# 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 Placer County Planning Area and describes why some hazards have been omitted from further consideration.
- **Section 4.2: Placer 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 Placer County Planning Area, with a focus on unincorporated Placer County.
- **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 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 of the Placer County Planning area.

This risk assessment covers the entire geographical extent of the Placer 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 Placer County Planning Area.

This LHMP Update involved a comprehensive review and update of each section of the 2016 risk assessment. Information from the 2016 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 Placer 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
- 2016 Placer 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 Placer County Planning Area. Hazards data from Cal OES, FEMA, the NOAA NCDC database, 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 Placer County Planning Area. Building upon this effort, hazards from the 2016 Placer County Local Hazard Mitigation Plan (LHMP) were also identified, and comments explain how hazards were updated from the 2016 Plan. Most hazards from the 2016 plan were profiled in this LHMP Update. Hazards dropped for this 2021 Plan Update include fog, subsidence, soil bank erosion (though it is included in the levee failure section), and hazardous materials transport. Severe Weather: Heavy Rains and Storms was broken up into two separate hazards. New hazards include climate change and pandemic.

### *Table 4-1 Placer County Hazard Identification and Comparison from 2016 LHMP*

| 2021 Hazards | 2016 Hazards | Comment |
|---|---|---|
| Agricultural Hazards | Agriculture Hazards | Similar analysis was performed. Updated information was placed, where available. |
| Avalanche | Avalanche | Additional information was added to the profile. Location and extent were fleshed out in greater detail. |
| Climate Change | – | New hazard |
| Dam Failure | Dam Failure | Additional analysis was performed. Dams inside and outside the County were analyzed with Cal OES and DSOD data. Structures, populations, and critical facilities were analyzed. |
| Drought and Water Shortage | Drought and Water Shortage | Additional data from the recent droughts were added. Public Safety Power Shutoff information was added to this hazard. |
| Earthquake | Earthquake | Hazus runs were updated. Two separate Hazus earthquake runs were performed – one for the eastern and one for the western County. |
| Flood: 1%/0.2% annual chance | Floods: 100/500 year | 2018 DFIRMs were used as the basis for analysis. Structures, populations, and critical facilities were analyzed. |
| Flood: Localized Stormwater Flooding | Floods: Localized Stormwater | Similar analysis was performed, with localized flooding areas being updated by Placer County. |
| Landslides, Mudslides, and Debris Flows | Landslides and Debris Flows | Similar analysis was performed. |
| Levee Failure | Levee Failure | Additional data from the new Flood Insurance Study was added. National Levee Database risk data by levee was added to the vulnerability to levee failure. |
| Pandemic | – | New hazard |
| Seiche | Seiche | Similar analysis was performed. |
| Severe Weather: Extreme Heat | Severe Weather: Extreme Heat | Similar analysis was performed. Public Safety Power Shutoff information was added to this hazard. |
| Severe Weather: Freeze and Snow | Severe Weather: Freeze and Snow | Similar analysis was performed. |

| 2021 Hazards | 2016 Hazards | Comment |
|---|---|---|
| – | Severe Weather: Fog and Freezing Fog | Due to the limited number of events and the limited mitigation actions that could be put forth, this hazard was dropped from consideration. |
| Severe Weather: Heavy Rains and Storms | Severe Weather: Heavy Rains and Storms (Thunderstorms/Hail, Lightning/Wind/Tornadoes | This hazard was broken up so that Heavy Rains and Storms was separated from High Winds and Tornadoes |
| Severe Weather: High Winds and Tornadoes | – | This hazard was broken up so that Heavy Rains and Storms was separated from High Winds and Tornadoes. Public Safety Power Shutoff information was added to this hazard. |
| – | Soil Bank Erosion | This was dropped as a standalone hazard. Erosion is dealt with in the flood and levee failure section of this Plan Update. |
| – | Subsidence | Due to the limited number of events and the limited mitigation actions that could be put forth, this hazard was dropped from consideration. |
| Tree Mortality | Wildfire | Tree mortality was separated from wildfire. A more detailed discussion on how this hazard affects the County was added. |
| Wildfire | Wildfire | Similar analysis was performed. Public Safety Power Shutoff information was added to this hazard. |
| – | Hazardous Materials Transport | Due to the focus on natural hazards, this hazard was dropped from consideration. |

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

### *Table 4-2 Placer County – Excluded Hazards*

| Hazard Excluded | Why Excluded |
|---|---|
| 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) is discussed in the wildfire hazard. |
| Coastal Flooding, Erosion, and Sea Level Rise | The County is not on the coast. |
| Aquatic Invasive Species | The County did consider this a hazard, it is dealt with in other planning mechanisms in the County. |
| Energy Shortage and Energy Resilience | The County did consider this a hazard, it is dealt with in other planning mechanisms in the County. |
| Sociotechnical/Technological Hazards | The County did consider this a hazard, but it is dealt with in other planning mechanisms in the County. |

| Hazard Excluded | Why Excluded |
|---|---|
| Threat and Disturbance Hazards | The County did consider this a hazard, but it is dealt with in other planning mechanisms in the County. |
| 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 is being discussed in that hazard profile and vulnerability assessment. |

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 Placer County Planning Area, enabling the County to focus resources where they are most needed.

### *Table 4-3 Placer County Hazard Assessment*

| Hazard | Geographic Extent | Likelihood of Future Occurrences | Magnitude/ Severity | Significance | Climate Change Influence |
|---|---|---|---|---|---|
| Agricultural Hazards | Significant | Highly Likely | Critical | Medium | Medium |
| Avalanche | Limited | Likely | Limited | Medium | Medium |
| Climate Change | Extensive | Likely | Limited | Medium | – |
| Dam Failure | Significant | Occasional | Critical | High | Medium |
| Drought & Water Shortage | Extensive | Likely | Critical | High | High |
| Earthquake | Significant | Occasional | Critical | Medium | Low |
| Floods: 1%/0.2% annual chance | Limited | Occasional | Critical | High | Medium |
| Floods: Localized Stormwater | Limited | Occasional/Highly Likely | Limited | Medium | Medium |
| Landslides, Mudslides, and Debris Flows | Limited | Occasional | Limited | Low | Medium |
| Levee Failure | Limited | Unlikely | Limited | Low | Medium |
| Pandemic | Extensive | Likely | Catastrophic | Medium | Medium |
| Seiche | Limited | Unlikely | Limited | High | Medium |
| Severe Weather: Extreme Heat | Extensive | Highly Likely | Limited | Medium | High |
| Severe Weather: Freeze and Snow | Extensive | Highly Likely | Critical | Medium | Medium |
| Severe Weather: Heavy Rains and Storms | Extensive | Occasional | Limited | Medium | Medium |
| Severe Weather: High Winds and Tornadoes | Extensive | Highly Likely | Critical | High | Low |
| Tree Mortality | Extensive | Likely | Limited | High | High |
| Wildfire | Extensive | Highly Likely | Critical | High | High |

**Geographic Extent**
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

**Likelihood of Future Occurrences**
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.

**Magnitude/Severity**
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

**Significance**
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

**Climate Change Influence**
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

### 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 Placer 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, Placer 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 Placer County received 25 state declarations between 1950 and 2020. Of the 25 state declarations: 16 were associated with severe winter storms, heavy rains, or flooding; 5 were from fire, 1 for drought; 1 was from economic disasters, 1 was from freeze, and 1 was from pandemic. A review of federal disasters shows 22 federal disaster declarations. Of these 22 federal declarations: 13 were associated with severe winter storms, heavy rains, or flooding, 6 were from fire, 1 was from drought, 1 was from pandemic, 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 Placer County State and Federal Disaster Declarations, 1950-2020***

| Year | Disaster Name | Disaster Type | Disaster Cause | Disaster # | State Declaration # | Federal Declaration # |
|---|---|---|---|---|---|---|
| 2020 | Covid-19 | Pandemic | Pandemic | DR-4482 | 3/4/2020 | 1/20/2020 |
| 2017 | California Severe Winter Storms, Flooding, And Mudslides | Flood | Storms | DR-4305 | 2/10/2017 | 3/16/2017 |
| 2014 | King Fire | Wildfire | Wildfire | FM-5081 | – | 9/17/2014 |
| 2014 | Applegate Fire | Wildfire | Wildfire | FM-5082 | – | 10/8/2014 |
| 2014 | California Drought | Drought | Drought | GP 2014-13 | 1/17/2014 | – |
| 2010 | Galleria Incident | Wildfire | Wildfire | GP 2010-12 | 10/22/2010 | – |
| 2009 | 49er Fire | Wildfire | Wildfire | FM-2832 | – | 8/31/2009 |
| 2008 | Gladding Fire | Wildfire | Wildfire | FM-2786 | – | 9/1/2008 |

| Year | Disaster Name | Disaster Type | Disaster Cause | Disaster # | State Declaration # | Federal Declaration # |
|---|---|---|---|---|---|---|
| 2008 | 2008 January Storms | Flood | Storms | GP 2008-01 | 1/5/2008 | – |
| 2006 | 2006 June Storms | Flood | Storms | DR-1646 | – | 6/5/2006 |
| 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 |
| 2004 | Stevens Fire | Wildfire | Wildfire | FM-2541 | – | 8/8/2004 |
| 2002 | Sierra Fire | Wildfire | Wildfire | FM-2463 | – | 9/19/2002 |
| 2001 | Energy Emergency | Economic | Greed | GP 2001 | 1/1/2001 | – |
| 1997 | 1997 January Floods | Flood | Storms | DR-1155 | 1/2/97-1/31/97 | 1/4/1997 |
| 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 |
| 1987 | 1987 Wildland Fires | Wildfire | Wildfire | GP | 9/3/1987 9/10/1987 | – |
| 1986 | 1986 Storms | Flood | Storms | DR-758 | 2/18-86-3/12/86 | 2/18/1986 |
| 1983 | Winter Storms | Flood | Flood | DR-677 | 12/8/82-3/21/83 | 2/9/1983 |
| 1980 | 1980 April Storms | Flood | Storms | 80-01 – 80-25 | 4/1/1980 | – |
| 1977 | 1977 Drought | Drought | Drought | EM-3023 | – | 1/20/1977 |
| 1973 | Southern Pacific Railroad Fires and Explosions (Roseville) | Fire | Explosion | – | 4/30/1973 | – |
| 1973 | 1973 Floods and Storms | Flood | Storms | – | 2/28/1973 | – |
| 1972 | 1972 Freeze | Freeze | Freeze | – | 4/17/1972 5/22/1972 5/31/1972 | – |
| 1969 | 1969 Storms | Flood | Storms | DR-253 | 1/23/69-3/12/69 | 1/26/1969 |
| 1965 | 1965 Fires | Wildfire | Wildfire | – | 9/18/1965 | – |
| 1964 | 1964 Late Winter Storms | Flood | Storms | DR-183 | – | 12/24/1964 |

| Year | Disaster Name | Disaster Type | Disaster Cause | Disaster # | State Declaration # | Federal Declaration # |
|---|---|---|---|---|---|---|
| 1963 | 1963 Floods | Flood | Storms | – | 2/14/1964 | – |
| 1962 | 1962 Floods and Rains | Flood | Storms | – | 10/17/1962<br>10/25/1962<br>10/30/1962<br>11/4/1962 | 10/24/1962 |
| 1961 | 1961 Widespread Fires | Wildfire | Wildfire | – | 9/18/1961 | – |
| 1958 | 1958 April Storms and Floods | Flood | Storms | DR-52 | 4/5/1958 | 4/4/1958 |
| 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 Placer County – State and Federal Disaster Declarations Summary 1950-2020*

| Disaster Type | State Declarations | | Federal Declarations | |
|---|---|---|---|---|
| | Count | Years | Count | Years |
| Drought | 1 | 2014 | 1 | 1977 |
| Economic | 1 | 2001 | 0 | |
| Flood (including heavy rains and storms) | 16 | 1950, 1955, 1958 (twice), 1962, 1963, 1969, 1973, 1980, 1983, 1986, 1995 (twice), 1997, 2008, 2017 | 13 | 1955, 1958, 1962, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 2006 (twice), 2017 |
| Freeze | 1 | 1972 | 0 | – |
| Hurricane | 0 | – | 1 | 2005 |
| Pandemic | 1 | 2020 | 1 | 2020 |
| Fire | 5 | 1961, 1965, 1973, 1987, 2010 | 6 | 2002, 2004, 2008, 2009, 2014 (twice) |
| **Totals** | **25** | – | **22** | **–** |

Source: Cal OES, FEMA

## *Disasters since 2016*

As detailed above, there have been three federal disaster declarations and three state disaster declarations since the 2016 plan:

- 2017 Floods (federal and state)
- 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 2002 to 2020, and the results for Placer County are shown on Table 4-6.

### *Table 4-6 Placer County – USDA Disaster Declarations 2002-2020*

| Year | Declaration Number | Primary or Contiguous County | Disaster Type |
|---|---|---|---|
| 2002 | N/A | N/A | Drought |
| 2002 | N/A | N/A | Rain and Wind |
| 2003 | N/A | N/A | Hail and Freeze |
| 2003 | N/A | N/A | Excessive Rain/Late Rain |
| 2003 | N/A | N/A | Drought |
| 2003 | N/A | N/A | N/A |
| 2004 | N/A | N/A | N/A |
| 2004 | N/A | N/A | N/A |
| 2004 | N/A | N/A | Fire |
| 2005 | N/A | N/A | Freeze |
| 2005 | N/A | N/A | Unseasonable Late Rain |
| 2005 | N/A | N/A | Heat |
| 2006 | N/A | N/A | Heat |
| 2006 | N/A | N/A | Rain/Hail |
| 2007 | N/A | N/A | Heat |
| 2007 | N/A | N/A | Freeze |
| 2007 | N/A | N/A | Drought |
| 2008 | N/A | N/A | Drought |
| 2008 | N/A | N/A | Freeze |
| 2008 | N/A | N/A | Wind |
| 2009 | N/A | N/A | Drought |
| 2012 | S3283 | Contiguous | Drought-FAST TRACK |
| 2012 | S3379 | Primary | Drought |
| 2012 | S3440 | Contiguous | Drought-FAST TRACK |
| 2013 | S3462 | Contiguous | Drought-FAST TRACK |
| 2013 | S3495 | Primary | Drought-FAST TRACK |
| 2013 | S3569 | Primary | Drought-FAST TRACK |
| 2014 | S3638 | Contiguous | Drought-FAST TRACK |
| 2014 | S3626 | Primary | Drought-FAST TRACK |
| 2014 | S3631 | Contiguous | Drought |
| 2014 | S3637 | Primary | Drought-FAST TRACK |

| Year | Declaration Number | Primary or Contiguous County | Disaster Type |
|---|---|---|---|
| 2014 | S3797 | Primary | Drought |
| 2015 | S3784 | Primary | Drought-FAST TRACK |
| 2015 | S3789 | Contiguous | Drought-FAST TRACK |
| 2015 | S3963 | Contiguous | Drought |
| 2016 | S3952 | Primary | Drought-FAST TRACK |
| 2016 | S3953 | Contiguous | Drought-FAST TRACK |
| 2016 | S4164 | Contiguous | Severe weather including excessive rainfall and high winds |
| 2016 | S4170 | Contiguous | Severe weather including excessive rainfall and high winds |
| 2017 | S4163 | Contiguous | Drought-FAST TRACK |
| 2018 | S4427 | Contiguous | Drought-FAST TRACK |
| 2019 | S4565 | Contiguous | Excessive rain |
| 2020 | S4697 | Primary | Drought-FAST TRACK |
| 2020 | S4765 | Contiguous | Drought-FAST TRACK |

Source: USDA

## *EOC Activations since 2016*

- 2016
  - ✓ Trail Head Fire (Todd Valley/Foresthill area) - 6/28 (Level 1 – Highest)

- 2017
  - ✓ Oroville Dam Failure (Butte Co), 2/12 – Level 3/OES & Public Health staffs only – Evacuation & mutual aid support to Butte Co & other affected nearby counties

- 2018
  - ✓ Winter storm period, Feb & Mar – Level 3/OES staff only
  - ✓ North Fire, 9/3 – Level 3
  - ✓ Sliger Fire, 9/4 – Level 3
  - ✓ Camp Fire (Butte Co), 10/14 – Level 3
  - ✓ PSPS 101418, 10/14 – Level 3
  - ✓ PSPS 110818, 11/8 – Level 3

- 2019
  - ✓ PSPS 091319, 9/13 – Level 3
  - ✓ PSPS 092119, 9/21 – Level 3
  - ✓ PSPS 100219, 10/2 – Level 3
  - ✓ PSPS 102319, 10/23 – Level 3
  - ✓ PSPS 102619, 10/26 – Level 3
  - ✓ PSPS 102819, 10/28 – Level 3
  - ✓ PSPS 112019, 11/20 – Level 3

- 2020
  - ✓ COVID-19, Mar – Apr (Level 1), May (Level 2), Jun (Level 3)
  - ✓ PSPS 090720, 9/7 -Level 3
  - ✓ PSPS 092620, 9/26 – Level 3
  - ✓ PSPS 101420, 10/14 – Level 3
  - ✓ PSPS 102120, 10/21 – Level 3
  - ✓ PSPS 102520, 10/25 – Level 3
  - ✓ Extreme Heat & Potential rolling blackout – Aug
  - ✓ Fork Fire (El Dorado Co, potential to cross over into Placer in direction of Foresthill), 9/8 – Level 3

## 4.2 Placer County Assets at Risk

As a starting point for analyzing the Placer 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. Data used 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 Placer County. The 2020 Placer County Parcel/Assessor's data, obtained from Placer County, was used for the basis of this analysis. This data provided by Placer County represents best available data.

Understanding the total assessed value of Placer 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

Placer 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 Placer County and CalAtlas to support countywide mapping and analysis of values at risk.

The County GIS parcel data contained 182,358 records for the entire Placer County planning area, of which 148,646 parcels are improved parcels. The parcel dataset includes 53,151 records for the City of Roseville, which does not participate in the County's hazard mitigation planning update. Values are shown for Roseville in the 'Total Exposure by Jurisdiction' table to provide a comprehensive county-wide overview. City of Roseville parcels and values were excluded from all further hazards analyses and Values at Risk tables.

### *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 values 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.

Another limitation to this data is found in the Williamson Act, also known as the California Land Conservation Act of 1965, that 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 further affects the County's overall values for assessed taxable lands.

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.

3,403 records represent public right-of- way (PROW) parcels that do not contain assessment values. These are useful for corridor-analysis but do not affect values-at-risk analysis. These parcels were included in the Total Values at Risk Tables as well as the hazard analyses.

### *Property Use Categories*

Placer 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 seven property use categories and linked back to the Placer County Assessor data. The final property use categories for Placer County are:

- Agricultural
- Commercial
- Industrial
- Institutional
- Miscellaneous
- Natural/ Open Space
- Residential

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

### *Estimated Content Replacement Values*

Placer 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 Placer County – Content Replacement Factors by Property Use*

| Placer County Property Use Categories | Hazus Property Use Categories | Hazus Content Replacement Values |
|---|---|---|
| Agricultural | Agricultural | 100% |
| Commercial | Commercial | 100% |
| Industrial | Industrial | 150% |
| Institutional | Institutional | 100% |
| Miscellaneous | Commercial | 100% |
| Natural/ Open Space | Commercial | 100% |

| Placer County Property Use Categories | Hazus Property Use Categories | Hazus Content Replacement Values |
|---|---|---|
| Residential | Residential | 50% |

Source: Hazus

## Placer 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 Placer 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 Placer 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 CRVs. It should be noted that Table 4-8 includes all of Placer County's jurisdictions. The City of Roseville is not a participating jurisdiction to this Plan, as the City maintains its own LHMP. In the vulnerability assessment of each hazard in Section 4.3 below, the analysis will not include values from the City of Roseville.

### *Table 4-8 Placer County Planning Area – Total Values at Risk by Jurisdiction*

| Jurisdiction | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Auburn | 6,490 | 5,180 | $648,497,133 | $1,548,994,382 | $908,323,171 | $3,105,814,686 |
| Colfax | 988 | 711 | $64,997,967 | $152,168,583 | $104,699,837 | $321,866,387 |
| Lincoln | 21,821 | 18,706 | $2,431,202,724 | $6,444,481,445 | $3,560,063,139 | $12,435,747,308 |
| Loomis | 2,995 | 2,552 | $409,549,357 | $818,568,036 | $502,038,115 | $1,730,155,508 |
| Rocklin | 23,657 | 21,009 | $3,105,707,112 | $8,167,173,274 | $4,840,152,035 | $16,113,032,421 |
| Unincorporated Placer County | 73,256 | 53,577 | $12,506,552,035 | $22,281,383,505 | $12,220,563,685 | $47,008,499,225 |
| **Total** | **129,207** | **101,735** | **$19,166,506,328** | **$39,412,769,225** | **$22,135,839,982** | **$80,715,115,535** |
| Roseville | 53,151 | 46,941 | $6,576,698,043 | $19,138,442,463 | $12,518,871,465 | $38,234,011,971 |
| **Grand Total** | **182,358** | **148,676** | **$25,743,204,371** | **$58,551,211,688** | **$34,654,711,447** | **$118,949,127,506** |

Source: Placer County 2020 Parcel/Assessor's Data

The values for unincorporated Placer 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 Placer 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 | 1,329 | 267 | $395,087,021 | $61,249,725 | $61,249,725 | $517,586,471 |
| Commercial | 1,533 | 951 | $524,860,676 | $793,192,976 | $793,192,976 | $2,111,246,628 |
| Industrial | 704 | 354 | $234,494,247 | $389,232,140 | $583,848,214 | $1,207,574,601 |
| Institutional | 696 | 113 | $50,761,281 | $274,504,591 | $274,504,591 | $599,770,463 |
| Miscellaneous | 10,728 | 240 | $596,937,975 | $34,285,408 | $34,285,408 | $665,508,791 |
| Natural / Open Space | 2,520 | 458 | $193,888,774 | $218,046,988 | $218,046,988 | $629,982,750 |
| Residential | 55,746 | 51,194 | $10,510,522,061 | $20,510,871,677 | $10,255,435,783 | $41,276,829,521 |
| **Unincorporated Placer County Total** | **73,256** | **53,577** | **$12,506,552,035** | **$22,281,383,505** | **$12,220,563,685** | **$47,008,499,225** |

Source: Placer County 2020 Parcel/Assessor's Data

### 4.2.2. Critical Facility Inventory

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Volume II of the Background Report to the Placer County General Plan, 1994 defines critical facilities as, "those services and facilities necessary during a major emergency." This definition was refined by separating out three categories of critical facilities.

Class 1 facilities include those facilities that contribute to command, control, communications and computer capabilities associated with managing an incident from initial response through recovery. Class 1 facilities include:

- Primary and alternate Emergency Operations Centers (EOCs),
- All Dispatch Centers,
  - ✓ Sheriff Auburn
  - ✓ Sheriff Tahoe
  - ✓ CHP Sacramento
  - ✓ CHP Truckee
  - ✓ CAL FIRE Grass Valley
  - ✓ Roseville City
  - ✓ Rocklin City
  - ✓ Lincoln City
  - ✓ Auburn City
- Emergency Services Communication Infrastructure,
- Primary and Alternate Computer Information Systems Infrastructure,
- Sutter Roseville Hospital Control Facility, and
- Major transportation corridors.

Class 2 facilities include those facilities that house Emergency Services capabilities. Class 2 facilities include

- All Police Stations,
  - ✓ Roseville
  - ✓ Rocklin
  - ✓ Lincoln
  - ✓ Auburn
- All CHP Stations,
  - ✓ Newcastle
  - ✓ Dutch Flat
  - ✓ Truckee
- All Fire Stations,
- All Hospitals,
  - ✓ Sutter Auburn Faith
  - ✓ Kaiser Roseville
  - ✓ Sutter Roseville
  - ✓ Tahoe Truckee
- All National Guard Armories,
- Coast Guard Facilities in Tahoe, and
- Airports:
  - ✓ Lincoln
  - ✓ Auburn
  - ✓ Blue Canyon
  - ✓ Truckee

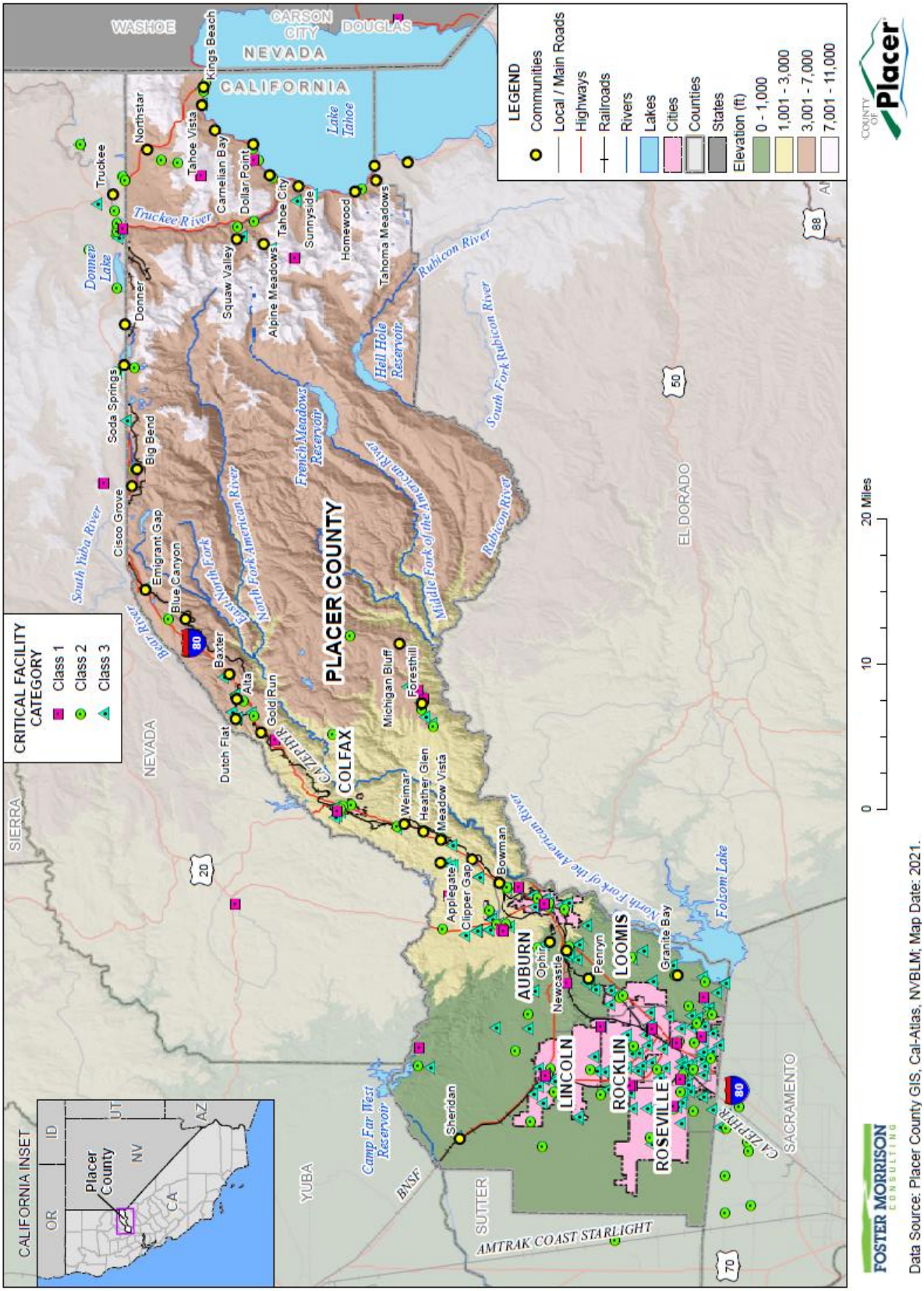
Class 3 facilities are those facilities that enable key utilities and can be used as evacuation centers/shelters/mass prophylaxis sites, etc. Class 3 facilities include

- All schools
- Water treatment plants
- Power generation infrastructure
- Fuel pipelines
- Fiber-optic lines
- Sewage infrastructure
- Fair Grounds in Auburn and in Roseville
- Memorial Halls
- Park Facilities
- Water-reactive materials

To support hazard analysis of critical facilities, Placer County GIS developed a critical facilities layer that pulled mapped critical facilities from existing GIS layers and organized them into a new critical facilities layer. Each facility was assigned one of the three different categories (each with a different symbology). County OES and others added additional mapped facilities to this layer as appropriate. The final critical facilities layer used for this analysis included facilities located in both unincorporated and incorporated communities. A summary of critical facilities in the Placer County Planning Area can be found in Figure

4-1 and Table 4-10. Table 4-11 details critical facilities by category. Additional details of individual critical facilities can be found in Appendix F of this Plan Update.

## *Figure 4-1 Placer County Planning Area – Critical Facilities*



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

| Critical Facility Class/Jurisdiction | Facility Count |
|---|---|
| **Auburn** | |
| Class 1 | 2 |
| Class 2 | 6 |
| Class 3 | 11 |
| **Auburn Total** | **19** |
| **Colfax** | |
| Class 2 | 3 |
| Class 3 | 2 |
| **Colfax Total** | **5** |
| **Lincoln** | |
| Class 1 | 2 |
| Class 2 | 5 |
| Class 3 | 17 |
| **Lincoln Total** | **24** |
| **Loomis** | |
| Class 2 | 2 |
| Class 3 | 3 |
| **Loomis Total** | **5** |
| **Rocklin** | |
| Class 1 | 3 |
| Class 2 | 4 |
| Class 3 | 23 |
| **Rocklin Total** | **30** |
| **Unincorporated Placer County** | |
| Class 1 | 24 |
| Class 2 | 65 |
| Class 3 | 119 |
| Unincorporated Placer County Total | 208 |
| **Placer County Planning Area Totals** | **291** |
| **Adjacent Counties** | |
| Class 1 | 6 |
| Class 2 | 19 |
| Class 3 | 12 |
| **Adjacent Counties Total** | **37** |
| | |

| Critical Facility Class/Jurisdiction | Facility Count |
|---|---|
| **Grand Total** | **328** |

Source: Placer County GIS

### *Table 4-11 Placer County Planning Area – Critical Facilities by Facility Type*

| Critical Facility Class / Jurisdiction | Critical Facility Type | Facility Count |
|---|---|---|
| **Auburn** | | |
| Class 1 | Dispatch Center | 1 |
| | Emergency Operation Center | 1 |
| Class 2 | Airport | 1 |
| | Fire Station | 3 |
| | National/Coast Guard | 1 |
| | Police Station | 1 |
| Class 3 | Fairground | 1 |
| | Hall | 5 |
| | School | 5 |
| **Auburn Total** | | **19** |
| **Colfax** | | |
| Class 2 | Fire Station | 2 |
| Class 3 | Police Station | 1 |
| | Hall | 1 |
| | Water Treatment Plant | 1 |
| **Colfax Total** | | **5** |
| **Lincoln** | | |
| Class 1 | Dispatch Center | 1 |
| | Emergency Operation Center | 1 |
| Class 2 | Airport | 1 |
| | Fire Station | 3 |
| | Police Station | 1 |
| Class 3 | Hall | 3 |
| | Hazardous Materials Facility | 1 |
| | School | 12 |
| | Water Treatment Plant | 1 |
| **Lincoln Total** | | **24** |
| **Loomis** | | |
| Class 2 | Fire Station | 1 |
| | Police Station | 1 |
| Class 3 | School | 3 |

| Critical Facility Class / Jurisdiction | Critical Facility Type | Facility Count |
|---|---|---|
| **Loomis Total** | | **5** |
| **Rocklin** | | |
| Class 1 | Communication Transmission Sites | 1 |
| | Dispatch Center | 1 |
| | Emergency Operation Center | 1 |
| Class 2 | Fire Station | 3 |
| | Police Station | 1 |
| Class 3 | Hall | 2 |
| | Hazardous Materials Facility | 1 |
| | School | 19 |
| | Water Treatment Plant | 1 |
| **Rocklin Total** | | **30** |
| **Unincorporated Placer County** | | |
| Class 1 | Communication Transmission Sites | 13 |
| | Computer Information Systems Infrastructure | 2 |
| | Dispatch Center | 2 |
| | Emergency Operation Center | 3 |
| | Fire Station | 1 |
| | Hospital Control Facility | 1 |
| | Telecommunications | 2 |
| Class 2 | Airport | 1 |
| | CHP Station | 2 |
| | Fire Station | 51 |
| | Hospital | 3 |
| | National/Coast Guard | 2 |
| | Police Station | 6 |
| Class 3 | Fairground | 1 |
| | Hall | 29 |
| | Hazardous Materials Facility | 8 |
| | School | 65 |
| | Water Treatment Plant | 16 |
| **Unincorporated Placer County Total** | | **208** |
| **Adjacent Counties** | | |
| Class 1 | Communication Transmission Sites | 3 |
| | Dispatch Center | 3 |
| Class 2 | Airport | 1 |

| Critical Facility Class / Jurisdiction | Critical Facility Type | Facility Count |
|---|---|---|
| | CHP Station | 1 |
| | Fire Station | 16 |
| | Hospital | 1 |
| Class 3 | School | 11 |
| | Water Treatment Plant | 1 |
| **Adjacent Counties Total** | | **37** |
| | | |
| **Grand Total** | | **328** |

Source: Placer County GIS

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

Assessing Placer 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

Placer 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 4-12.

### *Table 4-12 Placer County Planning Area – Historical Resources*

| Resource Name (Plaque Number) | National Register | State Landmark | Point of Interest | Date Listed | City |
|---|---|---|---|---|---|
| Allen & Sandhorfer Blacksmith, Auburn Iron Works (P619) | | | X | 8/16/1983 | Auburn |
| Auburn Grammar School, Auburn Civic Center Project (P693) | | | X | 3/3/1988 | Auburn |
| Auburn IOOF Hall (P803) | | | X | 8/23/1994 | Auburn |
| Auburn Public Library, Old Auburn Library (P838) | | | X | 9/11/2000 | Auburn |
| Baxter (P618) | | | X | 8/16/1983 | Dutch Flat |
| Buckner's Bar (P354) | | | X | 11/19/1974 | Auburn |
| Burns Home, Howell Home (P656) | | | X | 7/2/1985 | Auburn |
| Butcher Ranch (P357) | | | X | 11/19/1974 | Auburn |
| City of Auburn (404) | | | | 4/14/1948 | Auburn |
| Clipper Gap (P359) | | X | X | 11/19/1974 | Auburn |
| Colfax Freight Depot (N2076) | X | | | 12/17/1999 | Colfax |
| Colfax Passenger Depot (N2044) | X | | | 1/15/1999 | Colfax |
| Dutch Flat Historic District (N219) | X | | | 3/28/1973 | Dutch Flat |
| Emigrant Gap (403) | | X | | 4/14/1948 | Emigrant Gap |
| Finnish Temperance Hall, Finn Hall (P664) | | | X | 8/20/1985 | Rocklin |
| First Transcontinental Railroad-Auburn (780) | | X | | 11/20/1962 | Auburn |
| First Transcontinental Railroad-Colfax (780) | | X | | 11/20/1962 | Colfax |
| First Transcontinental Railroad-Newcastle (780) | | X | | 11/20/1962 | Newcastle |

| Resource Name (Plaque Number) | National Register | State Landmark | Point of Interest | Date Listed | City |
|---|---|---|---|---|---|
| First Transcontinental Railroad-Rocklin (780) | | X | | 11/20/1962 | Rocklin |
| First Transcontinental Railroad-Roseville (780) | | X | | 11/20/1962 | Roseville |
| Griffith Residence (P517) | | | X | 12/1/1977 | Penryn |
| Griffith House (N725) | X | | | 12/19/1978 | Penryn |
| Griffith Quarry (885) | | X | | 5/9/1975 | Penryn |
| Griffith Quarry (N522) | X | | | 10/20/1977 | Penryn |
| Grizzly Bear House (P355) | | | X | 11/19/1974 | Auburn |
| Haman House (N451) | X | | | 11/17/1976 | Roseville |
| Historic Gatekeeper's Log House (P228) | | | X | 10/5/1971 | Tahoe City |
| Iowa Hill (401) | | X | | 4/14/1948 | Iowa Hill |
| Lake Tahoe Dam (N948) | X | | | 3/25/1981 | Tahoe City |
| Lake Tahoe Outlet Gates (797) | | X | | 9/16/1964 | Tahoe City |
| Liberty House (P356) | | | X | 11/19/1974 | Auburn |
| Lincoln Public Library (N1660) | X | | | 12/10/1990 | Lincoln |
| Masonic Temple, Masonic Hall (P821) | | | X | 5/15/1996 | Auburn |
| Michigan Bluff–Last Chance Trail (N1779) | X | | | 6/26/1992 | Michigan Bluff |
| Mountain Quarries Bridge (N2227) | X | | | 2/11/2004 | Auburn |
| Newcastle Fruit Sheds (P836) | | | X | 3/15/2000 | Newcastle |
| Newcastle Portuguese Hall (P578) | X | | X | 12/21/1981 | Newcastle |
| Old Auburn Historic District (N62) | X | | | 12/29/1970 | Auburn |
| Ophir (463) | | X | | 8/30/1950 | Auburn |
| Outlet Gates and Gatekeeper's Cabin (N198) | X | | | 12/13/1972 | Tahoe City |
| Overland Emigrant Trail (799) | | X | | 9/16/1964 | Soda Springs |
| Pioneer Express Trail (585) | | X | | 5/22/1957 | Folsom |
| Pioneer Ski Area of America, Squaw Valley (724) | | X | | 1/18/1960 | Squaw Valley |
| Sheridan Cash Store (P728) | | | X | 8/17/1990 | Sheridan |
| Spring Garden School (P361) | | | X | 11/19/1974 | Auburn |
| Stevens Trail (N2181) | X | | | 11/20/2002 | Colfax |
| Strap Ravine Nisenan Maidu Indian Site (N200) | X | | | 1/8/1973 | Roseville |
| Summit Soda Springs (N720) | X | | | 12/15/1978 | Soda Springs |
| Todd's Valley (P358) | | | X | 11/19/1974 | Auburn |
| Town of Dutch Flat (397) | | X | | 4/14/1948 | Dutch Flat |
| Town of Foresthill (399) | | X | | 4/14/1948 | Foresthill |
| Town of Gold Run (405) | | X | | 4/14/1948 | Gold Run |
| Town of Michigan Bluff (402) | | X | | 4/14/1948 | Michigan Bluff |
| U.S. Ranch (P360) | | | X | 11/19/1974 | Auburn |

| Resource Name (Plaque Number) | National Register | State Landmark | Point of Interest | Date Listed | City |
|---|---|---|---|---|---|
| Virginiatown (400) | | X | | 4/14/1948 | Newcastle |
| Watson Log Cabin (N798) | X | | | 8/24/1979 | Tahoe City |
| Woman's Club of Lincoln (N2134) | X | | | 5/30/2001 | Lincoln |
| Yankee Jim's (398) | | X | | 4/14/1948 | Foresthill |

Source: California Department of Parks and Recreation Office of Historic Preservation, http://ohp.parks.ca.gov/; Retrieved January 26, 2020

A 1988 publication from the OHP identified five "ethnic historic sites" in Placer County. Five Views: An Ethnic Historic Site Survey for California was originally conceived to broaden the spectrum of ethnic community participation in historic preservation activities and to provide better information on ethnic history and associated sites. The five sites in Placer County identified in the OHP survey are listed below:

- Duke Luster House
- Auburn Chinese American Cemetery
- Auburn Chinese American Community
- Chinese Store
- Tsuda's Store

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.

The geographic extent of Placer County spans from the Sacramento Valley to the crest of the Sierra Nevada Range eastward to the Nevada state line. The County in its entirety incorporates four physiographic regions, 14 watersheds, numerous biotic regimes, and approximately 89 rare plant and animal species listed as threatened, endangered, or potential candidates for protection under the Endangered Species Act.

### Sacramento Valley Plains Region

Roughly the western one third of Placer County is located in the eastern portion of the Sacramento Valley. Much of this region has been impacted by or converted to urban or agricultural uses. The area is typified

by grasslands, oak savannah, and valley foothill riparian vegetation communities. Common plants across the Sacramento Valley Plains region include wild oats, ripgut brome, California poppy, lupines, clover and Valley oak. Common wildlife species include the California ground squirrel, Botta's pocket gopher, mourning dove, horned lark, and western meadowlark. Riparian zones in this region support Freemont's cottonwood, California sycamore, wild rose, California blackberry, blue elderberry, poison oak, and willows.

This region contains wetland types associated with valley floor topography, such as Northern hardpan and Northern volcanic vernal pools, alkali meadow and seep, wet meadow, and fresh emergent wetland.

### Lower Foothill Region

The Lower Foothill physiographic region of Placer County is located to the east of the Sacramento Valley Plains at elevations ranging from 100 to 1,300 feet. Typical vegetation communities are Blue Oak woodland, Blue Oak-Digger Pine woodland, annual grasslands, Chamise chaparral, and valley foothill riparian. Blue Oak woodlands are located in areas of shallow rocky soils with understory shrubs including poison oak, California coffeeberry and buckbrush. Blue Oak-Digger Pine woodland is similar to Blue Oak woodlands but includes a mix of pine conifer species.

Common wildlife species in the lower foothills region include California quail, band-tailed pigeons, scrub jay, acorn woodpeckers, yellow-billed magpie, wild turkey, California ground squirrel, western gray squirrel, mule deer, and gray fox.

### Upper Foothill/Low Mountain Region

The Upper Foothill/Low Mountain physiographic region is located east of the City of Auburn and includes elevations from 1300 to approximately 6000 feet. In general, forest cover is denser relative to the lower foothill region and tree species are more diverse. High variable factors including soil type, topography, slope and aspect, and human influences from grazing, hardwood harvesting, and other land clearing activities are indicators for forest density and composition. Moderate gradient perennial and intermittent streams and rivers support a varied amount of riparian habitat that provide valuable habitat for wildlife.

Montane Hardwood, Montane Hardwood-Conifer, Ponderosa, and Sierran Mixed Conifer are the dominant forest communities. Common tree species in this region includes canyon live oak, tan oak, Pacific madrone, black oak, Douglas fir, white fir, and incense cedar. Common types of shrubs from these forest types are deerbrush, chinquapin, mountain whitethorn, poison oak, and mountain misery.

Mixed chaparral communities composed of shrubs such as ceanothus, Manzanita, scrub oak, California buckeye and wildlife species such as western rattlesnake, California thrasher, California quail, gray fox, and mule deer are also present in this region. Montane riparian forests located in the Upper Foothill/Low Mountain physiographic region are made up of white alder, aspen, black cottonwood, dogwood, willows, and wild azalea.

### High Sierra Region

The High Sierra physiographic region represents the highest elevations of Placer County. The region supports wildlife including Pacific tree frogs, California mountain king snake, dark-eyed junco, Steller's jay, mountain chickadee, pygmy nuthatch, golden mantled ground squirrel, Allen's chipmunk, Douglas squirrel, mule deer, black bear and mountain lions. Forest types include aspen, white fir, lodgepole pine, red fir, subalpine conifer, Jeffrey pine and eastside pine. The harsh environment that accompanies the highest elevations of the Sierra crest (9,000-11,000 feet) results in somewhat lower overall plant and wildlife diversity and lower incidence and volume of understory shrubs.

