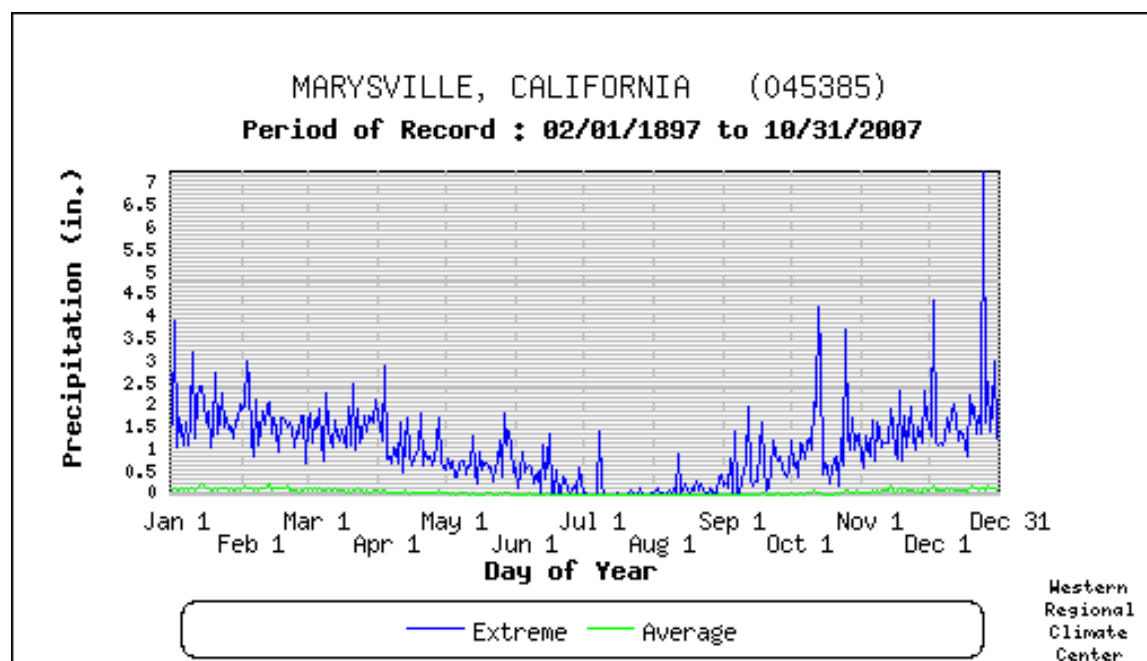
According to the WRCC, average annual precipitation in Yuba County is 20.96 inches per year. The highest recorded annual precipitation is 46.26 inches in 1983; the highest recorded precipitation for a 24-hour period is 7.29 inches on December 25, 1983. The lowest recorded annual precipitation was 7.41 inches in 1976. Average monthly precipitation for Yuba County is shown in Figure 4-23. Daily average and extreme precipitations are shown in Figure 4-24.

Figure 4-23 Yuba County—Monthly Average Total Precipitation



Source: Western Regional Climate Center, [www.wrcc.dri.edu/](http://www.wrcc.dri.edu/)

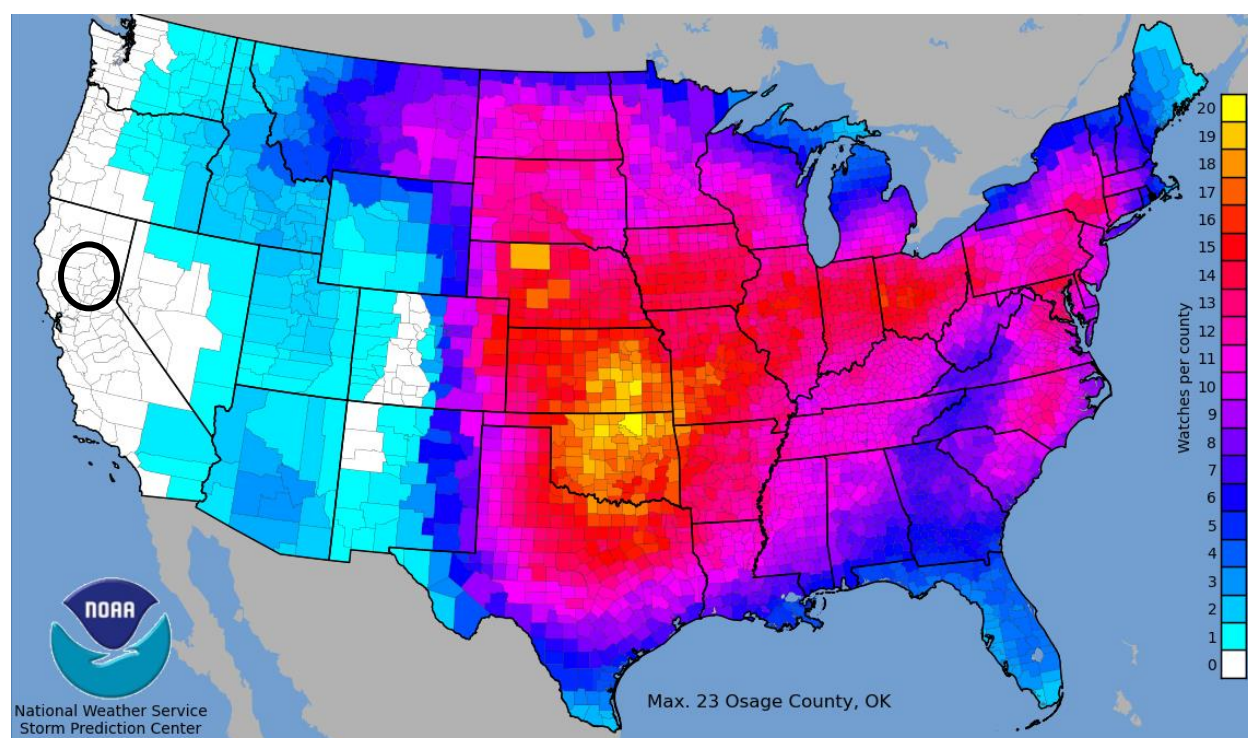
Figure 4-24 Yuba County—Daily Average and Extreme Precipitation



Source: Western Regional Climate Center, [www.wrcc.dri.edu/](http://www.wrcc.dri.edu/)

The NOAA Storm Prediction Center tracks thunderstorm watches on a county basis. Figure 4-25 shows thunderstorm watches in Yuba County and the United States for a 20-year period between 1993 and 2012, the most recent map available.

*Figure 4-25 Yuba County – Average Thunderstorm Watches per Year (1993 to 2012)*



Source: NOAA Storm Prediction Center, map retrieved 2/12/2021

## Hail

Hail can occur throughout the Yuba County Planning Area during storm events, though it is rare. Hail is formed when water droplets freeze and thaw as they are thrown high into the upper atmosphere by the violent internal forces of thunderstorms. Hail is sometimes associated with severe storms within the Yuba County Planning Area. Hailstones are usually less than two inches in diameter and can fall at speeds of 120 miles per hour (mph). Severe hailstorms can be quite destructive, causing damage to roofs, buildings, automobiles, vegetation, and crops.

The National Weather Service classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4-26 indicates the hailstone measurements utilized by the National Weather Service.

*Table 4-26 Hailstone Measurements*

Average Diameter	Corresponding Household Object
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter

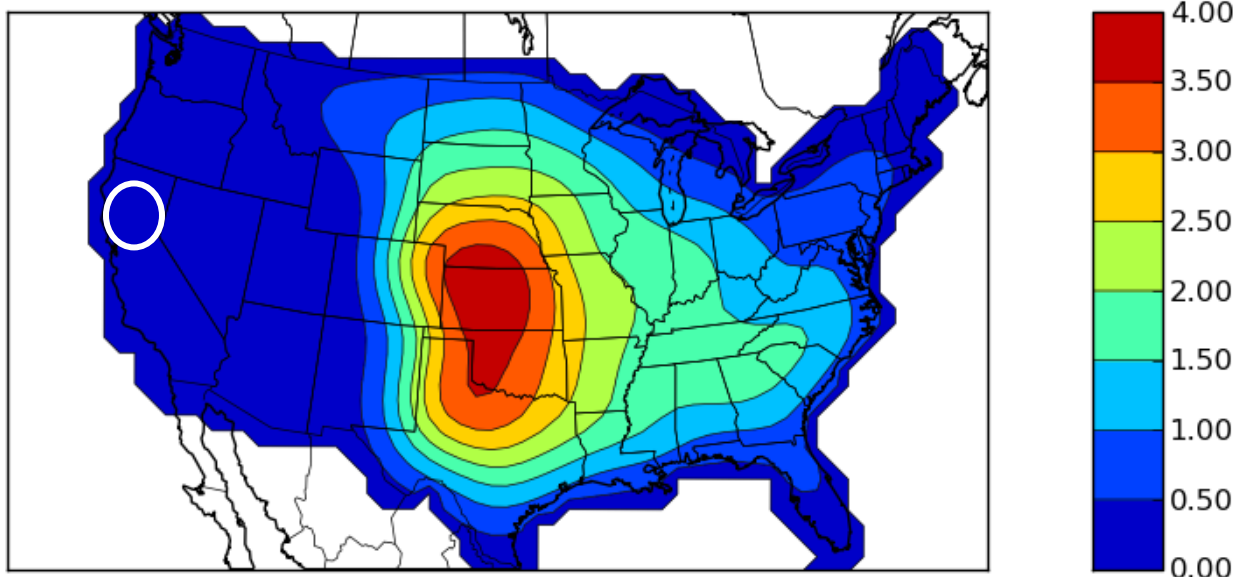
Average Diameter	Corresponding Household Object
1.5 inch	Ping-pong ball
1.75 inch	Golf-Ball
2.0 inch	Hen Egg
2.5 inch	Tennis Ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: National Weather Service

### *Location and Extent*

Hail events can occur in any location of the County. All portions of the County are at risk to hail. There is no scale in which to measure hail, other than hail stone size as detailed above. The speed of onset of hail can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of thunderstorms that can cause hail in California is often short, ranging from minutes to hours. Hail events last shorter than the duration of the total thunderstorm. The National Weather Service tracks hail events. Figure 4-26 shows the average days each year where hail of greater than 1" in diameter occurred during a 20-year period from 1990 to 2009. The most recent map available.

*Figure 4-26 Yuba County – Average Hail Days per Year (1990 to 2009)*



Source: National Weather Service, map retrieved 2/12/2021

### **Lightning**

Lightning can occur throughout the County both during and outside of storm events. Lightning is defined by the NWS as any and all of the various forms of visible electrical discharge caused by thunderstorms.

Thunderstorms and lightning are usually (but not always) accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be struck directly, which may result in an explosion, burn, or total destruction. Or, damage may be indirect, when the current passes through or near an object, which generally results in less damage.

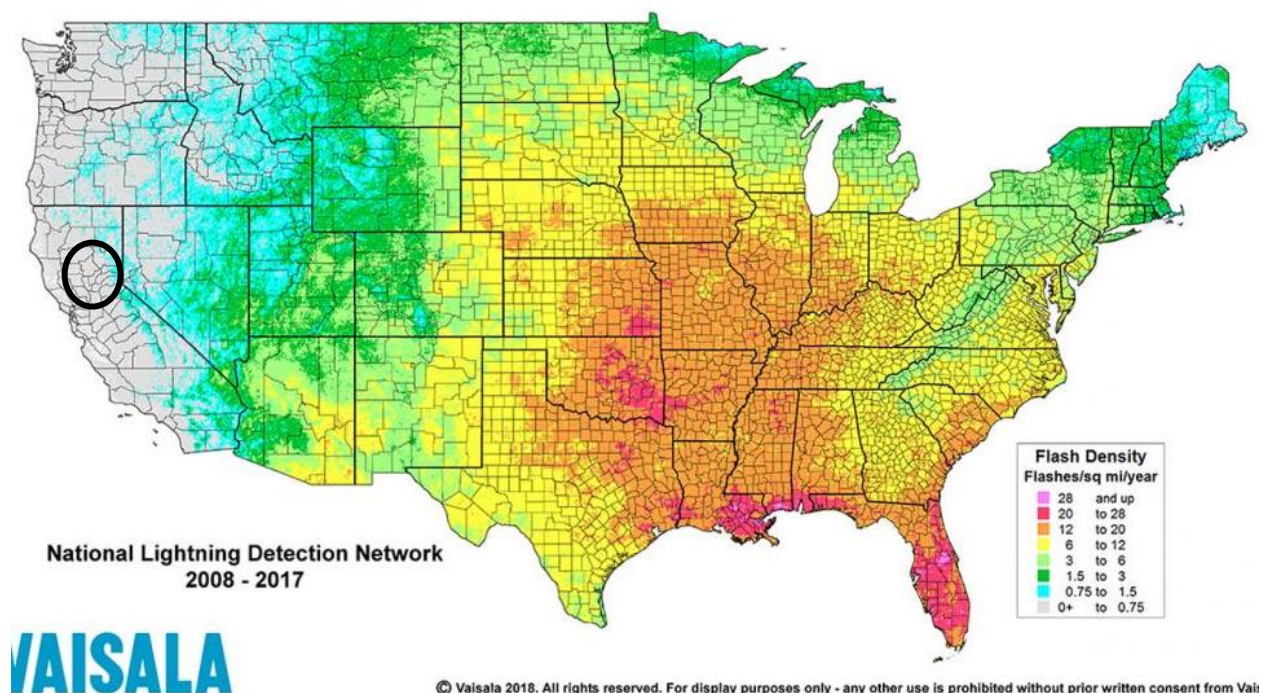
Intra-cloud lightning is the most common type of discharge. This occurs between oppositely charged centers within the same cloud. Usually it takes place inside the cloud and looks from the outside of the cloud like a diffuse brightening that flickers. However, the flash may exit the boundary of the cloud, and a bright channel, similar to a cloud-to-ground flash, can be visible for many miles.

Cloud-to-ground lightning is the most damaging and dangerous type of lightning, though it is also less common. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, a large minority of flashes carry positive charge to earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life. Positive flashes are also more common as a percentage of total ground strikes during the winter months. This type of lightning is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm in areas that most people do not consider to be a threat. Positive lightning also has a longer duration, so fires are more easily ignited. And, when positive lightning strikes, it usually carries a high peak electrical current, potentially resulting in greater damage. Lightning in the County is also a concern due to the number of fires that are started by lightning strikes. Wildfire is discussed in more detail in Section 4.3.14.

### *Location and Extent*

Lightning events can occur in any location of the County and are often associated with thunderstorms. All portions of the County are at risk to lightning. Lightning tends to be rare in the County, as discussed in the extent section below. Lightning in the County can occur both during and outside of thunderstorms; the latter often referred to as dry lightning events. The speed of onset of thunderstorms that can cause lightning can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of thunderstorms in California is often short, ranging from minutes to hours. Thunderstorms and lightning are rare in the County. Vaisala maintains the National Lightning Detection Network. It tracks cloud to ground lightning incidences in the United States. Figure 4-27 shows lightning incidences in the County and the rest of the United States from 2008 to 2017, the most recent map date available.

Figure 4-27 Yuba County – Lightning Incidence Map 2008 to 2017



Source: Vaisala National Lightning Detection Network, map retrieved 2/12/2021

## Past Occurrences

### Disaster Declaration History

A search of FEMA and Cal OES disaster declarations turned up multiple events. Heavy rains and storms have caused flooding in the County. Events where flooding resulted in a state or federal disaster declaration are shown in Table 4-27.

Table 4-27 Yuba County – Disaster Declarations from Heavy Rain and Storms (and Floods) 1950-2021

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	16	1950, 1955, 1958, 1962, 1963 (twice), 1969, 1973, 1982, 1983, 1986, 1995 (twice), 1997, 2008, 2017	15	1955, 1962, 1963, 1964, 1969, 1970, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (twice)

Source: FEMA, Cal OES

Another database of disaster declarations comes from the USDA. This database was searched from 2012 to 2021, which showed two disaster declarations for Yuba County. This is shown on Table 4-28.

*Table 4-28 Yuba County – USDA Disaster Declarations 2012-2021*

Year	Declaration Number	Primary or Contiguous County	Disaster Type
2016	S4164	Contiguous	Severe weather including excessive rainfall and high winds
2016	S4170	Primary	Severe weather including excessive rainfall and high winds

Source: USDA

## NCDC Events

The NCDC data recorded 5 hail, heavy rain, lightning, and wind incidents for Yuba County since 1950. A summary of these events is shown in Table 4-29. Additional events of heavy rain and storms are also discussed in the NCDC table in the flood profile in Section 4.3.10.

*Table 4-29 NCDC Hail, Heavy Rain, Lightning, and Wind Events in Yuba County 1950–7/31/2020\**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Hail	1	0	0	\$0	\$0	0	0
Heavy Rain	4	0	0	\$0	\$0	0	0
<b>Total</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$ 0</b>	<b>\$ 0</b>

Source: NCDC

\*Note: Losses reflect totals for all impacted areas, some of which fell outside of Yuba County

## Hazard Mitigation Planning Committee Events

The HMPC noted that past events of heavy rain in the County can be found in the Flood: 1%/0.2% Annual Chance (see Section 4.3.10) and Localized Flood (see Section 4.3.11) Past Occurrence sections.

## Likelihood of Future Occurrence

**Highly Likely** – Based on NCDC data and HMPC input, 5 heavy rain and storm incidents over a 71-year period (1950-2021) equates to a severe storm event every 14.2 years. As noted, this database likely doesn't capture all heavy rain, hail, and lightning events. Severe weather is a well-documented seasonal occurrence that will continue to occur often in the Yuba County Planning Area.

## Climate Change and Heavy Rains and Storms

Climate change and its effect on rain and storms near the City has been discussed by two sources:

- CAS – 2014
- Cal-Adapt

## CAS

According to the CAS, while average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21<sup>st</sup> century. It is unlikely that hail will become more common in the County. The amount of lightning is not projected to change.

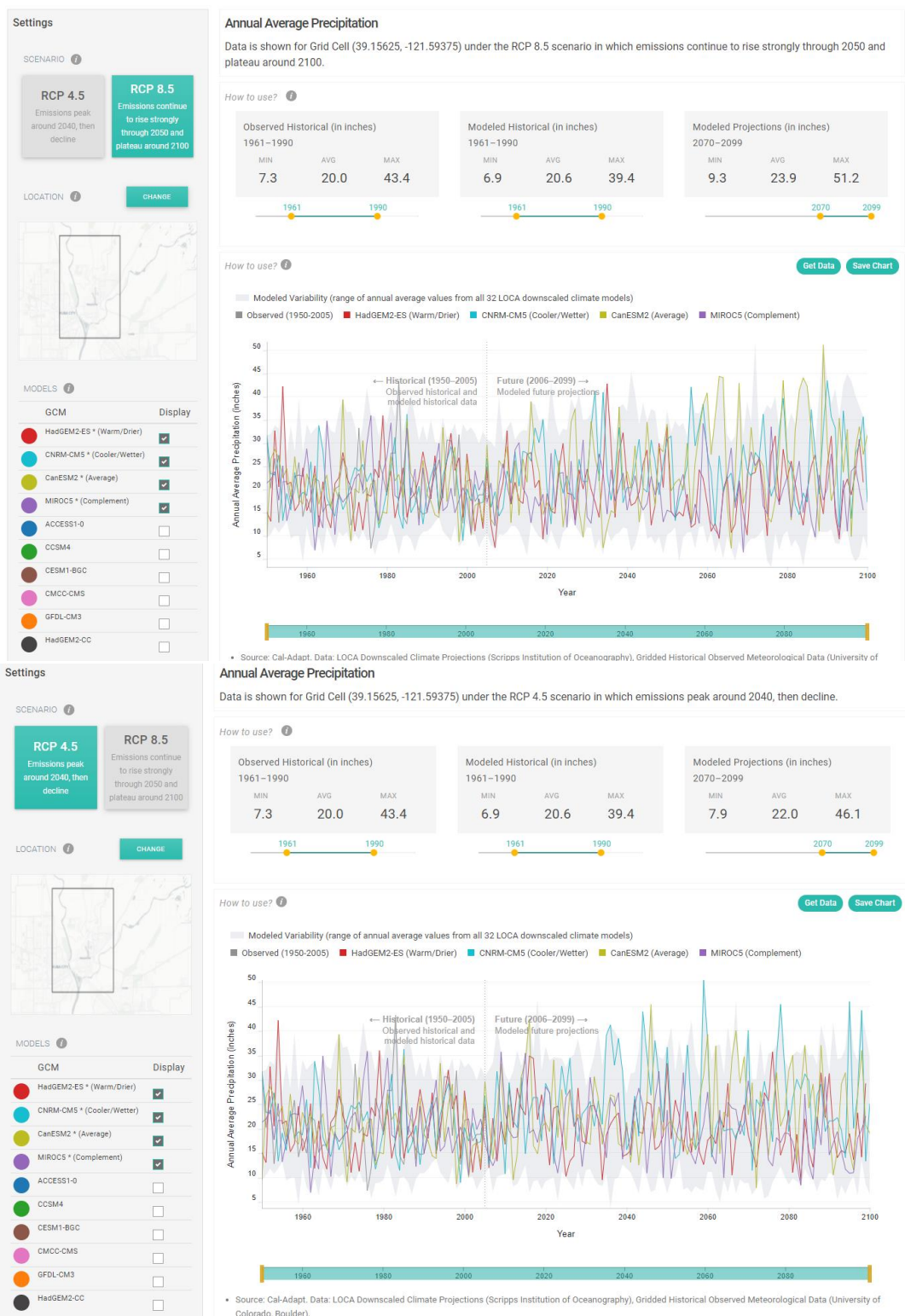
## Cal Adapt

Cal-Adapt noted that, on average, the projections show little change in total annual precipitation in California. Furthermore, among several models, precipitation projections do not show a consistent trend during the next century. The Mediterranean seasonal precipitation pattern is expected to continue, with most precipitation falling during winter from North Pacific storms. One of the four climate models projects slightly wetter winters, and another projects slightly drier winters with a 10 to 20 percent decrease in total annual precipitation. However, even modest changes would have a significant impact because California ecosystems are conditioned to historical precipitation levels and water resources are nearly fully utilized.

These projections also differ depending on the time of year and the type of measurement (highs vs. lows), all of which have different potential effects to the state's ecosystem health, agricultural production, water use and availability, and energy demand. Future precipitation estimates from Cal-Adapt for the Yuba County Planning (using the quad that contains Marysville) are shown in Figure 4-28. It shows the following:

- The upper chart shows annual averages of observed and projected precipitation values for the selected area on map under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100. The gray line (1950 – 2005) is observed data. The colored lines (2006 – 2100) are projections from 10 LOCA downscaled climate models selected for California. The light gray band in the background shows the least and highest annual average values from all 32 LOCA downscaled climate models.
- The lower chart shows annual averages of observed and projected Precipitation values for the selected area on map under the RCP 4.5 scenario in which emissions peak around 2040, then decline. The gray line (1950 – 2005) is observed data. The colored lines (2006 – 2100) are projections from 10 LOCA downscaled climate models selected for California. The light gray band in the background shows the least and highest annual average values from all 32 LOCA downscaled climate models.

**Figure 4-28 Yuba County – Future Precipitation Estimates: High and Low Emission Scenarios**



Source: Cal-Adapt – Precipitation: Decadal Averages Map. Maps retrieved 2/11/2021

## *Vulnerability Assessment*

### **Vulnerability—Medium**

According to historical hazard data, heavy rains and storms are an annual occurrence in Yuba County. Impacts can be felt by both the population of the County as well as the structures that have been built in the County.

### **Vulnerability to and Impacts from Heavy Rains and Storms**

According to the HMPC, short-term, heavy storms can cause both widespread flooding as well as extensive localized drainage issues. As storms continue to increase in intensity, the limited drainage infrastructure has become an increasingly important issue. In addition to the flooding that often occurs during these storms, strong winds, when combined with saturated ground conditions, can down very mature trees and cause power outages

Impacts from heavy rains and storms include damages to property and infrastructure. This includes: downed trees, damaged utility structures and infrastructures; power outages; road damages and blockages; hail damage to crops, buildings, and automobiles, and lightning damages to homes, critical infrastructure, and people. Winds can affect almond trees and other agricultural crops during certain periods of the year. However, actual damage associated with the primary effects of severe weather have been somewhat limited. It is the secondary hazards caused by severe weather, such as floods, fire, and agricultural losses that have had the greatest impact on the County. The risk and vulnerability associated with these secondary hazards are discussed in other sections of this plan (Section 4.3.10 Flood: 1%/0.2% Annual Chance, Section 4.3.11 Flood: Localized Stormwater, Section 4.3.7 Dam Failure, Section 4.3.12 Levee Failure, and Section 4.3.14 Wildfire).

### **Heavy Rains and Storms and Power Outages/PSPS**

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power outages and failure can be found at the beginning of Section 4.3.

### **High Winds and Power Outages/PSPS**

During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on PSPS can be found at the beginning of Section 4.3.

## *Future Development*

Homes built in the County are built to existing building codes that generally withstand heavy rains and storms. New critical facilities such as communications towers and others should be built to withstand lightning, hail and thunderstorm winds. Backup power sources for all critical facilities should be incorporated into all new facilities. Properly located, designed, and constructed, future losses to new development should be minimal.

### 4.3.5. Severe Weather: High Winds and Tornadoes

#### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

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

This section includes a description and location and extent discussion for both high winds and tornadoes, respectively.

#### **Wind**

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 winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. These winds may occur as part of a seasonal climate pattern or in relation to other severe weather events such as thunderstorms.

#### *Location and Extent*

The entire Yuba County Planning Area is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical measure that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort wind force scale. Figure 4-29 shows the Beaufort wind scale.

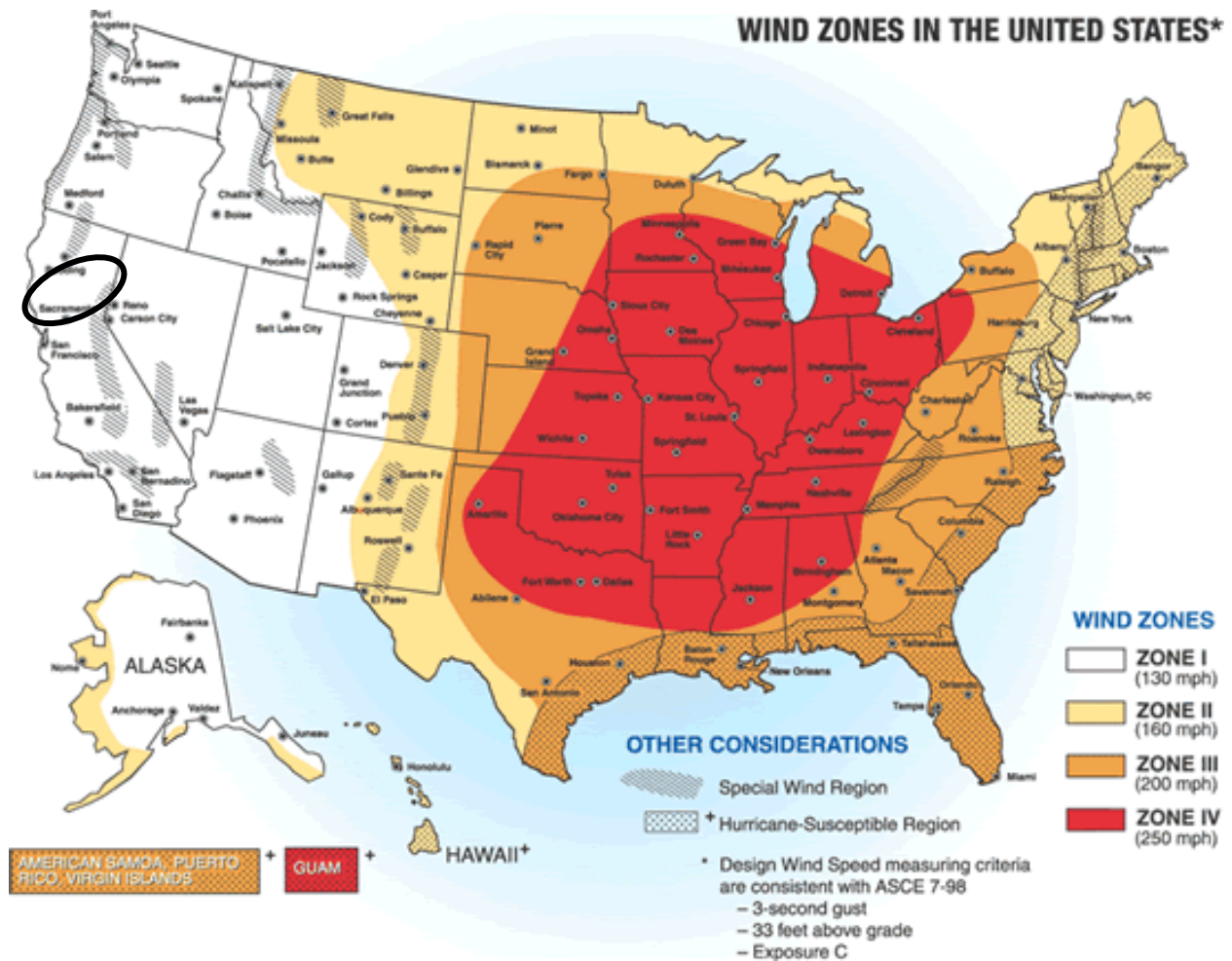
Figure 4-29 Beaufort Wind Scale

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.

Source: National Weather Service

Figure 4-30 depicts wind zones for the United States. The map denotes that Yuba County falls into Zone I, which is characterized by high winds of up to 130 mph.

Figure 4-30 Wind Zones in the United States



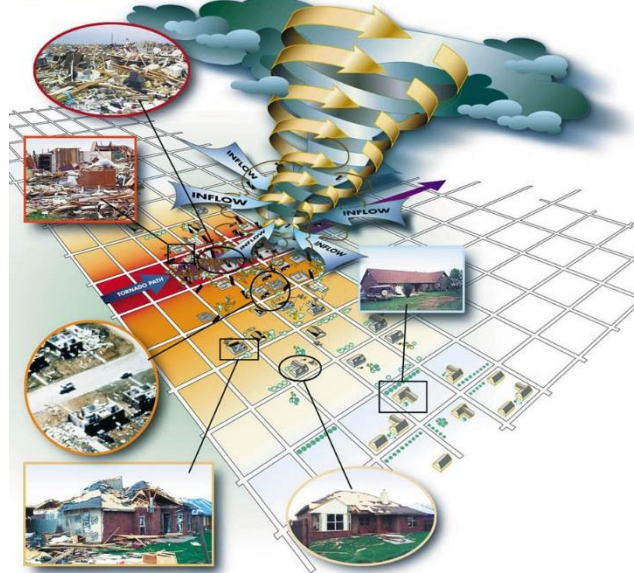
Source: FEMA

## Tornadoes

Tornadoes and funnel clouds can also occur during these types of severe storms. Tornadoes are another severe weather hazard that, though rare, can affect anywhere within the Yuba County Planning Area, primarily during the rainy season in the late fall and early spring. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure differential across a path only 300 yards wide or less as 300-mile-wide hurricanes. Figure 4-31 illustrates the potential impact and damage from a tornado.

Figure 4-31 Potential Impact and Damage from a Tornado

Figure 2-2 Potential impact of a tornado



## Potential Impact and Damage From a Tornado

Managing Risk	Damage Color Code	Description of Damage
The Threat to Property and Personal Safety Can Be Minimized Through Compliance With Up-To-Date Model Building Codes and Engineering Standards	<span style="background-color: #e0e0e0; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	Some damage can be seen to poorly maintained roofs. Unsecured light-weight objects, such as trash cans, are displaced.
	<span style="background-color: #fff9c4; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	Minor damage to roofs and broken windows occur. Larger and heavier objects become displaced. Minor damage to trees and landscaping can be observed.
Property and Personal Protection Can Be Improved Through Wind Hazard Mitigation Techniques Not Normally Required by Current Building Codes	<span style="background-color: #fff176; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	Roofs are damaged, including the loss of shingles and some sheathing. Manufactured homes, on nonpermanent foundations can be shifted off their foundations. Trees and landscaping either snap or are blown over. Medium-sized debris becomes airborne, damaging other structures.
	<span style="background-color: #ffc107; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	Roofs and some walls, especially unreinforced masonry, are torn from structures. Small ancillary buildings are often destroyed. Manufactured homes on nonpermanent foundations can be overturned. Some trees are uprooted.
Personal Protection Can Only Be Achieved Through Use of a Specially Designed Extreme Wind Refuge Area, Shelter, or Safe Room	<span style="background-color: #ff9800; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	Well constructed homes, as well as manufactured homes, are destroyed, and some structures are lifted off their foundations. Automobile-sized debris is displaced and often tumbles. Trees are often uprooted and blown over.
	<span style="background-color: #d32f2f; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	Strong frame houses and engineered buildings are lifted from their foundations or are significantly damaged or destroyed. Automobile-sized debris is moved significant distances. Trees are uprooted and splintered.

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

Source: FEMA: Building Performance Assessment: Oklahoma and Kansas Tornadoes

### Location and Extent

Tornadoes, while rare, can occur at locations in the lower elevations County. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. Table 4-30 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at different levels of intensity. Table 4-31 shows the wind speeds associated with the Enhanced Fujita Scale ratings.

Table 4-30 Original Fujita Scale

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown, and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, [www.spc.noaa.gov/faq/tornado/f-scale.html](http://www.spc.noaa.gov/faq/tornado/f-scale.html)

*Table 4-31 Enhanced Fujita Scale*

Enhanced Fujita (EF) Scale	Enhanced Fujita Scale Wind Estimate (mph)
EF0	65-85
EF1	86-110
EF2	111-135
EF3	136-165
EF4	166-200
EF5	Over 200

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, [www.spc.noaa.gov/faq/tornado/ef-scale.html](http://www.spc.noaa.gov/faq/tornado/ef-scale.html)

It is difficult to predict a tornado or the conditions that preclude a tornado far in advance. Tornadoes can strike quickly with very little warning. In California it is rare for tornadoes to exceed EF3 magnitude. Most tornadoes that touch down are not long lived.

## Past Occurrences

### Disaster Declaration History

There have been no past federal or state disaster declarations due to high winds or tornadoes, according to Table 4-4. The County had two USDA disaster declarations since 2012 related to high winds and tornadoes, as shown on Table 4-32.

*Table 4-32 Yuba County – USDA Disaster Declarations from Wind and Tornadoes 2012-2021*

Year	Declaration Number	Primary or Contiguous County	Disaster Type
2016	S4164	Contiguous	Severe weather including excessive rainfall and high winds
2016	S4170	Primary	Severe weather including excessive rainfall and high winds

Source: USDA

## NCDC Events

The NCDC data recorded 75 high wind incidents for Yuba County since 1955. This includes 4 tornado and 7 funnel cloud events. A summary of these events is shown in Table 4-33.

*Table 4-33 NCDC High Wind and Tornado Events in Yuba County 1955-7/31/2020\**

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage	Deaths (indirect)	Injuries (indirect)
Funnel Cloud	7	0	0	\$0	\$0	0	0
High Wind	45	2	3	\$10,458,000	\$30,011,000	0	0
Strong Wind	16	0	0	\$1,892,000	\$0	0	0
Thunderstorm Wind	3	0	0	\$10,000	\$0	0	0
Tornado	4	0	0	\$26,000	\$0	0	0
<b>Total</b>	<b>75</b>	<b>2</b>	<b>3</b>	<b>\$12,386,000</b>	<b>\$30,011,000</b>	<b>0</b>	<b>0</b>

Source: NCDC

\*Note: Losses reflect totals for all impacted areas, some of which fell outside of Yuba County

## HMPC Events

HMPC also noted the following events:

**October 22, 2012** –The Olivehurst Tornado: Supercells developed behind the cold front along a north-south boundary in the middle of the Central Valley, where both instability and shear were large. Emergency manager reported a tornado touchdown at approximately 2:30pm (PST). The estimated damage path length was a quarter mile with wind speeds estimated at 90-100mph. A sturdy roof on a wood frame building suffered significant damage. Metal roofs on several other industrial buildings were also badly damaged.

**October 22, 2012** – The Browns Valley Tornado: Supercells developed behind the cold front along a north-south boundary in the middle of the Central Valley, where both instability and shear were large. Law enforcement reported a brief tornado touchdown in a rice field. The estimated damage path length was about 100 ft to the northeast with wind speeds estimated at 70-80mph or less. No damage was associated with this tornado.

**March 21, 2018** – Tornado touchdown observed by Yuba County deputies at Yuba County. Minor damage was observed, including ripped tarps and objects knocked over. Another touchdown was observed and videoed in an open field, about a mile to the north. No damage was observed at the second touchdown location.

## Likelihood of Future Occurrence

**Highly Likely/Occasional** – Based on NCDC data and HMPC input, 75 wind incidents over a 66-year period (1955-2020) equates to a severe wind event every year. High winds are a well-documented seasonal occurrence that will continue to occur annually in the Yuba County Planning Area. Tornadoes tend to be rare in the County, and warrant a likelihood of future occurrence rating of occasional.

## Climate Change and High Winds

According to the CAS, while average annual rainfall may increase or decrease slightly, the intensity of individual thunderstorm events is likely to increase during the 21<sup>st</sup> century. This may bring stronger thunderstorm winds. The CAS does not discuss non-thunderstorm winds.

### *Vulnerability Assessment*

#### **Vulnerability—Medium**

Yuba County is subject to potentially destructive straight-line winds and tornadoes. High winds are common throughout the area and can happen during most times of the entire year and outside of a severe storm event. Tornadoes are rare. Straight line and tornadoes winds are primarily a public safety and economic concern. Structures, agriculture (crops and livestock), and the citizens of the County are at risk to high winds and tornadoes.

### Vulnerability to and Impacts from High Winds and Tornadoes

Windstorms and tornadoes can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind or tornado events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered.

Impacts from straight line winds and tornadoes include:

- Increased wildfire risk
- Increased chance of PSPS event
- Erosion (soil loss)
- Dry land farming seed loss
- Increased levee erosion during periods of high water and high winds
- Windblown weeds
- Downed trees
- Downed crops
- Power line impacts and economic losses from power outages
- Occasional building damage, primarily to roofs

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, as in dust and snowstorms. The winds may also exacerbate fire conditions by drying out the ground cover, propelling fuel around the region, and increasing the ferocity of exiting fires. High winds can also lead to PSPS events. These winds may damage crops, push automobiles off roads, damage roofs and structures, and cause secondary damage due to flying debris.

Campers, mobile homes, barns, and sheds and their occupants are particularly vulnerable as windstorm events in the region can be sufficient in magnitude to overturn these lighter structures. 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. Overhead power lines are vulnerable and account for the majority of

historical damages. State highways can be vulnerable to high winds and dust storms, where high profile vehicles may be overturned by winds and lowered visibility can lead to multi-car accidents. The greatest threat to Yuba County from wind is not from damage from the winds themselves, but from the spread of wildfires during windy days, and now from the periodic PSPS events.

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. The HMPC also noted that tornado associated with fire conditions have now been documented in Yuba County as well.

### *Future Development*

Future development projects should consider windstorm and tornado hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability. Utilities at risk to high winds should be undergrounded as new facilities are improved or added. Whether high winds and tornadoes will occur, where, when, and of what intensity are all factors that evolve over the days and hours before they form and after they do. Improved weather forecasts coupled with new information technologies, including social media, has resulted in an increasingly large volume of risk information that is available to people when tornadoes and high winds threaten. Development trends in the County are not expected to increase vulnerability to this hazard.

## **4.3.6. Climate Change**

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

### **Hazard/Problem Description**

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 LHMP Update 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 in the 19th century, 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 are already experiencing.

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven 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. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

In Yuba County, the HMPC noted that each year it seems to get a bit warmer. California’s Adaptation Planning Guide (APG): Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. California’s Adaptation Planning Guide: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Yuba County falls within the Northern Central Valley Region characterized as an agricultural, inland region with over 3.7 million people, with substantial cities, the largest being the state capitol, Sacramento. Agriculture is the predominant economic activity. The agricultural operations in this region include rice, dairy, and nut trees (almond and walnut). The region’s agricultural activity is one of the most productive in the nation. Table 4-34 provides a summary of Cal-Adapt Climate Projections for the North Central Valley Region.

*Table 4-34 North Central Valley Region and Yuba County – Cal Adapt Climate Projections*

Effect	Ranges
Temperature Change, 1990-2100	January increase in average temperature of 4°F to 6°F in 2050 and between 8°F and 12°F by 2100. July increase in average temperature of 6°F to 7°F in 2050 and 12°F to 15°F by 2100. (Modeled average temperatures; high emissions scenario)
Precipitation	Annual precipitation is projected to decline by approximately one to two inches by 2050 and three to six inches by 2100. (Community Climate System Model Version 3 (CCSM3) climate model; high carbon emissions scenario)
Heat wave	Heat wave is defined as five days over 102°F to 105°F, except in the mountainous areas to the east. Two to three more heat waves per year are expected by 2050 with five to eight more by 2100.

Effect	Ranges
Wildfire	By 2085, the north and eastern portions of the region will experience an increase in wildfire risk, more than 4 times current levels in some areas. (Geophysical Fluid Dynamics Laboratory (GFDL) climate model; high carbon emissions scenario)

Source: Cal-Adapt

## Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the County. There is no scale to measure the extent of climate change. Climate change exacerbates other hazard, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

## Past Occurrences

### Disaster Declaration History

Climate change has never been directly linked to any declared disasters, as shown in Table 4-4. The County had no USDA disaster declarations since 2012 related to climate change, as shown on Table 4-6.

### NCDC Events

The NCDC does not track climate change events.

### Hazard Mitigation Planning Committee Events

While the HMPC noted that climate change is of concern, no specific impacts of climate change could be recalled. HMPC members noted that the strength of storms does seem to be increasing and the temperatures seem to be getting hotter. The HMPC also noted that the winter rains of 2017 and 2019 were more intense.

## Likelihood of Future Occurrence

**Likely** – Climate change is virtually certain to continue without immediate and effective global action. According to NASA, 2017 and 2019 were two of the hottest years on record. Without significant global action to reduce greenhouse gas (GHG) emissions, the IPCC concludes in its Fifth Assessment Synthesis Report (2014) that average global temperatures are likely to exceed 1.5°C by the end of the 21<sup>st</sup> 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.

## Climate Scenarios

The United Nations IPCC developed several GHG emissions scenarios based on differing sets of assumptions about future economic growth, population growth, fossil fuel use, and other factors. The emissions scenarios range from “business-as-usual” (i.e., minimal change in the current emissions trends) to more progressive (i.e., international leaders implement aggressive emissions reductions policies). Each

of these scenarios leads to a corresponding GHG concentration, which is then used in climate models to examine how the climate may react to varying levels of GHGs. Climate researchers use many global climate models to assess the potential changes in climate due to increased GHGs.

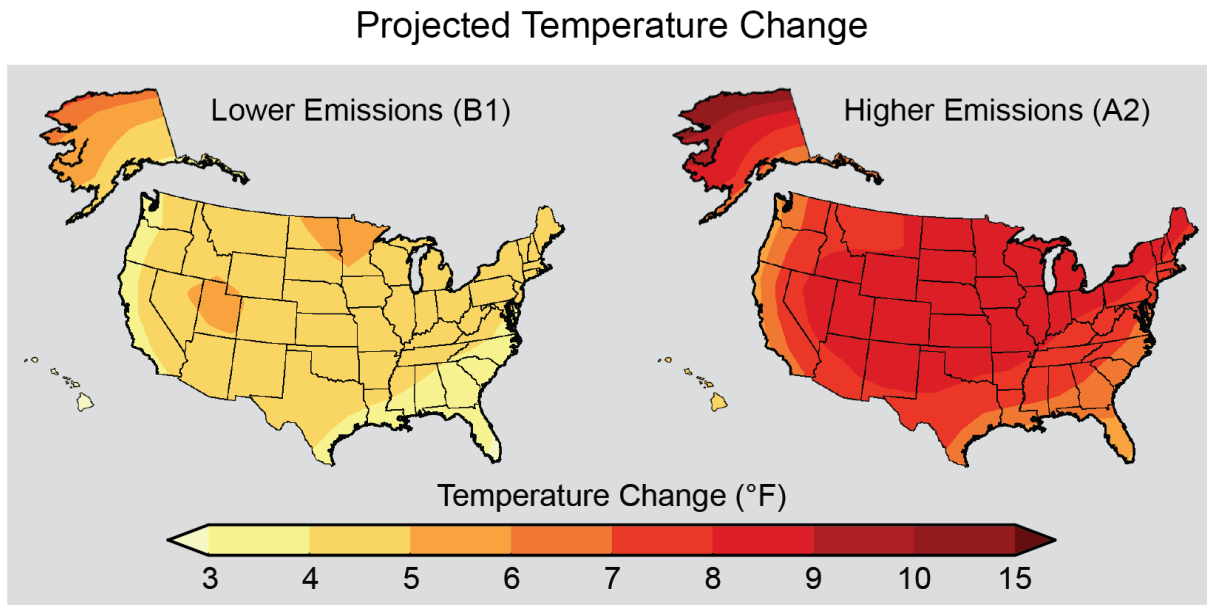
### Key Uncertainties Associated with Climate Projections

- Climate projections and impacts, like other types of research about future conditions, are characterized by uncertainty. Climate projection uncertainties include but are not limited to:
  - ✓ Levels of future greenhouse gas concentrations and other radiatively important gases and aerosols,
  - ✓ Sensitivity of the climate system to greenhouse gas concentrations and other radiatively important gases and aerosols,
  - ✓ Inherent climate variability, and
  - ✓ Changes in local physical processes (such as afternoon sea breezes) that are not captured by global climate models.

Even though precise quantitative climate projections at the local scale are characterized by uncertainties, the information provided can help identify the potential risks associated with climate variability/climate change and support long term mitigation and adaptation planning.

Maps show projected change in average surface air temperature in the later part of this century (2071-2099) relative to the later part of the last century (1970-1999) under a scenario that assumes substantial reductions in heat trapping gases and a higher emissions scenario that assumes continued increases in global emissions. These are shown in Figure 4-32.

*Figure 4-32 Projected Temperature Change – Lower and Higher Emissions Scenario*



Source: National Climate Assessment

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, sea 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 can result in a variety of secondary consequences including detrimental impacts on human health and safety, economic continuity, ecosystem integrity and provision of basic services.

The CNRA's 2014 CAS delineated how climate change may impact and exacerbate natural hazards in the future, including wildfires, extreme heat, floods, and drought:

- Climate change is expected to lead to increases in the frequency, intensity, and duration of extreme heat events and heat waves in Yuba County and the rest of California, which are likely to increase the risk of mortality and morbidity due to heat-related illness and exacerbation of existing chronic health conditions. Those most at risk and vulnerable to climate-related illness are the elderly, individuals with chronic conditions such as heart and lung disease, diabetes, and mental illnesses, infants, the socially or economically disadvantaged, and those who work outdoors.
- Higher temperatures will melt the Sierra snowpack earlier and drive the snowline higher, resulting in less snowpack to supply water to California users.
- Droughts are likely to become more frequent and persistent in the 21st century.
- Intense rainfall events, periodically ones with larger than historical runoff, will continue to affect California with more frequent and/or more extensive flooding.
- Storms and snowmelt may coincide and produce higher winter runoff from the landward side, while accelerating sea-level rise will produce higher storm surges during coastal storms. Together, these changes may increase the probability of floods and levee and dam failures, along with creating issues related to saltwater intrusion.
- Warmer weather, reduced snowpack, and earlier snowmelt can be expected to increase wildfire through fuel hazards and ignition risks. These changes can also increase plant moisture stress and insect populations, both of which affect forest health and reduce forest resilience to wildfires. An increase in wildfire intensity and extent will increase public safety risks, property damage, fire suppression and emergency response costs to government, watershed and water quality impacts, vegetation conversions and habitat fragmentation.

## *Vulnerability Assessment*

### **Vulnerability—Medium**

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 climate change on its own is a hazard, its effect on exacerbating other hazards is also a concern.

## Vulnerability to and Impacts from Climate Change

The Yuba County Agriculture Commissioner noted that 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. This section sources multiple documents that focus on Yuba County's climate change vulnerability:

- California Adaptation Planning Guide – 2012
- Proceedings of the National Academy of Sciences – 2016

### California Adaptation Planning Guide

The APG prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. The APG: Defining Local and Regional Impacts focuses on understanding the ways in which climate change can affect a community. According to this APG, climate change impacts (temperature, precipitation, sea level rise, ocean acidification, and wind) affect a wide range of community structures, functions and populations. These impacts further defined by regional and local characteristics are discussed by secondary impacts and seven sectors found in local communities: Public Health, Socioeconomic, and equity impacts; Ocean and Coastal Resources; Water Management; Forest and Rangeland; Biodiversity and Habitat; Agriculture; and Infrastructure.

The APG: Understanding Regional Characteristics identified the following impacts specific to the North Central Valley region in which the Yuba County Planning Area is part of:

- Temperature increases – particularly nighttime temperature
- Reduced precipitation
- Flooding – increase flows, snowmelt, levee failure in the Delta
- Reduced agricultural productivity (e.g., nut trees, dairy)
- Reduced water supply
- Wildfire in the Sierra foothills
- Public health and heat
- Reduced tourism

California's Adaptation Guide: Understanding Regional Characteristics provides input on adaptation considerations for the Northern Central Valley Region. As detailed in this guide, climate change has the potential to disrupt many features that characterize the region, including ecosystems health, snowpack, and the tourist economy. Specific regional impacts include the following:

**Flooding.** The eastern part of the Northern Central Valley contains the foothills of the Sierra Nevada mountain range. The mountainous areas of the state are projected to have less precipitation falling as snow and to be subject to rapid melt events. This will result in extreme, high-flow events and flooding in the Central Valley. Communities should evaluate local floodplains and recognize areas where a small increase in flood height would inundate large areas and potentially threaten structures, infrastructure, agricultural

fields, and/or public safety. As the rivers of the region flow toward San Francisco Bay, the land decreases in elevation and is protected by levees, many of which are vulnerable, particularly to seismic events.

**Agriculture.** The Northern Central Valley is one of the largest agricultural producing regions, not only in California, but in the United States. Between climate change impacts on water availability and seasonal temperature regimes, the health of livestock, and productivity of trees and crops are likely to be affected. Agriculture in this region is varied, with rice, nuts (almonds, walnuts, pistachios), and dairy being three of the most predominant products. Others include pears, cattle, wine grapes, chicken, sweet potatoes, and plums. Each crop is likely to react slightly differently to alteration in seasonal temperature regimes and water availability. Rice is projected to experience a moderate loss in productivity (less than 10%). In the case of nut trees, it is the reduction in nighttime cooling that may have the most impact. Jurisdictions reliant on almonds, walnuts, pistachios, or other nuts should specifically evaluate projected changes in daily low temperatures and/or loss of nighttime chill hours. It is difficult to specifically project the production impact on crops because this relates to many factors in addition to temperature and precipitation, including pest regimes, availability of imported or groundwater irrigation water, and management practices. As with crops, climate change impacts on dairy cows can occur and depend on a variety of factors.

The impact of climate change on agricultural productivity has the potential to alter a community's economic continuity, including its employment base.

**Public Health, Socioeconomic, and Equity Impact.** Increased temperatures and more frequent heat waves are expected in the region. Impervious surfaces are increasing in the Central Valley, increasing the potential impacts of heat islands. Farm employment or lodging and food services are among the top five employment sectors in several of the counties in this region. Agricultural workers and employees in the tourist industry are more susceptible to heat events. Regardless of their occupation, the poor are less likely to have the adaptive capacity to prevent and address impacts for reasons stated above.

**Water Supply.** Shorter rainfall events and rapid snowmelt will reduce the region's water supply by making water more difficult to capture in reservoirs or retain for groundwater recharge. Recreation and tourism in the region are also likely to suffer due to lower water levels in waterways and reservoirs and declining snowpack. Agriculture will also be impacted due to reduced or altered precipitation. Water supply (for irrigation) can alleviate some of the other climate stresses (altered temperature or precipitation) or, in the case of reduced water supply, exacerbate them. The challenge of climate change is that water supply is projected to be reduced and water that is available will be more costly for users. Employees of water-reliant industries such as agriculture may become more economically vulnerable because of unstable working conditions.

**Fire.** Fire risk is projected to increase in the foothills lining the eastern edge of the region. The areas northeast of Sacramento, due to population density and fire risk, are projected to have large property loss. Jurisdictions should pay careful attention to the wildland-urban interface and enforcement of mitigation measures such as residential vegetation and setbacks.

## Proceedings of the National Academy of Sciences

A report from the Proceedings of the National Academy of Sciences (PNAS) states that some of the recent fire impacts may have been attributed to climate change. The PNAS report posits that climate influences wildfire potential primarily by modulating fuel abundance in fuel-limited environments, and by modulating fuel aridity in flammability-limited environments. Increased forest fire activity across the western United States in recent decades has contributed to widespread forest mortality, carbon emissions, periods of degraded air quality, and substantial fire suppression expenditures. Those most vulnerable to high levels of ozone and particulate matter include people who work or spend a lot of time outdoors, such as residents of this region who are employees of the tourist industry. Households eligible for energy utility financial assistance programs are an indicator of potential impacts. These households may be more at risk of not using cooling appliances, such as air conditioning, due to associated energy costs.

### *Future Development*

Yuba County in general could see population fluctuations as a result of climate impacts relative to those experienced in other regions, and these fluctuations could be expected to impact demand for housing and other development. For example, sea level rise may disrupt economic activity and housing in coastal communities, resulting in migration to inland urban areas. Other interior western states may experience an exodus of population due to challenges in adapting to heat even more extreme than that which is projected to occur here. While there are currently no formal studies of specific migration patterns expected to impact the Yuba County region, climate-induced migration was recognized within the UNFCCC Conference of Parties Paris Agreement of 2015 and is expected to be the focus of future studies.

**Climate change, coupled with shifting demographics and market conditions, could impact both the location of desired developments and the nature of development.** Demand may increase for smaller dwellings that are less resource intensive, more energy efficient, easier to maintain and can be more readily adapted or even moved in response to changing conditions. Compact, mixed-use and infill developments that can help residents avoid long commutes and vulnerabilities associated with the transportation system will likely continue to grow in popularity. The value of open space and pressure to preserve it will likely increase, due in part to its restorative, recreational, environmental and habitat benefits but also for its ability to sequester carbon, help mitigate the accumulation of greenhouse gas in the atmosphere and slow down the global warming trend. Higher flood risks, especially if coupled with increased federal flood insurance rates, may decrease market demand for housing and other types of development in floodplains, while increased risk of wildfires may do the same for new developments in the urban-wildland interface. Flood risks may also inspire new development and building codes that elevate structures while maintaining streetscapes and neighborhood characteristics.

**Climate change will stress water resources.** Water is an issue in every region, but the nature of the potential impacts varies. Drought, related to reduced precipitation, increased evaporation, and increased water loss from plants, is an important issue in many U.S. regions, especially in the West. Floods, water quality problems, and impacts on aquatic ecosystems and species are likely to be amplified by climate change. Declines in mountain snowpack are important in Yuba County the Sierra Nevada Mountains and across the state, where snowpack provides vital natural water storage and supply. The ability to secure and provide water for new development requires on-going monitoring and assurances. It is recommended that

the ability to provide a reliable water supply from the appropriate water purveyor, continue to be in the conditions for project approval, and such assurances shall be verified and in place prior to issuing building permits.

**Similarly, protecting and enhancing water supply will also need to be addressed.** California's Sustainable Groundwater Management Act (SGMA) will contribute to addressing groundwater and aquifer recharge needs. Good groundwater management will provide a buffer against drought and climate change, and contribute to reliable water supplies regardless of weather patterns. California depends on groundwater for a major portion of its annual water supply, and sustainable groundwater management is essential to a reliable and resilient water system. Protection of critical recharge areas should be addressed across the County in the respective Groundwater Management Plans. Further, these plans should include provisions that guide development or curtail development in areas that would harm or compromise recharge areas.

**Climate change will affect transportation.** The transportation network is vital to the County and the region's economy, safety, and quality of life. While it is widely recognized that emissions from transportation have impacts on climate change, climate will also likely have significant impacts on transportation infrastructure and operations. Examples of specific types of impacts include softening of asphalt roads and warping of railroad rails; damage to roads; flooding of roadways, rail routes, and airports from extreme events; and interruptions to flight plans due to severe weather. Climate change impacts considered in the plan include: extreme temperatures; increased precipitation, runoff and flooding; increased wildfires; and landslides. Although landslides are not a direct result of climate change, these events are expected to increase in frequency due to increased rainfall, runoff, and wildfire. These events have the potential to cause injuries or fatalities, environmental damage, property damage, infrastructure damage, and interruption of operations. During flood events, these trails serve as secondary transportation facilities when roadways are blocked or otherwise impassible. During Hurricane Sandy, bicycles were one of the primary modes used to deliver food and water to residents stranded in their homes due to flood. Including dual or multi-purpose facilities and amenities as part of all new development provides not just desirable community amenities but critical infrastructure for climate resiliency.

**Climate change will affect land uses and planning.** Climate change coupled with shifting demographics and market conditions, could impact both the location of desired developments and the nature of development. Demand may increase for smaller dwellings that are less resource intensive, more energy efficient, easier to maintain and can be more readily adapted or even moved in response to changing conditions. Compact, mixed-use and infill developments that can help residents avoid long commutes and vulnerabilities associated with the transportation system will likely continue to grow in popularity. The value of open space, urban greening, green infrastructure, tree canopy expansion and pressure to preserve it will likely increase, due in part to its restorative, recreational, environmental, and habitat, and physical and mental health benefits but also for its ability to sequester carbon and cool the surrounding environment.

**Climate change will affect Utilities.** California is already experiencing impacts from climate change such as an increased number of wildfires, sea level rise and severe drought. Utility efforts to deal with these impacts range from emergency and risk management protocols to new standards for infrastructure design and new resource management techniques. Utilities are just beginning to build additional resilience and redundancy into their infrastructure investments from a climate adaptation perspective, but have been doing so from an overall safety and reliability perspective for decades. Significant efforts are also being made in

those areas that overlap with climate change mitigation such as diversification of resources, specifically the addition of more renewables to the portfolio mix, as well as implementation of demand response efforts to curb peak demand. Efforts are also under way to upgrade the distribution grid infrastructure, which should add significant resilience to the grid as well. Next, they will issue a guidance document that expands upon the vulnerability assessments phase and includes plans for resilience solutions including cost/benefit analysis methodologies. The outcomes of this work will help to inform next steps on how infrastructure, the grid and other related operations will be modified to address climate change. New development will have to adapt and incorporate these new approaches as they evolve. Existing and new development will be affected from impacts that includes not only diminished capacity from all of the utility assets from generation to transmission and distribution, but also the cost consequences resulting from prevention, replacement, outage, and energy loss. These have the potential for greatly impacting not just residential development but commercial and industrial and all utility users.

### 4.3.7. Dam Failure

#### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

#### *Hazard/Problem Description*

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 or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Dam failures can also 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; and/or
- Failure of upstream dams on the same waterway.

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

Dams and reservoirs have been built throughout California to supply water for agriculture and domestic use, to allow for flood control, as a source of hydroelectric power, and to serve as recreational facilities. The storage capacities of these reservoirs range from a few thousand acre-feet to five million acre-feet. The water from these reservoirs eventually makes its way to the Pacific Ocean by way of several river systems.

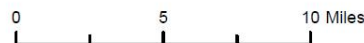
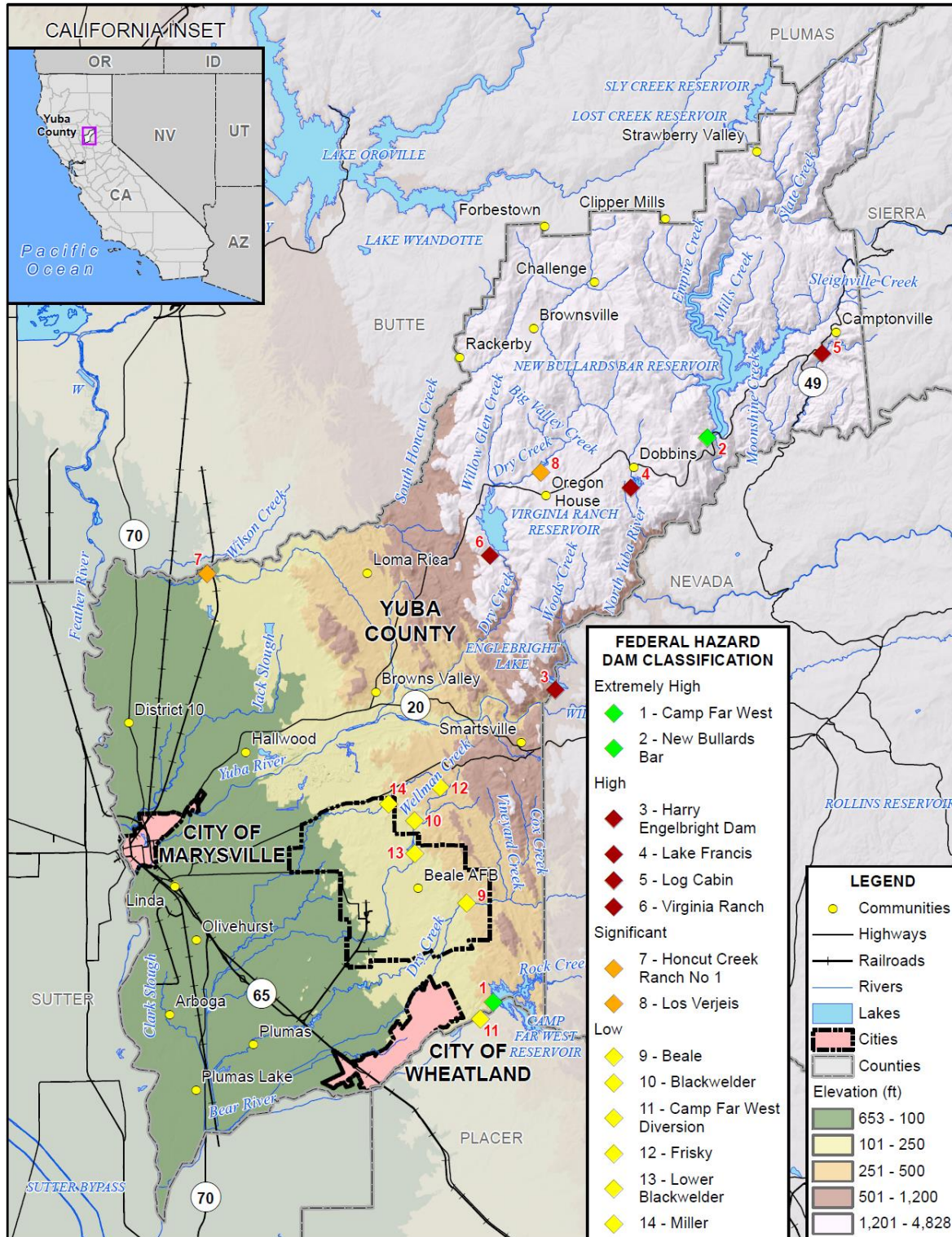
The California Department of Water Resources (CA DWR) Division of Safety of Dams (DSOD) has jurisdiction over impoundments that meet certain capacity and height criteria. Embankments that are less than six feet high and impoundments that can store less than 15 acre-feet are non-jurisdictional. Additionally, dams that are less than 25 feet high can impound up to 50 acre-feet without being jurisdictional. CA DWR, DOSD 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 four categories that identify the potential hazard to life and property:

- **Extremely High Hazard** – Expected to cause considerable loss of human life or would result in an inundation area with a population of 1,000 or more
- **High Hazard** – Expected to cause loss of at least one human life.
- **Significant Hazard** – No probable loss of human life but can cause economic loss, environmental damage, impacts to critical facilities, or other significant impacts.
- **Low Hazard** – No probable loss of human life and low economic and environmental losses. Losses are expected to be principally limited to the owner’s property.