East of the Sierra crest, the drier climate regime supports Ponderosa pine, big sagebrush, rabbitbrush and bitterbrush, and High Sierra/Great Basin transition species. The High Sierra physiographic region is classified as major land resource area 22 under the USDA Soil Conservation Service description of land resource areas. Rivers and streams are at a higher gradient than their foothill or valley floor reaches and support a montane riparian habitat that, like the others, provides valuable habitat for resident and migratory wildlife.

Each physiographic region hosts specific habitats that together support a wide variety of vegetation and wildlife (see Table 4-13), and each region has different susceptibilities to hazards such as wildfire, flood, and drought. Placer County recognizes the importance of protecting, preserving, conserving, and restoring this biodiversity.

***Table 4-13 Placer County Habitat Types by Physiographic Region***

| Sacramento Valley Plains Region | Lower Foothill Region | Upper Foothill/Lower Mountain Region | High Sierra Region |
|---|---|---|---|
| Urban, Agricultural and Rangeland<br>Annual Grasslands<br>Grassland (with Oak Woodland)<br>Valley-Foothill Riparian/Riverine<br>Valley Oak Woodland<br>Northern Hardpan and Northern Volcanic Vernal Pools<br>Fresh Emergent Wetland<br>Alkali Meadow and Seep<br>Wet Meadow | Urban, Agricultural and Rangeland<br>Annual Grasslands<br>Grassland (with Oak Woodland)<br>Valley-Foothill Riparian/Riverine<br>Blue Oak Woodland<br>Blue Oak-Digger Pine Woodland<br>Chamise Chaparral<br>Fresh Emergent Wetland<br>Wet Meadow | Montane Hardwood<br>Montane Hardwood-Conifer<br>Ponderosa<br>Sierran Mixed Conifer<br>Valley-Foothill Riparian/Riverine<br>Fresh Emergent Wetland<br>Mixed Chaparral<br>Blue Oak Woodland<br>Blue Oak-Digger Pine Woodland<br>Fresh Emergent Wetland<br>Wet Meadow | Montane Chaparral<br>Montane Hardwood Conifer<br>Montane Riparian Forest<br>Sierran Mixed Conifer<br>Ponderosa Pine<br>Jeffrey Pine<br>White/Red Fir<br>Lodgepole Pine<br>Sub-alpine Conifer<br>Alpine Dwarf Scrub<br>Bitterbrush<br>Juniper<br>Fresh Emergent Wetland<br>Wet Meadow |

Source: Placer County General Plan Background Report 1994

There are 17 primary ecosystem types in Placer County (not including barren, agricultural, and developed land) according to the state's California Wildlife Habitat Relationships (CWHR) classification system, although many of these can be subdivided into specific habitats. The vulnerability assessment grouped local ecosystems into six categories. Table 4-14 lists these six wild vegetated areas as well as developed and wild unvegetated areas and their acre age in Placer County.

### *Table 4-14 Ecosystem Coverage in Placer County*

| Ecosystem | Acres | Percent of Wild Vegetated Area | Percent of All Unincorporated Area |
|---|---|---|---|
| **Wild vegetated areas** | | | |
| Chaparral | 60,997 | 8.4% | 6.8% |
| Conifer forests | 526,822 | 72.8% | 58.7% |
| Grasslands | 69,290 | 9.6% | 7.7% |
| Mountain meadows and scrub | 2,195 | 0.3% | 0.2% |
| Valley and riparian woodlands | 61,677 | 8.5% | 6.9% |
| Wetlands | 2,866 | 0.4% | 0.3% |
| All wild vegetated areas | 723,847 | 100% | 80.6% |
| **Developed and wild unvegetated areas** | | | |
| Agriculture | 50,243 | – | 5.6% |
| Barren | 18,613 | – | 2.1% |
| Urban | 42,156 | – | 4.7% |
| Water bodies | 62,876 | – | 7.0% |
| Total developed and wild unvegetated areas | 173,888 | – | 19.4% |
| Total unincorporated area | 897,735 | – | 100% |

Source: California Department of Fish and Wildlife, 2021

## 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 Placer County. A summary list of these species is found below in Table 4-15. 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 Placer County.

### *Table 4-15 Placer County Planning Area – Summary of Special Status Species*

| Type | Number |
|---|---|
| Animals – Amphibians | 10 |
| Animals – Arachnids | 1 |

| Type | Number |
|---|---|
| Animals – Birds | 46 |
| Animals – Crustaceans | 6 |
| Animals – Fish | 10 |
| Animals – Insects | 11 |
| Animals – Mammals | 20 |
| Animals – Mollusks | 5 |
| Animals – Reptiles | 2 |
| Community – Terrestrial | 5 |
| Plants – Bryophytes | 3 |
| Plants – Vascular | 74 |

Source: California Natural Diversity Database, retrieved January 20, 2021

## Rare Natural Plant Communities

The Placer County General Plan Draft Background Report identifies five rare natural plant communities in the Planning Area:

- Big Tree Forest
- Alkali Meadow
- Alkali Seep
- Northern Hardpan Vernal Pool
- Northern Volcanic Mud Flow Vernal Pool

## Significant Natural Areas of Placer County

From information provided in the Placer County General Plan Background Report, Table 4-16 below outlines the location, elements, and rationale for listing of significant natural areas in Placer County.

### *Table 4-16 Description of Significant Natural Areas in Placer County*

| Location | Elements | Rationale |
|---|---|---|
| Lower Miners Ravine | Fall-run chinook salmon stream | Best example |
| Roseville eastern vernal pools | Northern volcanic mudflow vernal pools, wetlands | |
| Roseville northern vernal pools | Roseville northern vernal pools, northern | Extremely rare |
| Pole Creek | Lahontan cutthroat trout stream | Extremely rare |
| Upper Secret Ravine | Fall-run chinook salmon stream | Best example |
| Long Canyon | Saw toothed lewisia, Stebbins' phacelia | |
| Upper Pleasant Grove Creek | Alkali meadow, alkali seep, hispid birds | |

| Location | Elements | Rationale |
|---|---|---|
| Martis Creek | Lahontan cutthroat trout stream | Best example |
| Blackwood Creek | Tahoe yellow cress | Extremely rare |
| Ward Creek | Tahoe yellow cress | Extremely rare |

Source: Placer County General Plan Background Report (1994)

## 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 4-2 shows the wetlands areas in the County. These areas are detailed in Table 4-17 by wetland type.

## *Figure 4-2 Placer County – Wetlands Areas*

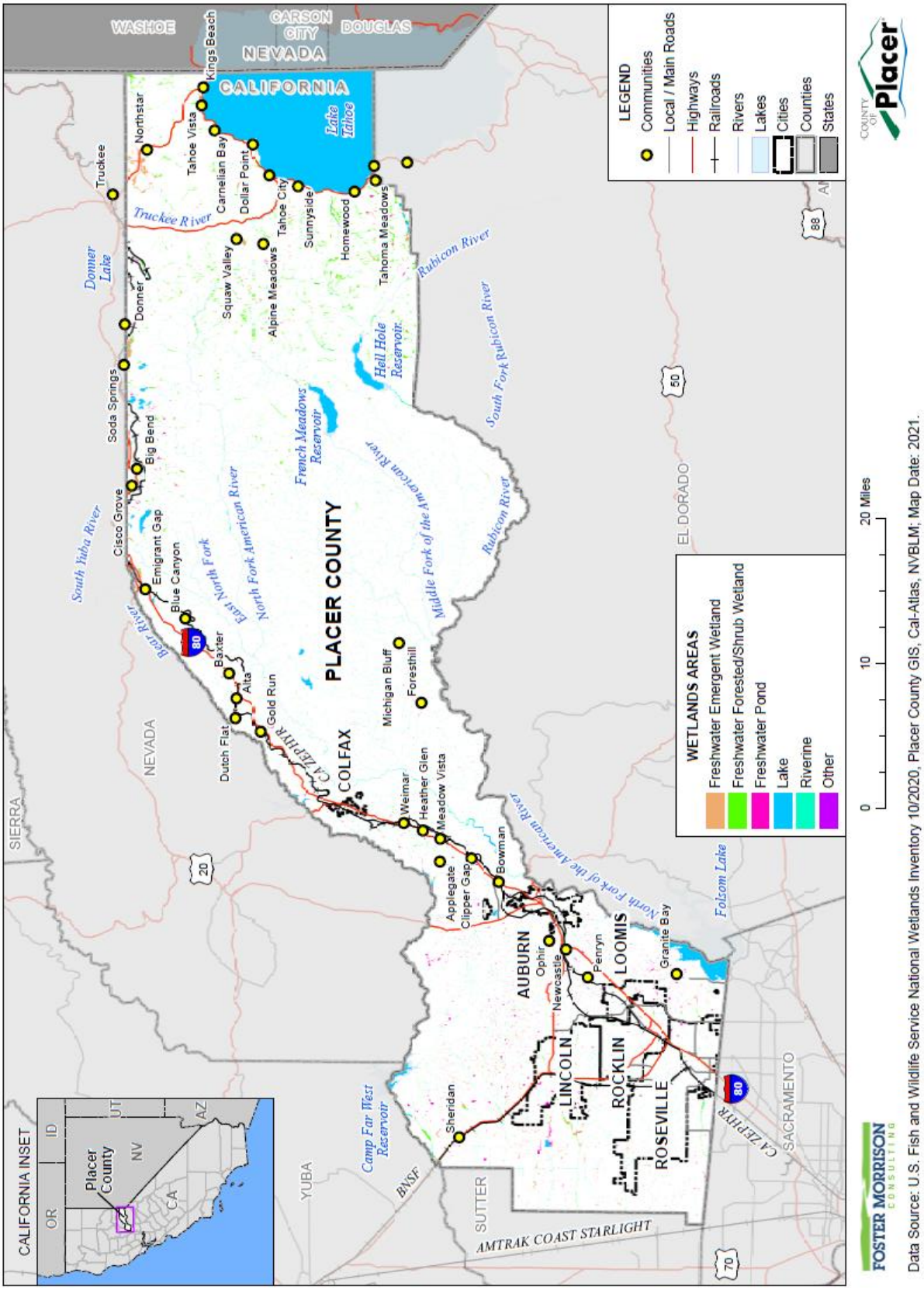


*Table 4-17 Placer County Planning Area – Wetlands Areas by Area Type*

| Wetlands Area Type | Wetlands Area (in Acres) |
|---|---|
| Freshwater Emergent Wetland | 4,013 |
| Freshwater Forested/Shrub Wetland | 597,652 |
| Freshwater Pond | 2,136 |
| Lake | 59,072 |
| Riverine | 598,543 |
| Other | 1 |
| **Grand Total** | **1,261,417** |

Source: US Fish and Wildlife Service 10/2020

## 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 floodplains 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 Placer County Planning Area.

## Farmlands

Farmlands are important considerations in rural counties in California. Placer County is located within the northern portion of California's Central Valley in the area known as the Sacramento Valley. It contains some of the richest soils in the State. These soils make the County's agricultural resources very productive. Even though agricultural production is dependent on weather and economic market fluctuations, local agricultural market revenues continue to rise in Placer County.

### 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. The County has designated areas as agricultural preserves within which the county will enter into contracts for the preservation of the land in agriculture. The County has 40,596 acres under Williamson Act Contract as of 2013. UPDATE - Emailed Josh Hutsinger about this on 12/12/2020.

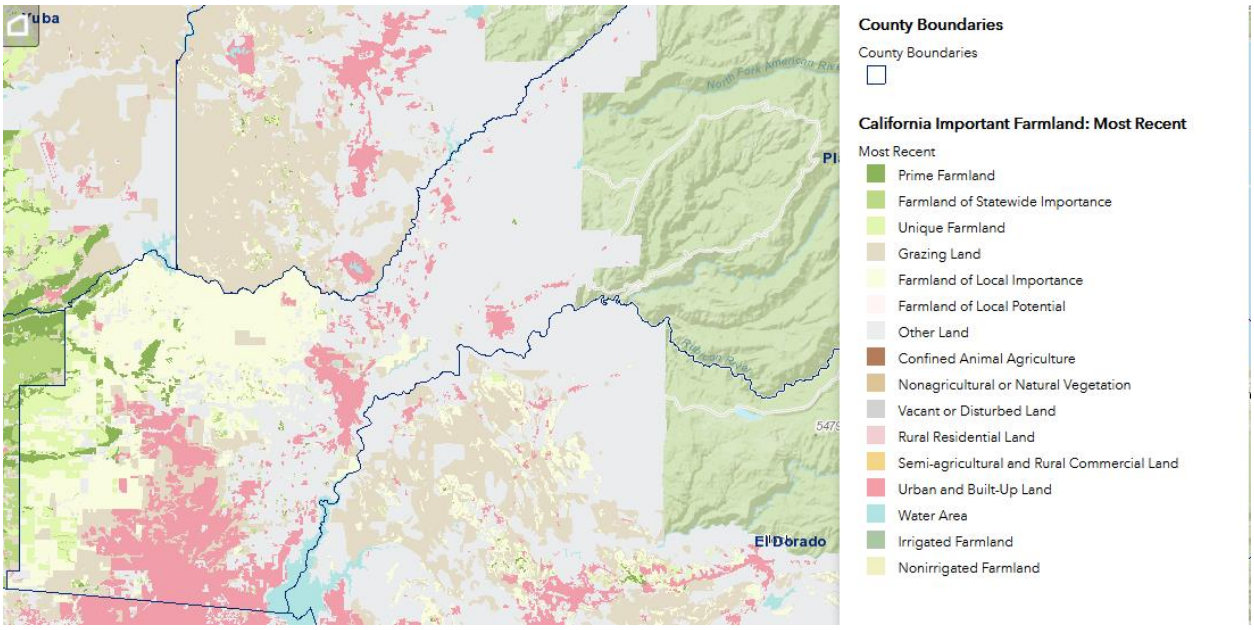
### State Inventory of Important Farmland

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.

These lands and their locations in Placer County are shown in Figure 4-3.

*Figure 4-3 Placer County – Farmland of Importance*




Source: California Department of Conservation, Retrieved 1/18/2021

## 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 Placer 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 Placer County for January 1, 2020 was 403,711, representing a seven-fold increase from just under 57,000 people in 1960. Table 4-18 and Table 4-19 illustrate the pace of population growth in Placer County dating back to 1940 along with more recent population trends for each jurisdiction. The data on population and housing growth shows that Placer County has seen tremendous growth during the last decades, especially in the incorporated areas of the County. Placer County is consistently one of the fastest growing counties in California.

*Table 4-18 Placer County Population Growth 1960-2014*

| Year | Population | Change | % Change |
|---|---|---|---|
| 1940 | 28,108 | – | – |
| 1950 | 41,649 | 13,451 | 48.2% |
| 1960 | 56,998 | 15,349 | 36.9% |
| 1970 | 77,632 | 20,308 | 36.2% |

| Year | Population | Change | % Change |
|---|---|---|---|
| 1980 | 117,247 | 39,941 | 51.0% |
| 1990 | 172,796 | 55,549 | 47.4% |
| 2000 | 248,399 | 75,603 | 43.8% |
| 2010 | 326,503 | 100,033 | 31.4% |
| 2020 | 403,711 | 77,208 | 23.6% |

Sources: Placer County Housing Element Background Report, California Department of Finance E-1 Report (2020)

### *Table 4-19 Population Growth for Jurisdictions in Placer County, 2000-2020*

| Area | 2000 | 2010 | 2020 | % Change 2000 to 2020 |
|---|---|---|---|---|
| Auburn | 12,462 | 13,330 | 14,594 | 17.1% |
| Colfax | 1,520 | 1,963 | 2,152 | 42.6% |
| Lincoln | 11,205 | 42,819 | 49,317 | 440.1% |
| Loomis | 6,260 | 6,430 | 6,888 | 10.0% |
| Rocklin | 36,330 | 56,974 | 70,350 | 93.6% |
| Roseville | 79,921 | 118,788 | 145,163 | 81.6% |

Source: US Census Bureau, California Department of Finance E-1 Report (2020)

## Special Populations and Disadvantaged Communities

The HMPC noted that the 2020 Placer County Sustainability Plan contained information related to 14 special populations in the County. The following is sourced from that report.

- **Children**: Children ten years old or younger. According to the 2015 ACS, approximately 11,390 children live in the unincorporated areas of Placer County, or approximately 10.1 percent of the total population.
- **Homeless persons**: Persons who do not have a permanent home, including those who live in temporary shelters. There are approximately 580 homeless persons in Placer County, according to the County's 2018 homeless count, although most of these persons are likely in incorporated communities.
- **Households in mobile homes**: Households who live in mobile homes (not including recreational vehicles, or RVs). The 2015 American Community Survey (ACS) reports approximately 2,500 households in the unincorporated areas of Placer County who live in mobile homes, or approximately 6.0 percent of the total number of households.
- **Outdoor workers**: People who mostly work outdoors, including construction workers and people who work in agricultural operations.
- **Persons in poverty**: People living in households with an income below the poverty limit, which is $25,100 for a household of four people. There are approximately 10,120 people in Placer County who live in poverty, or approximately 9.1 percent of the total population for whom poverty status can be determined, according to the 2015 ACS.
- **Persons in overcrowded households**: People living in households with more than one person per room in the house, not including bathrooms. The 2015 ACS reports approximately 1,180 households in the unincorporated areas of Placer County living in overcrowded or severely overcrowded (more

than 1 and a half people per room) conditions, or approximately 2.9 percent of the total number of households.

- **Persons with chronic health problems**: People who have a long term or permanent health condition that can create regular challenges in their day to day lives. These health problems include obesity, cancer, heart disease, and arthritis.
- **Persons with disabilities**: Persons with any kind of disability, including mobility challenges, hearing and/or vision impairments, behavioral disabilities, and challenges living independently or taking care of themselves. Some people may have more than one disability. According to the 2015 ACS, approximately 13,440 people in the unincorporated areas of Placer County have a disability, or approximately 12.1 percent of the total noninstitutionalized population. Approximately 10,270 households, or approximately 24.9 percent, have at least one household member with a disability.
- **Persons with limited English proficiency**: People who say they do not speak English "well", or "very well," although the Census Bureau does not formally define what these terms mean. The 2015 ACS reports that approximately 2,380 people in the unincorporated areas of Placer County who are at least 5 years old have limited English proficiency, or approximately 2.2 percent of the total population.
- **Persons without access to lifelines**: These are individuals who do not have access to basic technology or services, such as transportation or modern telecommunication. These persons may live in areas where these lifelines are not available or feasible, may not be able to afford these lifelines, or for personal reasons may choose not to have them. While data is not available on all persons without lifelines, the 2015 ACS reports that approximately 1,350 households do not have vehicles, or approximately 3.3 percent of all households.
- **Renters**: People who live in homes that they (or the head of their household) do not own. According to the 2015 ACS, approximately 8,920 households in the unincorporated areas of Placer County are renters, or approximately 21.6 percent of all households.
- **Senior citizens:** Persons 65 years of age or older. The 2015 ACS reports that there are approximately 21,260 senior citizens in the unincorporated areas of Placer County, or approximately 18.9 percent of the total population.
- **Senior citizens living alone**: Senior citizens who are the only people living in their homes, although they may have one or more caretakers. According to the 2015 ACS, approximately 4,220 senior citizens live alone in the unincorporated areas of Placer County, or approximately 19.8 percent of all senior citizens.
- **Undocumented persons**: People who do not have formal permission to live in the United States (they do not have citizenship, permanent residency, visas, or other similar status). There are no official counts of how many undocumented persons live in Placer County, but a 2017 study estimated that the total number of undocumented persons in Placer County (including those living in incorporated areas) was 11,600 (other studies have reported somewhat lower populations).

### Center for Disease Control 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

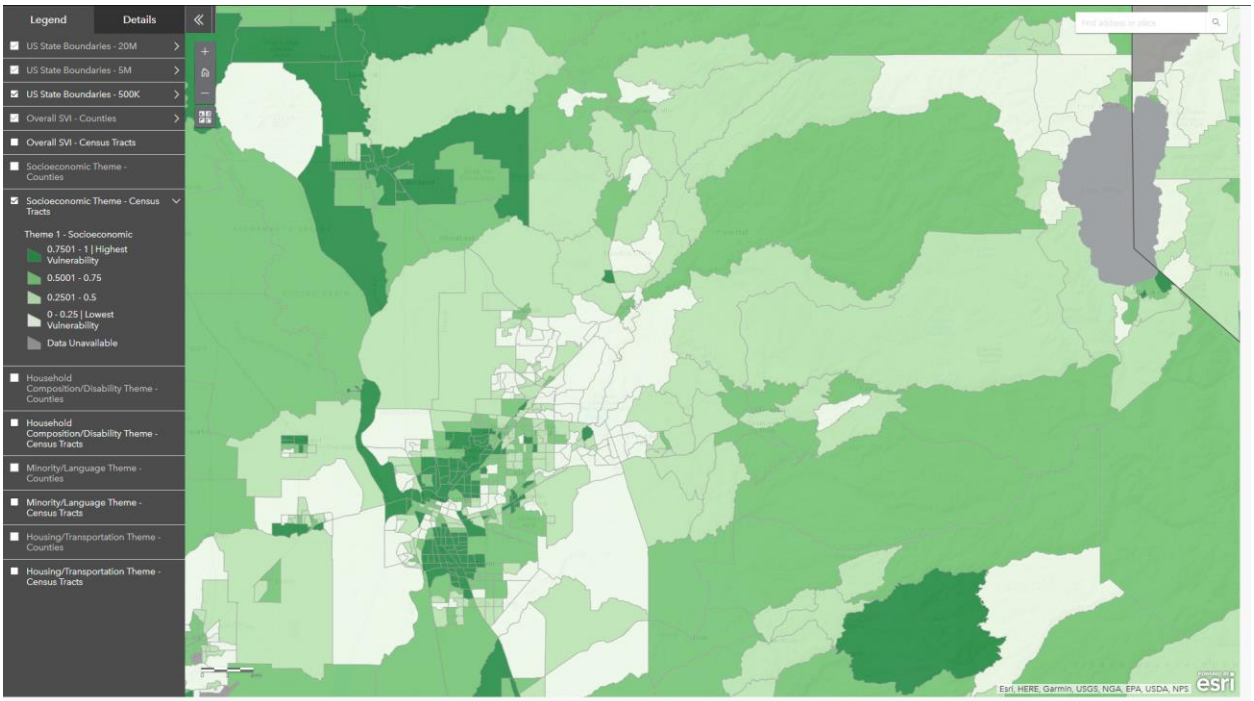
social vulnerability can decrease both human suffering and economic loss. CDC Social Vulnerability Index (CDC SVI) uses 15 U.S. census variables to help local officials identify communities that may need support before, during, or after disasters.

ATSDR's 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 4-4; the socioeconomic SVI for the County is shown in Figure 4-5; the household composition SVI for the County is shown in Figure 4-6; ; the minority and language SVI for the County is shown in Figure 4-7; and the housing and transportation SVI for the County is shown in Figure 4-8.

### *Figure 4-4 Placer County – Overall Social Vulnerability*

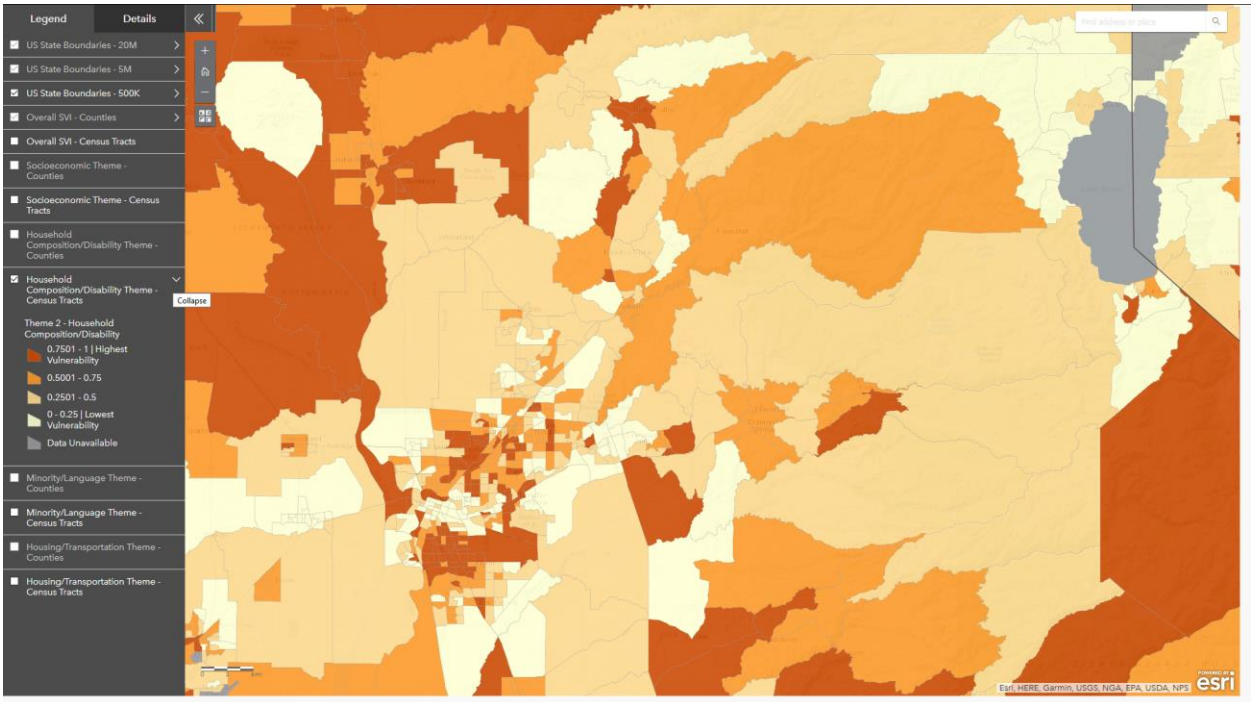
Source: CDC Social Vulnerability Index – map retrieved 11/30/2020

## *Figure 4-5 Placer County – Socioeconomic Status Vulnerability*



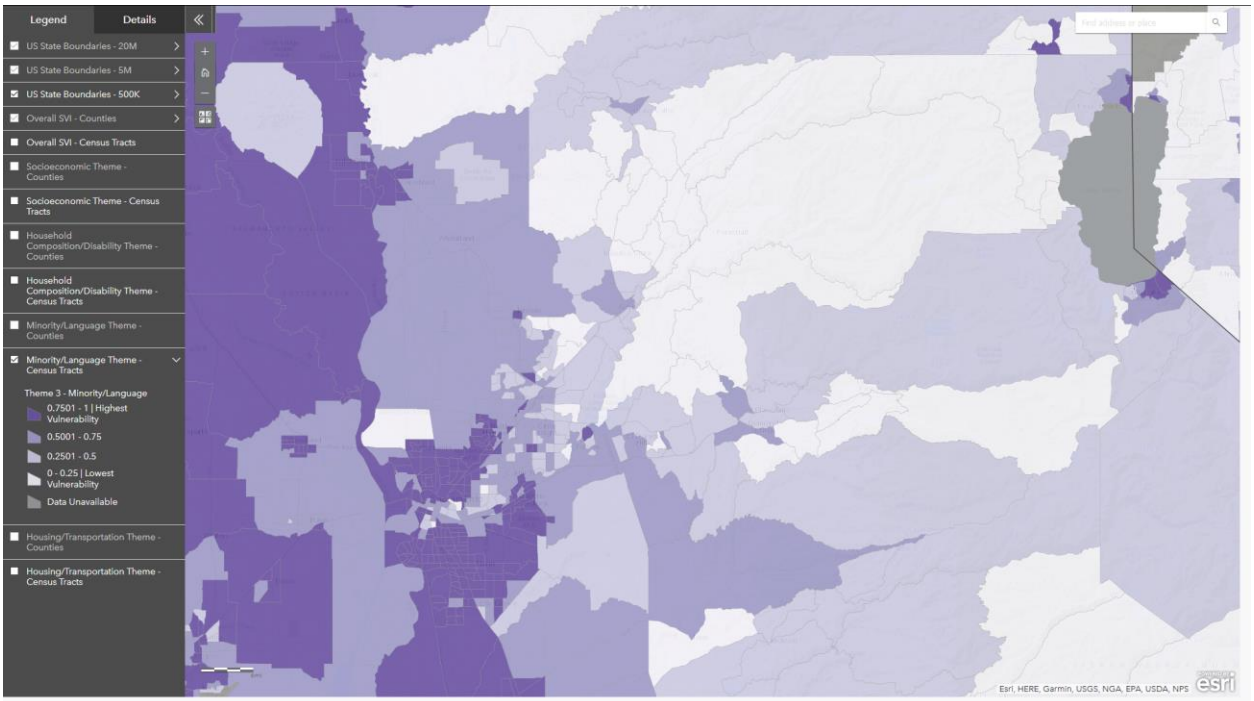

Source: CDC Social Vulnerability Index – map retrieved 11/30/2020

## *Figure 4-6 Placer County – Household Composition and Disabilities Social Vulnerability*



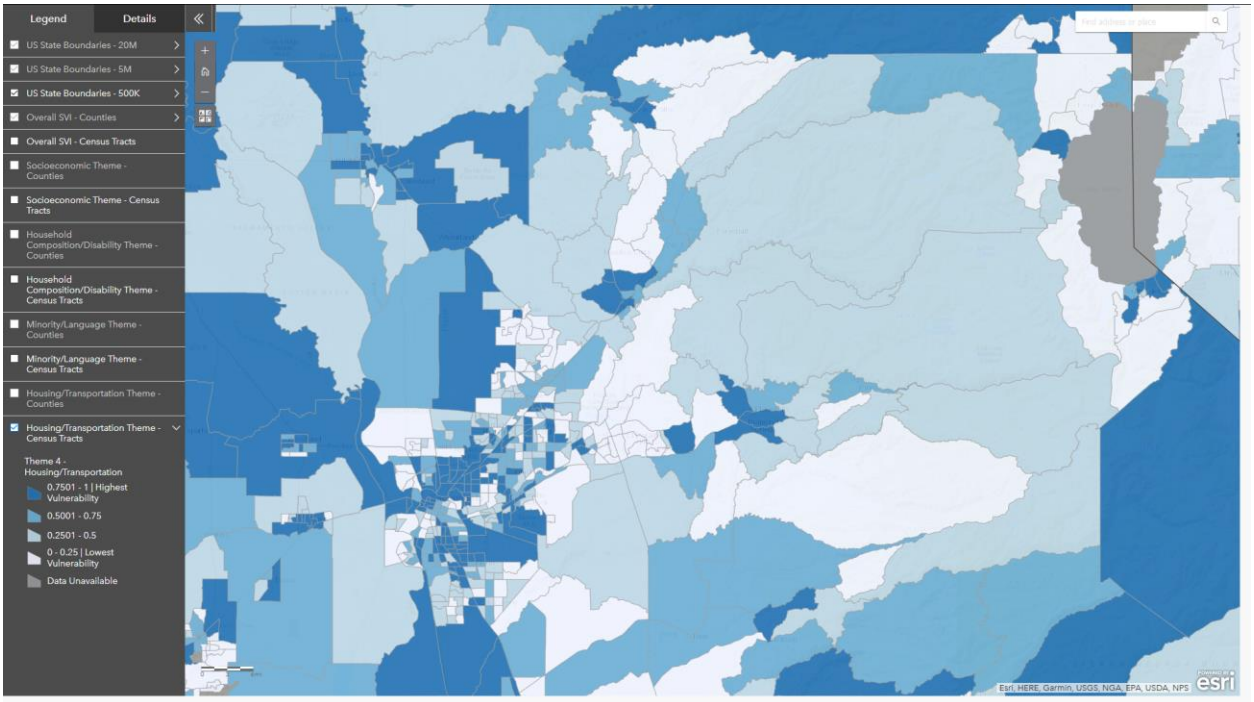

Source: CDC Social Vulnerability Index – map retrieved 11/30/2020

## *Figure 4-7 Placer County – Minority/Language Social Vulnerability*




Source: CDC Social Vulnerability Index – map retrieved 11/30/2020

## *Figure 4-8 Placer County – Housing/Transportation Social Vulnerability*




Source: CDC Social Vulnerability Index – map retrieved 11/30/2020

The Placer County Sustainability Plan noted areas in the County with high vulnerability scores. This includes:

- **West Placer County Communities with High Social Vulnerability Scores**
  - ✓ **Sheridan**: Sheridan is in the northern part of Placer County's western region, near the Bear River and Camp Far West Reservoir. It has high proportions of households with disabled persons, households living in poverty, English limited households, and households living in mobile homes.
  - ✓ **North Auburn**: The unincorporated areas north of Auburn are split int o two areas by State Route 49, each with a unique set of social vulnerability factors. The area west of State Route 49 has high numbers of children, persons in poverty, and rental households. The area east of State Route 49 has a high proportion of senior citizens, households with a disabled individual, and English limited households. Both parts of North Auburn have a high proportion of households in mobile homes.
  - ✓ **Elders Corner**: Elders Corner is beyond North Auburn, in the area north of Bell Road and west of State Route 49. There are a large number of children living in this area, senior citizens (including seniors living alone), households with a disabled individual, English limited households, rental households, households in poverty, and households in mobile homes.

- **Central Placer County and Tahoe Basin Communities with High Social Vulnerability Scores**
  - ✓ **Shady Glen**: Shady Glen is a community immediately north of Colfax, along the Interstate 80 corridor. It has a large proportion of seniors living alone, households with a disabled individual, persons in poverty, renters, and persons living in mobile homes.
  - ✓ **Tahoe Vista**: Tahoe Vista is a community on the north shore of Lake Tahoe between Carnelian Bay and Kings Beach. It has a high level of social vulnerability due to a large proportion of children, English limited households, renters, overcrowded households, and households in mobile homes.
  - ✓ **Kings Beach**: Kings Beach is a community clustered along the north shore of Lake Tahoe. It has a high proportion of English limited households, households in poverty, rental households, and overcrowded households.
  - ✓ **Brockway**: Brockway is in north Lake Tahoe along the Nevada state border, directly east of Kings Beach. A high proportion of seniors living alone, English limited households, rental households, and severely overcrowded households contribute to its social vulnerability.

## CA DWR Special Population and Disadvantaged Community Mapping

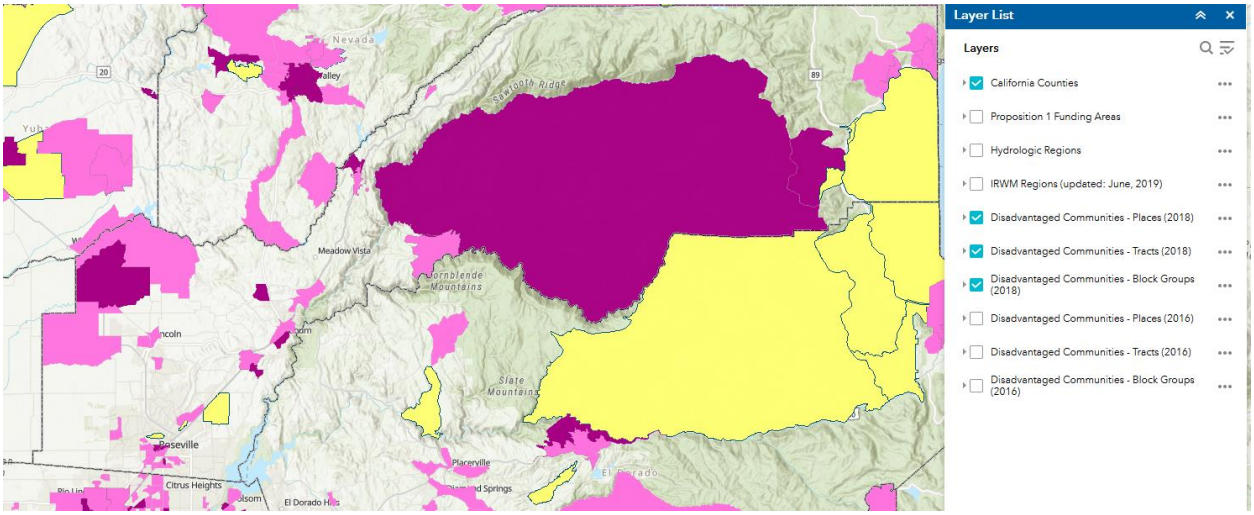
CA DWR has developed a web-based application to assist local agencies and other interested parties in evaluating disadvantaged community (DAC) status throughout the State, using the definition provided by Proposition 84 Integrated Regional Water Management (IRWM) Guidelines (2015). The DAC Mapping Tool 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 Placer County is shown in Figure 4-9.

### *Figure 4-9 Placer County – Disadvantaged Communities*




Source: CA DWR, retrieved 11/30/2020

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

The 2017 Climate Change and Health Profile Report for Placer 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 Placer County was nearly the same as 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 40% of adults (119,086) reported one or more chronic health conditions including heart disease, diabetes, asthma, severe mental stress or high blood pressure. In 2012, 16% of adults reported having been diagnosed with asthma. In 2012, approximately 18% of adults were obese (statewide average was 25%). In 2012, nearly 11% 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 50 heat-related emergency room visits and an age-adjusted rate of 15 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 20,851 children under the age of 5 years and 53,562 adults aged 65 years and older. In 2010, there were approximately 3,807 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, 3% of households (3,359) did not have a household member 14 years or older who spoke English proficiently (called linguistically isolated; statewide average was 10%).***

***In 2010, approximately 7% of adults aged 25 years and older had less than a high school education (statewide average was 19%).***

***In 2010, 7% 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 19,000 (39%) 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, Placer County had approximately 8,666 outdoor workers whose occupation increased their risk of heat illness. In 2010, roughly four percent of households did not own a vehicle that could be used for evacuation (statewide average was 8%). In 2012, approximately 98% of residents did not live within a half mile to frequent public transit.***

***In 2009, approximately 10% 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 otherenvironmental benefits, was present on 19% of the county's land area (statewide average was 8%).***

## Development since 2016 Plan

Placer County Building Services tracks total building permits issued since 2016 for unincorporated Placer County. A summary of this development is shown in Table 4-20. Development by known flood fire, and other hazard areas is shown in Table 4-21. 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.

FILL OUT TABLES

### *Table 4-20 Placer County Development 2016-2020 Summary*

| Property Use | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| Residential | | | | | |
| Commercial | | | | | |
| Industrial | | | | | |
| **Total** | | | | | |

Source: Placer County Building Services

### *Table 4-21 Placer County Development in Hazard Zones since 2016*

| Property Use | 1% Annual Chance Flood | Wildfire Risk Area | Other |
|---|---|---|---|
| Residential | | | |
| Commercial | | | |
| Industrial | | | |
| Other | | | |
| **Total** | | | |

Source: Placer County Building Services

## Future Development

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

### Future Population Projections

As indicated in the previous section, Placer 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 Placer County continuing through 2060. Table 4-22 shows the population projections for the County as a whole through 2060. Based on this data, population growth continues steadily through 2060.

### *Table 4-22 Population Projections for Placer County (incorporated and unincorporated), 2020-2060*

| | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|
| Placer County | 400,434 | 456,935 | 511,683 | 556,006 | 604,522 |

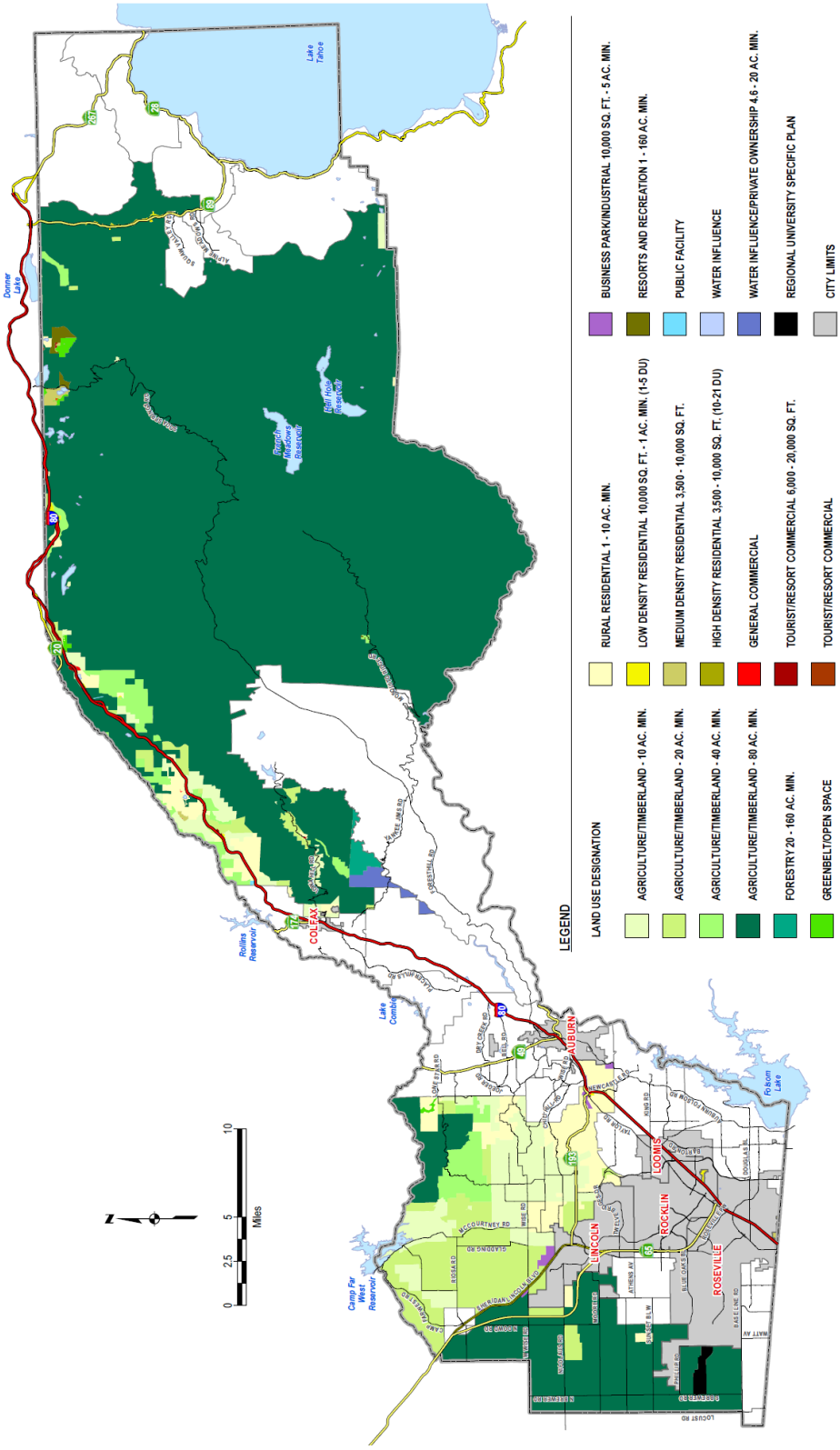
Source: California Department of Finance P-2 Report

### 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 Placer County General Plan Land Use Element. Figure 4-10 is sourced from this section. IS THIS BEING UPDATED?

## *Figure 4-10 Placer County General Plan Land Use*




Source: Placer County General Plan Land Use and Circulation Element (2013)

### Future Development GIS Analysis

INSERT – APNs DO NOT CURRENTLY ALIGN

## 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. The methodologies for the Hazard Profiles and Vulnerability Assessment is presented first in this section followed by the Hazard Profiles and Vulnerability Assessment for each identified hazard.

### *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 Placer 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 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 Placer 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 Placer County Planning Area as a whole, as well as the unincorporated Placer County.

An estimate of the vulnerability of the Placer County Planning Area and unincorporated Placer County to each identified hazardis provided in each of the hazard-specific vulnerability sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, 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 Placer County Planning Area to that hazard.

The vulnerability assessment identified four 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 four hazards are dam failure, earthquake, flood, and wildfire. The vulnerability of the flood, dam failure, (1%/0.2% annual chance), 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), 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:

- Agricultural Pests and Diseases
- Avalanche
- Climate Change
- Drought and Water Shortage
- Flood: Localized/Stormwater
- Landslide, Mudslide, Debris Flows
- Levee Failure
- Pandemic
- Seiche
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rain and Storms
- Severe Weather: High Winds and Tornadoes

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.***

## *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.

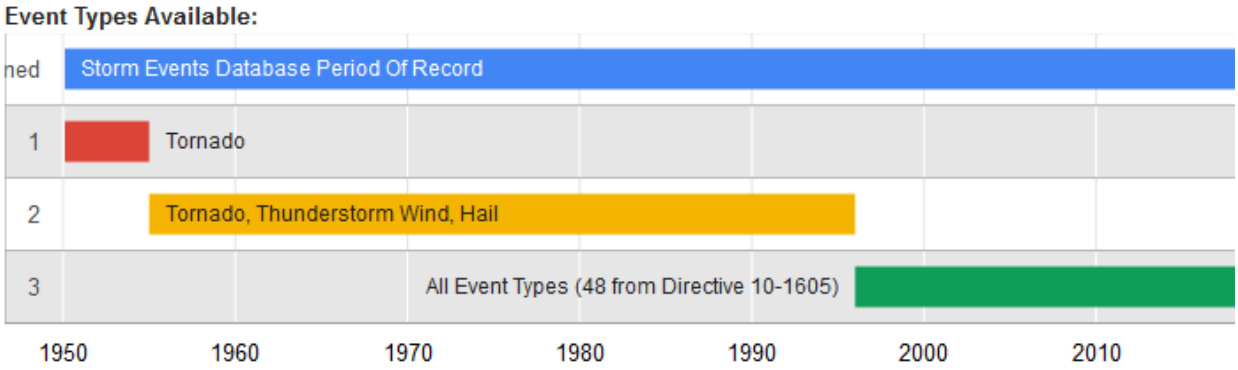
- 2018 California State Hazard Mitigation Plan
- ArkStorm at Tahoe - Stakeholder Perspectives on Vulnerabilities and Preparedness for an Extreme Storm Event in the Greater Lake Tahoe, Reno and Carson City Region. 2014.
- Bureau of Land Management
- CA DWR Best Available Maps
- CAL FIRE GIS datasets
- 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 – Placer 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
- Placer County General Plan (2013)
- Placer County General Plan Background Report
- Placer County Housing Element (2013)
- Placer County Housing Element Background Report (2013)
- Placer County Resource Conservation District Long Range Strategic Plan (2011)
- Placer County Sustainability Plan (2020)
- 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 Placer County

### 4.3.1. Severe Weather: General

Severe weather is generally any destructive weather event, but usually occurs throughout the Placer 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 4-11.

### *Figure 4-11 NCDC Storm Events Database Period of Record*




**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 1,349 severe weather events that occurred in Placer County between January 1, 1950, and July 31, 2020. Table 4-23 summarizes these events.

### *Table 4-23 NCDC Severe Weather Events for Placer County 1950-7/31/2020**

| Event Type | Number of Events | Deaths | Injuries | Property Damage | Crop Damage | Deaths (indirect) | Injuries (indirect) |
|---|---|---|---|---|---|---|---|
| Avalanche | 15 | 6 | 12 | $0 | $0 | 0 | 0 |
| Blizzard | 4 | 0 | 0 | $30,000 | $0 | 0 | 1 |
| Cold/Wind Chill | 19 | 1 | 0 | $0 | $0 | 2 | 8 |
| Debris Flows | 6 | 0 | 0 | $8,000 | $0 | 0 | 0 |
| Dense Fog | 11 | 6 | 38 | $2,120,000 | $0 | 0 | 1 |
| Dense Smoke | 1 | 0 | 0 | $0 | $0 | 0 | 0 |
| Drought | 44 | 0 | 0 | $0 | $0 | 0 | 0 |
| Excessive Heat | 5 | 6 | 1 | $0 | $0 | 0 | 2 |
| Extreme Cold/Wind Chill | 1 | 0 | 0 | $0 | $0 | 0 | 0 |

| Event Type | Number of Events | Deaths | Injuries | Property Damage | Crop Damage | Deaths (indirect) | Injuries (indirect) |
|---|---|---|---|---|---|---|---|
| Flash Flood | 6 | 0 | 0 | $150,000 | $0 | 0 | 0 |
| Flood | 33 | 2 | 1 | $12,370,000 | $7,800,000 | 0 | 0 |
| Frost/Freeze | 9 | 0 | 0 | $200,000 | $5,000,000 | 0 | 0 |
| Funnel Cloud | 2 | 0 | 0 | $0 | $0 | 0 | 0 |
| Hail | 9 | 0 | 0 | $1,000 | $0 | 0 | 0 |
| Heat | 27 | 0 | 3 | $0 | $0 | 1 | 1 |
| Heavy Rain | 59 | 2 | 0 | $10,000 | $0 | 0 | 0 |
| Heavy Snow | 633 | 2 | 6 | $1,675,000 | $0 | 1 | 3 |
| High Surf | 1 | 0 | 0 | $0 | $0 | 0 | 0 |
| High Wind | 150 | 0 | 1 | $12,371,000 | $48,000 | 0 | 0 |
| Landslide | 1 | 0 | 0 | $0 | $0 | 0 | 0 |
| Strong Wind | 34 | 1 | 2 | $2,599,600 | $0 | 0 | 0 |
| Thunderstorm Wind | 4 | 0 | 0 | $20,000 | $0 | 0 | 0 |
| Tornado | 5 | 0 | 0 | $252,530 | $0 | 0 | 0 |
| Waterspout | 1 | 0 | 0 | $0 | $0 | 0 | 0 |
| Wildfire | 22 | 3 | 22 | $500,525,000 | $0 | 21 | 0 |
| Winter Storm | 154 | 2 | 3 | $265,000 | $0 | 1 | 1 |
| Winter Weather | 93 | 4 | 0 | $10,000 | $0 | 0 | 2 |
| **Total** | **1,349** | **35** | **89** | **$532,607,130** | **$12,848,000** | **26** | **19** |

Source: NCDC

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

The NCDC table above summarize severe weather events that occurred in Placer 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 Placer 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 Heat
- Freeze and Snow
- Heavy Rains and Storms
- High Winds and Tornadoes

Due to size of the County and changes in elevation (i.e., from approximately 100 feet to more than 9,000 feet above mean sea level (msl)) and climate, weather conditions can vary greatly across the County. For purposes of this hazard profile, the County will be divided into two distinct sections, as applicable: western Placer County, which is predominantly below an elevation of 4,000 feet above msl, is generally below the snowfall line (although snow has fallen at lower elevations), and includes the community of Foresthill and

all land to the west (including all incorporated cities and towns); and eastern Placer County, which is generally above 4,000 feet above msl, receives snowfall, and includes all of the County east of Foresthill. The profiles that follow provide information, where possible, from two Western Regional Climate Center (WRCC) weather stations located in these two different parts of the County: Auburn (elevation: 1,290 feet above msl) in west Placer County and Tahoe (elevation: 6,230 feet above msl), in east Placer County.

## 4.3.2. Severe Weather: Extreme Heat

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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 and the National Weather Service (NWS), extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and 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 Placer County. During times of high heat, low humidity, and winds, PG&E can issue a Public Safety Power Shutdown (PSPS) for the County.

A key concern is the effect of extreme heat on people, especially vulnerable populations. 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.

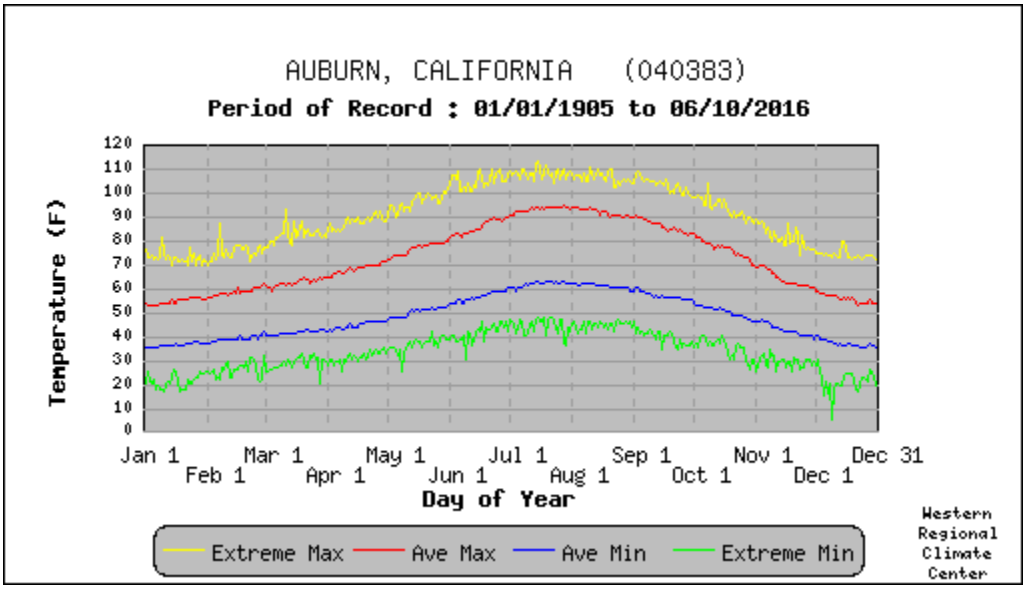
### Location and Extent

Extreme heat events occur on a regional basis. Extreme heat can occur in any location of the County, though it is more prevalent in the lower elevations in the western portions 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 stations introduced in Section 4.3.1 is summarized below.

### Placer County – West (Auburn Weather Station, Period of Record 1905 to 2016 [Elevation of 1,360 feet above msl])

According to the WRCC, in western Placer County, monthly average maximum temperatures in the warmest months (May through October) range from the upper-70s to the low-90s. The highest recorded daily extreme was 113°F on July 15, 1972. In a typical year, maximum temperatures exceed 90°F on 67.7 days. Figure 4-12 shows the average daily high temperatures and extremes for the western County. Table 4-24 shows the record high temperatures by month for the western County.

*Figure 4-12 Placer County – West Daily Temperature Averages and Extremes*




Source: Western Regional Climate Center, www.wrcc.dri.edu/

*Table 4-24 Placer County – West Record High Temperatures 1905 to 2016*

| Month | Record High | Date | Month | Record High | Date |
|---|---|---|---|---|---|
| January | 81° | 1/9/1962 | July | 113° | 7/15/1972 |
| February | 78° | 2/20/1964 | August | 111° | 8/10/1978 |
| March | 93° | 3/11/1910 | September | 109° | 9/3/1950 |
| April | 90° | 4/25/1910 | October | 100° | 10/6/1913 |
| May | 102° | 5/31/1910 | November | 89° | 11/1/1965 |
| June | 110° | 6/16/1961 | December | 85° | 12/6/1913 |

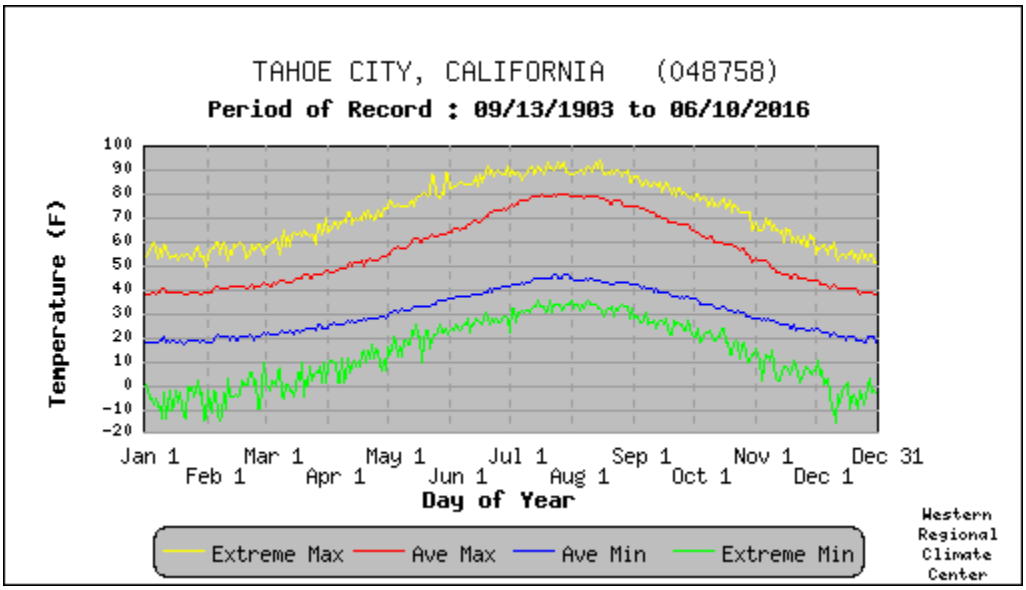
Source: Western Regional Climate Center

### Placer County – East (Tahoe City Weather Station, Period of Record 1903 to 2016 [Elevation of 6,230 feet above msl])

According to the WRCC, in eastern Placer County, monthly average maximum temperatures in the warmest months (May through October) range from the upper-40s to the low-70s. The highest recorded daily extreme was 94°F on August 15, 1933. In a typical year, maximum temperatures exceed 90°F on 0.4 days.

Figure 4-13 shows the average daily high temperatures and extremes for the eastern County. Table 4-25 shows the record high temperatures by month for the eastern County.

### *Figure 4-13 Placer County – East Daily Temperature Averages and Extremes*




Source: Western Regional Climate Center, www.wrcc.dri.edu/

### *Table 4-25 Placer County – Eastern Record High Temperatures 1903 to 2016*

| Month | Record High | Date | Month | Record High | Date |
|---|---|---|---|---|---|
| January | 59° | 1/10/1990 | July | 93° | 7/20/1931 |
| February | 60° | 2/17/1985 | August | 94° | 8/15/1933 |
| March | 67° | 3/27/1988 | September | 87° | 9/3/1931 |
| April | 74° | 4/30/1981 | October | 80° | 10/3/1933 |
| May | 89° | 5/30/1910 | November | 70° | 11/6/1988 |
| June | 90° | 6/22/1961 | December | 60° | 12/10/1990 |

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 4-26.

### *Table 4-26 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 five USDA disaster declarations since 20022 related to extreme heat, as shown on Table 4-27.

### *Table 4-27 Placer County – USDA Heat Disaster Declarations 2002-2020*

| Year | Declaration Number | Primary or Contiguous County | Disaster Type |
|---|---|---|---|
| 2003 | N/A | N/A | Late Rain/Heat |
| 2004 | N/A | N/A | Unseasonable Early Heat |
| 2005 | N/A | N/A | Heat |
| 2006 | N/A | N/A | Heat |
| 2007 | N/A | N/A | Heat |

Source: USDA

### NCDC Events

The NCDC data showed 32 extreme heat incidents for Placer County since 1993. This can be seen in Table 4-28

*Table 4-28 NCDC Heat Events for Placer County 1950-7/31/2020**

| Event Type | Number of Events | Deaths | Injuries | Property Damage | Crop Damage | Deaths (indirect) | Injuries (indirect) |
|---|---|---|---|---|---|---|---|
| Excessive Heat | 5 | 6 | 1 | $0 | $0 | 0 | 2 |
| Heat | 27 | 0 | 3 | $0 | $0 | 1 | 1 |
| **Total** | **32** | **6** | **4** | **$ 0** | **$ 0** | **1** | **3** |

Source: NCDC

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

## Hazard Mitigation Planning Committee Events

The HMPC identified the following events related to extreme temperatures in the Placer County Planning Area.

- June 13, 1961 – A heat event recorded in the SHELDUS database reported property damage of $14,700.
- July 2006 – In response to extreme high temperature, the Governor's Office of Emergency Service (now Cal OES) directed that the California Department of Food and Agriculture make each state-owned fairground a cooling center, which included the Placer County Gold Country Fairgrounds (PC GCF). PCOES and Health & Human Services served as lead in coordinating and staffing the cooling center located at the PC GCF.
- June-September 2007 – PCOES & County HHS coordinated contingency preparedness to activate cooling centers for general public and assistance to special population in response to very high temperatures occurring throughout the summer.
- June-September 2008 – PCOES & County HHS coordinated contingency preparedness to activate cooling centers for general public and assistance to special population in response to very high temperatures occurring throughout the summer.

OTHER EVENTS – DATES AND DAMAGES? PROVIDE INFORMATION ON COOLING CENTER ACTIVATIONS IN THE COUNTY SINCE 2016 OR FROM 2008 TO CURRENT

## Likelihood of Future Occurrence

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

## Climate Change and Extreme Heat

Climate change and its effect on extreme heat in the County is discussed utilizing four sources:

- Placer County Sustainability Plan – 2020
- Climate Change and Health Profile Report – Placer County
- California Climate Adaptation Strategy (CAS) – 2014
- Cal-Adapt

## 2020 Placer County Sustainability Plan

The warmer temperatures brought on by climate change are likely to cause an increase in extreme heat events in all parts of California, including the different areas of Placer County. Depending on emission levels, the number of extreme heat days is expected to rise from a historical average of 4 annually to between 22 and 32 by the middle of the century, and to between 33 and 62 by the end of the century, depending on the location and level of emissions. According to the state Cal Adapt database, cooler areas may see about as many extreme heat days as warmer areas. For example, even though the extreme heat threshold in Tahoe City is more than 20 degrees cooler than the threshold in Sheridan, both communities are projected to see a similar number of extreme heat days. Table 4-29 shows extreme heat thresholds and projections for the number of extreme heat days in different communities in the unincorporated area of Placer County.

### *Table 4-29 Placer County – Future Extreme Heat Days by Community*

| Community | Extreme Heat Threshold (°F) | Number of Historical Extreme Heat Days | Number of Extreme Heat Days (2040-2060) | | Number of Extreme Heat Days (2070-2099) | |
|---|---|---|---|---|---|---|
| | | | Medium GHGS (RCP 4.5) | High FHGS (RCP 8.5) | Medium GHGS (RCP 4.5) | High GHGS (RCP 8.5) |
| Granite Bay | 104.6 | 4.3 | 23 | 30 | 33 | 53 |
| Penryn | 104.1 | 4.3 | 24 | 32 | 35 | 56 |
| Sheridan | 105.0 | 4.3 | 25 | 32 | 37 | 59 |
| Meadow Vista | 100.8 | 4.3 | 22 | 31 | 35 | 58 |
| Foresthill | 99.3 | 4.3 | 22 | 30 | 34 | 58 |
| Alta | 94.3 | 4.2 | 23 | 30 | 35 | 62 |
| Tahoe City | 82.1 | 4.2 | 22 | 31 | 36 | 61 |
| Kings Beach | 82.7 | 4.3 | 23 | 31 | 36 | 60 |

Source: Placer County Sustainability Plan - 2020

In addition to the increases in extreme heat events, all of Placer County is also expected to see an increase in the average daily high temperatures. Although the temperature increases may appear modest, the projected high temperatures are substantially greater than historical norms. These increases also make it more likely that an above--average high temperature will cross the extreme heat threshold. average high temperature will cross the extreme heat threshold.

## Climate Change and Health Profile Report – Placer County

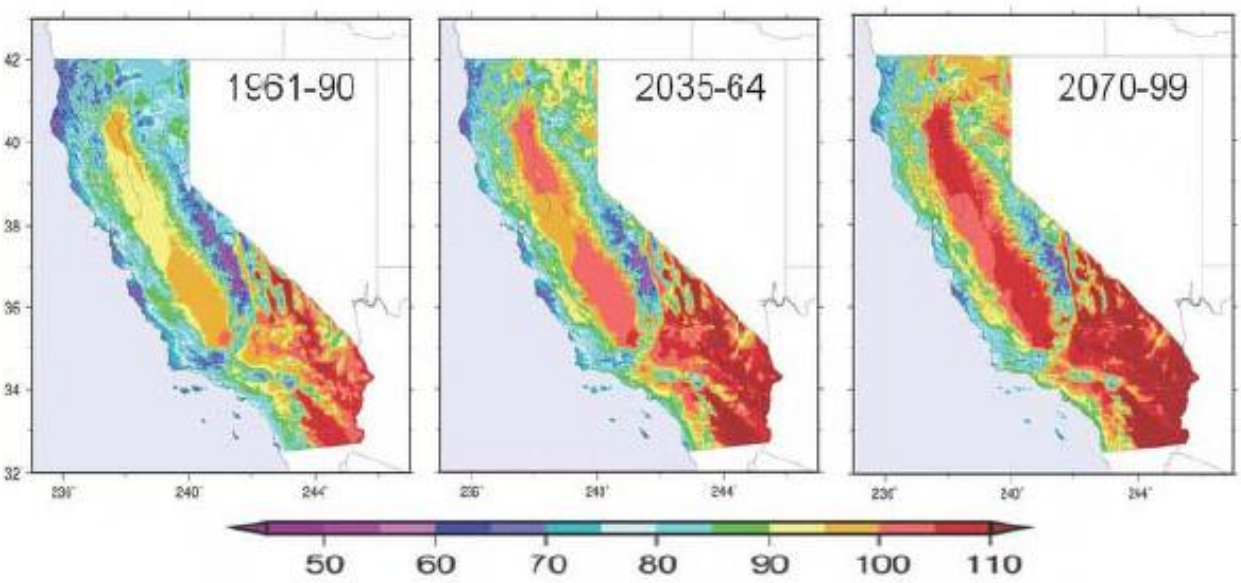
The 2017 Climate Change and Health Profile Report (CCHPR) noted for Placer County that increased temperatures manifested as heat waves and sustained high heat days directly harm human health through heat-related illnesses (mild heat stress to fatal heat stroke) and the exacerbation of pre-existing conditions 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.

## Climate Adaptation Strategy

The 2014 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 as shown in Figure 4-14.

***Figure 4-14 California Historical and Projected Temperature Increases – 1961 to 2099***




Source: Dan Cayan; California Climate Adaptation Strategy

As temperatures increase, California and Placer 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 mortality related to extreme heat in Placer County.

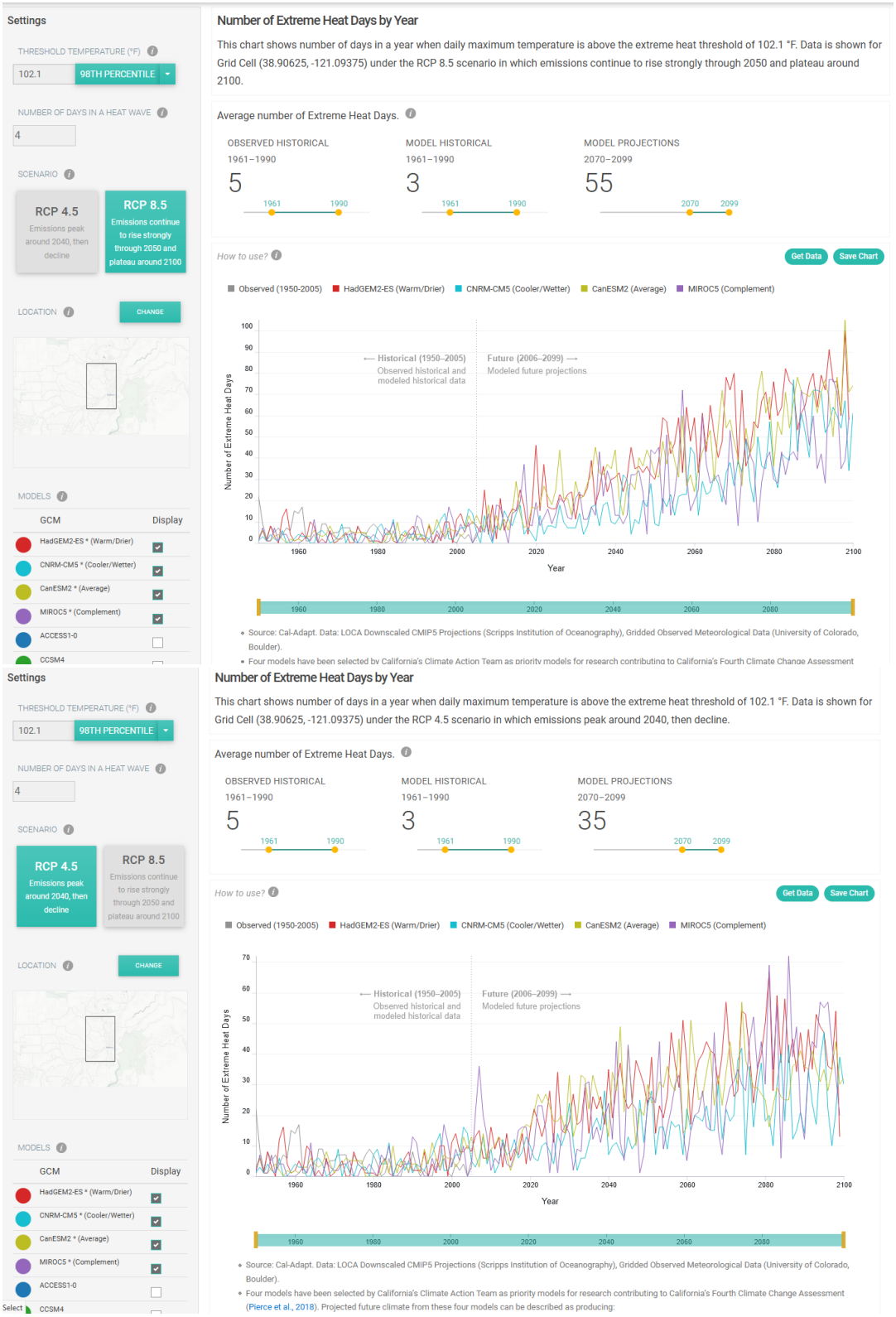
## Cal-Adapt

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 Placer County Planning (using the quad that contains the Auburn) are shown in Figure 4-15. 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 Placer 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 Placer County under the RCP 4.5 scenario in which emissions peak around 2040, then decline.

## *Figure 4-15 Placer County – Future Temperature Estimates in Low and High Emission Scenarios*




Source: Cal-Adapt – Number of Extreme Heat Days by Year, Retrieved 12/7/2020

## *Vulnerability Assessment*

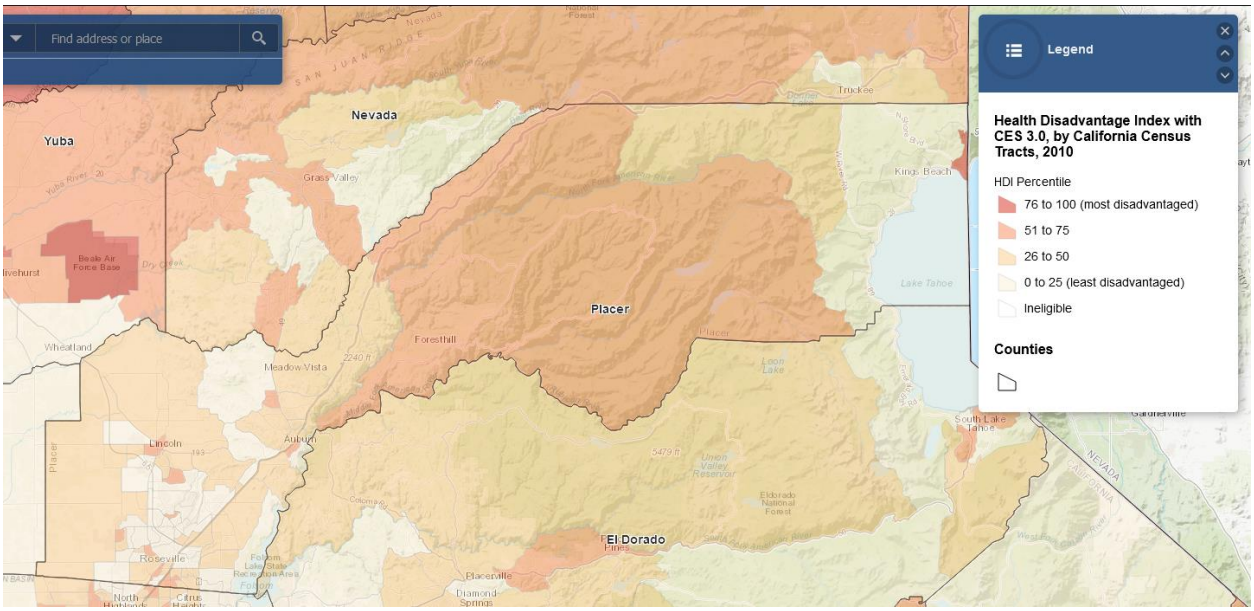
**Vulnerability**—Medium

Extreme heat happens in Placer County each year, especially in the lower elevations in the Valley area of western Placer County. Extreme heat rarely affects buildings in the County, but affects the population inside the County as well as the County's agricultural industry.

### 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 4-16.

### *Figure 4-16 Health Disadvantage Index by California Census Tract*




Source: Public Health Alliance of Southern California, retrieved 12/7/2020

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. Extreme heat dries out vegetation in the County, creating greater risks from wildfires. Hot weather and

extreme heat can worsen ozone levels and air quality as well as leading to drought conditions. Excessive heat and prolonged dry or drought conditions can impact agriculture by creating worker safety issues for farm field workers, severely damaging crops, and reducing availability of water and food supply for livestock. Extreme heat dries out vegetation in the County, creating greater risks from wildfires, which is discussed in Section 4.3.17.

### Power Shortage/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).

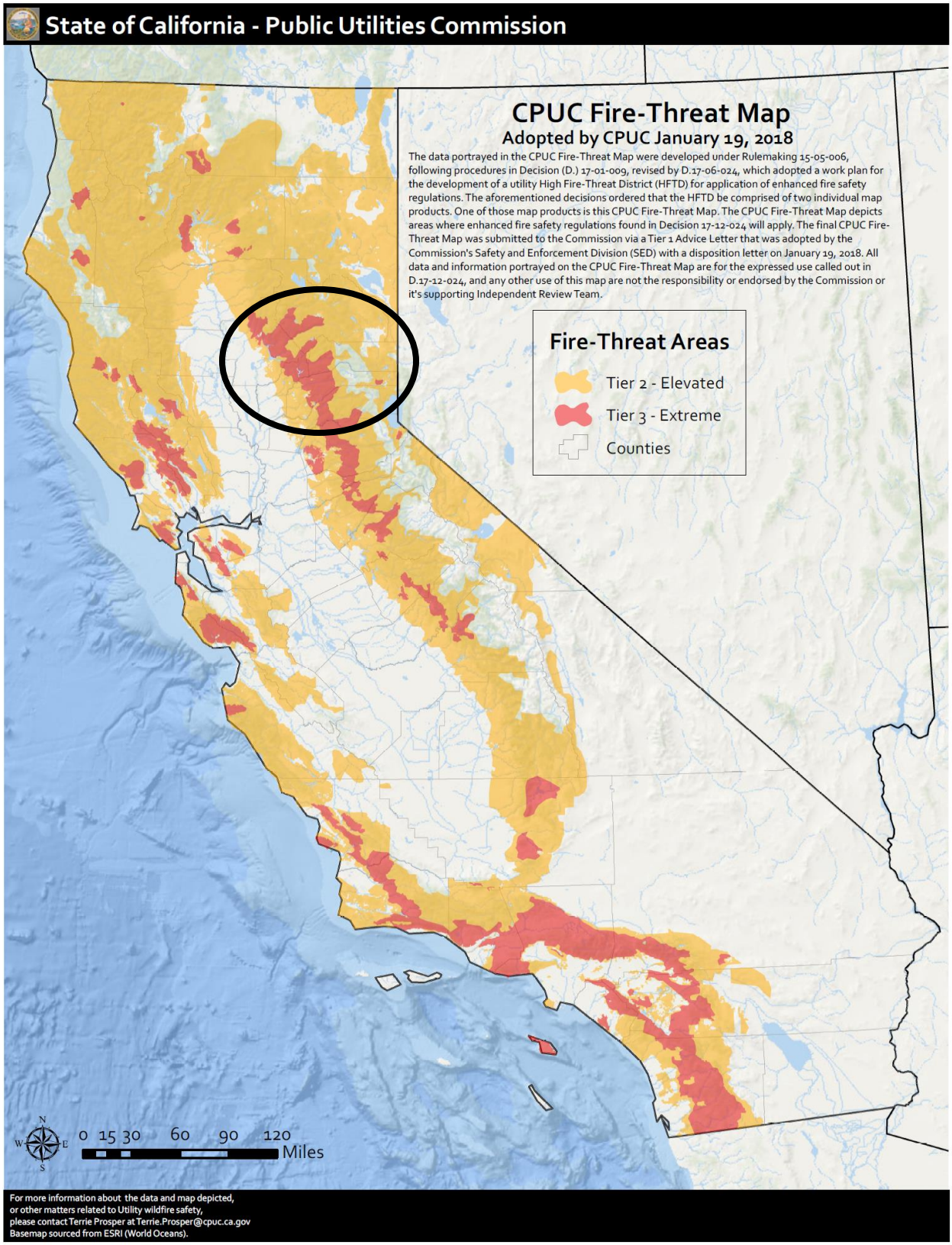
#### *Public Safety Power Shutoff Criteria*

The Wildfire Safety Operations Center (WSOC) monitors fire danger conditions across PG&E service areas and evaluates whether to turn off electric power lines in the interest of safety. While no single factor will drive a Public Safety Power Shutoff, 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 4-17). 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.

*Figure 4-17 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

The County noted it have been affected by PSPS on September 8th and 9th of 2020; September 26th through September 28, 2020; October 25, 2020; and October 28, 2020

### *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. Future development may also need to consider changes to both the length of wildfire season and the increasing hazards of wildfire (discussed in more detail in 4.3.17).

## 4.3.3. Severe Weather: Freeze and Snow

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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 NWS and the WRCC, winter snow storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns.

#### Location and Extent

Freeze and snow events occur on a regional basis. Extreme cold can occur in any location of the County. Snowfall can occur in any location of the County, but is much more prevalent in the upper elevations of the County. 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.

In 2001, the NWS implemented an updated Wind Chill Temperature index (shown in Figure 4-18), 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 4-18 Wind Chill Temperature Chart*

| Wind (mph) \ Temperature (°F) | 40 | 35 | 30 | 25 | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | -45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calm | 40 | 35 | 30 | 25 | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | -45 |
| 5 | 36 | 31 | 25 | 19 | 13 | 7 | 1 | -5 | -11 | -16 | -22 | -28 | -34 | -40 | -46 | -52 | -57 | -63 |
| 10 | 34 | 27 | 21 | 15 | 9 | 3 | -4 | -10 | -16 | -22 | -28 | -35 | -41 | -47 | -53 | -59 | -66 | -72 |
| 15 | 32 | 25 | 19 | 13 | 6 | 0 | -7 | -13 | -19 | -26 | -32 | -39 | -45 | -51 | -58 | -64 | -71 | -77 |
| 20 | 30 | 24 | 17 | 11 | 4 | -2 | -9 | -15 | -22 | -29 | -35 | -42 | -48 | -55 | -61 | -68 | -74 | -81 |
| 25 | 29 | 23 | 16 | 9 | 3 | -4 | -11 | -17 | -24 | -31 | -37 | -44 | -51 | -58 | -64 | -71 | -78 | -84 |
| 30 | 28 | 22 | 15 | 8 | 1 | -5 | -12 | -19 | -26 | -33 | -39 | -46 | -53 | -60 | -67 | -73 | -80 | -87 |
| 35 | 28 | 21 | 14 | 7 | 0 | -7 | -14 | -21 | -27 | -34 | -41 | -48 | -55 | -62 | -69 | -76 | -82 | -89 |
| 40 | 27 | 20 | 13 | 6 | -1 | -8 | -15 | -22 | -29 | -36 | -43 | -50 | -57 | -64 | -71 | -78 | -84 | -91 |
| 45 | 26 | 19 | 12 | 5 | -2 | -9 | -16 | -23 | -30 | -37 | -44 | -51 | -58 | -65 | -72 | -79 | -86 | -93 |
| 50 | 26 | 19 | 12 | 4 | -3 | -10 | -17 | -24 | -31 | -38 | -45 | -52 | -60 | -67 | -74 | -81 | -88 | -95 |
| 55 | 25 | 18 | 11 | 4 | -3 | -11 | -18 | -25 | -32 | -39 | -46 | -54 | -61 | -68 | -75 | -82 | -89 | -97 |
| 60 | 25 | 17 | 10 | 3 | -4 | -11 | -19 | -26 | -33 | -40 | -48 | -55 | -62 | -69 | -76 | -84 | -91 | -98 |

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

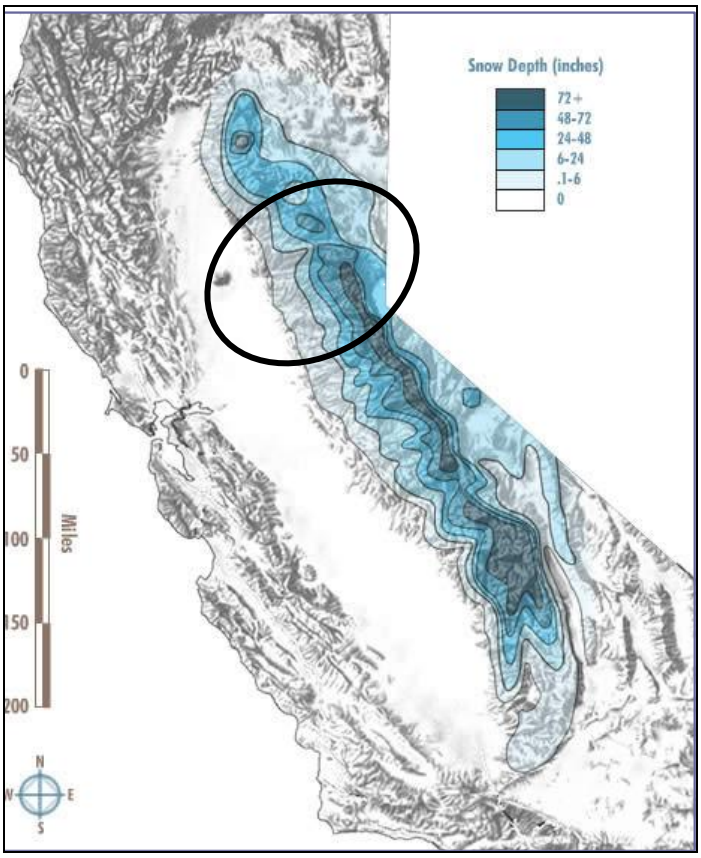
Where, T= Air Temperature (°F) V= Wind Speed (mph) *Effective 11/01/01*

Source: National Weather Service

Snowfall has a short speed on onset, and can stay on the ground for months in the County. The western portion of the Placer County Planning Area does not experience snowfall on a regular seasonal basis; however, the northern and eastern portions of the County receive an abundance of snow, mostly between the months of November through March. Winter snow storms in this part of the County, including strong winds and blizzard conditions can result in localized power and phone outages and closures of streets, highways, schools, businesses, and nonessential government operations. During periods of heavy snow there is also an increase in the number and severity of traffic accidents. People can become isolated in their homes and vehicles and are unable to receive essential services. Snow removal costs can impact budgets significantly. Heavy snowfall during winter can lead to flooding or landslides during the spring if the area snowpack melts too quickly and also create numerous challenges for emergency responders. In the higher elevations at Lake Tahoe, snowfall will bury fire hydrants and street signs. It can often take the district weeks to dig out the approximately 2,500 fire hydrants. This is exacerbated by County snow plows/blowers re-burying the hydrants in subsequent plowing efforts. Inaccessible hydrants and/or delayed responses can impact life and property.

Snowfall in the Sierras increases with elevation. The lower foothills rarely receive any measurable snow. Middle elevations receive a mix of snow and rain during the winter. Above about 6,000 ft., the majority of precipitation falls as snow. It is not unusual, in some locations, to have ten feet of snow on the ground for extended periods. Figure 4-19 shows the average maximum measured snow depth in the Sierra Nevada for the month of March (the month of greatest average snow depths).

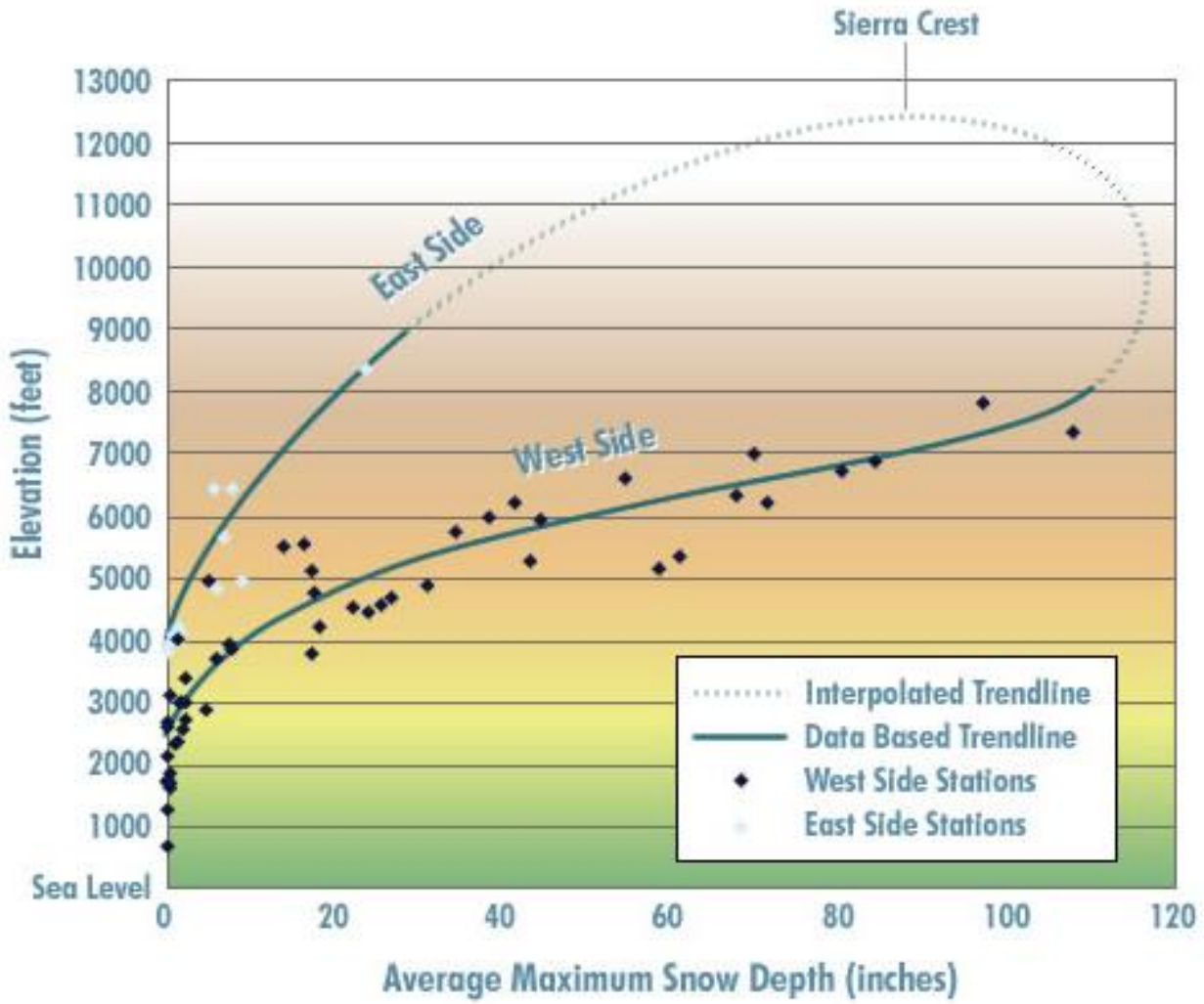
### *Figure 4-19 Average Maximum Snow Depths of Sierra Nevada Mountains in March*




Source: http://www.sierranevadaphotos.com/geography/snow_depth.asp. Retrieved in 2016.