### Location and Extent

According to data provided by Yuba County, CA DWR, and Cal OES, there are 14 dams inside the County. There are 2 extremely high, 3 high hazard, 2 significant hazard, and 7 low hazard dams (as shown on Figure 4-33) in Yuba County that falls under the jurisdiction of the DSOD (jurisdictional dams described above). Table 4-35 gives information on the 14 dams inside the County that falls under DSOD jurisdiction. Figure 4-34 identifies the extremely high and high hazard dams outside the County that threaten the County. Table 4-36 shows the 15 dams outside of Yuba County that could affect areas inside Yuba County, should they fail. These include 7 extremely high, 7 high hazard, and 1 significant hazard dam.

Figure 4-33 Yuba County Dams Inside the County



Data Source: DWR DSOD Data 2021, Yuba County GIS, Cal-Atlas; Map Date: 1/15/2021.



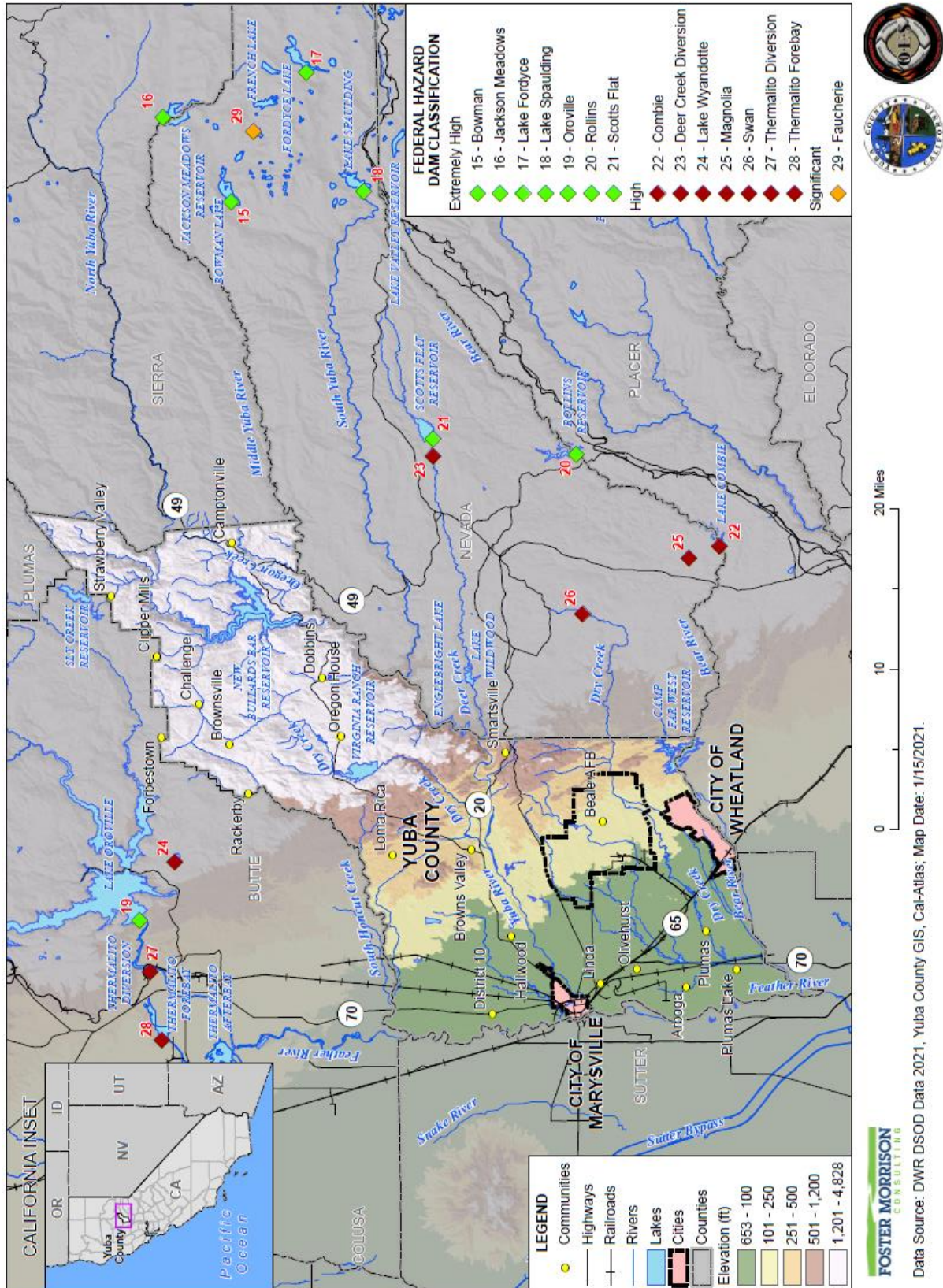
*Table 4-35 Yuba County – Inventory of Dams Inside the County under DSOD Jurisdiction*

Name	Significance	Owner	River	Dam Height	Dam Storage (acre-feet)*	Year Built
Beale	Low	US Dept of Defense - USAF	Dry Creek	0	50	1952
Blackwelder	Low	US Dept of Defense - USAF	Hutchinson Creek	0	80	1962
Camp Far West	Extremely High	South Sutter Water District	Bear River	185	104,500	1963
Camp Far West Diversion	Low	South Sutter Water District	Bear River	32	425	1977
Frisky	Low	US Dept of Defense - USAF	Tributary of Hutchinson Creek	0	20	1958
Harry Engelbright Dam	High	US Dept. of Interior	Yuba River	246	45,000	1941
Honcut Creek Ranch No 1	Significant	Private	Tributary of South Honcut River	19	95	1964
Lake Francis	Significant	Yuba County Water Agency	Dobbins Creek	79	1,905	2000
Log Cabin	Low	Yuba County Water Agency	Oregon Creek	49	89	1968
Los Verjels	High	Private	Dry Creek	56	1,530	1915
Lower Blackwelder	Low	US Dept of Defense - USAF	Hutchinson Creek	0	20	1958
Miller	Low	US Dept of Defense - USAF	Reeds Creek	0	200	1962
New Bullards Bar	Extremely High	Yuba County Water Agency	North Yuba River	635	969,600	1970
Virginia Ranch	High	Browns Valley Irrigation District	French Dry Creek	152	2,700	1963

Source: Cal OES and the DSOD National Performance of Dams Program (2021)

\*One Acre Foot=326,000 gallons

Figure 4-34 Yuba County – Dams of Concern Outside the County



*Table 4-36 Dams of Concern Outside Yuba County*

Name (County)	Significance	Owner	River	Dam Height	Dam Storage (acre-feet)*	Year Built
Bowman (Nevada)	Extremely High	Nevada Irrigation District	Canyon Creek	178	64,000	1927
French Lake (Nevada)	Significant	Nevada Irrigation District	Canyon Creek	39	1,065	1859
Jackson Meadows (Nevada)	Extremely High	Nevada Irrigation District	Middle Yuba River	195	52,500	1965
Lake Fordyce (Nevada)	Extremely High	PG&E	Fordyce Creek	143	48,900	1873
Lake Spaulding (Nevada)	Extremely High	PG&E	South Yuba	275	74,773	1913
Oroville (Butte)	Extremely High	CA DWR	Feather River	770	3,553,405	1968
Rollins (Nevada)	Extremely High	Nevada Irrigation District	Bear River	242	66,000	1965
Scotts Flat (Nevada)	Extremely High	Nevada Irrigation District	Deer Creek	175	49,000	1948
Combie (Nevada)	High	Nevada Irrigation District	Bear River	85	5,555	1928
Deer Creek Diversion (Nevada)	High	Nevada Irrigation District	Deer Creek	92	1,400	1928
Lake Wyandotte (Butte)	High	South Feather Water and Power Agency	North Honcut Creek	46	313	1924
Magnolia (Nevada)	High	Lake of the Pines Association	Magnolia Creek	68	4,150	1967
Swan (Nevada)	High	Lakewood Association	Swan Lake	59	550	1967
Thermalito Diversion (Butte)	High	CA DWR	Feather River	128	13,328	1967
Thermalito Forebay (Butte)	High	CA DWR	Feather River	75	11,768	1967

Source: Cal OES and the DSOD National Performance of Dams Program (2021)

\*One Acre Foot=326,000 gallons

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, dam failure would most probably happen in consequence of the natural disaster triggering the event. However, DOSD assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail: Low, Significant, High, and Extremely High. There is no scale with which to measure dam failure. While a dam may fill slowly with runoff from winter storms, a dam break can have a very quick speed of onset. The duration of dam failure is not long – only as long as it takes to empty the reservoir of water the dam held back. Dam inundation flood geographic extents are discussed in Table 4-43 in the flooded acres analysis in the Vulnerability Assessment section below.

## Past Occurrences

### Disaster Declaration History

There has been one disaster declaration related to dam failure affecting Yuba County, as shown in Table 4-4 from the 2017 Oroville Dam incident. The County had no USDA disaster declarations since 2012 related to dam failure, as shown on Table 4-6.

### NCDC Events

There have been no NCDC dam failure events in Yuba County.

### National Performance of Dams Program Events

The National Performance of Dams Program at Stanford University tracks dam failures. A search of the National Performance of Dams Program database showed no past dam failure events in Yuba County.

### Hazard Mitigation Planning Committee Events

The HMPC noted the following related to the Oroville spillway event:

**February 2017** – A hazardous situation developed with the Oroville Dam emergency spillway in nearby Butte County. At approximately 4:30 pm on February 12, 2017, officials were alerted by DWR that the Auxiliary Spillway at Oroville Dam was subject to imminent failure within 60 minutes, Yuba County Immediately notified residents to evacuate immediately. Failure of the emergency spillway structure would result in an uncontrolled release of flood waters from Lake Oroville. In response to the situation, DWR increased water releases to 100,000 cubic feet per second. Immediate evacuation from the low levels of Oroville and areas downstream were ordered. Yuba County opened their EOC during this event. Due to flooding concerns, the EOC was evacuated. the evacuation of the Emergency Operations Center (EOC) to the Ruud Center in Nevada County was smooth and all EOC Operations were able to continue in a safe location away from the existing threat. The move took approximately 1.5 hours to complete and stand up fully operational in Nevada County within 45 minutes.

## Likelihood of Future Occurrence

**Occasional**—No dam failure events have occurred in the County, but the County was affected by the Oroville Spillway incident. Thus, based on historical data and input from the HMPC, it is occasional that major dam failure event will occur affecting Yuba County.

## 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 in Yuba County.

## *Vulnerability Assessment*

**Vulnerability**—Extremely High

Dam failure flooding can occur as the result of a partial or complete collapse of an impoundment. Dam failures often result from prolonged rainfall and flooding. An earthquake event can also contribute to a dam failure. The primary danger associated with dam failure is the high velocity flooding of those properties downstream of the dam. A dam failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to dam failures is confined to the areas subject to inundation downstream of the facility. Secondary losses would include loss of the multi-use functions of the facility and associated revenues that accompany those functions. Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding.

## Impacts

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.

A major dam failure could have a devastating impact on the Yuba County Planning Area. Dam failure flooding presents a threat to life and property, including buildings, their contents, and their use. Large flood events can affect crops and livestock as well as lifeline critical utilities (e.g., water, sewerage, and power), transportation, jobs, tourism, the environment, and the local and regional economies.

Flooding, including that from dam failure, 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.

## Dams of Concern

Based on the hazard classifications and locations of dams inside and outside of Yuba County, the County is most vulnerable to the following 20 dams:

### Extremely High Hazard Dams Inside County

- Camp Far West
- New Bullards Bar

### High Hazard Dams Inside County

- Lake Francis
- Log Cabin
- Virginia Ranch

### Extremely High Hazard Dams Outside County

- Bowman
- French Lake
- Jackson Meadows
- Lake Fordyce
- Lake Spaulding
- Oroville
- Rollins
- Scotts Flat

### High Hazard Dams Outside County

- Combie
- Deer Creek Diversion
- Lake Wyandotte
- Magnolia
- Swan
- Thermalito Diversion
- Thermalito Forebay

Available dam inundation maps show areas that lie within the potential dam failure inundation areas, as shown in Figure 4-37 through Figure 4-36.

## Values at Risk

Dam inundation areas were available for the dams of concern, as obtained from CA DWR, DSOD, and Cal OES, were used as the basis of this dam inundation analysis. Dams were grouped by hazard rating in order to perform analysis. The depth of flooding due to the failure of these dams is unknown.

## Methodology and Results

The same methodology was used for both the extremely high hazard and high hazard dam analysis. Yuba County's 2020 Parcel/Assessor Data, obtained from Yuba County, were used for the County inventory of parcels and values. GIS was used to for analysis on the parcel layer. The dam inundation areas, obtained from Cal OES and DSOD, were then overlaid on the parcel layer. For the purposes of this analysis, if the dam inundation layer intersected any part of the parcel, the entire parcel was considered to be in the dam inundation area. The parcels were segregated and analyzed in this fashion for the entirety of Yuba County. Once completed, the parcel boundary layer was joined to the centroid layer and values were transferred based on the identification number in the Assessors database and the GIS parcel layer.

Also, it is important to keep in mind that these assessed values may be well below the actual market value of improved parcels located within the dam inundation areas due primarily to Proposition 13.

### *Extremely High and High Hazard Dams Inside the County*

Dam inundation analysis was performed for the two mapped extremely high and three high hazard dams that could affect the County. The depth of flooding due to the failure of a dam is unknown. The following maps and tables show the risk from dam inside the County.

- Figure 4-35 shows the dam inundation areas of the extremely high hazard dams of concern located inside the County.
- Figure 4-36 shows the dam inundation areas of the high hazard dams of concern located inside the County.
- Table 4-37 shows the total parcel counts, improved parcel counts, their improved structure and land values in each extremely high hazard dam inundation areas in the Yuba County Planning Area.
- Table 4-38 shows the total parcel counts, improved parcel counts, their improved structure and land values in each high hazard dam inundation areas in the Yuba County Planning Area.
- Table 4-39 shows the property uses affected by both the extremely high and high hazard dam inundation area in unincorporated County from dams inside the County. Tables showing the property uses affected by each dam inundation area for each jurisdiction in the County are shown in their respective annexes to this Plan Update.

For these tables it should be noted that:

- Inundation cannot be summed as the inundations intersect in similar area coverage. By summing, duplication would occur.

Figure 4-35 Yuba County – Extremely High Hazard Dam Inundation Areas from Dams Inside the County

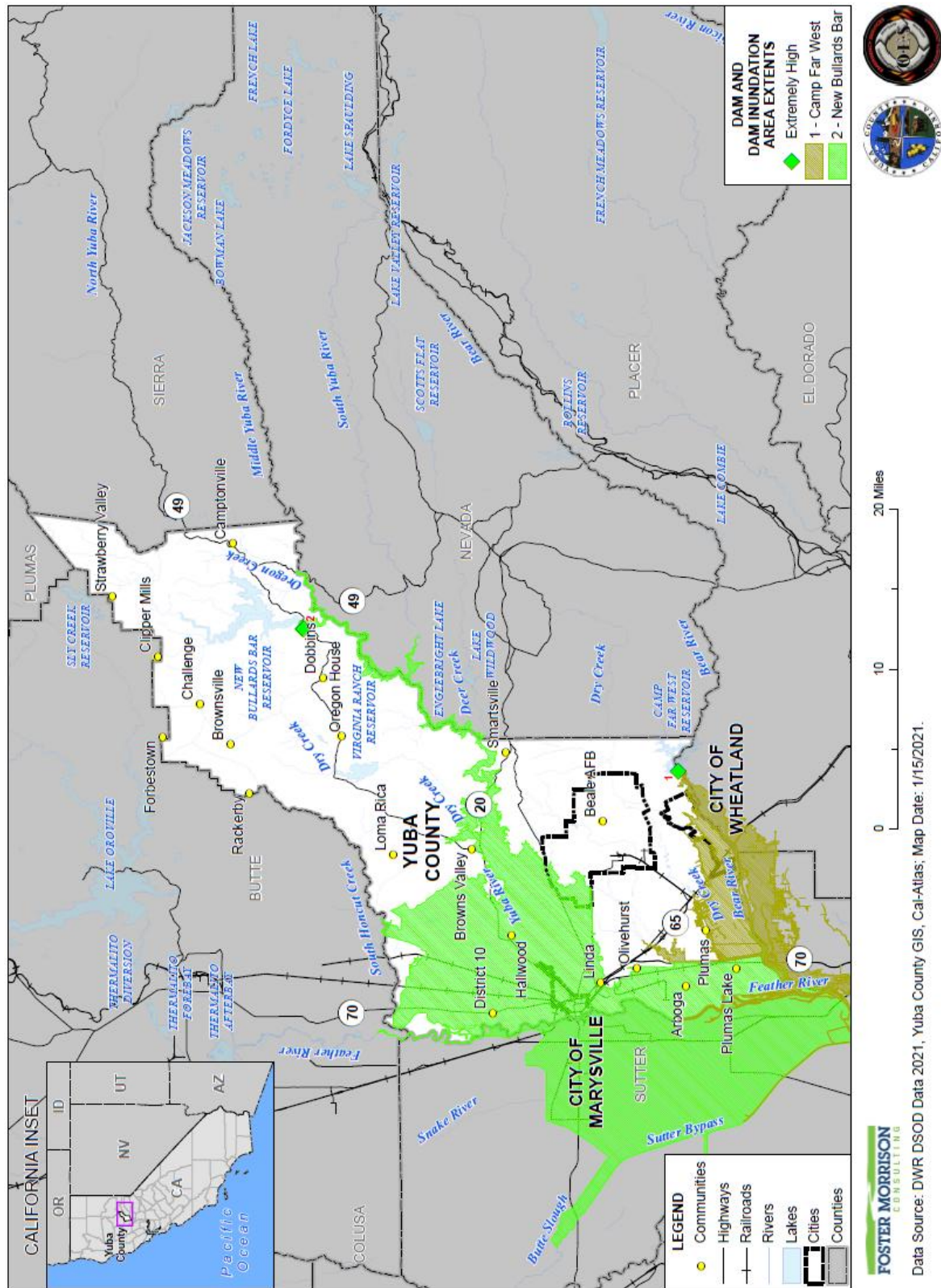
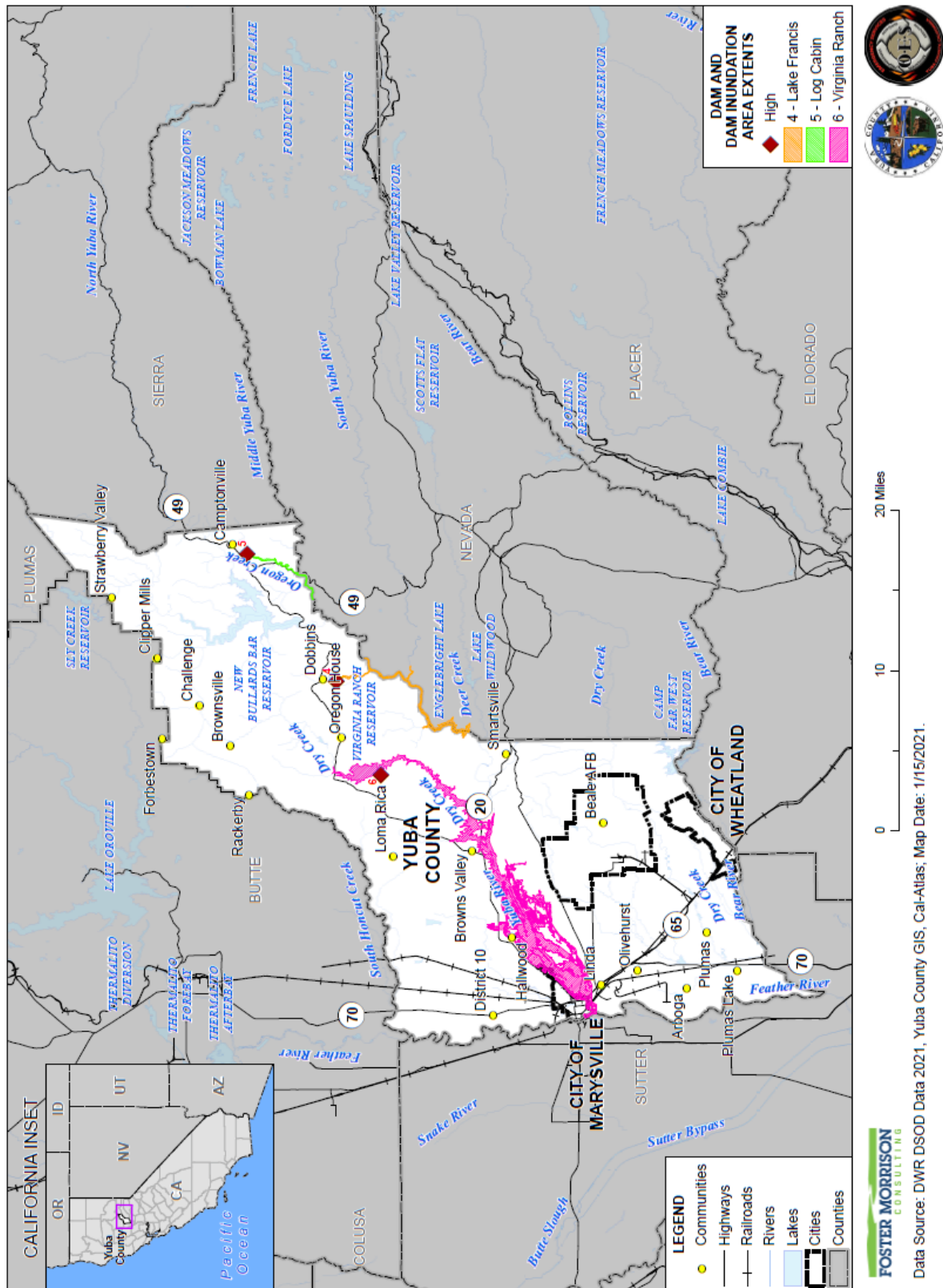


Figure 4-36 Yuba County – High Hazard Dam Inundation Areas from Dams Outside the County



*Table 4-37 Yuba County Planning Area – Summary Count and Value of Parcels in the Extremely High Hazard Dam Inundation Areas Inside the County*

Dam Inundation Areas	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Camp Far West	1,802	1,374	\$165,110,249	\$264,836,961	\$155,658,383	\$585,605,593
New Bullards Bar	17,486	13,432	\$1,075,849,542	\$2,941,583,849	\$1,942,274,603	\$5,959,707,994

Source: Yuba County 2020 Parcel/Assessor's Data, Cal OES, DSOD

*Table 4-38 Yuba County Planning Area – Summary Count and Value of Parcels in the High Hazard Dam Inundation Areas Inside the County*

Dam Inundation Areas	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Lake Francis	35	4	\$2,524,927	\$492,326	\$259,411	\$3,276,664
Log Cabin	36	15	\$2,523,073	\$2,486,544	\$1,542,177	\$6,551,794
Virginia Ranch	792	334	\$102,960,979	\$85,818,815	\$66,703,481	\$255,483,275

Source: Yuba County 2020 Parcel/Assessor's Data, Cal OES, DSOD

*Table 4-39 Unincorporated Yuba County – Count and Value of Parcels in the Extremely High and High Hazard Dam Inundation Areas Inside the County by Property Use*

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>Camp Far West Dam (Extremely High Hazard Dam Inside of County)</b>						
Agricultural	189	120	\$76,464,451	\$19,540,930	\$19,540,930	\$115,546,311
Commercial	11	5	\$1,311,783	\$1,350,077	\$1,350,077	\$4,011,937
Government-Owned / Non-Taxable Property	41	0	\$0	\$0	\$0	\$0
Industrial	5	3	\$591,848	\$1,055,349	\$1,583,024	\$3,230,221
Miscellaneous	21	0	\$0	\$0	\$0	\$0
Residential	140	116	\$6,533,116	\$24,611,800	\$12,305,895	\$43,450,811
<b>Unincorporated Yuba County Total</b>	<b>407</b>	<b>244</b>	<b>\$84,901,198</b>	<b>\$46,558,156</b>	<b>\$34,779,926</b>	<b>\$166,239,280</b>
<b>New Bullards Bar Dam (Extremely High Hazard Dam Inside of County)</b>						
Agricultural	1,326	546	\$428,168,488	\$64,452,197	\$64,452,197	\$557,072,882
Commercial	280	162	\$51,553,291	\$102,805,708	\$102,805,708	\$257,164,707

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Government-Owned / Non-Taxable Property	485	1	\$542,845	\$949	\$949	\$544,743
Industrial	108	82	\$20,626,907	\$94,764,633	\$142,146,950	\$257,538,490
Miscellaneous	301	1	\$233,889	\$134,433	\$134,433	\$502,755
Residential	10,602	8,965	\$405,842,421	\$1,684,759,342	\$842,379,582	\$2,932,981,345
<b>Unincorporated Yuba County Total</b>	<b>13,102</b>	<b>9,757</b>	<b>\$906,967,841</b>	<b>\$1,946,917,262</b>	<b>\$1,151,919,819</b>	<b>\$4,005,804,922</b>
<b>Lake Francis Dam (High Hazard Dam Inside County)</b>						
Agricultural	19	1	\$2,216,184	\$26,497	\$26,497	\$2,269,178
Commercial	0	0	\$0	\$0	\$0	\$0
Government-Owned / Non-Taxable Property	12	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	1	0	\$0	\$0	\$0	\$0
Residential	3	3	\$308,743	\$465,829	\$232,914	\$1,007,486
<b>Unincorporated Yuba County Total</b>	<b>35</b>	<b>4</b>	<b>\$2,524,927</b>	<b>\$492,326</b>	<b>\$259,411</b>	<b>\$3,276,664</b>
<b>Log Cabin Dam (High Hazard Dam Inside County)</b>						
Agricultural	8	1	\$712,662	\$47,838	\$47,838	\$808,338
Commercial	1	1	\$14,561	\$22,165	\$22,165	\$58,891
Government-Owned / Non-Taxable Property	8	0	\$0	\$0	\$0	\$0
Industrial	1	1	\$126,094	\$263,904	\$395,856	\$785,854
Miscellaneous	4	0	\$0	\$0	\$0	\$0
Residential	14	12	\$1,669,756	\$2,152,637	\$1,076,318	\$4,898,711
<b>Unincorporated Yuba County Total</b>	<b>36</b>	<b>15</b>	<b>\$2,523,073</b>	<b>\$2,486,544</b>	<b>\$1,542,177</b>	<b>\$6,551,794</b>
<b>Virginia Ranch Dam (High Hazard Dam Inside County)</b>						
Agricultural	333	101	\$83,761,061	\$15,192,268	\$15,192,268	\$114,145,597
Commercial	11	7	\$1,758,383	\$4,051,150	\$4,051,150	\$9,860,683
Government-Owned / Non-Taxable Property	57	0	\$38,463	\$0	\$0	\$38,463
Industrial	5	5	\$1,741,023	\$786,473	\$1,179,709	\$3,707,205

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Miscellaneous	36	0	\$0	-\$4,219	-\$4,219	-\$8,438
Residential	233	218	\$14,999,879	\$52,394,197	\$26,197,100	\$93,591,176
<b>Unincorporated Yuba County Total</b>	<b>675</b>	<b>331</b>	<b>\$102,298,809</b>	<b>\$72,419,869</b>	<b>\$46,616,008</b>	<b>\$221,334,686</b>

Source: Yuba County 2020 Parcel/Assessor's Data, Cal OES, DSOD

### *Extremely High and Hazard Dams Outside the County*

Dam inundation analysis was performed for the eight extremely high and the seven high hazard dams located outside of concern to the County. The depth of flooding due to the failure of a dam is unknown. The following maps and tables show the risk from dam inside the County.

- Figure 4-37 shows the extremely high dam inundation areas of the eight dams of concern located outside of the County.
- Figure 4-38 shows the high dam inundation areas of the seven dams of concern located outside of the County.
- Table 4-40 the total parcel counts, improved parcel counts, their improved structure and land values in each outside the County extremely high hazard dam inundation areas in the Planning Area.
- Table 4-41 the total parcel counts, improved parcel counts, their improved structure and land values in each outside the County extremely high hazard dam inundation areas in the Planning Area.
- Table 4-42 shows the property uses affected by both the extremely high and high hazard dam inundation area in unincorporated County from dams outside the County. Tables showing the property uses affected by each dam inundation area for each jurisdiction in the County are shown in their respective annexes to this Plan Update.

For these tables it should be noted that:

- Inundation cannot be summed as the inundations intersect in similar area coverage. By summing, duplication would occur.

Figure 4-37 Yuba County – Extremely High Hazard Dam Inundation Areas from Dams Outside the County

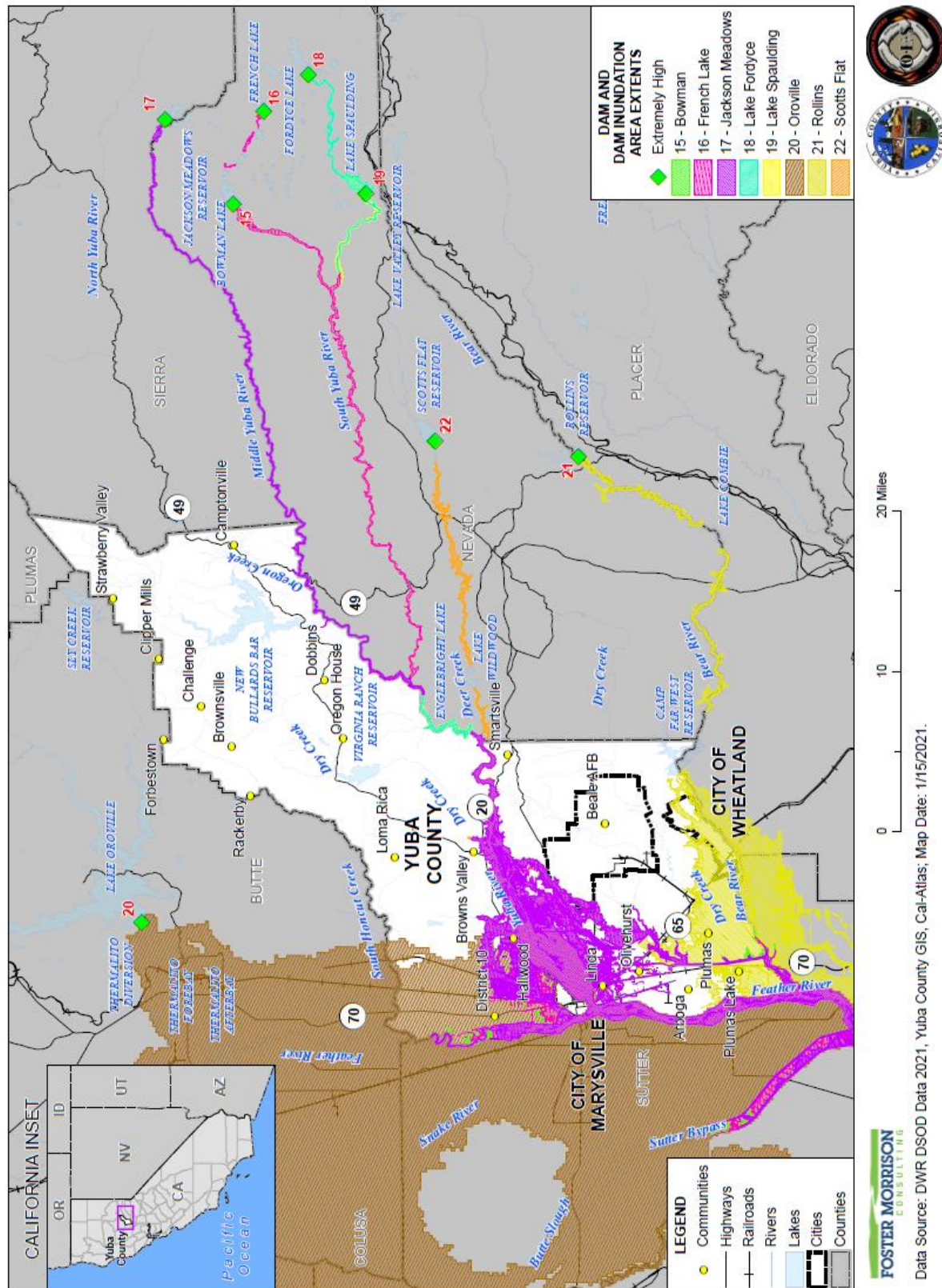
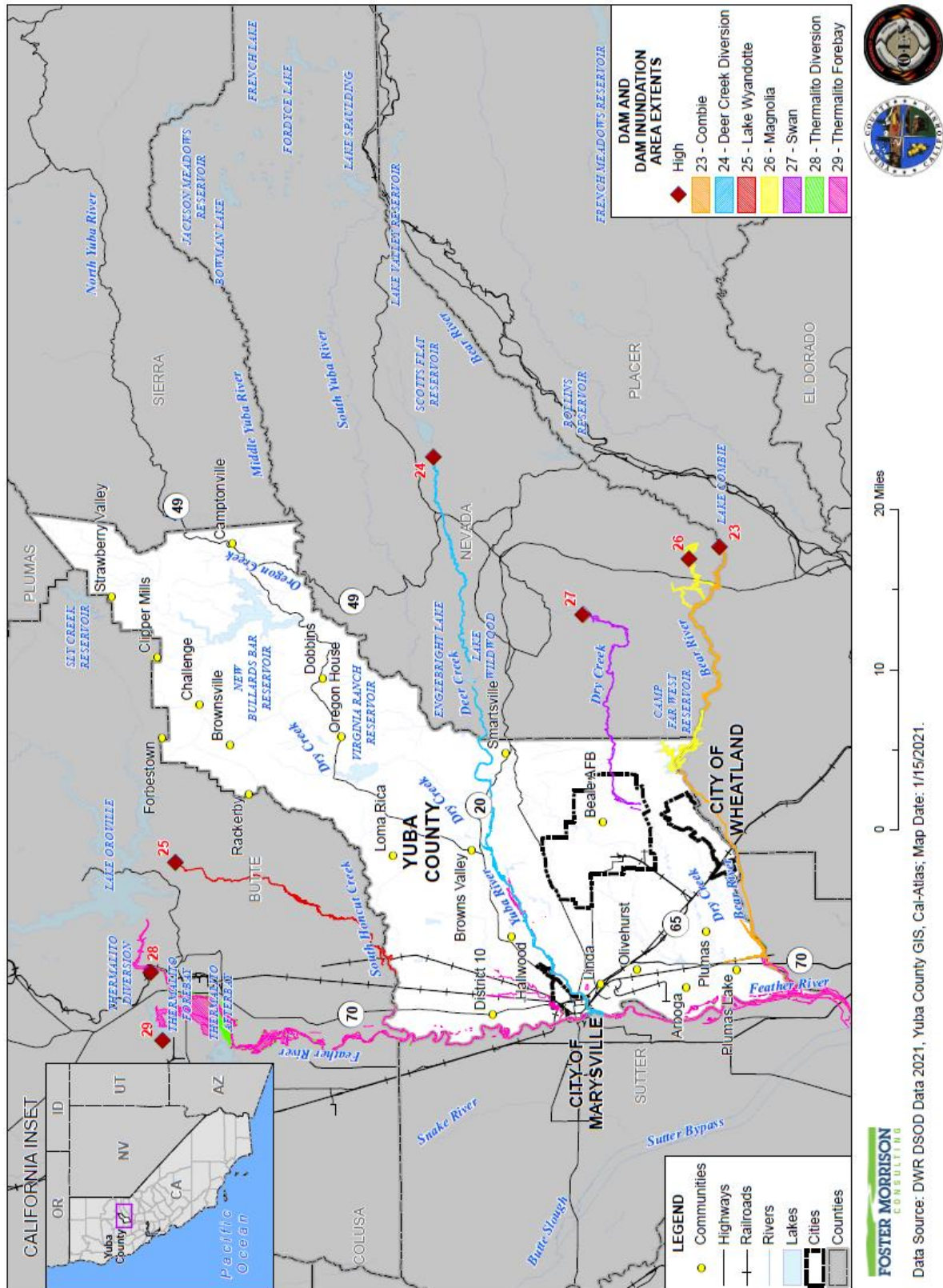


Figure 4-38 Yuba County – High Hazard Dam Inundation Areas from Dams Outside the County



**Table 4-40 Yuba County Planning Area– Count and Value of Parcels in the Extremely High Hazard Dam Inundation Areas Outside the County**

Dam Inundation Areas	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Bowman	6,466	4,575	\$450,932,759	\$864,067,825	\$543,278,929	\$1,858,279,513
French Lake	6,294	4,439	\$436,605,553	\$836,034,838	\$522,710,614	\$1,795,351,005
Jackson Meadows	6,627	4,729	\$440,994,536	\$901,462,797	\$570,046,305	\$1,912,503,638
Lake Fordyce	57	4	\$3,631,164	\$449,865	\$242,276	\$4,323,305
Lake Spaulding	92	12	\$6,725,087	\$1,911,684	\$1,179,736	\$9,816,507
Oroville	1,948	1,045	\$285,161,261	\$235,858,090	\$204,783,734	\$725,803,085
Rollins	4,410	3,235	\$346,272,409	\$783,588,664	\$447,290,938	\$1,577,152,011
Scotts Flat	783	220	\$104,042,507	\$54,663,693	\$51,749,924	\$210,456,124

Source: Yuba County 2020 Parcel/Assessor's Data, Cal OES, DSOD

**Table 4-41 Yuba County Planning Area– Count and Value of Parcels in the High Hazard Dam Inundation Areas Outside the County**

Dam Inundation Areas	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Combie	34	5	\$7,129,461	\$368,057	\$368,057	\$7,865,575
Deer Creek Diversion	149	29	\$44,296,083	\$13,666,078	\$14,412,881	\$72,375,042
Lake Wyandotte	4	3	\$1,553,677	\$1,317,382	\$1,317,382	\$4,188,441
Magnolia	11	0	\$143,340	\$0	\$0	\$143,340
Swan	12	0	\$0	\$0	\$0	\$0
Thermalito Diversion	128	36	\$27,210,855	\$3,017,198	\$2,893,318	\$33,121,371
Thermalito Forebay	244	61	\$81,719,888	\$15,878,935	\$17,149,202	\$114,748,025

Source: Yuba County 2020 Parcel/Assessor's Data, Cal OES, DSOD

**Table 4-42 Unincorporated Yuba County – Count and Value of Parcels in the Extremely High Hazard Dam Inundation Areas by Property Use**

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>Bowman Dam (Extremely High Hazard Dam Outside the County)</b>						
Agricultural	717	267	\$222,904,999	\$31,305,731	\$31,305,731	\$285,516,461
Commercial	224	135	\$45,220,911	\$86,639,688	\$86,639,688	\$218,500,287

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Government-Owned / Non-Taxable Property	292	1	\$60,082	\$949	\$949	\$61,980
Industrial	68	43	\$13,899,925	\$38,809,144	\$58,213,715	\$110,922,784
Miscellaneous	213	1	\$239,953	\$149,453	\$149,453	\$538,859
Residential	4,650	4,125	\$167,700,664	\$693,763,914	\$346,881,920	\$1,208,346,498
<b>Unincorporated Yuba County Total</b>	<b>6,164</b>	<b>4,572</b>	<b>\$450,026,534</b>	<b>\$850,668,879</b>	<b>\$523,191,456</b>	<b>\$1,823,886,869</b>
<b>French Lake Dam (Extremely High Hazard Dam Outside the County)</b>						
Agricultural	709	266	\$216,086,095	\$31,225,251	\$31,225,251	\$278,536,597
Commercial	214	127	\$41,134,444	\$68,048,704	\$68,048,704	\$177,231,852
Government-Owned / Non-Taxable Property	277	1	\$60,082	\$949	\$949	\$61,980
Industrial	70	45	\$13,863,623	\$41,593,049	\$62,389,573	\$117,846,245
Miscellaneous	208	1	\$243,464	\$149,453	\$149,453	\$542,370
Residential	4,518	3,996	\$164,311,620	\$681,618,486	\$340,809,211	\$1,186,739,317
<b>Unincorporated Yuba County Total</b>	<b>5,996</b>	<b>4,436</b>	<b>\$435,699,328</b>	<b>\$822,635,892</b>	<b>\$502,623,141</b>	<b>\$1,760,958,361</b>
<b>Jackson Meadows Dam (Extremely High Hazard Dam Outside the County)</b>						
Agricultural	694	237	\$210,836,200	\$29,369,419	\$29,369,419	\$269,575,038
Commercial	226	138	\$40,219,078	\$87,428,984	\$87,428,984	\$215,077,046
Government-Owned / Non-Taxable Property	300	1	\$60,082	\$949	\$949	\$61,980
Industrial	78	49	\$15,597,620	\$47,532,629	\$71,298,941	\$134,429,190
Miscellaneous	201	0	\$6,065	-\$10,719	-\$10,719	-\$15,373
Residential	4,834	4,301	\$173,369,726	\$723,742,589	\$361,871,258	\$1,258,983,573
<b>Unincorporated Yuba County Total</b>	<b>6,333</b>	<b>4,726</b>	<b>\$440,088,771</b>	<b>\$888,063,851</b>	<b>\$549,958,832</b>	<b>\$1,878,111,454</b>
<b>Lake Fordyce Dam (Extremely High Hazard Dam Outside the County)</b>						
Agricultural	43	1	\$3,152,802	\$34,687	\$34,687	\$3,222,176
Commercial	0	0	\$0	\$0	\$0	\$0
Government-Owned / Non-Taxable Property	10	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Miscellaneous	1	0	\$0	\$0	\$0	\$0
Residential	3	3	\$478,362	\$415,178	\$207,589	\$1,101,129
<b>Unincorporated Yuba County Total</b>	<b>57</b>	<b>4</b>	<b>\$3,631,164</b>	<b>\$449,865</b>	<b>\$242,276</b>	<b>\$4,323,305</b>
<b>Lake Spaulding Dam (Extremely High Hazard Dam Outside the County)</b>						
Agricultural	68	3	\$5,613,282	\$62,788	\$62,788	\$5,738,858
Commercial	1	1	\$245,000	\$385,000	\$385,000	\$1,015,000
Government-Owned / Non-Taxable Property	11	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	3	0	\$0	\$0	\$0	\$0
Residential	9	8	\$866,805	\$1,463,896	\$731,948	\$3,062,649
<b>Unincorporated Yuba County Total</b>	<b>92</b>	<b>12</b>	<b>\$6,725,087</b>	<b>\$1,911,684</b>	<b>\$1,179,736</b>	<b>\$9,816,507</b>
<b>Oroville Dam (Extremely High Hazard Dam Outside the County)</b>						
Agricultural	494	315	\$232,918,527	\$41,666,052	\$41,666,052	\$316,250,631
Commercial	23	15	\$5,964,631	\$4,837,445	\$4,837,445	\$15,639,521
Government-Owned / Non-Taxable Property	140	1	\$60,081	\$949	\$949	\$61,979
Industrial	19	18	\$5,788,551	\$48,046,704	\$72,070,059	\$125,905,314
Miscellaneous	80	1	\$233,888	\$160,172	\$160,172	\$554,232
Residential	606	472	\$28,056,940	\$89,754,936	\$44,877,463	\$162,689,339
<b>Unincorporated Yuba County Total</b>	<b>1,362</b>	<b>822</b>	<b>\$273,022,618</b>	<b>\$184,466,258</b>	<b>\$163,612,140</b>	<b>\$621,101,016</b>
<b>Rollins Dam (Extremely High Hazard Dam Outside the County)</b>						
Agricultural	318	188	\$127,018,174	\$26,036,692	\$26,036,692	\$179,091,558
Commercial	42	13	\$24,979,824	\$26,260,504	\$26,260,504	\$77,500,832
Government-Owned / Non-Taxable Property	138	0	\$103,809	\$0	\$0	\$103,809
Industrial	14	7	\$3,190,421	\$17,608,973	\$26,413,460	\$47,212,854
Miscellaneous	84	0	\$1	\$0	\$0	\$1
Residential	2,379	1,862	\$106,479,153	\$487,361,375	\$243,680,667	\$837,521,195

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>Unincorporated Yuba County Total</b>	<b>2,975</b>	<b>2,070</b>	<b>\$261,771,382</b>	<b>\$557,267,544</b>	<b>\$322,391,323</b>	<b>\$1,141,430,249</b>
<b>Scotts Flat Dam (Extremely High Hazard Dam Outside the County)</b>						
Agricultural	329	105	\$93,002,528	\$16,055,277	\$16,055,277	\$125,113,082
Commercial	13	8	\$2,019,832	\$4,436,150	\$4,436,150	\$10,892,132
Government-Owned / Non-Taxable Property	84	0	\$38,463	\$0	\$0	\$38,463
Industrial	5	5	\$1,741,023	\$786,473	\$1,179,709	\$3,707,205
Miscellaneous	26	0	\$0	-\$4,219	-\$4,219	-\$8,438
Residential	120	99	\$6,351,338	\$19,991,066	\$9,995,534	\$36,337,938
<b>Unincorporated Yuba County Total</b>	<b>577</b>	<b>217</b>	<b>\$103,153,184</b>	<b>\$41,264,747</b>	<b>\$31,662,451</b>	<b>\$176,080,382</b>
<b>Combie Dam (High Hazard Dam Outside of County)</b>						
Agricultural	17	5	\$6,370,349	\$368,057	\$368,057	\$7,106,463
Commercial	0	0	\$0	\$0	\$0	\$0
Government-Owned / Non-Taxable Property	14	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	1	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
<b>Unincorporated Yuba County Total</b>	<b>32</b>	<b>5</b>	<b>\$6,370,349</b>	<b>\$368,057</b>	<b>\$368,057</b>	<b>\$7,106,463</b>
<b>Deer Creek Dam (High Hazard Dam Outside of County)</b>						
Agricultural	104	20	\$43,507,901	\$10,182,040	\$10,182,040	\$63,871,981
Commercial	1	0	\$1,065	\$0	\$0	\$1,065
Government-Owned / Non-Taxable Property	13	0	\$36,096	\$0	\$0	\$36,096
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	3	0	\$0	\$0	\$0	\$0
Residential	8	8	\$673,116	\$995,215	\$497,607	\$2,165,938
<b>Unincorporated Yuba County Total</b>	<b>129</b>	<b>28</b>	<b>\$44,218,178</b>	<b>\$11,177,255</b>	<b>\$10,679,647</b>	<b>\$66,075,080</b>

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>Lake Wyandotte Dam (High Hazard Dam Outside of County)</b>						
Agricultural	4	3	\$1,553,677	\$1,317,382	\$1,317,382	\$4,188,441
Commercial	0	0	\$0	\$0	\$0	\$0
Government-Owned / Non-Taxable Property	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	0	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
<b>Unincorporated Yuba County Total</b>	<b>4</b>	<b>3</b>	<b>\$1,553,677</b>	<b>\$1,317,382</b>	<b>\$1,317,382</b>	<b>\$4,188,441</b>
<b>Magnolia Dam (High Hazard Dam Outside of County)</b>						
Agricultural	1	0	\$143,340	\$0	\$0	\$143,340
Commercial	0	0	\$0	\$0	\$0	\$0
Government-Owned / Non-Taxable Property	10	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	0	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
<b>Unincorporated Yuba County Total</b>	<b>11</b>	<b>0</b>	<b>\$143,340</b>	<b>\$0</b>	<b>\$0</b>	<b>\$143,340</b>
<b>Swan Dam (High Hazard Dam Outside of County)</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	0	0	\$0	\$0	\$0	\$0
Government-Owned / Non-Taxable Property	11	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	1	0	\$0	\$0	\$0	\$0
Residential	0	0	\$0	\$0	\$0	\$0
<b>Unincorporated Yuba County Total</b>	<b>12</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>Thermalito Diversion Dam (High Hazard Dam Outside of County)</b>						
Agricultural	47	32	\$26,809,730	\$2,747,548	\$2,747,548	\$32,304,826
Commercial	0	0	\$0	\$0	\$0	\$0

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Government-Owned / Non-Taxable Property	19	0	\$36,096	\$0	\$0	\$36,096
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	5	0	\$0	\$0	\$0	\$0
Residential	6	3	\$262,951	\$247,759	\$123,879	\$634,589
<b>Unincorporated Yuba County Total</b>	<b>77</b>	<b>35</b>	<b>\$27,108,777</b>	<b>\$2,995,307</b>	<b>\$2,871,427</b>	<b>\$32,975,511</b>
<b>Thermalito Forebay Dam (High Hazard Dam Outside of County)</b>						
Agricultural	124	54	\$79,774,197	\$12,858,654	\$12,858,654	\$105,491,505
Commercial	1	1	\$13,405	\$2,211	\$2,211	\$17,827
Government-Owned / Non-Taxable Property	50	0	\$36,096	\$0	\$0	\$36,096
Industrial	2	2	\$1,304,476	\$279,535	\$419,302	\$2,003,313
Miscellaneous	9	0	\$0	\$0	\$0	\$0
Residential	5	2	\$213,104	\$227,821	\$113,910	\$554,835
<b>Unincorporated Yuba County Total</b>	<b>191</b>	<b>59</b>	<b>\$81,341,278</b>	<b>\$13,368,221</b>	<b>\$13,394,077</b>	<b>\$108,103,576</b>

Source: Yuba County 2020 Parcel/Assessor's Data, Cal OES, DSOD

## Dam Inundation – Flooded Acres

In addition to the centroid analysis used to obtain numbers of parcels and values at risk to the dam failure hazard, parcel boundary analysis was performed to obtain total acres and flooded acres by dam inundation area. The following is an analysis of inundated or flooded acres associated with dam failures and inundation areas in the County.

### Methodology

GIS was used to calculate acres flooded by each Cal OES and DWR DSOD dam inundation area. The parcel layer was intersected with the dam inundation area data to obtain the acres inundated by dam. The Yuba County parcel layer and inundation areas were intersected, and each segment divided by the intersection of inundation area and parcels was calculated for acres.

### Limitations

One limitation created by this type of analysis is that with respect to the improved acres analysis, improvements are uniformly found throughout the parcel, while in reality, only portions of the parcel are improved, and improvements may or may not fall within the inundated portion of a parcel; thus, areas of

improvements inundated, calculated through this method, may be higher or lower than those actually seen in a similar real-world event.

## Analysis Results

The following tables represent a summary and detailed analysis of total acres for each dam inundation area in the Planning Area. Table 4-43 shows the flooded acres of the Yuba County Planning Area in the inundation areas of each extremely high and high hazard dam inside the County. Table 4-44 shows the flooded acres of the Yuba County Planning Area in the inundation areas of each extremely high and high hazard dam outside the County.

*Table 4-43 Yuba County Planning Area– Flooded Acres from Extremely High and High Hazard Dams Inside the County*

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
<b>Extremely High Hazard Dam Inundation Areas</b>							
Camp Far West	City of Wheatland	2,822	0.7%	1,843	1.2%	979	0.4%
	Unincorporated Yuba County	12,487	3.0%	9,239	6.0%	3,248	1.3%
New Bullards Bar	City of Marysville	2,345	0.6%	759	0.5%	1,586	0.6%
	Unincorporated Yuba County	96,230	23.4%	52,789	34.2%	43,442	16.9%
<b>High Hazard Dam Inundation Areas</b>							
Lake Francis Dam	Unincorporated Yuba County	480	0.1%	35	0.0%	445	0.2%
Log Cabin Dam	Unincorporated Yuba County	179	0.0%	34	0.0%	145	0.1%
Virginia Ranch Dam	City of Marysville	216	0.1%	41	0.0%	175	0.1%
	Unincorporated Yuba County	12,735	3.1%	6,425	4.2%	6,310	2.5%

Source: Cal OES, DSOD

*Table 4-44 Yuba County Planning Area – Flooded Acres from Extremely High and High Hazard Dams Outside the County*

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
<b>Extremely High Hazard Dam Inundation Areas</b>							
Bowman Dam	City of Marysville	652	0.2%	42	0.0%	610	0.2%

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
	Unincorporated Yuba County	36,469	8.9%	18,844	12.2%	17,626	6.9%
French Lake Dam	City of Marysville	645	0.2%	42	0.0%	603	0.2%
	Unincorporated Yuba County	34,061	8.3%	17,490	11.3%	16,571	6.5%
Jackson Meadows Dam	City of Marysville	627	0.2%	41	0.0%	587	0.2%
	Unincorporated Yuba County	34,731	8.4%	17,667	11.4%	17,065	6.6%
Lake Fordyce Dam	Unincorporated Yuba County	592	0.1%	27	0.0%	565	0.2%
Lake Spaulding Dam	Unincorporated Yuba County	1,132	0.3%	64	0.0%	1,068	0.4%
Oroville Dam	City of Marysville	761	0.2%	76	0.0%	686	0.3%
	Unincorporated Yuba County	39,094	9.5%	27,317	17.7%	11,777	4.6%
Rollins Dam	City of Wheatland	3,343	0.8%	1,929	1.3%	1,414	0.6%
	Unincorporated Yuba County	22,513	5.5%	16,246	10.5%	6,266	2.4%
Scotts Flat Dam	City of Marysville	379	0.1%	39	0.0%	340	0.1%
	Unincorporated Yuba County	11,049	2.7%	5,581	3.6%	5,468	2.1%
<b>High Hazard Dam Inundation Areas</b>							
Combie Dam	City of Wheatland	1	0.0%	0	0.0%	1	0.0%
	Unincorporated Yuba County	185	0.0%	34	0.0%	151	0.1%
Deer Creel Diversion	City of Marysville	42	0.0%	2	0.0%	40	0.0%
	Unincorporated Yuba County	716	0.2%	139	0.1%	577	0.2%
Lake Wyandotte Dam	Unincorporated Yuba County	47	0.0%	47	0.0%	0	0.0%
Magnolia Dam	Unincorporated Yuba County	462	0.1%	0	0.0%	462	0.2%

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Swan Dam	Unincorporated Yuba County	246	0.1%	0	0.0%	246	0.1%
Thermalito Diversion Dam	City of Marysville	105	0.0%	0	0.0%	105	0.0%
	Unincorporated Yuba County	335	0.1%	190	0.1%	145	0.1%
Thermalito Forebay Dam	City of Marysville	138	0.0%	2	0.0%	136	0.1%
	Unincorporated Yuba County	817	0.2%	336	0.2%	481	0.2%

Source: Cal OES, DSOD

## Population at Risk

A separate analysis was performed to determine population in dam inundation areas for identified dams of concern. Using GIS, the dam inundation area dataset was overlaid on the improved residential parcel data. Those parcel centroids that intersect an inundation area were counted and multiplied by the Census Bureau average household size for Yuba County and its jurisdictions. Table 4-45 shows the populations at risk to dam failure flooding for extremely high hazard dams. It is unlikely that all dams that could affect Yuba County would fail at the same time.

*Table 4-45 Yuba County Planning Area – Residential Population at Risk in Extremely High Hazard Dam Inundation Area for Dams Inside and Outside of the County*

Dam	City of Marysville		City of Wheatland		Unincorporated Yuba County	
	Improved Res. Parcels	Pop. At Risk	Improved Res. Parcels	Pop. At Risk	Improved Res. Parcels	Pop. At Risk
<b>Extremely High Hazard Dams Inside County</b>						
Camp Far West	0	0	1,067	2,870	116	329
New Bullards Bar	3,275	8,089	0	0	8,965	25,461
<b>High Hazard Dams Inside County</b>						
Lake Francis	0	0	0	0	3	8
Log Cabin	0	0	0	0	12	34
Virginia Ranch	0	0	0	0	218	619
<b>Extremely High Hazard Dams Outside County</b>						
Bowman	0	0	0	0	4,125	11,715
French Lake	0	0	0	0	3,996	11,349
Jackson Meadows	0	0	0	0	4,301	12,215
Lake Fordyce	0	0	0	0	3	8

Dam	City of Marysville		City of Wheatland		Unincorporated Yuba County	
	Improved Res. Parcels	Pop. At Risk	Improved Res. Parcels	Pop. At Risk	Improved Res. Parcels	Pop. At Risk
Lake Spaulding	0	0	0	0	8	23
Oroville	200	494	0	0	472	1,340
Rollins	0	0	1,102	2,964	1,862	5,288
Scotts Flat	0	0	0	0	99	281
<b>High Hazard Dams Outside County</b>						
Combie	0	0	0	0	0	0
Deer Creek Diversion	0	0	0	0	8	23
Lake Wyandotte	0	0	0	0	0	0
Magnolia	0	0	0	0	0	0
Swan	0	0	0	0	0	0
Thermalito Diversion	0	0	0	0	3	8
Thermalito Forebay	0	0	0	0	2	6

Source: Cal OES Dam Inundation Data, DSOD, US Census Bureau Average Household Sizes: Marysville (2.47); Wheatland (2.69) and unincorporated Yuba County (2.84)

## Critical Facilities at Risk

A separate analysis was performed on the critical facility inventory in Yuba County to determine critical facilities in the Cal OES and DSOD dam inundation areas. Using GIS, the dam inundation areas were overlaid on the critical facility GIS layer. Figure 4-39 shows critical facilities, as well as the dam inundation areas of extremely high hazard dams located inside the County. Figure 4-40 shows critical facilities, as well as the dam inundation areas of high hazard dams located inside the County. Table 4-46 summarizes critical facilities in extremely high and high hazard dams located inside the County by jurisdiction for the Planning Area. Figure 4-41 shows critical facilities, as well as the dam inundation areas of extremely high hazard dams located outside the County. Table 4-47 summarizes critical facilities in extremely high hazard dams located outside the County by jurisdiction for the Planning Area. There are no high hazard dam inundation areas from outside the County that affect critical facilities in the County, as such no maps or tabular analysis are shown. Details of critical facility definition, type, name and address by flood zone are listed in Appendix F.