Snow accumulation does not directly follow precipitation in the Sierra Nevada. While the greatest total precipitation occurs in the northern part of the range, the greatest snow accumulation occurs in the central and high southern parts of the range, due to higher elevations and colder temperatures which inhibit snow melt. The western slope of the Sierra Nevada acts as trap for winter storms, wringing out the moisture before it can get to the east side. Weather stations located on the west side begin registering measurable snow between 2,500 and 3,000 feet elevation. On the east side, measurable snow accumulation doesn't begin until about 4,000 feet and increases more slowly with altitude. Snow depths drop dramatically on the east side of the range due to the rain shadow effect as illustrated in the comparative east side/west side snow depth chart shown on Figure 4-20.

*Figure 4-20 Snow Accumulation with Directional Variations*



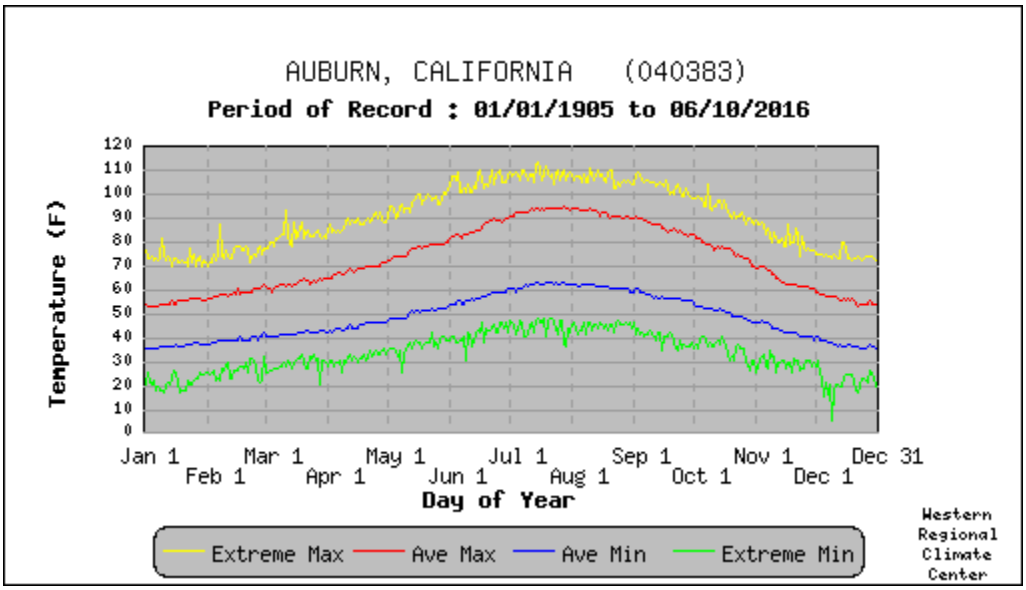

Source: http://www.sierranevadaphotos.com/geography/east_west_snow_depth.html. Retrieved in 2016.

Information on extreme cold and freeze from the WRCC coop stations introduced in Section 4.3.1 for the County are shown below.

### Placer County – West (Auburn Weather Station, Period of Record 1905 to 2016 [Elevation of 1,360 feet above msl])

According to the WRCC, in western Placer County monthly average minimum temperatures from November through April range from the upper-30s to mid-50s. The lowest recorded daily extreme was 16°F on December 9, 1972. In a typical year, minimum temperatures fall below 32°F on 22.6 days with 0 days falling below 0°F. Table 4-30 shows the record low temperatures by month for Placer County. Average daily temperatures for western Placer County are shown in Figure 4-21.

### *Figure 4-21 Placer County – West Daily Temperature Averages and Extremes*




Source: Western Regional Climate Center

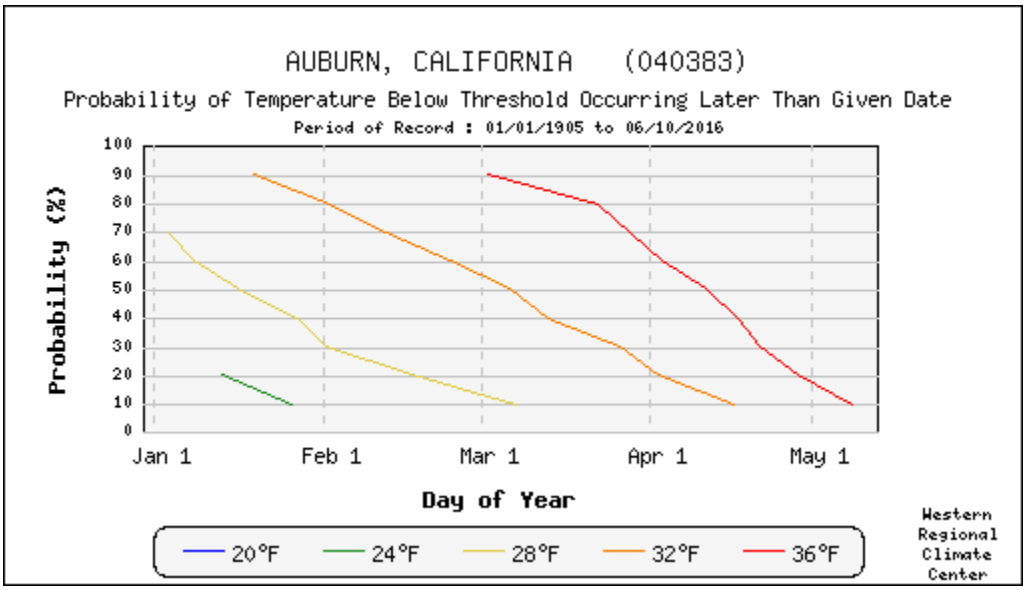
### *Table 4-30 Placer County – West Record Low Temperatures 1905 to 2016*

| Month | Record Low | Date | Month | Record Low | Date |
|---|---|---|---|---|---|
| January | 20° | 1/6/1913 | July | 41° | 7/4/1948 |
| February | 21° | 2/27/1962 | August | 35° | 8/25/2004 |
| March | 25° | 3/1/1971 | September | 34° | 9/15/1906 |
| April | 30° | 4/20/1912 | October | 30° | 10/19/1949 |
| May | 32° | 5/6/1912 | November | 24° | 11/24/2010 |
| June | 30° | 6/26/1905 | December | 16° | 12/9/1972 |

Source: Western Regional Climate Center

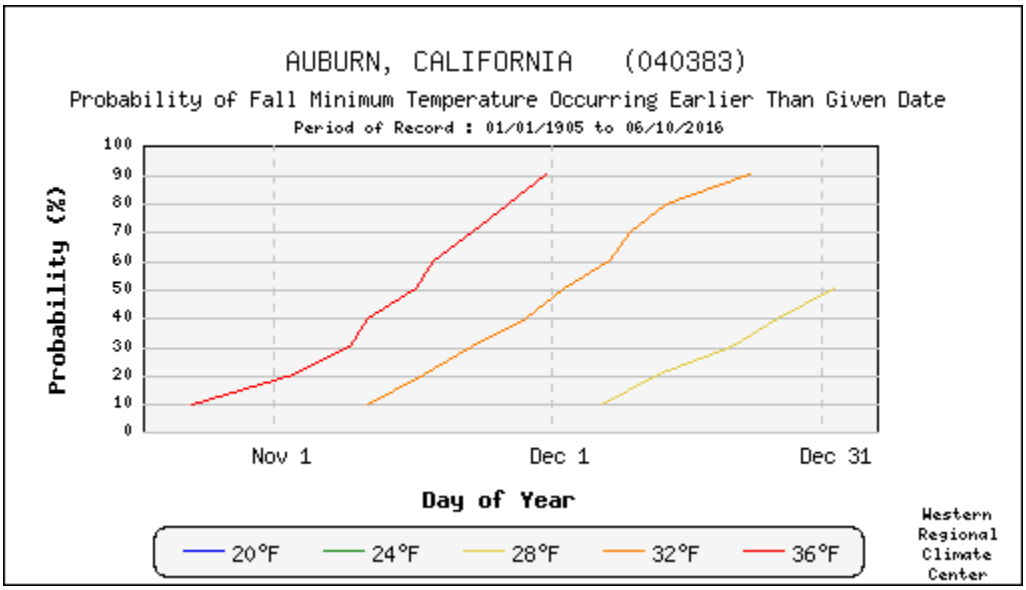
Figure 4-22 and Figure 4-23 show the probabilities of freeze for both spring and fall in western Placer County.

### *Figure 4-22 Placer County – West Spring Freeze Probabilities*




Source: Western Regional Climate Center

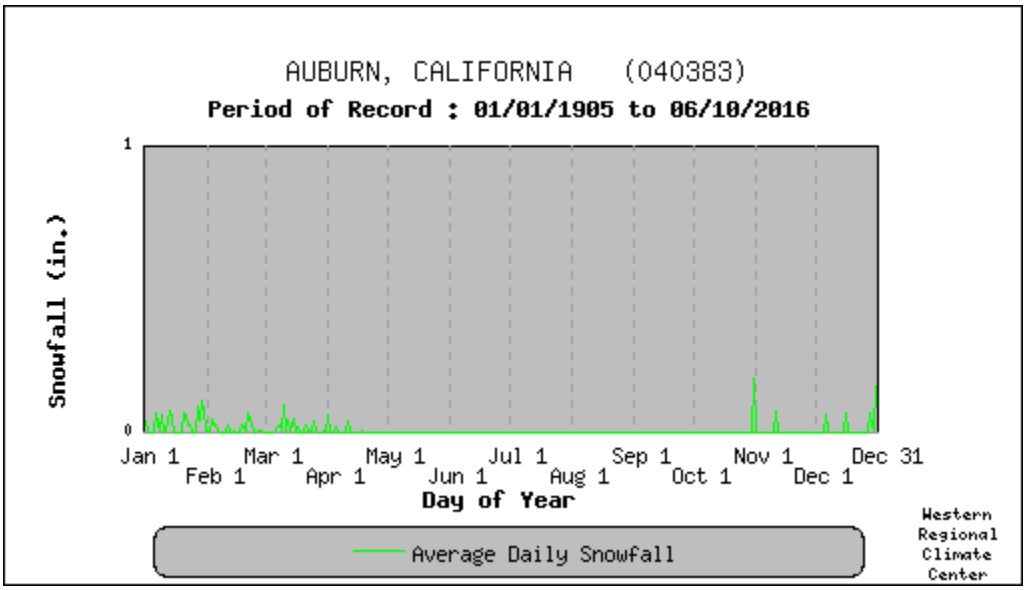
### *Figure 4-23 Placer County – West Fall Freeze Probabilities*




Source: Western Regional Climate Center

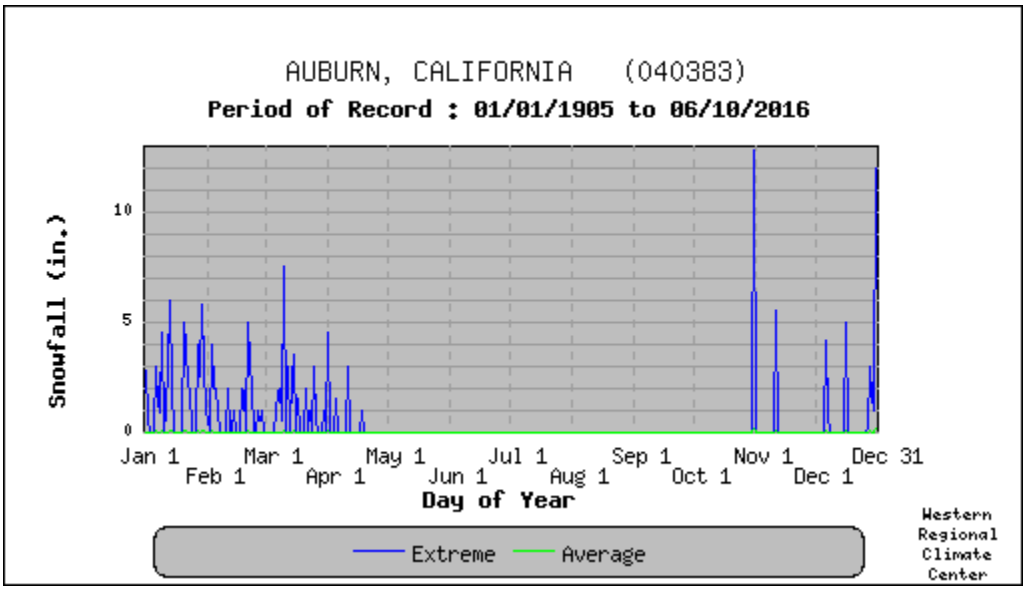
According to the WRCC, average snowfall on the western side of the County is 1.4 inches, as shown in Figure 4-24. The highest annual snowfall fell in 1972, when 10.7 inches fell. Highest monthly snowfall accumulation came in January of 1972, when 6.5 inches fell. Average snowfall in January through March are minimal. This can be seen in Figure 4-25.

*Figure 4-24 Placer County – West Snowfall Average Daily Snowfall*




Source: Western Regional Climate Center

*Figure 4-25 Placer County – West Snowfall Averages and Extremes*

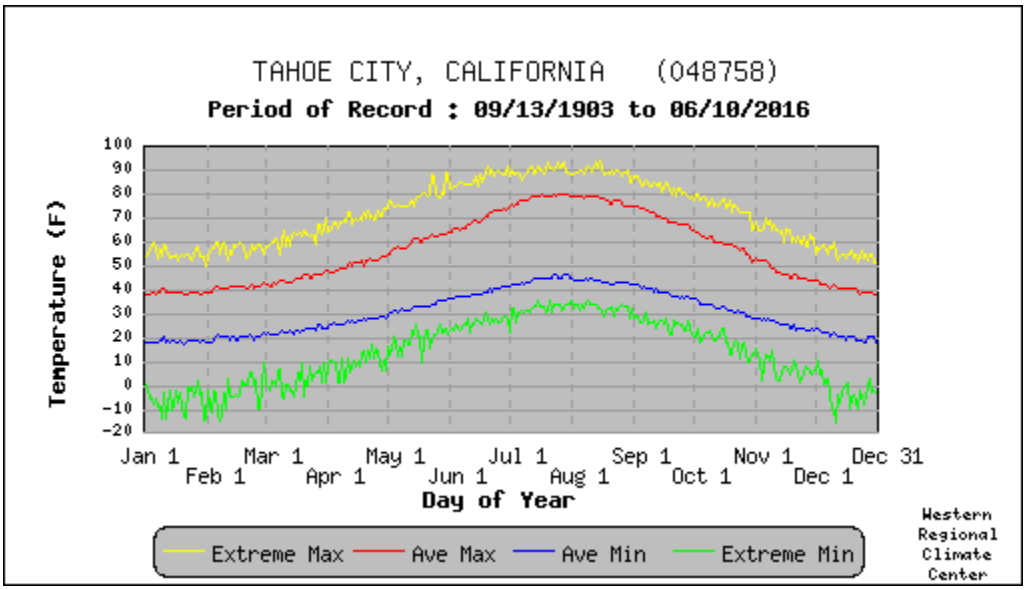



Source: Western Regional Climate Center

### Placer County – East (Tahoe City Weather Station, Period of Record 1903 to 2016 [Elevation of 6,230 feet above msl])

According to the WRCC, in eastern Placer County monthly average minimum temperatures from November through April range from the upper-10s to upper-30s. The lowest recorded daily extreme was -16°F on December 11, 1972. In a typical year, minimum temperatures fall below 32°F on 209.0 days with 0.4 days falling below 0°F. Table 4-31 shows the record low temperatures by month for eastern Placer County. Average daily temperatures for eastern Placer County are shown in Figure 4-26.

### *Figure 4-26 Placer County – East Daily Temperature Averages and Extremes*




Source: Western Regional Climate Center

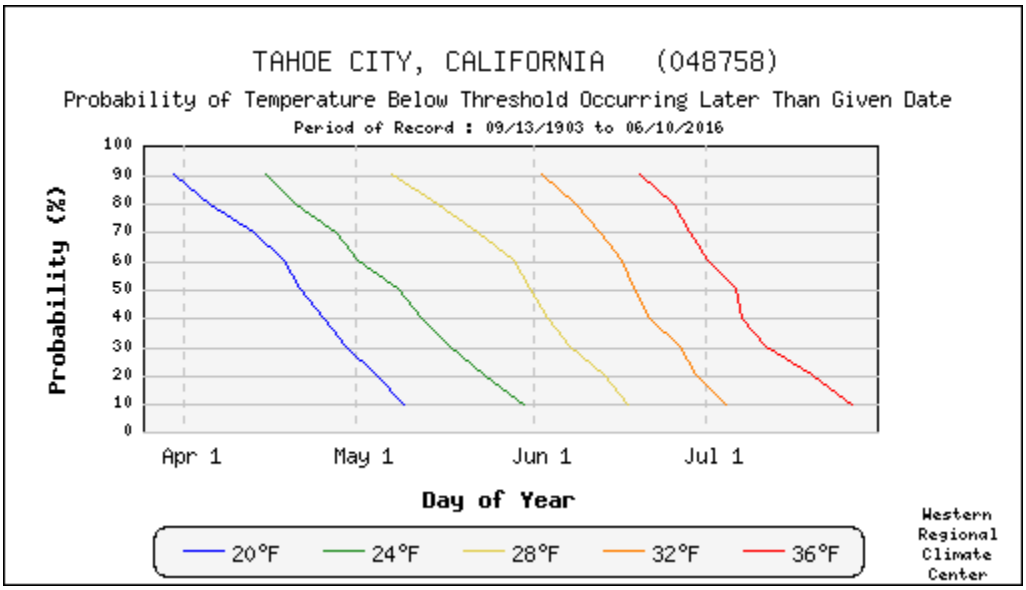
### *Table 4-31 Placer County – East Record Low Temperatures 1903 to 2016*

| Month | Record Low | Date | Month | Record Low | Date |
|---|---|---|---|---|---|
| January | -14° | 1/9/1937 | July | 22° | 7/1/1975 |
| February | -15° | 2/7/1989 | August | 28° | 8/30/1912 |
| March | -6° | 3/10/1935 | September | 21° | 9/30/1950 |
| April | 5° | 4/12/1911 | October | 9° | 10/28/1971 |
| May | 9° | 5/18/1974 | November | -1° | 11/23/1931 |
| June | 24° | 6/1/1955 | December | -16° | 12/11/1972 |

Source: Western Regional Climate Center

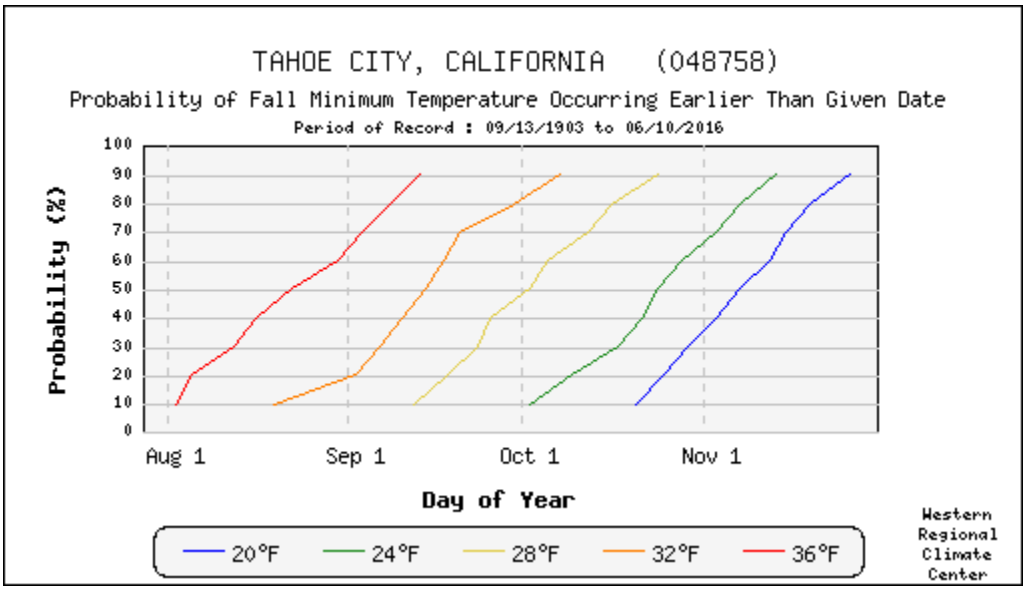
Figure 4-27 and Figure 4-28 show the probabilities of freeze for both spring and fall in eastern Placer County.

### *Figure 4-27 Placer County – East Spring Freeze Probabilities*




Source: Western Regional Climate Center

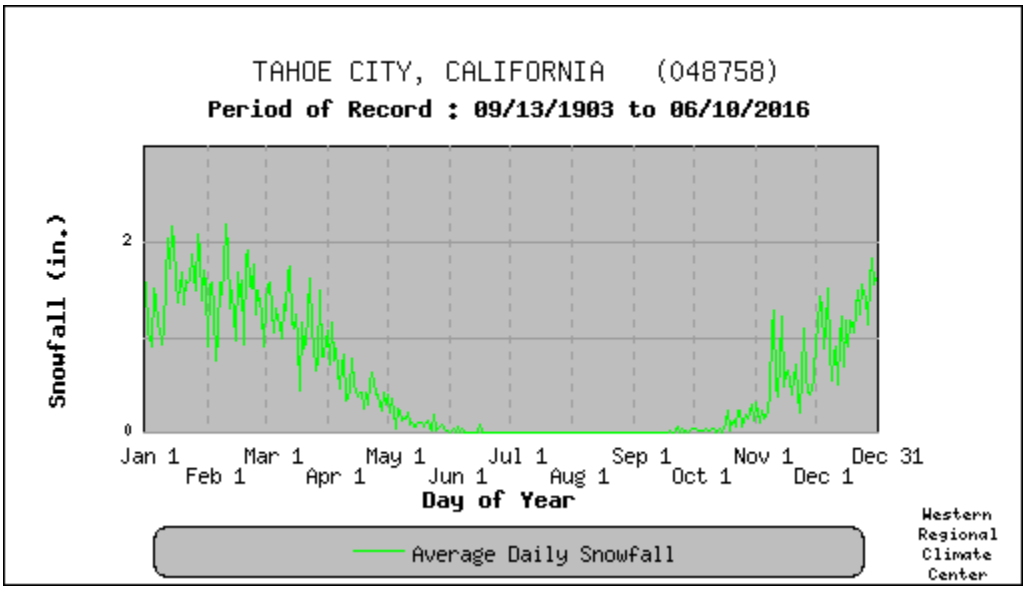
### *Figure 4-28 Placer County – East Fall Freeze Probabilities*




Source: Western Regional Climate Center

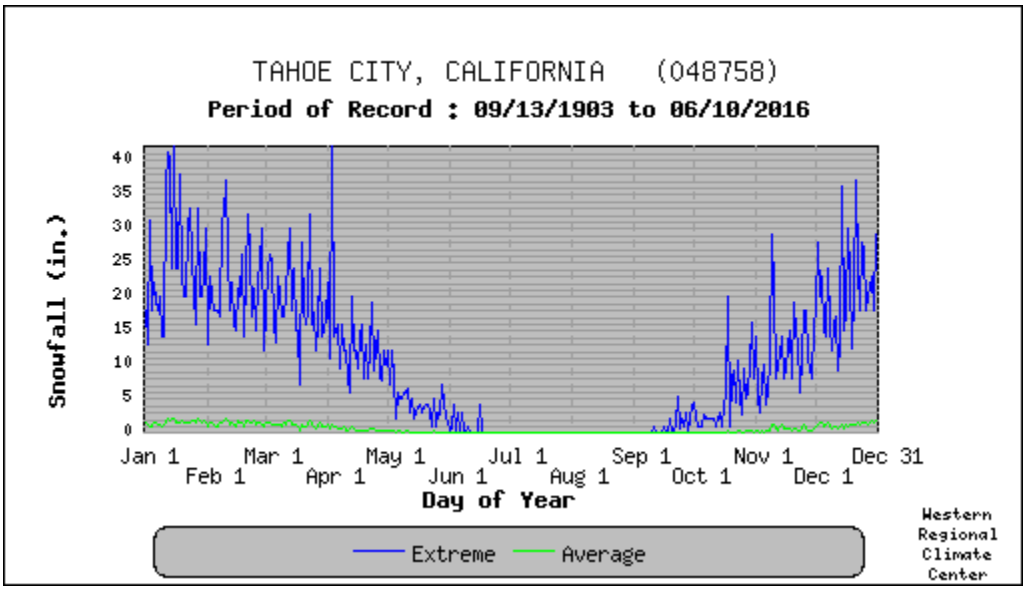
According to the WRCC, average snowfall on the eastern side of the County is 190.7 inches, as shown in Figure 4-24. The highest annual snowfall fell in 1952, when 499.3 inches fell. Highest monthly snowfall accumulation came in January of 1911, when 229.0 inches fell. Average snowfall in January through March range from 10" to 40". This can be seen in Figure 4-25.

*Figure 4-29 Placer County – East Average Daily Snowfall*




Source: Western Regional Climate Center

*Figure 4-30 Placer County – East Snowfall Averages and Extremes*




Source: Western Regional Climate Center

## Past Occurrences

### Disaster Declaration History

The County has had no past federal and one past state disaster declarations for freeze and snow, as shown on Table 4-32.

*Table 4-32 Placer County – State and Federal Disaster Declarations from Freeze and Snow 1950-2020*

| Disaster Type | State Declarations | | Federal Declarations | |
|---|---|---|---|---|
| | Count | Years | Count | Years |
| Freeze | 1 | 1972 | 0 | – |

Source: Cal OES, FEMA

Another database of disaster declarations comes from the USDA. This database was searched from 2002 to 2020, which showed four freeze disaster declarations for Placer County. This is shown on Table 4-33.

*Table 4-33 Placer County – USDA Disaster Declarations 2002-2020*

| Year | Declaration Number | Primary or Contiguous County | Disaster Type |
|---|---|---|---|
| 2003 | N/A | N/A | Hail and Freeze |
| 2005 | N/A | N/A | Freeze |
| 2007 | N/A | N/A | Freeze |
| 2008 | N/A | N/A | Freeze |

Source: USDA

## NCDC Events

The NCDC reports 913 events of past extreme cold and freeze for Placer County since 1996 as shown on Table 4-34.

*Table 4-34 NCDC Freeze and Snow Events for Placer County 1996 – 7/31/2020**

| Event Type | Number of Events | Deaths | Injuries | Property Damage | Crop Damage | Deaths (indirect) | Injuries (indirect) |
|---|---|---|---|---|---|---|---|
| Blizzard | 4 | 0 | 0 | $30,000 | $0 | 0 | 1 |
| Cold/Wind Chill | 19 | 1 | 0 | $0 | $0 | 2 | 8 |
| Extreme Cold/Wind Chill | 1 | 0 | 0 | $0 | $0 | 0 | 0 |
| Frost/Freeze | 9 | 0 | 0 | $200,000 | $5,000,000 | 0 | 0 |
| Heavy Snow | 633 | 2 | 6 | $1,675,000 | $0 | 1 | 3 |
| Winter Storm | 154 | 2 | 3 | $265,000 | $0 | 1 | 1 |
| Winter Weather | 93 | 4 | 0 | $10,000 | $0 | 0 | 2 |
| **Total** | **913** | **9** | **9** | **$2,180,000** | **$5,000,000** | **4** | **15** |

Source: NCDC

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

## Hazard Mitigation Planning Committee Events

The HMPC identified the following events related to extreme temperatures in the Placer County Planning Area.

- **April 17, 1972** – State declaration for freeze and severe weather conditions.
- **December 1990** – Freezing temperatures cause the fire sprinkler pipes to burst in the main office of the Placer County Office of Education causing $107,487 in damages.
- **December 17, 1992** – Heavy snow on a roof caused damages to a building located in the Foresthill Union School District causing $3,371 in damages.
- **March 23, 1995** – Excessive snow closed the school in Colfax; damages unknown.
- **January 26, 1999** – Excessive snow closed the school in Colfax; damages unknown.
- **1999** – A severe freeze caused broken pipes at three schools in the Eureka Union School District (Oakhills, Ridgeview, Cavitt) in southern Placer County. Total damage to carpet, drinking fountains, and miscellaneous supplies was $10,281 ($1,000 deductible, remainder insurance).
- **February 2003** – A severe snowstorm caused a variety of damage to schools located in the areas of Tahoe City, West Shore, and Polaris Road. The snowstorm caused an underground propane leak at one school, a district-wide power outage, and damages resulting from roof snow loading and removal. School closures ranged from two days to two weeks.
- **December 2006/January 2007** – Placer County, as well as the State, declared a local disaster proclamation declared as result of an extreme low temperature event for the entire state. Placer County OES & Health and Human Services (HHS) coordinated with the Salvation Army in the City of Roseville, and local church organizations to open warming centers at the fairgrounds in Auburn and in church affiliated facilities in the Auburn and Roseville area.
- In **March, April, and May 2011** the Serene Lakes community was hit by a continuous stream of storms that dumped record setting amounts of snow on the area. Approximately 700 of the structures in Serene Lakes are served by propane and the high snow levels led to one home explosion, 43 identified propane leaks, a voluntary evacuation order, a protective sheriff's patrol and a very anxious community. No lives were lost and there were no major injuries, but it was just luck that the community avoided human catastrophe. None of the installations that leaked met current code requirements. The principal reason for propane leaks was failure of piping in all areas.
- **January 2016** – A winter storm event occurred in the Tahoe area of the County. During this event, a tree fell on the Tahoe Engineering Building at 7717 N Lake Blvd, Tahoe Vista, CA. Damages of $124,312.59 were reported for clean up and roof repair.

OTHER PAST EVENTS (ESPECIALLY SINCE 2016) – DATES, DAMAGES, INJURIES, DEATHS

## Likelihood of Future Occurrence

**Highly Likely**— Freeze and snow are likely to continue to occur annually in the Placer County Planning Area. This is especially true for the eastern portion of the County where elevations are higher.

## Climate Change and Freeze and Snow

Climate change and its effect on freeze and snow in the County has been discussed by three sources:

- 2020 Placer County Sustainability Plan
- CAS – 2014
- Cal-Adapt – 2021

### Placer County Sustainability Plan

According to the Placer County Sustainability Plan, severe winter weather includes heavy snowfall, ice storms, extreme cold, and similar events. In Placer County these events are usually limited to the Sierra Nevada region, although in rare cases severe winter weather can occur at lower elevations, such as the communities of Colfax or Foresthill. Overall, climate change is expected to increase average temperatures, so the total number of days with cooler temperatures is expected to drop. However, climate change may increase the number of severe storms affecting Placer County. These intense storm systems could create severe winter weather conditions in the Sierra Nevada and more severe winter weather events in the area.

### CAS

According to the 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 21st 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.

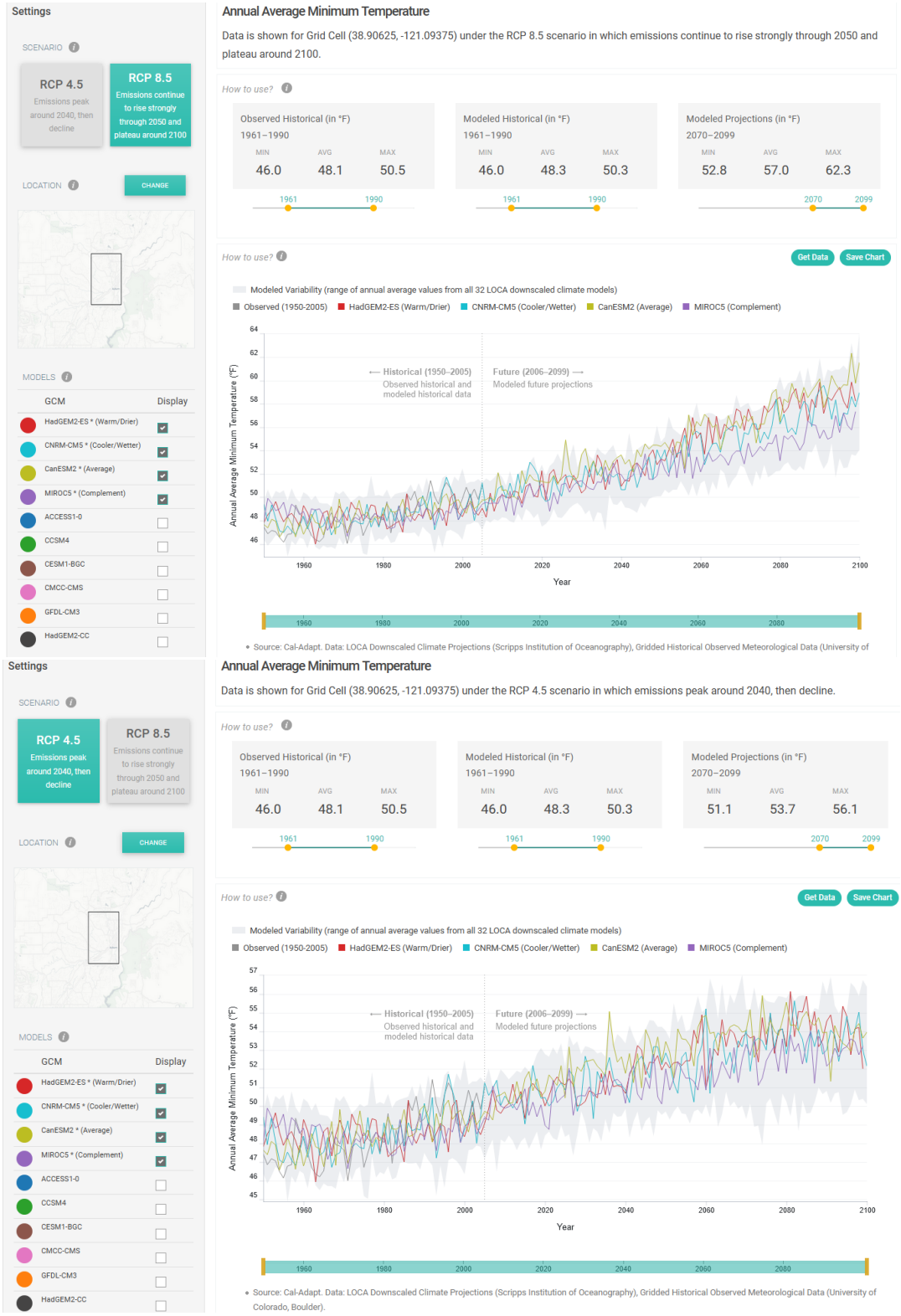
### Cal Adapt

Cal Adapt also noted that overall temperatures are expected to rise substantially throughout this century, reducing the number of days of freeze and possibly turning snow into rain in certain areas of the State and County. 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 Placer County Planning (using the quad that contains the Auburn) are shown in Figure 4-31. It shows the following:

- The upper chart shows projections for annual average minimum temperatures in the County. Data is shown for Placer County under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100.
- The lower chart shows projections for annual average minimum temperatures in the County. Data is shown for Placer County under the RCP 4.5 scenario in which emissions peak around 2040, then decline.

## *Figure 4-31 Placer County – Future Minimum Temperature Estimates: High and Low Emission Scenarios*




Source: Cal-Adapt – Precipitation: Decadal Averages Map. Retrieved 12/9/2020

## *Vulnerability Assessment*

**Vulnerability**—Medium

Freeze and snow events occur in Placer County each year. It can impact structures, critical facilities and infrastructure, and populations in Placer County, especially in the upper elevations in the eastern County.

### Impacts

Freeze and snow events happen in Placer County each year. Freeze and snow can occasionally be accompanied by high winds, which can cause downed trees and power lines, power outages, accidents, and road closures. Transportation networks, communications, and utilities infrastructure are the most vulnerable physical assets to impacts of severe winter weather in the County. The ability for the County to continue to operate during periods of winter storm and freeze is paramount. 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. In addition to vulnerable populations, pets and livestock are at risk to freeze and cold.

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until the damage can be repaired. Power outages can have a significant impact on communities, especially critical facilities such as public utilities. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds accompanying these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibility to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents with injuries and deaths can result. Freezing temperatures can cause significant damage to the agricultural industry.

P{potential impacts were noted on the closed landfill gas flare system at the Eastern Regional Landfill (ERL) in Truckee at the end of Cabin Creek Road. The flare system (extraction wells and piping underground below the closed landfill and a flare system) pulls gas from under the landfill cap. If the gas is not removed for long periods of time, it may migrate downward toward ground water. If in contact with groundwater, it has the potential to partition into groundwater and cause contamination. Excessive snow

loads can build up and cause breaks in operation of the flare system on the order of a couple days. Multiple back-to-back extreme events that may cause a long service disruption exceeding multiple weeks could create a potential hazard to groundwater. Snow removal is present onsite and the likelihood of an inability to access the flare system to restart it is low.

The varying elevations in the County, in part, determine the extent to which a given area is affected by freeze and snow. The agricultural industry is especially vulnerable to extreme temperatures. Freezing temperatures can cause significant loss to crops, and excessive heat can cause high levels of mortality among livestock as well as damage to crops.

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 be either burying or insulating them from freeze as new facilities are improved or added. Backup power should be considered for any new critical facility. 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.

## 4.3.4. Severe Weather: Heavy Rains and Storms

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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 Placer 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 4.3.3). 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. Heavy precipitation in the Placer County area falls mainly in the fall, winter, and spring months.

This 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.

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.

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

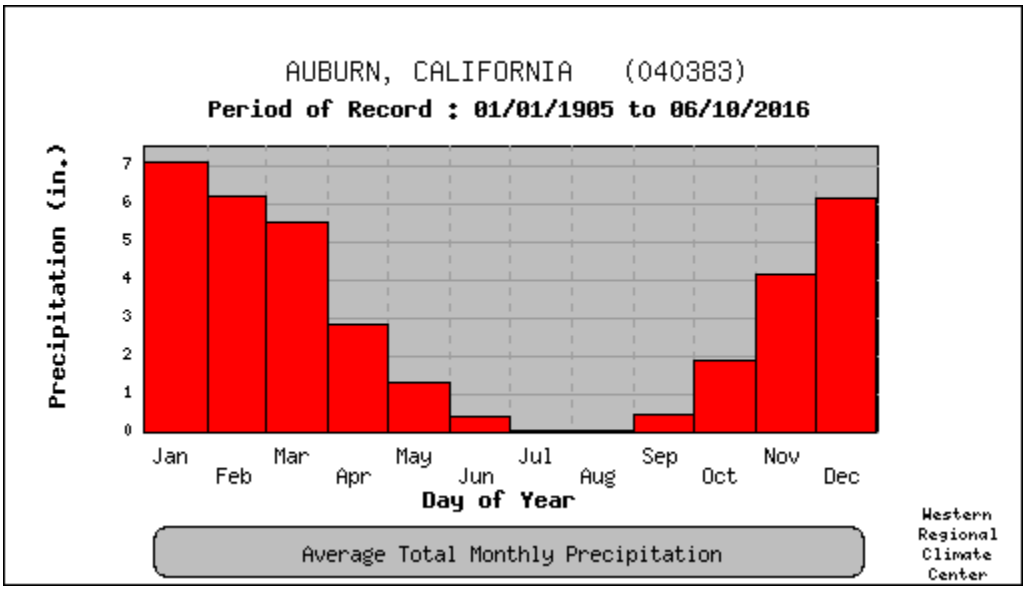
#### *Location and Extent*

Heavy rains in Placer County vary by season and location. 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 Placer County previously discussed in Section 4.3.1 is summarized below.

#### Placer County – West (Auburn Weather Station, Period of Record 1905 to 2016 [Elevation of 1,360 feet above msl])

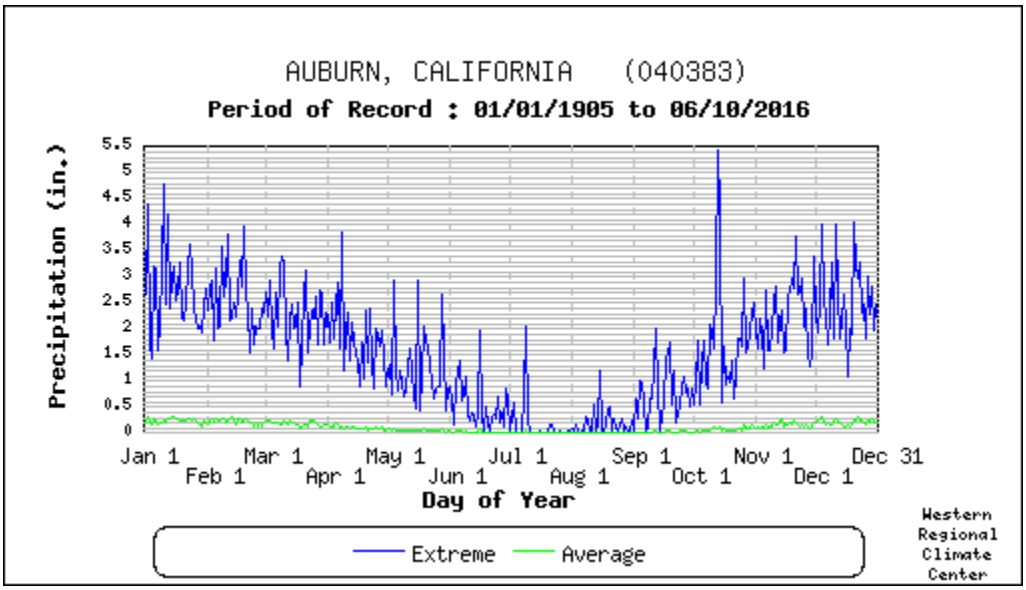
According to the WRCC, average annual precipitation in western Placer County is 34.39 inches per year. The highest recorded annual precipitation is 64.87 inches in 1983; the highest recorded precipitation for a 24-hour period is 5.41 inches on October 13, 1962. The lowest recorded annual precipitation was 11.76 inches in 1976. Average monthly precipitation for western Placer County is shown in Figure 4-32. Daily average and extreme precipitations are shown in Figure 4-33.

*Figure 4-32 Placer County – West Monthly Average Total Precipitation*




Source: Western Regional Climate Center, www.wrcc.dri.edu/

*Figure 4-33 Placer County – West Daily Average and Extreme Precipitation*

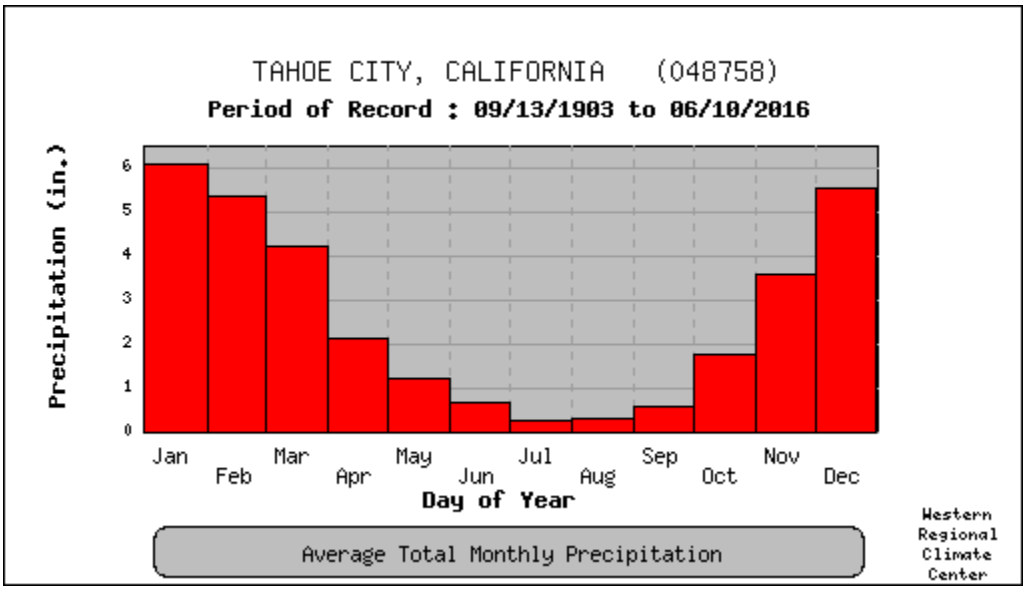



Source: Western Regional Climate Center, www.wrcc.dri.edu/

### Placer County – East (Tahoe City Weather Station, Period of Record 1903 to 2016 [Elevation of 6,230 feet above msl])

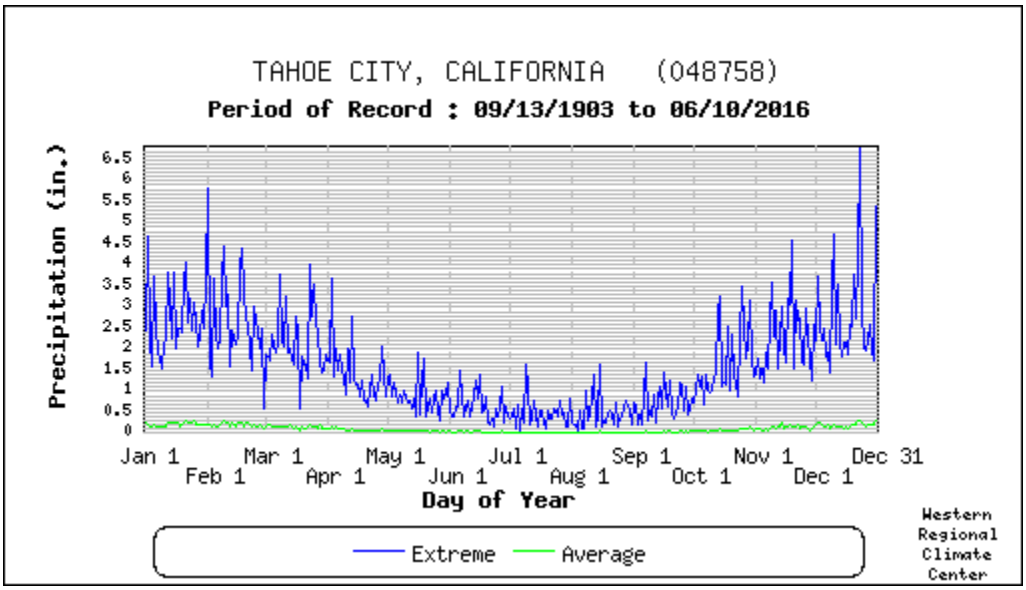
According to the WRCC, average annual precipitation in eastern Placer County is 31.46 inches per year. The highest recorded annual precipitation is 66.41 inches in 1996; the highest recorded precipitation for a 24-hour period is 7.0 inches on November 4, 1903. The lowest recorded annual precipitation was 9.34 inches in 1976. Average monthly precipitation for eastern Placer County is shown in Figure 4-34. Daily average and extreme precipitations are shown in Figure 4-35.

*Figure 4-34 Placer County – East Monthly Average Total Precipitation*




Source: Western Regional Climate Center, www.wrcc.dri.edu/

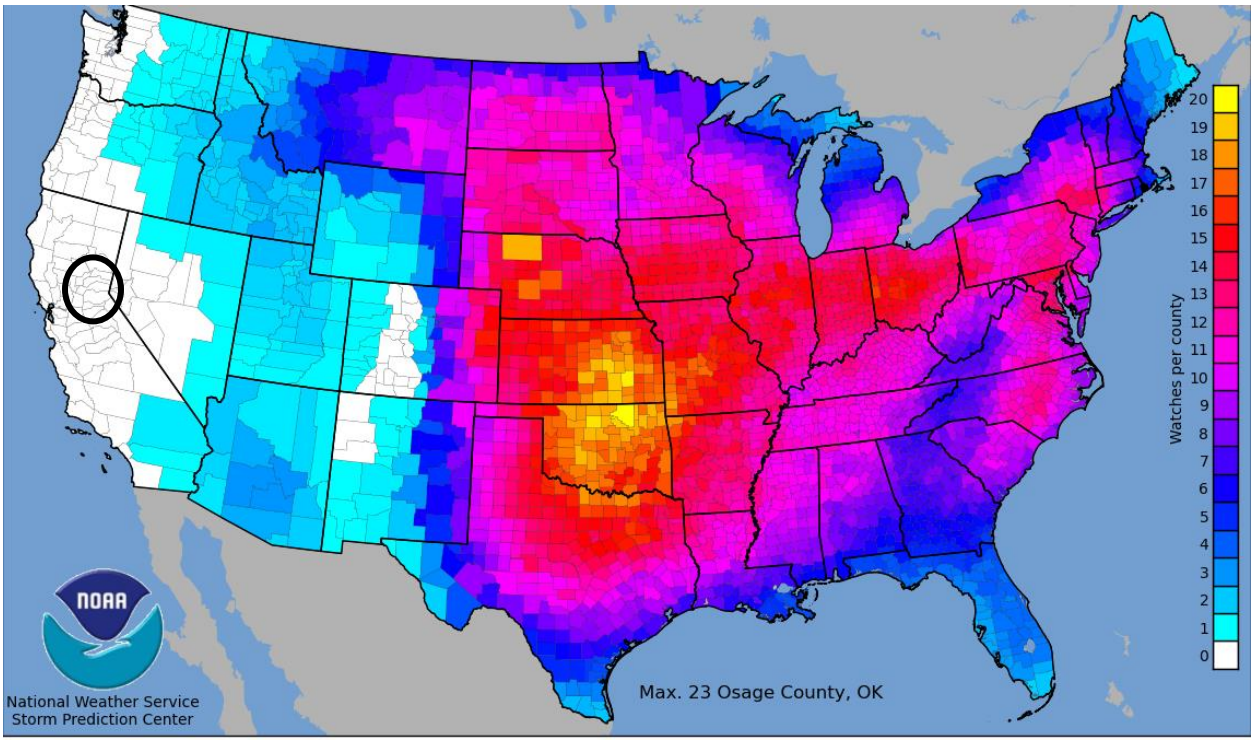
*Figure 4-35 Placer County – East Daily Average and Extreme Precipitation*




Source: Western Regional Climate Center, www.wrcc.dri.edu/

The NOAA Storm Prediction Center tracks thunderstorm watches on a county basis. Figure 4-36 shows thunderstorm watches in Placer County and the United States for a 20-year period between 1993 and 2012, the most recent map available.

*Figure 4-36 Placer County – Average Thunderstorm Watches per Year (1993 to 2012)*




Source: NOAA Storm Prediction Center, map retrieved 12/14/2020

## Hail

Hail can occur throughout the Placer 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 Placer 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 4-35 indicates the hailstone measurements utilized by the National Weather Service.

*Table 4-35 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 |

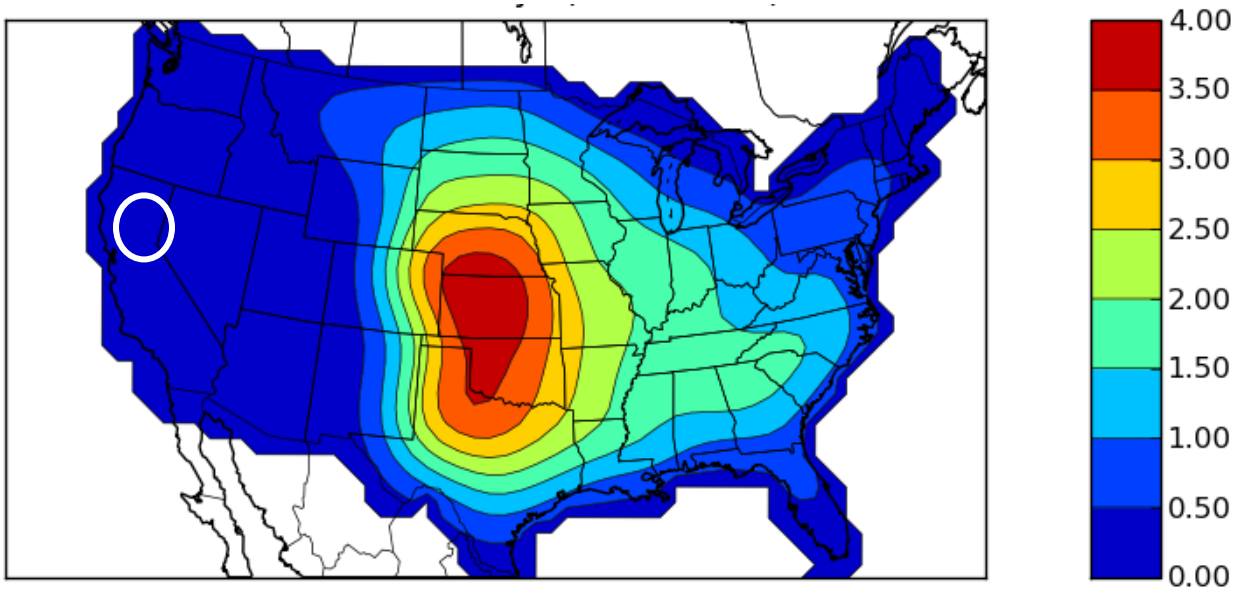
| Average Diameter | Corresponding Household Object |
|---|---|
| 1.5 inch | Ping-pong ball |
| 1.75 inch | Golf-Ball |
| 2.0 inch | Hen Egg |
| 2.5 inch | Tennis Ball |
| 2.75 inch | Baseball |
| 3.00 inch | Teacup |
| 4.00 inch | Grapefruit |
| 4.5 inch | Softball |

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 4-37 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 4-37 Placer County – Average Hail Days per Year (1990 to 2009)*




Source: National Weather Service, map retrieved 12/14/2020

## 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.

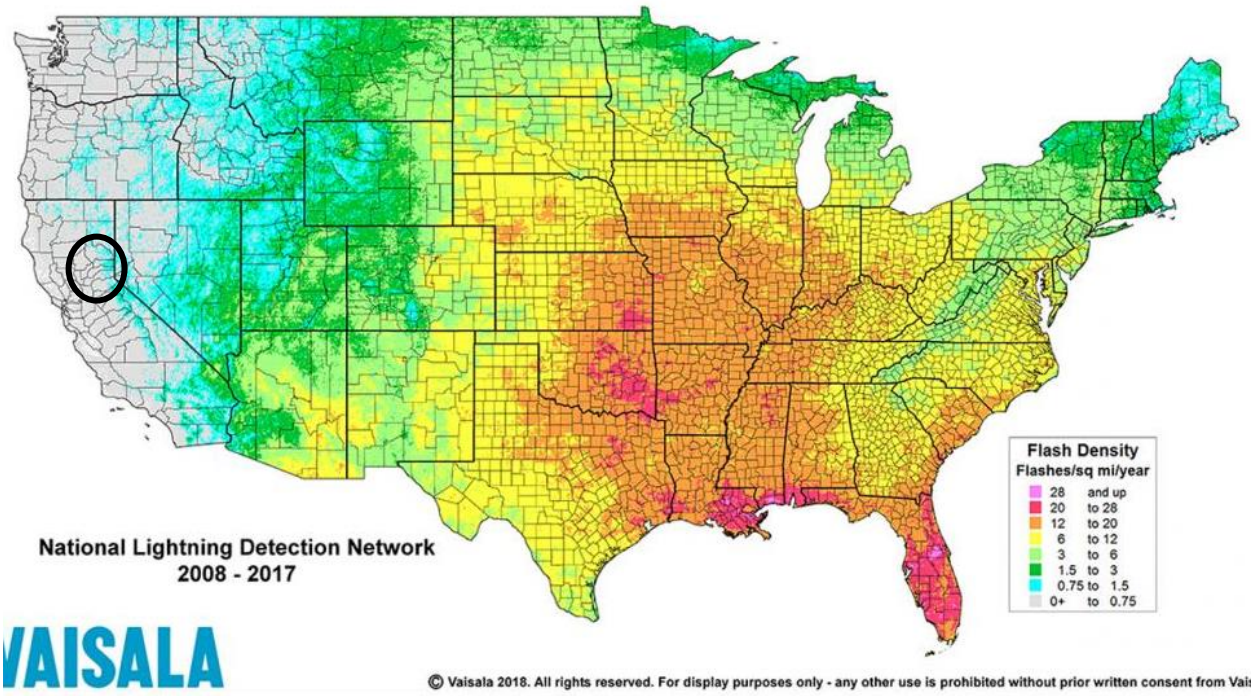
Intra-cloud lightning is the most common type of discharge. This occurs between oppositely charged centers within the same cloud. Usually, it takes place inside the cloud and looks from the outside of the cloud like a diffuse brightening that flickers. However, the flash may exit the boundary of the 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 4.3.17.

### *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. Vaisala maintains the National Lightning Detection Network. It tracks cloud to ground lightning incidences in the United States. Figure 4-38 shows lightning incidences in the County and the rest of the United States from 2008 to 2017, the most recent map date available.

*Figure 4-38 Placer County – Lightning Incidence Map 2008 to 2017*




Source: Vaisala National Lightning Detection Network, map retrieved 12/14/2020

## 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 4-36.

*Table 4-36 Placer County – Disaster Declarations from Heavy Rain and Storms (and Floods) 1950-2020*

| Disaster Type | Federal Declarations | | State Declarations | |
|---|---|---|---|---|
| | Count | Years | Count | Years |
| Flood (including heavy rains and storms) | 16 | 1950, 1955, 1958 (twice), 1962, 1963, 1969, 1973, 1980, 1983, 1986, 1995 (twice), 1997, 2008, 2017 | 13 | 1955, 1958, 1962, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 2006 (twice), 2017 |

Source: FEMA, Cal OES

Another database of disaster declarations comes from the USDA. This database was searched from 2002 to 2020, which showed nine disaster declarations for Placer County, related to heavy rains and storms, including hail and lightning. This is shown on Table 4-37.

*Table 4-37 Placer County – USDA Disaster Declarations 2002-2020*

| Year | Declaration Number | Primary or Contiguous County | Disaster Type |
|---|---|---|---|
| 2002 | N/A | N/A | Rain and Wind |
| 2003 | N/A | N/A | Hail and Freeze |
| 2003 | N/A | N/A | Excessive Rain/Late Rain |
| 2003 | N/A | N/A | Late Rain/Heat |
| 2005 | N/A | N/A | Unseasonable Late Rain |
| 2006 | N/A | N/A | Rain/Hail Event |
| 2016 | S4164 | Contiguous | Severe weather including excessive rainfall and high winds |
| 2016 | S4170 | Contiguous | Severe weather including excessive rainfall and high winds |
| 2019 | S4565 | Contiguous | Excessive rain |

Source: USDA

## NCDC Events

The NCDC data recorded 68 hail, heavy rain, and lightning incidents for Placer County since 1950. A summary of these events is shown in Table 4-38. Additional events of heavy rain and storms are also discussed in the NCDC table in the flood profile in Section 4.3.12.

*Table 4-38 NCDC Hail, Heavy Rain, Lightning, and Wind Events in Placer County 1950–7/31/2020**

| Event Type | Number of Events | Deaths | Injuries | Property Damage | Crop Damage | Deaths (indirect) | Injuries (indirect) |
|---|---|---|---|---|---|---|---|
| Hail | 9 | 0 | 0 | $1,000 | $0 | 0 | 0 |
| Heavy Rain | 59 | 2 | 0 | $10,000 | $0 | 0 | 0 |
| **Total** | **68** | **2** | **0** | **$11,000** | **$ 0** | **0** | **0** |

Source: NCDC

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

## Hazard Mitigation Planning Committee Events

The HMPC also noted the following events:

- **February 1, 1990** – A rainstorm caused water damage to a floor in the Foresthill Union School District causing $4,680 in damages.
- **February 20/21, 1990** – Excessive rain and wind closed the schools in Colfax and Iowa Hill; damages unknown.
- **January 10/11, 1995-** Excessive rain and wind closed the school in Colfax; damages unknown.
- **1995 Winter Storms** – The roof drains of the Placer Union High School gymnasium became clogged, damaging the roof and flooding the gymnasium. Damages were incurred and FEMA paid out disaster monies in the amount of $7,108.33.

- **1996** – Heavy rain clogged storm drains causing flooding in the Cavitt School gymnasium in southern Placer County. Total damage was $85,976 covered by Emergency Services under a disaster declaration.
- **December 16, 2002** – Excessive rain and wind closed the school in Colfax; damages unknown.
- **October 31, 2003** - Winds associated with heavy storms caused a power outage and closure of Truckee Elementary School. The area affected Donner Pass Road in the city of Truckee. Costs associated with the closure were paid for by the State insurance program.
- **December 2005/January 2006 –** Flooding occurred in the County as a result of heavy rains and stormwater runoff caused by severe winter storms. Storms impacted transit on public roads and caused some business closures.
- **March/April 2006** – Spring storm resulted in local disaster proclamation from extended rain and windstorm. Placer County roadways in unincorporated areas, particularly Foresthill Road and Ophir Road, were significantly damaged due to rain and mudslides. Costs to public agencies were in excess of $1 million.
- **January 2008** –Severe winter storms brought massive snow, rain, and near record winds to Northern California over the first weekend in January, 2008 beginning on Friday January 4, 2008. It resulted in the temporary loss of power to some 2.5 million Pacific Gas & Electric (PG&E) customers throughout Northern California; approximately 45,000 in Placer County alone. In some cases, power outages lasted up to six days; and, in addition to the power outages, extensive physical damage was recorded in the foothill area between Alta/Dutch Flat and Foresthill due primarily to falling trees or large tree limbs. Numerous other houses and businesses throughout the foothills and western portions of the County were damaged by falling trees, flying debris, water or wind. As a result, Placer County declared a local emergency. The initial damage assessment provided to the State Office of Emergency Services indicated damages of over $410,000 in the public sector, and an estimated $600,000 of private, residential damage. Businesses losses were much smaller and initial estimates were in the range of only $205,000 total for five businesses.
- **January 2016** – Flash flood warnings were issued for burn zone areas in the Sierra foothills, as heavy rains pummeled the area. Drivers were also urged not to not use area roadways in the area because of the possibility of debris flows and mudslides on hillsides that might be unstable because of the fires.

OTHER PAST EVENTS (ESPECIALLY SINCE 2016)? DATES AND DAMAGES

## Likelihood of Future Occurrence

**Highly Likely** – Based on NCDC data and HMPC input, 68 heavy rain and storm incidents over a 71-year period (1950-2020) equates to a severe storm event every year. As noted, this database doesn't likely capture all heavy rain, hail, and lightning events. Severe weather is a well-documented seasonal occurrence that will continue to occur often in the Placer County Planning Area.

## Climate Change and Heavy Rains and Storms

Climate change and its effect on rain and storms in the County has been discussed by three sources:

- Placer County Sustainability Plan – 2020
- CAS – 2014
- Cal-Adapt – 2021

### Placer County Sustainability Plan

In Placer County, according to their Sustainability Plan, most severe weather is linked to high winds. Climate change is expected to cause an increase in intense rainfall, which is usually associated with strong storm systems. This means that Placer County could see more intense storms in the coming years and decades. Such an increase may not affect all forms of severe weather and may not always be apparent.

### 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 21st century. It is unlikely that hail will become more common in the County. The amount of lightning is not projected to change.

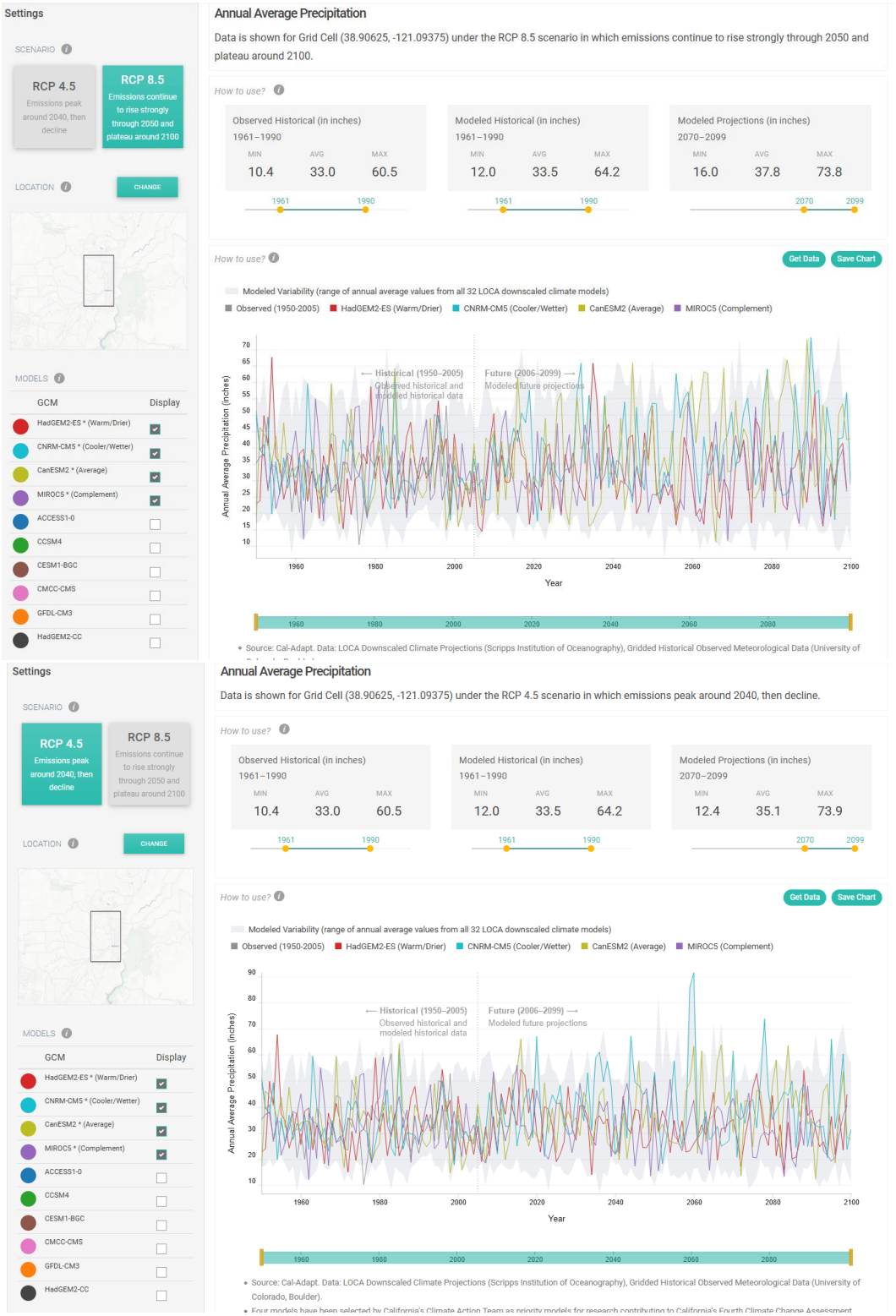
### Cal Adapt

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 Placer County Planning (using the quad that contains Auburn) are shown in Figure 4-39.. 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 4-39 Placer County – Future Precipitation Estimates: High and Low Emission Scenarios*




Source: Cal-Adapt – Precipitation: Decadal Averages Map, Retrieved 12/8/2020

### *Vulnerability Assessment*

**Vulnerability**—Medium

According to historical hazard data, heavy rains and storms are an annual occurrence in Placer County. Lightning occurs less frequently and can occur both with and without storm events. Hail tends to occur less frequently in the County. Impacts can be felt by both the population of the County as well as the structures that have been built in the County.

#### Impacts

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. 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 4.3.12 Flood: 1%/0.2% Annual Chance, Section 0 Flood: Localized Stormwater, Section 4.3.9 Dam Failure, Section 4.3.14 Levee Failure, and Section 4.3.17 Wildfire).

#### Heavy Rains and Storms and Power Shortage/PSPS

During periods of heavy rains and storms, power outages can occur. These power outages can affect critical facilities and infrastructure, including pumping stations and lift stations that help alleviate flooding. More information on power shortage and failure can be found in Section 4.3.2.

### *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 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 Placer 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

### High Winds

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.

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. These winds may damage crops, push automobiles off roads, damage roofs and structures, and cause secondary damage due to flying debris.

#### *Location and Extent*

The entire Placer 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 wind force scale is an empirical measure that relates wind speed to observed conditions at sea or on land. Figure 4-40 shows the Beaufort wind scale.

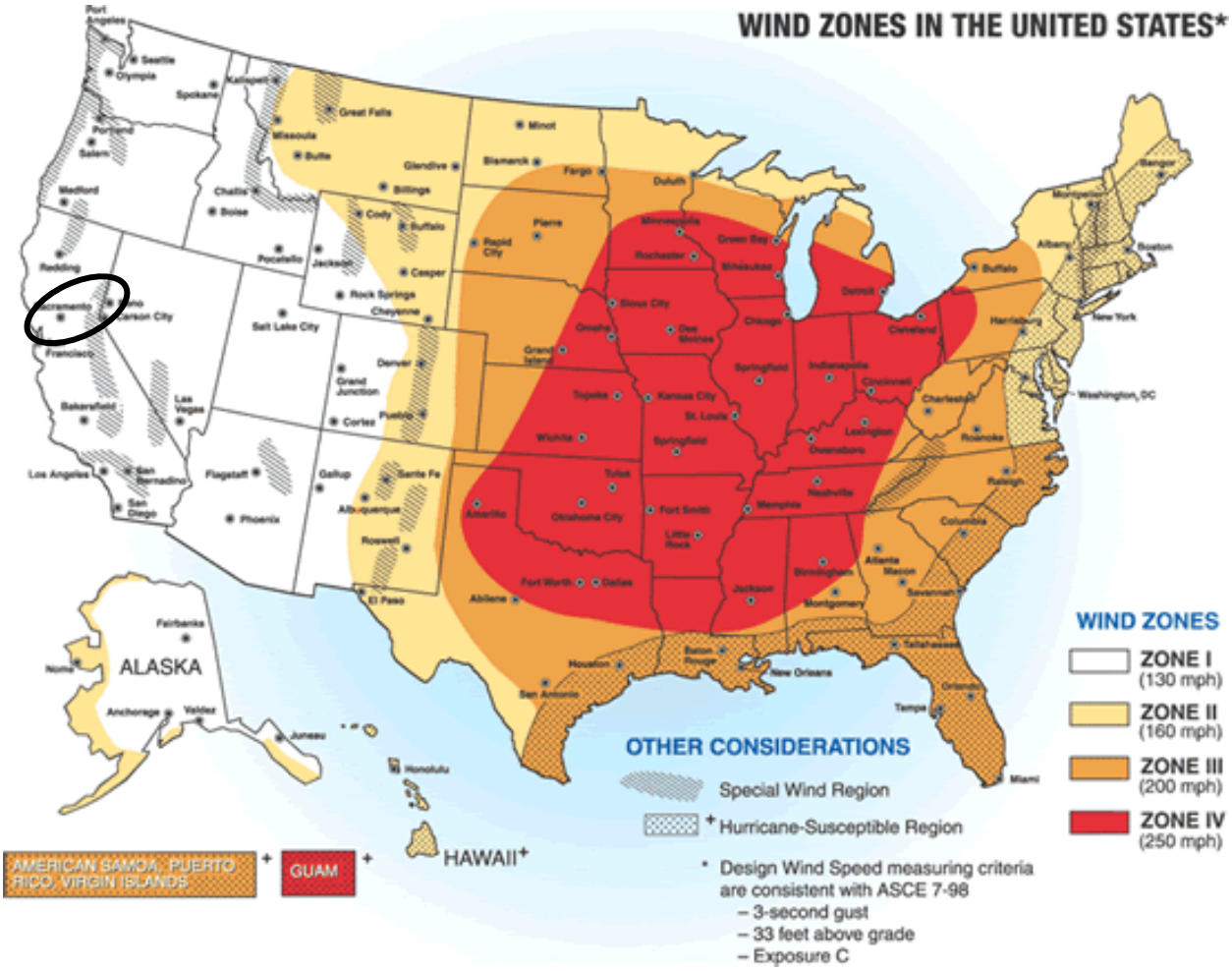
*Figure 4-40 Beaufort Wind Force Scale*

| 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 4-41 depicts wind zones for the United States. The map denotes that Placer County falls into Zone I, which is characterized by high winds of up to 130 mph. Portions of the County are also located in a special wind hazard region, which is a result of foehn winds. A foehn wind is a type of dry down-slope wind that occurs in the lee (downwind side) of a mountain range. Winds of this type are called "snow-eaters" for their ability to make snow melt or sublimate rapidly. This snow-removing ability is caused not only by warmer temperatures, but also the low relative humidity of the air mass coming over the mountain(s). They are also associated with the rapid spread of wildfires, making some regions which experience these winds particularly fire prone. This is discussed in greater detail in the wildfire profile in Section 4.3.18.

*Figure 4-41 Wind Zones in the United States*

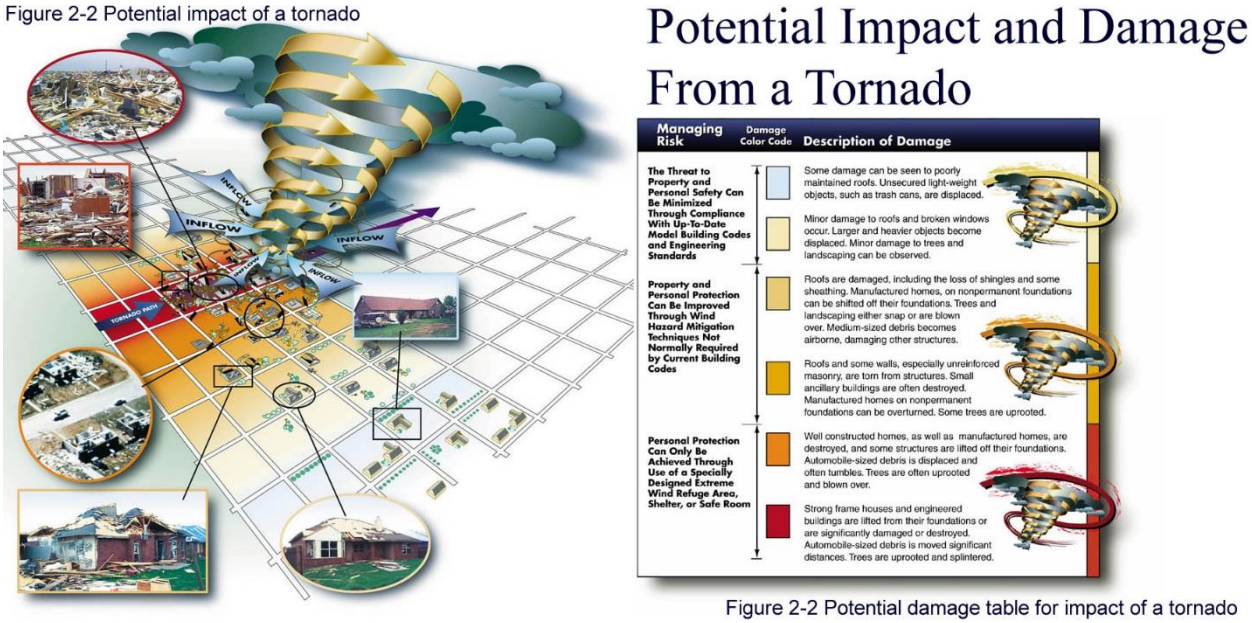



Source: FEMA

## Tornadoes

Tornadoes and funnel clouds can also occur during severe storms. Tornadoes are another severe weather hazard that, though rare, can affect anywhere within the Placer 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 4-42 illustrates the potential impact and damage from a tornado. Tornadoes can cause damage to property and loss of life.

### *Figure 4-42 Potential Impact and Damage from a Tornado*




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

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.

### *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 4-39 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at different levels of intensity. Table 4-40 shows the wind speeds associated with the Enhanced Fujita Scale ratings.

### *Table 4-39 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. |

| Fujita (F) Scale | Fujita Scale Wind Estimate (mph) | Typical Damage |
|---|---|---|
| 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. |
| 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

### *Table 4-40 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

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. There have been four past USDA Secretarial Disaster Declarations due to high winds (and rainfall). This is shown in Table 4-41.

### *Table 4-41 Placer County – USDA Disaster Declarations 2002-2020*

| Year | Declaration Number | Primary or Contiguous County | Disaster Type |
|---|---|---|---|
| 2002 | N/A | N/A | Rain and Wind |
| 2008 | N/A | N/A | Wind Event |
| 2016 | S4164 | Contiguous | Severe weather including excessive rainfall and high winds |

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

Source: USDA

## NCDC Events

The NCDC data recorded 195 high wind and tornado incidents for Placer County since 1955. A summary of these events is shown in Table 4-42.

### *Table 4-42 NCDC High Wind and Tornado Events in Placer County 1955-7/31/2020**

| Event Type | Number of Events | Deaths | Injuries | Property Damage | Crop Damage | Deaths (indirect) | Injuries (indirect) |
|---|---|---|---|---|---|---|---|
| Funnel Cloud | 2 | 0 | 0 | $0 | $0 | 0 | 0 |
| High Wind | 150 | 0 | 1 | $12,371,000 | $48,000 | 0 | 0 |
| Strong Wind | 34 | 1 | 2 | $2,599,600 | $0 | 0 | 0 |
| Thunderstorm Wind | 4 | 0 | 0 | $20,000 | $0 | 0 | 0 |
| Tornado | 5 | 0 | 0 | $252,530 | $0 | 0 | 0 |
| **Total** | **195** | **1** | **3** | **$15,243,130** | **$48,000** | **0** | **0** |

Source: NCDC

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

## HMPC Events

The HMPC noted the following wind and tornado events:

- **March 4, 1991** – High winds caused a roof to blow off a building in the Foresthill Union School District causing $10,629 in damages.
- **December 12, 1995** – High winds caused a power outage resulting in the closure of Franklin Elementary, Placer Elementary, and Loomis Grammar School (Loomis Union School District).
- **December 20, 2002** – High winds caused a power outage resulting in the Franklin Elementary School closure (Loomis Union School District).
- **October 31, 2003 -** Winds associated with heavy storms caused a power outage and closure of Truckee Elementary School. The area affected Donner Pass Road in the city of Truckee. Costs associated with the closure were paid for by the State insurance program.
- **March/April 2006** – Spring storm resulted in local disaster proclamation from extended rain and wind storm. Placer County roadways in unincorporated areas, particularly Foresthill Road and Ophir Road, were significantly damaged due to rain and mudslides. Costs to public agencies were in excess of $1 million.
- **January 2008** –Severe winter storms brought massive snow, rain, and near record winds to Northern California over the first weekend in January, 2008 beginning on Friday January 4, 2008. It resulted in the temporary loss of power to some 2.5 million Pacific Gas & Electric (PG&E) customers throughout Northern California; approximately 45,000 in Placer County alone. In some cases, power outages lasted up to six days; and, in addition to the power outages, extensive physical damage was recorded in the foothill area between Alta/Dutch Flat and Foresthill due primarily to falling trees or large tree limbs.

Numerous other houses and businesses throughout the foothills and western portions of the County were damaged by falling trees, flying debris, water or wind. As a result, Placer County declared a local emergency. The initial damage assessment provided to the State Office of Emergency Services indicated damages of over $410,000 in the public sector, and an estimated $600,000 of private, residential damage. Businesses losses were much smaller and initial estimates were in the range of only $205,000 total for five businesses.

- **2018** – During a weather event in the Tahoe region, a large Pine tree fell on the roof of the Tahoe Engineering Building (TED) 7717 N Lake Blvd, Tahoe Vista, CA. The event caused holes in the roof and structural damage to the rafters. The primary damage was over a file room in the building and the incident occurred while employees were not present in the building.

OTHERS SINCE 2016? DATES? DAMAGES?

### Likelihood of Future Occurrence

**Highly Likely/Occasional** – Based on NCDC data and HMPC input, 195 wind and tornado incidents over a 66-year period (1955-2020) equates to a severe wind/tornado event every year. High winds are a well-documented seasonal occurrence that will continue to occur annually in the Placer 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

Climate change and its effect on high winds and tornadoes in the County has been discussed by two sources:

- Placer County Sustainability Plan – 2020
- CAS – 2014

#### Placer County Sustainability Plan

In Placer County, most severe weather is linked to high winds. Climate change is expected to cause an increase in intense rainfall, which is usually associated with strong storm systems. This means that Placer County could see more intense storms in the coming years and decades. Such an increase may not affect all forms of severe weather and may not always be apparent. The Placer County Sustainability Plan does not discuss non-thunderstorm winds or tornadoes.

#### CAS

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 21st century. This may bring stronger thunderstorm winds. The CAS does not discuss non-thunderstorm winds or tornadoes.

## *Vulnerability Assessment*

**Vulnerability**—Medium

Placer 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 less common and tend to occur mostly in the lower elevations in the western portion of the County.

### Impacts from High Winds and Tornadoes

Straight line and tornadoes winds are primarily a public safety and economic concern. 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
- Erosion (soil loss)
- Dry land farming seed loss
- Windblown weeds
- Downed trees
- Power line impacts and economic losses from power outages
- Occasional building damage, primarily to roofs

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 Placer 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.

### High Winds and Power Shortage/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 in Section 4.3.2.

## *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. Agricultural Hazards

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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

Before its rapid population growth in the 1970s and 1980s, Placer County was known as an agricultural and timber-producing county. Agriculture and timber production are still important sectors of the County's economy; however, manufacturing, recreation, and service industries have increased in economic importance. Agricultural lands continue to be at risk to development based on population growth projections for the County. In western Placer County, land traditionally used for agricultural purposes lies near existing cities and is expected to accommodate much of this population increase. While its agricultural land is threatened, Placer County retains a significant amount of agricultural land where the economy is intact and where farmers are a real presence in the community.

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

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

According to the California Department of Conservation's Farmland Mapping and Monitoring Program (FMPP), as of 2016 the County has approximately 7,431 acres of prime farmland, 4,097 acres of farmland of statewide importance, 18,784 acres of farmland of local importance, and 30,267 acres of grazing land. These numbers have been reduced quite considerably since 1996 due to increased development in the County. (see Table 4-43).

***Table 4-43 Placer County Farmland Inventory – 1996, 2006, and 2016***

| Soil Category | 1996 Acres | 2006 Acres | 2016 Acres |
|---|---|---|---|
| Prime Farmland | 9,867 | 8,524 | 7,431 |
| Farmland of Statewide Importance | 5,546 | 5,021 | 4,097 |
| Unique Farmland | 23,301 | 22,793 | 18,784 |

| Soil Category | 1996 Acres | 2006 Acres | 2016 Acres |
|---|---|---|---|
| Farmland of Local Importance | 114,270 | 101,846 | 94,732 |
| Grazing Land | 33,694 | 28,692 | 30,267 |
| Urban and Built-Up Land | 35,002 | 55,770 | 61,214 |
| Water | 184,804 | 183,874 | 189,929 |
| Other Land | 5,047 | 5,011 | 5,012 |
| **Total Area Inventoried** | **411,531** | **411,531** | **411,466** |

Source: State of California Department of Conservation Farmland Mapping and Monitoring Program, www.conservation.ca.gov/

According to the 2019 Placer County Crop Report, Placer County's total gross value of agricultural crops and products for 2019 was $86,707,959. This represents an increase of $14,005,069, or 17% above 2018's value of $72,702,890. This report reflects the gross value of agricultural crops and products and not the net income producers receive. Rice retained its spot as Placer County's top grossing crop with a value of $25,766,652, which represented a $5 million increase due to strong prices and an increase in planted acreage. Although down significantly from 2018, beef cattle remained second in overall value, with a total value of $12,925,000. Walnuts took over the third position at $11,777,842 with a significant increase in value of more than $6 million due to much of the recently planted new acreage coming into production. Nursery stock and timber rounded out the top five with respective values of $7,04 8,500 and $6,026,000. A summation of crop production values, sourced from the Placer County Agricultural Commissioner's Annual Crop Reports, from 2015-2019 for Placer County is shown in Table 4-44.

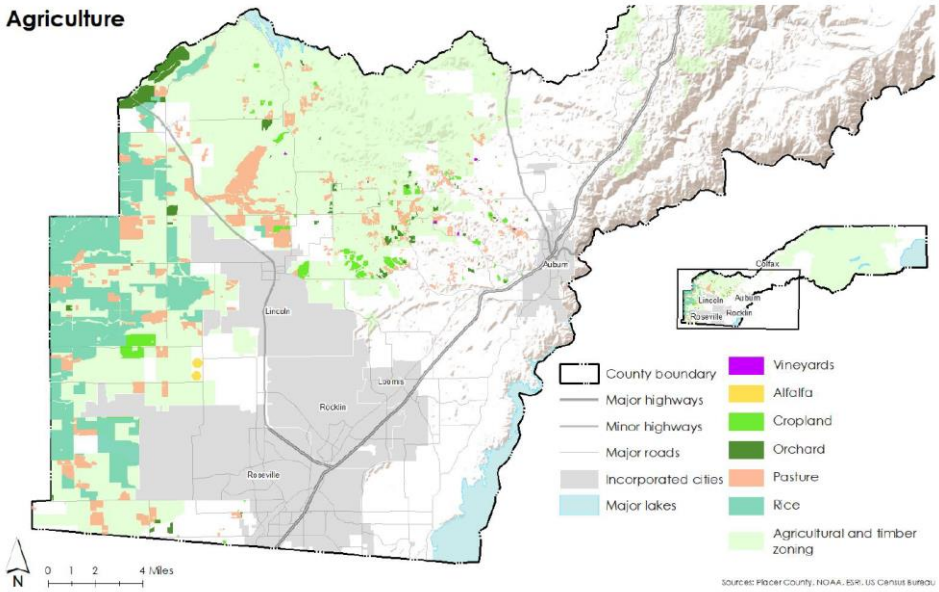
### *Table 4-44 Placer County – Value of Agricultural Production 2015-2019*

| Crop | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| Fruit & Nut | $20,761,473 | $11,348,890 | $9,818,000 | $9,779,000 | $9,047,000 |
| Field Crops | $32,484,236 | $27,140,000 | $16,565,000 | $19,122,000 | $22,385,000 |
| Vegetable Crops | $1,710,000 | $2,000,000 | $1,850,000 | $1,750,000 | $1,750,000 |
| Livestock/Poultry | $16,263,000 | $17,839,000 | $13,298,000 | $20,580,000 | $15,177,000 |
| Livestock/Poultry Products | $1,860,000 | $1,904,000 | $1,929,000 | $1,500,000 | $1,716,000 |
| Nursery Products | $7,048,500 | $7,558,000 | $8,442,000 | $8,154,000 | $8,208,000 |
| Apiary Products | $278,750 | $75,000 | $73,000 | $62,000 | $113,000 |
| Subtotals | $80,405,959 | $67,864,890 | $51,975,000 | $60,947,000 | $58,396,000 |
| Gross Timber Harvest/ Christmas Trees | $6,302,000 | $4,838,000 | $6,084,000 | $4,259,000 | $5,918,000 |
| Grand Totals | $86,707,959 | $72,702,890 | $58,059,000 | $65,206,000 | $64,314,000 |

Source: Placer County Agricultural Commissioner

These agricultural products are grown in various areas of the County. These areas are shown on Figure 4-43.