Figure 4-39 Yuba County – Critical Facilities in Extremely High Hazard Dam Inundation Areas from Dams Inside the County

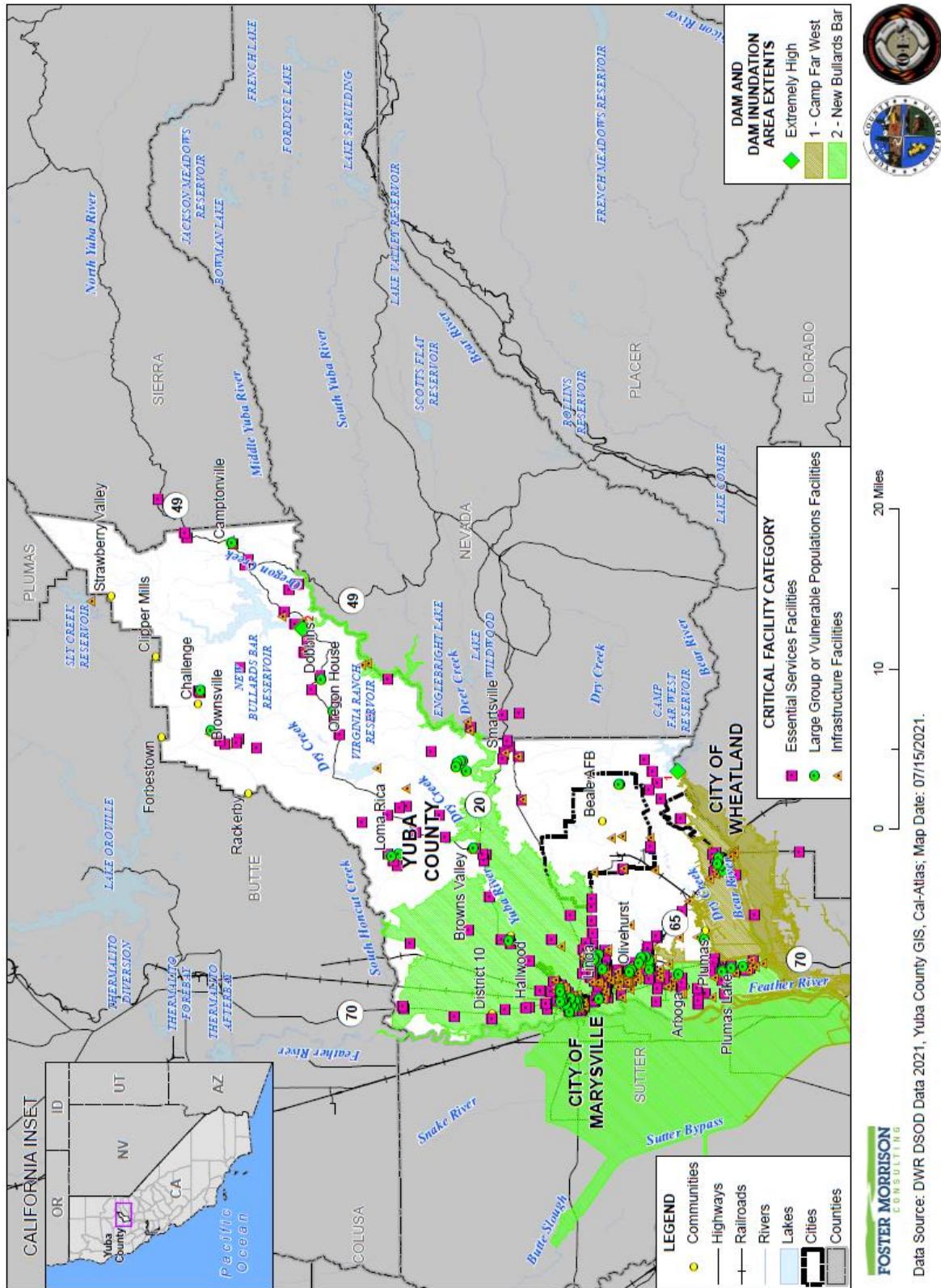
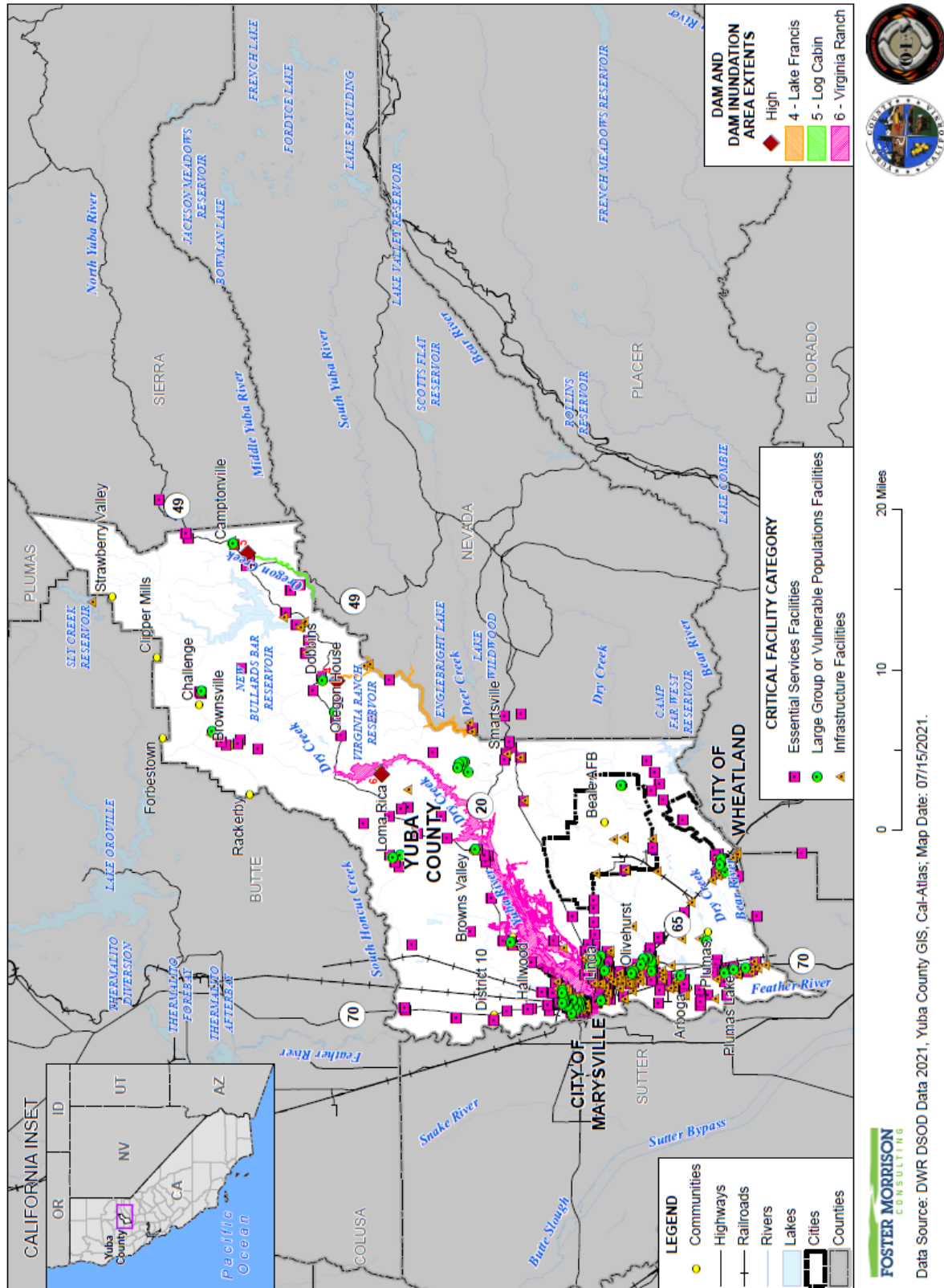


Figure 4-40 Yuba County – Critical Facilities in High Hazard Dam Inundation Areas from Dams Inside the County

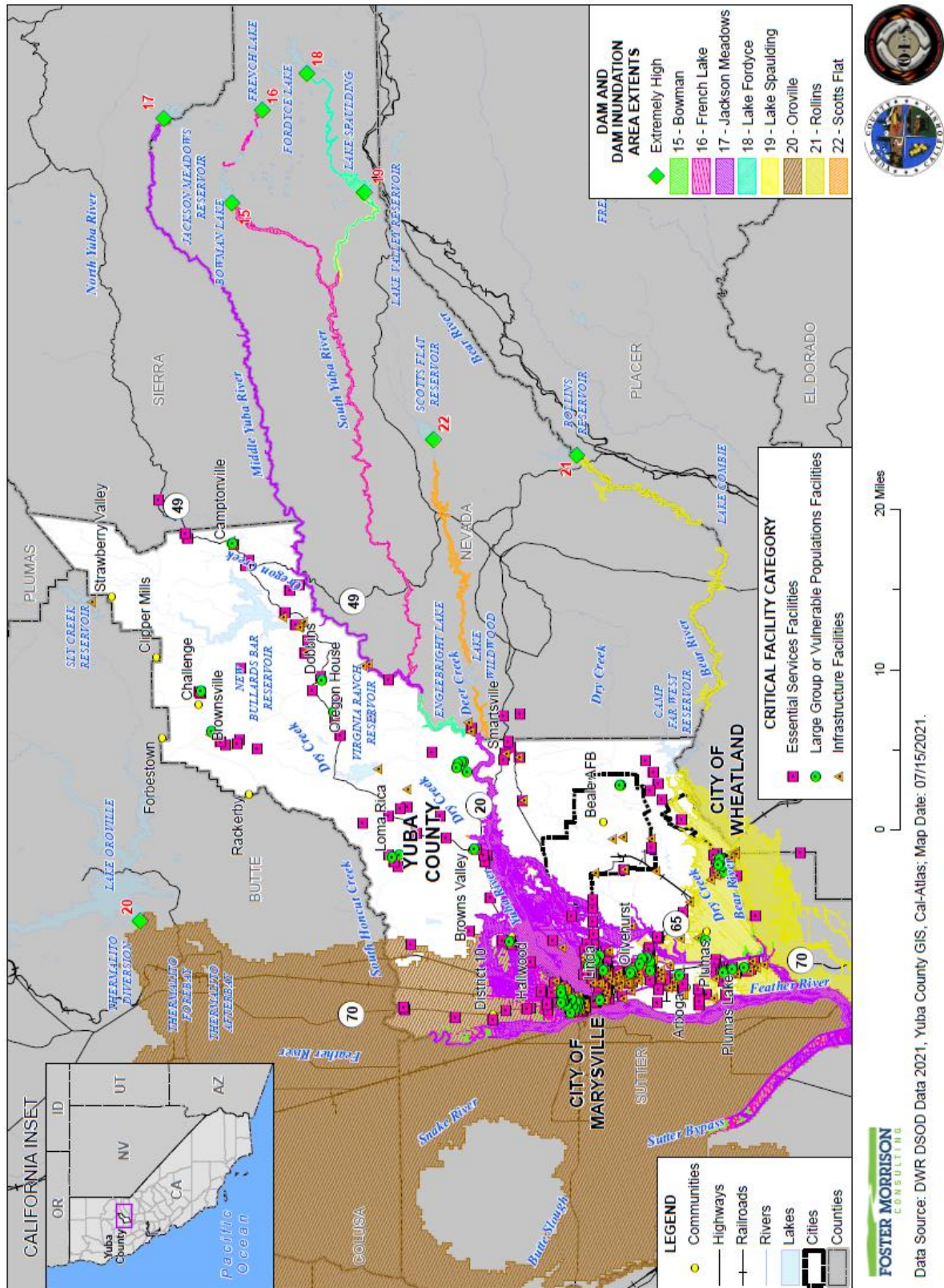


*Table 4-46 Yuba County – Summary of Critical Facilities in Extremely High and High Hazard Dam Inundation Areas from Dams Inside Yuba County*

Dam Inundation Areas	Jurisdiction	Facility Count
Cap Far West (Extremely High Hazard Dam)	City of Wheatland	38
	Unincorporated Yuba County	3
	Outside of Unincorporated Yuba County	1
New Bullards Bar (Extremely High Hazard Dam)	City of Marysville	125
	Unincorporated Yuba County	200
Virginia Ranch (High Hazard Dam)	Unincorporated Yuba County	5

Source: Yuba County GIS, Cal OES, DSOD

Figure 4-41 Yuba County – Critical Facilities in Extremely High Hazard Dam Inundation Areas from Dams Outside the County



*Table 4-47 Yuba County – Summary of Critical Facilities in Extremely High Hazard Dam Inundation Areas from Dams Outside Yuba County*

Dam Inundation Areas	Jurisdiction	Facility Count
Bowman	Unincorporated Yuba County	45
French Lake	Unincorporated Yuba County	39
Jackson Meadows	Unincorporated Yuba County	53
Lake Fordyce	Unincorporated Yuba County	1
Lake Spaulding	Unincorporated Yuba County	1
Oroville	City of Marysville	4
	Unincorporated Yuba County	22
Rollins	City of Wheatland	40
	Unincorporated Yuba County	27
	Outside of Unincorporated Yuba County	1
Scotts Flat	Unincorporated Yuba County	4

Source: Yuba County GIS, Cal OES, DSOD

## Overall Community Impact

Dam failure floods and their impacts vary by location and severity of any given dam failure event and will likely only directly affect certain areas of the Yuba County Planning Area during specific times. Based on the risk assessment, it is evident that dam failure floods have the potential for devastating life safety, property, environmental, and economic impacts to certain areas of the County. Impacts that are not always quantified, but can be anticipated in a large dam failure event, include:

- Injury and loss of life;
- Impacts to agricultural;
- Commercial and residential structural and property damage;
- Disruption of and damage to critical infrastructure and services;
- Health hazards associated with mold and mildew, contamination of drinking water, etc.;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) to the community;
- Negative impact on commercial and residential property values; and
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.
- Impact on the overall mental health of the community.

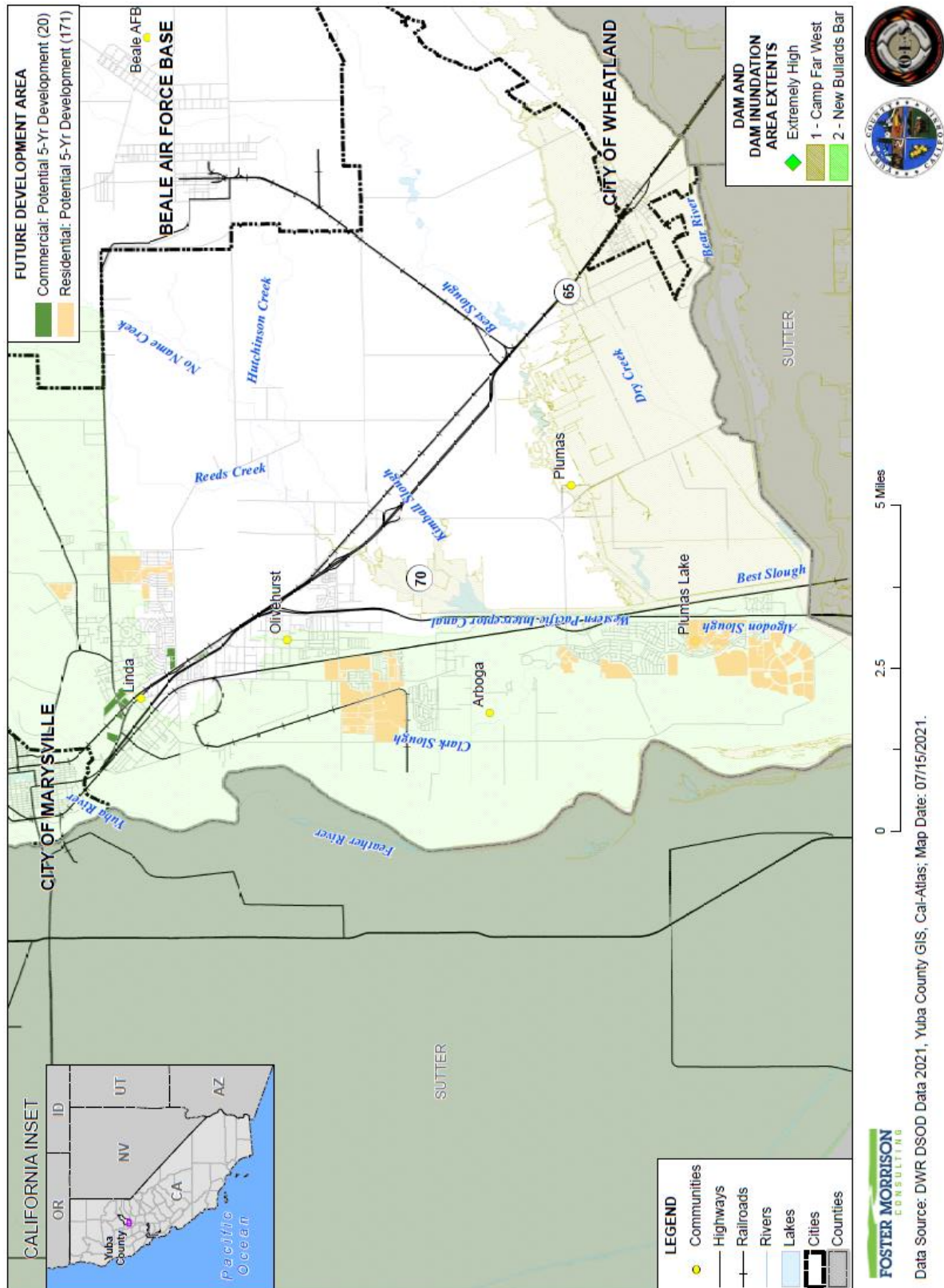
## Future Development

Although new growth and development corridors would fall in the area flooded by a dam failure, given the limited potential of total dam failure and the large area that a dam failure would affect, development in the dam inundation area will continue to occur.

## Future Development GIS Analysis

In order to ascertain if future development areas fall in dam inundation areas, a GIS analysis was performed. Using GIS, the following methodology was used in determining parcel counts and values associated with future development in the unincorporated Yuba County Planning Area. Yuba County's 2020 Parcel/Assessor's data and data from the County planning department were used as the basis for the unincorporated County's inventory of parcels and acres of future development areas. Using the GIS parcel spatial file and the APNs, the future development projects were mapped, and overlaid on the Cal OES and DSOD dam inundation areas. This can be seen on Figure 4-42 and detailed in Table 4-48 for extremely high hazard dam inundation areas inside the County. This can be seen on Figure 4-43 and detailed in Table 4-49 for extremely high hazard dam inundation areas inside the County. It should be noted that no high hazard dam inundation areas, either from inside or outside the County, affect future development areas. As such, no maps or tabular analysis are shown for those high hazard dam inundation areas. Maps of future development and dam inundation areas in the incorporated jurisdictions are presented in their respective annexes to this Plan Update.

Figure 4-42 Unincorporated Yuba County – Future Development in Extremely High Hazard Dam Inundation Areas Inside the County

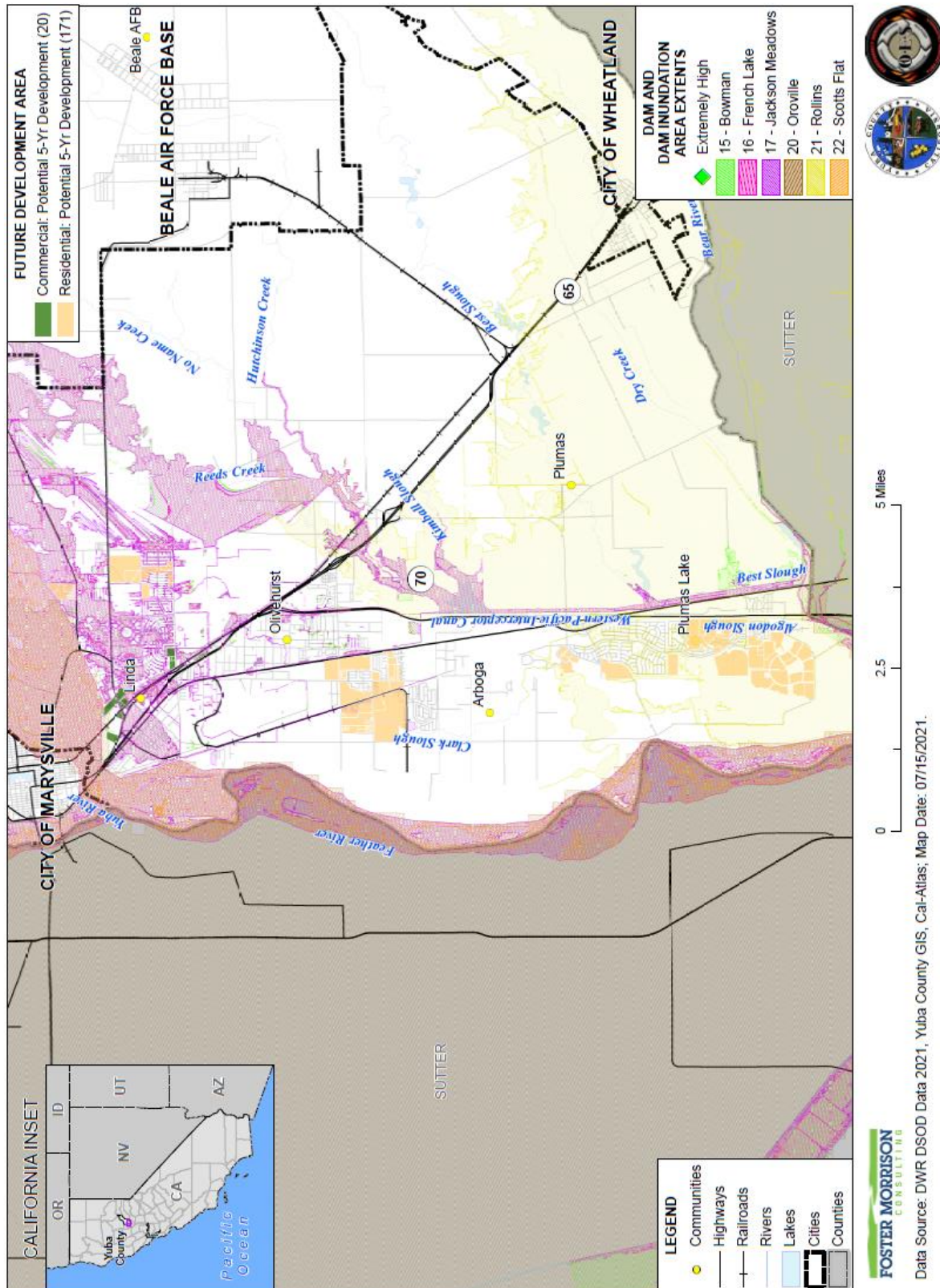


*Table 4-48 Unincorporated Yuba County – Future Development Parcels and Acres in Extremely High Hazard Dam Inundation Areas Inside the County*

Future Development / Dam Inundation Area	Total Parcel Count	Improved Parcel Count	Total Acres
<b>New Bullards Bar</b>			
Commercial: Potential 5-Yr Development	6	1	58.3
Residential: Potential 5-Yr Development	164	70	1,771.2
<b>New Bullards Bar Total</b>	<b>170</b>	<b>71</b>	<b>1,829.5</b>

Source: Cal OES, DSOD, Yuba County GIS

Figure 4-43 Unincorporated Yuba County – Future Development in Extremely High and High Hazard Dam Inundation Areas Outside the County



*Table 4-49 Unincorporated Yuba County – Future Development Parcels and Acres in Extremely High and High Hazard Dam Inundation Areas Outside the County*

Dam Inundation Area/Future Development	Total Parcel Count	Improved Parcel Count	Total Acres
<b>Bowman Dam</b>			
Commercial: Potential 5-Yr Development	9	1	54.0
Residential: Potential 5-Yr Development	25	1	80.3
<b>Bowman Total</b>	<b>34</b>	<b>2</b>	<b>134.3</b>
<b>French Lake Dam</b>			
Commercial: Potential 5-Yr Development	7	1	47.5
Residential: Potential 5-Yr Development	10		49.8
<b>French Lake Total</b>	<b>17</b>	<b>1</b>	<b>97.3</b>
<b>Jackson Meadows Dam</b>			
Commercial: Potential 5-Yr Development	7	1	52.4
Residential: Potential 5-Yr Development	66	20	88.3
<b>Jackson Meadows Total</b>	<b>73</b>	<b>21</b>	<b>140.7</b>
<b>Rollins Dam</b>			
Commercial: Potential 5-Yr Development	0	0	0
Residential: Potential 5-Yr Development	27	11	546.2
<b>Rollins Total</b>	<b>27</b>	<b>11</b>	<b>546.2</b>

Source: Cal OES, DSOD, Yuba County GIS

### 4.3.8. Drought and Water Shortage

#### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

#### Hazard/Problem Description

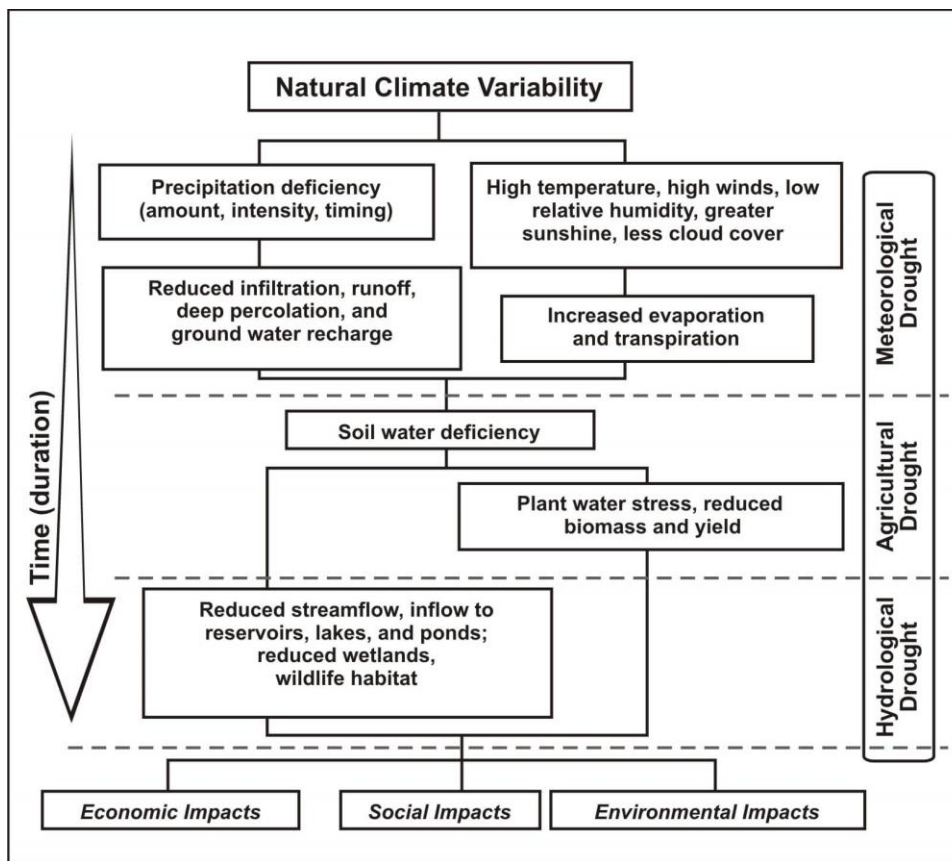
##### Drought

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a 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 (see Figure 4-44) many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area’s usual water-consuming activities. Drought can often be defined regionally based on its effects:

- **Meteorological drought** is usually defined by a period of below average water supply.
- **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.
- **Hydrological drought** is defined as deficiencies in surface and subsurface water supplies. It is generally measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels.
- **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.

*Figure 4-44 Causes and Impact of Drought*



Source: National Drought Mitigation Center (NDMC)

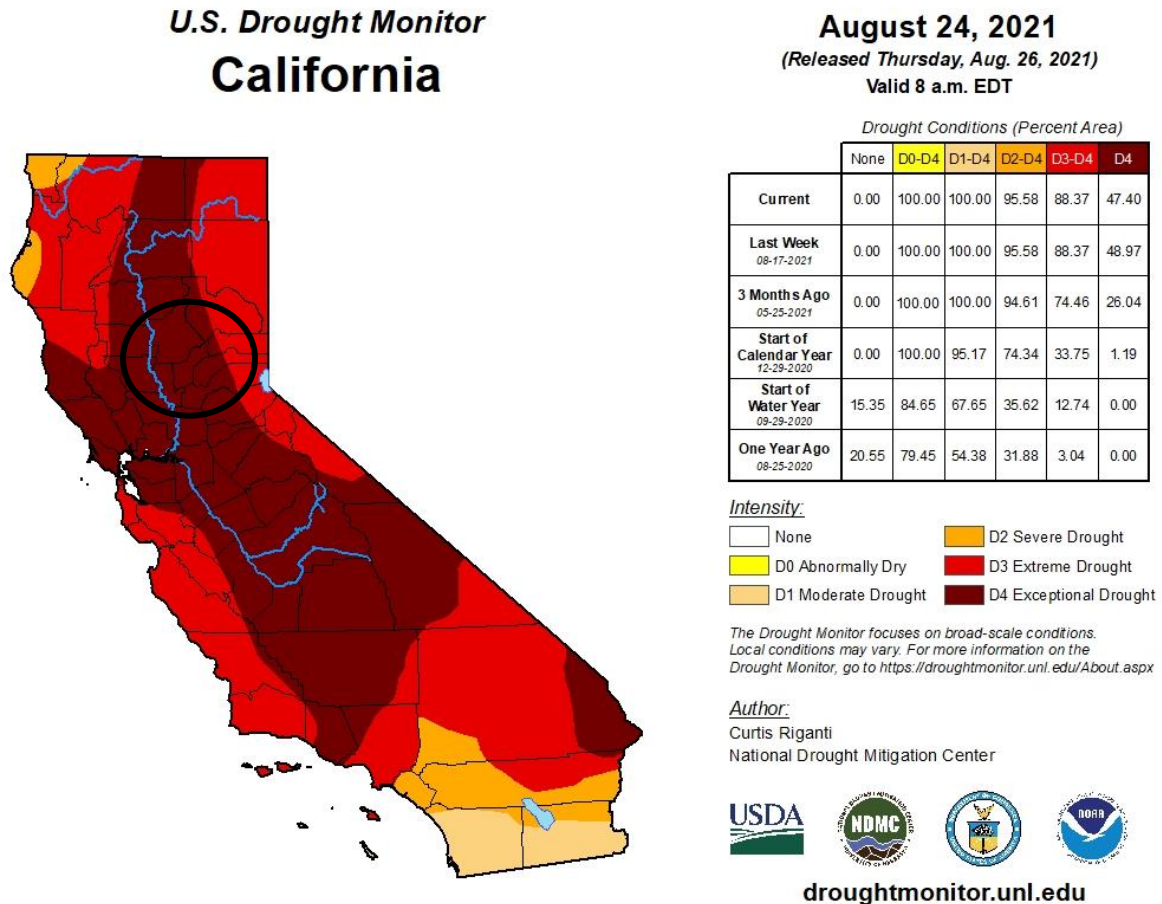
The HMPC noted that drought can cause increased wildfire risk, discussed in Section 4.3.14.

### *Location and Extent*

Since drought is a regional phenomenon, it affects the whole of the 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 (NIDIS). A major component of this portal is the U.S. Drought Monitor. The Drought Monitor concept was developed jointly by the NOAA’s

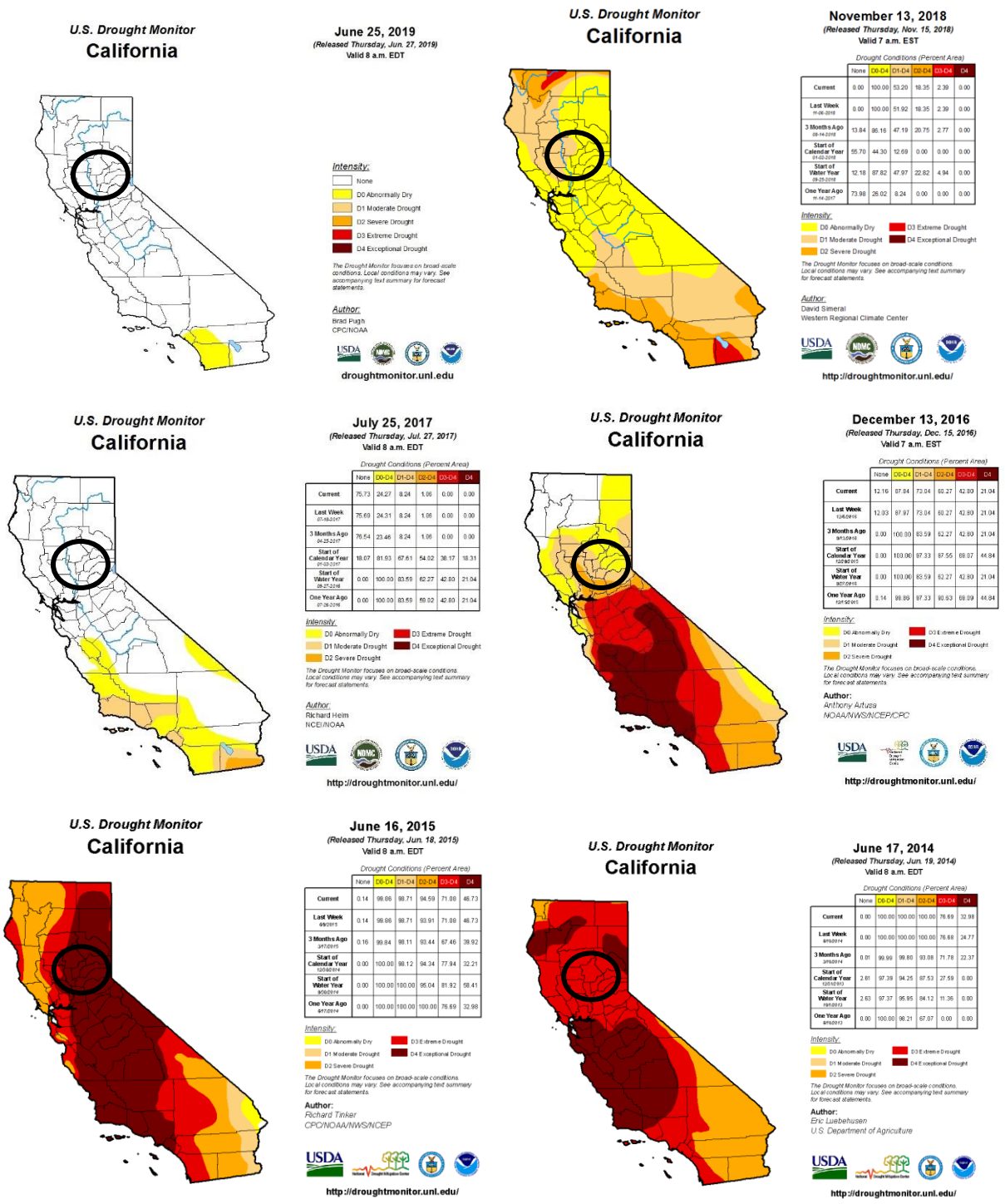
Climate Prediction Center, the NDMC, and the USDA’s Joint Agricultural Weather Facility in the late 1990s as a process that synthesizes multiple indices, outlooks and local impacts, into an assessment that best represents current drought conditions. The final outcome of each Drought Monitor is a consensus of federal, state, and academic scientists who are intimately familiar with the conditions in their respective regions. A snapshot of the drought conditions in California and Yuba County (2021) can be found in Figure 4-45. Snapshots from 2014 through 2019 is shown in Figure 4-46.

Figure 4-45 Yuba County – Current Drought Status



Source: US Drought Monitor

Figure 4-46 Previous Drought Status in Yuba County



Source: US Drought Monitor

CA DWR says the following about drought:

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

The drought issue in California is further compounded by water rights. Water is a commodity possessed under a variety of legal doctrines. The prioritization of water rights between farming and federally protected fish habitats in California contributes to this issue.

As shown on the previous figures, drought is tracked by the US 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)

## **Water Shortage**

Northern Sacramento Valley counties, including Yuba County, generally have sufficient groundwater and surface water supplies to mitigate even the severest droughts of the past century. Many other areas of the State, however, also place demands on these water resources during severe drought. For example, Northern California agencies, including those from Yuba County, were major participants in the Governor's Drought Water Bank of 1991, 1992 and 1994. Water supply has not been significant issues in Yuba County in years past due to the extensive surface and groundwater supplies in the region; the County's senior water rights; and their ability to maximize water resources through conjunctive use.

### *Location and Extent*

Since water shortage happens on a regional scale, the entirety of the County is at risk. There is no established scientific scale to measure water shortage. The speed of onset of water shortage tends to be lengthy. The duration of water shortage can vary, depending on the severity of the drought that accompanies it.

## Past Occurrences

### Disaster Declaration History

There has been one federal disaster related to drought and water shortage in Yuba County issued in 1977. There has been two state disaster related to drought and water shortage in Yuba County issued in 2014 and 2021. This can be seen in Table 4-50.

*Table 4-50 Yuba County – Disaster Declarations from Drought 1950-2021*

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2014, 2021	1	1977

Source: FEMA, Cal OES

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 to 2020, and the results for drought for Yuba County are shown on Table 4-52.

*Table 4-51 Yuba County – USDA Disaster Declarations 2012-2021*

Year	Declaration Number	Primary or Contiguous County	Disaster Type
2012	S3268	Primary	Drought-FAST TRACK
2012	S3379	Primary	Drought
2012	S3440	Primary	Drought-FAST TRACK
2013	S3569	Primary	Drought-FAST TRACK
2015	S3784	Primary	Drought-FAST TRACK
2016	S3952	Primary	Drought-FAST TRACK
2020	S4692	Contiguous	Drought-FAST TRACK
2020	S4697	Primary	Drought-FAST TRACK

Source: USDA

### NCDC Events

There have been 38 NCDC drought events in Yuba County, related to events in the 2014 to 2016 drought. No deaths, injuries, or property damages were reported to the NCDC from these events.

*Table 4-52 NCDC Drought Events for Yuba County 1996-7/31/2020\**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Drought	38	0	0	\$0	\$0	0	0

Source: NCDC

\*Note: Losses reflect totals for all impacted areas, some of which fell outside of Yuba County

## CA DWR and Hazard Mitigation Planning Committee Events

Historically, California has experienced multiple severe droughts. According to the 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. Table 4-53 compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to the 1976-77, 1987-92, and 2007-09 droughts. Figure 4-47 depicts California’s Multi-Year Historical Dry Periods, 1850-2000.

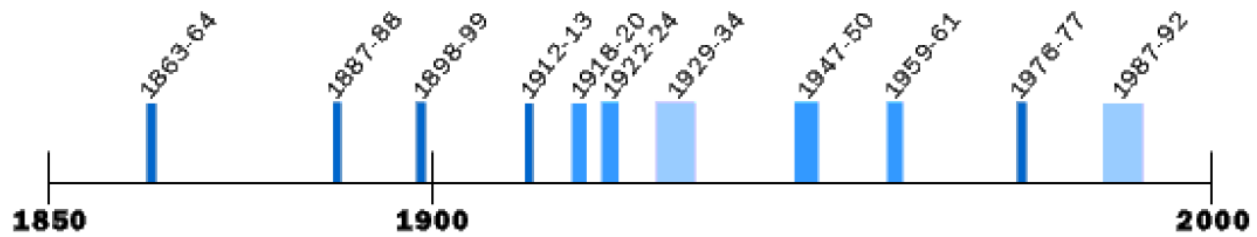
*Table 4-53 Severity of Extreme Droughts in the Sacramento and San Joaquin Valleys*

Drought Period	Sacramento Valley Runoff		San Joaquin Valley Runoff	
	(maf*/yr)	(percent Average 1901-96)	(maf*/yr)	(percent Average 1906-96)
1929-34	9.8	55	3.3	57
1976-77	6.6	37	1.5	26
1987-92	10.0	56	2.8	47
2007-09	11.2	64	3.7	61

Source: California’s Drought of 2007-2009, An Overview. State of California Natural Resources Agency, California Department of Water Resources.

\*maf=million acre feet

*Figure 4-47 California’s Multi-Year Historical Dry Periods, 1850-2000*

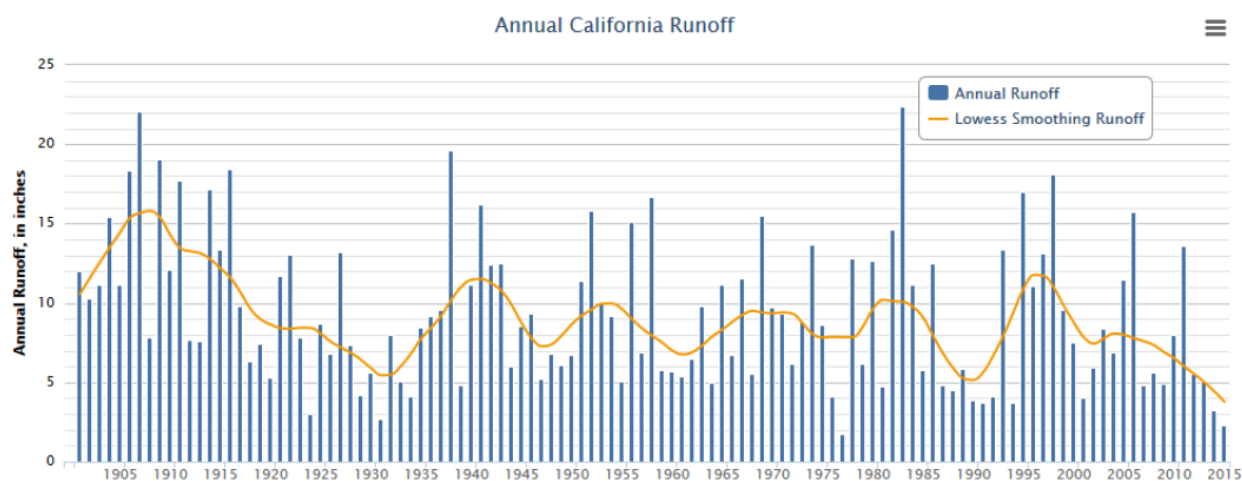


Source: California Department of Water Resources, [www.water.ca.gov/](http://www.water.ca.gov/)

Notes: Dry periods prior to 1900 estimated from limited data; covers dry periods of statewide or major regional extent

Figure 4-48 depicts runoff for the State from 1900 to 2015. This gives a historical context for the 2014-2015 drought to compare against past droughts.

Figure 4-48 Annual California Runoff—1900 to 2015



Source: California DWR

The 2018 California State Hazard Mitigation Plan fleshed out the major droughts from 1900 to 2017. This discussion below appends to the tables and figures above.

### *The 1975-1977 Drought*

From November 1975 through November 1977, California experienced one of its most severe droughts. Although people in many areas of the state are accustomed to very little precipitation during the growing season (April to October), they expect it in the winter. In 1976 and 1977, the winters brought only one-half and one-third of normal precipitation, respectively. Most surface storage reservoirs were substantially drained in 1976, leading to widespread water shortages when 1977 turned out to be even drier. 31 counties were affected, resulting in \$2.67 billion in crop damages.

### *The 1987-1992 Drought*

From 1987 to 1992, California again experienced a serious drought due to low precipitation and run-off levels. The hardest-hit region was the Central Coast, roughly from San Jose to Ventura. In 1988, 45 California counties experienced water shortages that adversely affected about 30 percent of the state's population, much of the dry-farmed agriculture, and over 40 percent of the irrigated agriculture. Fish and wildlife resources suffered, recreational use of lakes and rivers decreased, forestry losses and fires increased, and hydroelectric power production decreased. In February 1991, DWR and Cal OES surveyed drought conditions in all 58 California counties and found five main problems: extremely dry rangeland, irrigated agriculture with severe surface water shortages and falling groundwater levels, widespread rural areas where individual and community supplies were going dry, urban area water rationing at 25 to 50 percent of normal usage, and environmental impacts.

Storage in major reservoirs had dropped to 54 percent of average, the lowest since 1977. The shortages led to stringent water rationing and severe cutbacks in agricultural production, including threats to survival of permanent crops such as trees and vines. Fish and wildlife resources were in critical shape as well. Not since the 1928-1934 drought had there been such a prolonged dry period. In response to those conditions,

the Governor established the Drought Action Team. This team almost immediately created an emergency drought water bank to develop a supply for four critical needs: municipal and industrial uses, agricultural uses, protection of fish and wildlife, and carryover storage for 1992. The large-scale transfer program, which involved over 800,000 acre-feet of water, was implemented in less than 100 days with the help and commitment of the entire water community and established important links between state agencies, local water interests, and local governments for future programs.

### *The 2007-2009 Drought*

Water years 2007-2009 were collectively the 15th driest three-year period for DWR's eight-station precipitation index, which is a rough indicator of potential water supply availability to the State Water Project (SWP) and Central Valley Project (CVP). Water year 2007 was the driest single year of that drought, and fell within the top 20 percent of dry years based on computed statewide runoff. In June 2008, a state emergency proclamation was issued due to water shortage in selected Central Valley counties. In February 2009, for the first time in its history, the State of California proclaimed a statewide drought. The state placed unprecedented restrictions on CVP and SWP diversions from the Delta to protect listed fish species, a regulatory circumstance that exacerbated the impacts of the drought for water users.

The greatest impacts of the 2007–2009 drought were observed in the CVP service area on the west side of the San Joaquin Valley, where hydrologic conditions combined with reduced CVP exports resulted in substantially reduced water supplies (50 percent supplies in 2007, 40 percent in 2008, and 10 percent in 2009) for CVP south-of-Delta agricultural contractors. Small communities on the west side highly dependent on agricultural employment were especially affected by land fallowing due to lack of irrigation supplies, as well as by factors associated with current economic recession. The coupling of the drought and economic recession necessitated emergency response actions related to social services, such as food banks and unemployment assistance.

### *The 2012-2017 Drought*

The statewide drought of 2012-2017 will be remembered as one of the most severe and costliest droughts of record in California. The drought that spanned water years 2012 through 2017 included the driest four-year statewide precipitation on record (2012-2015) and the smallest Sierra-Cascades snowpack on record (2015, with 5 percent of average). It was marked by extraordinary heat: 2014, 2015, and 2016 were (at the time) California's first, second, and third warmest years in terms of statewide average temperatures. By the time the drought was declared officially over in April 2017, the state had expended \$6.6 billion in drought response and mitigation programs, and had been declared a federal disaster area. The immediate cause of California's 2014 drought can be traced to the altered route of atmospheric water vapor, which is necessary for strong winter precipitation in the state. Ordinarily, water evaporates from the ocean in the warm Tropical Pacific Ocean and winds carry that water vapor to the U.S. west coast. However, in 2014 the water vapor transport split into two branches and ended up going either north or south of California. The Gold Village community ran out of water and Yuba County OES delivered potable water to the residents.

## *The 2021 Drought*

California recently expanded the April 2021 drought emergency proclamation. In total, 41 counties are under a drought state of emergency, representing 30 percent of the state’s population. Climate change-induced early warm temperatures and extremely dry soils have further depleted the expected runoff water from the Sierra-Cascade snowpack, resulting in historic and unanticipated reductions in the amount of water flowing to major reservoirs, especially in the Russian River Watershed as well as in Klamath River, Sacramento-San Joaquin Delta and Tulare Lake Watershed counties.

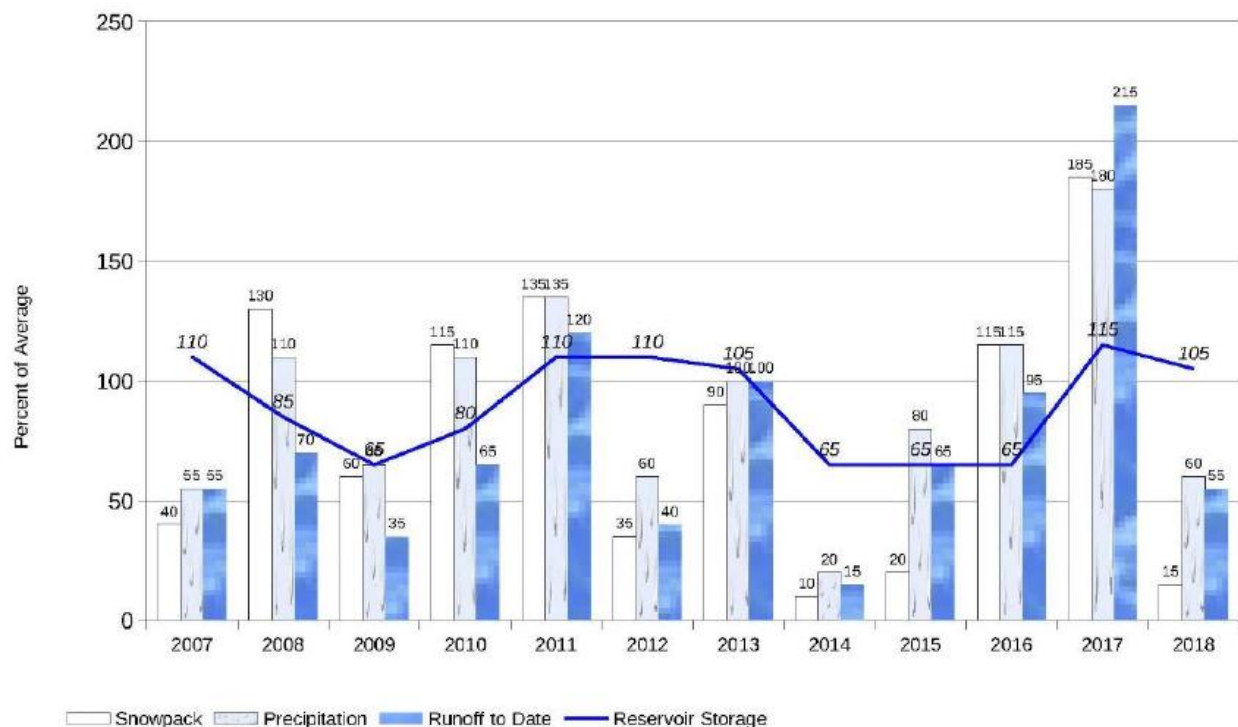
Extraordinarily warm temperatures in April and early May separate this critically dry year from all others on California record. California experienced an accelerated rate of snow melt in the Sacramento, Feather and American River watersheds, which feed the major reservoirs of the state and federal water projects. This was exacerbated when much of the snowpack, sitting on very dry ground, seeped into the earth rather than flowing into our rivers and streams and into these reservoirs. Warming temperatures also prompted water diverters below the dams to withdraw their water much earlier and in greater volumes than typical even in other recent critically dry years. These factors reduced expected water supplies by more than 500,000 acre feet, enough to supply up to one million households with water for a year. The drastic reduction in water supplies means these reservoirs are extremely low for water users, including farmers, and fish and wildlife in the counties the drought proclamation covers.

This emergency proclamation directed state agencies to take immediate action to bolster drought resilience across the state. The Governor’s proclamation directs the State Water Board to consider modifying requirements for reservoir releases and diversion limitations to conserve water upstream later in the year to maintain water supply, improve water quality and protect cold water pools for salmon and steelhead. The state of emergency also enables flexibilities in regulatory requirements and procurement processes to mitigate drought impacts and directs state water officials to expedite the review and processing of voluntary transfers of water from one water right holder to another, enabling available water to flow where it is needed most.

## **Water Shortage**

Figure 4-49 illustrates several indicators commonly used to evaluate water conditions in California. The percent of average values are determined by measurements made in each of the ten major hydrologic regions. The chart describes water conditions in California between 2007 and 2018. The chart illustrates the cyclical nature of weather patterns in California.

Figure 4-49 Water Supply Conditions, 2007 to 2018



Source: 2018 State of California Hazard Mitigation Plan

Beginning in 2012, snowpack levels in California dropped dramatically. 2015 estimates placed snowpack as 5 percent of normal levels. Snowpack measurements have been kept in California since 1950 and nothing in the historic record comes close to 2015’s severely depleted level. The previous record for the lowest snowpack level in California, 25 percent of normal, was set both in 1976-77 and 2013-2014. In “normal” years, the snowpack supplies about 30 percent of California’s water needs, according to the California Department of Water Resources. Snowpack levels began to increase in 2016, and in 2017 snowpack increased to the largest in 22 years, according to the State Department of Water Resources. In late 2017 and early 2018, drought conditions began to return to California but were dampened by periods of above average rainfall in the first part of 2019. Yuba County has been in and out of drought conditions since 2019. Most recently drought in California is again a significant concern as evidenced by the lack of rain over the 2020/2021 rainy season and by the State’s issuance of the 2021 Drought Emergency Proclamation.

## Likelihood of Future Occurrence

### Drought

**Likely**—Historical drought data for the Yuba County Planning Area and region indicate there have been 5 significant droughts in the last 85 years. This equates to a drought every 17 years on average or a 5.9 percent chance of a drought in any given year. However, based on this data and given the multi-year length and cyclical nature of droughts, the HMPC determined that future drought occurrences in the Planning Area are likely.

## Water Shortage

**Occasional** — Recent historical data for water shortage indicates that Yuba County may at some time be at risk to both short and prolonged periods of water shortage. Based on this it is possible that water shortages will affect the County in the future during extreme drought conditions. Water supply has not caused significant issues in Yuba County in years past due to the extensive surface and groundwater supplies in the region; the County’s senior water rights; and their ability to maximize water resources through conjunctive use.

## Climate Change and Drought and Water Shortage

Climate scientists studying California find that drought conditions are likely to become more frequent and persistent over the 21<sup>st</sup> century due to climate change. The experiences of California during recent years underscore the need to examine more closely the state’s water storage, distribution, management, conservation, and use policies. The 2014 CAS stresses the need for public policy development addressing long term climate change impacts on water supplies. The CAS notes that climate change is likely to significantly diminish California’s future water supply, stating that: California must change its water management and uses because climate change will likely create greater competition for limited water supplies needed by the environment, agriculture, and cities.

A report from the Public Policy Institute of California noted that thousands of Californians – mostly in rural, small, disadvantaged communities – already face acute water scarcity, contaminated groundwater, or complete water loss. Climate change would make these effects worse.

Cal-Adapt has modeled future risk of drought. Recent research suggests that extended drought occurrence (“mega-drought”) could become more pervasive in future decades. This tool explores data for two 20-year drought scenarios (using the quad that contains the City of Marysville) derived from LOCA downscaled meteorological and hydrological simulations (Figure 4-50) – one for the earlier part of the 21st century, and one for the latter part:

- The upper chart represents a mid-century dry spell from 2023-2042 identified from the HadGEM2-ES RCP 8.5 simulation. The extended drought scenario is based on the average annual precipitation over 20 years. This average value equates to 78% of historical median annual precipitation averaged over the North Coast and Sierra California Climate Tracker regions.
- The lower chart represents a late century dry spell from 2051–2070 identified from the HadGEM2-ES RCP 8.5 simulation. The extended drought scenario is based on the average annual precipitation over 20 years. This average value equates to 78% of historical median annual precipitation averaged over the North Coast and Sierra California Climate Tracker regions.

**Figure 4-50 Yuba County – Future Extended Drought Scenarios**

**Settings**

YEAR ⓘ

Water Year (Oct - Sep)

Calendar Year (Jan - Dec)

SCENARIO ⓘ

**Late 21st Century Drought**  
2051 – 2070

**Early 21st Century Drought**  
2023 – 2042

This scenario represents an early century dry spell from 2023–2042 derived from the late century drought scenario. The precipitation during this scenario is the same as in the late century scenario, however the temperature has been adjusted to take into account climate warming over the century.

LOCATION ⓘ [CHANGE](#)

CLIMATE VARIABLES ⓘ

Maximum Temperature

Minimum Temperature

Precipitation

Tair

Evapotranspiration

**Extended drought scenario for Grid Cell (39.15625, -121.59375) during the early part of 21st century (2023–2042)**

The following charts show data for various climate variables over a 20 year dry spell and additionally data for 5 years before and 4 years after the dry spell.

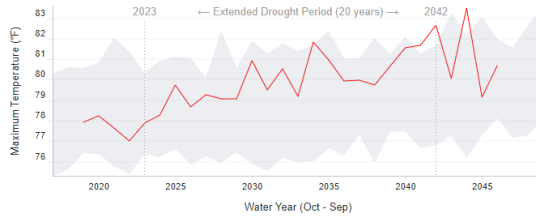
How to use? ⓘ

[Get Data](#)

Modeled Variability Envelope (Range of annual average values from all 32 LOCA downscaled climate models) ■ HadGEM2-ES RCP 8.5 (2023 – 2042)

**Maximum Temperature**

Maximum daily temperature which typically occurs in the early afternoon.



OBSERVED HISTORICAL

1961–1990 Average

75.5 °F

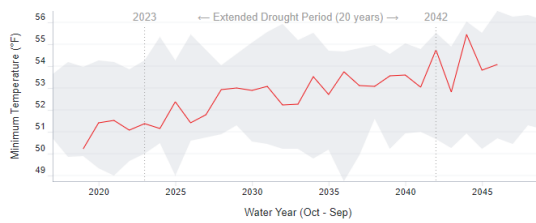
DROUGHT SCENARIO

2023–2042 Average

80.1 °F

**Minimum Temperature**

Minimum daily temperature which typically occurs in the early morning before sunrise.



OBSERVED HISTORICAL

1961–1990 Average

49.4 °F

DROUGHT SCENARIO

2023–2042 Average

52.8 °F

**Settings**

YEAR ⓘ

Water Year (Oct - Sep)

Calendar Year (Jan - Dec)

SCENARIO ⓘ

**Late 21st Century Drought**  
2051 – 2070

**Early 21st Century Drought**  
2023 – 2042

This scenario represents a late century dry spell from 2051–2070 identified from the HadGEM2-ES RCP 8.5 simulation. The extended drought scenario is based on the average annual precipitation over 20 years. This average value equates to 78% of historical median annual precipitation averaged over the North Coast and Sierra California Climate Tracker regions.

LOCATION ⓘ [CHANGE](#)

CLIMATE VARIABLES ⓘ

Maximum Temperature

Minimum Temperature

Precipitation

Tair

**Extended drought scenario for Grid Cell (39.15625, -121.59375) during the later part of 21st century (2051–2070)**

The following charts show data for various climate variables over a 20 year dry spell and additionally data for 5 years before and 4 years after the dry spell.

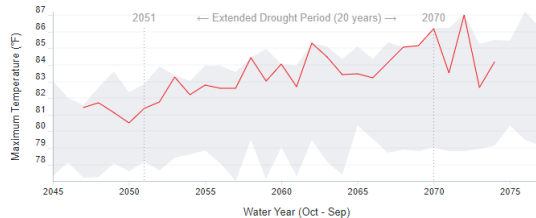
How to use? ⓘ

[Get Data](#)

Modeled Variability Envelope (Range of annual average values from all 32 LOCA downscaled climate models) ■ HadGEM2-ES RCP 8.5 (2051 – 2070)

**Maximum Temperature**

Maximum daily temperature which typically occurs in the early afternoon.



OBSERVED HISTORICAL

1961–1990 Average

75.5 °F

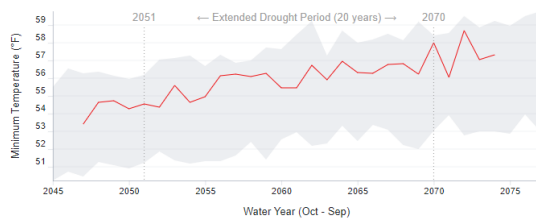
DROUGHT SCENARIO

2051–2070 Average

83.6 °F

**Minimum Temperature**

Minimum daily temperature which typically occurs in the early morning before sunrise.



OBSERVED HISTORICAL

1961–1990 Average

49.4 °F

DROUGHT SCENARIO

2051–2070 Average

56.0 °F

Source: Cal Adapt – Extended Drought Scenarios (retrieved 2/10/2021)

## *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 can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue for agricultural, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Yuba County has abundant water resources owing to its topography and location in the Sacramento Valley, where several rivers flow and/or converge. Major rivers in or near Yuba County include the Yuba, Feather, Bear, and Sacramento rivers. Many smaller water courses also cross Yuba County. Rivers and streams flow from the Sierra Nevada Foothills and Mountains north and east of Yuba County. The Sacramento River, while not in Yuba County, drains Yuba County's rivers and streams and flows near the Yuba-Yuba County boundary where the Feather River flows into the Sacramento River.

### **Vulnerability to and Impacts from Drought and Water Shortage**

Based on historical information, the occurrence of drought in California, including Yuba County, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts is often extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. The vulnerability of Yuba County to drought is countywide, but impacts may vary and may include reduction in water supply, agricultural losses, and an increase in dry fuels. Due to the high amount of agricultural production in the County, significant impacts from drought are expected to affect the agricultural industry and the County.

The most significant qualitative impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. The HMPC noted that drought can impact habitat and wildfire areas in the County. Mandatory conservation measures are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

With a reduction in water, water supply issues based on water rights becomes more evident. Some agricultural uses are severely impacted through limited water supply, especially those with livestock. Other impacts include decreased crop yields, impact to feed and forage, altered plant populations and tree mortality. Drought and water supply issues will continue to be a concern to the Planning Area. The drawdown of the groundwater table is one factor that has been recognized to occur during repeated dry years. Lowering of groundwater levels results in the need to deepen wells, which subsequently lead to increased pumping costs. These costs are a major consideration for residents relying on domestic wells and agricultural producers that irrigate with groundwater and/or use it for frost protection. Land subsidence can also occur when the groundwater table is depleted.

## Drought Impact Monitor

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult. The Drought Impact Reporter from the NDMC is a useful reference tool that compiles reported drought impacts nationwide. Table 4-54 show drought impacts for the Yuba County Planning Area from 1850 to March 2021. The data represented is skewed, with the majority of these impacts from records within the past ten years.

*Table 4-54 Yuba County Drought Impacts*

Category	Number of Impacts
Agriculture	421
Business and Industry	13
Energy	369
Fire	419
Plants & Wildlife	938
Relief, Response, and Restrictions	104
Society and Public Health	264
Tourism and Recreation	652
Water Supply and Quality	127

Source: National Drought Mitigation Center, 1/1/1850-3/1/2021

## CA DWR Impacts

Recently, a March 2020 report by CA DWR (titled *Small Water Suppliers and Rural Communities at Risk of Drought and Water Shortage Vulnerability and Recommendations and Guidance to Address the Planning Needs of these Communities*), sought to quantify the drought and water shortage vulnerability to rural counties, like Yuba County, in the State of California. Included in the draft report is the methodology for developing relative risk assessment scores that show where small water systems rank on an index of drought and water shortage vulnerability and recommendations on drought and water shortage vulnerability for small water systems. It is important to note that the primary benefit of this scoring exercise is to offer local and regionally-specific information to assist with drought and water shortage planning.

DWR developed a tool to rate drought and water shortage risk by water provider. To develop the tool, DWR used statewide datasets to estimate risk of drought and water shortage for small water suppliers and rural communities. DWR was only able to calculate relative risk scores for small water systems that had a digital service area boundary, with data available from the Water Board. DWR is working with the Water Board to create a process to obtain service areas boundaries for the remaining small water systems. Table 4-55 was extracted from the Excel table from the report, and shows the systems in Yuba County that were reviewed and their risk score for drought and water shortage.

*Table 4-55 Yuba County – Drought and Water Shortage Risk Factors for Small Water Suppliers*

System Name	Risk Score
Rebel Ridge Village	79
Whispering Pines Mobile Home Park	75
Fellowship of Friends	74
Castlewood Mobile Home Park	73
Country Village Mobile Home Park	73
Feather River Manor	72
Heritage Park	70
Loma Rica Water Company	68
County Air Mobile Home Park	67
River Highlands CSD	66
Countryside Mobile Home Park	65
Fairway Downs Mutual Water Company	64
Bullards Bar Recreational Facility Water System	63
Lake Francis Mutual Water Company	57
North Yuba Water District	56
Beale Air Force Base	48
City of Wheatland	44
Camptonville Community Service District	43

Source: CDAG Report – data retrieved on 3/9/2021

Note: It is important to note that the primary benefit of this scoring exercise is to offer local and regionally specific information to assist with drought and water shortage planning.

0 is the lowest risk and 100 is highest risk, compared to other small water suppliers

## **Drought and Power Shortage/PSPS**

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 PSPS can be found at the beginning of Section 4.3.

## ***Future Development***

Water supply has not been significant issues in Yuba County in years past due to the extensive surface and groundwater supplies in the region; the County’s senior water rights; and their ability to maximize water resources through conjunctive use. Population in the County in the future is expected to increase (see Table 4-17), which increases pressure on water companies during periods of drought and water shortage. Water companies will need to continue to plan for and add infrastructure capacity to replace aging systems and accommodate additional users.

### 4.3.9. Earthquake

#### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

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

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and 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. This section briefly discusses issues related to types of seismic hazards.

#### *Ground Shaking*

Ground shaking is motion that occurs as a result of energy released 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.

Actual ground breakage generally affects only those buildings directly over or nearby 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 [URM]) and soft story buildings are 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.

Liquefaction during an earthquake requires strong shaking and is not likely to occur in the County due to the relatively low occurrence of seismic activity in the area; however, the clean sandy layers paralleling the Sacramento River, Feather River, and Bear River have lower soil densities and high overall water table, and are potentially a higher risk area if major seismic activity were to occur. Areas of bedrock have high density compacted soils and contain no liquefaction potential, although localized areas of valley fill alluvium can have moderate to high liquefaction potential.

### *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.

### **Location and Extent**

California is seismically active because it sits on the boundary between two of the earth's tectonic plates. Most of the state - 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 relative rate of movement is about two inches per year. The San Andreas Fault is considered the boundary between the two plates, although some of the motion is taken up on faults as far away as central Utah.

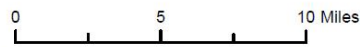
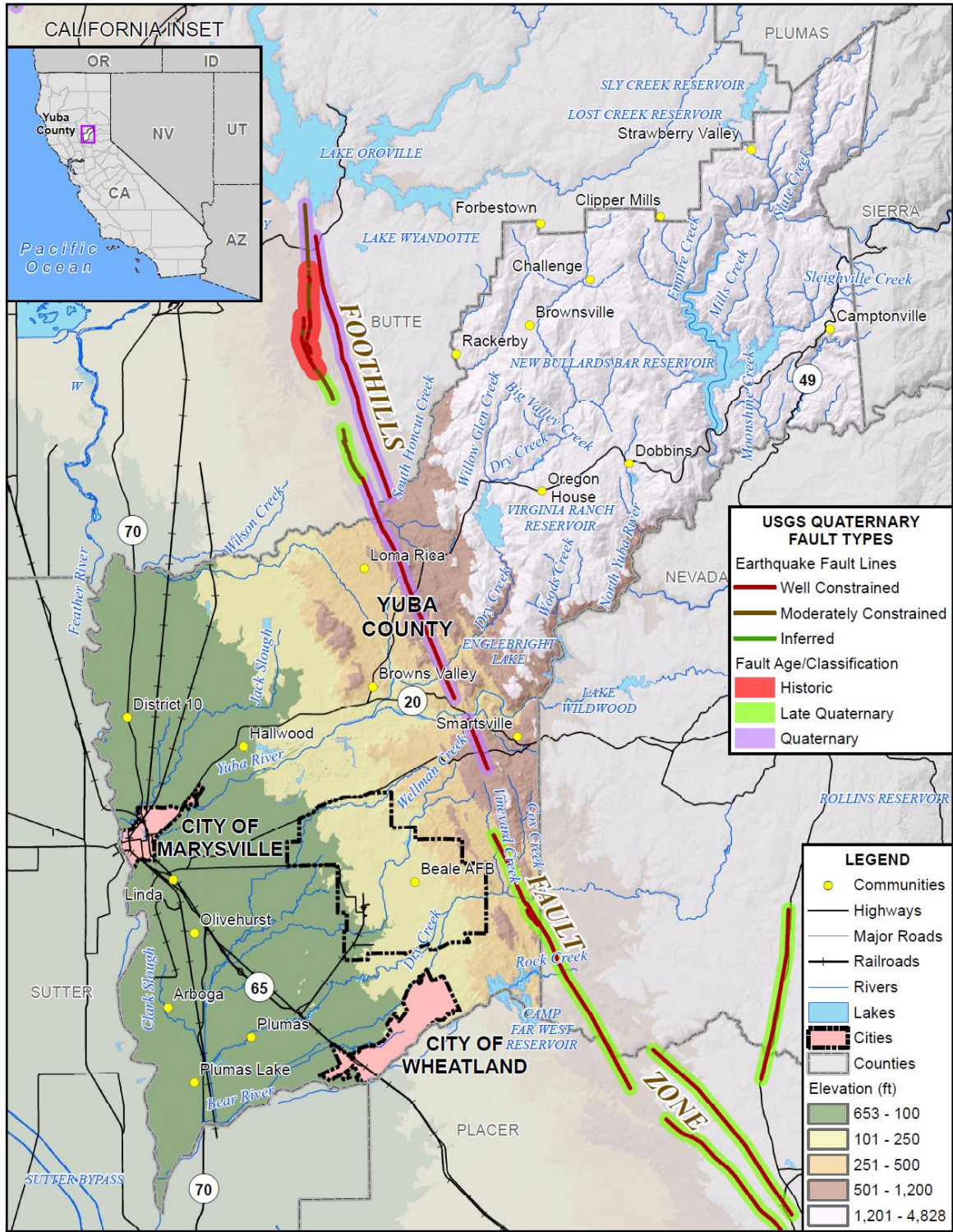
## Faults

A fault is defined as “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 (Quaternary). An inactive fault shows no evidence of movement in historic (last 200 years) or geologic time, suggesting that these faults are dormant.

Two types of fault movement represent possible hazards to structures in the immediate vicinity of the fault: fault creep and sudden fault displacement. Fault creep, a slow movement of one side of a fault relative to the other, can cause cracking and buckling of 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.