### *Figure 4-43 Placer County – Agricultural Areas*




Source: 2020 Placer County Sustainability Plan

## Natural Disasters and Severe Weather

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

### *Location and Extent of Severe Weather*

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

## Insect Pests

Placer County is threatened by a number of insects that, under the right circumstances, can cause severe economic and environmental harm to the agricultural industry. Insects of concern to plants and crops include the melon fruit fly, Oriental fruit fly, Mediterranean fruit fly, gypsy moth, light brown apple moth, Japanese beetle, European grapevine moth, Asian citrus psyllid, and glassy-winged sharpshooter. The

Placer County Department of Agriculture traps and monitors all of these agricultural pests. Pest detection is a proactive program that seeks to identify exotic, invasive insects. These pests have a wide host ranges and are difficult and costly to manage once established. Early detection is essential for quick and efficient eradication. Public participation is critical to the success of this program, since staff relies on the goodwill of property owners who allow traps to be placed on their properties. The Agriculture Department deploys over 1,700 traps annually between spring and fall.

### *Location and Extent of Insect Pests*

Insect pests can affect the whole of the County. The speed of onset can be short, while the duration of the infestation varies, but can be long. Insect pests affecting crop production result in economic disasters. These hazards can have a major economic impact on farmers, farm workers, packers, and shippers of agricultural products. They can also cause significant increases in food prices to the consumer due to shortages. Under some conditions, insects that have been present and relatively harmless can become hazardous. For example, severe drought conditions can weaken trees and make them more susceptible to destruction from insect attacks.

## Weeds

Noxious weeds, defined as any plant that is or is liable to be troublesome, aggressive, intrusive, detrimental, or destructive to agriculture, silviculture, or important native species, and difficult to control or eradicate, are also of concern. Noxious weeds within the Planning Area include those listed on Table 4-23.

### *Table 4-45 Placer County Weeds of Concern*

| Species of Concern | | | | |
|---|---|---|---|---|
| Barb Goatgrass | Giant Reed | Red Brome | Downy Brome | Spotted Knapweed |
| Yellow Starthistle | Jubatagrass | Pampasgrass | Scotch Broom | Water Hyacinth |
| French Bloom | English Ivy | Hydrilla | Perrenial Pepperweed | Uruguay Water Primrose |
| Creeping Water Primrose | Purple Loosestrife | Parrotfeather | Eurasian watermilfoil | Scotch Thistle |
| Himalayan Blackberry | Red Sesbania | Spanish Broom | Medusahead | Smallflower Tamarisk |
| Tamarisk | | | | |

Source: California Invasive Plant Council Weed Mapper – Containment Opportunities (high) retrieve on 12/2/2020

Roadways serve as conduits for the movement of invasive plants into and throughout Placer County. Vehicles traveling on interstate and regional highways as well as local roads can unintentionally move and introduce invasive plants to new locales. The most significant and threatening travel thoroughfare in the area is the I-80 corridor which directly links northern California to other western states that are infested with invasive plants that are not established in California, or are present in limited numbers. Likewise, weeds like yellow starthistle and stinkwort, which are prevalent on the western slope of the Sierras, are poised to move eastward along roadways into the mountains absent intervention and management.

To counter these threats, the Placer County Agriculture Department cooperates with Caltrans to conduct annual surveys and treatments along I-80 between Colfax and Donner Summit. During the summer months when weeds are actively growing and readily visible, agriculture department inspectors scour the interstate shoulders and medians looking for new occurrences of troublesome weeds like spotted knapweed, musk thistle and perennial pepperweed. These annual efforts allow inspectors to identify, treat and eradicate infestations before they become established and spread outside of the travel way into forest, riparian and other environments including agricultural lands in western Placer County. In 2019, over 579 noxious weed sites were treated.

#### *Location and Extent of Weeds*

Agricultural hazards occur throughout the County where lands are used for farming and grazing. The County has large swaths of agricultural lands. These were shown for the County on Figure 4-3 in Section 4.2 above. Areas not as greatly affected by severe weather, insects, and pests are the incorporated jurisdictions in the County, as well as the forest lands in the eastern portion of the County which all contain fewer agricultural acres. However, while the cities may not be directly affected, they are indirectly affected economically when agricultural losses occur.

There is no scale that measures agricultural hazards. Agriculture in the County is at risk to many hazards: insects, weeds, severe weather, as well as downturns in commodity prices. Each of these has a different duration and speed of onset. Some, such as freeze, can have a short onset and a short duration. Drought can have a long onset and long duration. Insects and weeds can have short or long onset, and short or long durations. All agricultural losses can have a significant impact on affected communities.

### Past Occurrences

#### Disaster Declaration History

The agricultural lands of Placer County have historically been affected by weather related events such as freeze, heavy rain, and drought. The severe weather events can have devastating effects leading to losses in yield and affecting quality. The US Farm Services Agency provided information on disaster declarations from 2012 through 2020 (the length of data available on their website). These are shown in Table 4-46.

*Table 4-46 Placer County – USDA Disaster Declarations 2012 to 2020**

| Year | Declaration Number | Primary or Contiguous County | Disaster Type |
|---|---|---|---|
| 2002 | N/A | N/A | Drought |
| 2002 | N/A | N/A | Rain and Wind |
| 2003 | N/A | N/A | Hail and Freeze |
| 2003 | N/A | N/A | Excessive Rain/Late Rain |
| 2003 | N/A | N/A | Drought |
| 2003 | N/A | N/A | Late Rain/Heat |
| 2004 | N/A | N/A | Drought |
| 2004 | N/A | N/A | Unseasonable Early Heat |

| Year | Declaration Number | Primary or Contiguous County | Disaster Type |
|---|---|---|---|
| 2004 | N/A | N/A | Fire |
| 2005 | N/A | N/A | Freeze |
| 2005 | N/A | N/A | Unseasonable Late Rain |
| 2005 | N/A | N/A | Heat |
| 2006 | N/A | N/A | Heat |
| 2006 | N/A | N/A | Rain/Hail Event |
| 2007 | N/A | N/A | Heat |
| 2007 | N/A | N/A | Freeze |
| 2007 | N/A | N/A | Drought |
| 2008 | N/A | N/A | Drought Event |
| 2008 | N/A | N/A | Freeze Event |
| 2008 | N/A | N/A | Wind Event |
| 2009 | N/A | N/A | Drought Event |
| 2012 | S3283 | Contiguous | Drought-FAST TRACK |
| 2012 | S3379 | Primary | Drought |
| 2012 | S3440 | Contiguous | Drought-FAST TRACK |
| 2013 | S3462 | Contiguous | Drought-FAST TRACK |
| 2013 | S3495 | Primary | Drought-FAST TRACK |
| 2013 | S3569 | Primary | Drought-FAST TRACK |
| 2014 | S3638 | Contiguous | Drought-FAST TRACK |
| 2014 | S3626 | Primary | Drought-FAST TRACK |
| 2014 | S3631 | Contiguous | Drought |
| 2014 | S3637 | Primary | Drought-FAST TRACK |
| 2014 | S3797 | Primary | Drought |
| 2015 | S3784 | Primary | Drought-FAST TRACK |
| 2015 | S3789 | Contiguous | Drought-FAST TRACK |
| 2015 | S3963 | Contiguous | Drought |
| 2016 | S3952 | Primary | Drought-FAST TRACK |
| 2016 | S3953 | Contiguous | Drought-FAST TRACK |
| 2016 | S4164 | Contiguous | Severe weather including excessive rainfall and high winds |
| 2016 | S4170 | Contiguous | Severe weather including excessive rainfall and high winds |
| 2017 | S4163 | Contiguous | Drought-FAST TRACK |
| 2018 | S4427 | Contiguous | Drought-FAST TRACK |
| 2019 | S4565 | Contiguous | Excessive rain |
| 2020 | S4697 | Primary | Drought-FAST TRACK |
| 2020 | S4765 | Contiguous | Drought-FAST TRACK |

Source: Placer County Agricultural Commissioner, US Farm Service Agency
* Disaster declarations for 2019 were released, but no disasters have yet been declared for the County in the 2019 agricultural year

### NCDC Events

The NCDC does not track agriculture events.

### Hazard Mitigation Planning Committee Events

The HMPC noted that agriculture events occur yearly, though with varying levels of damages to a variety of crops. Severe weather, insect pests, and noxious weeds occur yearly.

## Likelihood of Future Occurrence

**Highly Likely**—As long as severe weather events, insects, and weeds continue to be an ongoing concern to the Placer County Planning Area, the potential for agricultural losses remains.

## Climate Change and Agricultural Hazards

Climate change and its effect on the agriculture industry in the County has been discussed by two sources:

- Placer County Sustainability Plan – 2020
- CAS – 2014

### Placer County Sustainability Plan

The forests, farms, and ranches of Placer County all face risk from assorted pests and diseases that may affect crop plants, trees, and livestock. One of the most direct effects of climate change is that average temperatures will increase, and this has a bearing on many pests and diseases. Many pests and organisms that carry diseases are most active during warmer months, so the threat of infection or infestation can be higher during this time of year. Temperatures are expected to get warmer earlier in the year and remain warmer until later in the year due to climate change, creating a wider window for pests and diseases to be active and spread. While there are treatment options for a number of agriculture and forestry diseases, some have no cure.

Many crop plants, trees, and livestock may also be harmed and consequently weakened by warmer temperatures and changes in precipitation. The weaker plants and animals may not be able to fend off infestations or infections as well as stronger plants or animals, causing pests and diseases to affect more of the population. These pests and diseases can cause plants and animals to grow slower, damage them so their products are less appealing and harder to sell, or even kill them.

### CAS

According to the CAS, addressing climate change in agriculture will encompass reducing vulnerability through adapting to the ongoing and predicted impacts of climate. Agriculture in California is vulnerable to predicted impacts of climate change, including less reliable water supplies, increased temperatures, and increased pests.

## *Vulnerability Assessment*

**Vulnerability**—Medium

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

### Impacts

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

- Drought's most severe effects on agriculture include water quality and quantity issues. Other impacts include decreased crop yields, impact to feed and forage, altered plant populations and tree mortality.
- Earthquakes, though rare in Placer 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.
- Extreme cold may result in loss of livestock, increased deicing, downed power lines, and increased use of generators. Deicing can impact agriculture by damaging local ecosystems and contaminating water bodies. Downed power lines cause people to run generators more often, which can release harmful air pollutants.
- Hot weather and extreme heat can worsen ozone levels and air quality as well as leading to drought conditions. Excessive heat and prolonged dry or drought conditions can impact agriculture by creating worker safety issues for farm field workers, severely damaging crops, and reducing availability of water and food supply for livestock.
- Wildfires can spread quickly and devastate thousands of acres of land, which may include agricultural lands. This devastation could lead to large losses in crops, forestry, livestock, and agricultural infrastructure.
- Flooding causes many impacts to agricultural production, including water contamination, damage to crops, loss of livestock, increased susceptibility of livestock to disease, flooded farm machinery, and environmental damage to and from agricultural chemicals.
- Landslides and debris flow occur in all 50 states and commonly occur in connection with other major natural disasters such as earthquakes, volcanoes, wildfires, and floods. Some of the threats from landslides and debris flow include rapidly moving water and debris that can cause trauma; broken electrical, water, gas, and sewage lines; and disrupted roadways and railways. This can lead to

agricultural impacts including contamination of water, change in vegetation, and harvest and livestock losses.

In addition to threats to agriculture from weather and other natural hazard events, agriculture in the County is at risk from insects, pests, and noxious weeds. Establishment of an invasive species would be detrimental to the agricultural industry of Placer County because of product losses, stringent quarantine regulations, loss of exporting opportunities and increased treatment costs. The introduction of exotic plants influences wildlife by displacing forage species, modifying habitat structure—such as changing grassland to a forb-dominated community—or changing species interactions within the ecosystem. In addition, invasive plants:

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

Invasive plants cost California $82 million every year (2008 California Invasive Plan Council). Estimates on exact yearly losses in Placer County varies and was not available for the County. Due to the high economic value of crops in the County, invasive species have the ability to cause immense financial harm.

### *Future Development*

Future development in the County is not likely to have an impact on agricultural hazards in Placer County, except to the extent that agricultural lands are taken out of production as new development occurs reducing available land for agricultural uses, including those related to farming, timber production and grazing. However, the HMPC did note that with additional development in the County, there may be additional competition for water resources thus possibly impacting the agricultural industry and the Placer County Planning Area.

## 4.3.7. Avalanche

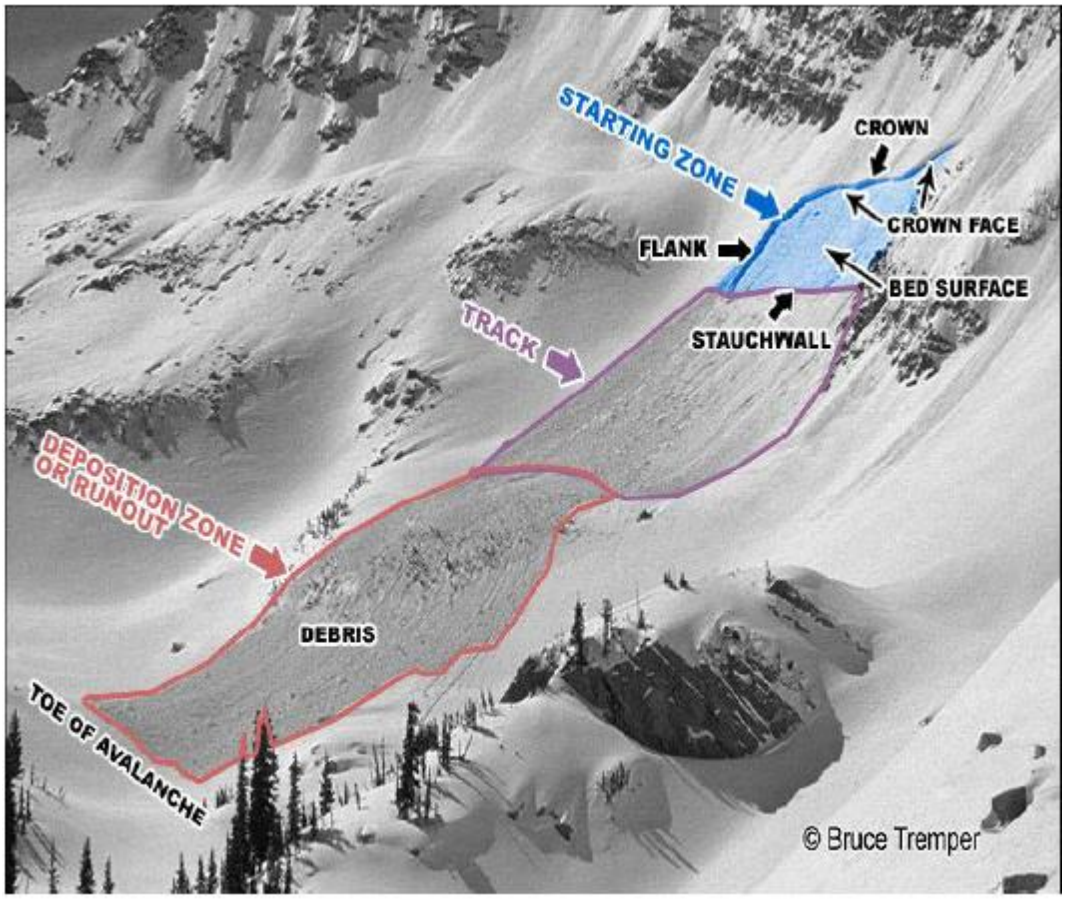
### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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 Sierra Avalanche Center, avalanches occur when loading of new snow increases stress at a rate faster than strength develops, and the slope fails. Avalanches are a rapid down-slope movement of snow, ice and debris triggered by ground shaking, sound, or human or animal movement. Avalanches consist of a starting zone where the ice or snow breaks loose, a track which is the grade or channel the debris slides down and a run-out zone where the snow is deposited. This can be seen in Figure 4-44.

*Figure 4-44 Avalanche Zones*




Source: Sierra Avalanche Center

Critical stresses develop more quickly on steeper slopes and where deposition of wind-transported snow is common. The vast majority of avalanches occur during and shortly after storms. This hazard generally affects a small number of people, such as snowboarders, skiers, and hikers who venture into backcountry areas during or after winter storms. Roads and highway closures, damaged structures, and destruction of forests are also a direct result of avalanches.

## Location and Extent

The two primary factors impacting avalanche activity are weather and terrain. Large, frequent storms deposit snow on steep slopes to create avalanche hazards. Additional factors that contribute to slope stability are the amount of snow, rate of accumulation, moisture content, wind speed and direction and type of snow crystals. Topography also plays a vital role in avalanche dynamics. Slope angles between 30 to 45 degrees are optimal for avalanches. The risk of avalanches decreases on slope angles below 30 degrees. At 50 or more degrees they tend to produce sluff or loose snow avalanches that account for only a small percentage of avalanche deaths and property damage annually.

Speed of onset of avalanche is short, as is the duration of each event. Most avalanches occur during and shortly after storms between January and March. A scale of avalanche danger has been created for North America. This can be found in Table 4-47.

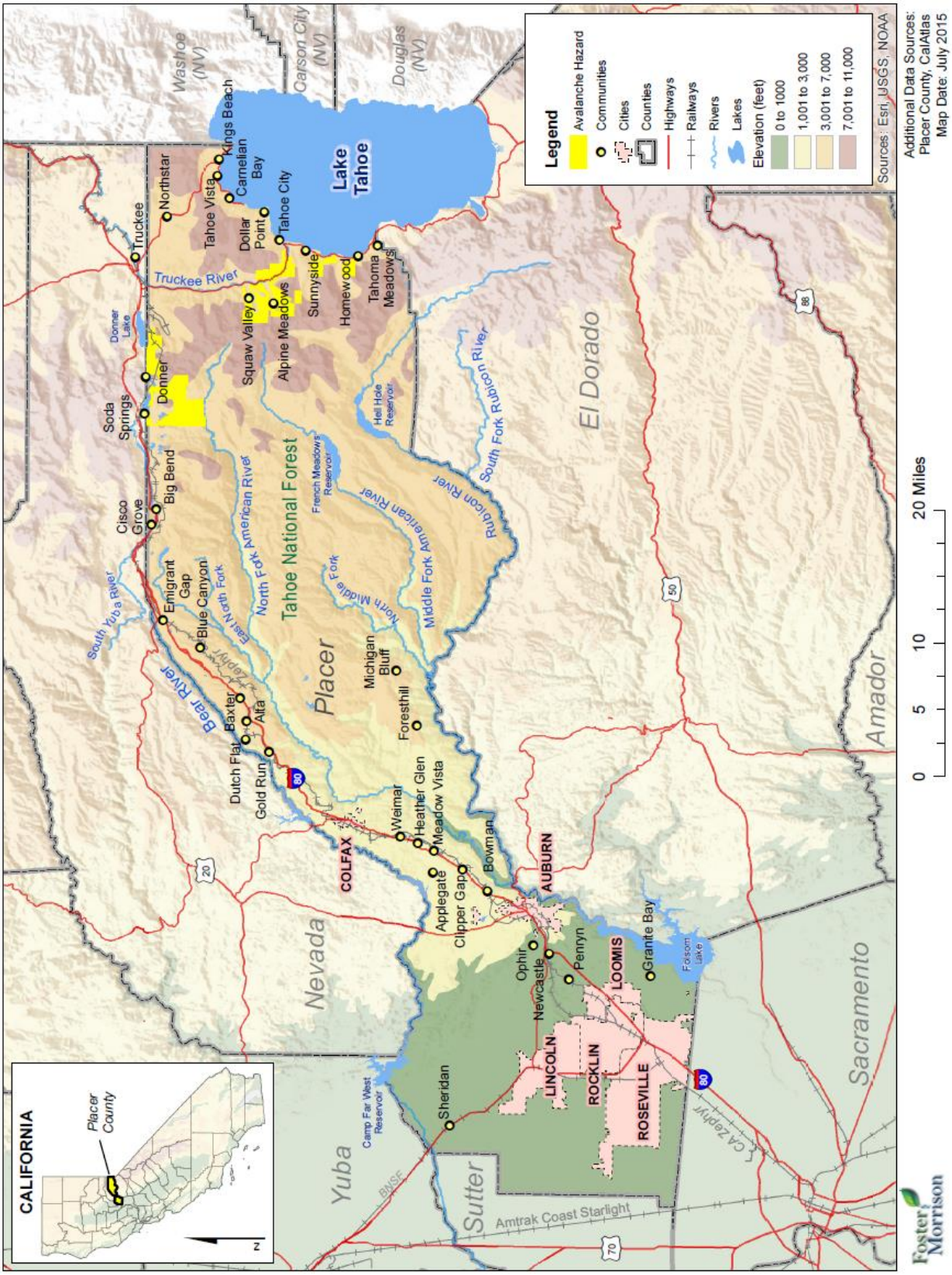
### *Table 4-47 North American Public Avalanche Danger Scale*

| Danger Level | Travel Advice | Likelihood of Avalanche | Avalanche Size or Distribution. |
|---|---|---|---|
| 5 – Extreme | Avoid all avalanche terrain | Natural and human-triggered avalanches certain | Large to very large avalanches in many areas |
| 4 – High | Very dangerous avalanche conditions. Travel in avalanche terrain not recommended | Natural avalanches likely; human-triggered avalanches very likely | Large avalanches in many areas; or very large avalanches in specific areas |
| 3 – Considerable | Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision making essential | Natural avalanches possible; human-triggered avalanches likely | Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas |
| 2 – Moderate | Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern | Natural avalanches unlikely; human-triggered avalanches possible | Small avalanches in specific areas; or large avalanches in isolated areas |
| 1 – Low | Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features | Natural and human-triggered avalanches unlikely | Small avalanches in isolated areas or extreme terrain |

Source: National Avalanche Center

Areas prone to avalanche hazards include hard to access areas deep in the backcountry. Avalanche hazards exist in eastern Placer County where combinations of the above criteria occur. This is shown on Figure 4-45.

## *Figure 4-45 Placer County – Avalanche Hazard Areas*



## Past Occurrences

### Disaster Declaration History

There have been no state or federal disaster declarations related to avalanche in Placer County, as shown in Table 4-4.

### NCDC Events

The NCDC database shows 15 avalanche events in Placer County since 1996, as shown in Table 4-48.

*Table 4-48 NCDC Avalanche Events for Placer County 1950-7/31/2020**

| Event Type | Number of Events | Deaths | Injuries | Property Damage | Crop Damage | Deaths (indirect) | Injuries (indirect) |
|---|---|---|---|---|---|---|---|
| Avalanche | 15 | 6 | 12 | $0 | $0 | 0 | 0 |

Source: NCDC

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

### HMPC Events

Historically, avalanches occur within the County between the months of December and March, following snowstorms. Although avalanches have occurred on slopes of many angles, they most often occur on slopes ranging between 30 degrees and 45 degrees. Therefore ski resorts, residences, roads, businesses, and other structures and activities in these areas are vulnerable. Areas where the potential for avalanches to exist are zoned as moderate or high avalanche hazard zones and have been identified. Moderate hazard zones are usually on shallow slopes and located immediately downhill of high zones. These high and moderate zones are located near the Nevada County line, south of Donner Lake and Lake Van Norden, east of Tahoe City, near Twin Peaks and McKinney Bay, and in areas near Squaw Valley, Alpine Meadows, and Sugar Bowl. According to the 2004 Placer Operational Area, Emergency Operations Plan, areas of particular concern include:

- Alpine Meadows, Bear Creek drainage;
- West shore of Donner Lake;
- Donner Summit/Norden Area;
- West shore of Lake Tahoe (Homewood & Ward Creek tract);
- Serene Lakes, Onion Creek drainage;
- Squaw Valley;
- Sugar Bowl Ski Resort and Onion Creek;
- Truckee River Corridor/Highway 89 Corridor; and
- Northstar Ski Resort.

The following avalanche incidents have resulted in 19 fatalities within Placer County since 1982:

- **March 31, 1982** – At Alpine Meadows, a 30-foot high wall of snow plowed through a ski lodge and other buildings at 80 mph, killing seven people. SHELDUS estimated the cost of the damages at $5 million.

- **February 11, 199**8 – Donner Summit backcountry, one fatality - snowboarder.
- **February 6, 1999 –** Donner Summit, one fatality.
- **February 21, 2001** – Squaw Valley, two fatalities, Class II Avalanche. A storm resulted in 20 inches of snow and winds out of the SSW were in the 40-50 mile per hour range with gusts up to 60-70 miles per hour.
- **March 8, 2002** – Sugarbowl Resort, one fatality. A storm hit with 34 inches of snow and winds were up to 100 miles per hour.
- **January 1, 2004** – Donner Summit near Castle Peak, one fatality.
- **December 25, 2008** – The Sacramento Bee newspaper reported that a 21-year-old skier died in an avalanche in the Sierra on Christmas morning. The newspaper reported that the skier's body was found buried following an avalanche in the Red Dog area at Squaw Valley Ski Resort. The victim was a resident of Tahoe City.
- **March 3, 2009** – A ski patrolman was partially buried in an avalanche at Squaw Valley Ski Resort while he was working avalanche controls. He was dug out of the avalanche by another member of the ski patrol. He was transferred to Renown Regional Medical Center in Reno but later died from his injuries.
- **March 1, 2012** – A Sierra Avalanche Center report indicated that three skiers were skiing in the backcountry near Alpine Meadows when one of the skiers triggered an avalanche about 300 ft wide by 500 feet long and one foot deep. The skier was buried under 3 feet of snow. The other two skiers found the victim within several minutes. However, the victim sustained severe injuries due to impact with trees and debris and died in the hospital that night.
- **December 24, 2012** – One fatality occurred when a male snowboarder, age 49, was caught in an avalanche at Donner Ski Ranch. The man's body was found under 2-3 feet of snow at the base of the avalanche. The wind had blown snow to depths of 7 ft or more where the man was snowboarding.
- **December 24, 2012** – Avalanche control activities (explosives) at the Alpine Meadows Ski resort resulted in the death of an experienced ski patroller. The avalanche broke much wider and higher than expected based on past experience. The man was found and uncovered within 8 minutes of the avalanche. He was airlifted via CareFlight helicopter to Renown Medical Center in Reno where he died.
- **February 4, 2019** – Between 4pm and midnight, the meter at the bottom of Roundhouse (~6950 elevation) recorded 21.6 new inches of snow, a snowfall rate of ~2.5 inches per hour. Natural slides were observed around 9:50 pm on 2/4/19 at depths about 3 feet near Alpine Meadows Road between Juniper Mountain and Deer Park roads. North Tahoe Fire, PCSO, and DPW responded and managed the scene until the road was reopened. No injuries or damages recorded.
- **On January 18, 2020**, one man was killed and another man was seriously injured by an avalanche near the Subway ski run at Alpine Meadows.

## Likelihood of Future Occurrence

**Likely**—Injuries and loss of life from an avalanche are usually due to people recreating in remote areas at the wrong time. Given the topography and amount of snow falling on an annual basis in eastern Placer County, avalanches and resulting damages, including injuries and loss of life, will continue to occur.

## Climate Change and Avalanche

Climate change and its effect on avalanche in the County has been discussed by two sources:

- Placer County Sustainability Plan – 2020
- CAS – 2014

### Placer County Sustainability Report

Climate change is likely to cause more intense winter storms, and warmer temperatures are likely to cause a greater percent of precipitation to fall as rain instead of snow. Warmer conditions can cause more rapid melting of snow, which may destabilize snow on hillsides, causing more avalanches in Placer County.

### CAS

According to the CAS, climate change may exacerbate the avalanche hazard in the County. Avalanches stemming from a weather pattern of heavy snowfalls followed by thawing may increase – a dangerous combination that can be expected with climate change.

## *Vulnerability Assessment*

**Vulnerability**—Low

Avalanches occur when the weight of new snow increases stress faster than strength of the snowpack develops, causing the slope to fail. Avalanche conditions develop more quickly on steeper slopes (located in the eastern portions of the County) and where wind-blown snow is common. The combination of steep slopes, abundant snow, weather, snowpack, and a trigger to cause movement create avalanches. In Placer County, there is not significant development in these areas.

### Impacts

Avalanche impacts vary, but include risk to property, injury, or death. Avalanches generally affect a few snowboarders, skiers, and hikers who venture into backcountry areas during or after winter storms. Avalanches cause road closures, and can damage structures and forests.

## *Future Development*

The County noted that future development occurs infrequently in avalanche prone areas. CAN THE COUNTY PROVIDE INPUT ON REQUIREMENTS FOR DEVELOPMENT WITHIN AVALANCHE HAZARD AREAS?

## 4.3.8. Climate Change

## *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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. Climate change is caused by an increase in levels of greenhouse gases (GHGs) in the atmosphere. Common GHGs include carbon dioxide, methane, and nitrous oxide, which trap heat and increase Earth's average temperature, causing changes in the planet's climate system and altering conditions across the globe.

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.

Similarly, as noted in California's Fourth Climate Change Assessments, projections show that average temperatures will continue to rise across California, drought will increase in length and frequency, and sea levels will rise in coastal communities. Drought and temperature increases are likely to create secondary hazards that can include a decline in overall snowpack, changes in frequency and intensity of precipitation events, and an increase in wildfire activity. Climate change hazards can impact water availability, agricultural production, public health systems, essential transportation corridors, and disadvantaged communities in both rural and urban areas across California.

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. 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. Placer County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. Table 4-49 provides a summary of Cal-Adapt Climate Projections for the North Sierra Region.

***Table 4-49 North Sierra Region and Placer County – Cal Adapt Climate Projections***

| Effect | Ranges |
|---|---|
| Temperature Change, 1990-2100 | January increase in average temperatures: 2.5 °F to 4°F by 2050 and 6°F to 7°F by 2100. The largest changes are observed in the southern part of the region. July increase in average temperatures: 4 °F to 5°F by 2050 and I 0°F by the end of the century, with the greatest change in the northern part of the region. (Modeled average temperatures; high emissions scenario) |
| Precipitation | Precipitation decline is projected throughout the region. The amount of decrease varies from 3 to 5 inches by 2050 and 6 inches to more than 10 inches by 2100, with the larger rainfall reductions projected for the southern portions of the region. (CCSM3 climate model; high carbon emissions scenario) |
| Heat wave | Heat waves are defined as five consecutive days over 83 °F to 97°F depending on location. By 2050, the number of heat waves per year is expected to increase by two. A dramatic increase in annual heat waves is expected by 2100, eight to I 0 more per year. |
| Snowpack | Snowpack levels are projected to decline dramatically in many portions of the region. In southern portions of the region, a decline of nearly 15 inches in snowpack levels - a more than 60 percent drop - is projected by 2090. (CCSM3 climate model; high carbon emissions scenario) |
| Wildfire | Wildfire risk is projected to increase in a range of 1.1 to 10.5 times throughout the region, with the highest risks expected in the northern and southern parts of the region. (GFDL climate model; high carbon emissions scenario) |

Source: Cal-Adapt

In Placer County, climate change will be more localized in the form of specific hazards (or exposures) that will occur through changes in existing conditions or new natural hazards. These exposures are analyzed in the vulnerability assessment and include agriculture and forestry pests and diseases, avalanche, drought, extreme heat, flooding, pandemic hazards, landslides, severe weather, severe winter weather, and wildfire. Some hazards, such as wildfire and drought, relate directly to the occurrence of other hazards, such as agriculture and forestry pests and diseases, landslides, and flooding. Placer County is currently experiencing some of these changes, but others may not occur or be apparent for several years or decades.

## 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 2002 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. VERIFY THIS INFORMATION AND ADD TO IF POSSIBLE

## 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 21st century, with consequences for people, assets, economies and ecosystems, including risks from heat stress, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea level rise and storm surges.

### 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,

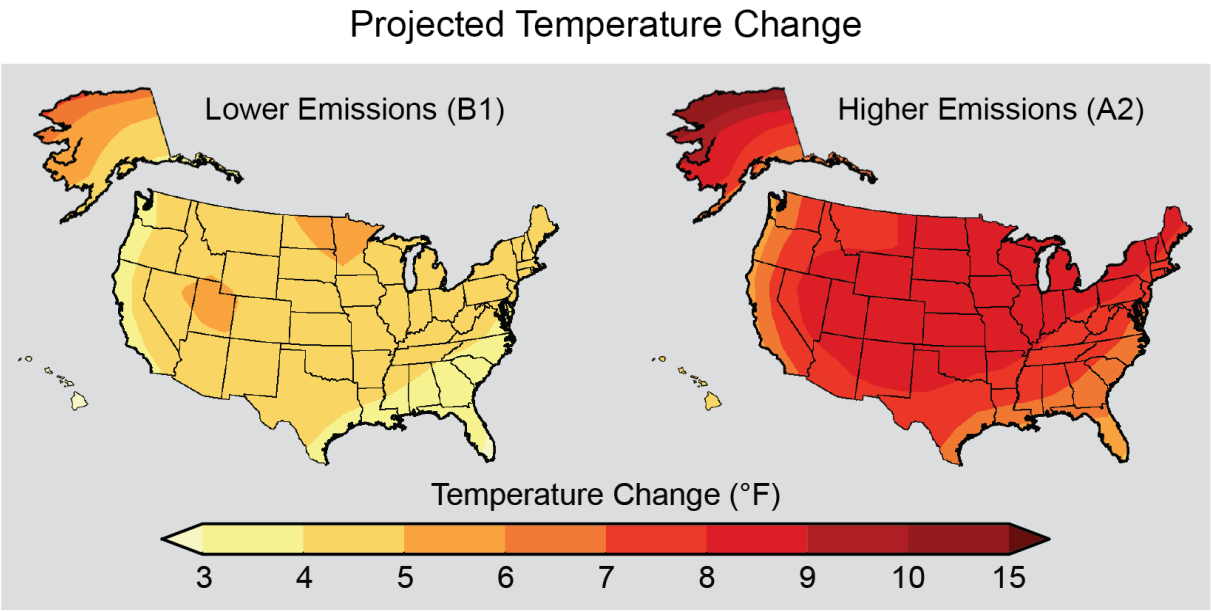
- ✓ Sensitivity of the climate system to greenhouse gas concentrations and other radiatively important gases and aerosols,
- ✓ Inherent climate variability, and
- ✓ Changes in local physical processes (such as afternoon sea breezes) that are not captured by global climate models.

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.

### *National Climate Assessment*

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 4-46.

***Figure 4-46 Projected Temperature Change – Lower and Higher Emissions Scenario***




Source: National Climate Assessment 2014

### *CAS – 2014*

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 Placer 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 effects on exacerbating other hazards is also a concern.

## Placer County Climate Change Impacts

The Placer County HMPC 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 Placer County's climate change vulnerability:

- Placer County Sustainability Plan - 2020
- California Adaptation Planning Guide - 2012
- Proceedings of the National Academy of Sciences - 2014

### Placer County Sustainability Plan

When putting the Placer County Sustainability Plan together, Placer County took an inventory of impacts to the County. Placer County relied on local plans and reports, scholarly research, spatial data, and other scientific and government studies to assess the damage these hazards can cause and the capacity of people and assets to resist this damage and adapt to it. As part of this analysis, a measure of vulnerability is assigned to each population and asset type for each applicable hazard condition. This assessment measures vulnerability (V) on a scale of 1 to 5, with V1 being the least vulnerable and V5 being the most vulnerable. Of the 58 populations and assets in this analysis, 31 have a high level of vulnerability (scoring V4 or V5) for at least one of the eleven hazards. Additionally, ten of the eleven hazards created a high level of vulnerability for at least one population or asset. The one exception is fog, which did not result in a score higher than V3. Key findings of this vulnerability assessment include the following.

- Most of the vulnerable people in Placer County are those who have socioeconomic challenges (e. g. people in poverty) and persons who are more likely to have physical or behavioral limitations that can impede their ability to respond to emergency conditions.
- Vulnerable infrastructure systems include various parts of the local transportation network and systems that help provide electrical and communication services.
- The most vulnerable buildings and facilities are in more rural areas, where they are more likely to be exposed to harmful events such as wildfires or landslides.
- The economic drivers most at risk from climate change range widely, although the agricultural and recreational industries are among the most susceptible.
- Placer County's conifer forests, already harmed by events such as bark beetles and wildfires, are among the most vulnerable ecosystems, along with grasslands and mountain meadow/scrubland.
- Among key services, the communication and energy delivery services are the most vulnerable.

Additionally, the County looked at impacts from climate change to 11 different natural hazards: avalanche, droughts, extreme heat, flooding, fog, human health hazards, landslides, pests and diseases in agriculture and forestry, severe weather, severe winter weather, and wildfire. 9 of these hazards are contained in this LHMP Update, and the affects of climate change on those hazards is dealt with in their respective sections of this LHMP Update. The 2 hazards not discussed in this LHMP Update and their associated impacts are below.

- **Fog** is a low cloud—typically low enough to touch the ground—that forms when the air near the surface reaches the right temperature for water vapor in the air to condense into a cloud. In Placer County, fog usually forms in the valley regions, although it sometimes appears in the Tahoe Basin. Although the impacts of climate change on fog are less clear, there have been significantly fewer days with fog in California's Central Valley in recent years than in the past, close to a 50 percent reduction since the early 1980s. Scientists believe that the warmer temperatures created by climate change make it harder for the air to become cool enough to create fog, and that warmer temperatures are more likely to evaporate any fog that does form. However, scientists have also found that fog formation may be linked to levels of air pollution, because particles of pollutants in the air help water vapor to condense, and so

a reduction in pollution can make it harder for fog to form. The most recent science suggests that both warmer temperatures and a decline in air pollution may be responsible for the decrease in fog, although more research is needed.

- **Human Health Hazards** – There are several diseases that are linked to climate change that have the potential to affect Placer County. Examples include hantavirus pulmonary syndrome, Lyme disease, West Nile fever, and influenza. Many of these diseases are carried by animals such as mice and rats or insects such as ticks and mosquitos, all of which are usually seen as pests even if they do not cause disease. Climate change can increase the rates of various diseases because many of the creatures that carry diseases are more active during warmer weather. Warmer temperatures in both winter and spring can cause them to be active for longer periods, increasing the time that these diseases can be transmitted. Warmer temperatures may also cause some mosquito-carried illnesses not currently present in California, such as Zika. West Nile virus appears to be more active during drought periods, and periods of intense precipitation can increase populations of rodents and ticks. Although some of these diseases may not be serious for most people, others can be debilitating or even fatal.

### 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 Sierra region in which the Placer County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

California's APG: Understanding Regional Characteristics provides input on adaptation considerations for the North Sierra 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:

**Ecosystems and Biodiversity**. Exacerbated by new development in the region, climate change can cause habitats to shift, creating conditions that stress ecosystems and endemic species. Timber practices, also compounded by climate change, has resulted in forests with trees of similar age, lacking snags and

underbrush, further reducing the diversity of the habitat. The Sierra's aquatic and riparian systems are one of the most altered habitats in the region through past development and water diversion activities. Continued changes in hydrologic flow regimes and increased temperatures will further stress these systems regional habitats supporting many special-status species.

**Snowpack and Flooding.** Climate-related decrease in snowpack can have significant consequences on the areas that depend on this water. In addition, a decrease in snowpack can increase impacts from flooding, landslide, and loss of economic base related to a drop in tourism. Recreation and tourism are likely to suffer due to lower water levels in waterways and reservoirs and declining snowpack. This can result in fewer ski days and impacts to hotels, restaurants, and second home development. Increases in flood events can further stress the region and increase flood related impacts and damages.

**Wildfire.** The North Sierra Region is already challenged through past fire suppression combined with the large number of structures that have been built throughout the WUI areas. Climate change is projected to result in large increases in wildfire frequency and size which will further compound the wildfire problem. In addition, potential impacts following fires, such as heavy rains causing landslide and erosion in post-burn areas can have significant consequences on waterways and entire watersheds.

**Public Health, Socioeconomic, and Equity Impact.** The foothills of the North Sierra Region show higher ozone levels and increased temperatures causing vulnerable populations to be at greater risk to these issues. In addition to the elderly population found in this region, people who work and play outdoors are also vulnerable.

### Proceedings of the National Academy of Sciences

In addition to the APG, 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*

Placer 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 Placer 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 Placer 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.

## 4.3.9. Dam Failure

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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.

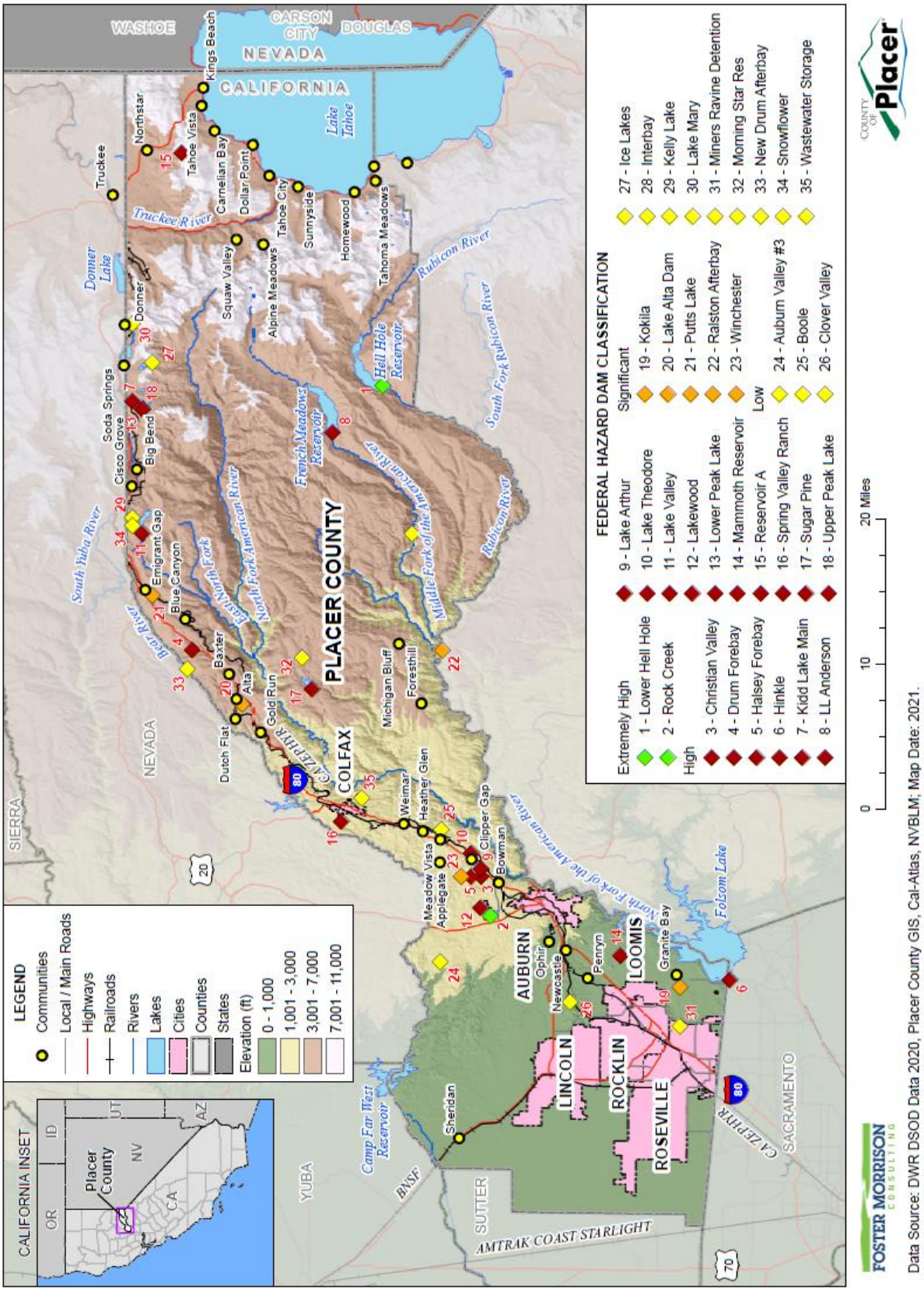
- **Low Hazard** – No probable loss of human life and low economic and environmental losses. Losses are expected to be principally limited to the owner's property.

### Location and Extent

According to data provided by Placer County, CA DWR, and Cal OES, there are 47 dams in the County. Of these, there are 3 extremely high hazard dams, 11 high hazard dams, 9 significant hazard dams, and 12 low hazard dams in Placer County that falls under the jurisdiction of the DSOD (jurisdictional dams described above). 12 dams in Placer County lie outside the jurisdiction of the DSOD and do not have a hazard classification. All mapped dams that lie in the County are shown on Figure 4-47. Table 4-50 gives information on the dams in the County.

Figure 4-48 shows and Table 4-51 identifies the dams outside of Placer County that could affect areas inside Placer County should they fail.

## *Figure 4-47 Placer County Dam Inventory – Inside County*



### *Table 4-50 Placer County – Inventory of Dams under DSOD Jurisdiction*

| Name | Hazard Classification | Owner | River | Nearest City/ Distance (mi) | Mapped | Year Built | Structural Height (ft) | Maximum Storage (acre-ft)* |
|---|---|---|---|---|---|---|---|---|
| Auburn Dam** | N/A | N/A | N/A | N/A | N | N/A | N/A | N/A |
| Auburn Valley #3 | Low | Golf Resources of Auburn | Tributary of the Bear River | Auburn 4 | Y | 1959 | 39 | 200 |
| Auburn Valley #2** | N/A | N/A | N/A | N/A | Y | N/A | N/A | N/A |
| Baldwin** | N/A | N/A | N/A | N/A | Y | N/A | N/A | N/A |
| Boole | Low | Our Lady of the Oaks | Tributary of American River | Applegate 1 | Y | 1951 | 25 | 65 |
| Christian Valley | High | Pac Gas and Electric | South Fork of Dry Creek | Bowman 0 | Y | 1916 | 33 | 110 |
| City Of Lincoln # 2** | N/A | City of Lincoln | Tributary of Markham Ravine | Lincoln 1 | Y | – | 21 | 301 |
| City Of Lincoln # 4** | N/A | City of Lincoln | Offstream | – | Y | – | 18 | 301 |
| City Of Lincoln WWTP** | N/A | City of Lincoln | Tributary of Markham Ravine | Lincoln 2 | Y | – | 33 | 454 |
| Clover Valley | Low | Placer County Water Agency | Tributary of Antelope Creek | Rocklin 5 | Y | 1909 | 35 | 29 |
| Columbian** | N/A | Private | Tributary of Auburn Ravine | Lincoln 5 | N | – | 44 | 132 |
| Drum Forebay | Significant | Pacific Gas and Electric | Drum Canal | Baxter 3 | Y | 1913 | 65 | 564 |
| Halsey Forebay | High | Pacific Gas and Electric | Dry Creek | Auburn 1 | Y | 1916 | 42 | 220 |
| Hinkle | High | San Juan Suburban Water Dist. | Tributary of American River | Orangevale 2 | Y | 1980 | 20 | 200 |

| Name | Hazard Classification | Owner | River | Nearest City/ Distance (mi) | Mapped | Year Built | Structural Height (ft) | Maximum Storage (acre-ft)* |
|---|---|---|---|---|---|---|---|---|
| Ice Lakes | Low | Sierra Lakes Co Water Dist. | Serena Creek | Soda Springs 2 | Y | 1942 | 12 | 220 |
| Interbay | Low | Placer County Water Agency | Middle Fork Interbay | Auburn 30 | Y | 1966 | 70 | 178 |
| Kelly Lake | Low | Pacific Gas and Electric | North Fork American River | Washington 8 | Y | 1928 | 21 | 290 |
| Kidd Lake Main | High | Pacific Gas and Electric | South Yuba River - Tributary | Washington | 25 | 1855 | 40 | 1,930 |
| Kokila | Significant | Private | Tributary of Miners Ravine | Roseville 6 | Y | 1951 | 18 | 54 |
| LL Anderson | Extremely High | Placer County Water Agency | Middle Fork American River | N/A | Y | 1965 | 231 | 155,000 |
| Lake Alta Dam | Significant | Placer County Water Agency | Tributary of the North Fork of the American River | Dutch Flat 1 | Y | 1862 | 22 | 270 |
| Lake Arthur | Significant | Placer County Water Agency | South Fork of Dry Creek | Auburn 3 | Y | 1909 | 44 | 87 |
| Lake Mary | Low | Sugar Bowl Corporation | Tributary of the South Fork of Yuba River | Soda Springs 3 | Y | 1926 | 22 | 172 |
| Lake Tahoe** | N/A | Department of the Interior | Truckee River | Truckee 17 | Y | – | 18 | 840,000 |
| Lake Theodore | Significant | Placer County Water Agency | South Fork of Dry Creek | Bowman 4 | Y | 1896 | 40 | 207 |
| Lake Valley | High | Pacific Gas & Electric | North Fork of American River | Washington 25 | Y | 1911 | 74 | 8,127 |

| Name | Hazard Classification | Owner | River | Nearest City/ Distance (mi) | Mapped | Year Built | Structural Height (ft) | Maximum Storage (acre-ft)* |
|---|---|---|---|---|---|---|---|---|
| Lakewood | High | Private | Dry Creek | Auburn 2 | Y | 1959 | 33 | 152 |
| Lower Hell Hole | Extremely High | Placer County Water Agency | Rubicon River | N/A | Y | 1969 | 410 | 208,400 |
| Lower Peak Lake | High | Pacific Gas & Electric | Tributary of South Yuba River | Washington 25 | Y | 1860 | 33 | 494 |
| Mammoth Res | High | Placer County Water Agency | Offstream | Hidden Valley 4 | Y | 1851 | 23 | 103 |
| Miners Ravine Detention | Low | Placer County Flood Control District | Miners Ravine | N/A | Y | 2007 | 23 | 120 |
| Morning Star Res | Low | De Anza Placer Gold Mining | North Forbes Cr | Auburn 30 | Y | 1870 | 44 | 1,405 |
| North Fork Dam** | N/A | Cespk | North Fork American River | Folsom 22 | Y | N/A | 155 | 14,700 |
| Patterson Sec 29 | Low | Private | Tributary of Bear River | Wheatland 5 | Y | 1962 | 22 | 92 |
| Putts Lake | Significant | Private | Blue Canyon Creek | Blue Canyon 2 | Y | 1916 | 19 | 249 |
| Quail Lake** | N/A | Tahoe City PUD | Tributary of Lake Tahoe | Tahoma 2 | Y | N/A | 14 | 160 |
| Ralston Afterbay | Significant | Placer County Water Agency | Rubicon River | Auburn 20 | Y | 1966 | 85 | 2,800 |
| Reservoir A | Significant | Northstar Comm Svc, Dist. | West Martis Creek | Truckee | 5 | 1973 | 93 | 180 |
| Rock Creek | Extremely High | Pacific Gas & Electric | Rock Creek | Auburn 1 | Y | 1916 | 35 | 410 |
| Sewer Stab Pond #3** | N/A | N/A | N/A | N/A | Y | N/A | N/A | N/A |

| Name | Hazard Classification | Owner | River | Nearest City/ Distance (mi) | Mapped | Year Built | Structural Height (ft) | Maximum Storage (acre-ft)* |
|---|---|---|---|---|---|---|---|---|
| Sewer Stab Pond #5** | N/A | N/A | N/A | N/A | Y | N/A | N/A | N/A |
| Snowflower | Low | Naco West of California | Kelly Creek | Auburn 42 | Y | 1964 | 28 | 165 |
| Spring Valley Ranch | High | Private | Tributary of Campbell Creek | Pinecroft 2 | Y | 1958 | 39 | 60 |
| Sugar Pine | High | Department of the Interior | North Shirttail Creek | None | Y | 1981 | 251 | 6,916 |
| Upper Peak Lake | High | Pacific Gas and Electric | South Yuba River | Washington 25 | Y | 1850 | 37 | 2,112 |
| Wastewater Storage | Low | City of Colfax | Tributary of Smuthers Ravine | Illinois Town 1 | Y | 1978 | 75 | 212 |
| Winchester | Significant | Private | Tributary of Orr Creek | N/A | Y | 1999 | 39 | 58 |

Source: Cal OES, DSOD, and the National Performance of Dams Program

*One Acre Foot=326,000 gallons

**Dam location and information provided by Placer County. These dams do not fall under the jurisdiction of the DSOD.

*Figure 4-48 Placer County – Dams of Concern Outside the County*

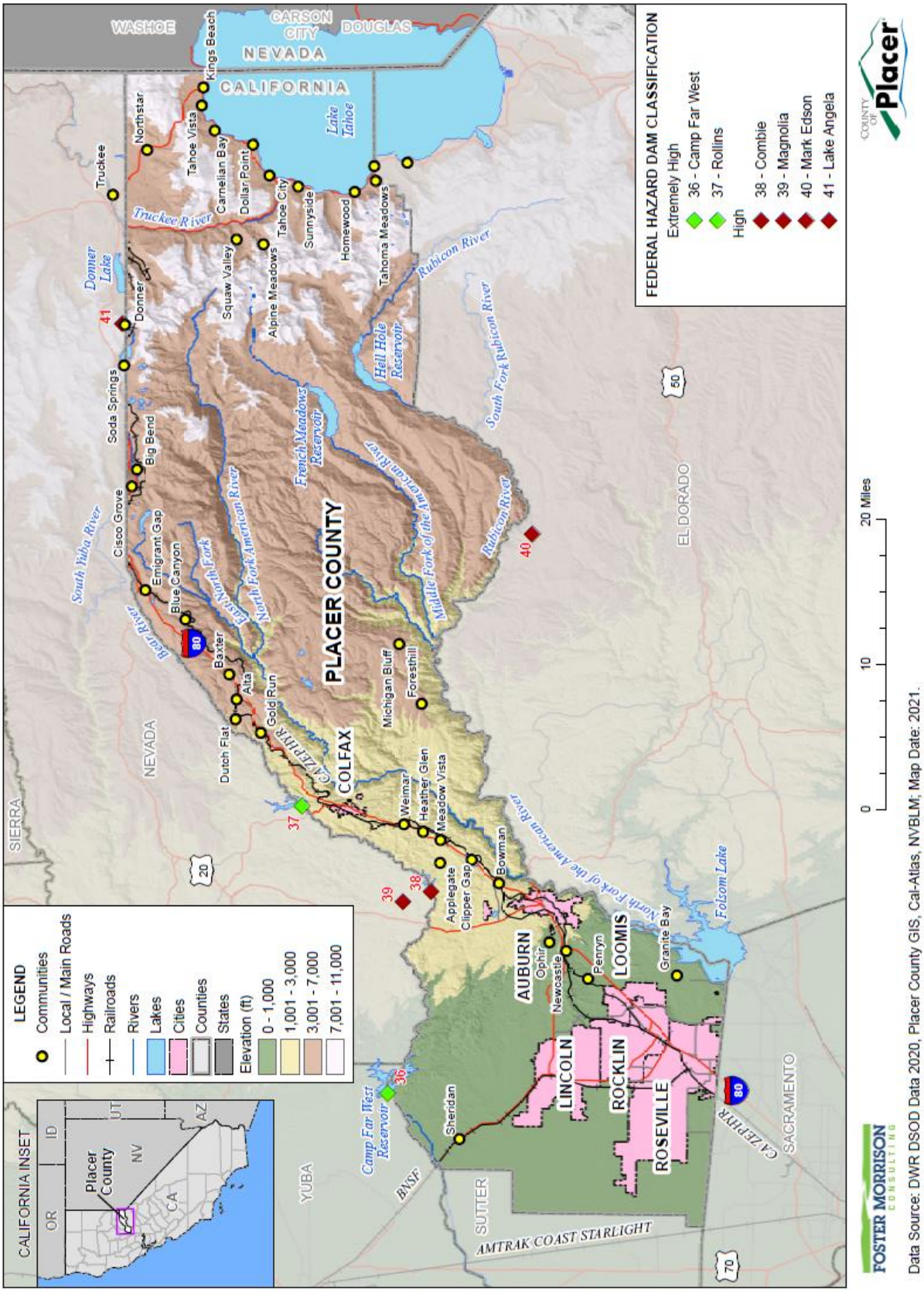


*Table 4-51 Dams of Concern Outside Placer County*

| Name (County) | River/Stream | Hazard Classification | Owner | Dam Type | Capacity (acre-ft) | Structural Height (ft) | Year Built |
|---|---|---|---|---|---|---|---|
| Camp Far West (Yuba) | Bear River | Extremely High | South Sutter Water District | Earth and Rock | 104,500 | 185 | 1963 |
| Rollins (Nevada) | Bear River | Extremely High | Nevada Irrigation District | Earth and Rock | 66,000 | 242 | 1911 |
| Combie (Nevada) | Bear River | High | Nevada Irrigation District | Variable Radius Arch | 5,555 | 80 | 1928 |
| Magnolia (Nevada) | Tributary of Bear River | High | Lake of the Pines Association | Earth and Rock | 4,150 | 58 | 1967 |
| Mark Edson (El Dorado) | Pilot Creek | High | Georgetown Divide PUD | Earth and Rock | 20,000 | 162 | 1962 |
| Lake Angela (Nevada) | Tributary of Yuba River | High | Donner Summit PUD | Rockfill | 310 | 28 | 1924 |

Source: Cal OES and the National Performance of Dams Program
*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 4-60 (for extremely high hazard dams) and Table 4-61 (for high hazard dams) in the flooded acres analysis in the vulnerability assessment of this section.

## Past Occurrences

### Disaster Declaration History

There has been no state or federal disaster declaration related to dam failure affecting Placer County, as shown in Table 4-4. The County had no USDA disaster declarations since 2002 related to dam failure, as shown on Table 4-6.

### NCDC Events

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

### Hazard Mitigation Planning Committee Events

According to the HMPC, there have been five dam failure type events:

- **Hell Hole Dam -** In **1964** construction of the Hell Hole dam was underway and the contractor had stopped operations for the winter. A major storm event (rains) occurred during December 1964 causing the Hell Hole Reservoir to fill and since the dam was not completed, it failed sending a considerable amount of water towards Auburn. 30,000 acre-feet of water washed out a bridge on Highway 49 over the American River at the confluence of the North and Middle Forks and flooded a quarry. Due to the way the construction contract was worded, the contractor had to rebuild the dam at his own expense. As a result, Placer County incurred no costs related to this event. No claims for damages were filed against PCWA by either the quarry owner or the state.
- **1986 Auburn Coffer Dam** – As a result of area flooding, the Coffer Dam at Auburn breached and partially washed away. The U.S. Bureau of Reclamation had designed the Coffer Dam for a controlled failure by building a soft earthen plug into the dam for this purpose. It appears the dam failed as designed.
- **August 2004 Ralston Dam Release Gate Break** – A broken release gate on Ralston Dam in the Middle Fork of the American River prompted the National Weather Service to issue a flash flood warning in Placer County. According to the PCWA, the gate near the Ralston Powerhouse malfunctioned at 6 a.m. The sudden release of water from Ralston Reservoir south of Auburn sent a "wall of water three to four-feet high" down the river. About 800 to 1,000 acre-feet of water were released, with flows peaking between 10-11 a.m. It was expected to reach Folsom Dam by 12 noon. Sheriff's deputies and California Highway Patrol officers alerted campers in the Auburn State Recreation Area to move to higher ground. The CHP was monitoring the muddy water as it approached Highway 49. There were no immediate reports of injuries or damage along the river, which is popular with rafters, kayakers and residents fleeing the summer heat.
- **August 2009 Cottonwood Dam** – a privately owned and constructed dam on Miners Ravine located within the Hidden Valley Estates subdivision (Auburn Folsom Rd and Twin Rocks Rd area of Granite Bay), failed and leached flows and sediment into Miners Ravine. NOAA/NMFS quickly became involved because of the impacts to critical fish species. A temporary fix (notch) in the concrete portion of the dam was approved and made while the HOA and interested agencies determined next steps. A dam removal project with creek restoration is now being proposed.
- **February 12, 2017 –** The Oroville Spillway in Butte County was at threat of collapse. A Level 3/OES & Public Health staffs only was declared and the EOC was opened. Evacuation & mutual aid support to Butte Co and other affected nearby counties was supplied by Placer County. No damages were sustained in the County.

### Likelihood of Future Occurrence

**Occasional**—The County remains at risk to dam breaches/failures from numerous dams under a variety of ownership and control and of varying ages and conditions. Given the number and types of dams in the

County and the history of past uncontrolled releases to dams, the potential exists for future dam issues in the Placer County Planning Area.

### 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 Placer County.

## *Vulnerability Assessment*

**Vulnerability**—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 Placer 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 and Mapped Dams

As detailed in Table 4-50, the County is vulnerable to a large number of extremely high, high, and significant hazard dams. The mapped dams analyzed for this Plan Update are:

### Dams inside Placer County

- Rock Creek (extremely high hazard dam)
- Christian Valley (high hazard dam)
- Drum Forebay (high hazard dam)
- Halsey Forebay (high hazard dam)
- Hinkle (high hazard dam)
- Kidd Lake Main (high hazard dam)
- Lake Arthur (high hazard dam)
- Lake Theodore (high hazard dam)
- Lake Valley (high hazard dam)
- LL Anderson (high hazard dam)
- Lower Peak Lake (high hazard dam)
- Mammoth Reservoir (high hazard dam)
- Reservoir A (high hazard dam)
- Spring Valley Ranch (high hazard dam)
- Sugar Pine(high hazard dam)
- Upper Peak Lake (high hazard dam)

### Dams outside Placer County

- Camp Far West (extremely high hazard dam)
- Rollins (extremely high hazard dam)
- Combie (high hazard dam)
- Lake Angela (high hazard dam)
- Magnolia (high hazard dam)
- Mark Edson (high hazard dam)

## 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 Inside the County and Outside the County dam analysis. Placer County's 2020 Parcel/Assessor Data, obtained from Placer 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. A modified methodology was used for both the Inside the County and Outside the County dam analysis. Placer County's 2020 Parcel/Assessor Data, obtained from Placer County, were used for the County inventory of parcels and values. GIS was used to perform analysis on the parcel layer. The dam inundation areas, obtained from Cal OES and DSOD, were then overlaid on the polygon parcel layer unlike the assets at risk analysis which was performed by centroid analysis. For the purposes of this analysis, if the dam inundation layer intersected any part of the polygon 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 Placer 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.

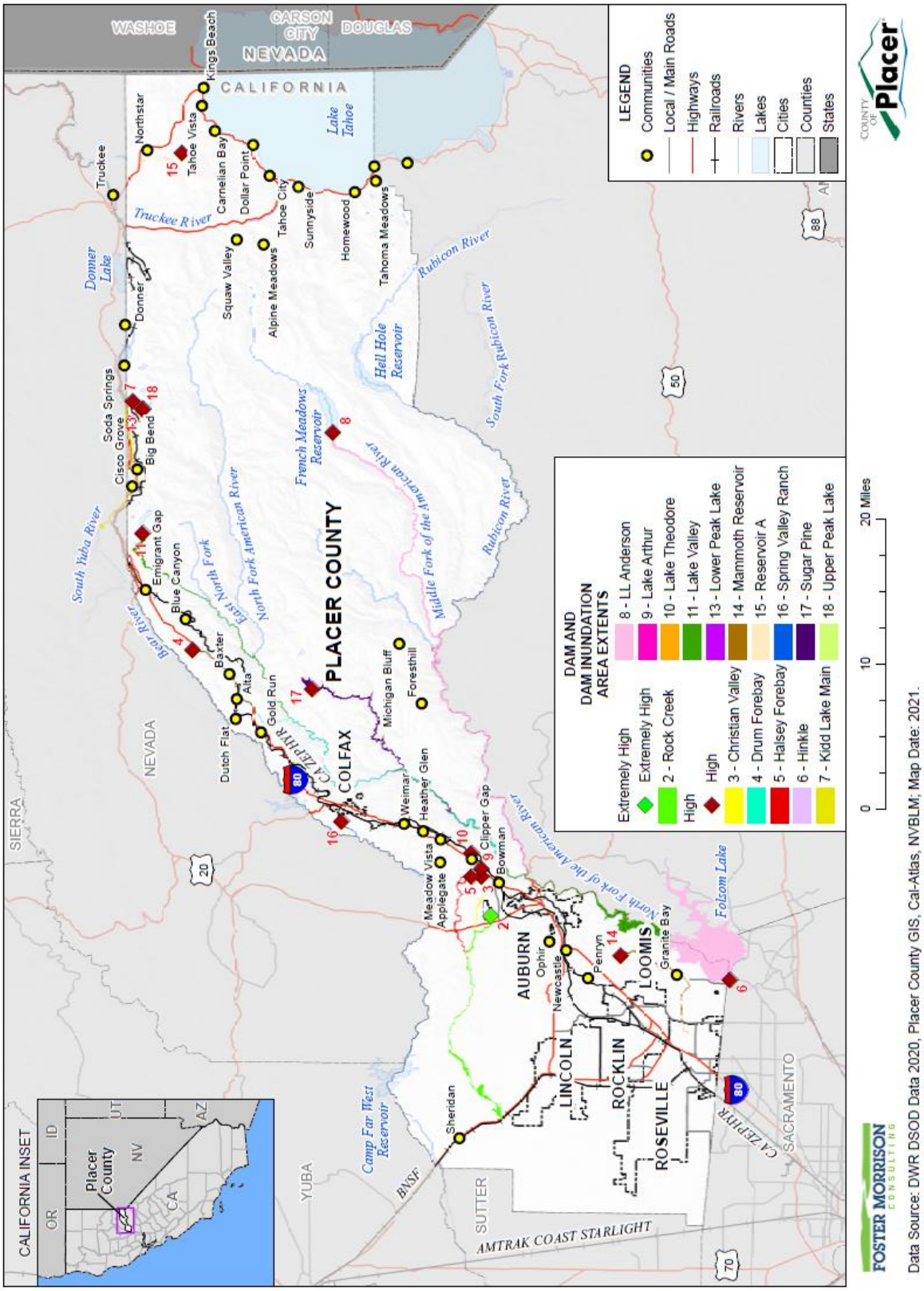
Also, it is important to keep in mind that these assessed values may be well below the actual market value of improved parcels located within the dam inundation areas due primarily to Proposition 13 and to a lesser extent, properties falling under the Williamson Act.

### *Dams Inside Placer County*

Dam inundation analysis was performed for the 1 extremely high and 15 high hazard dams located inside the County. Figure 4-49 shows the dam inundation areas of both the mapped extremely high and high hazard dams located inside County. The depth of flooding due to the failure of a dam is unknown. Analysis was performed in the following manner:

- Extremely High Hazard Dam
  - ✓ Table 4-52 the total parcel counts, improved parcel counts, their improved structure and land values in the extremely high hazard dam inundation areas in the Planning Area. Table 4-53 shows the property uses affected by each dam inundation area in unincorporated 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.
- High Hazard Dams
  - ✓ Table 4-54 the total parcel counts, improved parcel counts, their improved structure and land values in the high hazard dam inundation areas in the Planning Area. Table 4-55 shows the property uses affected by each dam inundation area in unincorporated 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.

## *Figure 4-49 Placer County – Extremely High and High Hazard Dam Inundation Areas inside County*



### *Table 4-52 Placer County Planning Area – Count and Value of Parcels in the Extremely High Hazard Dam Inundation Areas from Dams Inside the County*

| Dam | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Rock Creek | 208 | 131 | $39,415,718 | $57,675,695 | $43,813,872 | $140,905,285 |

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

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### *Table 4-53 Unincorporated Placer County – Count and Value of Parcels in the Extremely High Hazard Dam Inundation Areas by Property Use from Dams Inside the County*

| Dam/Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| **Rock Creek Dam** | | | | | | |
| Agricultural | 35 | 9 | $13,595,084 | $1,374,521 | $1,374,521 | $16,344,126 |
| Commercial | 7 | 4 | $1,818,195 | $4,702,846 | $4,702,846 | $11,223,887 |
| Industrial | 4 | 3 | $1,185,430 | $6,984,409 | $10,476,614 | $18,646,453 |
| Institutional | 2 | 1 | $289,493 | $7,625,696 | $7,625,696 | $15,540,885 |
| Miscellaneous | 31 | 1 | $2,502,431 | $15,688 | $15,688 | $2,533,807 |
| Natural / Open Space | 16 | 5 | $2,364,960 | $2,264,480 | $2,264,480 | $6,893,920 |
| Residential | 113 | 108 | $17,660,125 | $34,708,055 | $17,354,027 | $69,722,207 |
| **Total** | **208** | **131** | **$39,415,718** | **$57,675,695** | **$43,813,872** | **$140,905,285** |

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

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### *Table 4-54 Placer County Planning Area – Count and Value of Parcels in the High Hazard Dam Inundation Areas from Dams Inside the County*

| Dam | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Christian Valley | 214 | 129 | $35,244,536 | $40,569,595 | $21,839,466 | $97,653,597 |
| Drum Forebay | 231 | 20 | $7,977,364 | $3,894,239 | $2,237,232 | $14,108,835 |
| Halsey Forebay | 260 | 176 | $40,959,305 | $59,347,685 | $32,043,094 | $132,350,084 |
| Hinkle | 5 | 0 | $0 | $0 | $0 | $0 |
| Kidd Lake Main | 128 | 62 | $5,208,563 | $7,930,246 | $4,504,492 | $17,643,301 |

| Dam | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Lake Arthur | 165 | 97 | $20,202,247 | $33,240,967 | $17,502,220 | $70,945,434 |
| Lake Theodore | 192 | 112 | $21,832,216 | $35,207,590 | $18,758,185 | $75,797,991 |
| Lake Valley | 312 | 25 | $7,603,078 | $2,697,033 | $1,353,568 | $11,653,679 |
| LL Anderson | 188 | 4 | $1,553,188 | $1,993,099 | $996,550 | $4,542,837 |
| Lower Peak Lake | 87 | 34 | $4,252,881 | $5,137,469 | $3,729,941 | $13,120,291 |
| Mammoth Reservoir | 323 | 263 | $67,937,801 | $118,997,377 | $59,498,690 | $246,433,868 |
| Reservoir A | 79 | 49 | $13,109,762 | $21,469,965 | $11,490,576 | $46,070,303 |
| Spring Valley Ranch | 25 | 18 | $2,655,983 | $5,748,000 | $2,874,000 | $11,277,983 |
| Sugar Pine | 273 | 10 | $6,850,047 | $1,667,927 | $906,399 | $9,424,373 |
| Upper Peak Lake | 126 | 55 | $5,694,899 | $7,939,209 | $5,130,812 | $18,764,920 |

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

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### *Table 4-55 Unincorporated Placer County – Count and Value of Parcels in the High Hazard Dam Inundation Areas by Property Use from Dams Inside the County*

| Dam/Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| **Christian Valley Dam** | | | | | | |
| Agricultural | 32 | 8 | $12,337,499 | $1,071,260 | $1,071,260 | $14,480,019 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 1 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 48 | 1 | $3,739,626 | $15,688 | $15,688 | $3,771,002 |
| Natural / Open Space | 10 | 4 | $908,899 | $2,022,396 | $2,022,396 | $4,953,691 |
| Residential | 123 | 116 | $18,258,512 | $37,460,251 | $18,730,122 | $74,448,885 |
| **Total** | **214** | **129** | **$35,244,536** | **$40,569,595** | **$21,839,466** | **$97,653,597** |
| **Drum Forebay Dam** | | | | | | |
| Agricultural | 5 | 0 | $35,474 | $0 | $0 | $35,474 |
| Commercial | 3 | 1 | $375,839 | $200,000 | $200,000 | $775,839 |
| Industrial | 8 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 0 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 193 | 2 | $4,955,099 | $10,200 | $10,200 | $4,975,499 |

| Dam/Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Natural / Open Space | 6 | 1 | $463,235 | $370,026 | $370,026 | $1,203,287 |
| Residential | 16 | 16 | $2,147,717 | $3,314,013 | $1,657,006 | $7,118,736 |
| **Total** | **231** | **20** | **$7,977,364** | **$3,894,239** | **$2,237,232** | **$14,108,835** |
| **Halsey Forebay Dam** | | | | | | |
| Agricultural | 30 | 8 | $12,200,346 | $1,071,260 | $1,071,260 | $14,342,866 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 2 | 1 | $358,362 | $374,846 | $562,269 | $1,295,477 |
| Institutional | 5 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 35 | 1 | $2,607,856 | $15,688 | $15,688 | $2,639,232 |
| Natural / Open Space | 24 | 7 | $1,557,701 | $2,901,870 | $2,901,870 | $7,361,441 |
| Residential | 164 | 159 | $24,235,040 | $54,984,021 | $27,492,007 | $106,711,068 |
| **Total** | **260** | **176** | **$40,959,305** | **$59,347,685** | **$32,043,094** | **$132,350,084** |
| **Hinkle Dam** | | | | | | |
| Agricultural | 0 | 0 | $0 | $0 | $0 | $0 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 0 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 5 | 0 | $0 | $0 | $0 | $0 |
| Natural / Open Space | 0 | 0 | $0 | $0 | $0 | $0 |
| Residential | 0 | 0 | $0 | $0 | $0 | $0 |
| **Total** | **5** | **0** | **$0** | **$0** | **$0** | **$0** |
| **Kidd Lake Dam** | | | | | | |
| Agricultural | 6 | 0 | $109,531 | $0 | $0 | $109,531 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 3 | 1 | $242,870 | $1,028,309 | $1,028,309 | $2,299,488 |
| Institutional | 1 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 48 | 1 | $1,511,603 | $50,428 | $50,428 | $1,612,459 |
| Natural / Open Space | 7 | 0 | $102,000 | $0 | $0 | $102,000 |
| Residential | 63 | 60 | $3,242,559 | $6,851,509 | $3,425,755 | $13,519,823 |
| **Total** | **128** | **62** | **$5,208,563** | **$7,930,246** | **$4,504,492** | **$17,643,301** |
| **Lake Arthur Dam** | | | | | | |
| Agricultural | 15 | 2 | $1,148,062 | $278,700 | $278,700 | $1,705,462 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |

| Dam/Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Industrial | 2 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 0 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 43 | 0 | $3,461,881 | $0 | $0 | $3,461,881 |
| Natural / Open Space | 3 | 1 | $475,309 | $1,484,779 | $1,484,779 | $3,444,867 |
| Residential | 102 | 94 | $15,116,995 | $31,477,488 | $15,738,741 | $62,333,224 |
| **Total** | **165** | **97** | **$20,202,247** | **$33,240,967** | **$17,502,220** | **$70,945,434** |
| **Lake Theodore Dam** | | | | | | |
| Agricultural | 15 | 2 | $1,148,062 | $278,700 | $278,700 | $1,705,462 |
| Commercial | 2 | 1 | $46,847 | $52,350 | $52,350 | $151,547 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 4 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 55 | 2 | $3,777,787 | $492,953 | $492,953 | $4,763,693 |
| Natural / Open Space | 3 | 1 | $475,309 | $1,484,779 | $1,484,779 | $3,444,867 |
| Residential | 113 | 106 | $16,384,211 | $32,898,808 | $16,449,403 | $65,732,422 |
| **Total** | **192** | **112** | **$21,832,216** | **$35,207,590** | **$18,758,185** | **$75,797,991** |
| **Lake Valley Dam** | | | | | | |
| Agricultural | 8 | 0 | $231,406 | $0 | $0 | $231,406 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 16 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 255 | 2 | $4,985,808 | $10,100 | $10,100 | $5,006,008 |
| Natural / Open Space | 9 | 0 | $88,025 | $0 | $0 | $88,025 |
| Residential | 23 | 23 | $2,297,839 | $2,686,933 | $1,343,468 | $6,328,240 |
| **Total** | **311** | **25** | **$7,603,078** | **$2,697,033** | **$1,353,568** | **$11,653,679** |
| **LL Anderson Dam** | | | | | | |
| Agricultural | 14 | 0 | $161,129 | $0 | $0 | $161,129 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 3 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 157 | 0 | $378,104 | $0 | $0 | $378,104 |
| Natural / Open Space | 5 | 0 | $0 | $0 | $0 | $0 |
| Residential | 5 | 3 | $724,791 | $886,535 | $443,268 | $2,054,594 |
| **Total** | **184** | **3** | **$1,264,024** | **$886,535** | **$443,268** | **$2,593,827** |

| Dam/Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| **Lower Peak Lake Dam** | | | | | | |
| Agricultural | 6 | 0 | $109,841 | $0 | $0 | $109,841 |
| Commercial | 5 | 3 | $1,234,485 | $2,265,022 | $2,265,022 | $5,764,529 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 1 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 39 | 2 | $1,066,386 | $57,392 | $57,392 | $1,181,170 |
| Natural / Open Space | 5 | 0 | $102,000 | $0 | $0 | $102,000 |
| Residential | 31 | 29 | $1,740,169 | $2,815,055 | $1,407,527 | $5,962,751 |
| **Total** | **87** | **34** | **$4,252,881** | **$5,137,469** | **$3,729,941** | **$13,120,291** |
| **Mammoth Reservoir Dam** | | | | | | |
| Agricultural | 4 | 0 | $15,075,318 | $0 | $0 | $15,075,318 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 1 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 38 | 0 | $1,794,766 | $0 | $0 | $1,794,766 |
| Natural / Open Space | 13 | 0 | $0 | $0 | $0 | $0 |
| Residential | 267 | 263 | $51,067,717 | $118,997,377 | $59,498,690 | $229,563,784 |
| **Total** | **323** | **263** | **$67,937,801** | **$118,997,377** | **$59,498,690** | **$246,433,868** |
| **Reservoir A Dam** | | | | | | |
| Agricultural | 4 | 0 | $64,136 | $0 | $0 | $64,136 |
| Commercial | 2 | 1 | $64,481 | $585,733 | $585,733 | $1,235,947 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 5 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 7 | 0 | $4,080 | $0 | $0 | $4,080 |
| Natural / Open Space | 17 | 4 | $2,645,343 | $925,451 | $925,451 | $4,496,245 |
| Residential | 44 | 44 | $10,331,722 | $19,958,781 | $9,979,392 | $40,269,895 |
| **Total** | **79** | **49** | **$13,109,762** | **$21,469,965** | **$11,490,576** | **$46,070,303** |
| **Spring Valley Ranch Dam** | | | | | | |
| Agricultural | 0 | 0 | $0 | $0 | $0 | $0 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 0 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 7 | 0 | $433,921 | $0 | $0 | $433,921 |

| Dam/Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Natural / Open Space | 0 | 0 | $0 | $0 | $0 | $0 |
| Residential | 18 | 18 | $2,222,062 | $5,748,000 | $2,874,000 | $10,844,062 |
| **Total** | **25** | **18** | **$2,655,983** | **$5,748,000** | **$2,874,000** | **$11,277,983** |
| **Sugar Pine Dam** | | | | | | |
| Agricultural | 19 | 0 | $162,178 | $0 | $0 | $162,178 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 15 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 0 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 224 | 3 | $5,617,249 | $144,870 | $144,870 | $5,906,989 |
| Natural / Open Space | 6 | 0 | $100,974 | $0 | $0 | $100,974 |
| Residential | 8 | 7 | $969,646 | $1,523,057 | $761,529 | $3,254,232 |
| **Total** | **272** | **10** | **$6,850,047** | **$1,667,927** | **$906,399** | **$9,424,373** |
| **Upper Peak Lake Dam** | | | | | | |
| Agricultural | 8 | 0 | $130,593 | $0 | $0 | $130,593 |
| Commercial | 5 | 3 | $1,234,485 | $2,265,022 | $2,265,022 | $5,764,529 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 1 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 53 | 2 | $1,505,326 | $57,392 | $57,392 | $1,620,110 |
| Natural / Open Space | 7 | 0 | $102,000 | $0 | $0 | $102,000 |
| Residential | 52 | 50 | $2,722,495 | $5,616,795 | $2,808,398 | $11,147,688 |
| **Total** | **126** | **55** | **$5,694,899** | **$7,939,209** | **$5,130,812** | **$18,764,920** |

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

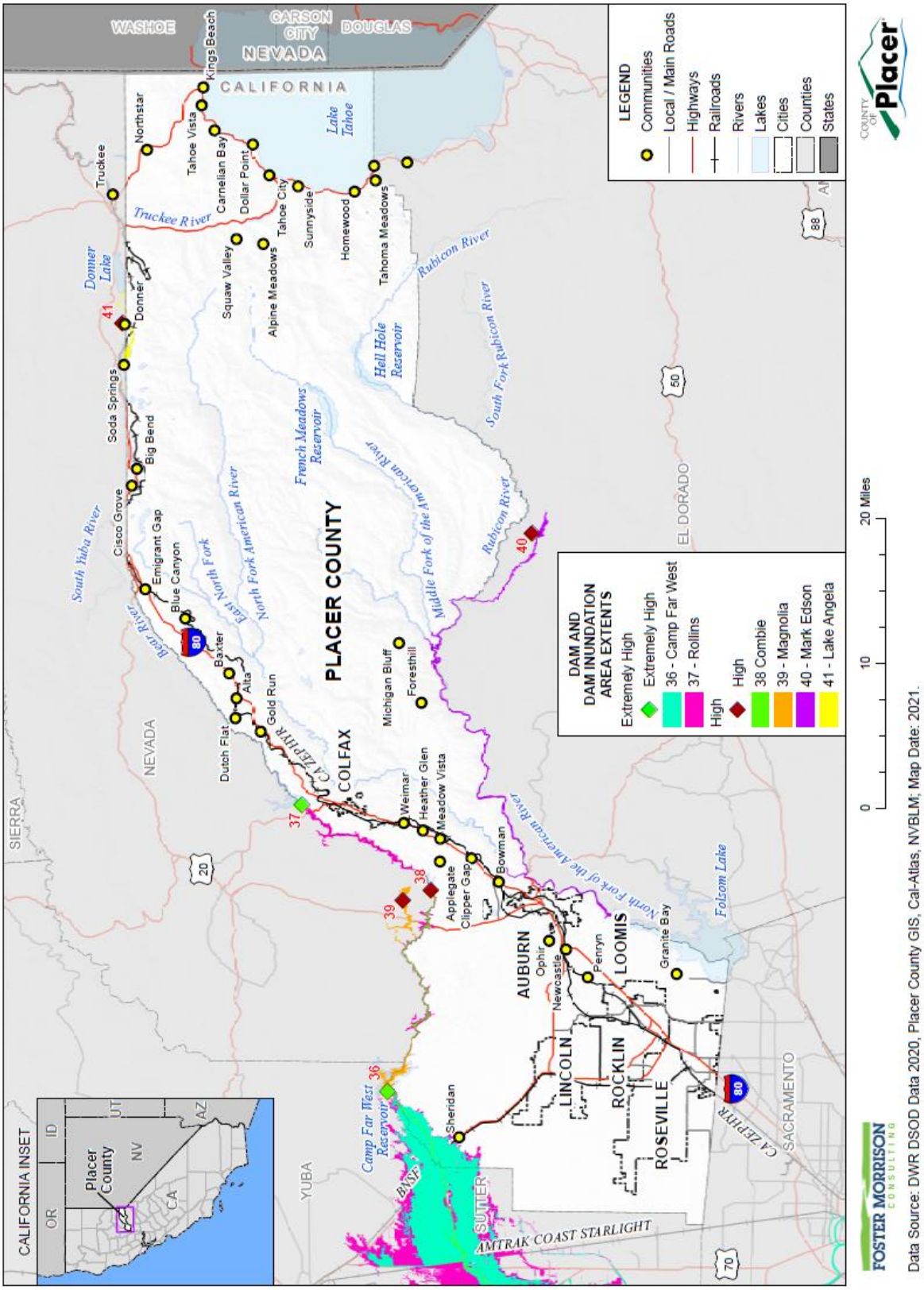
### *Dams Outside of Placer County*

Dam inundation analysis was performed for the 2 extremely high and 15 high hazard dams located outside to the County. Figure 4-50 shows the dam inundation areas of both the mapped extremely high and high hazard dams located outside County that have inundation areas inside the County. The depth of flooding due to the failure of a dam is unknown. Analysis was performed in the following manner:

- Extremely High Hazard Dams
  - ✓ Table 4-56 the total parcel counts, improved parcel counts, their improved structure and land values in the extremely high hazard dam inundation areas in the Planning Area.
  - ✓ Table 4-57 shows the property uses affected by each dam inundation area in unincorporated 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.

- High Hazard Dams
  - ✓ Table 4-58 the total parcel counts, improved parcel counts, their improved structure and land values in the high hazard dam inundation areas in the Planning Area. Table 4-59 shows the property uses affected by each dam inundation area in unincorporated 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.