Yuba County is located within an area of relatively low seismic activity and is not located within a highly active fault zone. No Alquist-Priolo Earthquake Fault Zones are located in the County. Faults include primarily inactive faults of the Foothills Fault System, running south-southeastward near Loma Rica, Browns Valley, and Smartville. Faults include the Prairie Creek Fault Zone, the Spenceville Fault, and the Swain Ravine Fault. Figure 4-51 shows the faults in the County.

Figure 4-51 Faults in and near Yuba County



Data Source: USGS/CGS Quaternary Faults (March 16, 2021), Yuba County GIS, Cal-Atlas;  
Map Date: 3/16/2021.



The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake’s magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales. One of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Richter Magnitude Scale is used to quantify the magnitude or strength of the seismic energy released by an earthquake. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface (see Table 4-56). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

**Table 4-56 Modified Mercalli Intensity (MMI) Scale**

MMI	Felt Intensity
I	Not felt except by a very few people under special conditions. Detected mostly by instruments.
II	Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
III	Felt noticeably indoors. Standing automobiles may rock slightly.
IV	Felt by many people indoors; by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.
V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.
VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.
VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction, considerable in buildings of poor construction.
VIII	Damage is slight in specially designed structures, considerable in ordinary buildings, and great in poorly built structures. Heavy furniture is overturned.
IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.
X	Some well-built wooden structures are destroyed. Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.
XI	Few, if any, masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.
XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.

Source: Multi-Hazard Identification and Risk Assessment, FEMA 1997

## Past Occurrences

### Disaster Declaration History

There have been no disaster declarations in the County related to earthquakes, as shown on Table 4-4. The County had no USDA disaster declarations since 2012 related to earthquake, as shown on Table 4-6.

### NCDC Events

Earthquake events are not tracked by the NCDC database.

## USGS Events

The USGS National Earthquake Information Center database contains data on earthquakes in the Yuba County area. Table 4-57 shows the approximate distances earthquakes can be felt away from the epicenter. According to the USGS data, a magnitude 5.0 earthquake could be felt up to 90 miles away. The USGS database was searched for magnitude 5.0 or greater on the Richter Scale within 90 miles of the City of Marysville in Yuba County. There are 42 events that are detailed in Table 4-58.

*Table 4-57 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 State Geologic Survey, Earthquake Intensity Zonation and Quaternary Deposits, Miscellaneous Field Studies Map 9093, 1977.

*Table 4-58 Magnitude 5.0 Earthquakes or greater within 90 Miles of Yuba County\**

Date	Richter Magnitude	Location
12/14/2016	5.01	8km NW of The Geysers, California
8/10/2016	5.09	20km NNE of Upper Lake, California
8/24/2014	6.02	South Napa
5/24/2013	5.69	10km WNW of Greenville, California
4/26/2008	5.1	1km NW of Mogul, Nevada
8/10/2001	5.2	Northern California
11/28/1980	5.1	Northern California
1/24/1980	5.1	San Francisco Bay area, California
1/24/1980	5.8	San Francisco Bay area, California
8/2/1975	5.2	Northern California
8/2/1975	5.1	Northern California
8/1/1975	5.7	0km WSW of Palermo, California
10/2/1969	5.1	Northern California
4/29/1968	5	Northern California
9/12/1966	5.91	Northern California
6/6/1962	5.2	Northern California
4/1/1959	5.6	Northern California

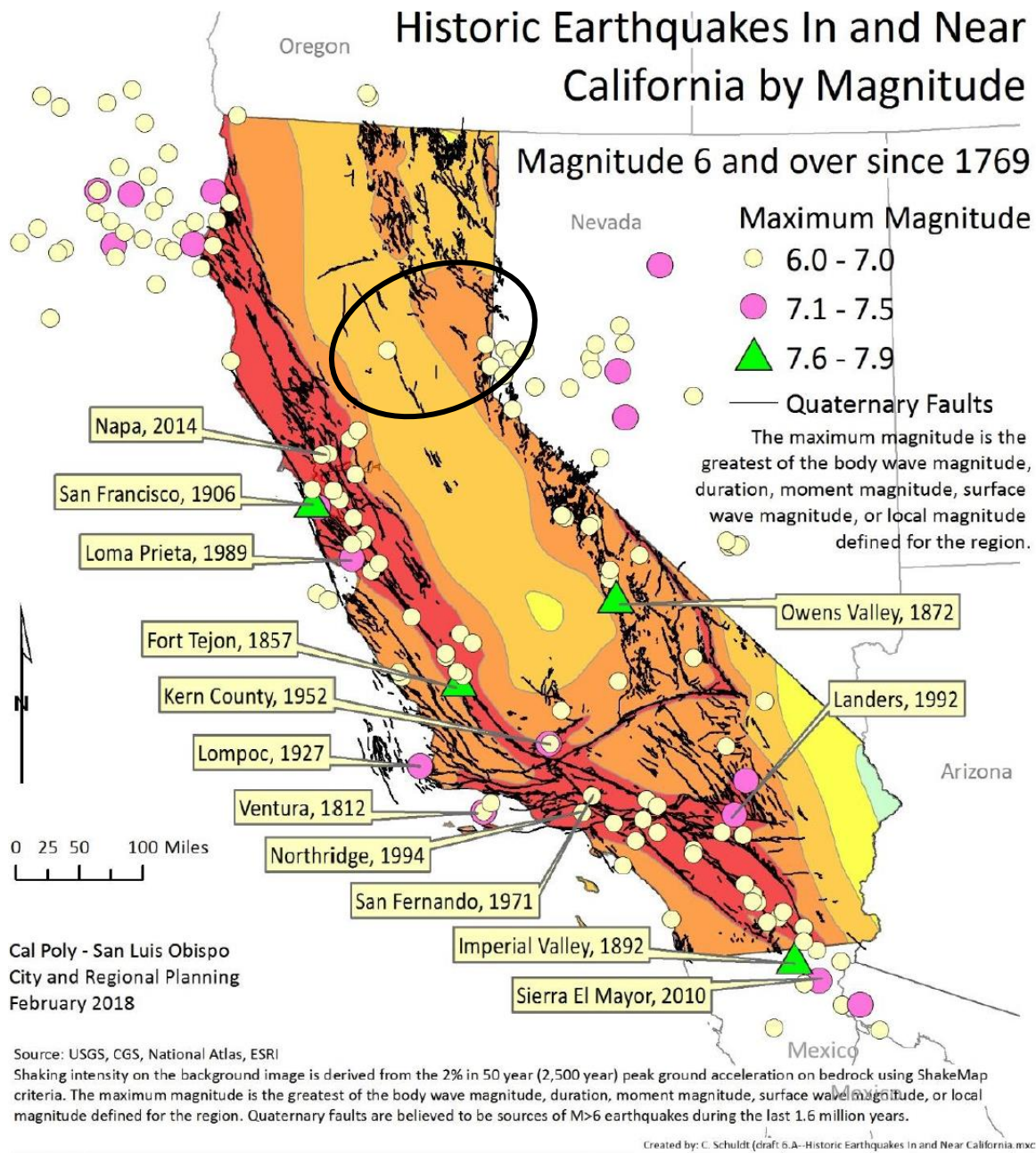
Date	Richter Magnitude	Location
10/24/1955	5.4	San Francisco Bay area, California
9/26/1953	5.3	Nevada
3/22/1953	5	Northern California
3/20/1950	5.5	Lassen Peak area, California
12/29/1948	6	Northern California
3/30/1943	5.3	Northern California
12/17/1942	5.1	Northern California
2/8/1940	5.7	Northern California
6/23/1909	5.7	Northern California
3/3/1909	5	Northern California
5/19/1902	5.4	Northern California
3/31/1898	6.2	San Francisco Bay area, California
8/9/1893	5.1	Northern California
4/30/1892	5.5	Northern California
4/21/1892	6.2	Northern California
4/19/1892	6.4	Northern California
10/12/1891	5.5	Northern California
5/19/1889	6	North of Antioch, California
4/29/1888	6.2	South of Cromberg, California
1/7/1881	5.6	Near Red Bluff, California
7/10/1877	5.5	Lake Tahoe area, California-Nevada border
1/24/1875	6.2	South of Janesville, California
10/8/1869	5.6	Near Ukiah, California
9/3/1857	6	California-Nevada Border east of Truckee
1/25/1855	5.5	Sierra County, California

Source: USGS

\*Search dates 1/1/1850 – 3/1/2021

Figure 4-52 shows major historical earthquakes in California from 1769 to 2017.

Figure 4-52 Historic Earthquakes in California 1769 to 2017



Cal Poly - San Luis Obispo  
City and Regional Planning  
February 2018

MMI	Damage	Effects
X	Very Heavy	Some well-built, wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
IX	Heavy	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.
VIII	Moderate to Heavy	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.
VII	Moderate	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.
VI	Light	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
V	Very Light	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.

Source: 2018 State of California Multi-Hazard Mitigation Plan

## Hazard Mitigation Planning Committee Events

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

- A potential earthquake source is the Midland Fault Zone on the western side of Sacramento Valley, where in 1892 an earthquake centered between the cities of Vacaville and Winters caused minor damage in surrounding areas.
- An estimated 4.0+ Richter magnitude earthquake occurred between Auburn and Folsom in nearby Placer County in 1908 with an epicenter possibly associated with the Bear Mountain fault.
- To the east in Nevada, there are several faults associated with a series of earthquakes in 1954, especially the major (7.1 Richter magnitude) December 16, 1954, Fairview Peak event (about 100 miles east of Carson City). These events caused no damage in Reno, but there was some damage in Sacramento, probably because of the soft soil conditions.
- A recently active fault in the western Sierra Nevada foothills is the Cleveland Hills fault. This fault was the source of the 1975 Oroville earthquake (Richter Magnitude: 5.7), which was felt strongly in neighboring areas, including Yuba County
- According to the HMPC, the 1989 San Francisco earthquake was felt in the Yuba County Planning Area.
- On May 24, 2013, a 5.7 magnitude earthquake struck 80 miles northeast of Marysville near Canyon Dam, California. Residents reported seismic shaking in the County but there were no reports of damage within the Planning Area. This earthquake was felt as far south as Stockton, California.
- The recent earthquake on June 9th, 2021, was felt in Yuba County, but no damages were noted.

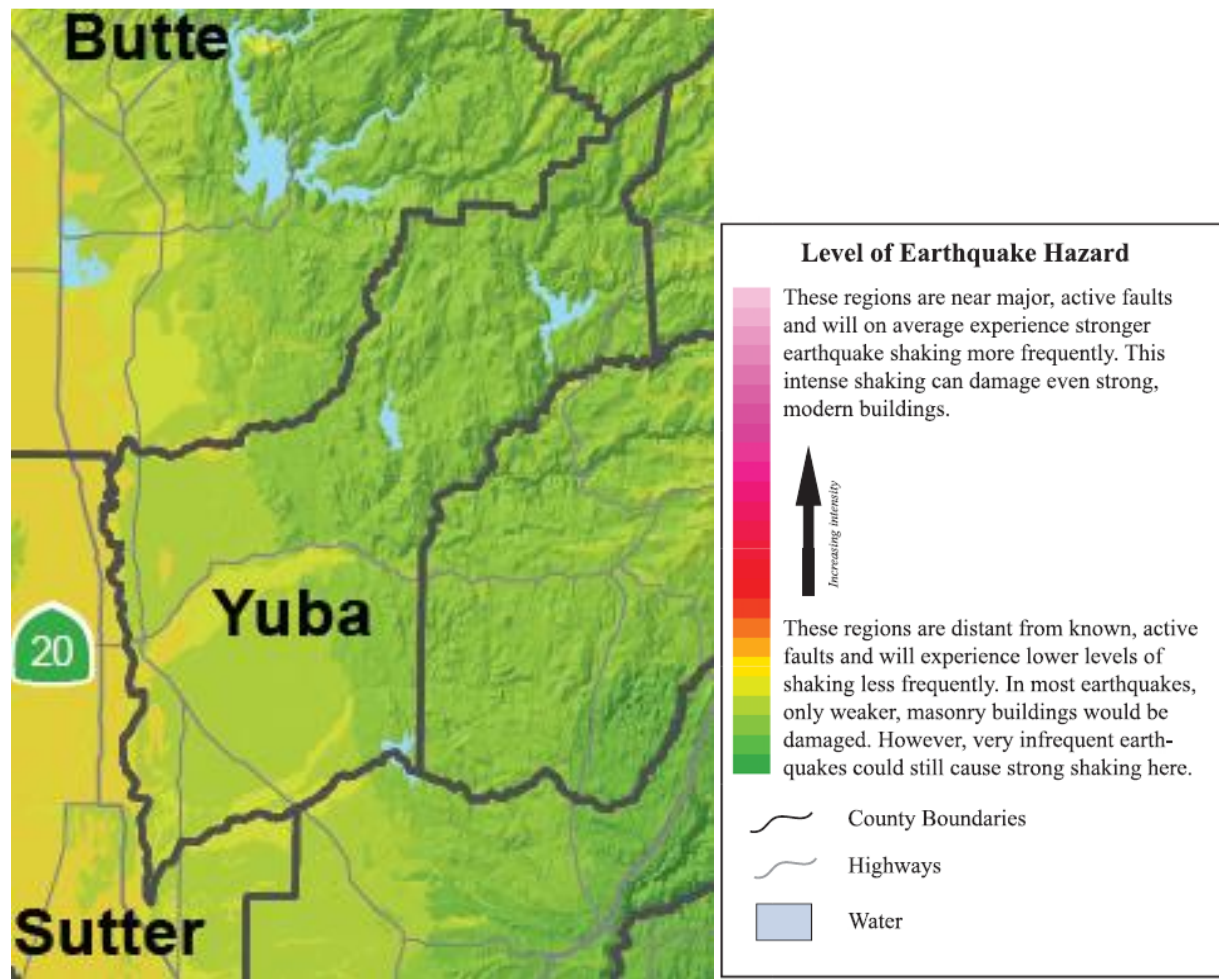
## Likelihood of Future Occurrence

**Unlikely (major earthquake); Likely (minor earthquake)**— A few sizeable earthquakes have occurred within 90 miles of the County, but nothing of significance has occurred within the County. The possibility of an earthquake is an ever-present phenomenon in California and Yuba County. The combination of plate tectonics and associated California coastal mountain range building geology essentially guarantees earthquake as a result of the periodic release of tectonic stresses.

## Mapping of Future Occurrences

Maps indicating the maximum expectable intensity of ground shaking for the County are available through several sources. Figure 4-53, prepared by the California Division of Mines and Geology, shows the expected relative intensity of ground shaking and damage in California from anticipated future earthquakes. The shaking potential is calculated as the level of ground motion that has a 2% chance of being exceeded in 50 years, which is the same as the level of ground-shaking with about a 2,500-year average repeat time. This data shows that Yuba County falls within an area of mostly low seismic risk.

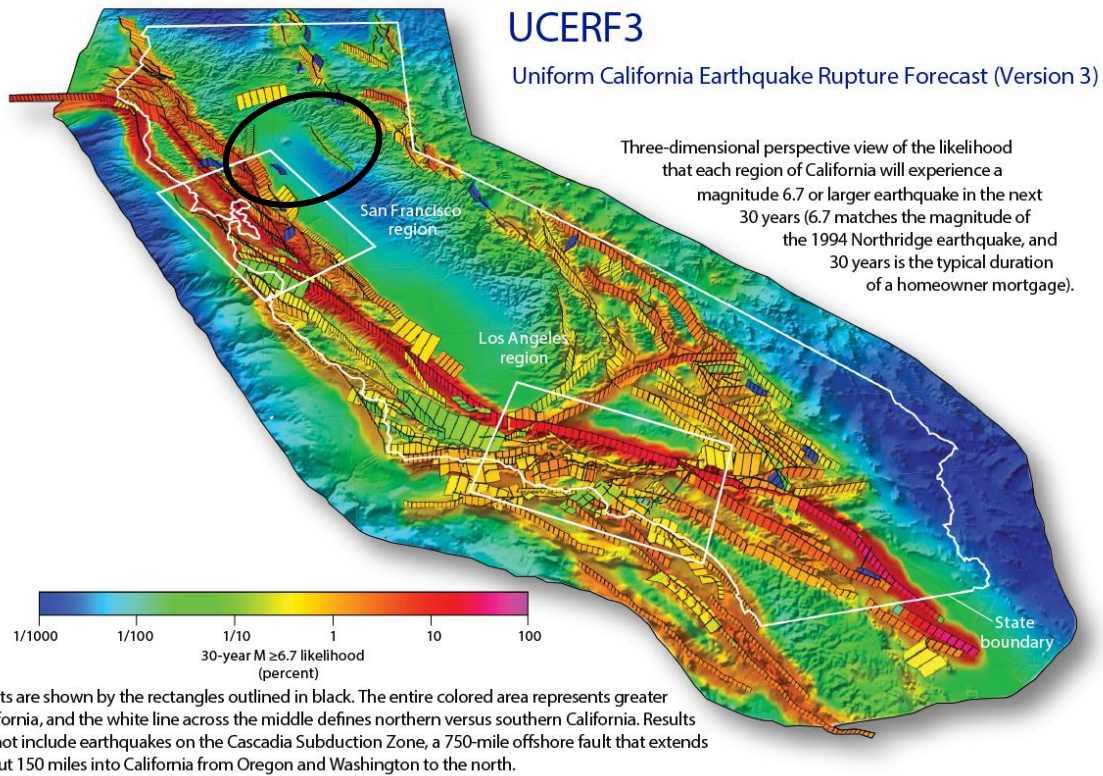
Figure 4-53 Maximum Expectable Earthquake Intensity – 2% Chance in 50 Years



Source: California Division of Mines and Geology - 2016

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 4-54 and indicates that Yuba County has a mostly low to moderate risk of earthquake occurrence, which coincides with the likelihood of future occurrence rating of occasional.

Figure 4-54 Probability of Earthquake Magnitudes Occurring in 30 Year Time Frame



Source: United States Geological Survey Open File Report 2015-3009

## Climate Change and Earthquake

Climate changes is unlikely to increase earthquake frequency or strength.

### *Vulnerability Assessment*

#### **Vulnerability—High**

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable. The primary impacts of concern are life safety and property damage. Although several faults are within and near the County, seismic hazard mapping indicates that the County has low seismic hazard potential. Additionally, the County is not located within a delineated Alquist-Priolo Earthquake Fault Zone. The risks associated with earthquakes, such as surface fault rupture, within the County are considered low.

Seismic events can have particularly negative effects on older buildings constructed of URM, including materials such as brick, concrete and stone. The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. Yuba County is within the less hazardous Zone 3. The County noted that there may be URM buildings in the older areas of the County, no inventory of them is kept.

## Impacts

Impacts to the County would include damages to infrastructure (roads, bridges, railroad tracks, etc.), damages and loss of services to utilities and critical infrastructure, damages to residential and commercial buildings, and possible loss of life and injuries. Earthquakes, though rare in Yuba County, can strike without warning and cause dramatic changes to the landscape of an area that can 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. Impacts to levee systems and dams could occur, and if an earthquake coincides with a high water event, the impacts could be disastrous in Yuba County.

The HMPC noted that overall, the County is not significantly vulnerable to earthquake, but would expect some settlement and repairs due to an earthquake event.

## Estimating Potential Losses

Earthquake losses will vary across the Yuba County Planning Area depending on the source and magnitude of the event. To further evaluate potential losses associated with earthquake activity in the Planning Area, one HAZUS-MH earthquake scenarios were run for this 2021 LHMP Update:

- A probabilistic 7.0 earthquake event

These events were chosen from data gathered from the General Plan Safety Element. It should be noted that the deterministic events are chosen based on actual events that have occurred. The fault's distance to the County is taken into account when analyzing earthquake shake hazards on the County. The probabilistic event is a "worst case" event, and assumes an earthquake takes place on an unknown fault that lies inside the County.

## 2021 Earthquake Scenario

### *Probabilistic 7.0 Earthquake Event*

HAZUS-MH 4.2 was utilized to model earthquake losses for the County. Specifically, the probabilistic magnitude used for Yuba County utilized a 7.0 magnitude earthquake. Level 1 analyses were run, meaning that only the default data was used and not supplemented with local building inventory or hazard data. There are certain data limitations when using the default data, so the results should be interpreted accordingly; this is a planning level analysis. The represents a "worst case" scenario.

The methodology for running the probabilistic earthquake scenario used seismic hazard contour maps developed by the U.S. Geological Survey (USGS) for the 2002 update of the National Seismic Hazard Maps that are included with HAZUS-MH. The USGS maps provide estimates of potential ground acceleration and spectral acceleration at periods of 0.3 second and 1.0 second, respectively. The 2,500-year return period analyzes ground shaking estimates with a 2 percent probability of being exceeded in 50 years, from the various seismic sources in the area. The International Building Code uses this level of ground shaking for building design in seismic areas and is more of a worst-case scenario.

The results of the probabilistic scenario are captured in Table 4-59 and shown on Figure 4-55. Key losses included the following:

- Total economic loss estimated for the earthquake was \$1,870,680,000, which includes building losses and lifeline losses based on the HAZUS-MH inventory.
- Building-related losses, including direct building losses and business interruption losses, totaled \$1,394,810,000.
- 5,330 buildings in the County were at least moderately damaged. 1,006 buildings were completely destroyed.
- Over 53 percent of the building- and income-related losses were residential structures.
- 15 percent of the estimated losses were related to business interruptions.
- The mid-day earthquake had the highest number of casualties at 128.
- 8,740 households experienced a loss of potable water the first day after the earthquake.
- No households experienced a loss of electricity the first day after the earthquake.

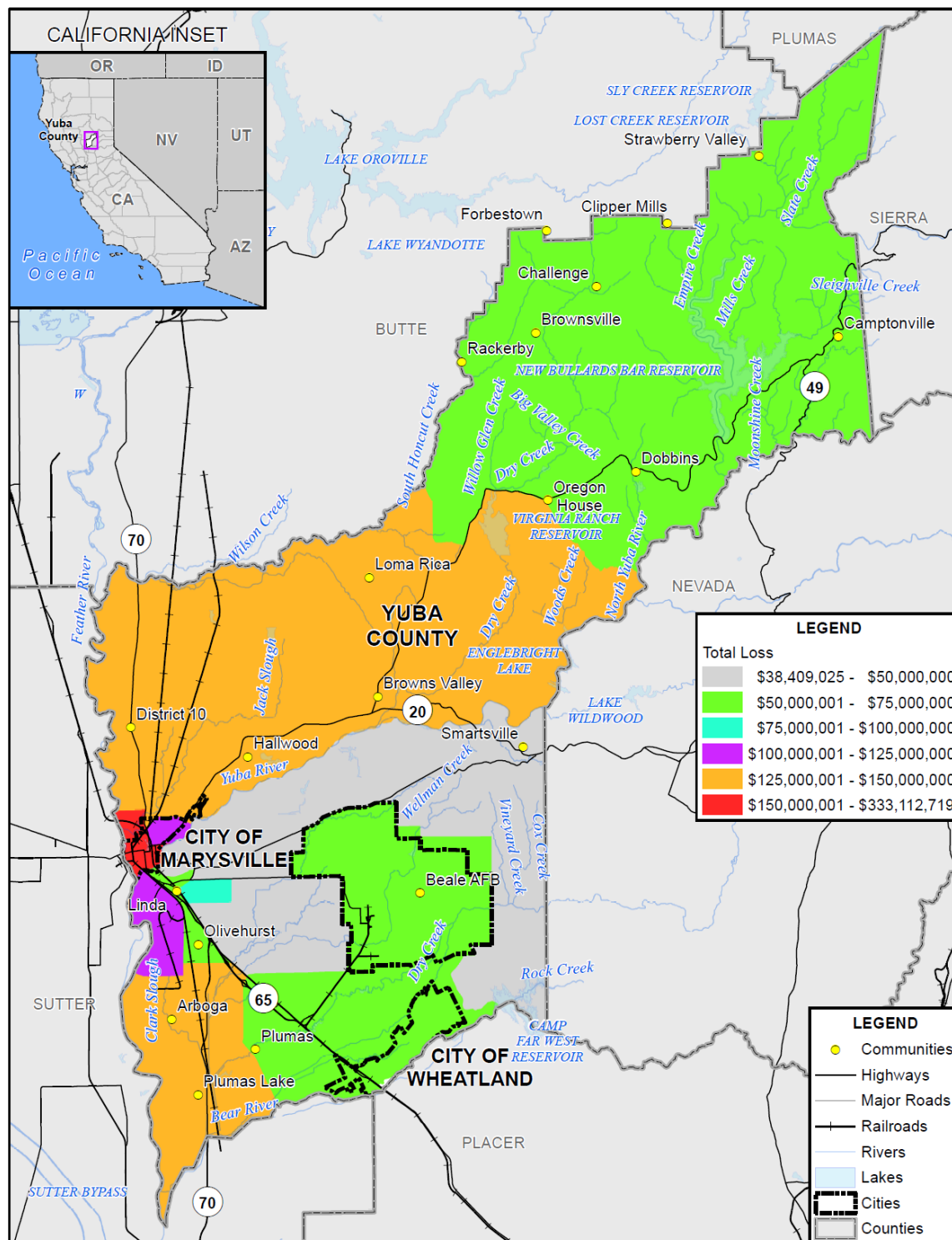
**Table 4-59 HAZUS-MH Earthquake Loss Estimation Probabilistic 2,500-Year Scenario Results**

Type of Impact	Impacts to County from 7.0 Probabilistic Earthquake
Total Buildings Damaged (based on 25,000 buildings)	Slight: 7,772 Moderate: 5,330 Extensive: 2,226 Complete: 1,006
Building and Income Related Losses	\$1,394,810,000
Total Economic Losses (Includes building, income and lifeline losses)	\$1,870,680,000
Casualties (Based on 2 a.m. time of occurrence)	Without requiring hospitalization: 261 Requiring hospitalization: 60 Life threatening: 7 Fatalities: 14
Casualties (Based on 2 p.m. time of occurrence)	Without requiring hospitalization: 1,221 Requiring hospitalization: 379 Life threatening: 66 Fatalities: 128
Casualties (Based on 5 p.m. time of occurrence)	Without requiring hospitalization: 744 Requiring hospitalization: 228 Life threatening: 45 Fatalities: 74
Damage to Transportation Systems	3 bridges with at least moderate damage

Type of Impact	Impacts to County from 7.0 Probabilistic Earthquake	
Damage to Essential Facilities	2 hospitals, 34 schools, 1 EOC, 4 police stations, and 3 fire stations with at least moderate damage. 2 schools and 1 police station with complete damage.	
Damage to Utility Systems	7 facilities with at least moderate damage 384 potable water line breaks, 193 wastewater line breaks, and 1 natural gas line break	
Households without Power/Water Service (Based on 31,437 total households)	Power loss, Day 1: 0 Power loss, Day 3: 0 Power loss, Day 7: 0 Power loss, Day 30: 0 Power loss, Day 90: 0	Water loss, Day 1: 8,740 Power loss, Day 3: 7,196 Power loss, Day 7: 3,887 Water loss, Day 30: 0 Water loss, Day 90: 0
Displaced Households	1,144 displaced households	
Shelter Requirements	927 persons	
Debris Generation	344,000 tons	

Source: HAZUS-MH 4.2, 2020

Figure 4-55 Yuba County – Total Loss Map from 7.0 Magnitude Probabilistic Hazus Earthquake Scenario



0 5 10 Miles

Data Source: Hazus-MH 4.2, Yuba County GIS, Cal-Atlas; Map Date: 3/18/2021.



## *Future Development*

Although new growth and development corridors would fall in the area affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in the earthquake area will continue to occur.

### **4.3.10. Flood: 1%/0.5%/0.2% Annual Chance**

#### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

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

Flooding is the rising and overflowing of a body of water onto normally dry land. History clearly highlights floods as one of the primary natural hazards impacting Yuba County. Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. The Yuba County Planning Area is susceptible to various types of flood events as described below.

- **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 already saturated soils from previous rain events. This type of flood occurs in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. The onset and duration of riverine floods may vary from a few hours to many days. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. In the Yuba County Planning Area, riverine flooding is largely caused by heavy and continued rains, sometimes combined with snowmelt, and heavy flow from tributary streams. These intense storms can overwhelm the local waterways as well as the integrity of flood control structures. The warning time associated with slow rise 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. More on localized flooding can be found in Section 4.3.11.
- **Dam failure flooding** – Flooding from failure of one or more upstream dams is also a concern to the Yuba County Planning Area. A catastrophic dam failure could easily overwhelm local response capabilities and require mass evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could

result, and there could be associated health concerns as well as problems with the identification and burial of the deceased. Dam failure is further addressed in Section 4.3.7 Dam Failure.

### *Streambank Erosion*

In addition to the damages to people and property from the above flooding issues, there can be issues along Yuba County's waterways related to streambank erosion. Stream bank erosion is a natural process, but acceleration of this natural process, such as during high water or flood events, leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss and other adverse effects. Stream bank erosion processes, although complex, are driven by two major components: stream bank characteristics (erodibility) and hydraulic/gravitational forces. Many land use activities can affect both of these components and lead to accelerated bank erosion. The vegetation rooting characteristics can protect banks from fluvial entrainment and collapse, and also provide internal bank strength. When riparian vegetation is changed from woody species to annual grasses and/or forbs, the internal strength is weakened, causing acceleration of mass wasting processes. Stream bank aggradation or degradation is often a response to stream channel instability. Since bank erosion is often a symptom of a larger, more complex problem, the long-term solutions often involve much more than just bank stabilization. Numerous studies have demonstrated that stream bank erosion contributes a large portion of the annual sediment yield.

Determining the cause of accelerated streambank erosion is the first step in solving the problem. When a stream is straightened or widened, streambank erosion increases. Accelerated streambank erosion is part of the process as the stream seeks to re-establish a stable size and pattern. Damaging or removing streamside vegetation to the point where it no longer provides for bank stability can cause a dramatic increase in bank erosion. A degrading streambed results in higher and often unstable, eroding banks. When land use changes occur in a watershed, such as clearing land for agriculture or development, runoff increases. With this increase in runoff the stream channel will adjust to accommodate the additional flow, increasing streambank erosion. Addressing the problem of streambank erosion requires an understanding of both stream dynamics and the management of streamside vegetation.

As farmers settled the valleys, the Gold Rush drew prospectors to the hills. Hydraulic gold mining in the northern Sierra Nevada foothills produced 1.1 billion cubic meters of sediment. As a result, the enormous amounts of silt deposited in the riverbeds of the Central Valley increased flood risk. These low-lying, unconsolidated deposits reside below all dams and reservoirs and are largely between modern levees.

During the 1870's and 1880's, valuable farmland in Yuba County was lost to the silting up of the rivers caused by hydraulic gold mining in the Sierras. Local farmers formed the Anti-Debris Association, and in 1884, they won a landmark suit halting the practice of hydraulic mining. As a remedy to these rising riverbeds, levees were built very close to the river channels to keep water velocity high and thereby scour away the sediment. However, the design of these narrow channels has been too successful. While the Gold Rush silt is long gone, the erosive force of the constrained river continues to eat away at the levee system. Streambank erosion increases the sediment that a stream must carry, results in the loss of fertile bottomland and causes a decline in the quality of habitat on land and in the stream.

## Location and Extent

The Yuba County Planning Area is located in the east part of the Sacramento Valley. The 2011 Yuba County Flood Insurance Study (FIS) noted that approximately one-half of the County lies in the mountainous uplands and foothills of the Sierra Nevada and is used primarily for grazing and timber harvesting. The western half of the County lies in the Sacramento Valley and, excluding the urban and suburban areas, is devoted to agriculture consisting primarily of irrigated field crops and orchards. The Feather River forms the western boundary of Yuba County; South Honcut Creek forms part of the northern boundary; the Yuba River forms a portion of the eastern boundary; and the Bear River flows along the southern boundary of Yuba County.

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

### *Major Sources of Flooding*

California has 10 hydrologic regions. Yuba County sits in the Sacramento hydrologic region. The Sacramento River hydrologic region covers approximately 17.4 million acres (27,200 square miles). The region includes all or large portions of Modoc, Siskiyou, Lassen, Shasta, Tehama, Glenn, Sutter, Butte, Colusa, Yuba, Sierra, Nevada, Placer, Sacramento, El Dorado, Yolo, Solano, Lake, and Napa counties. Small areas of Alpine and Amador counties are also within the region. Geographically, the region extends south from the Modoc Plateau and Cascade Range at the Oregon border to the Sacramento-San Joaquin Delta. The Sacramento Valley, which forms the core of the region, is bounded to the east by the crest of the Sierra Nevada and southern Cascades and to the west by the crest of the Coast Range and Klamath Mountains. The Sacramento metropolitan area and surrounding communities form the major population center of the region. With the exception of Redding, cities and towns to the north, while steadily increasing in size, are more rural than urban in nature, being based in major agricultural areas.

A map of the California's hydrological regions is provided in Figure 4-56.

Figure 4-56 California Hydrologic Regions



Source: 2018 State of California Hazard Mitigation Plan

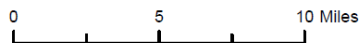
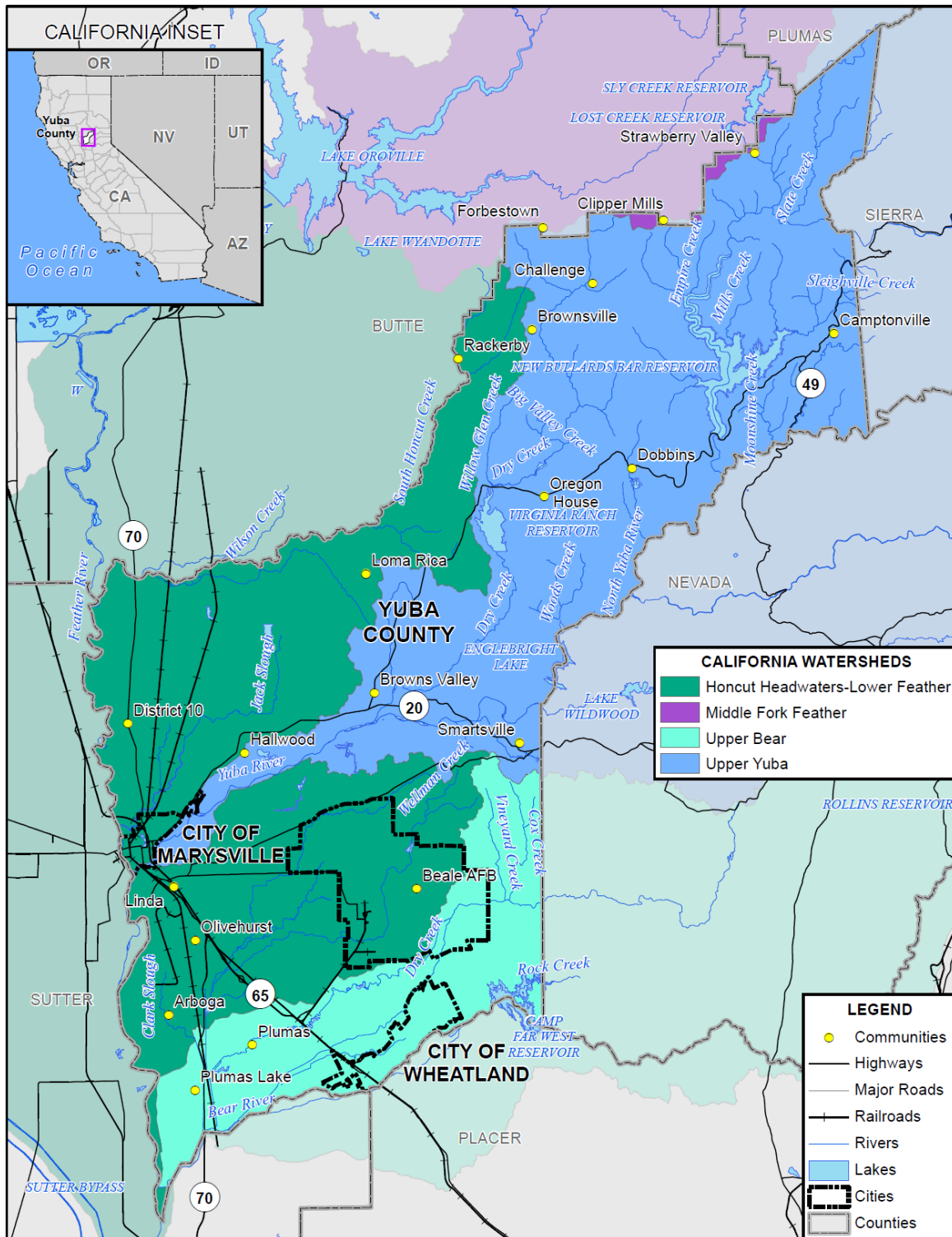
### *The Yuba County Waterway System*

The County drains to the Feather River, an integral part of the Sacramento River Flood Control Project. Its major tributary, the Yuba River, is also an important part of the project. Both the Feather and Yuba Rivers are perennial streams, having their sources in the lakes, springs, and snowfields near the 10,000-foot level of the Sierra Nevada. The drainage area to these streams is approximately 5,300 square miles on the eastern side of the Central Valley of California. They drain to the Pacific Ocean via Sacramento River, the principal stream in Northern California.

Approximately one-third of the higher elevations of the County drain into the Yuba River. Jack-Simmerly Slough and South Honcut Creek drain the northern area of the County, and the Bear River drains the southern portion of the county via the Western Pacific Interceptor Canal.

Figure 4-57 illustrates the primary watersheds of Yuba County, as well as the primary waterways in the County.

Figure 4-57 Primary Watersheds and Waterways of Yuba County

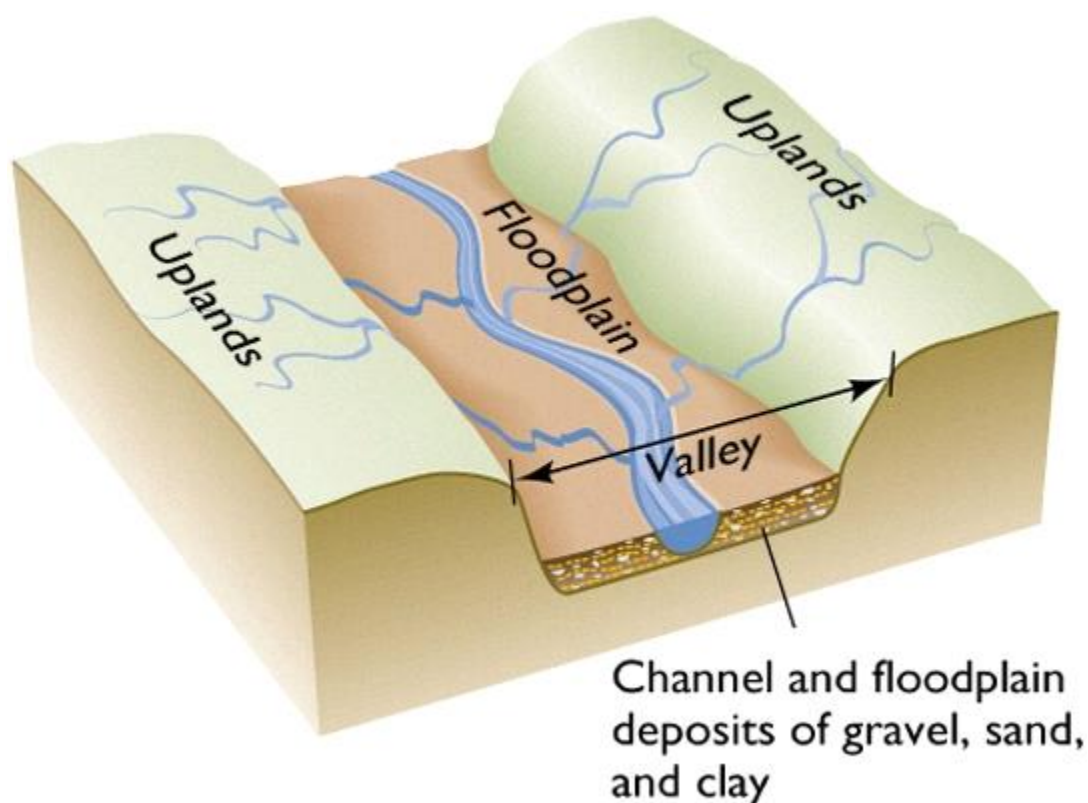


Data Source: USGS Watershed Boundary Dataset (wbdhu8\_a\_ca115) 2/2017, Yuba County GIS, Cal-Atlas; Map Date: 1/15/2021.

## *Floodplains*

The area adjacent to a channel is the floodplain (see Figure 4-58). 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 1% annual chance (or 100-year) flood, the flood that has a one percent chance in any given year of being equaled or exceeded. The 1% annual chance flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program. The 200-year flood is the flood that has a 0.5% chance of being equaled or exceeded in any given year. The 500-year flood is the flood that has a 0.2% 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.

*Figure 4-58 Floodplain Schematic*



Source: FEMA

## *Yuba County Flood Control Structures*

The 2011 FIS noted the following paragraphs regarding flood control structures in the County. The first efforts at flood protection occurred in the early 1860s when a ring levee was built around Marysville. After that time, various extensions and improvements were made, and in 1917, these levees were incorporated into the Sacramento River Flood Control Project. Also included in the project are levees on the Feather

River, the Bear River, the Yuba River, Dry Creek, South Honcut Creek, Jack-Simmerly Slough, and the Western Pacific Interceptor Canal.

Lake Oroville on the Feather River near Oroville and New Bullards Bar Reservoir on the North Yuba River are major flood control structures which are operated under coordinated operating procedures to control total flows in the valley reaches of the Sacramento River Flood Control Project.

New Bullards Bar Reservoir and Lake Oroville would be expected to lessen an 1%-annual chance flood and significantly decrease downstream discharges in a 0.2%-annual-chance flood on the Yuba River and the Feather River, respectively. The Marysville Lake project on lower Yuba River, 12 miles east of Marysville, was authorized for construction by the USACE in 1966 as the final segment of the three dam system that includes Lake Oroville and New Bullards Bar Reservoir.

Flooding in the Plumas Lake area south of Olivehurst is caused by levee failure along the Feather River as well as high stages in the Bear River restricting outflow from the Western Pacific Interceptor Canal. Flowage easements in the Plumas Lake area have been acquired by the California State Reclamation Board. Ponding in Plumas Lake will cause some backwater along Linda and Olivehurst Drains south of Sixth Avenue during the 1%-annual-chance flood.

Flood protection is afforded Marysville by Lake Oroville on the Feather River, New Bullards Bar Reservoir on the North Yuba River, and by levees that encircle almost all of the City. A storm drain system provides a low degree of protection against ponding and flooding from intense rainfall over the area inside the ring levee. Flood protection to Marysville will be enhanced by Marysville Lake, a multiple-purpose project authorized for construction by the USACE on the mainstem Yuba River.

In the early years, 1851-1861, the main part of Marysville was surrounded by sloughs that served as drainage channels. During periods of highwater, however, flow backed up sloughs and spilled into the city, and overflow from the rivers inundated large areas. Following the severe floods of 1861-62, the City Council began a serious effort to protect the city with levees, and a low ring levee was completed in January 1869. In spite of many improvements during the ensuing 5 years, the levee failed during a flood that occurred in 1874-75. A new levee was planned and completed in November 1875. In some locations it followed differing alignments than the 1869 levee, but the principal improvements comprised raising the crown elevation to 65.5 feet and increasing the width of the crown and base. In addition to the levee encircling the city, the system included a levee section that extends approximately 4 miles north-easterly from the city. Its principal purpose is to prevent Yuba River floodwater from commingling with Feather River floodwater in the Jack-Simmerly Slough area. Subsequent to 1875, the Marysville levees were further strengthened and raised a number of times and in 1917, were incorporated into the Sacramento River Flood Control Project (a federally sponsored project comprising a comprehensive system of levees, overflow weirs and bypass channels, improved channels, and other works along the lower 184 miles of the Sacramento River and the lower reaches of its principal direct and indirect tributaries). Further improvements comprising new embankment, stone protection, levee surfacing, and miscellaneous other work have been completed since 1934 to bring the levees to project structural specifications and their present principal crown elevation of 84 feet. The ring levee is maintained to prescribed Federal standards by the Marysville Levee Commission under assurances given to the State Reclamation Board, which has the primary legal responsibility for maintaining facilities of the Sacramento River Flood Control Project.

Lake Oroville and New Bullards Bar Reservoir were built by local interests with Federal contributions toward their costs in recognition of the potential flood control capability. Projects built under this arrangement, which must be authorized by the Congress, are known as "Partnership Projects" and, pursuant to Section 7 of the 1944 Flood Control Act, must be operated for flood control according to regulations established by the USACE.

Marysville Lake was the final project in a three-dam system that includes Oroville Lake and New Bullards Bar Reservoir. Coordinated operation of this system contemplates releases that will not exceed levee project design capacities. If a major flood should occur on the local contributing area between Lake Oroville and Marysville at the same time that large flood control releases were being made; releases would be so regulated that Feather River flow would not exceed the objective flow of 180,000 cubic feet per second at Marysville. Objective flow is defined as the maximum flow, at critical control points downstream from flood control dams, that will not be exceeded so long as it is possible to regulate releases, giving consideration to local or tributary inflow between the dam and the control point. That flow would be adequately contained in the floodway. Until Marysville Lake is completed, it may be necessary to prolong encroachment into the flood control reservation at Lake Oroville and hold back outflow so that the combined flow in the Feather and Yuba Rivers will not exceed objective flow of 300,000 cubic feet per second in the Feather River downstream from Marysville.

Flood control structures in Yuba County are discussed in greater detail in the levee failure (4.3.12) and dam failure (4.3.7) sections.

### *Yuba County Flood Mapping*

As part of the County's ongoing efforts to identify and manage their flood prone areas, Yuba County relies on a variety of different mapping efforts. What follows is a brief description of FEMA and DWR mapping efforts covering the Yuba County Planning Area.

### **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. FEMA floodplain are lands subject to the 1% annual chance (100-year) flood. FEMA mapping also includes areas subject to the .02% annual chance (500-year) flood. The State Senate Bill 5 (SB5) required all communities to map their communities, including the 200-year (or 0.5% annual chance flood) as required for urban and urbanizing areas. Levee certification standards apply for mapping in areas protected by levees, and depending on the area protected, levees must be certified to either the 1% or 0.5% annual chance flood. SB5 requires levee protection in urban areas to a 0.5% annual chance flood. A general overview of floodplain mapping is provided in the following paragraphs.

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

The FIS develops flood-risk data for various areas of the community that will be used to establish flood insurance rates and to assist the community in its efforts to promote sound floodplain management. The current Yuba County FIS is dated February 18, 2011. This study covers both the unincorporated and incorporated areas of the County.

### **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 chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analysis and local floodplain regulation.

### **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.

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

As part of its Map Modernization program, FEMA is converting paper FIRMS to digital FIRMS, DFIRMS. These digital maps:

- Incorporate the latest updates (LOMRs and LOMAs);
- Utilize community supplied data;
- Verify the currency of the floodplains and refit them to community supplied basemaps;
- Incorporate levee accreditation status in accordance with FEMA requirements at 44 CFR 65.10;
- Upgrade the FIRMS to a GIS database format to set the stage for future updates and to enable support for GIS analyses and other digital applications; and
- Solicit community participation.

The 2011 DFIRMS are being used for the flood analysis for this LHMP Update.

### **California Floodplain Mapping**

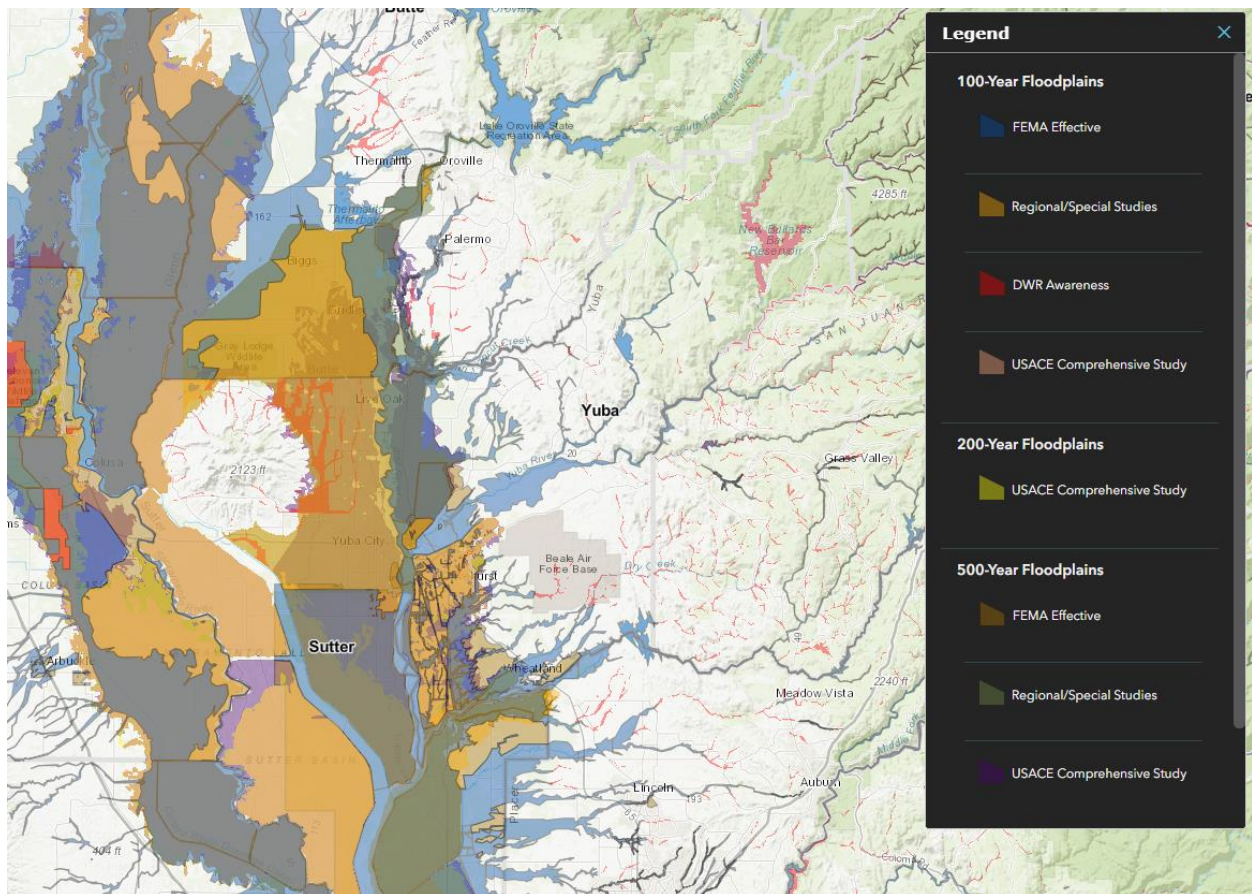
Also to be considered when evaluating the flood risks in Yuba County are various floodplain maps developed by the California DWR for various areas throughout California, and in the Sacramento-San Joaquin Valley cities and counties. The FEMA regulatory maps provide just one perspective on flood risks in Yuba County. Senate Bill 5 (SB 5), 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 DFIRMS 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% 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 use 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 DFIRMs. 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 to 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 4-59 shows the BAM for the Yuba County Planning Area.

*Figure 4-59 Yuba County– Flood Awareness (Best Available) Map*



Source: California DWR, Retrieved 8/18/2020

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% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2% (2002 Sac and San Joaquin River Basins Comp Study).

Flood extents are usually measured in depths of flooding, geographical extent of the floodplain, as well as flood zones that a location falls in (i.e. 1% or 0.2% annual chance flood). Expected flood depths in the County vary and are not well defined. Flood durations in the County tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Geographical flood extent from the FEMA DFIRMs is shown later on Figure 4-61 and below in Table 4-60.

*Table 4-60 Yuba County – Geographical Flood Hazard Extents in FEMA DFIRM Flood Zones*

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance	72,240	17.6%	43,593	28.3%	28,647	11.2%
0.2% Annual Chance	30,607	7.5%	18,851	12.2%	11,756	4.6%
Other Areas	307,718	74.9%	91,723	59.5%	215,995	84.2%
<b>Total</b>	<b>410,565</b>	<b>100.0%</b>	<b>154,167</b>	<b>100.0%</b>	<b>256,398</b>	<b>100.0%</b>

Source: 2/18/2011 DFIRM

Stream bank erosion occurs on rivers, streams, and other moving waterways, including leveed areas, in the County Planning Area. The speed of onset of this erosion is slow, as the erosion takes place over periods of years. Duration of erosion is extended. Greater erosion occurs during periods of high stream flow and during storm and wind events when wave action contributes to the extent and speed of streambank erosion.

## Past Occurrences

### Disaster Declaration History

A list of state and federal disaster declarations for Yuba County from flooding, (including heavy rains and storms) is shown on Table 4-61. No disasters were related to streambank erosion. The County had no USDA disaster declarations since 2012 related to flood, as shown on Table 4-6.

*Table 4-61 Yuba County – State and Federal Disaster Declaration from Flood 1950-2021*

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	16	1950, 1955, 1958, 1962, 1963 (twice), 1969, 1973, 1982, 1983, 1986, 1995 (twice), 1997, 2008, 2017	15	1955, 1962, 1963, 1964, 1969, 1970, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (twice)

Source: Cal OES, FEMA

## NCDC Events

The NCDC tracks flooding events for the County. Events have been tracked for flooding since 1993. Table 4-62 shows events in Yuba County since 1993. Other heavy rain and storm events can be found in the Past Occurrences of the Severe Weather: Heavy Rains and Storms in Section 4.3.4. More information from the NCDC on some of the flooding is woven into the discussion of HMPC events below. The NCDC does not track streambank erosion.

*Table 4-62 NCDC Flood Events in Yuba County 1993 to 7/31/2020\**

Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage	Deaths (indirect)	Injuries (indirect)
Flash Flood	1	0	0	\$0	\$0	0	0
Flood	20	2	0	\$5,965,000	\$0	0	0
Heavy Rain	4	0	0	\$0	\$0	0	0
<b>Total</b>	<b>25</b>	<b>2</b>	<b>0</b>	<b>\$5,965,000</b>	<b>\$ 0</b>	<b>0</b>	<b>0</b>

Source: NCDC

\*Note: Losses reflect totals for all impacted areas, much of which fell outside of Yuba County

## FIS Flood Events

The FIS noted ten flood periods on the Feather and Yuba Rivers (1805, 25-26, 49-50, 52-53, 59, 61-62, 74-75, 79, 80, and 81) are documented in the 19th century. Marysville was last flooded in 1875 when 10 to 12 feet of floodwater stood in the western part of the city. Nine major floods have been recorded since 1900 (1904, 1907, 1909, 1928, 1937, 1950, 1955, 1963, and 1964). Marysville was seriously threatened in December 1955 when sustained high flows severely damaged the levees. Extensive flood fighting by many citizens and hundreds of airmen from Beale Air Force Base was required to save the city, which had been entirely evacuated. At the peak of the flood, water was coming through the levees at a number of locations and the levees might have failed if a major break downstream on the Feather River had not served to relieve the pressure. In December 1964, another great flood occurred on the Feather and Yuba Rivers. Had it not been for available storage and reduced flow conditions afforded by the partially completed Oroville Lake Project, and reconstruction of the ring levee after the 1955 flood, combined flow of the rivers at Marysville could have resulted in the most disastrous flood ever known in that area. It is estimated that the 1955 and 1964 floods on the Feather River at Marysville both had a recurrence frequency of once in 200 years. The 1955 and 1964 floods on the Yuba River at Marysville both had frequencies estimated at once in 140 years and once in 160 years, respectively.

## Hazard Mitigation Planning Committee Events

Historically, 1%/0.5%/0.2% annual chance and localized flooding have been an ongoing problem throughout the Planning Area. The most notable major flood events occurred in 1986, 1995, and 1997 as described in detail below. Primary damages were to property and agricultural crops. These damaging floods were generally the result of heavy prolonged rains, flooding, and failures of the levee systems rather than the levees being overtopped. Other lesser flooding events have also occurred in other years. Some

streambank erosion would have occurred during these events, but no specific information regarding it could be recalled.

The history of flooding in Yuba County is associated with its geographic position at the convergence of three significant river systems: the Feather River, the Yuba River, and the Bear River. The Feather River is a principal tributary to the Sacramento River, draining a watershed of 3,222 square miles in the Sierra Nevada and Sacramento Valley (FRCRM, 2005). The Yuba and Bear rivers are tributaries to the Feather, draining watersheds 1,336 and 469 square miles, respectively. As a result, Yuba County has a long history of disastrous flooding. The legendary floods of 1862 and 1866 emphasized the need to develop systems to protect lives and property. By 1875, Marysville began to surround itself with levees. By the 1950's, the levees surrounding Marysville were among the strongest in the state. Bullards Bar Dam was built from 1922–1924, and the Narrows and Englebright Reservoir was built prior to 1945. New Bullards Bar Dam was built in the 70's to replace Bullards Bar Dam and provide additional flood control to the Yuba River.

There have been numerous major floods on the Yuba and Feather Rivers since 1950. These are discussed below.

### *1950 Flooding*

In 1950 the Yuba River broke through its banks at Hammonton and flooded 43,000 acres in southern Yuba County.

### *1955 Flooding*

Tropical storms hit in 1955 causing widespread flooding with water reaching the tops of the levees in Marysville, causing the deaths of forty people, and forcing the evacuation of over 30,000 people.

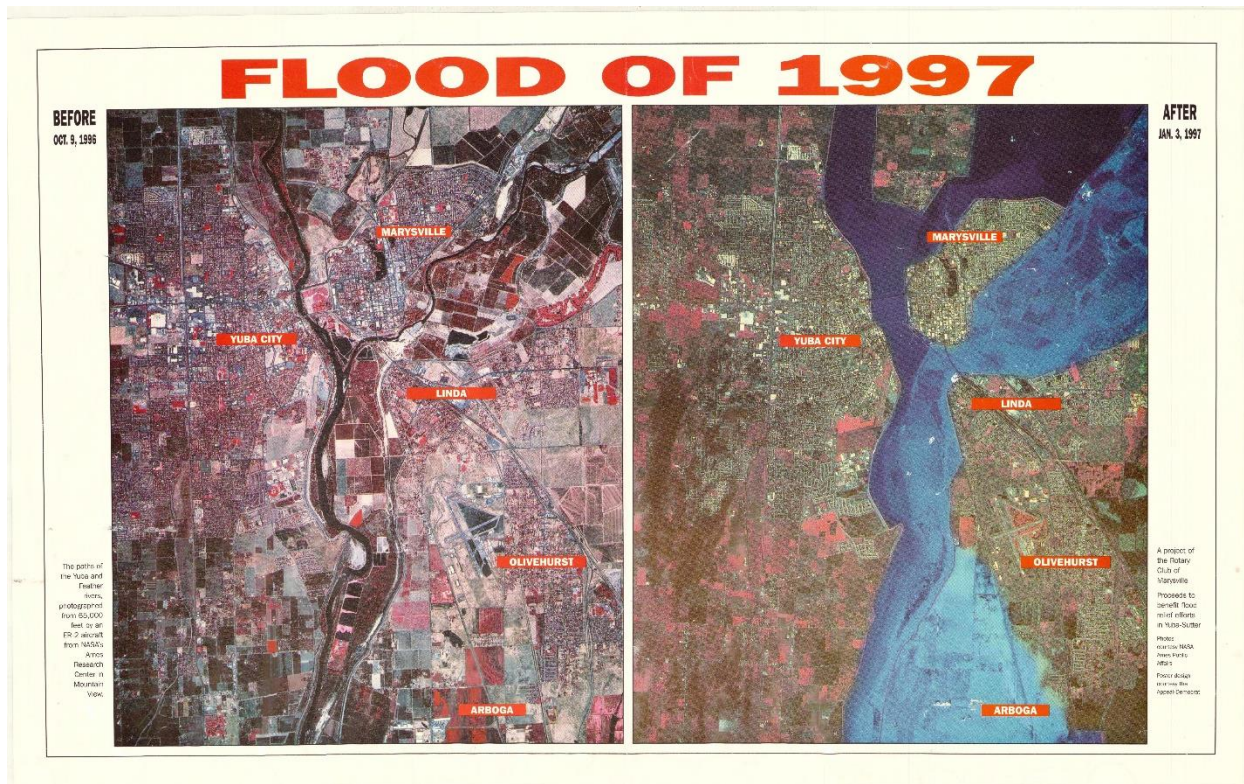
### *1986 Flooding*

In February of 1896, a storm caused 6 to 9 inches of rain to fall in a 10 day period. The left levee of the Yuba River failed just upstream of the Feather River confluence (RD 784). The communities of Linda and Olivehurst were inundated, resulting in one death, 895 destroyed homes, and 150 destroyed businesses.

### *1997 Flooding*

A series of storms generated by the "Pineapple Express" dumped warm, heavy rains onto a nearly double than average snowpack in the Sierra Nevada Mountains in late December. Runoff was filling the Shasta, Oroville, and New Bullards Bar Dams. The left levee of the Feather River failed near Arboga (RD 784), killing one person, destroying 180 homes and businesses, and prompting evacuation of about 15,000 people from Linda and Olivehurst. Illustrating the extent of flooding, a before and after aerial photo of the flooding of 1997 is included in Figure 4-60.

*Figure 4-60 1997 Flood Event (Before and After)*



Source: Yuba County Public Works

### **2017 Flooding**

During the winter of 2017 a series of storms called Atmospheric Rivers inundated Yuba County for more than a month. Most of California was impacted for these widespread warm storms. Three separate Presidential Disaster Declarations were issued and are as follows: DR-4301 (January 1-12), DR-4305 (January 18-23), and DR-4308 (February 1-23). During this time, the County responded to numerous events and incidents such as threats to the levee systems, road and highway damage, flooded areas and care and sheltering operations. Additionally, on February 12, 2017, information was received from the California Department of Water Resources (DWR) that the integrity of the emergency spillway on Oroville Dam was being compromised by erosion. The Butte County Sheriff's Department, in consultation with DWR and CAL FIRE technical experts, decided to evacuate citizens located in Butte County below Oroville Dam. After several days, the evacuation order was lifted and the residents were allowed to return back to their homes. Damages to roads between the Jan & February Storms resulted in approximately \$15,000,000 in damages.

### **2019 Flooding**

**February 25, 2019** – A strong atmospheric river brought heavy precipitation with widespread impacts across interior Northern California. These impacts included heavy high elevation snow, flooding, debris flows, strong mountain winds, and periods of whiteout conditions.

## Likelihood of Future Occurrence

### 1% Annual Chance Flood

**Occasional**— The 1% annual chance flood (100-year) is the flood that has a 1 percent chance of being equaled or exceeded in any given year. This, by definition, makes the likelihood of future occurrence occasional. However, the 100-year flood could occur more than once in a relatively short period of time.

### 0.5% Annual Chance Flood

**Unlikely**—The 0.5% annual chance flood (500-year) is the flood that has a 0.5 percent chance of being equaled or exceeded in any given year. This, by definition, makes the likelihood of future occurrence unlikely.

### 0.2% Annual Chance Flood

**Unlikely**—The 0.2% annual chance flood (500-year) is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. This, by definition, makes the likelihood of future occurrence unlikely.

## Climate Change and Flood

According to the CAS, climate change may affect flooding in Yuba County. While average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21<sup>st</sup> century. It is possible that average soil moisture and runoff could decline, however, due to increasing temperature, evapotranspiration rates, and spacing between rainfall events. Reduced snowpack and increased number of intense rainfall events are likely to put additional pressure on water infrastructure which could increase the chance of flooding associated with breaches or failures of flood control structures such as levees and dams. Future precipitation projections were shown in Figure 4-28 in Section 4.3.4. Also according to the National Center for Atmospheric Research in Boulder, Colorado, Atmospheric Rivers are likely to grow more intense in coming decades, as climate changes warms the atmosphere enabling it to hold more water.

## *Vulnerability Assessment*

### **Vulnerability**—High

Historically, the Yuba County Planning Area has always been at risk to flooding during the rainy season from November through April. The 2011 Yuba County FIS noted that Floods result from prolonged heavy rainfall and are characterized by high peak flows of moderate duration and by a large volume of runoff. Flooding is more severe when antecedent rainfall has resulted in saturated ground conditions. The severity of flooding on all the streams studied is intensified by backwater conditions between stream systems. Floodwater elevations are increased in the lower portions of tributary streams due to the backwater effect from main streams reducing hydraulic gradients and flow-storage areas. During this time there will be a high degree of coincidental flood flows on waterways.

Backwater from the Feather River during flood stage inundates a large area along Jack-Simmerly Slough north of Marysville. High stages on the Feather River and its tributary, the Bear River, create a backwater condition that extends up Western Pacific Interceptor Canal, Plumas Lake, and into Linda and Olivehurst Drains, which causes flooding in the town of Olivehurst and Linda southeast of Marysville.

Major floods on the Feather and Yuba Rivers can occur anytime during the period from October through June. Two types of flooding, rain and snowmelt, have occurred on these streams. Snowmelt floods usually occur in the late spring or early summer, April through June, and are characterized by long periods of runoff, large volume of flow, moderate peak flows, and diurnal fluctuation in flow. Rain floods can occur during the period from October through March. Rain flooding is characterized by high peak flows of short duration, and is more severe when snowmelt augments runoff. Rain floods usually continue for 3 to 5 days with the flood crest occurring during a 12-hour period in the middle of the flood producing storm. Rain floods can be expected in the Jack-Simmerly Slough area during the period from October through March. However, this source of flooding in itself does not constitute a significant flood threat to Marysville. The major flood problem in the slough area arises from Feather River floodwater, which has repeatedly backed into the area through a gap left in the project levees near the mouth of Jack Slough and collected against the levee protecting the city on the north. The area serves to store Feather River floodwater temporarily, thus providing a small measure of relief to the river channel downstream. Marysville is also subject to ponding and flooding from heavy general rain or cloudburst storms over the city itself.

As noted, Marysville is situated in the natural floodplains of the Feather and Yuba Rivers and Jack Slough. Prior to completion of the ring levee and the Oroville and New Bullards Bar projects, large floods caused levee failures and resulted in severe flood damage in the Marysville area. Now, levee failure by overtopping is extremely unlikely. There is, however, the remote possibility of levee failure from seepage or erosion. Therefore, the only areas of Marysville with significant flood problems are those outside the levees and in the floodways of the Feather and Yuba Rivers, or those subject to Feather River backwater in the lower Jack Slough area. Barring the unlikely event of failure of the ring levee, or floods greater than existing projects are designed to control, the flood threat to the protected area of Marysville is minimal.

Normally, wintertime storm floodwaters are kept within defined limits by levees, dykes, and open lowlands and cause no damage. But, occasionally, extended heavy rains result in floodwaters exceeding normal high-water boundaries and causing damage. The big damaging floods of 1955, 1986, 1995, and 1997, were generally the result of failures of the levee systems rather than the levees being overtopped. Other lesser flooding events have also occurred in other years.

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.

In addition to the major rivers, there are many streams, channels, canals, and creeks that serve the drainage needs of the County. There is significant threat of flooding in large areas of the county from several of these streams. Many of these streams are prone to rapid flooding with little notice.

## Aquatic Invasives and Flooding

Though not a standalone hazard, there are measurable past impacts to the County from aquatic invasives. Some of California's and Sutter County's most serious weed problems occur in waterways, lakes and streams. The aquatic plant hydrilla is considered one of the most serious aquatic weed problems in the world and the California Department of Food and Agriculture (CDFA) maintains an intensive program to survey and eradicate this aquatic weed pest. It can quickly take over lakes and streams, crowding out native animals and plants and blocking hydroelectric plants, while impeding water flow and delivery. Its rapid growth and ease of spread by boats makes it critical to detect early and eradicate.

In the County invasive species have plugged drains, contributing to greater flood impacts. The risk of aquatic invasive species exists and if a breakout occurs, there may be potentially large economic impacts. Thus there are always active weed management areas and aquatic weed control.

## Impacts

Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems, especially to critical facilities and infrastructure. Loss of power is usually a precursor to closure of governmental offices and community businesses. Schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. A car will float in less than two feet of moving water and can be swept downstream into deeper waters. This is one reason floods kill more people trapped in vehicles than anywhere else. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures, such as dam spillways. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. 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.

Erosion and deposition are occurring continually at varying rates over the Planning Area. Swiftly moving floodwaters cause rapid local erosion as the water carries away earth materials. This is especially problematic in leveed areas. Severe erosion removes the earth from beneath bridges, roads and foundations of structures adjacent to streams. By undercutting it can lead to increased rockfall and landslide hazard. The deposition of material can block culverts, aggravate flooding, destroy crops and lawns by burying them, and reduce the capacity of water reservoirs as the deposited materials displace water. Impacts from stream

bank erosion include greater levee maintenance and increased risk of levee failure. Should the levees fail, the area protected by the levees would be flooded.

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.

### **Health Hazards from 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 hogs 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 second type of health problems arise after most of the water has gone. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. If a city or county water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and irreplaceable keepsakes destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

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

Continued reliance upon flood control structures in the Yuba County Planning Area and the Central Valley will be without reprieve. The history of the area, beginning with hydraulic mining techniques of the gold miners, through the ongoing conversion of agricultural lands to commercial and residential developments, makes it impossible to reverse the dependence upon structural flood control protection. Levee maintenance is a continuous effort, due to erosion and scour brought on by the channelization itself.

To address this issue, the USACE is in the process of studies and reconstruction efforts along the most critical areas of the levee system. Additional improvements to strengthen the levees and make them less susceptible to seepage induced failures to reduce the risk of flooding are a priority of local and state agencies. Once these improvements have been made, certification of these levees may be possible. While these improvements may mitigate, the risk of flooding due to levee failure, the levees will remain subject to overtopping by flood events larger than their design capacity. In addition to improvements to the existing levee system, other flood control measures are also being evaluated to provide increased levels of flood protection throughout the Planning Area. This is discussed in greater extent in Section 4.3.12.

Flooding has been frequent in the Yuba County Planning Area and the vulnerability to flood damages is high. This section quantifies the vulnerability of the Planning Area to floods.

### Flood Hazard Assessment

This risk assessment for the Yuba County LHMP Update assessed the flood hazard specific to Yuba County. This included an evaluation of multiple flood hazards including the Special Flood Hazard Area (SFHA) shown on the DFIRM; Repetitive Loss (RL) Areas; localized, stormwater flooding areas; other areas that have flooded in the past, but not identified on the DFIRM; other areas of shallow flooding identified through other studies and sources; levee failure flooding; and dam failure flooding. This comprehensive flood risk assessment included an assessment of less-frequent flood hazards, areas likely to be flooded, and flood problems that are likely to get worse in the future as a result of changes in floodplain development and demographics, development in the watershed, and climate change. Existing studies, maps, historical data, and federal, state, and local community expertise and knowledge contributed to this current flood assessment for Yuba County. An evaluation of the success of completed and ongoing flood control projects and associated maintenance aspects contributed to this flood hazard assessment and the resulting flood mitigation strategy for the Yuba County Planning Area. This flood risk assessment for this LHMP Update also includes an assessment of future flooding conditions based on historic development in the floodplains and proposed future development as further described throughout this Plan Update.

The Yuba County Planning Area has mapped FEMA flood hazard areas as previously described. GIS was used to determine the possible impacts of flooding within the County and how the risk varies across the Planning Area. The following methodology was followed in determining improved parcel counts and values at risk to the 1% annual chance flood event and 0.2% annual chance flood events.

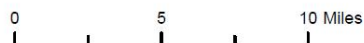
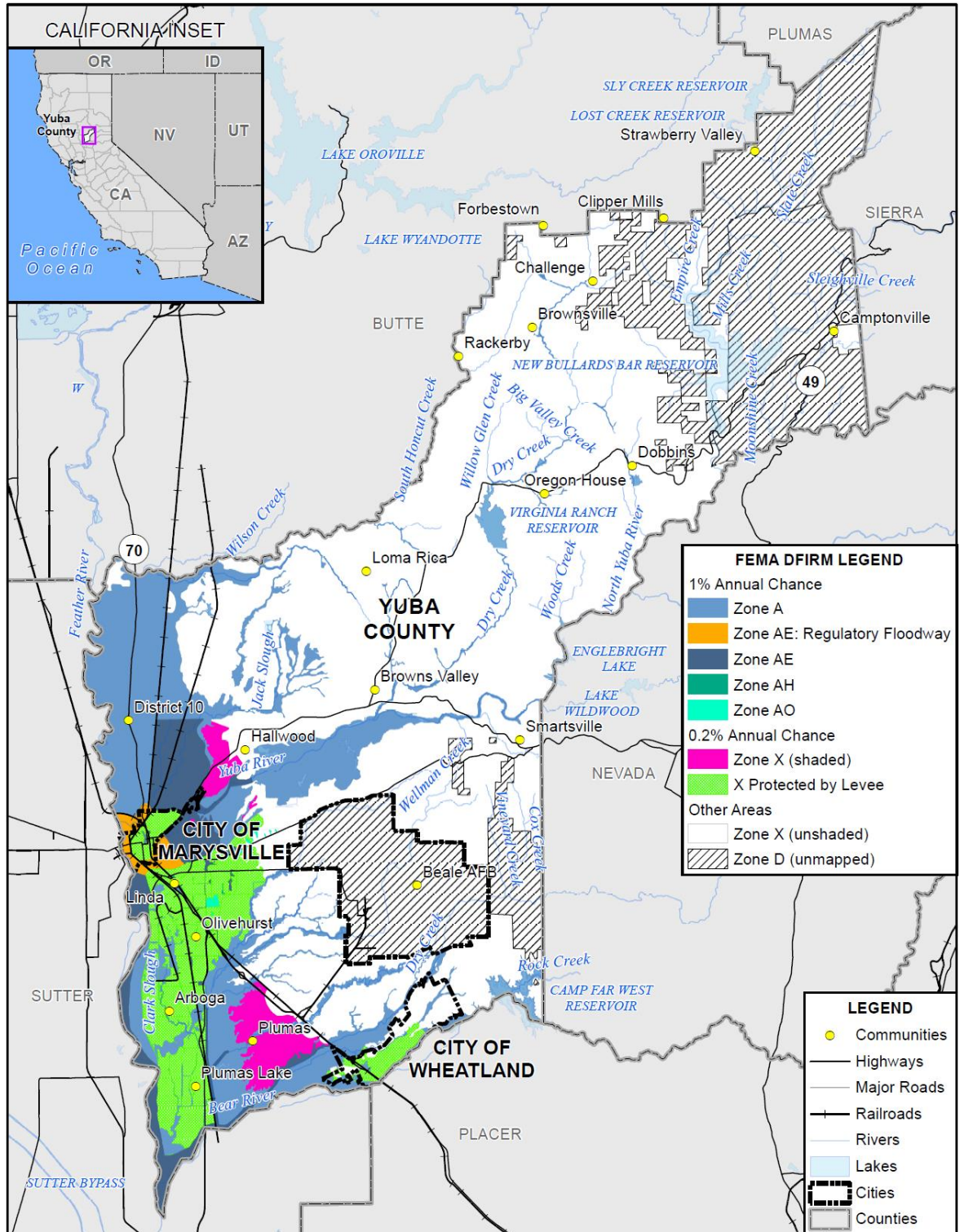
Each of the DFIRM flood zones that begins with the letter 'A' depict the Special Flood Hazard Area, or the 1% annual chance flood event (commonly referred to as the 100-year flood). Table 4-63 explains the difference between DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the County. The effective DFIRM maps for the Yuba County Planning Area are shown on Figure 4-61.

*Table 4-63 Yuba County Planning Area – DFIRM Flood Hazard Zones*

Flood Zone	Description	Flood Zone Present in City of Marysville	Flood Zone Present in City of Wheatland	Flood Zone Present in unincorporated County
A	1% annual chance flooding; No base flood elevations provided		X	X
AE	1% annual chance flooding; Base flood elevations provided	X		X
AE Floodway	1% annual chance flood; Regulatory floodway; Base flood elevations provided	X		X
AH	1% annual chance flood areas of shallow flooding between one to three feet deep. Regulatory floodway; Base flood elevations provided			X
AO	1% annual chance flooding; sheet flow areas. BFEs derived from detailed hydraulic analyses are shown in this zone.			X
D	Areas with a potentially moderate to high risk of flooding, but the probability has not been determined.			X
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood			X
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone.	X	X	X
X (unshaded)	No flood hazard	X	X	X

Source: FEMA

Figure 4-61 Yuba County – DFIRM Flood Zones



Data Source: FEMA DFIRM 2/18/2011, Yuba County GIS, Cal-Atlas; Map Date: 1/15/2021.



## Values at Risk and Flood Loss Estimates Analysis

Quantifying the values at risk and estimating losses within mapped FEMA floodplains in the County is an important element in understanding the risk and vulnerability of the Yuba County Planning Area to the flood hazard.

### *Methodology*

Yuba County's 2020 Parcel and Assessor Data, obtained from Yuba County, was used as the basis for the county inventory of parcels, values, and acres. Yuba County has a FEMA DFIRM dated 2/18/2011 which was utilized to perform the flood analysis.

In some cases, there are parcels in multiple flood zones, such as Zone A, Zone X, or Shaded X. GIS was used to create a centroid, or point representing the center of the parcel polygon. DFIRM flood data was then overlaid on the parcel layer. For the purposes of this analysis, the flood zone that intersected a parcel centroid was assigned the flood zone for the entire parcel. The parcels were segregated and analyzed in this fashion for Yuba County. Once completed, the parcel boundary layer was joined to the centroid layer and values were transferred based on the identification number in the Assessors database and the GIS parcel layer.

Analysis on values at risk to floods in the County is provided for Yuba County Planning Area and unincorporated Yuba County in the below results section.

### *Limitations*

It also should be noted that the resulting flood analysis estimates may actually be more or less than that presented in the below tables as the County may include structures located within the 1% or 0.2% annual chance floodplain that are elevated at or above the level of the base flood elevation, according to local floodplain development requirements. Also, it is important to keep in mind that these assessed values may be well below the actual market value of improved parcels located within the floodplain due primarily to Proposition 13.

### *Flood Loss Estimate*

The loss estimate for flood is based on the total of improved and contents value. Improved parcels include those with improved structure values identified in the Assessor's database. Only improved parcels and the value of their structure improvements were included in the flood loss analysis. The value of land is not included in the loss estimates as generally the land is not at loss to floods, just the value of structure improvements and contents. The land value is represented in the detailed flood tables, but are only present to show the value of the land associated with each flood zone.

Once the potential value of affected parcels was calculated, a damage factor was applied to obtain loss estimates by flood zone. When a flood occurs, seldom does the event cause total loss of an area or building. Potential losses from flooding are related to a variety of factors including flood depth, flood velocity, building type, and construction. The percent of damage is primarily related to the flood depth. FEMA's flood benefit/cost module uses a simplified approach to model flood damage based on building type and

flood depth. The values at risk in the flood analysis tables were refined by applying an average damage estimation of 20% of the total building value. The 20% damage estimate utilized FEMA’s Flood Building Loss Table based on an assumed average flood depth of 2 feet. The end result of the flood hazard analysis is an inventory of the numbers, types, and values of parcels subject to the flood hazard.

***Values at Risk and Flood Loss Estimates Results***

The end result of the values at risk and flood loss estimates analysis is an inventory of the numbers, types, and values of parcels and estimated losses subject to the flood hazard by flood zone. Results are presented here first for the Yuba County Planning Area and secondly for unincorporated County. Results for the incorporated jurisdictions are presented in their annexes to this Plan.

**Yuba County Planning Area**

Table 4-64 and Table 4-65 contain flood analysis results for Yuba County. These tables show the number of parcels and values at risk to the 1% and 0.2% annual chance event for Yuba County. Table 4-64 shows a summary of the value of improved parcels by 1% and 0.2% annual chance flood zones in the Planning Area. Table 4-65 shows the values in each flood zone by jurisdiction for the Planning Area.

***Table 4-64 Yuba County Planning Area – Count and Value of Parcels\* by 1% and 0.2% Flood Zone***

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard	2,904	1,655	361,647,754	330,971,553	253,454,574	946,073,881
0.2% Annual Chance Flood Hazard**	19,599	15,977	897,896,640	3,325,906,721	2,092,329,055	6,316,132,416
Other Areas	10,745	6,011	755,593,853	1,017,677,869	561,529,314	2,334,801,036
<b>Grand Total</b>	<b>33,248</b>	<b>23,643</b>	<b>2,015,138,247</b>	<b>4,674,556,143</b>	<b>2,907,312,943</b>	<b>9,597,007,333</b>

Source: FEMA 2/18/2011 DFIRM, Yuba County 2020 Parcel/Assessor’s Data

\*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

\*\*This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone. This parcel count also includes X Protected by Levee flood zones

***Table 4-65 Yuba County Planning Area – Count and Value of Parcels\* by 1% and 0.2% Flood Zone by Jurisdiction***

Flood Zone/ Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>City of Marysville</b>						
1% Annual Chance Flood Hazard	323	3	\$906,226	\$13,398,946	\$20,087,473	\$34,392,645

Flood Zone/ Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
0.2% Annual Chance Flood Hazard**	4,061	3,672	\$167,975,475	\$981,267,641	\$770,267,311	\$1,919,510,427
Other Areas	0	0	\$0	\$0	\$0	\$0
<b>City of Marysville Total</b>	<b>4,384</b>	<b>3,675</b>	<b>\$168,881,701</b>	<b>\$994,666,587</b>	<b>\$790,354,784</b>	<b>\$1,953,903,072</b>
<b>City of Wheatland</b>						
1% Annual Chance Flood Hazard	362	289	\$19,010,460	\$70,663,519	\$38,600,736	\$128,274,715
0.2% Annual Chance Flood Hazard**	612	489	\$37,986,565	\$86,994,070	\$49,153,803	\$174,134,438
Other Areas	458	388	\$28,134,207	\$68,877,401	\$37,252,011	\$134,263,619
<b>City of Wheatland Total</b>	<b>1,432</b>	<b>1,166</b>	<b>\$85,131,232</b>	<b>\$226,534,990</b>	<b>\$125,006,550</b>	<b>\$436,672,772</b>
<b>Unincorporated Yuba County</b>						
1% Annual Chance Flood Hazard	2,219	1,363	\$341,731,068	\$246,909,088	\$194,766,365	\$783,406,521
0.2% Annual Chance Flood Hazard**	14,926	11,816	\$691,934,600	\$2,257,645,010	\$1,272,907,941	\$4,222,487,551
Other Areas	10,287	5,623	\$727,459,646	\$948,800,468	\$524,277,303	\$2,200,537,417
<b>Unincorporated County Total</b>	<b>27,432</b>	<b>18,802</b>	<b>\$1,761,125,314</b>	<b>\$3,453,354,566</b>	<b>\$1,991,951,609</b>	<b>\$7,206,431,489</b>
<b>Grand Total</b>						
	<b>33,248</b>	<b>23,643</b>	<b>\$2,015,138,247</b>	<b>\$4,674,556,143</b>	<b>\$2,907,312,943</b>	<b>\$9,597,007,333</b>

Source: FEMA 2/18/2011 DFIRM, Yuba County 2020 Parcel/Assessor's Data

\*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

\*\*This parcel count only includes those parcels in the 0.2% annual chance floodplain, exclusive of the 1% annual chance floodplain. The 0.2% annual chance flood also includes all parcels in the 1% annual chance floodplain. This parcel count also includes X Protected by Levee flood zones

Table 4-66 shows a summary table of loss estimates by 1% and 0.2% annual chance flood zone for the Yuba County Planning Area. The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all parcels located in the Planning Area) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator that a community may have more difficulties recovering from a flood. The County should keep in mind that the loss ratio could increase with additional development in the 1% and 0.2% annual chance flood zone unless development is elevated in accordance with the local floodplain management ordinance.

*Table 4-66 Yuba County Planning Area – Flood Loss Estimate*

Flood Zone	Total Parcel Count*	Improved Parcel Count*	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood	2,904	1,655	\$330,971,553	\$253,454,574	\$584,426,127	\$116,885,225	1.75%
0.2% Annual Chance Flood**	19,599	15,977	\$3,325,906,721	\$2,092,329,055	\$5,418,235,776	\$1,083,647,155	16.20%
<b>Grand Total</b>	<b>22,503</b>	<b>17,632</b>	<b>\$3,656,878,274</b>	<b>\$2,345,783,629</b>	<b>\$6,002,661,903</b>	<b>\$1,200,532,380</b>	<b>17.95%</b>

Source: FEMA 2/18/2011 DFIRM, Yuba County 2020 Parcel/Assessor's Data

\*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual flood zone, may be elevated and or otherwise outside of the identified flood zone

\*\*This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood also includes all parcels in the 1% annual chance flood zone. This parcel count also includes X Protected by Levee flood zones.

According to the information in Table 4-64 through Table 4-66, the Yuba County Planning Area has 1,655 improved parcels and roughly \$584 million of structure and contents value in the 1% annual chance flood zone. There are an additional 15,977 improved parcels and roughly \$5.42 billion of structure and contents value in the 0.2% annual chance flood event. A loss ratio of 1.75% (1% annual chance) and 16.2% (0.2% annual chance) indicates that the Yuba County Planning Area has values at risk in the 1% annual chance floodplain that the County could recover from, but the sizable values in the 0.2% annual chance flood zone would be difficult to overcome.

### Unincorporated Yuba County

Table 4-67 contain flood analysis results for unincorporated Yuba County. These tables show the number of parcels and values at risk to the 1% and 0.2% annual chance event for unincorporated Yuba County. Table 4-67 shows the number of improved parcels and associated structure and other improved values at risk to the each of the FEMA flood zones using the DFIRM data by property use type.

*Table 4-67 Unincorporated Yuba County – Count and Value of Parcels\* by 1% and 0.2% Flood Zone by Property Use*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>1% Annual Chance Flood Hazard</b>						
<b>Zone A</b>						
Agricultural	602	341	\$229,182,549	\$40,899,475	\$40,899,475	\$310,981,499
Commercial	41	20	\$7,961,914	\$5,547,913	\$5,547,913	\$19,057,740

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Government-Owned / Non-Taxable Property	126	0	\$1	\$0	\$0	\$1
Industrial	43	32	\$8,004,559	\$41,627,592	\$62,441,391	\$112,073,542
Miscellaneous	76	1	\$233,888	\$145,152	\$145,152	\$524,192
Residential	997	871	\$42,793,806	\$141,686,040	\$70,843,014	\$255,322,860
<b>Zone A Total</b>	<b>1,885</b>	<b>1,265</b>	<b>\$288,176,717</b>	<b>\$229,906,172</b>	<b>\$179,876,945</b>	<b>\$697,959,834</b>
<b>Zone AE Floodway</b>						
Agricultural	27	15	\$5,180,629	\$357,769	\$357,769	\$5,896,167
Commercial	1	1	\$187,402	\$6,366	\$6,366	\$200,134
Government-Owned / Non-Taxable Property	26	0	\$39,694	\$0	\$0	\$39,694
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	4	0	\$0	\$0	\$0	\$0
Residential	8	2	\$99,161	\$177,759	\$88,879	\$365,799
<b>Zone AE Floodway Total</b>	<b>66</b>	<b>18</b>	<b>\$5,506,886</b>	<b>\$541,894</b>	<b>\$453,014</b>	<b>\$6,501,794</b>
<b>Zone AE</b>						
Agricultural	107	35	\$43,305,569	\$8,086,429	\$8,086,429	\$59,478,427
Commercial	8	6	\$1,299,775	\$4,032,494	\$4,032,494	\$9,364,763
Government-Owned / Non-Taxable Property	68	1	\$18,020	\$949	\$949	\$19,918
Industrial	1	1	\$182,076	\$91,035	\$136,552	\$409,663
Miscellaneous	13	0	\$0	\$0	\$0	\$0
Residential	56	29	\$1,661,312	\$3,615,332	\$1,807,667	\$7,084,311
<b>Zone AE Total</b>	<b>253</b>	<b>72</b>	<b>\$46,466,752</b>	<b>\$15,826,239</b>	<b>\$14,064,091</b>	<b>\$76,357,082</b>
<b>Zone AH</b>						
Agricultural	0	0	\$0	\$0	\$0	\$0
Commercial	2	0	\$319,452	\$0	\$0	\$319,452
Government-Owned / Non-Taxable Property	2	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	0	0	\$0	\$0	\$0	\$0
Residential	2	0	\$1	\$0	\$0	\$1
<b>Zone AH Total</b>	<b>6</b>	<b>0</b>	<b>\$319,453</b>	<b>\$0</b>	<b>\$0</b>	<b>\$319,453</b>
<b>Zone AO</b>						

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	5	4	\$1,153,773	\$109,847	\$109,847	\$1,373,467
Commercial	0	0	\$0	\$0	\$0	\$0
Government-Owned / Non-Taxable Property	0	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	0	0	\$0	\$0	\$0	\$0
Residential	4	4	\$107,487	\$524,936	\$262,468	\$894,891
<b>Zone AO Total</b>	<b>9</b>	<b>8</b>	<b>\$1,261,260</b>	<b>\$634,783</b>	<b>\$372,315</b>	<b>\$2,268,358</b>
<b>1% Annual Chance Flood Hazard Total</b>	<b>2,219</b>	<b>1,363</b>	<b>\$341,731,068</b>	<b>\$246,909,088</b>	<b>\$194,766,365</b>	<b>\$783,406,521</b>
<b>0.2% Annual Chance Flood Hazard**</b>						
<b>Zone X (shaded)</b>						
Agricultural	96	45	\$26,695,044	\$4,895,920	\$4,895,920	\$36,486,884
Commercial	6	4	\$9,348,339	\$12,138,168	\$12,138,168	\$33,624,675
Government-Owned / Non-Taxable Property	6	0	\$2,367	\$0	\$0	\$2,367
Industrial	5	4	\$2,453,888	\$6,520,900	\$9,781,349	\$18,756,137
Miscellaneous	7	0		\$4,219	\$4,219	\$8,438
Residential	93	78	\$4,417,178	\$14,643,020	\$7,321,509	\$26,381,707
<b>Zone X (shaded) Total</b>	<b>213</b>	<b>131</b>	<b>\$42,916,816</b>	<b>\$38,193,789</b>	<b>\$34,132,727</b>	<b>\$115,243,332</b>
<b>X Protected by Levee</b>						
Agricultural	263	122	\$89,185,053	\$15,231,112	\$15,231,112	\$119,647,277
Commercial	364	205	\$71,304,364	\$124,255,620	\$124,255,620	\$319,815,604
Government-Owned / Non-Taxable Property	318	0	\$482,763	\$0	\$0	\$482,763
Industrial	100	63	\$17,159,942	\$59,313,301	\$88,969,950	\$165,443,193
Miscellaneous	234	0	\$9,577	\$13,917	\$13,917	\$18,257
Residential	13,434	11,295	\$470,876,085	\$2,020,665,105	\$1,010,332,449	\$3,501,873,639
<b>X Protected by Levee Total</b>	<b>14,713</b>	<b>11,685</b>	<b>\$649,017,784</b>	<b>\$2,219,451,221</b>	<b>\$1,238,775,214</b>	<b>\$4,107,244,219</b>
<b>0.2% Annual Chance Flood Hazard Total</b>	<b>14,926</b>	<b>11,816</b>	<b>\$691,934,600</b>	<b>\$2,257,645,010</b>	<b>\$1,272,907,941</b>	<b>\$4,222,487,551</b>
<b>Other Areas</b>						
<b>Zone X (unshaded)</b>						

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	2,706	375	\$337,662,894	\$44,144,787	\$44,144,787	\$425,952,468
Commercial	128	105	\$10,989,858	\$43,569,680	\$43,569,680	\$98,129,218
Government-Owned / Non-Taxable Property	238	0	\$57,422	\$0	\$0	\$57,422
Industrial	11	9	\$9,140,350	\$1,479,891	\$2,219,836	\$12,840,077
Miscellaneous	269	0	\$0	0\$64,579	0\$64,579	0\$129,158
Residential	5,445	4,743	\$321,268,183	\$812,626,788	\$406,313,366	\$1,540,208,337
<b>Zone X (unshaded) Total</b>	<b>8,797</b>	<b>5,232</b>	<b>\$679,118,707</b>	<b>\$901,756,567</b>	<b>\$496,183,090</b>	<b>\$2,077,058,364</b>
<b>Zone D</b>						
Agricultural	329	26	\$22,073,480	\$1,315,904	\$1,315,904	\$24,705,288
Commercial	23	13	\$1,122,346	\$6,393,000	\$6,393,000	\$13,908,346
Government-Owned / Non-Taxable Property	298	0	\$6,368	\$0	\$0	\$6,368
Industrial	2	2	\$196,094	\$717,804	\$1,076,706	\$1,990,604
Miscellaneous	52	0	\$0	\$0	\$0	\$0
Residential	786	350	\$24,942,651	\$38,617,193	\$19,308,603	\$82,868,447
<b>Zone D Total</b>	<b>1,490</b>	<b>391</b>	<b>\$48,340,939</b>	<b>\$47,043,901</b>	<b>\$28,094,213</b>	<b>\$123,479,053</b>
<b>Other Areas Total</b>	<b>10,287</b>	<b>5,623</b>	<b>\$727,459,646</b>	<b>\$948,800,468</b>	<b>\$524,277,303</b>	<b>\$2,200,537,417</b>
<b>Unincorporated Yuba County Total</b>	<b>27,432</b>	<b>18,802</b>	<b>\$1,761,125,314</b>	<b>\$3,453,354,566</b>	<b>\$1,991,951,609</b>	<b>\$7,206,431,489</b>

Source: FEMA 2/18/2011 DFIRM, Yuba County 2020 Parcel/Assessor's Data

\*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

\*\*This parcel count only includes those parcels in the 0.2% annual chance floodplain, exclusive of the 1% annual chance floodplain. The 0.2% annual chance flood also includes all parcels in the 1% annual chance floodplain. This parcel count also includes X Protected by Levee flood zones

Table 4-68 shows a summary table of loss estimates by 1% and 0.2% annual chance flood zone for unincorporated Yuba County. The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all parcels located in the Planning Area) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator that a community may have more difficulties recovering from a flood. The County should keep in mind that the loss ratio could increase with additional development in the 1% and 0.2% annual chance flood zone unless development is elevated in accordance with the local floodplain management ordinance.

*Table 4-68 Unincorporated Yuba County – Flood Loss Estimate*

Flood Zone	Total Parcel Count*	Improved Parcel Count*	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood Hazard	2,219	1,363	\$246,909,088	\$194,766,365	\$441,675,453	\$88,335,091	1.32%
0.2% Annual Chance Flood Hazard**	14,926	11,816	\$2,257,645,010	\$1,272,907,941	\$3,530,552,951	\$706,110,590	10.56%
<b>Grand Total</b>	<b>17,145</b>	<b>13,179</b>	<b>\$2,504,554,098</b>	<b>\$1,467,674,306</b>	<b>\$3,972,228,404</b>	<b>\$794,445,681</b>	<b>11.88%</b>

Source: FEMA 6/16/2015 DFIRM, Yuba County 2020 Parcel/Assessor's Data

\*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual flood zone, may be elevated and or otherwise outside of the identified flood zone

\*\*This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood also includes all parcels in the 1% annual chance flood zone. This parcel count also includes X Protected by Levee flood zones

According to the information in Table 4-66, unincorporated Yuba County has 1,363 improved parcels and roughly \$442 million of structure and contents value in the 1% annual chance flood zone. There are an additional 1,816 improved parcels and roughly \$3.53 billion of structure and contents value in the 0.2% annual chance flood event. A loss ratio of 1.32% (1% annual chance) and 10.56% (0.2% annual chance) indicates that the Yuba County Planning Area has values at risk in the 1% annual chance floodplain that the County could recover from, but the sizable values in the 0.2% annual chance flood zone would be difficult to overcome.

### **Flooded Acres**

In addition to the centroid analysis used to obtain numbers of parcels and values at risk to flood hazards, parcel boundary analysis was performed to obtain total acres and flooded acres by flood zone for each parcel. The parcel layer was intersected with the FEMA DFIRM data to obtain the acres flooded. The following is an analysis of flooded acres in the County.

### *Methodology*

GIS was used to calculate acres flooded by FEMA flood zones and property use categories. The Yuba County parcel layer and FEMA DFIRM were intersected, and each segment divided by the intersection of flood zone and parcels was calculated for acres. This process was conducted for 1% and 0.2% annual chance floodplain areas, with each segment being defined by zone type (A, AE, 0.2% Annual Chance, and X) and acres. The resulting data tables with flooded acreages were then imported into a database and linked back to the original parcels, including total acres by parcel number. Once this was completed, each parcel contained acreage values for flooded acre by zone type within the parcel. In the tables below, the 1% and

0.2% annual chance flood zones are summarized and then split out by property use, their total flooded acres, total improved acres, and percent of improved acres that are flooded.

### Limitations

One limitation created by this type of analysis is that improvements are uniformly found throughout the parcel, while in reality, only portions of the parcel are improved, and improvements may or may not fall within the flood zone portion of a parcel; thus, areas of improvements flooded calculated through this method may be higher or lower than those actually seen in a similar real-world event.

The following tables represent a summary and detailed analysis of total acres for each FEMA DFIRM flood zone in the Planning Area. Table 4-69 gives summary information by 1% and 0.2% annual chance flood zone for the entire Yuba County Planning Area. In all of these tables, the Other Areas are areas (Zone X Unshaded – areas outside mapped flood hazard areas) outside of mapped flood hazard area.

*Table 4-69 Yuba County Planning Area– Flooded Acres Summary by Jurisdiction*

Flood Zone / Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
<b>City of Marysville</b>						
1% Annual Chance Flood Hazard	894	0.22%	82	0.05%	812	0.32%
0.2% Annual Chance Flood Hazard	1,450	0.35%	677	0.44%	773	0.30%
Other Areas	0	0.00%	0	0.00%	0	0.00%
<b>City of Marysville Total</b>	<b>2,345</b>	<b>0.57%</b>	<b>759</b>	<b>0.49%</b>	<b>1,585</b>	<b>0.62%</b>
<b>City of Wheatland</b>						
1% Annual Chance Flood Hazard	770	0.19%	273	0.18%	496	0.19%
0.2% Annual Chance Flood Hazard	1,755	0.43%	1,351	0.88%	404	0.16%
Other Areas	2,641	0.64%	370	0.24%	2,271	0.89%
<b>City of Wheatland Total</b>	<b>5,167</b>	<b>1.26%</b>	<b>1,995</b>	<b>1.29%</b>	<b>3,172</b>	<b>1.24%</b>
<b>Unincorporated Yuba County</b>						
1% Annual Chance Flood Hazard	70,576	17.19%	43,238	28.05%	27,338	10.66%

Flood Zone / Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
0.2% Annual Chance Flood Hazard	27,401	6.67%	16,823	10.91%	10,578	4.13%
Other Areas	305,076	74.31%	91,352	59.26%	213,724	83.36%
<b>Unincorporated Yuba County Total</b>	<b>403,053</b>	<b>98.17%</b>	<b>151,413</b>	<b>98.21%</b>	<b>251,640</b>	<b>98.14%</b>
<b>Grand Total</b>	<b>410,565</b>	<b>100.00%</b>	<b>154,167</b>	<b>100.00%</b>	<b>256,398</b>	<b>100.00%</b>

Source: FEMA DFIRM 2/18/2011, Yuba County 2020 Parcel/Assessor's Data

\*percent of the total acres in Yuba County

*Table 4-70 Unincorporated Yuba County – Flooded Acres by Flood Zone and Property Use*

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
<b>1% Annual Chance Flood Hazard</b>						
<b>Zone A</b>						
Agricultural	44,858	10.926%	32,668	21.190%	12,191	4.755%
Commercial	381	0.093%	231	0.150%	150	0.058%
Government-Owned / Non-Taxable Property	5,411	1.318%	0	0.000%	5,411	2.110%
Industrial	1,032	0.251%	712	0.462%	320	0.125%
Miscellaneous	1,502	0.366%	0	0.000%	1,501	0.586%
Residential	3,112	0.758%	2,823	1.831%	290	0.113%
<b>Zone A Total</b>	<b>56,297</b>	<b>13.712%</b>	<b>36,434</b>	<b>23.633%</b>	<b>19,863</b>	<b>7.747%</b>
<b>Zone AE</b>						
Agricultural	9,452	2.302%	5,332	3.458%	4,120	1.607%
Commercial	307	0.075%	300	0.195%	7	0.003%
Government-Owned / Non-Taxable Property	2,458	0.599%	12	0.008%	2,446	0.954%
Industrial	28	0.007%	28	0.018%	0	0.000%
Miscellaneous	167	0.041%	0	0.000%	167	0.065%
Residential	208	0.051%	107	0.069%	101	0.039%
<b>Zone AE Total</b>	<b>12,619</b>	<b>3.074%</b>	<b>5,779</b>	<b>3.749%</b>	<b>6,840</b>	<b>2.668%</b>
<b>Zone AE Floodway</b>						
Agricultural	1,049	0.255%	772	0.500%	277	0.108%

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Commercial	51	0.012%	51	0.033%	0	0.000%
Government-Owned / Non-Taxable Property	188	0.046%	0	0.000%	188	0.073%
Industrial	0	0.000%	0	0.000%	0	0.000%
Miscellaneous	35	0.009%	0	0.000%	35	0.014%
Residential	33	0.008%	16	0.010%	17	0.007%
<b>Zone AE Floodway Total</b>	<b>1,356</b>	<b>0.330%</b>	<b>838</b>	<b>0.544%</b>	<b>518</b>	<b>0.202%</b>
<b>Zone AH</b>						
Agricultural	10	0.002%	0	0.000%	10	0.004%
Commercial	8	0.002%	0	0.000%	8	0.003%
Government-Owned / Non-Taxable Property	5	0.001%	0	0.000%	5	0.002%
Industrial	0	0.000%	0	0.000%	0	0.000%
Miscellaneous	1	0.000%	0	0.000%	1	0.000%
Residential	6	0.001%	1	0.000%	5	0.002%
<b>Zone AH Total</b>	<b>30</b>	<b>0.007%</b>	<b>1</b>	<b>0.000%</b>	<b>29</b>	<b>0.011%</b>
<b>Zone AO</b>						
Agricultural	255	0.062%	180	0.117%	75	0.029%
Commercial	0	0.000%	0	0.000%	0	0.000%
Government-Owned / Non-Taxable Property	1	0.000%	0	0.000%	1	0.000%
Industrial	0	0.000%	0	0.000%	0	0.000%
Miscellaneous	11	0.003%	0	0.000%	11	0.004%
Residential	8	0.002%	6	0.004%	2	0.001%
<b>Zone AO Total</b>	<b>275</b>	<b>0.067%</b>	<b>186</b>	<b>0.121%</b>	<b>89</b>	<b>0.035%</b>
<b>1% Annual Chance Flood Hazard Total</b>	<b>70,576</b>	<b>17.190%</b>	<b>43,238</b>	<b>28.046%</b>	<b>27,338</b>	<b>10.662%</b>
<b>0.2% Annual Chance Flood Hazard</b>						
<b>Zone X (shaded)</b>						
Agricultural	5,466	1.331%	4,005	2.598%	1,461	0.570%
Commercial	667	0.163%	607	0.394%	60	0.023%
Government-Owned / Non-Taxable Property	18	0.004%	0	0.000%	18	0.007%

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Industrial	58	0.014%	35	0.023%	23	0.009%
Miscellaneous	153	0.037%	0	0.000%	153	0.060%
Residential	443	0.108%	418	0.271%	24	0.009%
<b>Zone X (shaded) Total</b>	<b>6,805</b>	<b>1.657%</b>	<b>5,066</b>	<b>3.286%</b>	<b>1,739</b>	<b>0.678%</b>
<b>X Protected by Levee</b>						
Agricultural	9,873	2.405%	6,524	4.232%	3,349	1.306%
Commercial	640	0.156%	308	0.200%	332	0.129%
Government-Owned / Non-Taxable Property	2,346	0.571%	0	0.000%	2,346	0.915%
Industrial	803	0.196%	625	0.406%	178	0.069%
Miscellaneous	1,606	0.391%	0	0.000%	1,606	0.627%
Residential	5,328	1.298%	4,300	2.789%	1,028	0.401%
<b>X Protected by Levee Total</b>	<b>20,597</b>	<b>5.017%</b>	<b>11,757</b>	<b>7.626%</b>	<b>8,839</b>	<b>3.447%</b>
<b>0.2% Annual Chance Flood Hazard Total</b>	<b>27,401</b>	<b>6.674%</b>	<b>16,823</b>	<b>10.912%</b>	<b>10,578</b>	<b>4.126%</b>
<b>Other Areas</b>						
<b>Zone X (unshaded)</b>						
Agricultural	140,243	34.158%	40,180	26.063%	100,062	39.026%
Commercial	2,062	0.502%	1,955	1.268%	106	0.042%
Government-Owned / Non-Taxable Property	14,921	3.634%	0	0.000%	14,921	5.819%
Industrial	1,018	0.248%	939	0.609%	78	0.031%
Miscellaneous	3,497	0.852%	0		3,497	1.364%
Residential	44,748	10.899%	41,902	27.180%	2,846	1.110%
<b>Zone X (unshaded) Total</b>	<b>206,487</b>	<b>50.293%</b>	<b>84,977</b>	<b>55.120%</b>	<b>121,511</b>	<b>47.391%</b>
<b>Zone D</b>						
Agricultural	18,592	4.528%	1,307	0.848%	17,285	6.741%
Commercial	216	0.053%	160	0.104%	56	0.022%
Government-Owned / Non-Taxable Property	73,844	17.986%	0	0.000%	73,844	28.801%
Industrial	28	0.007%	28	0.018%	0	0.000%
Miscellaneous	531	0.129%	0	0.000%	531	0.207%

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Residential	5,377	1.310%	4,881	3.166%	496	0.193%
<b>Zone D Total</b>	<b>98,589</b>	<b>24.013%</b>	<b>6,376</b>	<b>4.136%</b>	<b>92,213</b>	<b>35.965%</b>
<b>Other Areas Total</b>	<b>305,076</b>	<b>74.307%</b>	<b>91,352</b>	<b>59.256%</b>	<b>213,724</b>	<b>83.356%</b>
<b>Unincorporated Yuba County Total</b>	<b>403,053</b>	<b>98.171%</b>	<b>151,413</b>	<b>98.214%</b>	<b>251,640</b>	<b>98.144%</b>

Source: FEMA DFIRM 2/18/2011, Yuba County 2020 Parcel/Assessor's Data

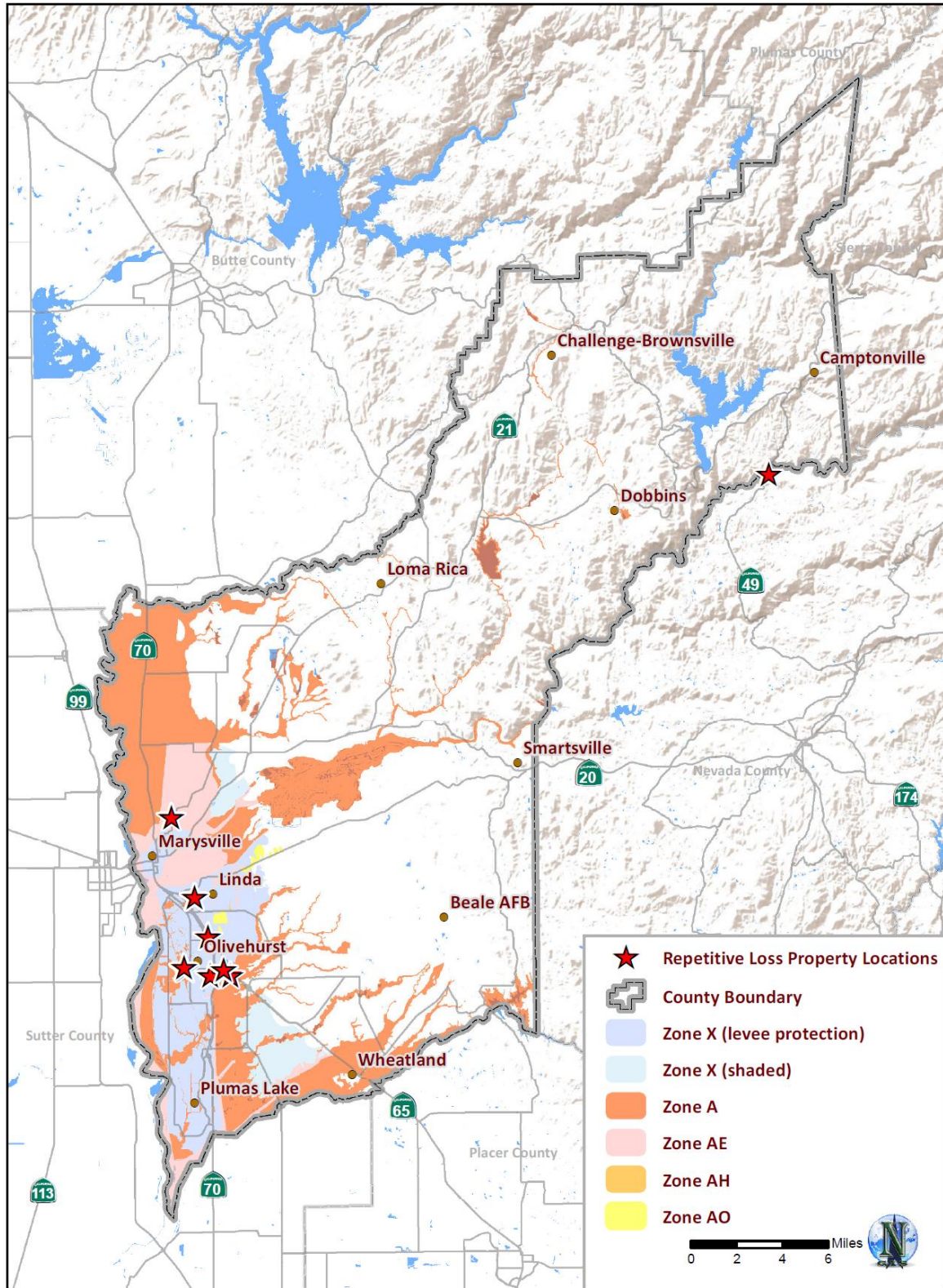
\*percent of the total acres in Yuba County

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

Standard property insurance does not include flood coverage because of the relatively high risk. The National Flood Insurance Program (NFIP) provides flood insurance to residents in those communities that participate in the NFIP. Federal financial assistance requires the purchase of flood for structures located within a 100-year floodplain – a requirement that affects nearly all mortgages financed through commercial lending institutions. Flood insurance is also recommended for all structures protected by levees, even if not mapped within a floodplain.

Yuba County entered the NFIP on an emergency basis on September 6, 1974 and has participated in the Regular Phase of the NFIP since May 17, 1982. The County participates in the CRS, and is currently a Class 7 community, which provides for a 15% discount to flood insurance policies in the SFHA. This saves residents in the unincorporated County an estimated \$83,121 each year. NFIP insurance data provided by DWR indicates that as of March 24, 2020, there were 2,086 policies in force in the unincorporated County, resulting in \$649,110,200 of insurance in force. There have been 278 closed paid losses totaling \$8,074,656.02. Of these losses, 105 were parcels in A zones, 2 were in D Zones and 159 parcels were in B, C, or X zone, with 2 in unknown or flood zones that no longer exist. There are 45 repetitive loss (RL) structures, and no severe repetitive loss (SRL) structures in the County. Repetitive Loss flood areas in the County area shown on Figure 4-62. The 45 RL structures saw paid losses of \$1,079,367.28. Of these RL buildings, 29 are in the A zones, 14 are in the B, C, or X zone, and 2 were in other zones. The County noted that many of the RL property claims are due to localized flooding issues due to lack of drainage or insufficient drainage infrastructure. There have been 62 substantial damage claims since 1978.

Figure 4-62 Yuba County – Repetitive Loss Areas



Sources: County of Yuba; FEMA; SACOG; ESRI; USGS; NOAA

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Based on this analysis of insurance coverage, Yuba County has significant values at risk to the 1% and 0.2% annual chance and greater floods. Of the 1,363 improved parcels within the 1% annual chance flood zone, only 160 (or 11.7 percent) of those parcels maintain flood insurance. This can be seen on Table 4-71, along with insurance information from the 2 incorporated communities in the County.

*Table 4-71 Yuba County Planning Area– Percentage of Policy Holders to Improved Parcels in the 1% Annual Chance Floodplain*

Jurisdiction	Improved Parcels in SFHA (1% Annual Chance) Floodplain*	Insurance Policies in the SFHA (1% Annual Chance) Floodplain	Percentage of 1% Annual Chance Floodplain Parcels Currently Insured
City of Marysville	3	2	66.6%
City of Wheatland	289	12	4.2%
Unincorporated County	1,363	160	11.7%

Source: FEMA DFIRM 2/18/2011, Yuba County 2020 Parcel/Assessor's Data

### DFIRM Population at Risk

A separate analysis was performed to determine populations that reside in flood zones. Using GIS, the DFIRM Flood dataset was overlaid on the improved residential parcel data. Those parcel centroids that intersect a flood zone were counted and multiplied by the Census Bureau average household size; and tabulated by flood zone (see Table 4-72). According to this analysis, there is a population of 853 in the 1% annual chance flood zone, and 41,583 in the 0.2% annual chance flood zone for the entire Yuba County Planning Area. Of these, in unincorporated Yuba County, there is a population of 94 and 32,300 respectively in the 1% and 0.2% annual chance floodplains. It should be noted here that the 0.2% annual chance includes both the 500-year floodplain as well as the X Protected by Levee areas.

*Table 4-72 Yuba County Planning Area – Residential Population at Risk to 1% and 0.2% Annual Chance Flooding*

Jurisdiction	1% Annual Chance		0.2% Annual Chance*	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
City of Marysville	0	0	3,275	8,089
City of Wheatland	282	759	444	1,194
Unincorporated Yuba County	33	94	11,373	32,300
<b>Total</b>	<b>315</b>	<b>853</b>	<b>15,092</b>	<b>41,583</b>

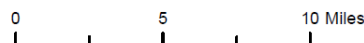
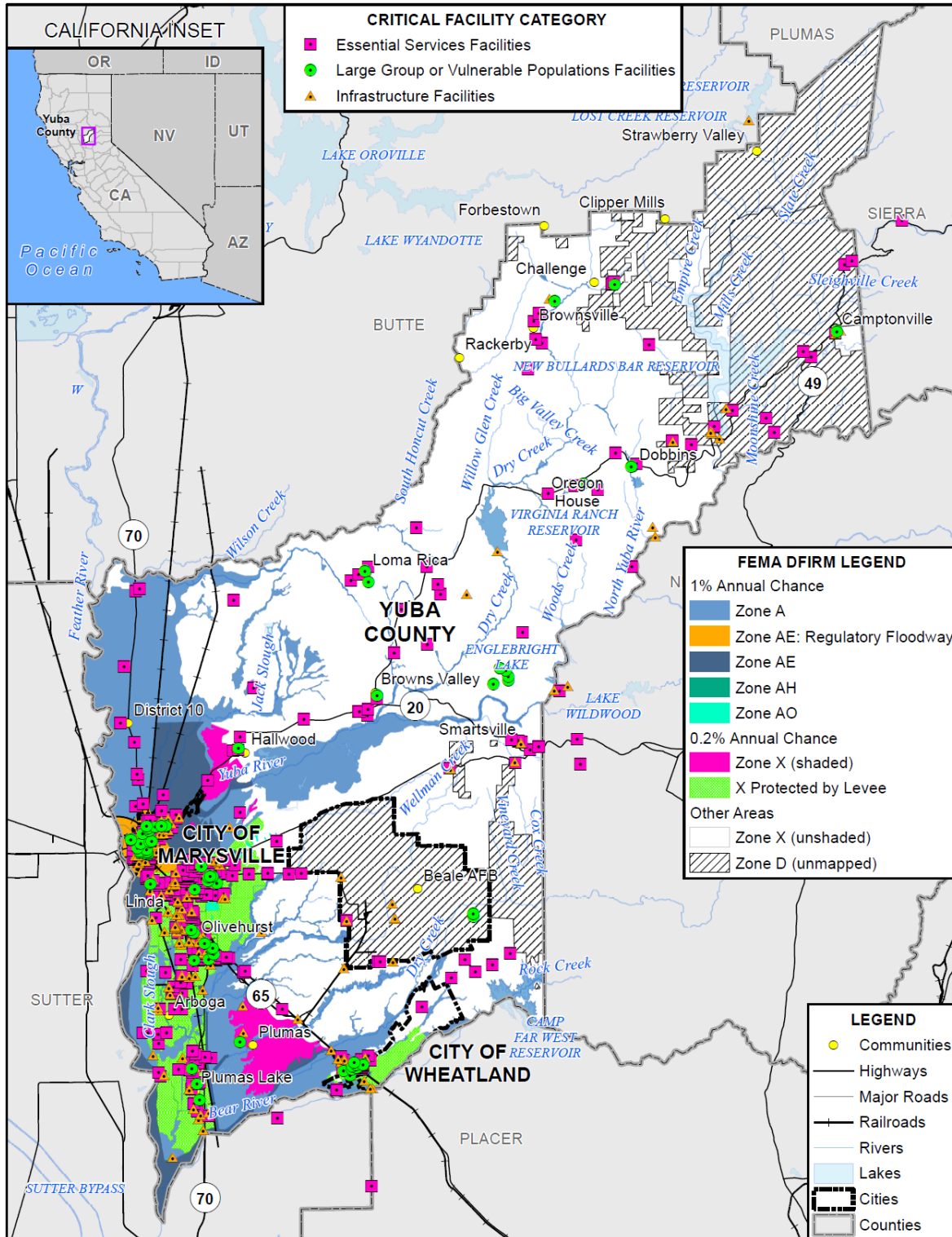
Source: FEMA DFIRM 7/19/2018, US Census Bureau Average Household Sizes: Maryville (2.47); Wheatland (2.69) and unincorporated Yuba County (2.84)

\*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

## **DFIRM Critical Facilities at Risk**

A separate analysis was performed on the critical facility inventory in Yuba County and all jurisdictions to determine critical facilities in the 1% and 0.2 annual chance flood zones. Using GIS, the DFIRM flood zones were overlaid on the critical facility GIS layer. Figure 4-63 shows critical facilities, as well as the DFIRM flood zones. Table 4-73 summarizes the critical facilities in the County by DFIRM flood zone. Table 4-74 details critical facilities by facility type and count for the Planning Area. Details of critical facility definition, type, name and address by flood zone are listed in Appendix F.

Figure 4-63 Yuba County – Critical Facilities in DFIRM Flood Zones



Data Source: FEMA DFIRM 2/18/2011, Yuba County GIS, Cal-Atlas; Map Date: 07/15/2021.

*Table 4-73 Yuba County – Summary of Critical Facilities in DFIRM Flood Zones*

Jurisdiction / Flood Zone	Facility Count
<b>City of Marysville</b>	
0.2% Annual Chance Flood Hazard	125
<b>City of Marysville Total</b>	<b>125</b>
<b>City of Wheatland</b>	
1% Annual Chance Flood Hazard	11
0.2% Annual Chance Flood Hazard	22
Other Areas	8
<b>City of Wheatland Total</b>	<b>41</b>
<b>Unincorporated Yuba County</b>	
1% Annual Chance Flood Hazard	37
0.2% Annual Chance Flood Hazard	250
Other Areas	121
<b>Unincorporated Yuba County Total</b>	<b>408</b>
<b>Outside of Unincorporated Yuba County</b>	
Unknown	10
<b>Outside of Unincorporated Yuba County Total</b>	<b>10</b>
<b>Grand Total</b>	
	<b>584</b>

Source: Yuba County GIS, FEMA 2/18/2011 DFIRM

*Table 4-74 Yuba County – Critical Facilities in DFIRM Flood Zones by Facility Category*

Jurisdiction / Flood Zone	Critical Facility Class	Facility Count
<b>City of Marysville</b>		
0.2% Annual Chance Flood Hazard	Essential Services Facilities	86
	Large Group or Vulnerable Populations Facilities	20
	Infrastructure Facilities	19
	<b>Total</b>	<b>125</b>
<b>City of Marysville Total</b>		<b>125</b>
<b>City of Wheatland</b>		
1% Annual Chance Flood Hazard	Essential Services Facilities	3
	Large Group or Vulnerable Populations Facilities	2
	Infrastructure Facilities	6
	<b>Total</b>	<b>11</b>
0.2% Annual Chance Flood Hazard	Essential Services Facilities	10
	Large Group or Vulnerable Populations Facilities	5

Jurisdiction / Flood Zone	Critical Facility Class	Facility Count
	Infrastructure Facilities	7
	<b>Total</b>	<b>22</b>
Other Areas	Essential Services Facilities	5
	Large Group or Vulnerable Populations Facilities	2
	Infrastructure Facilities	1
	<b>Total</b>	<b>8</b>
<b>City of Wheatland Total</b>		<b>41</b>
<b>Unincorporated Yuba County</b>		
1% Annual Chance Flood Hazard	Essential Services Facilities	28
	Large Group or Vulnerable Populations Facilities	0
	Infrastructure Facilities	9
	<b>Total</b>	<b>37</b>
0.2% Annual Chance Flood Hazard	Essential Services Facilities	160
	Large Group or Vulnerable Populations Facilities	22
	Infrastructure Facilities	68
	<b>Total</b>	<b>250</b>
Other Areas	Essential Services Facilities	78
	Large Group or Vulnerable Populations Facilities	17
	Infrastructure Facilities	26
	<b>Total</b>	<b>121</b>
<b>Unincorporated Yuba County Total</b>		<b>408</b>
<b>Outside of Unincorporated Yuba County</b>		
Unknown	Essential Services Facilities	6
	Large Group or Vulnerable Populations Facilities	
	Infrastructure Facilities	4
	<b>Total</b>	<b>10</b>
<b>Outside of Unincorporated Yuba County Total</b>		<b>10</b>
<b>Grand Total</b>		
<b>Grand Total</b>		<b>584</b>

Source: Yuba County GIS, FEMA 2/18/2011 DFIRM

## Overall Community Impact

Floods and their impacts vary by location and severity of any given flood event and will likely only affect certain areas of the County during specific times. Natural areas, such as wetlands and riparian areas within the floodplain, often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters. Preserving and protecting these areas and associated functions are a vital component of sound floodplain management practices for Yuba County. Based on the risk assessment, it is evident that floods will continue to have

potentially devastating economic impacts to certain areas of the County. However, many of the floods in the County are minor, localized flood events that are more of a nuisance than a disaster. Impacts that are not quantified, but can be anticipated in large future events, include:

- Injury and loss of life;
- Commercial and residential structural and property damage;
- Disruption of and damage to public infrastructure and services;
- Health hazards associated with mold and mildew, contamination of drinking water, etc.;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) to the community;
- Negative impact on commercial and residential property values; and
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.
- Impact on the overall mental health of the community.

### *Future Development and Future Flood Conditions*

This section provides an analysis of the flood hazard and proposed future development within the County based on FEMA floodplains and also discusses considerations in evaluating future flooding conditions.

#### **Future Development: General Considerations**

Communities that participate in the NFIP adopt regulations and codes that govern development in special flood hazard areas (SFHAs) and enforce those requirements through their local floodplain management ordinances through the issuance of permits. Yuba County's floodplain management ordinance provides standards for development, subdivision of land, construction of buildings, and improvements and repairs to buildings that meet, and in some instances exceed, the minimum requirements of the NFIP.

The International Residential Code (IRC) and International Building Code (IBC), by reference to ASCE 24, include requirements that govern the design and construction of buildings and structures in flood hazard areas. FEMA has determined that the flood provisions of the I-Codes are consistent with the requirements of the NFIP (the I-Code requirements shown either meet or exceed NFIP requirements). ASCE 24, a design standard developed by the American Society of Civil Engineers, expands on the minimum NFIP requirements with more specificity, additional requirements, and some limitations.

With the adoption of the International Codes, communities will be moving towards a more stringent approach to regulatory floodplain management, beyond the minimum requirements of the NFIP. The adoption and enforcement of disaster-resistant building codes is a core community action to promote effective mitigation. When communities ensure that new buildings and infrastructure are designed and constructed in accordance with national building codes and construction standards, they significantly increase local resilience now and in the future. With continued advancements in building codes, local ordinances should be reviewed and updated to meet and exceed standards as practicable to protect new development from future flood events and to further promote disaster resiliency.

One of the most effective ways to reduce vulnerability to potential flood damage is through careful land use planning that fully considers applicable flood management information and practices. Master planning

will also be necessary to assure that open channel flood flow conveyances serving the smaller internal streams and drainage areas are adequately prepared to accommodate the flows. Preservation and maintenance of natural and riparian areas should also be an ongoing priority to realize the flood control benefits of the natural and beneficial functions of these areas.

### **Future Development and Streambank Erosion**

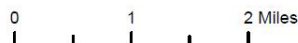
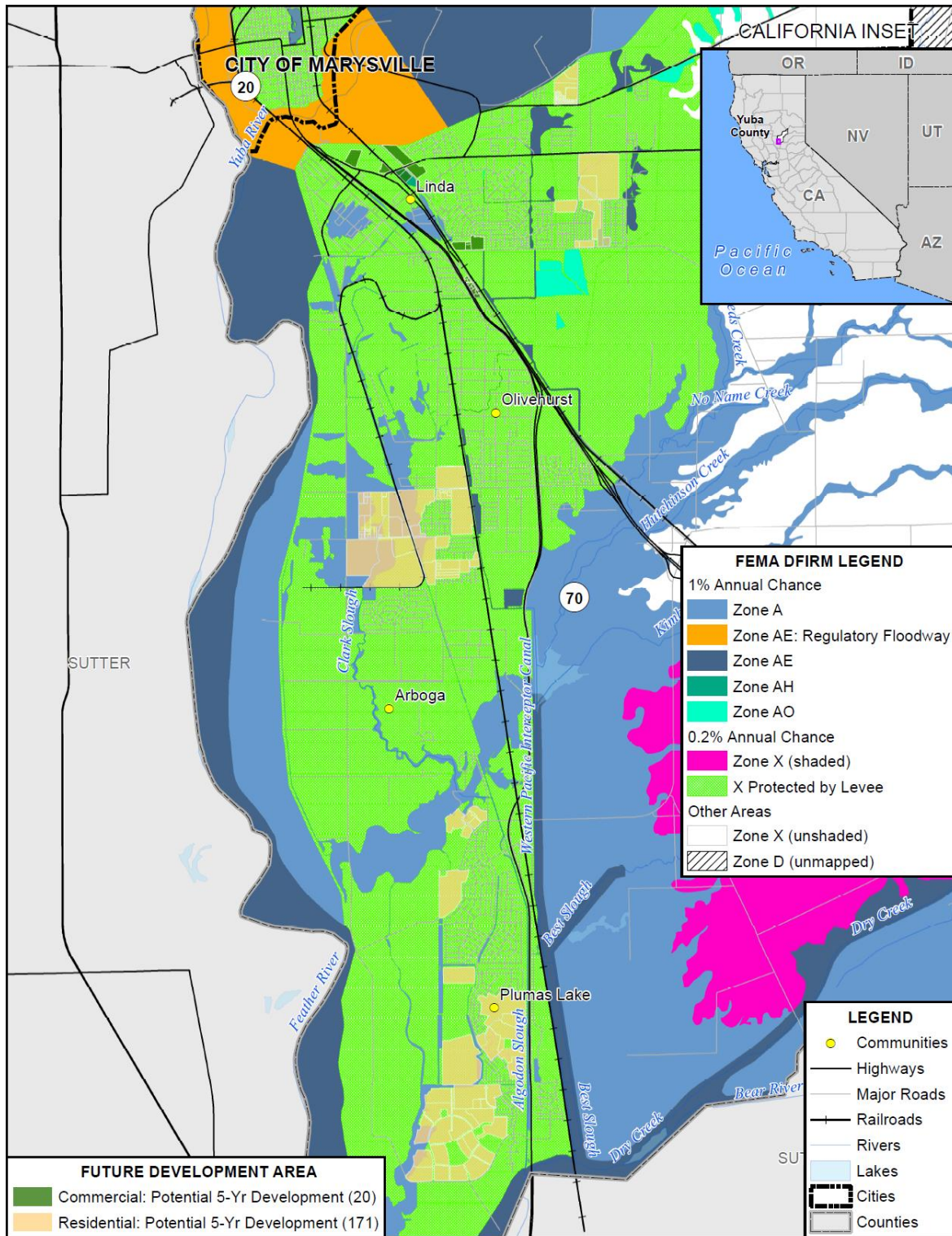
Also to be considered in reducing flooding in areas of existing and future development is to promote implementation of stormwater program elements and erosion and sediment controls, including the clearing of vegetation from natural and man-made drains that are critical to flood protection. Both native and invasive species can clog drains, and reduce flows of floodwaters, which slow that natural drainage process and can exacerbate flooding. Planned developments should take erosion risk areas into account during the construction of new homes and commercial properties. Erosion to streambanks may increase as development increases the amount of impervious surface that would normally hold or slow rainwaters. The County will continue to enforce the zoning and subdivision ordinances that are discussed in Section 4.4.1.

### **Future Development: GIS Analysis**

Yuba County's 2020 Parcel/Assessor's data and data from the County planning department were used as the basis for the unincorporated County's inventory of parcels and acres of future development areas. Using the GIS parcel spatial file and the APNs, the future development projects were mapped.

For the flood analysis of future development areas, the parcel data was converted to a point layer using a centroid conversion process, in which each parcel was identified by a central point and linked to the Assessor's data. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within each FEMA flood zone. DFIRM flood zones and future development areas are shown on Figure 4-64 and parcels and acreages in those areas are shown in Table 4-75.

Figure 4-64 Unincorporated Yuba County – Future Development in DFIRM Flood Zones



Data Source: FEMA DFIRM 2/18/2011, Yuba County GIS, Cal-Atlas; Map Date: 07/15/2021.



*Table 4-75 Unincorporated Yuba County – Future Development Parcels and Acres in DFIRM Flood Zones*

Future Development / Flood Zones	Total Parcel Count	Improved Parcel Count	Total Acres
<b>1% Annual Chance Flood Hazard</b>			
<b>Zone A</b>			
Residential: Potential 5-Yr Development	24	13	246.3
<b>Zone A Total</b>	<b>24</b>	<b>13</b>	<b>246.3</b>
<b>Zone AH</b>			
Commercial: Potential 5-Yr Development	2	0	8.8
Residential: Potential 5-Yr Development	1	0	4.4
<b>Zone AH Total</b>	<b>3</b>	<b>0</b>	<b>13.3</b>
<b>1% Annual Chance Flood Hazard Total</b>	<b>27</b>	<b>13</b>	<b>259.6</b>
<b>0.2% Annual Chance Flood Hazard</b>			
<b>X Protected by Levee</b>			
Commercial: Potential 5-Yr Development	18	1	80.8
Residential: Potential 5-Yr Development	146	58	1,581.6
<b>X Protected by Levee Total</b>	<b>164</b>	<b>59</b>	<b>1,662.4</b>
<b>0.2% Annual Chance Flood Hazard Total</b>	<b>164</b>	<b>59</b>	<b>1,662.4</b>
<b>Grand Total</b>	<b>191</b>	<b>72</b>	<b>1,922.0</b>

Source: FEMA 2/18/2011 DFIRM, Yuba County GIS

### Future Flood Conditions: The Effects of Climate Change

The effects of climate change on future flood conditions should also be considered. While the risk and associated short and long-term impacts of climate change are uncertain, experts in this field tend to agree that among the most significant impacts include those resulting from increased heat and precipitation events that cause increased frequency and magnitude of flooding. Changes associated with climate change and flooding could be significant given the higher elevations in neighboring counties where winter snow could turn to more significant rain events. Increases in damaging flood events will cause greater property damage, public health and safety concerns displacement, and loss of life. In addition, an increase in the magnitude and severity of flood events can lead to potential contamination of potable water and contamination of food crops given the agricultural industry in the County. Displacement of residents can include both temporary and long-term displacement, increase in insurance rates or restriction of coverage in vulnerable areas.

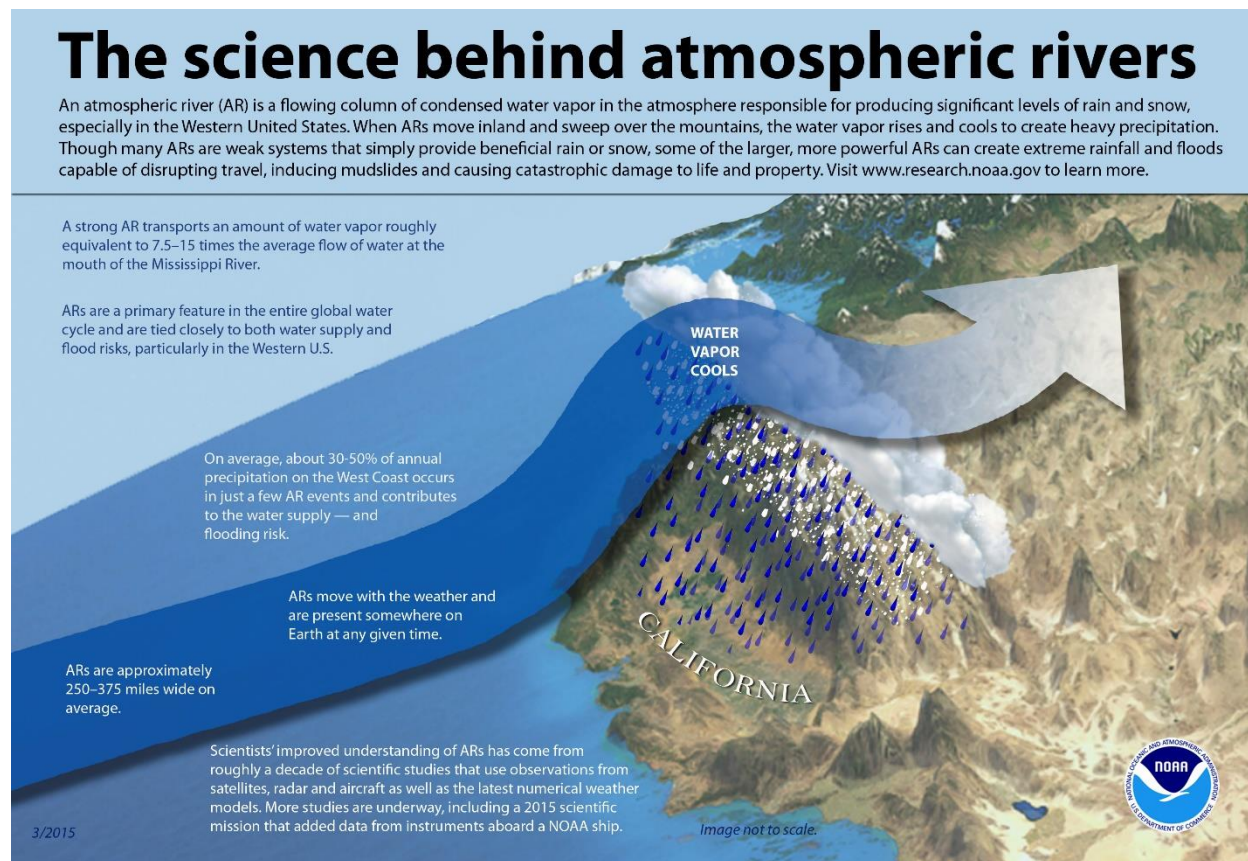
Yuba County will continue to study the risk and vulnerability associated with future flood conditions, both in terms of future growth areas and other considerations such as climate change, as they evaluate and implement their flood mitigation and adaptation strategy for the Yuba County Planning Area.

### Future Flood Conditions: Atmospheric Rivers

Yuba County and the rest of Northern California can be affected by a phenomenon known as an atmospheric river. According to the NOAA, atmospheric rivers are relatively long, narrow regions in the atmosphere –

like rivers in the sky – that transport most of the water vapor outside of the tropics. These columns of vapor move with the weather, carrying an amount of water vapor roughly equivalent to the average flow of water at the mouth of the Mississippi River. When the atmospheric rivers make landfall, they often release this water vapor in the form of rain or snow. This can be seen in Figure 4-65.

*Figure 4-65 Atmospheric Rivers*



Source: NOAA

Although atmospheric rivers come in many shapes and sizes, those that contain the largest amounts of water vapor and the strongest winds can create extreme rainfall and floods, often by stalling over watersheds vulnerable to flooding. These events can disrupt travel, induce mudslides and cause catastrophic damage to life and property. A well-known example is the "Pineapple Express," a strong atmospheric river that is capable of bringing moisture from the tropics near Hawaii over to the U.S. West Coast.

Not all atmospheric rivers cause damage; most are weak systems that often provide beneficial rain or snow that is crucial to the water supply. Atmospheric rivers are a key feature in the global water cycle and are closely tied to both water supply and flood risks — particularly in the western United States.

While atmospheric rivers are responsible for great quantities of rain that can produce flooding, they also contribute to beneficial increases in snowpack. A series of atmospheric rivers fueled the strong winter storms that battered the U.S. West Coast from western Washington to southern California from Dec. 10–

22, 2010, producing 11 to 25 inches of rain in certain areas. These rivers also contributed to the snowpack in the Sierras, which received 75 percent of its annual snow by Dec. 22, the first full day of winter.

### Future Flood Conditions: ARkStorm Scenario

Also to be considered in evaluating potential “worst case” future flood conditions, is the ARkStorm Scenario. Although much attention in California’s focuses on the “Big One” as a high magnitude earthquake, there is the risk of another significant event in California – a massive, statewide winter storm. The last such storms occurred in the 19th century, outside the memory of current emergency managers, officials, and communities. However, massive storms are a recurring feature of the state, the source of rare but inevitable disasters. The USGS Multi Hazards Demonstration Project’s (MHDP) developed a product called ARkStorm, which addressed massive U.S. West Coast storms analogous to those that devastated California in 1861-1862. Over the last decade, scientists have determined that the largest storms in California are the product of phenomena called Atmospheric Rivers, and so the MHDP storm scenario is called the ARkStorm, for Atmospheric River 1000 (a measure of the storm’s size).

Scientific studies of offshore deposits in northern and southern California indicate that storms of this magnitude and larger have occurred about as often as large earthquakes on the southern San Andreas Fault. Such storms are projected to become more frequent and intense as a result of climate change. This scientific effort resulted in a plausible flood hazard scenario to be used as a planning and preparation tool by hazard mitigation and emergency response agencies.

For the ARkStorm Scenario, experts designed a large, scientifically realistic meteorological event followed by an examination of the secondary hazards (e.g., landslides and flooding), physical damages to the intense winter storms of 1861-62 that left California’s Central Valley impassible. Storms far larger than the ARkStorm, dubbed megastorms, have also hit California at least six times in the last two millennia.

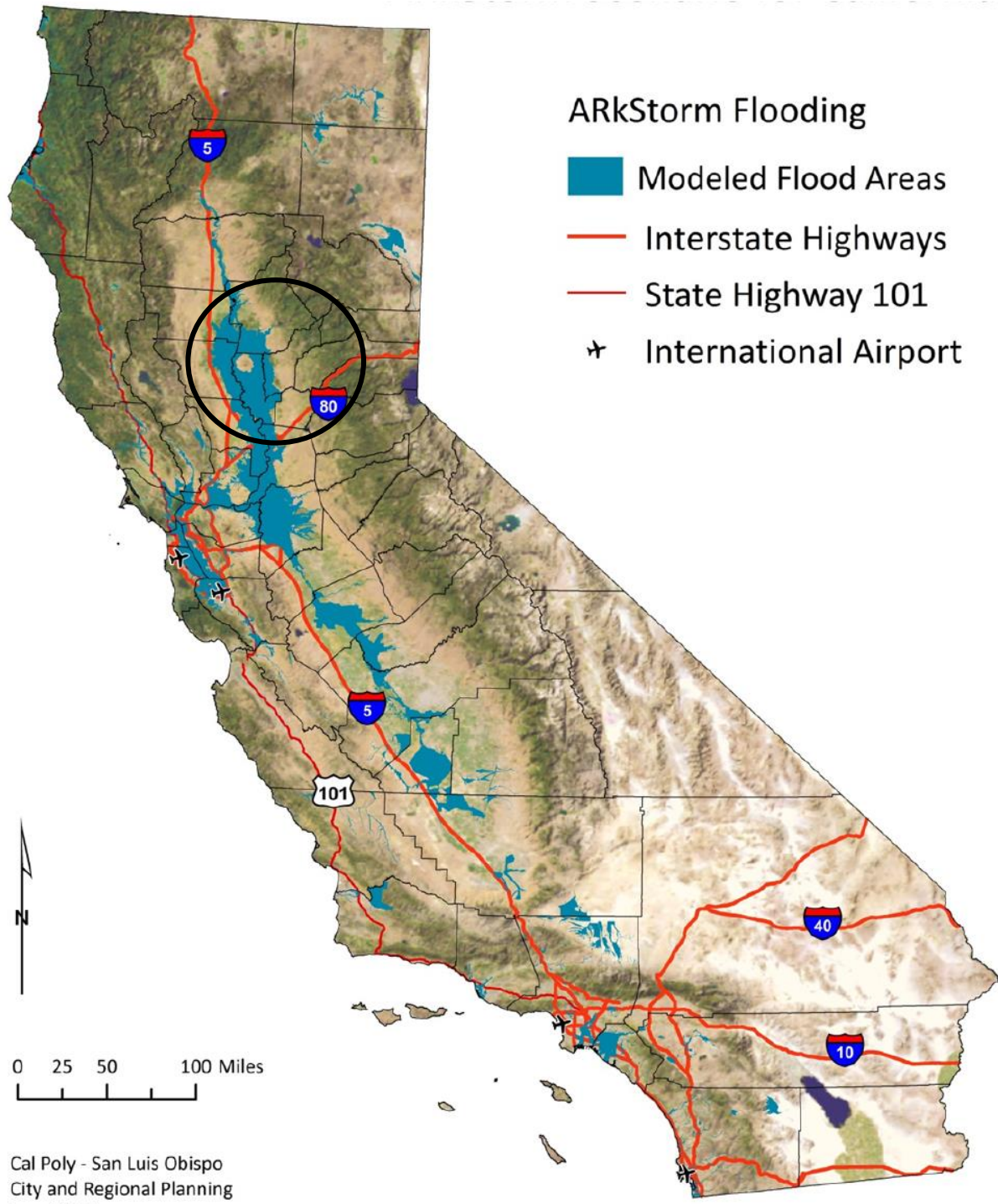
The ARkStorm produces precipitation in many places exceeding levels experienced on average every 500 to 1,000 years. Extensive flooding in many cases overwhelms the state’s flood protection system, which is at best designed to resist 100- to 200-year runoffs (many flood protection systems in the state were designed for smaller runoff events). The Central Valley experiences widespread flooding. Serious flooding also occurs in Orange County, Los Angeles County, San Diego, the San Francisco Bay Area, and other coastal communities. In some places, winds reach hurricane speeds, as high as 125 miles per hour. Hundreds of landslides occur, damaging roads, highways, and homes. Property damage exceeds \$300 billion, most of it from flooding. Agricultural losses and other costs to repair lifelines, dewater flooded islands, and repair damage from landslides brings the total direct property loss to nearly \$400 billion, of which only \$20 to \$30 billion would be recoverable through public and commercial insurance. Power, water, sewer, and other lifelines experience damage that takes weeks or months to restore. Flooding evacuation could involve over one million residents in the inland region and Delta counties.

A storm of ARkStorm’s magnitude has important implications: 1) it raises serious questions about the ability of existing national, state, and local disaster policy to handle an event of this magnitude; 2) it emphasizes the choice between paying now to mitigate, or paying a lot more later to recover; 3) innovative financing solutions are likely to be needed to avoid fiscal crisis and adequately fund response and recovery costs; 4) responders and government managers at all levels could be encouraged to conduct self-assessments

and devise table-top exercises to exercise their ability to address a similar event; 5) the scenario can be a reference point for application of FEMA and Cal OES guidance connecting federal, state, and local natural hazards mapping and mitigation planning under the NFIP and Disaster Mitigation Act of 2000; and 6) common messages to educate the public about the risk of such an extreme event could be developed and consistently communicated to facilitate policy formulation and transformation.

Figure 4-66 depicts an ARkStorm modeled scenario showing the potential for flooding primarily in the Central Valley as the result of a large storm. In Yuba County, the modeled scenario suggests the western portion of the County could be inundated in this ARkStorm model scenario.

Figure 4-66 Projected ARkStorm Flooding in California



Cal Poly - San Luis Obispo  
City and Regional Planning  
June 2013

Source: USGS ARkStorm

### 4.3.11. Flood: Localized Flooding

#### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

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

Localized, stormwater flooding also occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration. Flooding is more severe when previous rainfall has created saturated ground conditions. Urban storm drainpipes and pump station have a finite capacity. When rainfall exceeds this capacity, or the system is clogged, water accumulates in the street until it reaches a level of overland release. This type of flooding may occur when intense storms occur over areas of development.

#### **Location and Extent**

According to Yuba County, numerous parcels and roads throughout the County not included in the FEMA 1% and 0.2% annual chance floodplains and Local Flood Study areas are subject to flooding in heavy rains. In addition to flooding, damage to these areas during heavy storms includes pavement deterioration, washouts, mudslides, debris areas, and downed trees. The frequency and type of damage or flooding that occurs varies from year to year, depending on the quantity of runoff. There is no established scientific scale or measurement system for localized flooding. Localized flooding is generally measured by depth of flooding and the area affected. Localized flooding often happens quickly and has a short speed of onset. Localized flooding often has a short duration. Localized flooding areas in the County are shown in Table 4-45.

*Table 4-76 Yuba County Localized Flooding Areas*

Road/Area Name	Flooding	Pavement Deterioration	Washouts	High Water/Creek Crossing	Landslides/Mudslides	Debris	Downed Trees
Highway 70 at McGowan Pkwy	X						
Hammonton – Smartville Road at Brophy Road				X			
Area off Arboga Road at Buttercup and Butterfly Lanes	X						
Mage Avenue in Olivehurst	X						

Road/Area Name	Flooding	Pavement Deterioration	Washouts	High Water/ Creek Crossing	Landslides/ Mudslides	Debris	Downed Trees
Magnolia Avenue off Highway 70	X						
Ramirez Road	X						
Iowa City Road	X						
Fruitland Road	X						
Simpson Lane	X						

Source: Yuba County

The County provided notes about all of the locations on the table above:

- SR 70 at McGowan Parkway: Localized flooding at the underpass on Highway 70 may occur when the pump station is offline.
- Hammonton-Smartsville Road at Brophy Road – In the past we have had high waters at this location, but the water has never crossed the roads. The County recently updated the culverts on both Brophy and Hammonton Smartsville Road, so we do not expect flooding during future storm events.
- Arboga Road at Buttercup and Butterfly Lanes – The new drainage basin to the west of this subdivision has helped a lot. In addition, the County recently installed several new culverts throughout that neighborhood. With the new basin and the new culverts throughout the neighborhood, the drainage issues and localized flooding have been corrected.
- Mage Avenue in Olivehurst – The east end of Mage Avenue still has local flooding issues, and will continue to have them until somebody starts cleaning the vegetation out of the large drainage ditch at the east end of the road.
- Magnolia Avenue at SR 70: This area does not flood often. We did have a problem a few years back with clogged culverts, but since then our crews have been on top of cleaning the culverts every other year to prevent it from happening again. There is a bigger irrigation ditch that flows through there and does get high at times, but we have never seen it out of its banks.
- Ramirez Road: This area usually floods when the rice fields dump their waters and we have a lot of rain and cannot keep up with both. The road surface for Ramirez Road was recently raised (2017), so we will be monitoring to see if this is still a problem area.
- Iowa City Road: Iowa City Road still does have localized flooding. Flooding usually occurs when the adjacent farmers drain the rice fields and we get heavy amounts of rain.
- Fruitland Road: This area floods when the rice fields dump their water and we get rain in addition to the agricultural drainage.
- Simpson Lane: Simpson Lane occasionally floods when the water from the Yuba River overflows its banks.

According to the 2011 FIS for the County, the severity of flooding on all the streams studied is intensified by backwater conditions between stream systems. Floodwater elevations are increased in the lower portions of tributary streams due to the backwater effect from main streams reducing hydraulic gradients and flow-storage areas. During this time there will be a high degree of coincidental flood flows on waterways.

The 2011 FIS identified several areas where the high flow of floodwaters cause backwater conditions on other channels: Backwater from the Feather River during flood stage inundates a large area along Jack-Simmerly Slough north of Marysville. High stages on the Feather River and its tributary, the Bear River, create a backwater condition that extends up Western Pacific Interceptor Canal, Plumas Lake, and into Linda and Olivehurst Drains, which causes flooding in the town of Olivehurst and Linda southeast of Marysville.

## Past Occurrences

### Disaster Declarations

There are no identified state or federal disaster declarations for localized flooding, as shown in Table 4 4. However, localized flooding was likely an issue during previous declarations for severe storms, heavy rains and floods. The County had no USDA disaster declarations since 2012 related to localized flood, as shown on Table 4-6.

### NCDC Events

The past occurrences of localized flooding are included in the 1% and 0.2% annual Chance Flood profile in Section 4.2.10.

### Hazard Mitigation Planning Committee Events

The HMPC noted that localized flooding is an annual occurrence. The HMPC also noted that localized flooding has varying effects in the County.

## Likelihood of Future Occurrence

**Highly Likely**— With respect to localized, stormwater flood issues, 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. Urban storm drainage systems have a finite capacity. When rainfall exceeds this capacity or systems clog, water accumulates in the street until it reaches a level of overland release. With older infrastructure, this type of flooding will continue to occur on an annual basis during heavy rains.

### Climate Change and Localized Flood

Even if average annual rainfall may decrease slightly, the intensity of individual rainfall events is likely to increase during the 21<sup>st</sup> century, increasing the likelihood of overwhelming stormwater systems built to historical rainfall averages. This makes localized flooding more likely.

## *Vulnerability Assessment*

### **Vulnerability—Medium**

Historically, the Yuba County Planning Area has been at risk to flooding primarily during the winter and spring months when stream systems in the County swell with heavy rainfall. Localized flooding also occurs throughout the Planning Area at various times throughout the year with several areas of primary concern unique to each community as detailed above.

With the exception of the Plumas Lakes area, a newer development in the County, most communities lack drainage system infrastructure to manage stormwater runoff and localized flood events. It is anticipated that \$200 million is required over the next 15-20 years to address drainage issues in the County. Currently a Comprehensive Capital Improvement Plan for Drainage is being developed by the County to cover a 3 year effort. Key areas in need of drainage systems and improvements include Olivehurst, Linda, and West Linda. These communities continue to experience localized flooding impacts due to the lack of adequate drainage infrastructure.

### **Impacts**

Localized flooding can cause damage to roads, infrastructure and utilities, as well as to buildings in the County. Temporary road closures due to localized flooding can be a significant issue in the County. In addition to flooding and road closures, damage to these areas during heavy storms includes, pavement deterioration, washouts, landslides/mudslides, debris areas, and downed trees. Local community service districts have seen infiltration and inflow into sewer systems during heavy rain and localized flooding events. Power outages can be a significant concern during these events, especially in those areas that rely on pumping to alleviate local flood conditions. Life safety issues from localized flooding would be more limited. 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. As noted in the Flood section above, many of the Repetitive Loss claims are due to localized flooding and insufficient drainage.

### **Future Development**

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

Any 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 continue to result in floodplain impacts.

### 4.3.12. Levee Failure

#### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

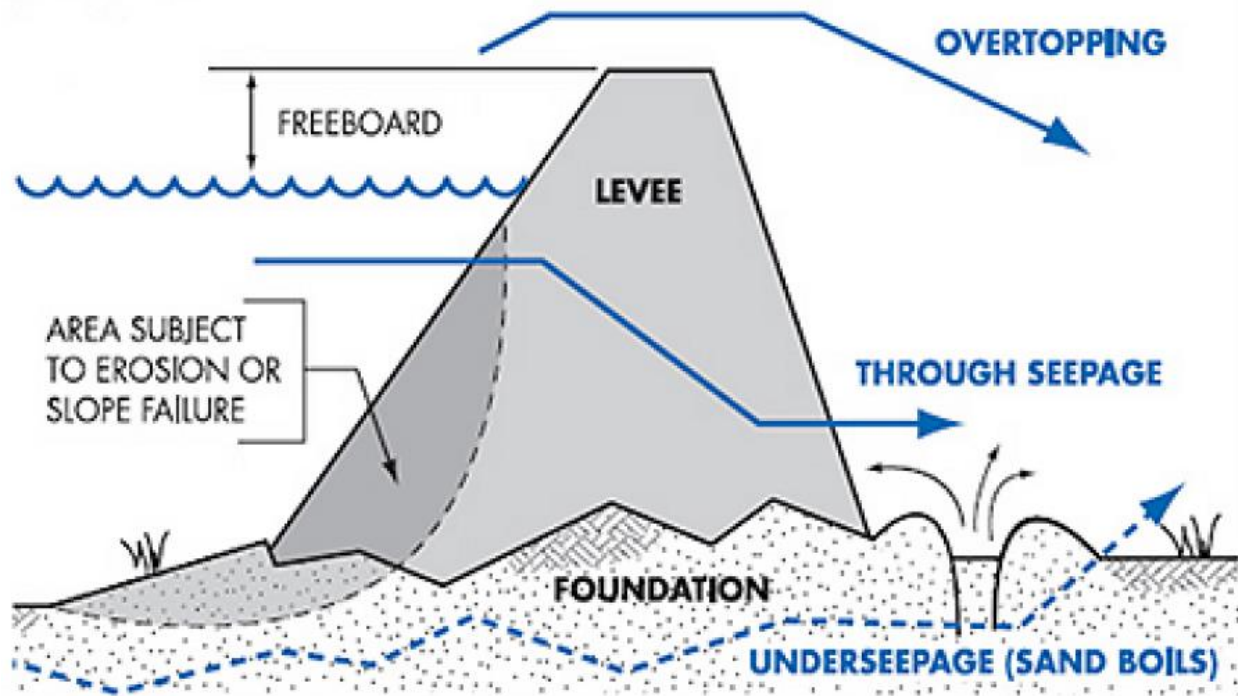
#### **Hazard/Problem Description**

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the 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 man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high-water velocities. It is important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

In addition to overtopping, levee systems can fail or be compromised in a variety of ways. Under-seepage refers to water flowing under the levee through the levee foundation materials, often emanating from the bottom of the landside slope and ground surface and extending landward from the landside toe of the levee. Through-seepage refers to water flowing through the levee prism directly, often emanating from the landside slope of the levee. Both conditions can lead to failure by several mechanisms, including excessive water pressures causing foundation heave and slope instabilities, slow progressing internal erosion, and piping leading to levee slumping. Rodents can burrow into and compromise the levee system. Erosion can also lead to levee failure. Figure 4-67 depicts the causes of levee failure.

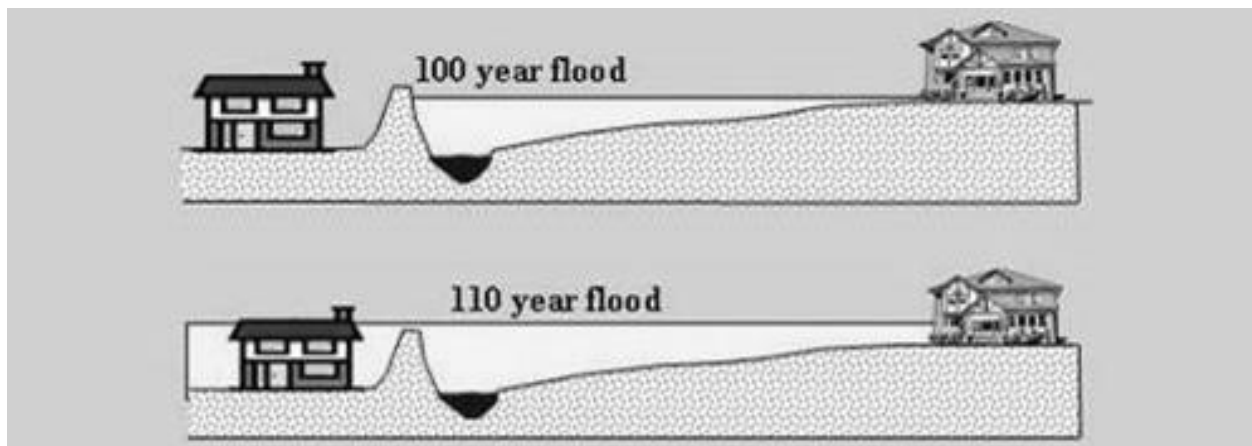
Figure 4-67 Potential Causes of Levee Failure



Source: USACE

Overtopping failure occurs when the flood water level rises above the crest of a levee. As shown in Figure 4-68, overtopping of levees can cause greater damage than a traditional flood due to the often lower topography behind the levee.

Figure 4-68 Flooding from Levee Overtopping



Source: *Levees in History: The Levee Challenge*. Dr. Gerald E. Galloway, Jr., P.E., Ph.D., Water Policy Collaborative, University of Maryland, Visiting Scholar, USACE, IWR.

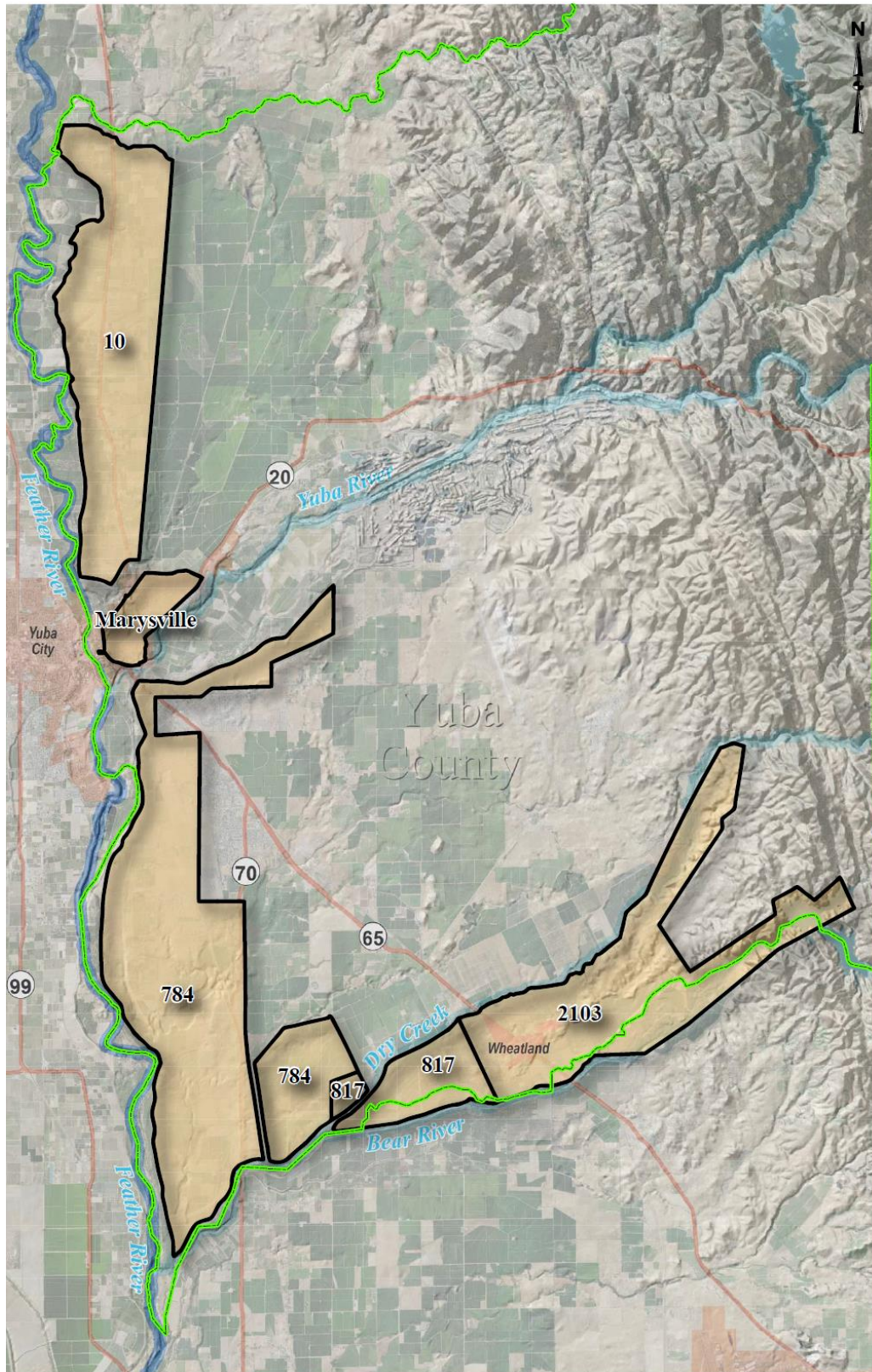
In addition to the above levee failure causes, streambank erosion can cause levees to fail. When flood waters are high, there is greater erosive capabilities of water. In addition, high winds during times of

flooding can cause additional erosive pressures on levees. Streambank erosion was discussed in more detail in the flood profile of Section 4.3.10. Rodent infestations can cause issues with levees, with the HMPC noting that there have been past issues with nutria causing issues with levees. Nutria burrowing causes extensive damage to water infrastructure, banks, and levees, and creates a hazard for people, livestock, and machine operators. Potential levee and dike failures due to nutria burrowing have serious implications for flood protection, water delivery, and agricultural irrigation in Yuba County and in greater California.

### **Location and Extent**

The 2011 Yuba County FIS noted that 88 miles of levees protect property adjacent to the Feather, Yuba, and Bear Rivers. Levee areas can be seen on Figure 4-69.

Figure 4-69 Yuba County – Levee Locations



Source: TRLIA

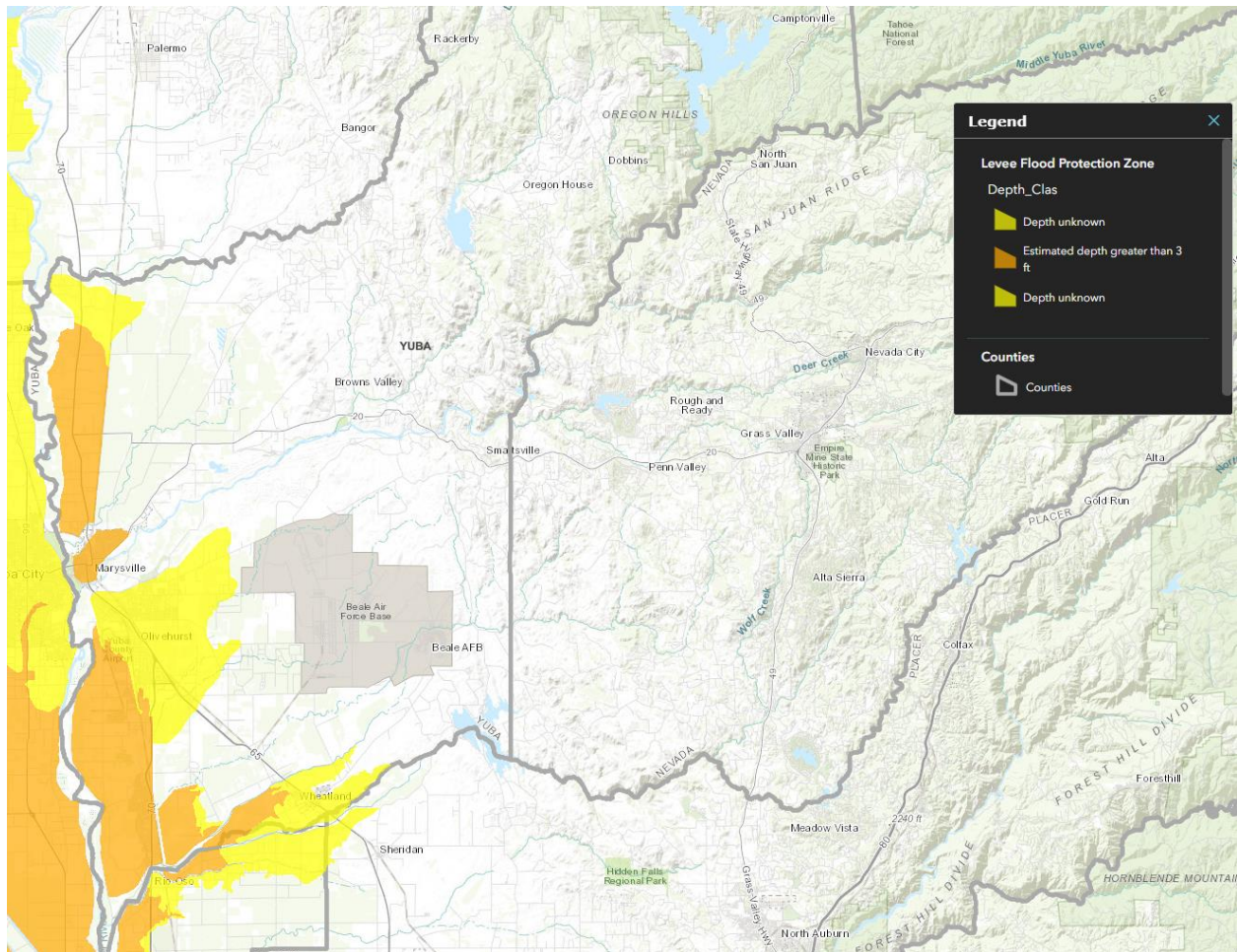
There is not a scientific scale or measurement system in place for levee failure. It is usually measured in area covered and depth of flooding. Maps showing specific inundation depths due to a levee failure in the County do not exist. The speed of onset is slow as the river rises, but if a levee fails the warning times are short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back.

### *Levee Flood Protection Zones*

Levee Flood Protection Zones estimate the maximum area that may be inundated if a project levee fails when water surface elevation is at the top of a project levee. Zones depicted on Figure 4-70 do not necessarily depict areas likely to be protected from flow events for which project levees were designed. Figure 4-70 illustrates the depths of flooding should a levee that protects that area fail.

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. 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.

**Figure 4-70 Yuba County LFPZs**



Source: CA DWR LFPZ Maps – 11/30/2021

## Past Occurrences

### Disaster Declaration History

There have been no disaster declarations related to levee failure in Yuba County, as shown on Table 4-5. There were levee failures related to flooding in the County in 1986 and 1997, which are discussed below, but the disaster declarations were given for the larger flooding issues. The County had no USDA disaster declarations since 2012 related to levee failure, as shown on Table 4-6.

### NCDC Events

There have been no NCDC levee failure events in Yuba County.

### Hazard Mitigation Planning Committee Events

The history of flooding in Yuba County is associated with its geographic position at the convergence of three significant river systems: the Feather River, the Yuba River, and the Bear River. The Feather River

is a principal tributary to the Sacramento River, draining a watershed of 3,222 square miles in the Sierra Nevada and Sacramento Valley. The Yuba and Bear rivers are tributaries to the Feather, draining watersheds 1,336 and 469 square miles, respectively. As a result, Yuba County has a long history of disastrous flooding.

The legendary floods of 1862 and 1866 emphasized the need to develop systems to protect lives and property. By 1875, Marysville began to surround itself with levees. In 1950 the Yuba River broke through its banks at Hammonton and flooded 43,000 acres in southern Yuba County. Tropical storms hit in 1955 causing widespread flooding with water reaching the tops of the levees in Marysville, causing the deaths of forty people, and forcing the evacuation of over 30,000 people. By the 1950's, the levees surrounding Marysville were among the strongest in the state. Bullards Bar Dam was built from 1922–1924, and the Narrows and Englebright Reservoir was built prior to 1945. New Bullards Bar Dam was built in the 70's to replace Bullards Bar Dam and provide additional flood control to the Yuba River.

The HMPC noted that the Yuba County 2011 FIS discussed past occurrences of levee failure. Since the completion of Oroville Dam in 1964, the two most significant floods in the study area occurred in 1986 and 1997. In 1986 the left levee of the Yuba River failed just upstream of the Feather River confluence. The communities of Linda and Olivehurst in Yuba County were inundated, resulting in one death, 895 destroyed homes, and 150 destroyed businesses. In 1997, the left levee of the Feather River failed near Arboga, killing one person, destroying 180 homes and businesses, and prompting evacuation of about 15,000 people from Linda and Olivehurst. Nearly 50,000 people from Yuba City, Marysville, and surrounding areas were evacuated because of fears of additional levee breaks. Both the 1986 and 1997 levee breaks occurred within RD 784. RD 784 has been actively working with the USACE Sacramento District to strengthen the levees in the area.

Other levee failure issues/more detailed information reported by the previous plan are discussed in the flood profile in Section 4.3.10.

### Likelihood of Future Occurrence

**Occasional** – Due to the number of past events, eroding levees, and the volume of levees in Yuba County, future levee failures should be considered unlikely. However, due to the amount of repair and reinforcement of the levees, future levee failure occurrences are estimated to be occasional.

### 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—Extremely High**

Levee failure flooding can occur as the 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 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.

### **Impacts**

Levee failure flooding and associated impacts would vary depending on which structure fails and the nature and extent of the failure and associated flooding. This flooding can present 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. Levee failure flooding can cause 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.

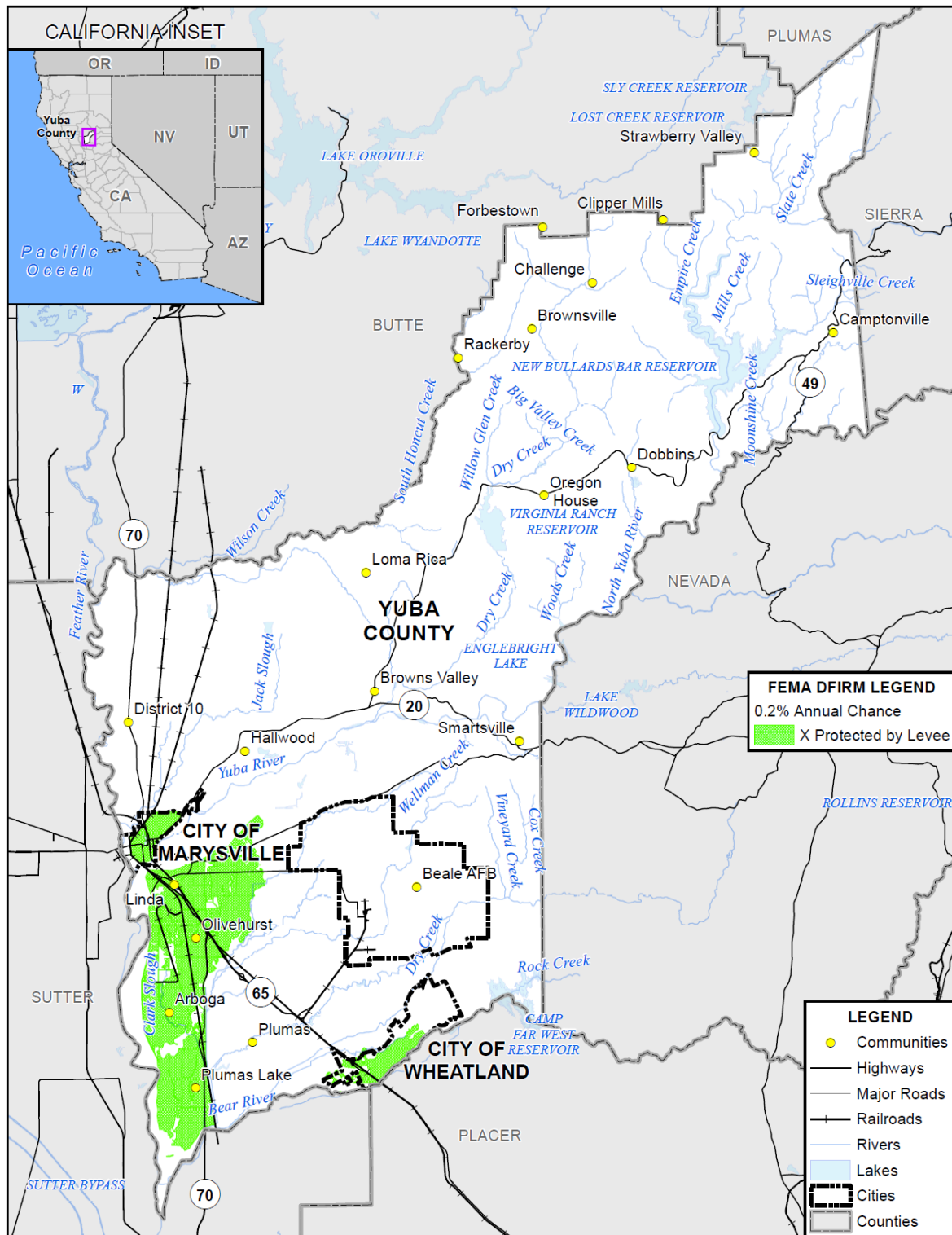
Yuba County's most highly populated areas within the county are protected by levees. A failure could result in loss of life, significant impacts to property, agriculture, and the economy.

### **Vulnerability Analysis**

This risk assessment for the Yuba County LHMP Update assesses the levee failure hazard specific to Yuba County. Existing studies, maps, historical data, and federal, state, and local community expertise and knowledge contributed to this current for Yuba County. An evaluation of the success of completed and ongoing flood control and levee improvement projects and associated maintenance aspects contributed to this levee hazard assessment and the resulting levee failure mitigation strategy for the Yuba County Planning Area. This flood risk assessment for this LHMP Update also includes an assessment of future flooding conditions based on historic development in the floodplains and proposed future development as further described throughout this plan. The levee failure vulnerability assessment that follows focuses on the flood hazard based on FEMA DFIRMs.

Yuba County has a FEMA effective DFIRM dated 2/18/2011, which was obtained from the National Flood Hazard Layer to perform the levee failure analysis. The X Protected by Levee DFIRM flood zone was extracted from the DFIRMs and analyzed. The effective FEMA flood maps and levee locations for the Yuba County Planning Area are shown on Figure 4-71.

Figure 4-71 Yuba County – Levees and DFIRM Flood Zones



0 5 10 Miles

Data Source: FEMA DFIRM 2/18/2011, Yuba County GIS, Cal-Atlas; Map Date: 6/7/2021.



## Values at Risk and Levee Failure Flood Loss Estimates Analysis

Quantifying the values at risk and estimating losses within mapped FEMA floodplains, including the X-Protected by Levee flood zone, in the County is an important element in understanding the risk and vulnerability of the Yuba County Planning Area to the levee failure hazard. The following methodology was followed in determining improved parcel counts and values at risk in areas within the X-protected by levee zone.

### Methodology

Yuba County’s 2020 Parcel and Assessor Data, obtained from Yuba County, was used as the basis for the county inventory of parcels, values, and acres. Yuba County has a FEMA DFIRM dated 2/18/2011 which was utilized to perform the levee analysis. This analysis follows the same methodology provided in Section 4.3.10 for the flood hazard.

### Values at Risk Results

The end result of the values at risk and flood loss estimates analysis is an inventory of the numbers, types, and values of parcels and estimated losses subject in the X Protected by Levee flood zone. Results are presented here first for the Yuba County Planning Area and secondly for unincorporated County. Results for the incorporated jurisdictions are presented in their annexes to this Plan.

#### *Yuba County Planning Area*

Table 4-77 contain X Protected by Levee flood zone analysis results for Yuba County. These tables show the number of parcels and values at risk in the X Protected by Levee flood zone for Yuba County. Table 4-64 shows a summary of the value of improved parcels in X Protected by Levee flood zone in the Planning Area.

*Table 4-77 Yuba County Planning Area – Count and Value of Parcels\* in X Protected by Levee Flood Zone by Jurisdiction*

Jurisdiction/ Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>City of Marysville</b>						
X Protected by Levee	4,061	3,672	\$167,975,475	\$981,267,641	\$770,267,311	\$1,919,510,427
<b>City of Wheatland</b>						
X Protected by Levee	612	489	\$37,986,565	\$86,994,070	\$49,153,803	\$174,134,438
<b>Unincorporated Yuba County</b>						
X Protected by Levee	14,713	11,685	\$649,017,784	\$2,219,451,221	\$1,238,775,214	\$4,107,244,219

Jurisdiction/ Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>Grand Total</b>	<b>19,386</b>	<b>15,846</b>	<b>\$854,979,824</b>	<b>\$3,287,712,932</b>	<b>\$2,058,196,328</b>	<b>\$6,200,889,084</b>

Source: FEMA 2/18/2011 DFIRM, Yuba County 2020 Parcel/Assessor's Data

\*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

### *Unincorporated Yuba County*

Table 4-78 contain X Protected by Levee flood analysis results for unincorporated Yuba County. These tables show the number of parcels and values at risk in the X Protected by Levee flood zone in unincorporated Yuba County. Table 4-67 breaks down the unincorporated Yuba County line from Table 4-77 and shows the number of improved parcels and associated structure and other improved values at risk to the X Protected by Levee flood zone using the DFIRM data by property use type.

*Table 4-78 Unincorporated Yuba County – Count and Value of Parcels\* in X Protected by Levee Flood Zone by Property Use*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>X Protected by Levee</b>						
Agricultural	263	122	\$89,185,053	\$15,231,112	\$15,231,112	\$119,647,277
Commercial	364	205	\$71,304,364	\$124,255,620	\$124,255,620	\$319,815,604
Government- Owned / Non- Taxable Property	318	0	\$482,763	\$0	\$0	\$482,763
Industrial	100	63	\$17,159,942	\$59,313,301	\$88,969,950	\$165,443,193
Miscellaneous	234	0	\$9,577	\$13,917	\$13,917	\$18,257
Residential	13,434	11,295	\$470,876,085	\$2,020,665,105	\$1,010,332,449	\$3,501,873,639
<b>X Protected by Levee Total</b>	<b>14,713</b>	<b>11,685</b>	<b>\$649,017,784</b>	<b>\$2,219,451,221</b>	<b>\$1,238,775,214</b>	<b>\$4,107,244,219</b>

Source: FEMA 2/18/2011 DFIRM, Yuba County 2020 Parcel/Assessor's Data

\*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

### **Flooded Acres**

In addition to the centroid analysis used to obtain numbers of parcels and values at risk to flood hazards, parcel boundary analysis was performed to obtain total acres and flooded acres by flood zone for each parcel. The parcel layer was intersected with the FEMA DFIRM data to obtain the acres flooded. The following is an analysis of flooded acres in the County within the X Protected by Levee flood zone.

Using the same methodologies as in Section 4.3.10, the following table represents a summary and detailed analysis of total acres for the X Protected by Levee flood zone in the Planning Area. Table 4-79 gives

summary information for the Planning Area by 1% and 0.2% annual chance flood zone for the entire Yuba County Planning Area. Table 4-80 breaks down Table 4-79, and shows the property uses in the X Protected by Levee zones in the unincorporated County.

*Table 4-79 Yuba County Planning Area– Flooded Acres Summary*

Jurisdiction/ Flood Zone	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
<b>City of Marysville</b>						
X Protected by Levee	1,447	0.352%	677	0.439%	770	0.300%
<b>City of Wheatland</b>						
X Protected by Levee	1,755	0.428%	1,351	0.876%	404	0.158%
<b>Unincorporated Yuba County</b>						
X Protected by Levee	20,597	5.017%	11,757	7.626%	8,839	3.447%

Source: FEMA DFIRM 2/18/2011, Yuba County 2020 Parcel/Assessor's Data

\*percent of the total acres in Yuba County

*Table 4-80 Unincorporated Yuba County – Flooded Acres by Property Use Type*

Property Use	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
Agricultural	9,873	2.405%	6,524	4.232%	3,349	1.306%
Commercial	640	0.156%	308	0.200%	332	0.129%
Government- Owned / Non- Taxable Property	2,346	0.571%	0	0.00%	2,346	0.915%
Industrial	803	0.196%	625	0.406%	178	0.069%
Miscellaneous	1,606	0.391%	-		1,606	0.627%
Residential	5,328	1.298%	4,300	2.789%	1,028	0.401%
<b>X Protected by Levee Total</b>	<b>20,597</b>	<b>5.017%</b>	<b>11,757</b>	<b>7.626%</b>	<b>8,839</b>	<b>3.447%</b>

Source: FEMA DFIRM 2/18/2011, Yuba County 2020 Parcel/Assessor's Data

\*percent of the total acres in Yuba County

## Population at Risk

A separate analysis was performed to determine populations that reside in flood zones. Using GIS, the DFIRM Flood dataset was overlaid on the improved residential parcel data. Those parcel centroids that intersect X Protected by Levee flood zone were counted and multiplied by the Census Bureau average household size; and tabulated by flood zone (see Table 4-81).

*Table 4-81 Yuba County – Residential Population within the X Protected by Levee Flood Zone by Jurisdiction*

Jurisdiction	Improved Residential Parcels	Population at Risk
City of Marysville	3,275	8,089
City of Wheatland	444	1,194
Unincorporated Yuba County	11,295	32,078
<b>Total</b>	<b>15,014</b>	<b>41,361</b>

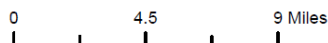
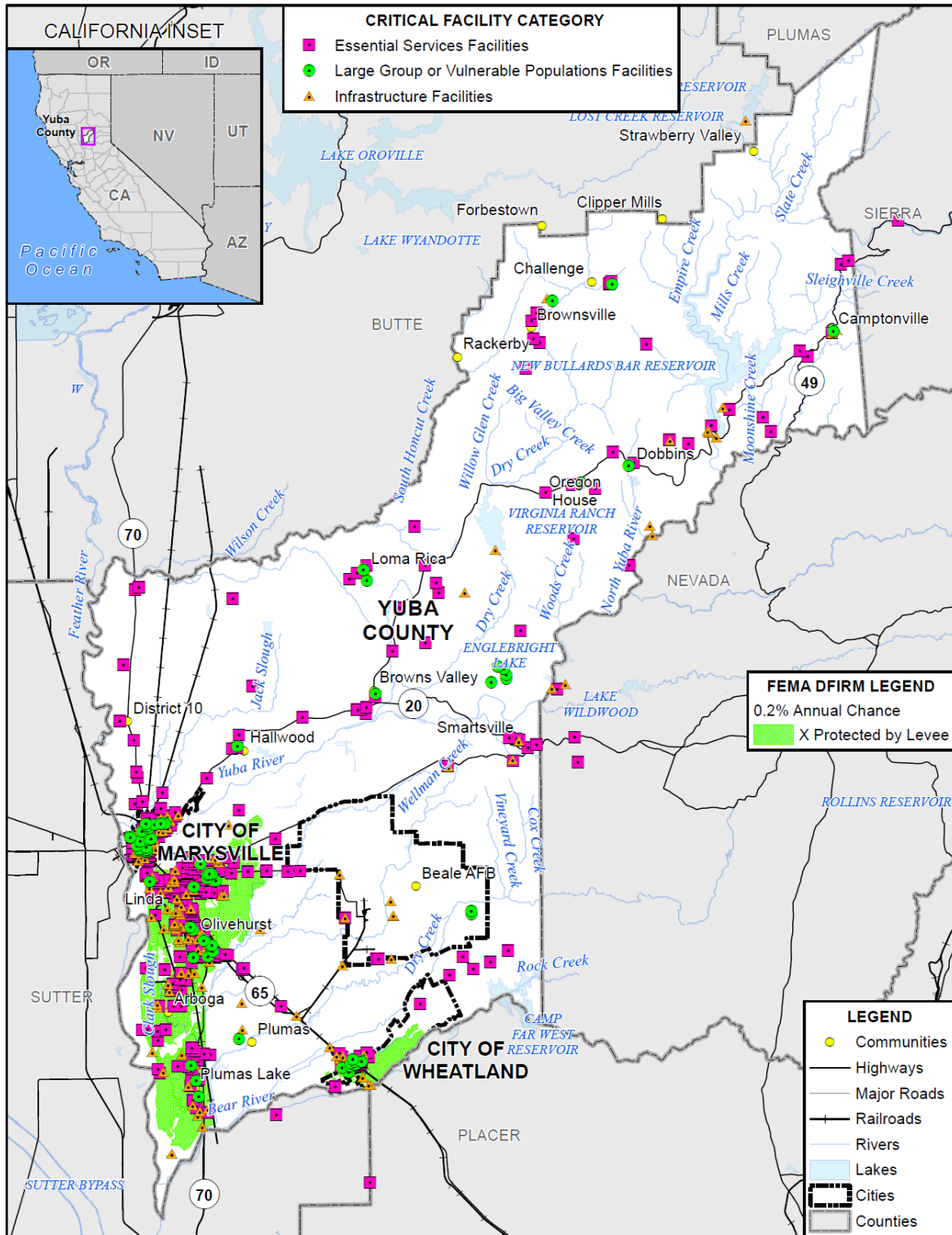
Source: FEMA DFIRM 7/19/2018, US Census Bureau Average Household Sizes: US Census Bureau Average Household Sizes: Marysville (2.47); Wheatland (2.69) and unincorporated Yuba County (2.84)

\*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**Critical Facilities at Risk**

A separate analysis was performed on the critical facility inventory in Yuba County and all jurisdictions to determine critical facilities in the X Protected by Levee flood zones. Using GIS, the DFIRM flood zones were overlaid on the critical facility GIS layer. Figure 4-72 shows critical facilities, as well as the DFIRM X Protected by Levee flood zones. Table 4-82 details critical facilities by facility type and count for the Planning Area. Details of critical facility definition, type, name and address by flood zone are listed in Appendix F.

Figure 4-72 Yuba County – Critical Facilities in DFIRM X Protected by Levee Flood Zones



Data Source: FEMA DFIRM 2/18/2011, Yuba County GIS, Cal-Atlas; Map Date: 07/15/2021.

*Table 4-82 Yuba County – Critical Facilities in DFIRM X Protected by Levee Flood Zones by Facility Category*

Jurisdiction / Flood Zone	Critical Facility Class	Facility Count
<b>City of Marysville</b>		
0.2% Annual Chance Flood Hazard	Essential Services Facilities	86
	Large Group or Vulnerable Populations Facilities	20
	Infrastructure Facilities	19
	<b>Total</b>	<b>125</b>
<b>City of Marysville Total</b>		<b>125</b>
<b>City of Wheatland</b>		
0.2% Annual Chance Flood Hazard	Essential Services Facilities	10
	Large Group or Vulnerable Populations Facilities	5
	Infrastructure Facilities	7
	<b>Total</b>	<b>22</b>
<b>City of Wheatland Total</b>		<b>22</b>
<b>Unincorporated Yuba County</b>		
0.2% Annual Chance Flood Hazard	Essential Services Facilities	0
	Large Group or Vulnerable Populations Facilities	0
	Infrastructure Facilities	0
	<b>Total</b>	<b>0</b>
<b>Unincorporated Yuba County Total</b>		<b>0</b>
<b>Outside of Unincorporated Yuba County</b>		
Unknown	Essential Services Facilities	0
	Large Group or Vulnerable Populations Facilities	0
	Infrastructure Facilities	0
	<b>Total</b>	<b>0</b>
<b>Outside of Unincorporated Yuba County Total</b>		<b>0</b>
<b>Grand Total</b>		<b>584</b>

Source: Yuba County GIS, FEMA 2/18/2011 DFIRM

### *Future Development*

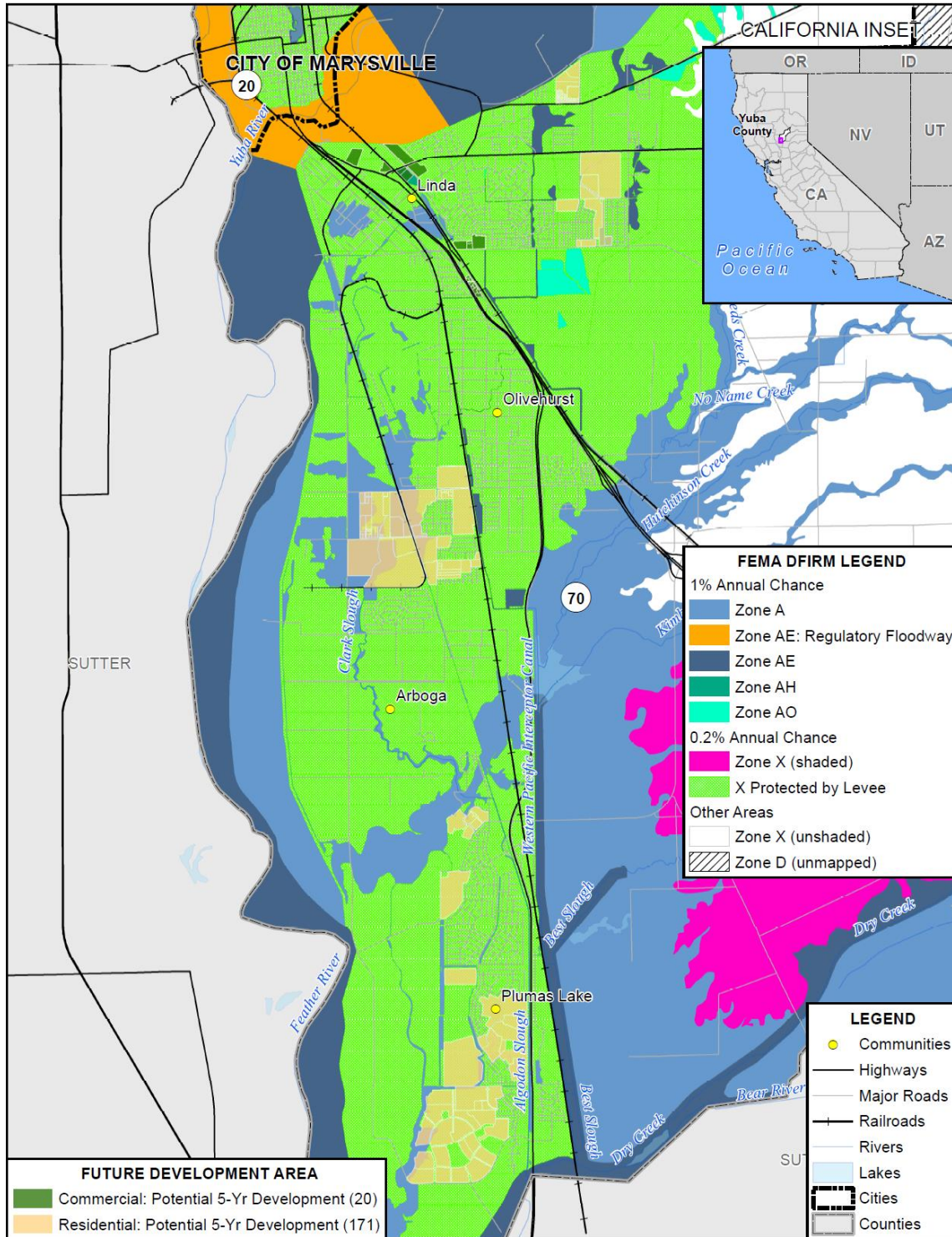
Communities that participate in the NFIP adopt regulations and codes that govern development in special flood hazard areas (SFHAs), which includes levee protected areas, and enforce those requirements through their local floodplain management ordinances through the issuance of permits. Yuba County’s floodplain management ordinance provides standards for development, subdivision of land, construction of buildings, and improvements and repairs to buildings that meet, and in some instances exceed, the minimum requirements of the NFIP.

## Future Development GIS Analysis

Yuba County's 2020 Parcel/Assessor's data and data from the County planning department were used as the basis for the unincorporated County's inventory of parcels and acres of future development areas. Using the GIS parcel spatial file and the APNs, the future development projects were mapped.

For the flood analysis of future development areas, the parcel data was converted to a point layer using a centroid conversion process, in which each parcel was identified by a central point and linked to the Assessor's data. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within the FEMA X Protected by Levee flood zone. DFIRM X Protected by Levee flood zones and future development areas are shown on Figure 4-73 and parcels and acreages in those areas are shown in Table 4-83.

Figure 4-73 Unincorporated Yuba County – Future Development in DFIRM X Protected by Levee Flood Zones



0 1 2 Miles

Data Source: FEMA DFIRM 2/18/2011, Yuba County GIS, Cal-Atlas; Map Date: 07/15/2021.



*Table 4-83 Unincorporated Yuba County – Future Development Parcels and Acres in DFIRM X Protected by Levee Flood Zones*

Future Development / Flood Zones	Total Parcel Count	Improved Parcel Count	Total Acres
<b>0.2% Annual Chance Flood Hazard</b>			
<b>X Protected by Levee</b>			
Commercial: Potential 5-Yr Development	18	1	80.8
Residential: Potential 5-Yr Development	146	58	1,581.6
X Protected by Levee Total	164	59	1,662.4
<b>0.2% Annual Chance Flood Hazard Total</b>	<b>164</b>	<b>59</b>	<b>1,662.4</b>

Source: FEMA 2/18/2011 DFIRM, Yuba County GIS

### 4.3.13. Pandemic

#### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

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

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity.

A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention (CDC) has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning, preparation, and response. An especially severe pandemic could lead to high levels of illness, death, social disruption, and economic loss.

#### **Location and Extent**

During a pandemic, the whole of the County is at risk, as pandemic is a regional, national, or international event. The speed of onset of a pandemic is usually short, while the duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by the numbers who die.

## Past Occurrences

### Disaster Declaration History

There have been two state and federal disaster declarations due to pandemic, as shown in Table 4-84. The County had no USDA disaster declarations since 2012 related to pandemic, as shown on Table 4-6.

*Table 4-84 Yuba County – State and Federal Pandemic Disaster Declarations 1950-2021*

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

### NCDC Events

The NCDC does not track pandemic.

### WHO Events

The 20th century saw three outbreaks of pandemic flu.

- The **1918-1919 Influenza Pandemic (H1N1)**, (aka the Spanish Flu), is the catastrophe against which all modern pandemics are measured. It is estimated that approximately 20 to 40 percent of the worldwide population became ill and that over 50 million people died. Approximately 675,000 deaths from the flu occurred in the U.S. alone.
- The **February 1957-1958 Influenza Pandemic (H2N2)** (aka the Asian Flu) was first identified in the Far East. Immunity to this strain was rare in people less than 65 years of age, and a pandemic was predicted. In preparation, vaccine production began in late May 1957, and health officials increased surveillance for flu outbreaks. Unlike the virus that caused the 1918 pandemic, the 1957 pandemic virus was quickly identified, due to advances in scientific technology. Vaccine was available in limited supply by August 1957. The virus came to the U.S. quietly, with a series of small outbreaks over the summer of 1957. When U.S. children went back to school in the fall, they spread the disease in classrooms and brought it home to their families. Infection rates were highest among school children, young adults, and pregnant women in October 1957. Most influenza-and pneumonia-related deaths occurred between September 1957 and March 1958. The elderly had the highest rates of death. By December 1957, the worst seemed to be over. However, during January and February 1958, there was another wave of illness among the elderly. This is an example of the potential “second wave” of infections that can develop during a pandemic. The disease infects one group of people first, infections appear to decrease and then infections increase in a different part of the population. Although the Asian flu pandemic was not as devastating as the 1918-1919 flu, about 69,800 people in the U.S. died.
- The **1968 Influenza Pandemic (H3N2)** was first detected in Hong Kong (aka the Hong Kong Flu). The first cases in the U.S. were detected as early as September of that year, but illness did not become widespread in the U.S. until December. Deaths from this virus peaked in December 1968 and January 1969. Those over the age of 65 were most likely to die. The same virus returned in 1970 and 1972.

The number of deaths between September 1968 and March 1969 for this pandemic was 33,800, making it the mildest pandemic in the 20th century.

To date, the 21st century has seen two acknowledged pandemics.

- **2009 Swine Flu (H1N1)**— 2009 H1N1 (sometimes called “swine flu”) was a new influenza virus causing illness in people. This virus was originally referred to as “swine flu” because laboratory testing showed that many of the genes in this new virus were very similar to influenza viruses that normally occur in pigs (swine) in North America. But further study showed that this virus was very different from what normally circulates in North American pigs. It had two genes from flu viruses that normally circulate in pigs in Europe and Asia and bird (avian) genes and human genes. Scientists call this a “quadruple reassortant” virus. This virus spread from person-to-person worldwide, probably in much the same way that regular seasonal influenza viruses spread. On June 11, 2009, the WHO signaled that a pandemic of 2009 H1N1 flu was underway. It was first detected in the United States in early 2009 and spread to the world later that year. About 70 percent of people who were hospitalized with this 2009 H1N1 virus had one or more medical conditions previously recognized as placing people at “high risk” of serious seasonal flu-related complications. This included pregnancy, diabetes, heart disease, asthma, and kidney disease. Young children were also at high risk of serious complications from 2009 H1N1, just as they are from seasonal flu. And while people 65 and older were the least likely to be infected with 2009 H1N1 flu, if they got sick, they were also at “high risk” of developing serious complications from their illness. Some studies estimated that 11 to 21 percent of the global population at the time—or around 700 million to 1.4 billion people (of a total 6.8 billion)—contracted the illness. This was more than the number of people infected by the Spanish flu pandemic, but only resulted in about 150,000 to 575,000 fatalities for the 2009 pandemic. A follow-up study done in September 2010 showed that the risk of serious illness resulting from the 2009 H1N1 flu was no higher than that of the yearly seasonal flu. For comparison, the WHO estimates that 250,000 to 500,000 people die of seasonal flu annually.
- **2019/2020 COVID 19** – During the creation of this LHMP Update, the world was under various forms of lockdown due to COVID-19 (known also as coronavirus). Coronaviruses are a large family of viruses which may cause illness in animals or humans. In humans, several coronaviruses are known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The most recently discovered coronavirus causes coronavirus disease COVID-19. COVID-19 is the infectious disease caused by the most recently discovered coronavirus. This new virus and disease were unknown before the outbreak began in Wuhan, China, in December 2019. The most common symptoms of COVID-19 are fever, tiredness, and dry cough. Some patients may have aches and pains, nasal congestion, runny nose, sore throat or diarrhea. These symptoms are usually mild and begin gradually. Some people become infected but don’t develop any symptoms and don’t feel unwell. Most people (about 80%) recover from the disease without needing special treatment. Around 1 out of every 6 people who gets COVID-19 becomes seriously ill and develops difficulty breathing. Older people, and those with underlying medical problems like high blood pressure, heart problems or diabetes, are more likely to develop serious illness. People with fever, cough and difficulty breathing should seek medical attention. As of the beginning of March 2021, there had been roughly 117 million cases worldwide, with 2.6 million deaths.

## HMPC Events

The HMPC noted that during the Covid outbreak of 2020/2021, the workforce in the County (both in the public and private sector) was decimated due to the lockdowns and closing of businesses in the County. As of late August 2021, there had been 7,389 cases of Covid-19 in the County, with 49 deaths reported.

## Likelihood of Future Occurrence

**Likely** – The calculation for future occurrence of pandemic must first be considered in light of circumstances. The diseases are naturally occurring in the populations that reside in the County. In addition, this Plan is not examining the pandemic potential of these diseases, but instead examines when these diseases manifest in severe injury or fatalities among humans. Given these assumptions and the five outbreaks since 1900, the likelihood of future occurrence is considered likely.

## Climate Change and Pandemic

According to the WHO, there are three categories of research into the linkages between climatic conditions and infectious disease transmission. The first examines evidence from the recent past of associations between climate variability and infectious disease occurrence. The second looks at early indicators of already-emerging infectious disease impacts of long-term climate change. The third uses the above evidence to create predictive models to estimate the future burden of infectious disease under projected climate change scenarios.

## Early Impacts of Climate Change

There is much evidence of associations between climatic conditions and infectious diseases. These include several infectious diseases, health impacts of temperature extremes and impacts of extreme climatic and weather events. Changes in infectious disease transmission patterns are a likely major consequence of climate change. We need to learn more about the underlying complex causal relationships, and apply this information to the prediction of future impacts, using more complete, better validated, integrated, models.

## *Vulnerability Assessment*

### **Vulnerability—High**

Pandemic has and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent spread of a pandemic by staying home, or “self-quarantining,” if they suspect they are infected. A Pandemic does not affect the buildings, critical facilities, and infrastructure in the County. Pandemics can have varying levels of impact to the citizens of the County, depending on the nature of the pandemic.

## Vulnerability to and Impacts from Pandemic

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently) and unemployment rose significantly. Supply chains for food can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

### *Future Development*

Future development is not expected to be significantly impacted by this hazard, though population growth in the County could increase exposure to a pandemic, and increase the ability of each disease to be transmitted among the population of the County. If the median age of County residents continues to increase, vulnerability to pandemic diseases may increase, due to the fact that these diseases are often more deadly to senior citizens. During 2020, it was reported that one in five adults moved due to COVID-19 or know someone who did according to Pew Research. Many college aged students moved back home, which increased populations in the areas in which they returned.

#### 4.3.14. Wildfire

##### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Yuba County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

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

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. Wildland fire is an ongoing concern for the Yuba County Planning Area. Generally, the fire season extends from June through October of each year during the hot, dry months. Fire conditions arise from a combination of high temperatures, an accumulation of vegetation, low humidity, and high winds. 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. Century old policies of fire exclusion and aggressive suppression have given way to better understanding of the importance fire plays in the natural cycle of certain forest types.

##### **Location and Extent**

Wildfire risk in Yuba County varies by location. According to the HMPC, wildfire hazard is greatest in the foothill and mountain areas of the County. Many of Yuba County's residential communities—Smartsville,

Dobbins, Oregon House, Collins Lake, Browns Valley, Loma Rica, Rackerby, Camptonville, Log Cabin, Brownsville, and Challenge—are located in areas of high or very high fire hazard.

### *Wildland Urban Interface*

Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. While wildfire risk is predominantly associated with wildland urban interface (WUI) areas, significant wildfires can also occur in heavily populated areas. The WUI is a general term that applies to development adjacent to landscapes that support wildland fire. The WUI defines the community development into the foothills and mountainous areas of California. The WUI describes those communities that are mixed in with grass, brush and timbered covered lands (wildland). These are areas where wildland fire once burned only vegetation but now burns homes as well.

### *Yuba County Wildfire Setting*

As previously stated, there are areas in the County that are prone to wildfire. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Generally, there are four major factors that sustain wildfires and allow for predictions of a given area's potential to burn. These factors include fuel, topography, weather, and human actions.

- **Fuel** – Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also to be considered as a fuel source are man-made structures, such as homes, and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Fuel is the only factor that is under human control. The 2014 Yuba County Community Wildfire Protection Plan (CWPP) noted that vegetation growth correlates with precipitation. At the lowest elevations in the region, including most of the Smartsville FD and Loma Rica/Browns Valley Community Services District, the vegetation is primarily blue oak and grass. In these areas, wildfires primarily burn in grass, and the hazard is a function of high rates of fire spread. At slightly higher elevations, but still below 1,000 feet, live oak and brush are present mostly on the deeper soils. Here wildfires can torch into the trees, creating serious control problems. At elevations in the approximate range of 1,000 to 2,000+ feet, (Dobbins/Oregon House Fire Protection District) are shrublands, made up of foothill gray pine, interior live oak, mixed hardwood, and chaparral. These areas also have the potential for torching and spotting, especially in areas where needles from gray pine drape onto brush below. The forested upland areas, primarily above 2,500' are comprised of California black oak, ponderosa pine, sugar pine, and Douglas fir, with Tanoak in the understory. This forestation is interspersed with chaparral stands, meadow and riparian forests. These areas experience significantly more precipitation than the lower elevation areas, causing the soils to become deeply weathered and much more productive. They have the heaviest fuel loads in the CWPP area and under dry and windy conditions will experience fuel and terrain-driven fires that exhibit torching, active crown fire runs, long distance spotting and other extreme fire behaviors.
- **Topography** – An area's terrain and land slopes affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise

via convection. The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.

- **Weather** – Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed the wildfire creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most treacherous weather factor. The greater a wind, the faster a fire will spread, and the more intense it will be. Winds can be significant at times in the Yuba County Planning Area. The CWPP noted that late summer to fall is the period is the most subject to wildfires, especially during the occasionally occurring north wind events. Weather conditions significantly impact the potential for fire ignition, as well as rates of spread, intensity, and direction in which fires burn. Wind is considered the most variable and difficult weather element to predict. The direction and velocity of surface winds can directly control the direction and rate at which fire spreads. Upper level winds can carry embers and firebrands downwind, causing spot fires ahead of the main fire. Weather conditions can change rapidly as upper-level wind currents and pressure systems in the Western States shift locations, and both dry and wet frontal systems move through the mountainous terrain. Frontal winds associated with low-pressure systems moving across the area can create hazardous fire conditions. Winds in advance of the frontal system can reach speeds exceeding 60 mph over ridges. Lightning also ignites wildfires, often in difficult-to reach terrain for firefighters. Lightning poses a serious problem during the summer months. Numerous wildfires have resulted from dry lightning occurring between July and August (more than 1100 reported between 2001 and 2013). Also of concern, during periods of drought, the threat of wildfire increases. High wind events have and continue to be a factor in wildfire spread and intensity in Yuba County.
- **Human Actions** – Most wildfires are ignited by human action, the result of direct acts of arson, carelessness, or accidents. Many fires originate in populated areas along roads and around homes, and are often the result of arson or careless acts such as the disposal of cigarettes, use of equipment or debris burning. Recreation areas that are located in high fire hazard areas also result in increased human activity that can increase the potential for wildfires to occur. Human-caused fires are a primary factor in the numbers of wildfires in the County.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned and the intensity of the burn. CAL FIRE measures fuels in the areas as part of their Fire Hazard Severity maps. Extents are measured in the following Fire Hazard Severity Zones (FHSZ) categories (discussed in more detail below):

- Very High
- High
- Moderate
- Non-Wildland/Non-Urban
- Urban/Unzoned

Geographical extents of these FHSZs in the County can be found on Table 4-85.

*Table 4-85 Yuba County – Geographical Extents of Fire Hazard Severity Zones*

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	191,630	46.7%	43,248	28.1%	148,382	57.9%
High	21,124	5.1%	9,947	6.5%	11,177	4.4%
Moderate	85,812	20.9%	23,812	15.4%	62,000	24.2%
Non-Wildland/Non-Urban	99,997	24.4%	72,500	47.0%	27,497	10.7%
Urban Unzoned	11,939	2.9%	4,652	3.0%	7,287	2.8%
<b>Total</b>	<b>410,502</b>	<b>100.000%</b>	<b>154,159</b>	<b>100.000%</b>	<b>256,343</b>	<b>100.000%</b>

Source: CAL FIRE

Fires can have a quick speed of onset, especially during periods of drought. Fires can burn for a short period of time, or may have durations lasting for a week or more.

### *Post-Wildfire Landslides and Debris Flows*

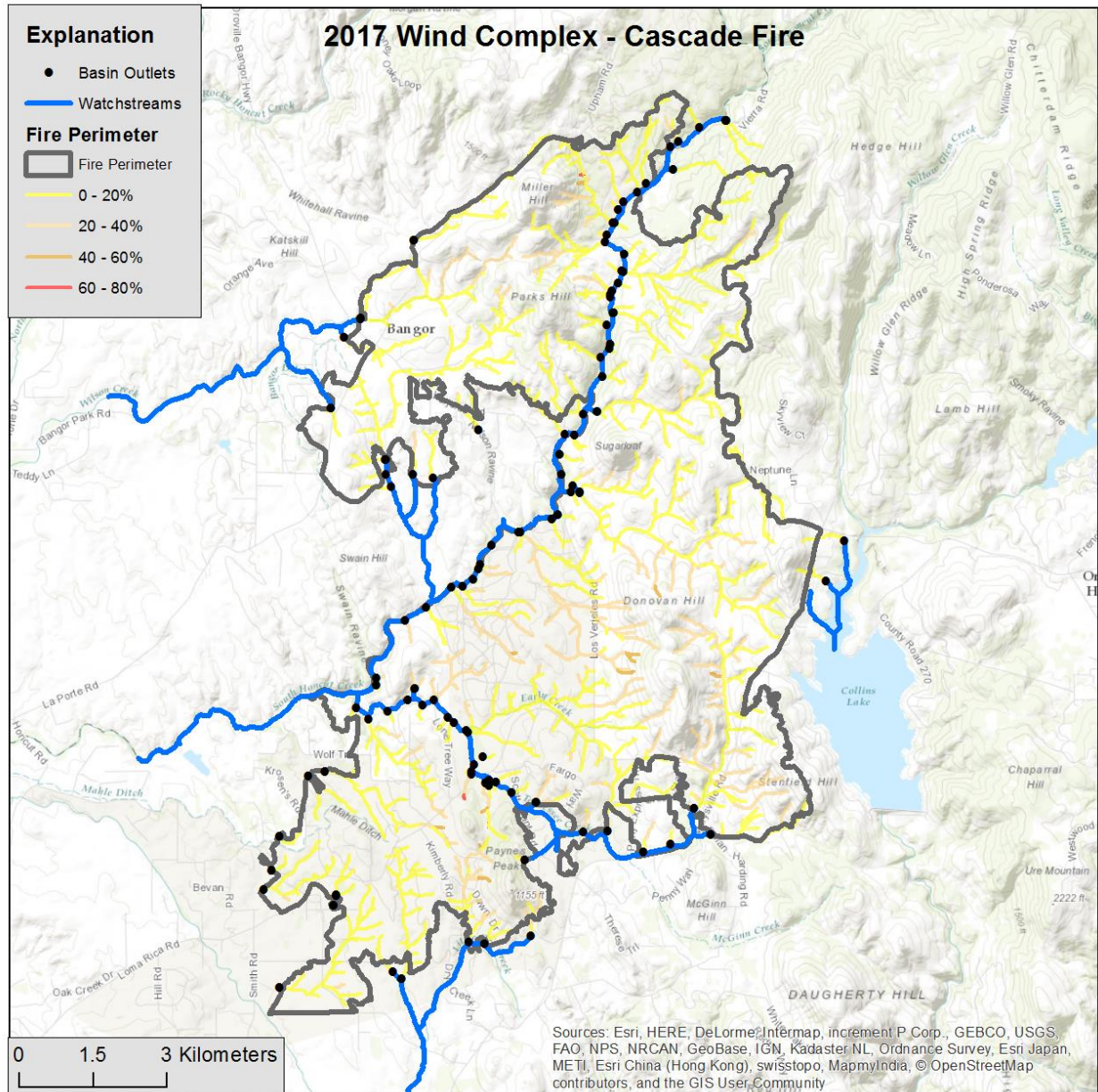
Post-wildfire landslides and debris flows are also a concern in Yuba County. Fires that burn in sloped areas remove vegetation that holds hillsides together during rainstorms. Once that vegetation is removed, the hillside may be compromised, resulting in landslides and debris flows. Mapping of these areas has begun to occur. Only one area in Yuba County has been recently mapped – the 2017 Wind Complex Fire.

### **2017 Wind Fire Landslide and Debris Flow Mapping**

Post-fire debris flow hazard assessments for the Wind Complex – Cascade Fire were performed by the USGS. These assessments are prepared at the request of land and emergency management agencies responsible for managing wildfires impacts. The assessments are presented as a series of maps and geospatial data showing the probability of debris flows and their expected volume for burned drainage basins. Other landslide hazard assessments produced by the USGS are performed at the request of government agencies or sometimes as demonstration products from research to improve methods of hazard and risk assessment.

Figure 4-74 estimates of the likelihood of debris flow (in %), potential volume of debris flow (in m<sup>3</sup>), and combined relative debris flow hazard from the Wind Fire. These predictions are made at the scale of the drainage basin, and at the scale of the individual stream segment. Estimates of probability, volume, and combined hazard are based upon a design storm with a peak 15-minute rainfall intensity of 24 millimeters per hour (mm/h).

Figure 4-74 Wind Fire Landslide and Debris Flow Probabilities



Source: USGS ([https://landslides.usgs.gov/hazards/postfire\\_debrisflow/detail.php?objectid=168](https://landslides.usgs.gov/hazards/postfire_debrisflow/detail.php?objectid=168))

## Past Occurrences

### Disaster Declaration History

A list of state and federal disaster declarations for Yuba County from wildfire is shown on Table 4-61. The County had no USDA disaster declarations since 2012 related to wildfire, as previously shown on Table 4-6.

*Table 4-86 Yuba County – State and Federal Disaster Declaration from Wildfire 1950-2021*

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Wildfire	3	1997, 2010, 2017	7	1988, 1999, 2009, 2017 (twice), 2020 (twice)

Source: Cal OES, FEMA

## NCDC Events

The NCDC has tracked wildfire events in the County dating back to 1993. Events in Yuba County in the database are shown in Table 4-87.

*Table 4-87 NCDC Wildfire Events in Yuba County 1993 to 7/31/2020\**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Wildfire	33	7	47	\$18,525,000	\$0	28	0

Source: NCDC

\*Deaths, injuries, and damages are for the entire event, and may not be exclusive to the County.

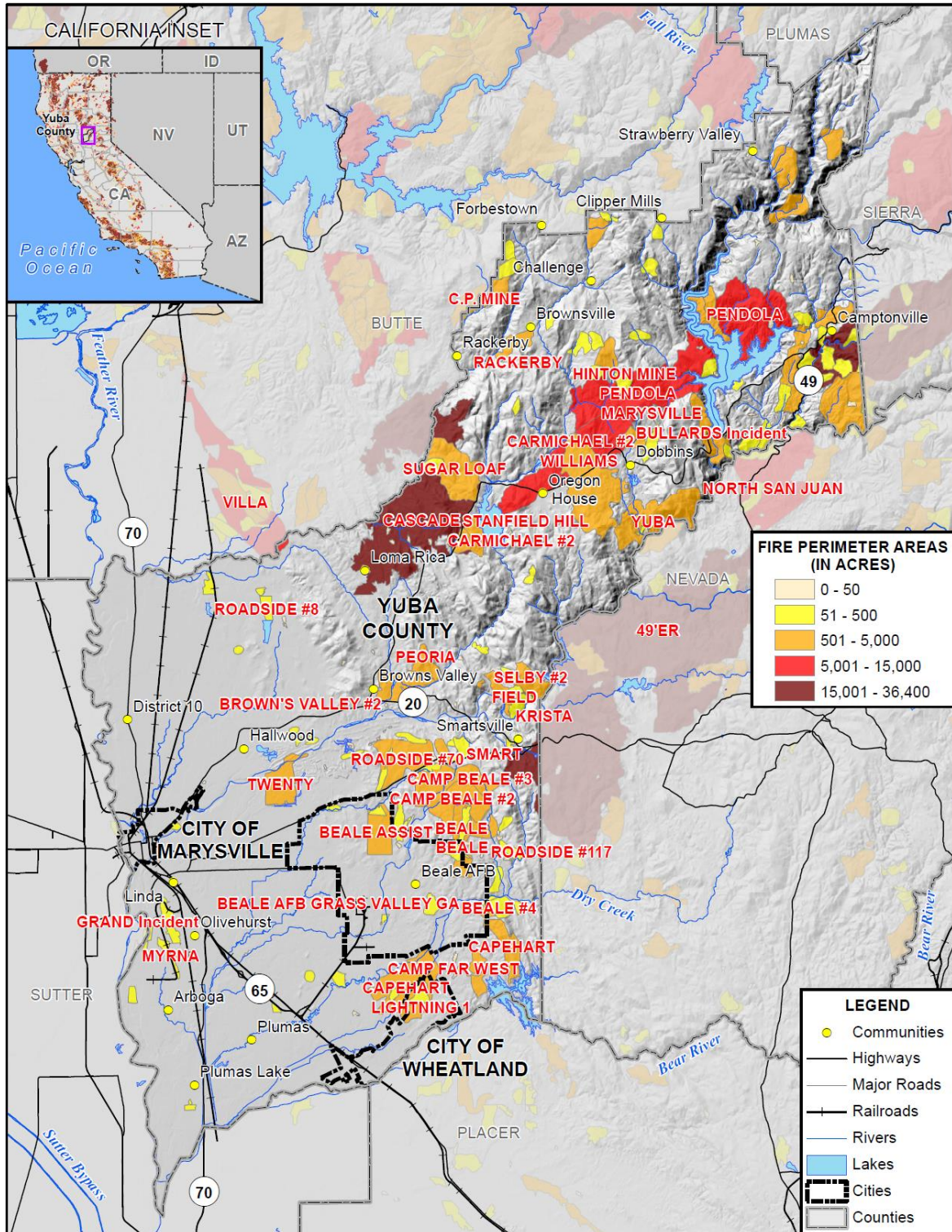
## CAL FIRE Events

CAL FIRE, USDA Forest Service Region 5, Bureau of Land Management (BLM), the National Park Service (NPS), Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878 (though the first recorded incident for the County was in 1917). For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. CAL FIRE recognizes the various federal, state, and local agencies that have contributed to this dataset, including USDA Forest Service Region 5, BLM, National Park Service, and numerous local agencies.

Fires may be missing altogether or have missing or incorrect attribute data. Some fires may be missing because historical records were lost or damaged, fires were too small for the minimum cutoffs, documentation was inadequate, or fire perimeters have not yet been incorporated into the database. Also, agencies are at different stages of participation. For these reasons, the data should not be used for statistical or analytical purposes.

The data provides a reasonable view of the spatial distribution of past large fires in California. Using GIS, fire perimeters that intersect Yuba County since 1950 were extracted and are listed in Table 4-88 sorted by acres burned. Each of them was tracked by CAL FIRE. Figure 4-75 shows the fires in the CAL FIRE database for the County from 1950 to 2020, colored by the size of the acreage burned.

Figure 4-75 Yuba County – Wildfire History CAL FIRE 1950 to 2020



**FOSTER MORRISON**  
CONSULTING

0 5 10 Miles



Data Source: CAL FIRE Fire History (firep19\_1) 5/2020, Yuba County GIS, Cal-Atlas; Map Date: 1/15/2021

*Table 4-88 Yuba County – Wildfires by Acres Burned 1950-2020*

Wildfire Name	Date	Cause Description	GIS Acres
49'er	9/11/1988	Debris	36,343
(blank)	(blank)	Miscellaneous	20,274
(blank)	–	Unknown / Unidentified	19,442
Cascade	10/8/2017	Unknown / Unidentified	16,141
Pendola	10/16/1999	Miscellaneous	12,324
Villa	9/25/1992	Powerline	6,605
North San Juan	8/21/1960	Miscellaneous	5,840
Williams	9/27/1997	Miscellaneous	5,838
Camp Beale #2	7/11/1950	Unknown / Unidentified	4,886
Carmichael #2	7/19/1960	Unknown / Unidentified	4,366
Yuba	8/15/2009	Powerline	3,829
Capehart	9/2/1961	Unknown / Unidentified	3,302
Sugar Loaf	9/17/1953	Unknown / Unidentified	2,602
Roadside #70	7/10/1979	Unknown / Unidentified	2,401
C.P. Mine	9/3/1961	Unknown / Unidentified	1,472
Twenty	6/21/2008	Lightning	1,355
Bullards Incident	8/27/2010	Unknown / Unidentified	1,289
Beale Assist	9/4/1998	Smoking	1,277
Brown's Valley #2	9/3/1961	Unknown / Unidentified	1,253
Camp Beale #3	6/17/1955	Unknown / Unidentified	1,116
Capehart	10/14/1967	Unknown / Unidentified	1,063
Field	6/9/2002	Powerline	937
Beale	8/20/2017	Powerline	867
Selby #2	6/16/1961	Unknown / Unidentified	864
Carmichael #2	9/14/1958	Unknown / Unidentified	831
Peoria	7/18/1983	Playing with Fire	817
Camp Beale #2	6/12/1952	Unknown / Unidentified	800
Camp Far West	6/27/1970	Unknown / Unidentified	589
Rackerby	9/2/1961	Unknown / Unidentified	578
Camp Beale #1	6/21/1954	Unknown / Unidentified	509
Stanfield Hill	7/20/1961	Unknown / Unidentified	507
Camp Beale #29	8/10/1963	Unknown / Unidentified	502
Grand Incident	10/11/2010	Unknown / Unidentified	493
Myrna	9/1/2008	Unknown / Unidentified	455
Camp Beale #7	9/9/1955	Unknown / Unidentified	446
Beale	6/3/2004	Powerline	434

Wildfire Name	Date	Cause Description	GIS Acres
Beale #4	9/2/1964	Unknown / Unidentified	426
Beale Escape	8/18/2016	Escaped Prescribed Burn	389
Marysville	8/16/2006	Miscellaneous	388
Hinton Mine	4/8/1951	Unknown / Unidentified	345
Smart	9/4/1998	Arson	344
Krista	7/9/2011	Unknown / Unidentified	342
Lightning 1	7/28/1980	Unknown / Unidentified	337
Roadside #88	7/20/1979	Unknown / Unidentified	300
Sugar Loaf	9/5/1957	Unknown / Unidentified	294
Beale	8/28/2009	Unknown / Unidentified	281
Roadside #8	8/1/1953	Unknown / Unidentified	275
Roadside #117	9/22/1980	Unknown / Unidentified	265
Beale AFB Grass Valley GA	9/10/2013	Unknown / Unidentified	255
Fish & Game #4	7/1/1973	Unknown / Unidentified	242
Ramirez	7/21/2012	Debris	199
P.G.&E. #17	9/17/1978	Unknown / Unidentified	198
Smartville	6/29/2007	Lightning	197
South Beale	10/23/2007	Railroad	195
Broadway / North Complex	7/7/2012	Arson	188
Yuba Consolidated	6/7/1974	Unknown / Unidentified	183
Daguerra Point	9/20/2002	Arson	179
U. OF C. R. I. Escape	8/2/1966	Unknown / Unidentified	169
(blank)	7/17/1977	Miscellaneous	163
Smartville	8/17/2011	Vehicle	149
Cook	6/18/2015	Escaped Prescribed Burn	140
Yeager Incident	8/11/2011	Vehicle	140
Scott	8/26/2004	Equipment Use	119
Beale	8/11/2012	Equipment Use	110
Beale AFB Beale	6/15/2013	Unknown / Unidentified	109
Pourier	3/17/1988	Escaped Prescribed Burn	108
Finley	8/30/2008	Arson	103
Plumas Brodhy Assist	9/11/1974	Unknown / Unidentified	101
Jasper	10/2/2007	Equipment Use	86
Columbia	6/16/2012	Equipment Use	83
Morrison Incident	10/11/2010	Vehicle	82
Colgate	6/9/2002	Powerline	80
Scott	6/24/2019	Equipment Use	80

Wildfire Name	Date	Cause Description	GIS Acres
Knipe	6/8/1979	Unknown / Unidentified	77
Meganney	7/8/2013	Unknown / Unidentified	73
22nd	6/8/2019	Unknown / Unidentified	72
Spenceville	9/10/2011	Unknown / Unidentified	66
Spenceville	6/15/2013	Unknown / Unidentified	66
Kibbe	10/29/2002	Railroad	59
Iowa	6/6/2008	Equipment Use	58
Beale	7/11/2015	Miscellaneous	53
Joines	9/3/2016	Vehicle	53
Doolittle	7/12/2013	Miscellaneous	41
Levee	8/18/2008	Unknown / Unidentified	41
Island	7/16/2012	Unknown / Unidentified	39
Waldo 2	9/7/2007	Arson	39
Gold	7/11/2017	Arson	37
Scales 1	1/5/1991	Debris	37
Spenceville	7/24/2017	Vehicle	37
(blank)	6/17/1978	Lightning	36
Dredge	10/8/2002	Unknown / Unidentified	35
Far	7/6/2019	Unknown / Unidentified	35
Loma Fire	9/30/2011	Escaped Prescribed Burn	32
Verdi	5/4/1980	Miscellaneous	31
Chuck	5/27/2016	Equipment Use	29
Francis	8/4/2015	Powerline	29
Jasper	9/26/2017	Unknown / Unidentified	28
Forbestown	6/21/2008	Lightning	26
Hill	4/20/2009	Miscellaneous	25
Thorntree	9/25/2018	Unknown / Unidentified	25
Hammonton	9/7/2016	Unknown / Unidentified	23
Range	5/30/2019	Equipment Use	23
Spence	7/1/2018	Miscellaneous	23
Waldo	6/11/2012	Miscellaneous	23
Waldo	5/11/2013	Miscellaneous	23
Waldo	7/6/2016	Miscellaneous	23
Waldo2	8/10/2016	Unknown / Unidentified	23
Douglas	8/18/2019	Equipment Use	22
Rancho	6/29/2018	Unknown / Unidentified	22
Cross	10/14/2005	Equipment Use	21

Wildfire Name	Date	Cause Description	GIS Acres
Beale	8/18/2011	Unknown / Unidentified	20
County	6/7/2012	Miscellaneous	20
Doolittle	7/14/2015	Unknown / Unidentified	20
Peoria	7/5/2004	Vehicle	20
Fountain	8/28/2015	Unknown / Unidentified	19
Rifle	5/11/2008	Miscellaneous	19
Waldo	6/15/2011	Unknown / Unidentified	19
Garden	8/6/2008	Lightning	18
Douglas	6/11/2016	Unknown / Unidentified	17
Scott	9/9/2011	Equipment Use	17
Spring	7/20/2009	Unknown / Unidentified	17
Bullards	8/6/2008	Lightning	16
Waldo	6/22/2007	Equipment Use	16
Bar	5/4/2013	Lightning	15
Collins	6/9/2012	Miscellaneous	15
Our	8/8/1970	Campfire	15
Parks	7/7/2003	Unknown / Unidentified	15
Brophy	9/16/2017	Unknown / Unidentified	14
Spenceville	9/21/2008	Miscellaneous	14
Twenty	7/13/2012	Equipment Use	13
Smartsville	10/8/2017	Unknown / Unidentified	12
Strawberry	2/24/1991	Equipment Use	12
Walker	9/10/2014	Miscellaneous	12
Beale	6/28/2016	Arson	11
Dobbins Incident	8/20/2010	Unknown / Unidentified	11
Reedy	1/2/2014	Debris	11
Spenceville	5/28/2017	Miscellaneous	11
(blank)	–	Lightning	11
Loma Rica / La Porte	8/7/2007	Arson	10
Monument	6/12/2014	Unknown / Unidentified	10
Plantz	9/1/2008	Unknown / Unidentified	10
Hammonton	6/9/2012	Unknown / Unidentified	9
Hammonton	7/13/2019	Unknown / Unidentified	9
Hammonton	7/6/2013	Unknown / Unidentified	8
Yellow	3/20/1970	Smoking	6
Loma	10/6/2019	Equipment Use	1

Source: CAL FIRE

## Hazard Mitigation Planning Committee

The HMPC noted the following fires to affect the County:

The Dobbins-Oregon House area has been affected by several wildfires, including: Bullards Fire (2010); Yuba Fire (2009); Marysville Road Fire (2006); Pendola Fire (1999); and Williams Fire (1997).

**2009 Yuba Fire** (FM-2825) – The Yuba Fire was started after a red-tailed hawk flew into a power line on August 14, and burned 3,891 acres before being contained on August 21 at a cost of US\$12.1 million. Two residences in Yuba County burned and power lines transporting electricity from a hydroelectric facility were threatened.

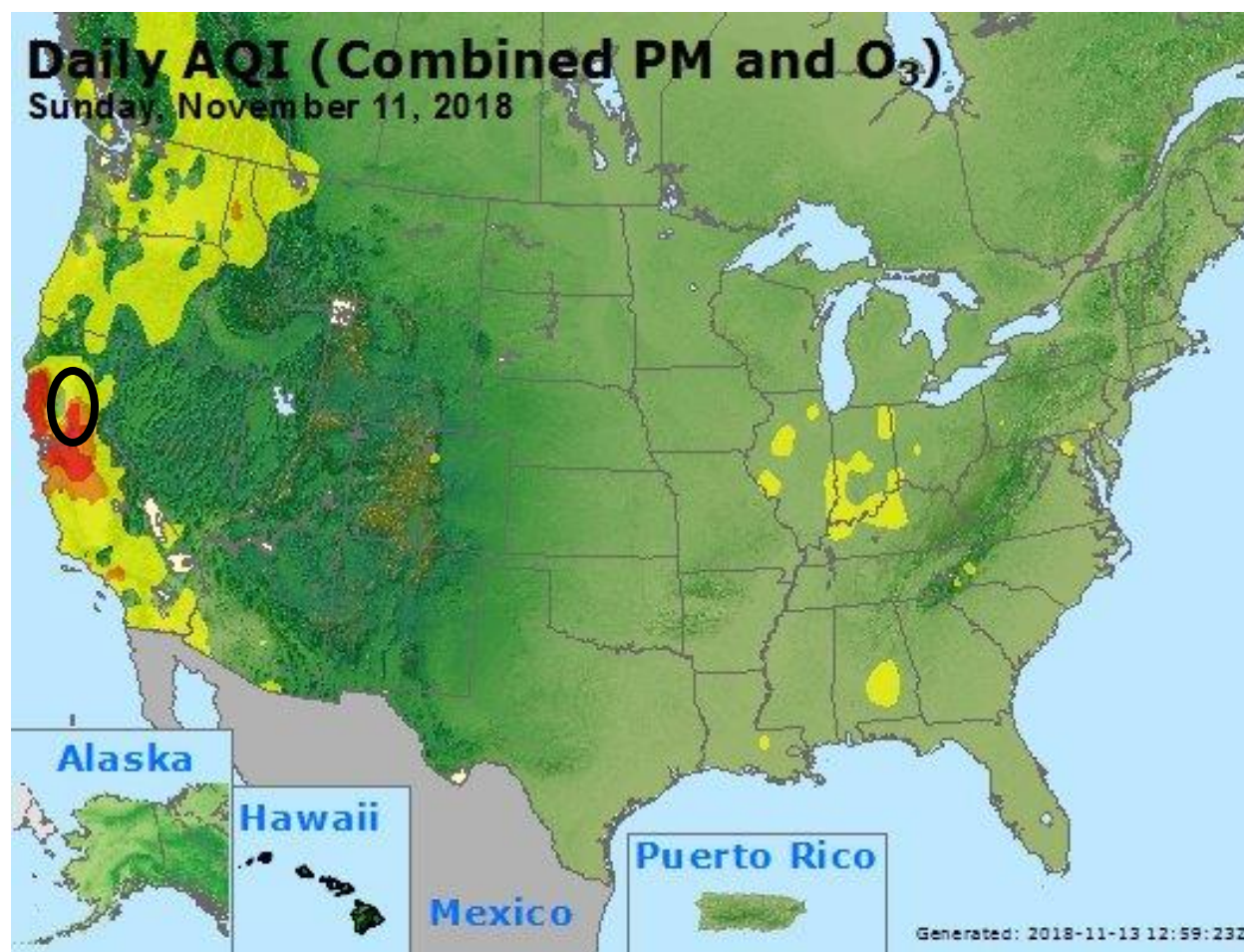
**2010 Bullards Fire** (GP-2010-08) – The fire began at 4:05 p.m. Aug. 27, and burned 1,307 in Yuba County south of Bullards Bar Reservoir, about 15 miles northwest of Grass Valley.

**2017 Cascade Fire** (FM-5216) – The 8,200-acre Cascade fire in Yuba County claimed one life, bringing to total number of people dead in Northern California fires to 11, county officials said. A Yuba County spokesman Russ Brown said Tuesday that the unidentified person was in a vehicle fleeing from the town of Loma Rica, ran off a back road and became trapped in the blaze. An After Action Report from Yuba County noted the following:

- With 74mph winds (1mph short a Category 1 Hurricane, the fire was narrow and running fast.
- Landlines, cell towers were burning down hindering notifications.
- Power lines were down everywhere increasing reflex time
- Set up 3 shelters within 4 hours in 3 separate counties. - The need immediately caused concern due to limited resources. (Normal response is to open for 200 evacuees within 4 hours.) Many signed in but did not stay at the shelter.

**November 2018** – November 8th the deadliest and most destructive Wildfire in that State of California began in Butte County. Leading to numerous evacuations of the Pulga, Paradise, Magalia, Oroville and parts of the City of Chico. Yuba and Sutter County emergency managers joined forces to provide a Bi-County response, which ultimately became the largest Mass Care Services response for the incident. Organizations included Yuba County, Sutter County, Yuba Sutter Fairgrounds, Salvation Army, Habitat for Humanity, Field Haven Feline Center, Yuba Sutter Domestic Animal Disaster Assistance (YSDADA). Yuba and Sutter Counties opened a joint shelter at the request of Butte County to assist with housing of the evacuees. Air quality issues were felt in Yuba County from this event, as shown on Figure 4-76. This figure shows a one day snapshot. Air quality issues persisted for weeks. Due to the smoke, the Board of Supervisors declared a local emergency due to air pollution.

Figure 4-76 Camp Fire – Air Quality Impacts

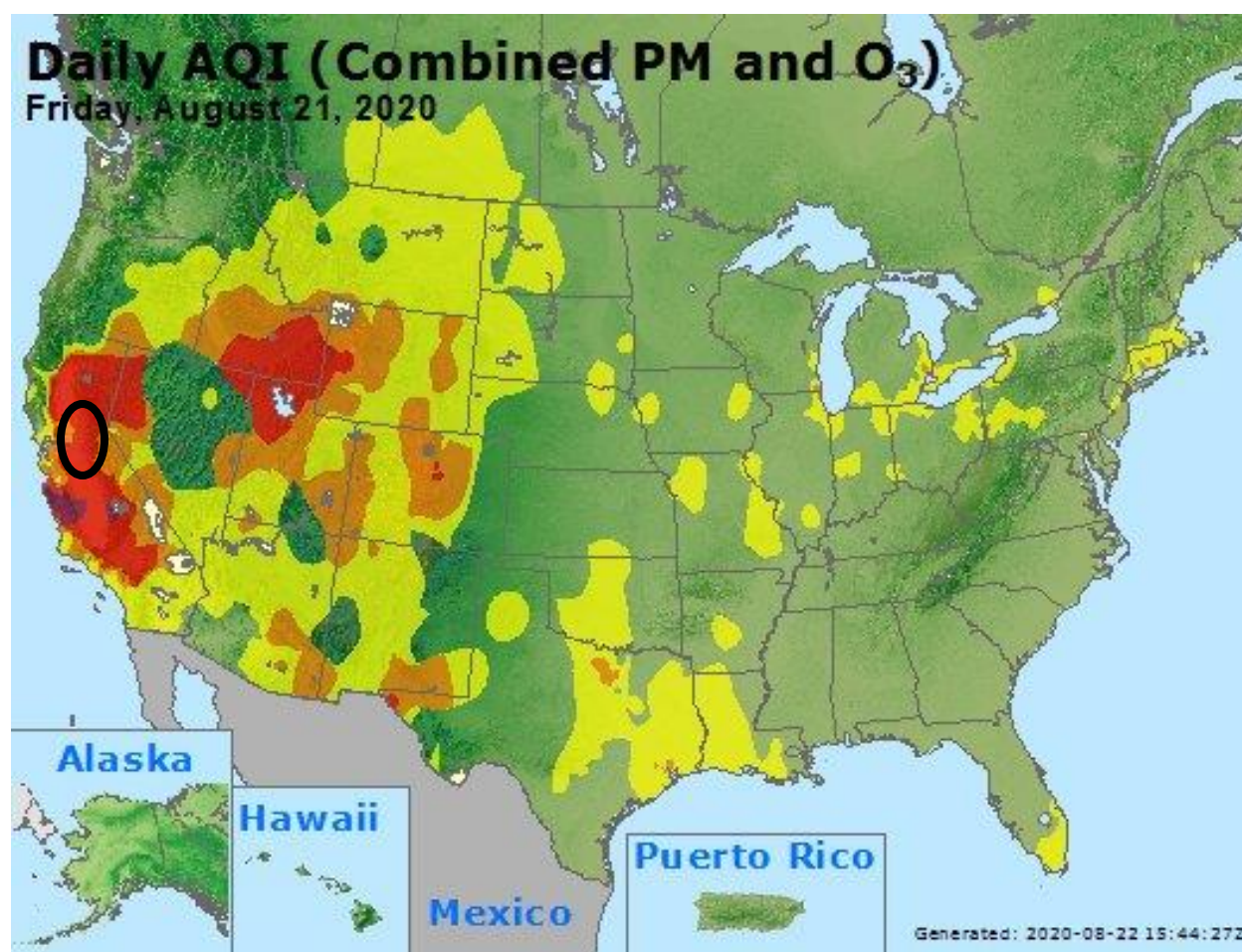


Source: EAP AirNow website. Retrieved on 1/11/2021.

Map Colors: Green (Good), Yellow (Moderate), Orange (Unhealthy for Sensitive Groups), Red (Unhealthy), Dark Pink (Very Unhealthy), Maroon (Hazardous)

**2020 North Complex Fire** – According to an After Action Report provided by the County, on September 8<sup>th</sup> around 13:00 the North Complex Fire began to threaten located in Butte and Plumas counties began to push down expanding the wildfire threat to residents on the Northwestern border of Yuba County. Leading to numerous evacuations of the foothill region, Clipper Mills, Strawberry Valley, Woodleaf, Rackerby, Brownsville, and Challenge. At approximately 23:00 on September 8<sup>th</sup> Yuba County OES received notification that a fire had started in Loma Rica area within Yuba County resulting in an expansion of the existing evacuations to include the Loma Rica, Dobbins-Oregon House, and several other communities in the Foothill region. Yuba County provided Non-Congregate Sheltering for residents and Animal Sheltering operations. Though it did not burn areas in the County, wildfire smoke and air quality issues were suffered by County residents. This can be seen on Figure 4-77. This figure shows a one day snapshot. Air quality issues persisted for over a month.

Figure 4-77 North Complex Fires – Air Quality Impacts



Source: EAP AirNow website. Retrieved on 1/11/2021.

Map Colors: Green (Good), Yellow (Moderate), Orange (Unhealthy for Sensitive Groups), Red (Unhealthy), Dark Pink (Very Unhealthy), Maroon (Hazardous)

### Likelihood of Future Occurrence

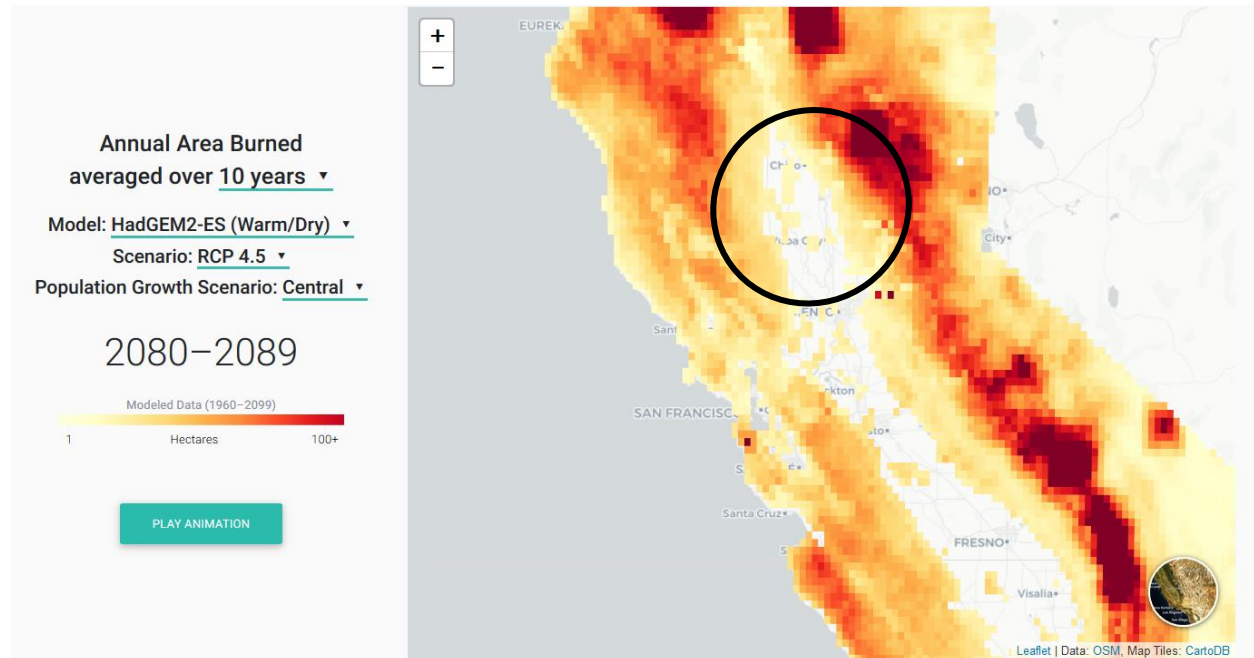
**Highly Likely** — From May to October of each year, Yuba County faces a wildfire threat. Fires will continue to occur on an almost annual basis in the Yuba County Planning Area. The threat of wildfire and potential losses constantly increase as human development and population increase in the wildland urban interface area in the County. This results in a highly likely rating of future occurrence.

### Climate Change and Wildfire

Warmer temperatures can exacerbate drought conditions. Drought often kills plants and trees, which serve as fuel for wildfires. Warmer temperatures could increase the number of wildfires and pest outbreaks, such as the western pine beetle. Cal-Adapt's wildfire tool predicts the potential increase in the amount of burned areas for the year 2080-2089, as compared to recent (2010) conditions. This is shown in Figure 4-78. Based on this model, Cal-Adapt predicts that wildfire risk in Yuba County will increase slightly (and much less than other California counties) in the near term and subside during mid-to late-century. However, wildfire

models can vary depending on the parameters used. Cal-Adapt does not take landscape and fuel sources into account in their model. In all likelihood, in Yuba County, precipitation patterns, high levels of heat, topography, and fuel load will determine the frequency and intensity of future wildfire.

*Figure 4-78 Yuba County – Projected Increase in Wildfire Burn Areas*



Source: Cal-Adapt. Retrieved 6/11/2021.

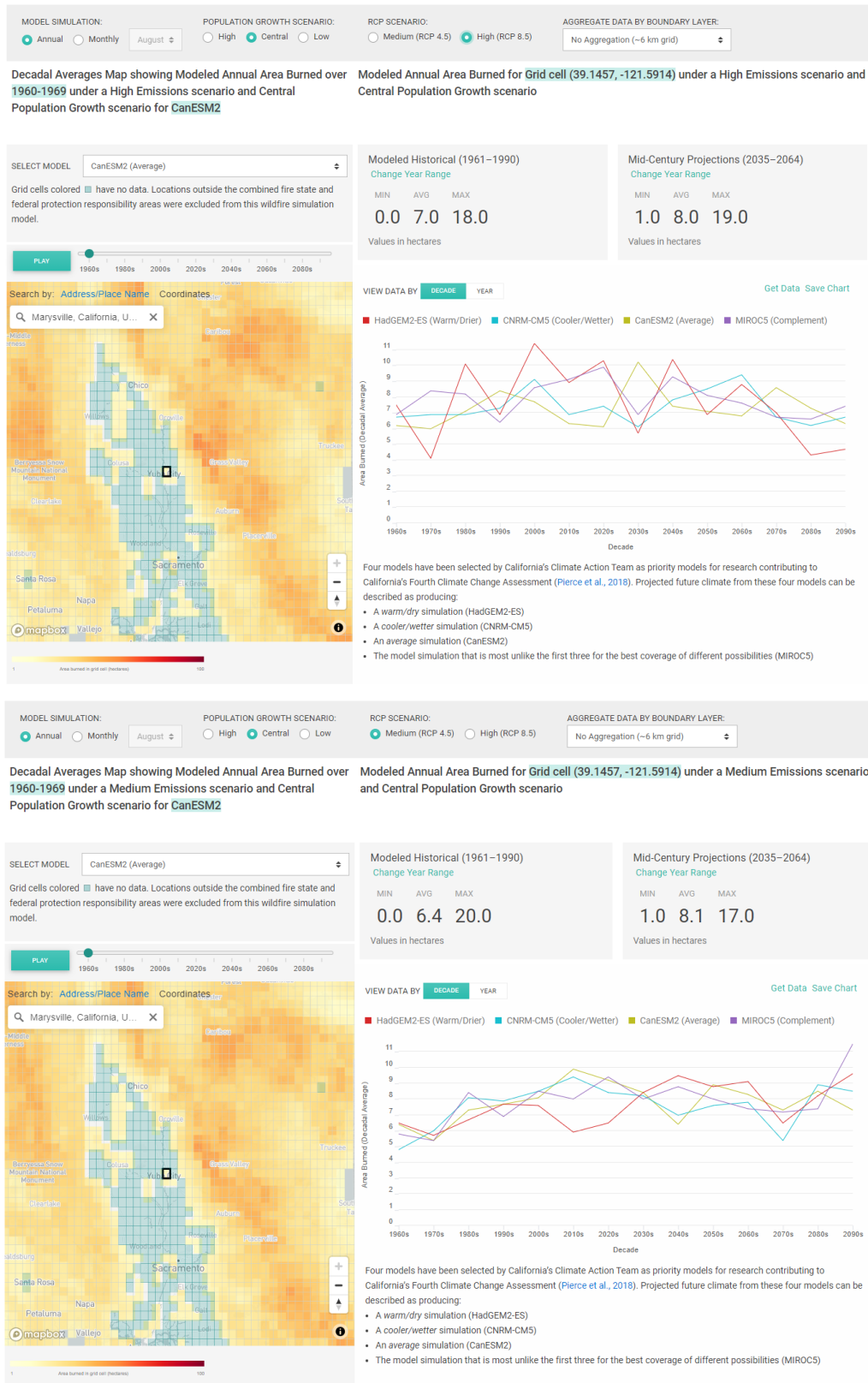
Cal-Adapt has also sought to model annual averages of area burned in the State. Four models have been selected by California’s Climate Action Team Research Working Group as priority models for research contributing to California’s Fourth Climate Change Assessment. Projected future climate from these four models can be described as producing:

- A warm/dry simulation (HadGEM2-ES) – shown by the red line on the below charts
- A cooler/wetter simulation (CNRM-CM5) – shown by the blue line on the below charts
- An average simulation (CanESM2) – shown by the green line on the below charts
- The model simulation that is most unlike the first three for the best coverage of different possibilities (MIROC5) – shown by the purple line on the below charts

Future modeled annual averages of area burned from Cal-Adapt for the Yuba County Planning (using the quad that contains Marysville) are shown in Figure 4-79. It shows the following:

- The upper chart shows modeled annual averages of area burned for the selected area on map under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100.
- The lower chart shows modeled annual averages of area burned for the selected area on map under the RCP 4.5 scenario in which emissions peak around 2040, then decline.

**Figure 4-79 Yuba County – Future Acreage Burned: High and Low Emission Scenarios**



Source: Cal-Adapt – Annual Average of Acres Burned, retrieved on 3/18/2021

## Vulnerability Assessment

### Vulnerability—Extremely High

Risk and vulnerability to the Yuba County Planning Area from wildfire is of concern, with some areas of the County being at greater risk than others as previously described. Fuel loads in portions of the County, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. During the nearly year around fire season, the dry vegetation and hot and sometimes windy weather results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

### Communities at Risk to Wildfire

The National Fire Plan is a cooperative, long-term effort between various government agency partners with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future. For purposes of the National Fire Plan, the California Department of Forestry and Fire Protection (CAL FIRE) generated a list of California communities at risk for wildfire. The intent of this assessment was to evaluate the risk to a given area from fire escaping off federal lands. Three main factors were used to determine the wildfire threat in the wildland-urban interface areas of California: fuel hazards, probability of fire, and areas of suitable housing density that could create wildland urban interface fire protection strategy situations. The preliminary criteria and methodology for evaluating wildfire risk to communities is published in the Federal Register, January 4, 2001. The National Fire Plan identifies 16 “Communities at Risk” in Yuba County. These are shown in Table 4-89.

*Table 4-89 Yuba County Communities at Risk to Wildfire*

Communities at Risk		
Beale Air Force Base East	Dobbins	Rackerby
Browns Valley	Iowa City	Sicard Flat
Brownsville	Linda	Smartville
Camptonville	Loma Rica	Strawberry Valley
Challenge	Marysville	Timbuctoo
Challenge-Brownsville	Oregon House	

Source: CAL FIRE

### Impacts

Wildfires can result in loss of life, injuries, damage to structures, and can cause short-term and long-term disruption to the County. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the County by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Potential losses from wildfire

can also include those to agricultural lands and crops in the County as well as to natural resources such as wildlife and habitat areas.

Although the physical damages and casualties arising from wildland-urban interface fires may be severe, it is important to recognize that they also can cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. In some cases, the economic impact of this loss of services may be comparable to the economic impact of physical damages or, in some cases, even greater. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides and mudflows, and erosion during the rainy season. School closures can also occur.

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.

In the foothills there is a significant issue with access to water, with no hydrant system or tank storage to note thereby directly increasing the threat and impacts of a wildfire and inhibiting the capabilities resulting in increased damages to infrastructure, private property, and life. Communication also poses another major issue in the foothills as it relates to alert and warning in the foothills. Particularly when compounded by a PSPS. Narrow roads also pose a significant threat to public safety, mitigation and response measures.

### **Wildfire (Smoke) and Air Quality**

Smoke and air pollution from wildfires can be a severe health hazard. Significant wildfires occurring in nearby counties since the 2015 LHMP 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 on power shortage and failure can be found at the beginning of Section 4.3.

### **Wildfire Analysis**

The Yuba County Planning Area has mapped CAL FIRE fire hazard severity zones (FHSZs) based on fire responsibility areas as further described below. GIS was used to determine the possible impacts of wildfire within the County and how the wildfire risk varies across the Planning Area. The wildfire analysis includes an analysis of affected parcels and values by Fire Responsibility areas and by CAL FIRE's FHSZs.

## Fire Responsibility Area Analysis

There are various wildland fire protection agencies that have responsibility within the California Counties. There are also numerous fire departments and fire protection districts that serve local areas, many of whom have mutual aid agreements with each other as well as state and federal agencies for fire suppression and protection. Fire Responsibility areas are generally categorized by Federal Responsibility Areas (FRA), State Responsibility Areas (SRA) and Local Responsibility Areas (LRA).

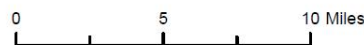
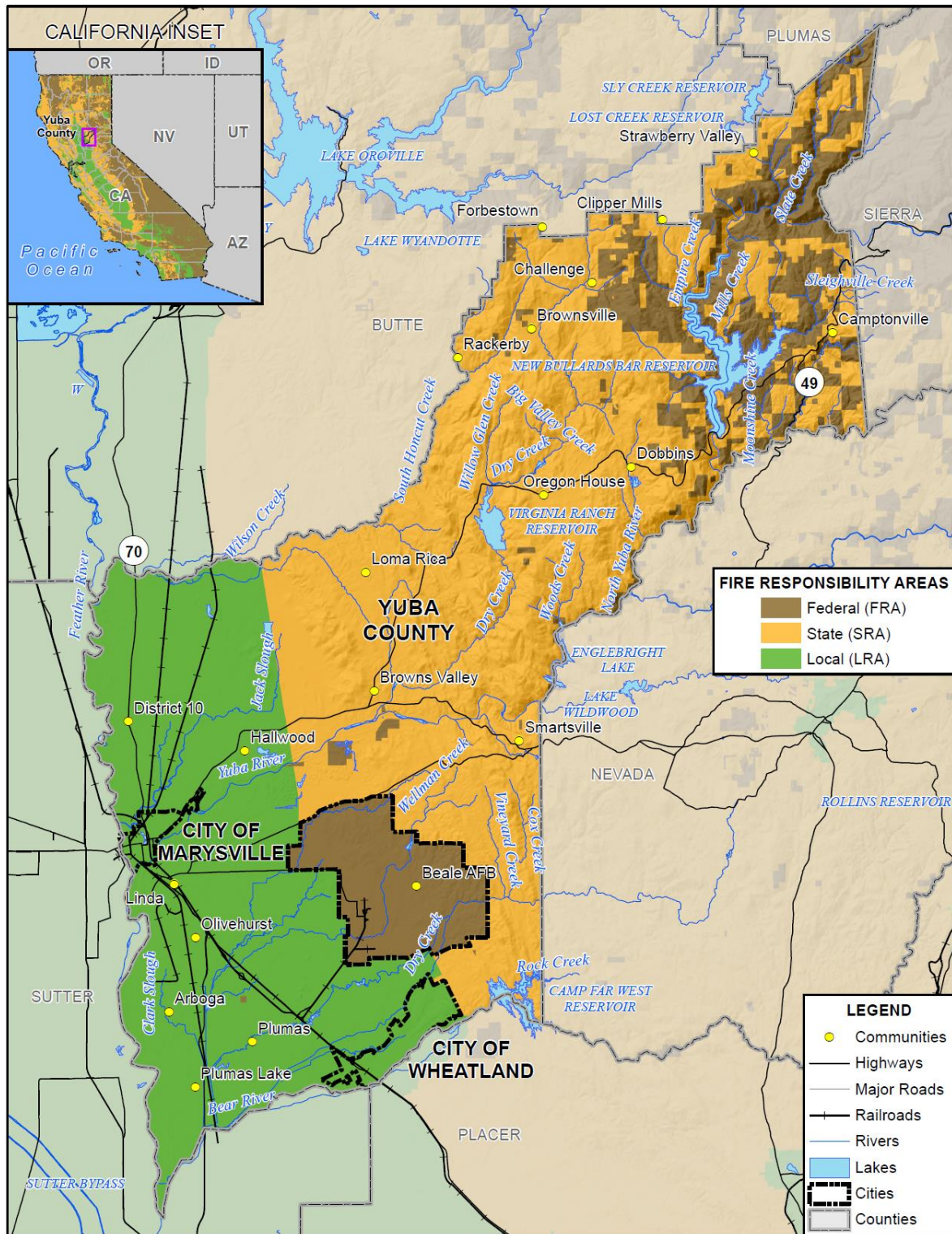
The CAL FIRE data, detailing Fire Responsibility Areas within the County Planning Area, was utilized to determine the locations, numbers, types, and values of land and structures falling within each Fire Responsibility Area. The following sections provide details on the methodology and results for this analysis.

### *Methodology*

CAL FIRE has a legal responsibility to provide fire protection on all SRA lands, which are defined based on land ownership, population density and land use. CAL FIRE's State Responsibility Area layer was used in this analysis to show Yuba County's parcel counts and values by FRA, SRA, and LRA.

The fire responsibility area layer was overlaid with the parcel data. Since it is possible for any given parcel to intersect with multiple fire responsibility areas, for purposes of this analysis, the parcel centroid was used to determine which fire responsibility area to assign to each parcel. Once completed, the parcel boundary layer was joined to the centroid layer and values were transferred based on the identification number in the Assessor's database and the FIS parcel layer. Based on this approach, the fire responsibility areas for the Yuba County Planning Area were determined and further broken out by property use and included information on both land and improved values. Locations of each responsibility area are shown in Figure 4-80.

Figure 4-80 Yuba County Planning Area – Fire Responsibility Areas by FRA, SRA, LRA



Data Source: CAL FIRE (SRA 20\_3) 11/2020, Yuba County GIS, Cal-Atlas; Map Date: 1/15/2021.



### *Fire Responsibility Areas and Values at Risk Results*

Most all of the physical area of Yuba County falls in the LRA. The LRA has 36,124 improved parcels with \$14.65 billion in total value. The FRA contains 35 parcels, of which 1 is improved. There are no parcels in the SRA. It should be noted that fire does not just affect structural values, fire can also affect land values. As such the Assessor’s land values and all parcels were accounted for in this analysis to represent total county values at risk. However, it is highly unlikely the whole County will ever be on fire at once. The County parcel inventory and associated values by fire responsibility area are provided in Table 4-90 for the entire Yuba County Planning Area, as described in the Values at Risk in Section 4.2. Also, it is important to keep in mind that these assessed values may be well below the actual market value of improved parcels located within the fire hazard severity zones due primarily to Proposition 13.

*Table 4-90 Yuba County Planning Area – Count and Value of Parcels by Local, State, and Federal Responsibility Areas by Property Use*

Jurisdiction/ Fire Responsibility Area	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>City of Marysville</b>						
LRA	0	0	\$0	\$0	\$0	\$0
SRA	0	0	\$0	\$0	\$0	\$0
FRA	4,384	3,675	\$168,881,701	\$994,666,587	\$790,354,784	\$1,953,903,072
<b>Total</b>	<b>4,384</b>	<b>3,675</b>	<b>\$168,881,701</b>	<b>\$994,666,587</b>	<b>\$790,354,784</b>	<b>\$1,953,903,072</b>
<b>City of Wheatland</b>						
LRA	0	0	\$0	\$0	\$0	\$0
SRA	0	0	\$0	\$0	\$0	\$0
FRA	1,432	1,166	\$85,131,232	\$226,534,990	\$125,006,550	\$436,672,772
<b>Total</b>	<b>1,432</b>	<b>1,166</b>	<b>\$85,131,232</b>	<b>\$226,534,990</b>	<b>\$125,006,550</b>	<b>\$436,672,772</b>
<b>Unincorporated County</b>						
LRA	546	0	\$62,290	\$0	\$0	\$62,290
SRA	8,921	5,018	\$580,357,849	\$847,537,365	\$457,072,043	\$1,884,967,257
FRA	17,965	13,784	\$1,180,705,175	\$2,605,817,201	\$1,534,879,566	\$5,321,401,942
<b>Total</b>	<b>27,432</b>	<b>18,802</b>	<b>\$1,761,125,314</b>	<b>\$3,453,354,566</b>	<b>\$1,991,951,609</b>	<b>\$7,206,431,489</b>
<b>Grand Total</b>						
<b>Grand Total</b>	<b>33,248</b>	<b>23,643</b>	<b>\$2,015,138,247</b>	<b>\$4,674,556,143</b>	<b>\$2,907,312,943</b>	<b>\$9,597,007,333</b>

Source: CAL FIRE, Yuba County 2020 Parcel/Assessor’s Data

### **Fire Hazard Severity Zone Analysis**

As part of the Fire and Resource Assessment Program (FRAP), CAL FIRE was mandated to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred

to as FHSZs, then define the application of various mitigation strategies to reduce risk associated with wildland fires.

Fire hazard is a way to measure the physical fire behavior so that people can predict the damage a fire is likely to cause. Fire hazard measurement includes the speed at which a wildfire moves, the amount of heat the fire produces, and most importantly, the burning fire brands that the fire sends ahead of the flaming front.

The fire hazard model developed by CAL FIRE considers the wildland fuels. Fuel is that part of the natural vegetation that burns during the wildfire. The model also considers topography, especially the steepness of the slopes. Fires burn faster as they burn up-slope. Weather (temperature, humidity, and wind) has a significant influence on fire behavior. The model recognizes that some areas of California have more frequent and severe wildfires than other areas. Finally, the model considers the production of burning fire brands (embers) how far they move, and how receptive the landing site is to new fires.

In 2007, CAL FIRE developed its FHSZ maps for the State of California to provide updated map zones, based on new data, science, and technology that will create more accurate zone designations such that mitigation strategies are implemented in areas where hazards warrant these investments. The zones will provide specific designation for application of defensible space and building standards consistent with known mechanisms of fire risk to people, property, and natural resources. The program is still ongoing with fire hazard severity zone maps being updated based on designated responsibility areas: FRA, SRA, and LRA.

The CAL FIRE data, detailing FHSZs within the Yuba County Planning Area, was utilized to determine the locations, numbers, types, and values of land and structures falling within each FHSZ. The following sections provide details on the methodology and results for this analysis.

### *Methodology*

CAL FIRE mapped the SRA FHSZs, or areas of significant fire hazard, based on fuels, terrain, weather, and other relevant factors. Zones are designated with Very High, High, Moderate, Non-Wildland/Non-Urban and Urban Unzoned hazard classes. The goal of this mapping effort is to create more accurate fire hazard zone designations such that mitigation strategies are implemented in areas where hazards warrant these investments. The FHSZs will provide specific designation for application of defensible space and building standards consistent with known mechanisms of fire risk to people, property, and natural resources.

The “Draft” LRA FHSZ (c6fhszl06\_1) dated September 2007 layer and the Adopted SRA FHSZ (fhszs06\_3\_6) dated November 2007 were used to get a complete coverage of Fire Hazards.

Analysis was performed using the FHSZ datasets, and using GIS, the parcel layer was overlaid on the Draft and Adopted FHSZ layers. For the purposes of this analysis, if the parcel centroid intersects the zone’s area, it will be assumed that the entire parcel is in that area. This analysis illustrates the FHSZs specific to the Planning Area and the unincorporated County.

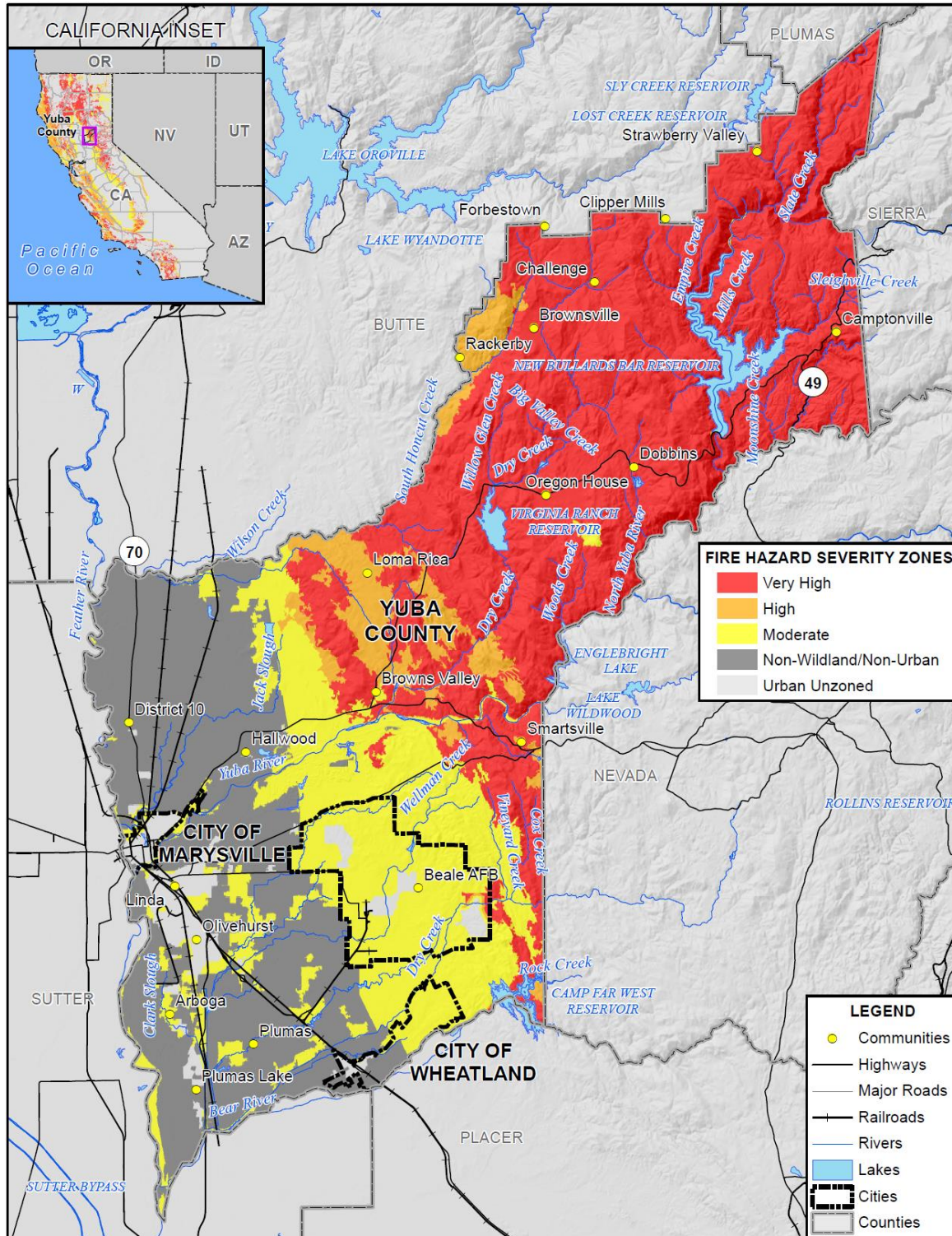
### *Fire Hazard Severity Zones Analysis Results: Values at Risk*

Results are presented in this section for the Yuba County Planning Area and the unincorporated County. Detail tables for the incorporated communities are included in their respective annexes to this LHMP Update.

#### **Yuba County Planning Area**

The FHSZs in Yuba County are shown in Figure 4-81. Analysis results for Yuba County are summarized in Table 4-91. These tables summarize total parcel counts, improved parcel counts, and their improved and land values, and the estimated contents replacement values based on the CRV factors detailed in Table 4-7. Details specific to land uses in the incorporated jurisdictions in the County are shown in their respective annexes to this Plan Update.

Figure 4-81 Yuba County Planning Area – Fire Hazard Severity Zones



FOSTER MORRISON  
CONSULTING

0 5 10 Miles

Data Source: CAL FIRE (Draft 9/2007 - c58fhfsl06\_1, Adopted, 11/2007 - fhfsz06\_3\_58),  
Yuba County GIS, Cal-Atlas; Map Date: 1/15/2021.



*Table 4-91 Yuba County Planning Area – Count and Value of Parcels in Fire Hazard Severity Zones by Jurisdiction*

Jurisdiction / Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>City of Marysville</b>						
Moderate	237	103	\$6,608,913	\$48,682,646	\$41,110,536	\$96,402,095
Non-Wildland/Non-Urban	9	1	\$243,768	\$21,891	\$21,891	\$287,550
Urban Unzoned	4,138	3,571	\$162,029,020	\$945,962,050	\$749,222,357	\$1,857,213,427
<b>City of Marysville Total</b>	<b>4,384</b>	<b>3,675</b>	<b>\$168,881,701</b>	<b>\$994,666,587</b>	<b>\$790,354,784</b>	<b>\$1,953,903,072</b>
<b>City of Wheatland</b>						
Moderate	36	21	\$14,679,448	\$3,515,125	\$2,055,248	\$20,249,821
Non-Wildland/Non-Urban	124	11	\$22,140,904	\$7,068,771	\$6,900,831	\$36,110,506
Urban Unzoned	1,272	1,134	\$48,310,880	\$215,951,094	\$116,050,471	\$380,312,445
<b>City of Wheatland Total</b>	<b>1,432</b>	<b>1,166</b>	<b>\$85,131,232</b>	<b>\$226,534,990</b>	<b>\$125,006,550</b>	<b>\$436,672,772</b>
<b>Unincorporated Yuba County</b>						
Very High	7,118	3,768	\$402,926,820	\$614,447,644	\$332,457,427	\$1,349,831,891
High	1,321	868	\$91,226,316	\$152,031,993	\$79,825,010	\$323,083,319
Moderate	3,472	2,374	\$236,302,363	\$463,514,429	\$251,786,475	\$951,603,267
Non-Wildland/Non-Urban	4,018	2,319	\$618,398,177	\$545,563,347	\$391,788,165	\$1,555,749,689
Urban Unzoned	11,503	9,473	\$412,271,638	\$1,677,797,153	\$936,094,532	\$3,026,163,323
<b>Unincorporated Yuba County Total</b>	<b>27,432</b>	<b>18,802</b>	<b>\$1,761,125,314</b>	<b>\$3,453,354,566</b>	<b>\$1,991,951,609</b>	<b>\$7,206,431,489</b>
<b>Grand Total</b>						
<b>Grand Total</b>	<b>33,248</b>	<b>23,643</b>	<b>\$2,015,138,247</b>	<b>\$4,674,556,143</b>	<b>\$2,907,312,943</b>	<b>\$9,597,007,333</b>

Source: CAL FIRE, Yuba County 2020 Parcel/Assessor's Data

### Unincorporated Yuba County

Analysis results for unincorporated Yuba County are broken out by property use in Table 4-92. This table details total parcel counts, improved parcel counts, and their improved and land values, and the estimated contents replacement values based on the CRV factors detailed in Table 4-7.

*Table 4-92 Unincorporated Yuba County– Count and Value of Parcels in Fire Hazard Severity Zones by Property Use*

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
<b>Very High</b>						
Agricultural	2,149	152	\$157,122,769	\$6,554,859	\$6,554,859	\$170,232,487
Commercial	115	91	\$9,434,518	\$41,723,207	\$41,723,207	\$92,880,932
Government-Owned / Non-Taxable Property	376	0	\$63,789	\$0	\$0	\$63,789
Industrial	6	5	\$434,645	\$1,126,875	\$1,690,312	\$3,251,832
Miscellaneous	238	0	\$0	0\$64,579	0\$64,579	0\$129,158
Residential	4,234	3,520	\$235,871,099	\$565,107,282	\$282,553,628	\$1,083,532,009
<b>Very High Total</b>	<b>7,118</b>	<b>3,768</b>	<b>\$402,926,820</b>	<b>\$614,447,644</b>	<b>\$332,457,427</b>	<b>\$1,349,831,891</b>
<b>High</b>						
Agricultural	378	36	\$32,587,585	\$2,886,846	\$2,886,846	\$38,361,277
Commercial	18	17	\$987,198	\$4,731,197	\$4,731,197	\$10,449,592
Government-Owned / Non-Taxable Property	25	0	\$0	\$0	\$0	\$0
Industrial	0	0	\$0	\$0	\$0	\$0
Miscellaneous	32	0	\$0	\$0	\$0	\$0
Residential	868	815	\$57,651,533	\$144,413,950	\$72,206,967	\$274,272,450
<b>High Total</b>	<b>1,321</b>	<b>868</b>	<b>\$91,226,316</b>	<b>\$152,031,993</b>	<b>\$79,825,010</b>	<b>\$323,083,319</b>
<b>Moderate</b>						
Agricultural	483	88	\$93,439,534	\$14,613,486	\$14,613,486	\$122,666,506
Commercial	56	22	\$10,976,153	\$5,480,144	\$5,480,144	\$21,936,441
Government-Owned / Non-Taxable Property	219	0	\$388,350	\$0	\$0	\$388,350
Industrial	27	18	\$13,003,112	\$9,992,082	\$14,988,121	\$37,983,315
Miscellaneous	98	0	\$0	0\$19,239	0\$19,239	0\$38,478
Residential	2,589	2,246	\$118,495,214	\$433,447,956	\$216,723,963	\$768,667,133
<b>Moderate Total</b>	<b>3,472</b>	<b>2,374</b>	<b>\$236,302,363</b>	<b>\$463,514,429</b>	<b>\$251,786,475</b>	<b>\$951,603,267</b>
<b>Non-Wildland/Non-Urban</b>						
Agricultural	1,097	684	\$469,479,944	\$90,930,966	\$90,930,966	\$651,341,876
Commercial	80	28	\$35,517,806	\$32,175,367	\$32,175,367	\$99,868,540

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Government-Owned / Non-Taxable Property	243	0	\$3,601	\$0	\$0	\$3,601
Industrial	39	32	\$10,179,036	\$57,373,249	\$86,059,876	\$153,612,161
Miscellaneous	163	1	\$243,465	\$160,172	\$160,172	\$563,809
Residential	2,396	1,574	\$102,974,325	\$364,923,593	\$182,461,784	\$650,359,702
<b>Non-Wildland/Non-Urban Total</b>	<b>4,018</b>	<b>2,319</b>	<b>\$618,398,177</b>	<b>\$545,563,347</b>	<b>\$391,788,165</b>	<b>\$1,555,749,689</b>
<b>Urban Unzoned</b>						
Agricultural	28	3	\$1,809,159	\$55,086	\$55,086	\$1,919,331
Commercial	304	196	\$45,617,775	\$111,833,326	\$111,833,326	\$269,284,427
Government-Owned / Non-Taxable Property	219	1	\$150,895	\$949	\$949	\$152,793
Industrial	90	56	\$13,520,116	\$41,258,317	\$61,887,475	\$116,665,908
Miscellaneous	124	0	\$0	\$13,917	\$13,917	\$27,834
Residential	10,738	9,217	\$351,173,693	\$1,524,663,392	\$762,331,613	\$2,638,168,698
<b>Urban Unzoned Total</b>	<b>11,503</b>	<b>9,473</b>	<b>\$412,271,638</b>	<b>\$1,677,797,153</b>	<b>\$936,094,532</b>	<b>\$3,026,163,323</b>
<b>Unincorporated Yuba County Total</b>						
	<b>27,432</b>	<b>18,802</b>	<b>\$1,761,125,314</b>	<b>\$3,453,354,566</b>	<b>\$1,991,951,609</b>	<b>\$7,206,431,489</b>

Source: CAL FIRE, Yuba County 2020 Parcel/Assessor's Data

## Population at Risk

A separate analysis was performed to determine population that reside in FHSZs. Using GIS, the CAL FIRE FHSZ datasets were overlaid on the improved residential parcel data. Those parcel centroids that intersect each FHSZ were counted and multiplied by the Census Bureau average household size; results were tabulated by FHSZ (see Table 4-93). According to this analysis, there is a population of 6,705 in the Moderate FHSZ, and 815 in the High, and 9,997 in the Very High FHSZ in the County.

*Table 4-93 Yuba County Planning Area – Residential Populations at Risk in Moderate or Higher Fire Hazard Severity Zones*

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
City of Marysville	0	0	0	0	97	275

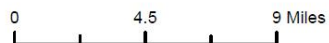
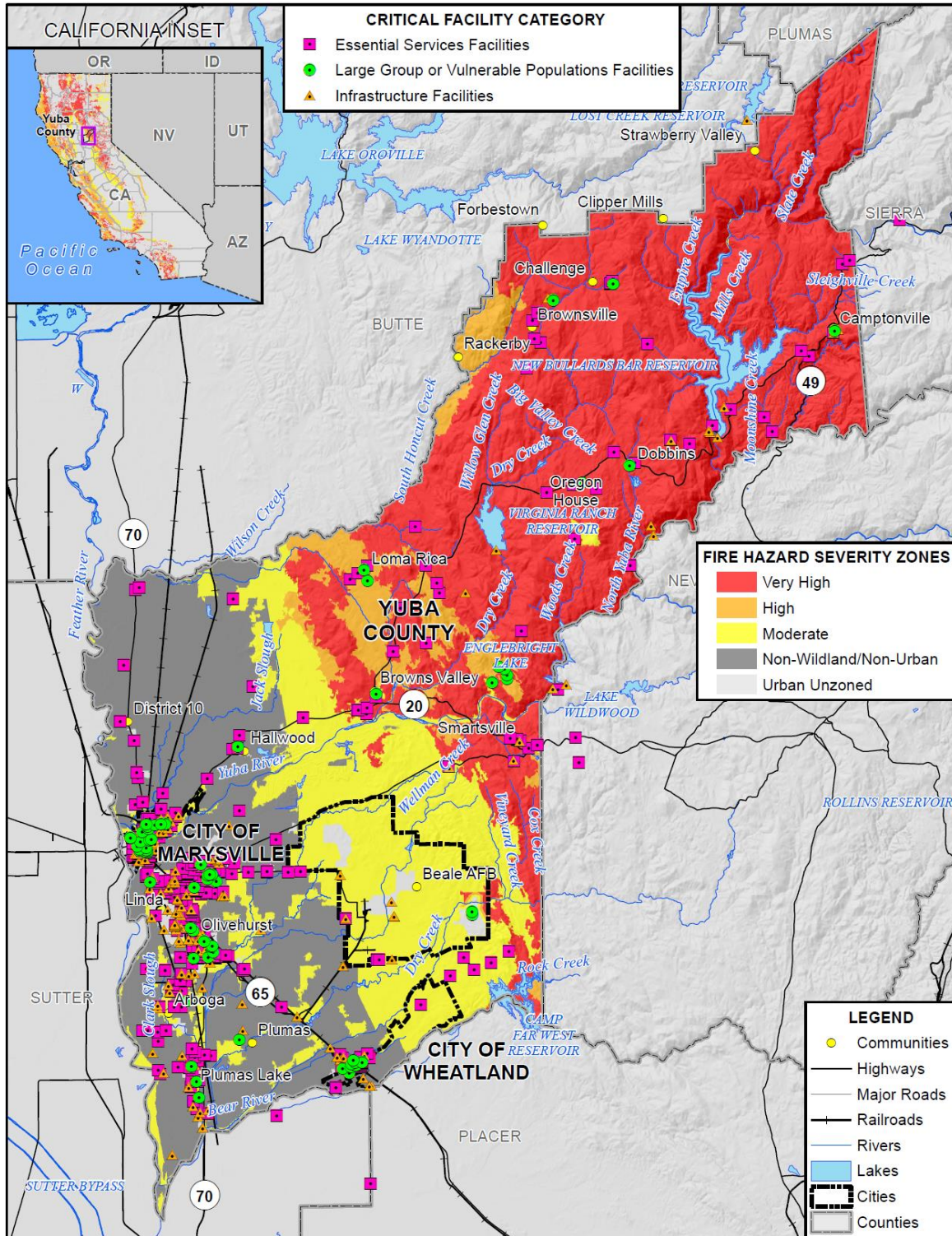
Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
City of Wheatland	0	0	0	0	18	51
Unincorporated Yuba County	3,520	9,997	815	2,315	2,246	6,379
<b>Total</b>	<b>3,520</b>	<b>9,997</b>	<b>815</b>	<b>2,315</b>	<b>2,361</b>	<b>6,705</b>

Source: CAL FIRE, US Census Bureau Average Household Sizes: Maryville (2.47); Wheatland (2.69) and unincorporated Yuba County (2.84)

### Critical Facilities at Risk

A separate analysis was performed on the critical facility inventory in Yuba County to determine critical facilities in the Fire Hazard Severity Zones. Using GIS, the CAL FIRE, Fire Hazard Severity Zones were overlaid on the critical facility GIS layer. Figure 4-82 shows critical facilities, as well as the Fire Hazard Severity Zones. Table 4-94 details critical facilities by facility type and count for the Planning Area. Details of critical facility definition, type, name and address by flood zone are listed in Appendix F.

Figure 4-82 Yuba County– Critical Facilities in FHSZs



Data Source: CAL FIRE (Draft 9/2007 - c58fhsz106\_1, Adopted, 11/2007 - fhszs06\_3\_58),  
Yuba County GIS, Cal-Atlas; Map Date: 07/15/2021.



*Table 4-94 Yuba County– Critical Facilities in FHSZs*

Jurisdiction / Fire Hazard Severity Zone	Critical Facility Class	Facility Count
<b>City of Marysville</b>		
Moderate	Essential Services Facilities	2
	Large Group or Vulnerable Populations Facilities	
	Infrastructure Facilities	1
	<b>Total</b>	<b>3</b>
Urban Unzoned	Essential Services Facilities	84
	Large Group or Vulnerable Populations Facilities	20
	Infrastructure Facilities	18
	<b>Total</b>	<b>122</b>
<b>City of Marysville Total</b>		<b>125</b>
<b>City of Wheatland</b>		
Moderate	Essential Services Facilities	1
	Large Group or Vulnerable Populations Facilities	0
	Infrastructure Facilities	0
	<b>Total</b>	<b>1</b>
Non-Wildland/Non-Urban	Essential Services Facilities	1
	Large Group or Vulnerable Populations Facilities	1
	Infrastructure Facilities	3
	<b>Total</b>	<b>5</b>
Urban Unzoned	Essential Services Facilities	16
	Large Group or Vulnerable Populations Facilities	8
	Infrastructure Facilities	11
	<b>Total</b>	<b>35</b>
<b>City of Wheatland Total</b>		<b>41</b>
<b>Unincorporated Yuba County</b>		
Very High	Essential Services Facilities	41
	Large Group or Vulnerable Populations Facilities	7
	Infrastructure Facilities	15
	<b>Total</b>	<b>63</b>
High	Essential Services Facilities	8
	Large Group or Vulnerable Populations Facilities	6
	Infrastructure Facilities	1
	<b>Total</b>	<b>15</b>
Moderate	Essential Services Facilities	42
	Large Group or Vulnerable Populations Facilities	3

Jurisdiction / Fire Hazard Severity Zone	Critical Facility Class	Facility Count
	Infrastructure Facilities	20
	<b>Total</b>	<b>65</b>
Non-Wildland/Non-Urban	Essential Services Facilities	47
	Large Group or Vulnerable Populations Facilities	4
	Infrastructure Facilities	18
	<b>Total</b>	<b>69</b>
Urban Unzoned	Essential Services Facilities	128
	Large Group or Vulnerable Populations Facilities	19
	Infrastructure Facilities	49
	<b>Total</b>	<b>196</b>
<b>Unincorporated Yuba County Total</b>		<b>408</b>
<b>Outside of Unincorporated Yuba County</b>		
Unknown	Essential Services Facilities	6
	Large Group or Vulnerable Populations Facilities	0
	Infrastructure Facilities	4
	<b>Total</b>	<b>10</b>
<b>Outside of Unincorporated Yuba County Total</b>		<b>10</b>
<b>Grand Total</b>		
		<b>584</b>

Source: Yuba County GIS, CAL FIRE

## Overall Community Impact

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

- Injury and loss of life;
- Commercial and residential structural and property damage;
- Decreased water quality in area watersheds;
- Increase in post-fire hazards such as flooding, sedimentation, and debris flows/mudslides;
- Damage to natural resource habitats and other resources, such as crops, timber and rangelands;
- Loss of water, power, roads, phones, and transportation, which could impact, strand, and/or impair mobility for emergency responders and/or area residents;
- Economic losses (jobs, sales, tax revenue) associated with loss of commercial structures;
- Negative impact on commercial and residential property values;
- Loss of churches, which could severely impact the social fabric of the community;
- Loss of schools, which could severely impact the entire school system and disrupt families and teachers, as temporary facilities and relocations would likely be needed; and
- Impact on the overall mental health of the community.

## *Future Development*

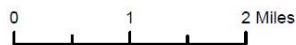
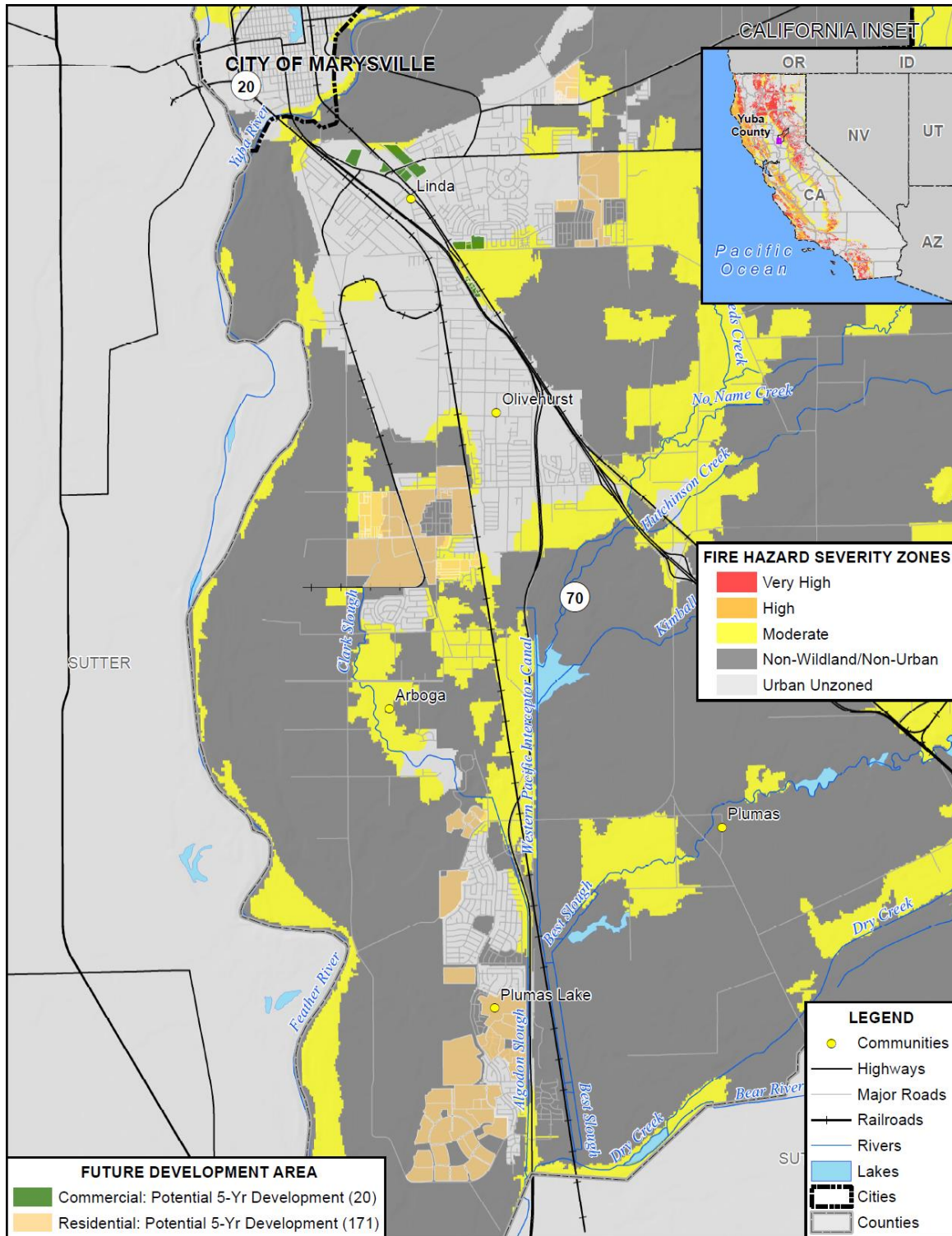
Population growth and development in Yuba County has recently slowed; however, additional growth and development within the WUI and other high fire hazard areas of the County would place additional values at risk to wildfire. County building codes are in effect to reduce this risk. Additional consideration should be given to enhancing building standards in areas located in Very High Fire Hazard Severity Zones.

## **GIS Analysis**

Yuba County's 2020 Parcel/Assessor's data and data from the County planning department were used as the basis for the unincorporated County's inventory of parcels and acres of future development areas. Using the GIS parcel spatial file and the APNs, the future development projects were mapped.

For the wildfire analysis of future development areas, the parcel data was converted to a point layer using a centroid conversion process, in which each parcel was identified by a central point and linked to the Assessor's data. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within each FHSZ. FHSZs and future development areas are shown on Figure 4-83 and parcels and acreages in those areas are shown in Table 4-95.

Figure 4-83 Unincorporated Yuba County – Future Development Areas and FHSZs



Data Source: CAL FIRE (Draft 9/2007 - c58fhszl06\_1, Adopted, 11/2007 - fhszs06\_3\_58), Yuba County GIS, Cal-Atlas; Map Date: 07/15/2021.



*Table 4-95 Unincorporated Yuba County – Future Development Parcels and Acres in FHSZs*

Future Development / Fire Hazard Severity Zones	Total Parcel Count	Improved Parcel Count	Total Acres
<b>Moderate</b>			
Commercial: Potential 5-Yr Development	14		31.3
Residential: Potential 5-Yr Development	37	28	121.2
<b>Moderate Total</b>	<b>51</b>	<b>28</b>	<b>152.5</b>
<b>Non-Wildland/Non-Urban</b>			
Residential: Potential 5-Yr Development	71	23	1,657.3
<b>Non-Wildland/Non-Urban Total</b>	<b>71</b>	<b>23</b>	<b>1,657.3</b>
<b>Urban Unzoned</b>			
Commercial: Potential 5-Yr Development	6	1	58.3
Residential: Potential 5-Yr Development	63	20	53.8
<b>Urban Unzoned Total</b>	<b>69</b>	<b>21</b>	<b>112.1</b>
<b>Grand Total</b>			
	<b>191</b>	<b>72</b>	<b>1,922.0</b>

Source: CAL FIRE, Yuba County GIS

### 4.3.15. Natural Hazards Summary

Table 4-96 summarizes the results of the hazard identification, hazard profile, and vulnerability assessment for the Yuba County Planning Area based on hazards data and input from the HMPC. For each hazard profiled in Section 4.3, this table includes the likelihood of future occurrence and whether the hazard is considered a priority hazard for mitigation actions (as discussed in Chapter 5 of this Plan Update) in the Yuba County Planning Area.

#### *Priority Hazards*

As detailed in the hazard identification section, those hazards identified as a high or medium significance in Table 4-3 are considered priority hazards for mitigation planning. Those hazards that occur infrequently or have little or no impact on the Planning Area were determined to be of low significance and not considered a priority hazard. Significance was determined based on the hazard profile, focusing on key criteria such as frequency, extent, and resulting damage, including deaths/injuries and property, crop, and economic damage. The ability of a community to reduce losses through implementation of existing and new mitigation measures was also considered as to the significance of a hazard. This assessment was used by the HMPC to prioritize those hazards of greatest significance to the Yuba County Planning Area, enabling the County to focus resources where they are most needed.

*Table 4-96 Hazard Identification/Profile Summary and Determination of Priority Hazards*

Hazard	Likelihood of Future Occurrence	Priority Hazard
Climate Change	Likely	Y
Dam Failure	Occasional	Y
Drought & Water Shortage	Likely	Y
Earthquake	Unlikely	Y
Floods: 1%/0.5%/0.2% annual chance	Occasional/Unlikely/Unlikely	Y
Floods: Localized Stormwater	Highly Likely	Y
Levee Failure	Occasional	Y
Pandemic	Likely	Y
Severe Weather: Extreme Cold and Freeze	Highly Likely	Y
Severe Weather: Extreme Heat	Highly Likely	Y
Severe Weather: Heavy Rains and Storms	Highly Likely	Y
Severe Weather: High Winds and Tornadoes	Highly Likely	Y
Wildfire	Highly Likely	Y

## 4.4 Capability Assessment

Thus far, the planning process has identified the natural hazards posing a threat to the Yuba County Planning Area and described, in general, the vulnerability of the County to these risks. The next step is to assess what loss prevention mechanisms are already in place. This part of the planning process is the mitigation capability assessment. Combining the risk assessment with the mitigation capability assessment results in the County’s net vulnerability to disasters, and more accurately focuses the goals, objectives, and proposed actions of this LHMP Update.

A two-step approach was used to conduct this assessment for the County. First, an inventory of common mitigation activities was made through the use of matrixes. The purpose of this effort was to identify policies and programs that were either in place, needed improvement, or could be undertaken if deemed appropriate. Second, an inventory and review of existing policies, regulations, plans, and programs was conducted to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses.

This section presents the County’s mitigation capabilities that are applicable to the County. These are in addition to, and supplement, the many plans, reports, and technical information reviewed and used for this LHMP Update as identified in Chapter 3 and in Chapter 4.

Similar to the HMPC’s effort to describe hazards, risks, and vulnerability of the County, this mitigation capability assessment describes the County’s existing capabilities, programs, and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This assessment is divided into four sections: regulatory mitigation capabilities are discussed in Section 4.4.1; administrative and technical mitigation capabilities are discussed in Section 4.4.2; fiscal mitigation capabilities are

discussed in Section 4.4.3; mitigation education, outreach, and partnerships are discussed in Section 4.4.4, and other mitigation efforts are discussed in Section 4.4.5.

#### 4.4.1. Yuba County’s Regulatory Mitigation Capabilities

Table 4-97 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Yuba County. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

*Table 4-97 Yuba County Regulatory Mitigation Capabilities*

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
General Plan	Y 2011	Plan addresses hazards, includes mitigation measures, and can be used to implement mitigation actions.
Capital Improvements Plan	Y 2020	Plan is updated every two years. Plan can be used to implement mitigation actions.
Economic Development Plan	N	
Local Emergency Operations Plan	Yes	Plan addresses hazards, includes mitigation measures, and can be used to implement mitigation actions.
Continuity of Operations Plan	Y In process	Plan will address hazards, includes mitigation measures, and can be used to implement mitigation actions.
Transportation Plan	Y 2019	South Yuba Transportation Authority completed a Traffic Impact Fee study in 2019. This did not address hazards.
Stormwater Management Plan/Program	N	But the County is currently developing a 3-year Comprehensive Capital Improvement Plan for Drainage.
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	N	
<b>Building Code, Permitting, and Inspections</b>	<b>Y/N</b>	<b>Are codes adequately enforced?</b>
Building Code	Y	Version: 2019 CBC
Building Code Effectiveness Grading Schedule (BCEGS) Score	Y	Score: 2
Fire department ISO rating:	Y	Rating: Varies by fire district
Site plan review requirements	Y	Codes are adequately enforced.

Land Use Planning and Ordinances		
Zoning ordinance	Y	Ordinance is enforced.
Subdivision ordinance	Y	Ordinance is enforced.
Floodplain ordinance	Y	Ordinance is enforced.
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y	Wildfire ordinances are enforced.
Flood insurance rate maps	Y	As part of the DFIRM flood maps.
Elevation Certificates	Y	Public Works reviews permits in the floodplain and issues Elevation Certificates.
Acquisition of land for open space and public recreation uses	Y	The County can use
Erosion or sediment control program	Y	Yuba County enforces regulations for soil and erosion control and water quality.
Other	Y	Special Plan Areas – Plumas Lake Specific Plan Area
How can these capabilities be expanded and improved to reduce risk?		
Telecommunications resiliency for broadband is being sought for the County. The Safety Element update is being completed. There is a need to hire a Fire Prevention Planner – in Building Department. The Recovery Plan is incorporated into Emergency Operations Plan. Disaster recovery plan needs to be built out and made more comprehensive. The County is working on a climate vulnerability assessment now. The County is currently developing a 3-year Comprehensive Capital Improvement Plan for Drainage that will expand capabilities and reduce risk.		

As indicated in the tables above, Yuba County has several plans and programs that guide the County’s mitigation of development of hazard-prone areas. Starting with the Yuba County General Plan, which is the most comprehensive of the County’s plans when it comes to mitigation, some of these are described in more detail below.

### *2030 Yuba County General Plan (2011)*

A general plan is a legal document, required by state law, that serves as a community's "constitution" for land use and development. The plan must be a comprehensive, long-term document, detailing proposals for the "physical development of the county or city, and of any land outside its boundaries which in the planning agency's judgment bears relation to its planning" (Government Code §65300 et seq.). Time horizons vary, but the typical general plan looks 10 to 20 years into the future. The law specifically requires that the general plan address seven topics or "elements." These are land use, circulation (transportation), housing, conservation, open space, noise, and safety. The plan must analyze issues of importance to the community, set forth policies in text and diagrams for conservation and development, and outline specific programs for implementing these policies.

Goals and policies related to mitigation from the General Plan include the following:

### **Infrastructure, Facilities, and Services Element**

The related mitigation goals and policies of the Infrastructure Element are:

Goal CD12.	Level of Service: Public Services and Facilities
Policy CD12.3	The County will implement stormwater master plans designed to provide collection, detention, and conveyance consistent with local standards for developed areas within the Valley Growth Boundary. In general, new developments will be required to demonstrate no net increase in stormwater runoff prior to approval.
Policy CD12.5	New developments shall demonstrate the availability of adequate fire flow pressure, storage, system gridding, hydrant spacing, and sprinkler systems prior to approval.
Policy CD12.6	The County will condition new developments and collaborate with local fire districts to locate stations so that first fire response can be provided within 6 minutes in 95% or more of cases within the Valley Growth Boundary.
Policy CD12.7	The County's target for fire protection is an ISO (Insurance Service Organization) rating of no greater than 5

Goal CD15	Smart Infrastructure, Facilities, Services
Policy CD15.5	New developments should incorporate water conservation techniques to reduce water demand, including the use of reclaimed water for landscaping and irrigation.
Policy CD15.8	The County will encourage the joint use of parks for school and public use, as well as stormwater detention, as appropriate.

## Public Health & Safety Element

The related mitigation goals and policies of the Public Health and Safety Element are:

Goal HS1.	Flood Protection
Policy HS1.1	The County will not approve new housing development that would have a finished floor within the 100-year floodplain, as defined by the Federal Emergency Management Agency.
Policy HS1.2	For areas under the jurisdiction of the Central Valley Flood Protection Board, the County will not approve new developments within a flood hazard area or an area of moderate flood hazard without demonstrating adequate flood protection according to Government Code Sections 65865.5, 65962, and 66474.5.
Policy HS1.3	The County may allow non-residential improvements within the 100-year floodplain so long as the proposed improvements do not: Increase flood heights or velocities; Inhibit emergency access; Create excessive costs in providing governmental services during or after flooding; Interfere with the existing waterflow capacity of the floodway; Substantially increase erosion and/or sedimentation; or Contribute to the deterioration of any watercourse or the quality of water in any body of water.
Policy HS1.4	Public buildings are discouraged in the 100-year flood zone, but if they are constructed, they should be flood-proofed to a point at or above the base flood level elevation.
Policy HS1.5	The County will continue to collaborate with the Yuba County Water Agency, local reclamation districts, levee commissions, and U.S. Army Corps of Engineers to improve, certify, and maintain the levee system that protects developed and planned development areas in Linda and Olivehurst, including the Plumas Lake Specific Plan Area. Urban areas in Yuba County should have 200-year flood protection or greater.

<b>Goal HS1.</b>	<b>Flood Protection</b>
Policy HS1.6	The County will prohibit construction near levees that would adversely affect the integrity of the subject levee or would impede maintenance, inspection, or planned levee expansion.
Policy HS1.7	The County will use the best available flood hazard information and mapping from regional, state, and federal agencies to inform land use, zoning, and public facility investment decisions.
Policy HS1.8	The County will update its policies and standards, if necessary, to remain consistent with state and federal standards for floodplains, levee design criteria, and urban development in areas subject to flooding during General Plan buildout.
Policy HS1.9	New developments shall evaluate potential flood hazards and demonstrate compliance with state and federal flood standards prior to approval.
Policy HS1.10	New developments shall provide drainage improvements according to County standards.
Policy HS1.11	Natural waterways should be protected from unnecessary alteration whenever flood protection structures or other forms of construction are proposed.

<b>Goal HS2.</b>	<b>Fire Risk</b>
Policy HS2.1	Prior to approval, new developments proposed in areas of very high, high, or moderate fire hazard, as designated on maps maintained by Cal Fire, shall demonstrate compliance with Fire Safety Regulations and local regulations for defensible space, ignition-resistant construction materials, property maintenance to reduce fuels, natural hazards disclosure requirements, emergency access and multiple access points, availability of water for fire suppression, and other relevant building and development standards.
Policy HS2.2	The County will communicate with appropriate local, state, and federal fire protection personnel during the development review process and will condition projects considering input from these agencies to require defensible space, fire-wise landscaping, fuel breaks, emergency access, fire flow, hydrants, sprinkler systems, fire stations and other improvements and conditions, as appropriate.
Policy HS2.3	New development projects shall pay on a fair-share basis for fire stations, equipment, and other fire suppression improvements necessary to provide adequate fire protection services.
Policy HS2.4	All community water systems serving new development projects are required to meet or exceed County minimum standards for provision of water for fire flows.
Policy HS2.5	Road and building construction on slopes of more than 15% is strongly discouraged and will only be approved if consistent with County standards and the Yuba County Wildfire Safety Plan.
Policy HS2.6	The County will seek funding for, and cooperate with efforts to protect watersheds, reforest areas, and restore ecosystems affected by wildfire.
Policy HS2.7	The County will use the best available science to evaluate and protect people and property from changes in fire risk attributable to climate change, insects, and disease.
Policy HS2.8	Communication and electricity infrastructure in areas prone to wildfire should be located and designed to avoid interruptions during periods of fire activity.
Policy HS2.9	Public trails and unimproved roads should be maintained, where feasible, to provide emergency access, including evacuation and wildfire response. These rights-of-way are not considered primary evacuation or emergency access routes and vehicles that cannot successfully navigate these routes shall not make use of them.
Policy HS2.10	New developments shall provide access that will allow safe evacuation and movement of firefighting equipment during a wildfire. Evacuation routes shall have the capacity to accommodate traffic in relation to the population served.
Policy HS2.11	New developments in moderate, high, or very high fire hazard areas cannot propose limited access roads unless such access limitations do not adversely affect fire response and suppression.

<b>Goal HS2.</b>	<b>Fire Risk</b>
Policy HS2.12	Property owners may manage fuel load on County road easements and rights-of-way adjacent to their properties with prior approval of the County and in compliance with applicable County standards.
Policy HS2.13	Clustered developments in Rural Community portions of the foothills are encouraged to take advantage of natural and manmade fire breaks, provide defensible space for clusters of buildings (rather than individual buildings), locate and orient buildings and pervious areas to reduce fire risk, avoid areas of steep topography and dense vegetation, and otherwise use a site plan review process in coordination with County staff to ensure that wildfire risk is minimized.
Policy HS2.14	The County will encourage the retrofitting of older buildings to current safety standards in coordination with proposed major remodeling or additions.
Policy HS2.15	Developments in the Valley Growth Boundary shall be planned and constructed to resist the encroachment of uncontrolled fire.

<b>Goal HS3</b>	<b>Water Quality</b>
Policy HS3.1	The County will collaborate with relevant service providers to ensure that municipal water supply, treatment, and delivery within unincorporated areas meet or exceed Maximum Contaminant Levels (MCLs) specified in Title 22 of the California Code of Regulations.
Policy HS3.2	County and regional water supply providers should monitor and proactively address water quality problems, with a focus on achieving and maintaining adequate water quality for “beneficial uses” of area waterways identified in the Yuba County Integrated Regional Water Management Plan. “Beneficial uses” in Yuba County include municipal and domestic supply, agricultural supply, industrial service supply, and industrial process supply.
Policy HS3.3	The County will regulate new developments, as necessary, and collaborate with irrigation districts to address Regional Water Quality Control Board requirements intended to protect agricultural use and sustain the agricultural economy.
Policy HS3.4	New developments shall be designed to control surface runoff discharges, in compliance with the permit requirements and the receiving water limitations administered by the Regional Water Quality Control Board.
Policy HS3.5	The County will cooperate with local, state, and federal agencies to remediate issues related to groundwater contamination and increases in total dissolved solids.
Policy HS3.6	New developments shall comply with streambed alteration standards and shall be designed to avoid harmful discharge that would substantially affect wetlands and riparian areas.
Policy HS3.7	Valley Neighborhoods, Employment Village areas, Commercial Mixed Use areas, and Employment areas should have coordinated drainage master planning and avoid a site-by-site approach to detention and drainage. Drainage master planning should implement an areawide approach that incorporates existing and constructed swales for conveyance and planned open space and parkland for detention.
Policy HS3.8	New developments in areas with moderate, severe, and very severe erosion potential shall provide technical documentation, to the satisfaction of the County, that adequate measures have been taken in site planning, design, and/or mitigation to avoid erosion and sediment loss (Exhibit Public Health & Safety-7).
Policy HS3.9	The County will evaluate available septic system technologies and shared leach field systems to serve planned Rural Centers and allow their use if proven to be protective of water quality.
Policy HS3.10	New developments proposing private well and septic systems shall demonstrate compliance with the County’s standards for water wells and sewage disposal systems, which are designed to protect the public and environmental health.

Goal HS3	Water Quality
Policy HS3.11	New community wastewater disposal systems are discouraged, but if considered, projects proposing a new system shall provide bonding or other financial mechanisms that are adequate for ongoing maintenance and periodic replacement, subject to County approval.
Policy HS3.12	New developments shall comply with applicable state siting, design, and monitoring standards for on-site wastewater treatment (septic) systems, including standards intended to protect the beneficial use of potentially affected waterbodies.
Policy HS3.13	Proposed residential property subdivisions that would create lots of 1 acre or less shall be served by a public water and sewer system designed in compliance with County standards. Projects that propose parcels of between 1 and 2.5 acres shall provide either a public sewer system or public water supply, as determined by the County Environmental Health Director.
Policy HS3.14	The County will encourage the preservation, creation, or restoration of riparian corridors, wetlands, open space buffers, and other types of open space that provide water quality benefits.
Policy HS3.15	New projects and plans in the Valley Growth Boundary should employ runoff collection strategies located close to the point where water initially meets the ground to minimize urban runoff, where feasible.
Policy HS3.16	New developments are encouraged to incorporate open, vegetated swales to filter, slow down, and convey stormwater and encourage groundwater infiltration.
Policy HS3.17	New developments shall limit construction of new impervious surfaces, such as parking lots, travelways, vehicle waiting areas, and vehicle loading areas to the minimum amount needed to implement the subject project.
Policy HS3.18	New developments shall break up parking areas, intersperse parking with vegetated areas, and incorporate other best management practices that filter and slow down runoff and promote infiltration.

### *Other Yuba County Plans/Studies/Programs*

#### **Yuba County Climate Change and Health Profile Report (2017)**

The Climate Change and Health Profile Report seeks to provide a county-level summary of information on current and projected risks from climate change and potential health impacts. This report represents a synthesis of information on climate change and health for California communities based on recently published reports of state agencies and other public data.

The content of this report was guided by a cooperative agreement between CDPH and the CDC Climate-Ready States and Cities Initiative's program Building Resilience Against Climate Effects (BRACE). The goals of BRACE are to assist state health departments to build capacity for climate and health adaptation planning. This includes using the best available climate science to project likely climate impacts, identifying climate-related health risks and populations vulnerable to these impacts, assessing the added burden of disease and injury that climate change may cause, identifying appropriate interventions, planning more resilient communities, and evaluating to improve the planning effort. Communities with economic, environmental, and social disadvantages are likely to bear disproportionate health impacts of climate change.

This Climate Change and Health Profile Report is intended to inform, empower, and nurture collaboration that seeks to protect and enhance the health and well-being of all California residents. This report is part

of a suite of tools that is being developed by the California Department of Public Health to support local, regional, and statewide efforts of the public health sector to build healthy, equitable, resilient, and adaptive communities ready to meet the challenges of climate change. Along with a county-level climate change and health vulnerability assessment and state guidance documents, such as Preparing California for Extreme Heat: Guidance and Recommendations, the profile provides a knowledge base for taking informed action to address climate change.

## Yuba-Sutter NCCP/HCP

Portions of the County are within the boundaries of the proposed Yuba-Sutter NCCP/HCP (Natural Community Conservation Plan/Habitat Conservation Plan). The Yuba-Sutter NCCP/HCP is a cooperative planning effort initiated by Yuba and Sutter counties in connection with improvements to Highways 99 and 70 and future development in the area surrounding those highways. The NCCP/HCP is being developed to facilitate ways to:

- continue economic growth and community development;
- retain the economic vitality of the agricultural community;
- maintain recreation, hunting, fishing, and other public uses of open space in the NCCP/HCP area;
- simplify and expedite land use and conservation planning in the NCCP/HCP area; and
- protect threatened and endangered species; and preserve plant and wildlife communities.

Preparation and approval of the NCCP/HCP is expected to take between 3 and 5 years, depending on the complexity of the planning process. Until the NCCP/HCP is approved, there is no requirement for compliance. However, it is prudent for longer term projects, or recently initiated smaller projects within the NCCP/HCP boundaries to give consideration to this planning document.

## Yuba Sutter Regional Conservation Plan

The purpose of the Yuba Sutter Regional Conservation Plan (Plan) is to protect and enhance ecological diversity and function within the rapidly urbanizing region of Yuba County and the more slowly urbanizing region of Sutter County. Yuba and Sutter Counties encompass 405,582 and 389,443 acres, respectively. The Plan Area encompasses a total of 469,271 acres: 141,644 acres in Yuba County and 327,627 in Sutter County. The Plan Area includes the cities of Wheatland, Yuba City, and Live Oak and the spheres of influence of each jurisdiction. The Plan describes how to avoid, minimize, and mitigate, to the maximum extent practicable, impacts on covered species and their habitats while allowing for the growth of selected areas within these counties and the expansion and ongoing maintenance of urban infrastructure. The Plan also describes the responsibilities associated with operating and maintaining the reserves that will be created to mitigate anticipated future impacts. Natural communities that will be included within the conservation plan include flooded herbaceous cropland and woody cropland; wildland communities including river and stream systems, vernal pool complexes, grasslands and oak savanna-woodland; developed communities. Agricultural land, including rice land will also be included.

## Yuba County Community Wildfire Protection Plan (2014)

This Community Wildfire Protection Plan (CWPP) was developed for the Yuba County Watershed Protection and Fire Safe Council, in collaboration with interested local parties and land management agencies. It provides a snapshot of current wildfire protection challenges and capabilities, identifies and prioritizes areas for hazardous fuel reduction, and recommends types and methods of vegetation management that may help protect the communities from wildfire losses.

## Yuba County Emergency Operations Plan (2015)

The Emergency Operations Plan addresses the County's planned response to emergencies associated with natural, man-made and technological disasters. It provides an overview of operational concepts and identifies components of the County's emergency management organization within the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS). It further describes the overall responsibilities of the local, state and federal entities for protecting life and property and assuring the overall well-being of the population.

The Emergency Operations Plan applies to all elements of the County of Yuba's emergency management structure during all phases of emergency management. The primary audience is intended to be emergency managers, department heads at the County level, emergency operations center staff and shall include officials from the incorporated cities, state and federal agencies. This Plan will provide those individuals general policy guidance for emergency management activities and interagency cooperation. The EOP should be used in conjunction with and support Standard Operating Procedures developed for the County and participating jurisdictions within the Operational Area.

### 4.4.2. Yuba County's Administrative/Technical Mitigation Capabilities

Table 4-98 identifies the County personnel responsible for activities related to mitigation and loss prevention in the County.

*Table 4-98 Yuba County Administrative/Technical Mitigation Capabilities*

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	Y	Planning commission coordination is effective.
Disaster Council	Y	Disaster Council coordination is effective.
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	County works with levee organizations on maintenance issues. County Public Works has tree trimming and draining clearance responsibilities.
Mutual aid agreements	Y	County works with multiple agencies inside and outside the County to respond to disasters. This coordination is effective.
Other	N	

Staff	Y/N FT/PT	Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	Y FT	Staff is adequate and trained. There are efforts to coordinate between agencies.
Floodplain Administrator	Y FT	Staff is adequate and trained. There are efforts to coordinate between agencies.
Emergency Manager	Y FT	Staff is adequate and trained. There are efforts to coordinate between agencies.
Community Planner	Y FT	Staff is adequate and trained. There are efforts to coordinate between agencies.
Civil Engineer	Y FT	Staff is adequate and trained. There are efforts to coordinate between agencies.
GIS Coordinator	Y FT	Staff is adequate and trained. There are efforts to coordinate between agencies.
Other	N	
Technical	Y/N	Describe capability Has capability been used to assess/mitigate risk in the past?
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Sirens and reverse 911 services are used. They have been used to mitigate hazards in the past.
Hazard data and information	Y	Multiple hazards are mapped. This has been used to mitigate hazards in the past.
Grant writing	Y	Grant writing staff work on grants on an as needed basis. Capability has been used in the past.
Hazus analysis	Y	County has Hazus info. This is rarely used as it is supplanted by parcel data as used in this Plan Update.
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
<p>The grant writers are used often, but there are times where their capacity is outstripped by the need. Additional grant staff could help alleviate this. County is considering expanding its warning systems by using Zonehaven software and reverse 911 type services. Additionally, additional staff in the County Emergency Services Office are needed. This would help expand many capabilities of the office.</p>		

### 4.4.3. Yuba County’s Fiscal Mitigation Capabilities

Table 4-99 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

*Table 4-99 Yuba County Fiscal Mitigation Capabilities*

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	This has been used in the past for levee work.
Authority to levy taxes for specific purposes	Y	Measure K funding has been passed to be available; however, a court challenge is currently pending. This may or may not be available.
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	Funding is used for a bevy of County services related to mitigation. It will be used that way in the future as well.
Storm water utility fee	Y	County has access. It has been used in the past for flood mitigation.
Incur debt through general obligation bonds and/or special tax bonds	Y	County has access. It has been used in the past for flood mitigation and the building of levees.
Incur debt through private activities	N	
Community Development Block Grant	Y	County has access. It has been used in the past for flood mitigation.
Other federal funding programs	Y	County has access. It has been used in the past for flood and fire mitigation.
State funding programs	Y	County has access. It has been used in the past for flood and fire mitigation.
Other		
<b>How can these capabilities be expanded and improved to reduce risk?</b>		
Increased capacity of departments to apply for grants would help to expand capabilities. The grant writers are used often, but there are times where their capacity is outstripped by the need. Additional grant staff could help alleviate this. Economic growth in the County would also help expand many of these. The County will seek to find any and all grant opportunities to expand its fiscal mitigation capabilities.		

### 4.4.4. Yuba County Mitigation Education, Outreach, and Partnerships

Table 4-100 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

**Table 4-100 Yuba County Mitigation Education, Outreach, and Partnerships**

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	FREED has partnered with the County to educate those with access or function need issues in the County on disaster issues. They have also worked to integrate the battery distribution project during times of PSPS. Transportation is assisted by FREED. Yuba Sutter American Kennel Club has partnered to get an animal trailer for times of disaster. Two organizations help with animal sheltering (Fieldhaven Feline Center and Yuba Sutter Domestic Animal Disaster Assistance). UC Extension is working on issuing an ag training for commercial ag organizations. At the Sherriff's discretion, these folks can rescue animals during times of fire.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Ready Yuba website is used for outreach. Social media is used to educate (Facebook, LinkedIn, etc.). Radio outreach is done on many issues (flood preparedness, where to get sandbags, how to fill them). County has done community workshops with other agencies for disaster preparedness. There is a Public
Natural disaster or safety related school programs	Y	Community outreach is done on an irregular basis. Yuba Water Agency does community outreach in this way, which is supported by the County.
StormReady certification	Y	Program assists in preparation for severe weather events and can be used for future mitigation activities.
Firewise Communities certification	N	No one has yet qualified, but multiple communities are seeking approval. The Fire Safe Council is working with these entities.
Public-private partnership initiatives addressing disaster-related issues	Y	County works with PG&E and other entities to address disaster related issues. There is an effort to underground power lines to reduce fire risk.
Other	Y	Fire Safe Council has been receiving funding from the County and is working on multiple grand funding issues. Sherriff's Posse partners with Yuba County OES during times of emergency response.

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
How can these capabilities be expanded and improved to reduce risk?		
Additional local citizen groups could be added. There was a CERT team that disbanded. It is unclear if there is a desire from the community to restart. If it was restarted, it would expand capabilities. Multiple communities are seeking Firewise approval, which would expand the capabilities of these areas and the County as a whole. Natural disaster education in schools could be expanded. The County is seeking to make this a more regular occurrence. However, additional funding is needed to expand these programs.		

#### 4.4.5. Other Mitigation Efforts

##### *Climate Change*

The County has undertaken the following regarding climate change: Climate Change Working Group. Yuba County has created a climate change team through the County Administrator’s Office and has organized a climate change working group that includes the cities and various districts, to coordinate countywide climate change efforts.

- Cool Counties. The County has committed to the Cool Counties Climate Stabilization Declaration, a pledge to reduce greenhouse gas emissions from County operations by 80 percent by 2050.
- California Climate Action Registry. The County has prepared a baseline audit energy usage associated with County operations. This baseline will be used to measure energy usage over time. Through the registry the County will use a common GHG emission reporting system and will receive credit for reductions in emissions.
- Increasing Energy Efficiency. The County has taken steps to increase the energy efficiency of county operations including replacement of incandescent lights with compact fluorescent bulbs, retrofit of infrastructure in County buildings, installation of computerized climate control in all major county buildings, installation of cogeneration capacity at the Monroe Detention Facility, development of a building closure program to retire less energy-efficient buildings, and a countywide appliance replacement program for Energy Star appliances. The County has a goal of ten percent annual reduction in energy usage through 2013.
- Full-Scale Landfill Bioreactor. The County recovers methane gas, a potent greenhouse gas, from the Central Landfill to generate electricity.
- LEED. The County has adopted Leadership in Energy and Environmental Design (LEED) standards for new county buildings.
- Recycling. All County buildings recycle paper, cardboard, cans, bottles, fluorescent tubes, oil, computers, rigid plastics, agricultural plastics, PVC pipe, toner cartridges, cell phones, batteries, and electronic waste. The County has a goal of 50 percent recycling of all sorted material at the landfill. The County also has a Construction and Demolition Recycling Ordinance that requires diversion and recycling of construction and demolition debris.
- Transportation and Fleet Vehicles. The County has installed charging stations for electric vehicles and uses electric vehicles for commuting between local facilities.
- Personnel Training. County staff attends classes on the California Environmental Quality Act (CEQA) and on climate change issues.

- Tree Planting. The County operates a small nursery that provides tree planting for County facilities.
- Research. The County is involved in a variety of research projects related to energy conservation and control of GHG emissions.
- The County also requires energy efficient project design and landscaping design as a part of the development review process.

### *Wildfire*

- The Upper Yuba Fire Break Collaborative Project consists of four fuelbreak components, all located in eastern Yuba County and west of New Bullards Bar Reservoir. These interconnected fuelbreak segments will help protect the communities of Brownsville, Challenge, Dobbins, Forbestown, Oregon House, and Rackerby, all designated as “Low-Income Communities”.
- The Yuba Foothills Healthy Forest Project is a collaborative effort between Yuba Water Agency, Cal Fire, Plumas NF, Tahoe NF, Yuba Watershed Protection & Fire Safe Council, private landowners (The CHY Company, Siller Bros., Inc., Soper-Wheeler Company, Ingersoll, Doner Tree Farm, and Golden Empire Council, BSA) and local residents. The specific project area, treatments, and treatment units have been developed cooperatively and strategically to provide the greatest benefit to the Project Partners and local communities. This Project is included in the Yuba Foothill Community Wildfire Protection Plan (CWPP). This proposed project is designed to compound the benefits already derived from past projects and to link these activities to future projects for on-going accrual of cumulative benefits. The Plumas National Forest has done a significant amount of forest health improvement and fuel reduction work in the Project Influence Zone (PIZ). All of the private land partners (and many others) in the PIZ have been intensively managing their lands for years in areas adjacent to the treatments planned in this Project. In this way, this project will fill vital gaps in Forest Health management and fire fuel reduction treatments in this region.
- Fuels reduction project located west and north of the community of Camptonville and east and north of Bullards Bar Reservoir. This USFS Tahoe National Forest Project is designed to improve forest health, watershed health and wildlife habitat, and reduce surface fuel loadings and ladder fuels to a level that would allow safe fire suppression.
- Smartville Fuel Reduction - Yuba Watershed Protection & Fire Safe Council CWPP fuel reduction project. Project information is preliminary and subject to revision by the CWPP workgroup
- Camptonville South Community Hazard Reduction – Yuba Watershed Protection & Fire Safe Council CWPP fuel reduction project. Project information is preliminary and subject to revision by the CWPP workgroup
- Hanson Hill Fuelbreak – Yuba Watershed Protection & Fire Safe Council CWPP fuel reduction project. Project information is preliminary and subject to revision by the CWPP workgroup
- Camp Pendola Hazard Reduction – Yuba Watershed Protection & Fire Safe Council CWPP fuel reduction project. Project information is preliminary and subject to revision by the CWPP workgroup.