*Figure 4-50 Placer County – Extremely High and High Hazard Dam Inundation Areas Outside County*



### *Table 4-56 Placer County Planning Area – Count and Value of Parcels in the Extremely High Hazard Dam Inundation Areas from Dams Outside the County*

| Dam | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Camp Far West | 157 | 44 | $32,843,478 | $8,321,974 | $6,310,190 | $47,475,642 |
| Rollins | 361 | 147 | $64,627,630 | $40,366,068 | $22,645,038 | $127,638,736 |

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

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### *Table 4-57 Unincorporated Placer County – Count and Value of Parcels in the Extremely High Hazard Dam Inundation Areas from Dams Outside the County*

| Dam/Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| **Camp Far West Dam** | | | | | | |
| Agricultural | 44 | 10 | $13,050,063 | $1,166,429 | $1,166,429 | $15,382,921 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 0 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 59 | 1 | $3,526,211 | $549,403 | $549,403 | $4,625,017 |
| Natural / Open Space | 35 | 16 | $7,818,247 | $2,582,571 | $2,582,571 | $12,983,389 |
| Residential | 19 | 17 | $8,448,957 | $4,023,571 | $2,011,787 | $14,484,315 |
| **Total** | **157** | **44** | **$32,843,478** | **$8,321,974** | **$6,310,190** | **$47,475,642** |
| **Rollins Dam** | | | | | | |
| Agricultural | 63 | 15 | $19,014,317 | $1,694,202 | $1,694,202 | $22,402,721 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 0 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 139 | 3 | $12,576,210 | $559,605 | $559,605 | $13,695,420 |
| Natural / Open Space | 40 | 16 | $7,719,168 | $2,670,193 | $2,670,193 | $13,059,554 |
| Residential | 119 | 113 | $25,317,935 | $35,442,068 | $17,721,038 | $78,481,041 |
| **Total** | **361** | **147** | **$64,627,630** | **$40,366,068** | **$22,645,038** | **$127,638,736** |

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

### *Table 4-58 Placer County Planning Area – Count and Value of Parcels in the High Hazard Dam Inundation Areas from Dams Outside the County*

| Dam | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Combie | 101 | 33 | $22,416,636 | $15,074,339 | $7,988,466 | $45,479,441 |
| Lake Angela | 35 | 6 | $2,312,218 | $4,801,250 | $3,183,440 | $10,296,908 |
| Magnolia | 57 | 12 | $13,429,895 | $9,341,895 | $4,690,508 | $27,462,298 |
| Mark Edson | 121 | 2 | $978,340 | $835,448 | $417,724 | $2,231,512 |

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

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### *Table 4-59 Unincorporated Placer County – Count and Value of Parcels in the High Hazard Dam Inundation Areas by Property Use from Dams Outside the County*

| Dam/Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| **Combie Dam** | | | | | | |
| Agricultural | 25 | 3 | $7,223,316 | $175,362 | $175,362 | $7,574,040 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 0 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 43 | 1 | $7,162,858 | $549,403 | $549,403 | $8,261,664 |
| Natural / Open Space | 7 | 3 | $929,549 | $177,825 | $177,825 | $1,285,199 |
| Residential | 26 | 26 | $7,100,913 | $14,171,749 | $7,085,876 | $28,358,538 |
| **Total** | **101** | **33** | **$22,416,636** | **$15,074,339** | **$7,988,466** | **$45,479,441** |
| **Lake Angela Dam** | | | | | | |
| Agricultural | 1 | 0 | $324 | $0 | $0 | $324 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 0 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 23 | 0 | $1,026,756 | $0 | $0 | $1,026,756 |
| Natural / Open Space | 5 | 3 | $495,499 | $1,565,630 | $1,565,630 | $3,626,759 |
| Residential | 6 | 3 | $789,639 | $3,235,620 | $1,617,810 | $5,643,069 |
| **Total** | **35** | **6** | **$2,312,218** | **$4,801,250** | **$3,183,440** | **$10,296,908** |
| **Magnolia Dam** | | | | | | |
| Agricultural | 11 | 2 | $5,071,367 | $28,423 | $28,423 | $5,128,213 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |

| Dam/Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 0 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 29 | 2 | $4,278,024 | $10,694 | $10,694 | $4,299,412 |
| Natural / Open Space | 9 | 0 | $135,067 | $0 | $0 | $135,067 |
| Residential | 8 | 8 | $3,945,437 | $9,302,778 | $4,651,391 | $17,899,606 |
| **Total** | **57** | **12** | **$13,429,895** | **$9,341,895** | **$4,690,508** | **$27,462,298** |
| **Mark Edson Dam** | | | | | | |
| Agricultural | 3 | 0 | $29,270 | $0 | $0 | $29,270 |
| Commercial | 0 | 0 | $0 | $0 | $0 | $0 |
| Industrial | 0 | 0 | $0 | $0 | $0 | $0 |
| Institutional | 1 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 109 | 0 | $370,274 | $0 | $0 | $370,274 |
| Natural / Open Space | 2 | 0 | $0 | $0 | $0 | $0 |
| Residential | 5 | 2 | $578,796 | $835,448 | $417,724 | $1,831,968 |
| **Total** | **120** | **2** | **$978,340** | **$835,448** | **$417,724** | **$2,231,512** |

Source: Placer 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, 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 Placer County parcel layer and inundation areas were intersected, and each segment divided by the intersection of inundation area, and was affected areas were 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 analysis of total acres for each dam inundation area in the Planning Area. Table 4-60 shows the flooded acres of the Placer County Planning Area in the inundation areas of each extremely high and high hazard dam located inside the County. Table 4-61 shows the flooded acres of the Placer County Planning Area in the inundation areas of each extremely high and high hazard dam located outside the County.

### *Table 4-60 Placer County – Flooded Acres from Extremely High and High Hazard Dams Inside of the County*

| Dam Inundation Areas | Jurisdiction | Total Acres | % of Total Acres | Improved Acres | % of Total Improved Acres | Unimproved Acres | % of Total Unimproved Acres |
|---|---|---|---|---|---|---|---|
| **Extremely High Hazard Dams** | | | | | | | |
| Rock Creek | Unincorporated Placer County | 946.52 | 0.1053% | 447.20 | 0.25% | 499.33 | 0.0694% |
| **High Hazard Dams** | | | | | | | |
| Christian Valley | Unincorporated Placer County | 363.28 | 0.0404% | 174.53 | 0.0969% | 188.75 | 0.0262% |
| Drum Forebay | Unincorporated Placer County | 823.69 | 0.0916% | 39.43 | 0.0219% | 784.26 | 0.1091% |
| Halsey Forebay | Unincorporated Placer County | 587.59 | 0.0653% | 308.63 | 0.1714% | 278.96 | 0.0388% |
| Hinkle | Unincorporated Placer County | 6.88 | 0.0008% | | | 6.88 | 0.0010% |
| Kidd Lake Main | Unincorporated Placer County | 332.93 | 0.0370% | 39.67 | 0.0220% | 293.26 | 0.0408% |
| Lake Arthur | Unincorporated Placer County | 110.34 | 0.0123% | 29.90 | 0.0166% | 80.45 | 0.0112% |
| Lake Theodore | Unincorporated Placer County | 150.37 | 0.0167% | 40.71 | 0.0226% | 109.66 | 0.0152% |
| Lake Valley | Auburn | 0.92 | 0.0001% | 0.36 | 0.0002% | 0.92 | 0.0001% |
| LakeValley | Unincorporated Placer County | 1,734.23 | 0.1929% | 20.12 | 0.0112% | 1,688.03 | 0.2347% |
| LL Anderson | Auburn | 11.14 | 0.0012% | 0.36 | 0.0002% | 10.78 | 0.0015% |
| LL Anderson | Unincorporated Placer County | 3,391.86 | 0.3772% | 20.12 | 0.0112% | 3,371.75 | 0.4689% |
| Lower Peak Lake | Unincorporated Placer County | 214.25 | 0.0238% | 26.99 | 0.0150% | 187.26 | 0.0260% |
| Mammoth Reservoir | Unincorporated Placer County | 321.66 | 0.0358% | 239.82 | 0.1332% | 81.83 | 0.0114% |
| Reservoir A | Unincorporated Placer County | 143.00 | 0.0159% | 41.72 | 0.0232% | 101.28 | 0.0141% |

| Dam Inundation Areas | Jurisdiction | Total Acres | % of Total Acres | Improved Acres | % of Total Improved Acres | Unimproved Acres | % of Total Unimproved Acres |
|---|---|---|---|---|---|---|---|
| Spring Valley Ranch | Unincorporated Placer County | 40.17 | 0.0045% | 24.52 | 0.0136% | 15.65 | 0.0022% |
| Sugar Pine | Auburn | 1.64 | 0.0002% | | | 1.64 | 0.0002% |
| Sugar Pine | Unincorporated Placer County | 2,011.65 | 0.2237% | 142.67 | 0.0792% | 1,868.98 | 0.2599% |
| Upper Peak Lake | Unincorporated Placer County | 377.80 | 0.0420% | 45.64 | 0.0253% | 332.15 | 0.0462% |

Source: Cal OES, DSOD

*Table 4-61 Placer County – Flooded Acres from Extremely High and High Hazard Dams Outside of the County*

| Dam Inundation Areas | Jurisdiction | Total Acres | % of Total Acres | Improved Acres | % of Total Improved Acres | Unimproved Acres | % of Total Unimproved Acres |
|---|---|---|---|---|---|---|---|
| **Extremely High Hazard Dams** | | | | | | | |
| Camp Far West | Unincorporated Placer County | 4,807.40 | 0.5347% | 2,082.63 | 1.16% | 2,724.77 | 0.3789% |
| Rollins | Unincorporated Placer County | 6,583.24 | 0.7322% | 2,666.17 | 1.48% | 3,917.06 | 0.5447% |
| **High Hazard Dams** | | | | | | | |
| Combie | Unincorporated Placer County | 401.80 | 0.0447% | 109.35 | 0.06% | 292.46 | 0.0407% |
| Lake Angela | Unincorporated Placer County | 203.43 | 0.0226% | 12.33 | 0.01% | 191.10 | 0.0266% |
| Magnolia | Unincorporated Placer County | 587.84 | 0.0654% | 39.24 | 0.02% | 548.60 | 0.0763% |
| Mark Edson | Unincorporated Placer County | 203.43 | 0.0226% | 12.33 | 0.01% | 191.10 | 0.0266% |

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 overlayed 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 Placer County and its jurisdictions. The following tables were created:

- Table 4-62 shows the populations at risk to dam failure flooding for extremely high and high hazard dams located inside the County.
- Table 4-63 shows the populations at risk to dam failure flooding for high hazard dams located inside the County.

It is unlikely that all dams that could affect Placer County would fail at the same time. The unincorporated County is the only jurisdiction with residential populations in dam inundation zones. While Auburn has some inundation areas, there are no affected residential parcels.

***Table 4-62 Placer County Planning Area – Residential Population at Risk in Extremely High and High Hazard Dam Inundation Area from Dams Inside the County***

| | City of Auburn | | City of Colfax | | City of Lincoln | | Town of Loomis | | City of Rocklin | | Unincorporated County | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dam | Impr. Res. Parcels | Pop. | Impr. Res. Parcels | Pop. | Impr. Res. Parcels | Pop. | Impr. Res. Parcels | Pop. | Impr. Res. Parcels | Pop. | Impr. Res. Parcels | Pop. |
| **Extremely High Hazard Dams** | | | | | | | | | | | | |
| Rock Creek | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 108 | 279 |
| **High Hazard Dams** | | | | | | | | | | | | |
| Christian Valley | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 116 | 299 |
| Drum Forebay | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 41 |
| Halsey Forebay | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 159 | 410 |
| Hinkle | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kidd Lake Main | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60 | 155 |
| Lake Arthur | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 94 | 242 |
| Lake Theodore | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 106 | 273 |
| Lake Valley | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 59 |
| LL Anderson | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 8 |
| Lower Peak Lake | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 75 |
| Mammoth Reservoir | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 263 | 679 |
| Reservoir A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 114 |
| Spring Valley Ranch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 46 |
| Sugar Pine | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 18 |
| Upper Peak Lake | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 129 |

Source: Cal OES Dam Inundation Data, US Census Bureau Average Household Sizes: Auburn (2.19); Colfax (2.30); Lincoln (2.57); Loomis (2.60), Rocklin (2.68); and unincorporated Placer County (2.58)
The City of Roseville is not included in the calculations of populations at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

***Table 4-63 Placer County Planning Area – Residential Population at Risk in Extremely High and High Hazard Dam Inundation Area from Dams Outside the County***

| | City of Auburn | | City of Colfax | | City of Lincoln | | Town of Loomis | | City of Rocklin | | Unincorporated County | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dam | Impr. Res. Parcels | Pop. | Impr. Res. Parcels | Pop. | Impr. Res. Parcels | Pop. | Impr. Res. Parcels | Pop. | Impr. Res. Parcels | Pop. | Impr. Res. Parcels | Pop. |
| **Extremely High Hazard Dams** | | | | | | | | | | | | |
| Camp Far West | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 44 |
| Rollins | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 113 | 292 |
| **High Hazard Dams** | | | | | | | | | | | | |
| Combie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 67 |
| Lake Angela | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 8 |
| Magnolia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 21 |
| Mark Edson | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 5 |

Source: Cal OES Dam Inundation Data, US Census Bureau Average Household Sizes: Auburn (2.19); Colfax (2.30); Lincoln (2.57); Loomis (2.60), Rocklin (2.68); and unincorporated Placer County (2.58)
The City of Roseville is not included in the calculations of populations at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

## Critical Facilities at Risk

***A separate analysis was performed on the critical facility inventory in Placer County to determine critical facilities that fall in mapped dam inundation areas. Using GIS, the Cal OES and DSOD dam inundation layers were overlayed on the critical facility GIS layer. Figure 4-51 shows critical facilities that fall inside of dam inundation areas from dams originating inside of Placer County. Table 4-64 details the critical facilities that fall inside dam inundation areas from dams originating inside of Placer County. Table 4-64 Placer County Planning Area – Critical Facilities in Dam Inundation Areas from Dams Inside the County***

| Jurisdiction | Critical Facility Class | Critical Facility Type / Critical Facility Name | Facility Count |
|---|---|---|---|
| **Rock Creek Dam** | | | |
| Unincorporated Placer County | Class 3 | **Hazardous Materials Facility** | |
| | | NID/Locksley | 1 |
| | | Placer County DPW | 2 |

| | | | |
|---|---|---|---|
| | | **Water Treatment Plant** | |
| | | NID North Auburn Water Treatment Plant | 1 |
| **Unincorporated Placer County Total** | | | **4** |
| **Kidd Lake Main** | | | |
| Unincorporated Placer County | Class 2 | **Fire Station** | |
| | | USFS FS #34- Soda Springs | 1 |
| **Unincorporated Placer County Total** | | | **1** |
| **Upper Peak Lake** | | | |
| Unincorporated Placer County | Class 2 | **Fire Station** | |
| | | USFS FS #34- Soda Springs | 1 |
| Unincorporated Placer County Total | | | 1 |

Source: Cal OES, DSOD, Placer County GIS

Figure 4-52 shows critical facilities that fall inside of dam inundation areas from dams originating outside of Placer County. No critical facilities fall in dam inundation areas from dams that originate outside of the County. As such, no tabular analysis was performed.

***Figure 4-51 Placer County Planning Area – Critical Facilities in Dam Inundation Areas from Dams Inside the County***

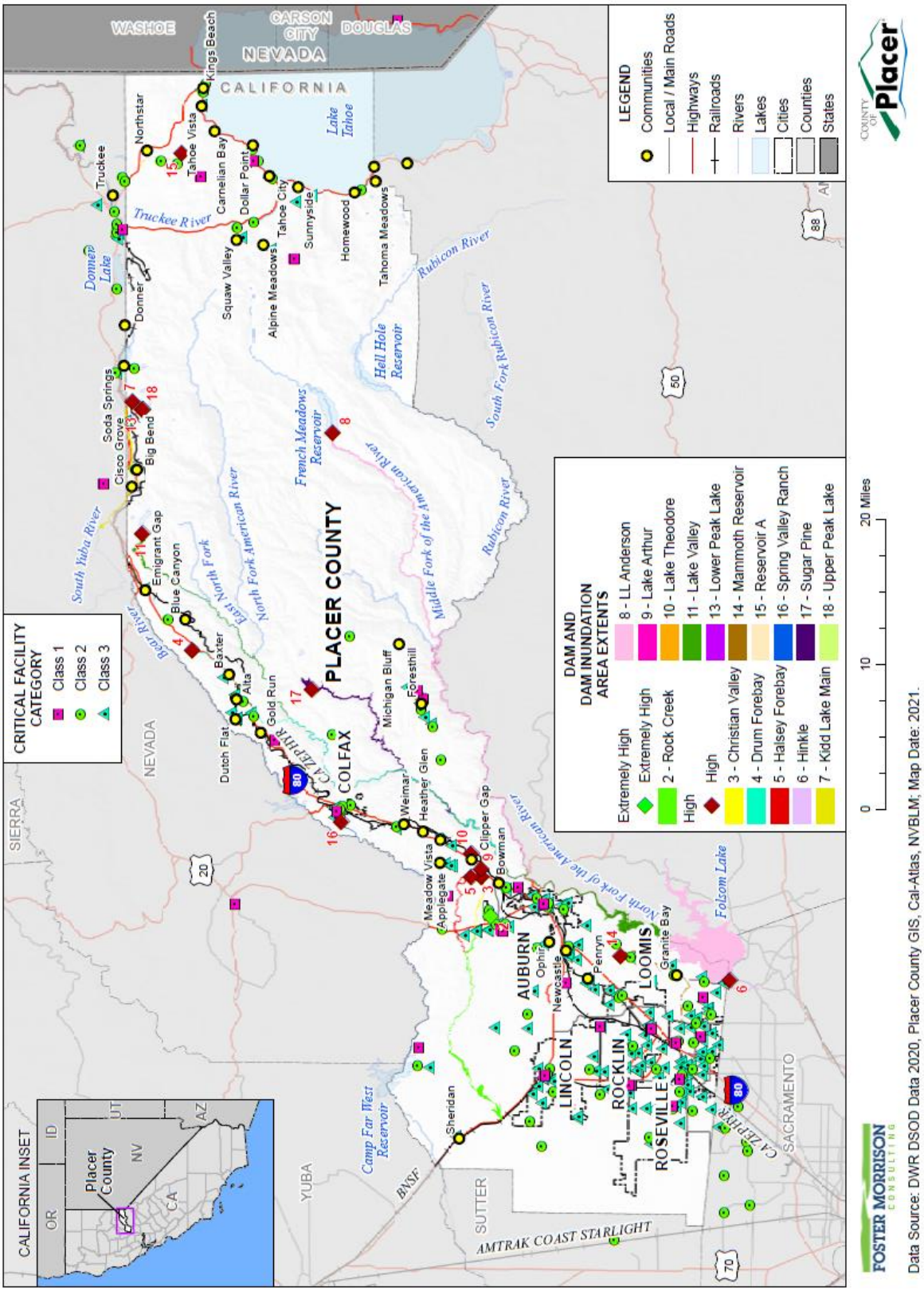
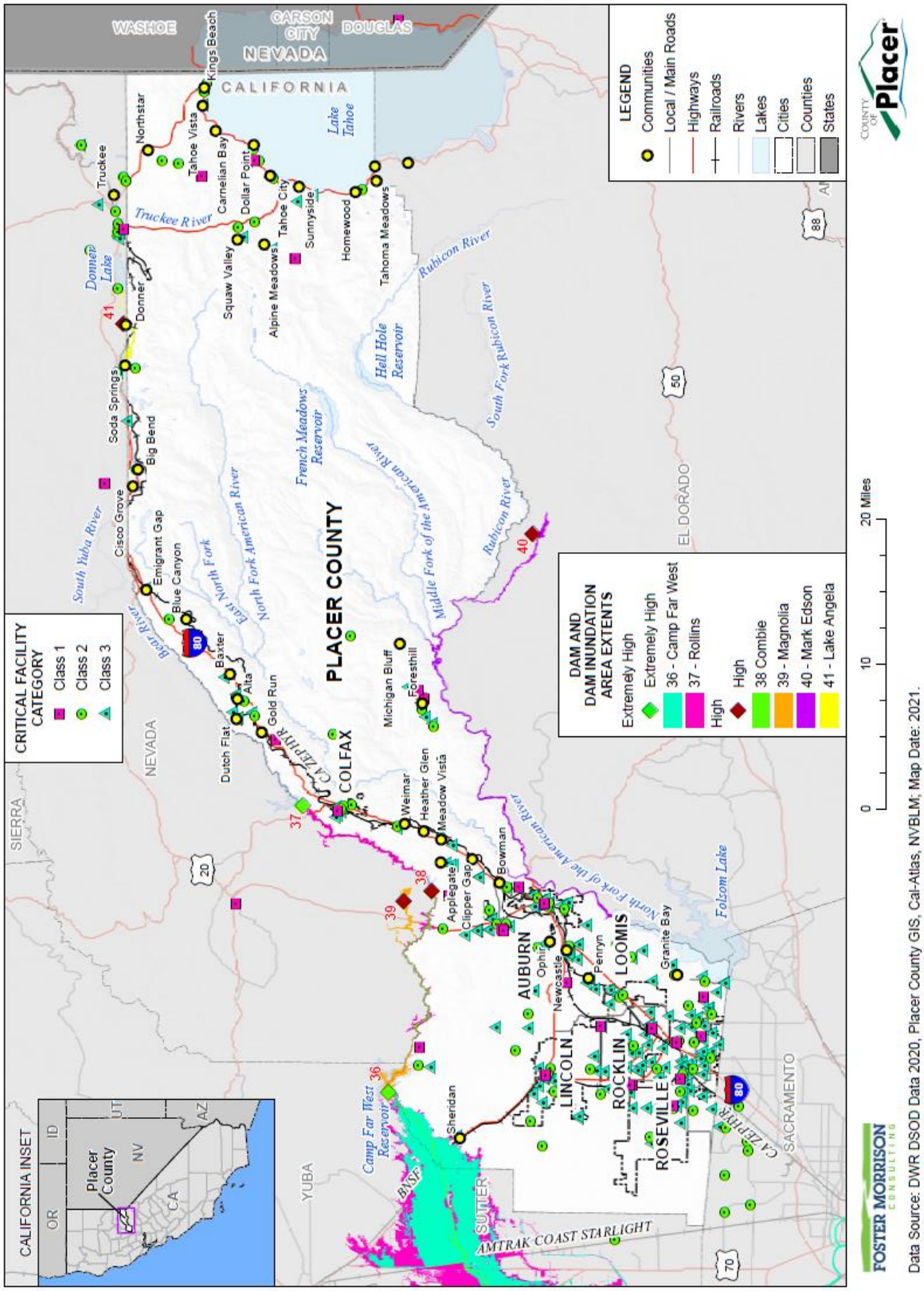


*Table 4-64 Placer County Planning Area – Critical Facilities in Dam Inundation Areas from Dams Inside the County*

| Jurisdiction | Critical Facility Class | Critical Facility Type / Critical Facility Name | Facility Count |
|---|---|---|---|
| **Rock Creek Dam** | | | |
| Unincorporated Placer County | Class 3 | **Hazardous Materials Facility** | |
| | | NID/Locksley | 1 |
| | | Placer County DPW | 2 |
| | | **Water Treatment Plant** | |
| | | NID North Auburn Water Treatment Plant | 1 |
| **Unincorporated Placer County Total** | | | **4** |
| **Kidd Lake Main** | | | |
| Unincorporated Placer County | Class 2 | **Fire Station** | |
| | | USFS FS #34- Soda Springs | 1 |
| **Unincorporated Placer County Total** | | | **1** |
| **Upper Peak Lake** | | | |
| Unincorporated Placer County | Class 2 | **Fire Station** | |
| | | USFS FS #34- Soda Springs | 1 |
| Unincorporated Placer County Total | | | 1 |

Source: Cal OES, DSOD, Placer County GIS

***Figure 4-52 Placer County Planning Area – Critical Facilities in Dam Inundation Areas from Dams Outside the County***



### 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 Placer 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 lands and industry;
- 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 may fall in the areas 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

INSERT

## 4.3.10. Drought and Water Shortage

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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

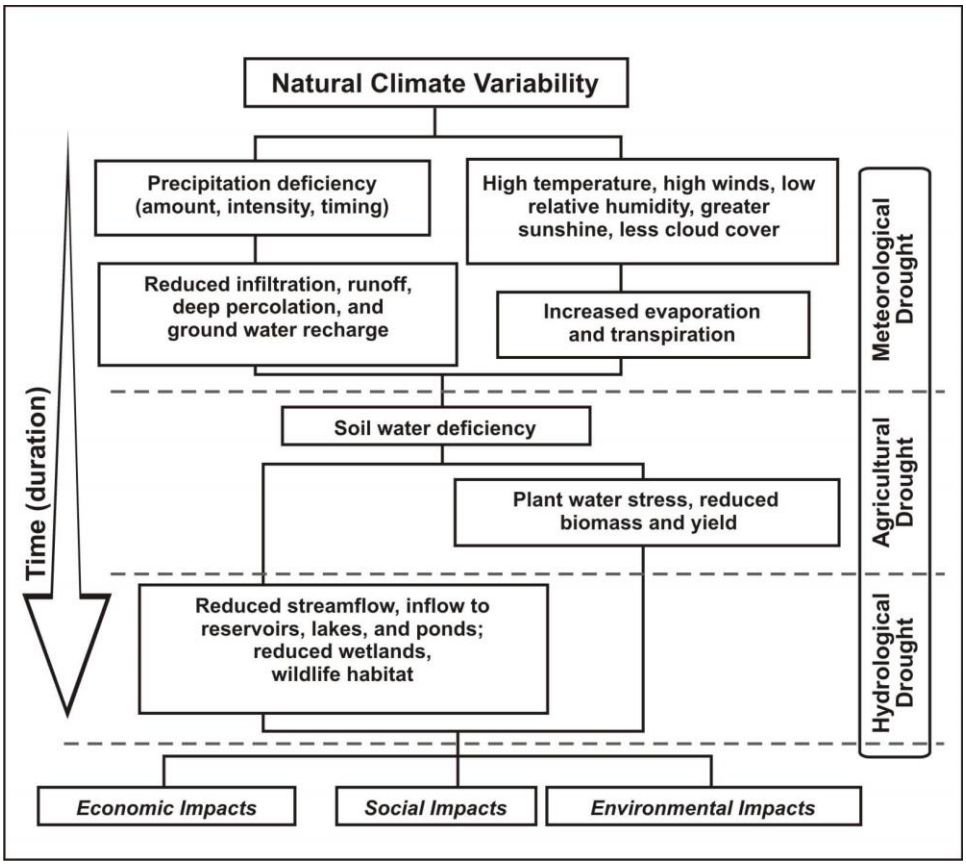
Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, 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 projects to mitigate the effects of a drought and water supply shortage.

Drought is a complex issue involving (see Figure 4-53) 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 4-53 Causes and Impact of Drought*



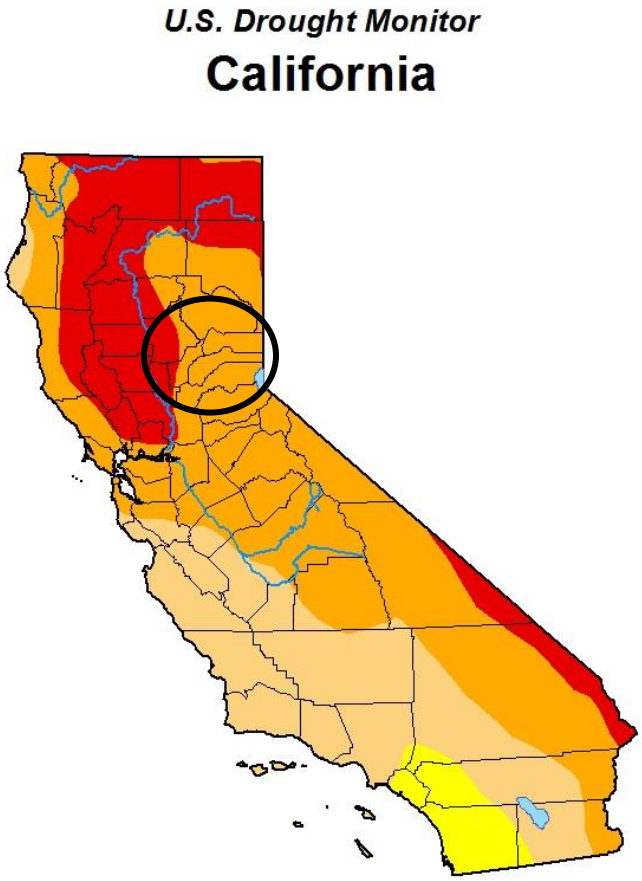

Source: National Drought Mitigation Center (NDMC)

The HMPC noted that drought can cause increased wildfire risk, discussed in Section 4.3.17. During periods of drought, subsidence can also occur.

### *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 Placer County (2020) can be found in Figure 4-54. Snapshots from 2014 through 2019 is shown in Figure 4-55.

### *Figure 4-54 Placer County – Current Drought Status*




**December 8, 2020**
*(Released Thursday, Dec. 10, 2020)*
Valid 7 a.m. EST

*Drought Conditions (Percent Area)*

| | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 |
|---|---|---|---|---|---|---|
| Current | 0.00 | 100.00 | 95.17 | 66.79 | 21.30 | 0.00 |
| Last Week 12-01-2020 | 3.46 | 96.54 | 75.03 | 48.19 | 19.36 | 0.00 |
| 3 Months Ago 09-08-2020 | 20.45 | 79.55 | 54.18 | 32.98 | 3.04 | 0.00 |
| Start of Calendar Year 12-31-2019 | 96.43 | 3.57 | 0.00 | 0.00 | 0.00 | 0.00 |
| Start of Water Year 09-29-2020 | 15.35 | 84.65 | 67.65 | 35.62 | 12.74 | 0.00 |
| One Year Ago 12-10-2019 | 96.43 | 3.57 | 0.00 | 0.00 | 0.00 | 0.00 |

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

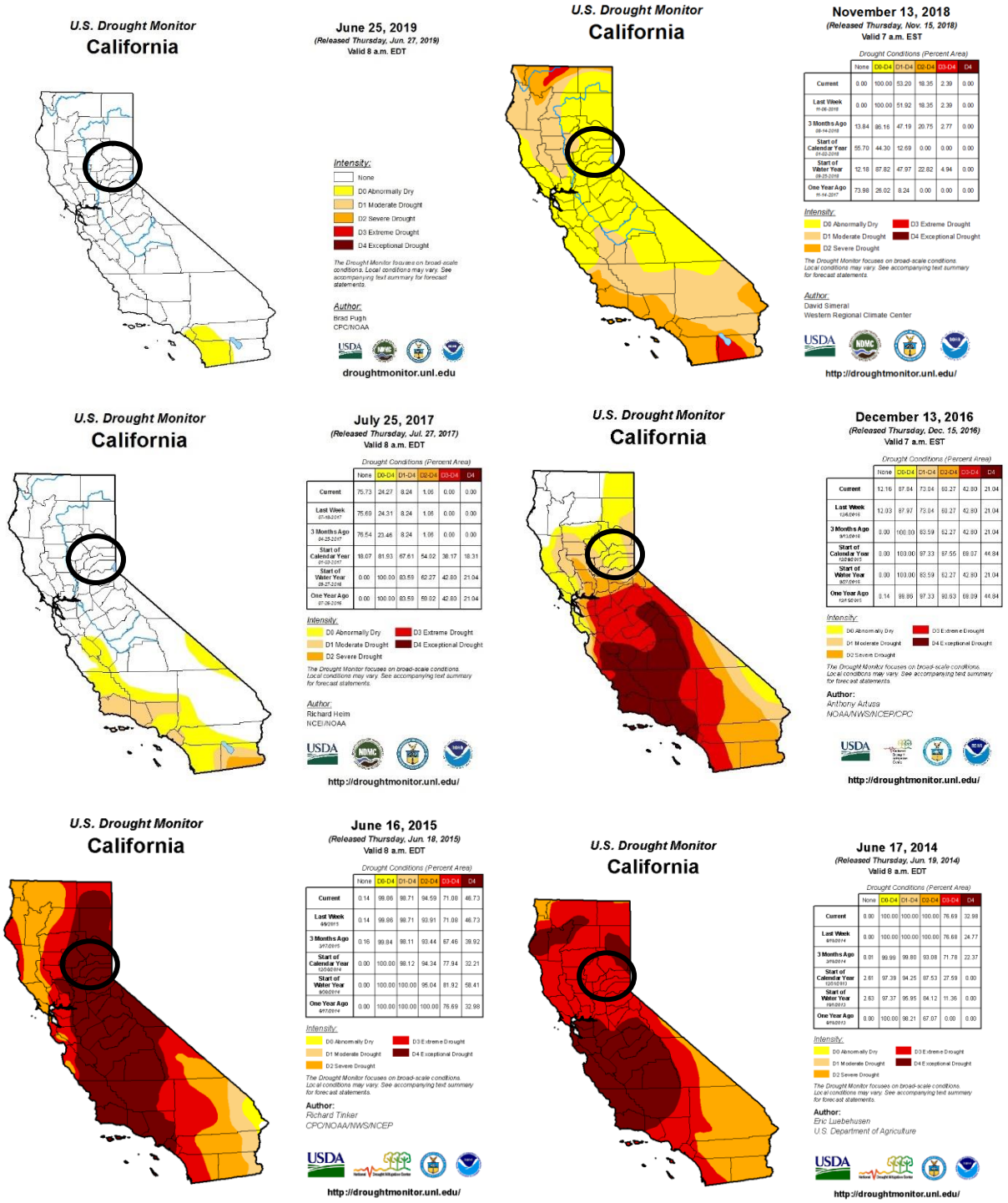
*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx*

*Author:*
David Simeral
Western Regional Climate Center

droughtmonitor.unl.edu

Source: US Drought Monitor

## *Figure 4-55 Previous Drought Status in Placer 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 Placer 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. Water supply has not been significant issues in Placer County in years past due to the extensive surface and groundwater supplies in the region.

#### *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 Placer County issued in 1977. There has been one state disaster related to drought and water shortage in Placer County issued in 2014. This can be seen in Table 4-65.

*Table 4-65 Placer County – Disaster Declarations from Drought 1950-2020*

| Disaster Type | State Declarations | | Federal Declarations | |
|---|---|---|---|---|
| | Count | Years | Count | Years |
| Drought | 1 | 2014 | 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 2002 to 2020, and the results for drought for Placer County are shown on Table 4-67.

*Table 4-66 Placer County – USDA Disaster Declarations 2002-2020*

| Year | Declaration Number | Primary or Contiguous County | Disaster Type |
|---|---|---|---|
| 2002 | N/A | N/A | Drought |
| 2003 | N/A | N/A | Drought |
| 2004 | N/A | N/A | Drought |
| 2007 | N/A | N/A | Drought |
| 2008 | N/A | N/A | Drought Event |
| 2009 | N/A | N/A | Drought Event |
| 2012 | S3283 | Contiguous | Drought-FAST TRACK |
| 2012 | S3379 | Primary | Drought |
| 2012 | S3440 | Contiguous | Drought-FAST TRACK |
| 2013 | S3462 | Contiguous | Drought-FAST TRACK |
| 2013 | S3495 | Primary | Drought-FAST TRACK |
| 2013 | S3569 | Primary | Drought-FAST TRACK |
| 2014 | S3638 | Contiguous | Drought-FAST TRACK |
| 2014 | S3626 | Primary | Drought-FAST TRACK |
| 2014 | S3631 | Contiguous | Drought |
| 2014 | S3637 | Primary | Drought-FAST TRACK |
| 2014 | S3797 | Primary | Drought |
| 2015 | S3784 | Primary | Drought-FAST TRACK |
| 2015 | S3789 | Contiguous | Drought-FAST TRACK |
| 2015 | S3963 | Contiguous | Drought |

| Year | Declaration Number | Primary or Contiguous County | Disaster Type |
|---|---|---|---|
| 2016 | S3952 | Primary | Drought-FAST TRACK |
| 2016 | S3953 | Contiguous | Drought-FAST TRACK |
| 2017 | S4163 | Contiguous | Drought-FAST TRACK |
| 2018 | S4427 | Contiguous | Drought-FAST TRACK |
| 2020 | S4697 | Primary | Drought-FAST TRACK |
| 2020 | S4765 | Contiguous | Drought-FAST TRACK |

Source: USDA, Placer County Agricultural Commissioner

## NCDC Events

There have been 44 NCDC drought events in Placer 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 4-67 NCDC Drought Events for Placer County 1996-7/31/2020**

| Event Type | Number of Events | Deaths | Deaths (indirect) | Injuries | Injuries (indirect) | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|---|
| Drought | 44 | 0 | 0 | $0 | $0 | 0 | 0 |

Source: NCDC

*Note: Losses reflect totals for all impacted areas, some of which fell outside of Placer 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 4-68 compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to the 1976-77, 1987-92, and 2007-09 droughts. Figure 4-56 depicts California's Multi-Year Historical Dry Periods, 1850-2000.

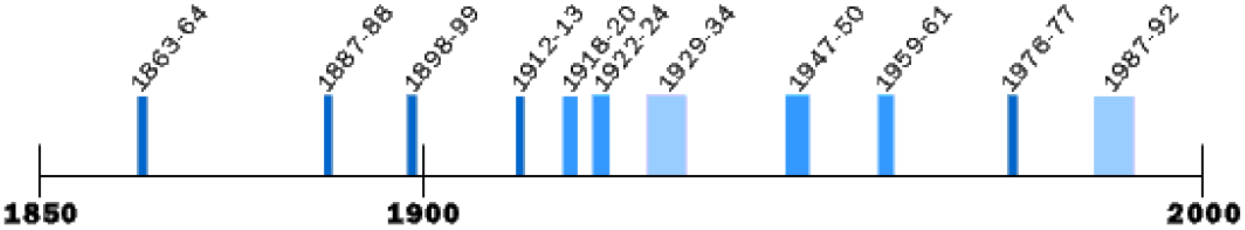
### *Table 4-68 Severity of Extreme Droughts in the Sacramento and San Joaquin Valleys*

| 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

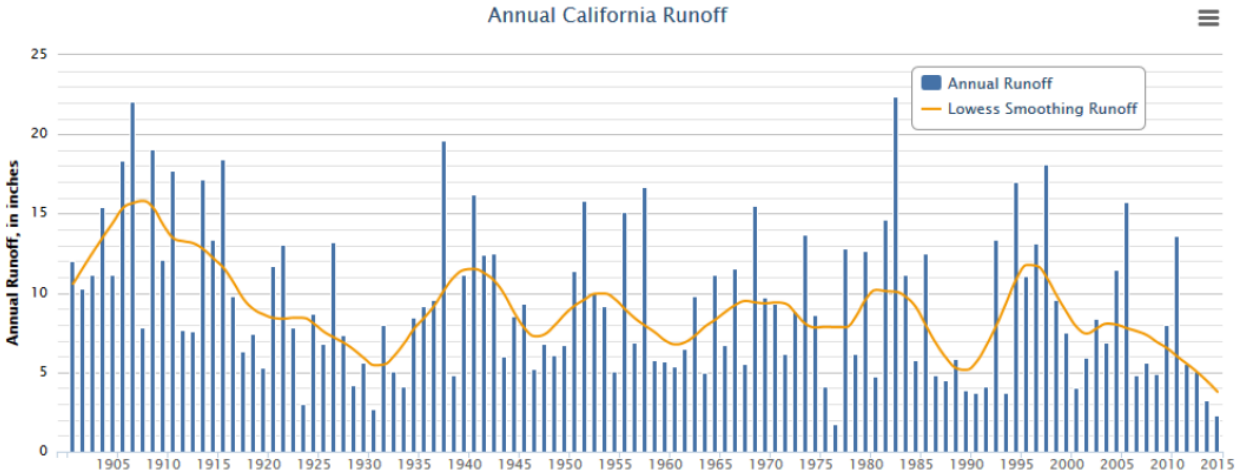
### *Figure 4-56 California's Multi-Year Historical Dry Periods, 1850-2000*




Source: California Department of Water Resources, www.water.ca.gov/
Notes: Dry periods prior to 1900 estimated from limited data; covers dry periods of statewide or major regional extent

Figure 4-57 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 4-57 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

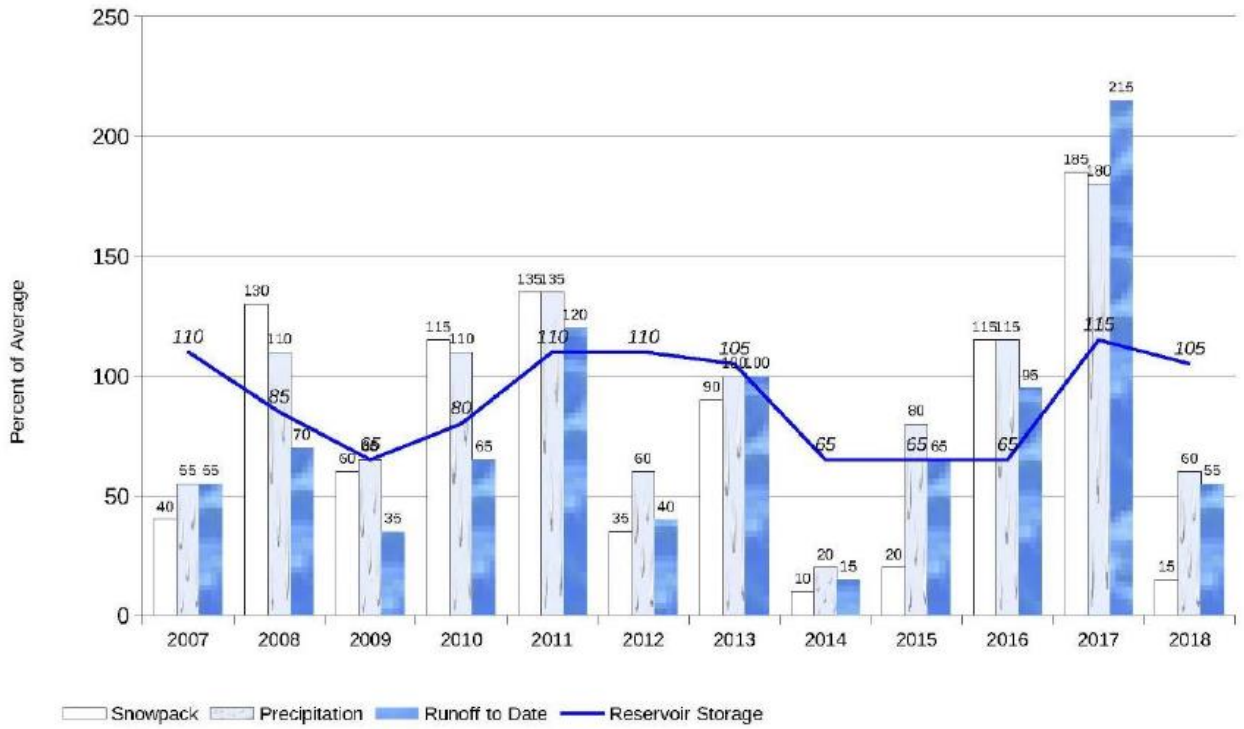
(2015, with 5 percent of average). It was marked by extraordinary heat: 2014, 2015, and 2016 were (at the time) California's first, second, and third warmest years in terms of statewide average temperatures. By the time the drought was declared officially over in April 2017, the state had expended $6.6 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. In March of 2015, Yuba City noted that there was a possibility that water demand may exceed supply. The City's Public Works Director spelled out the City's options to the Yuba City City Council and recommended the City continue to implement mandatory water use restrictions for the rest of the year. At that time, the worst case scenario showed that demand could exceed supply by an estimated 1,000 acre-feet. Conservation measures were put into place in the City and the County which reduced use by 28 to 35 percent.

According to the HMPC, during this drought significant shortages were occurring on the west side and some residential areas (the largest City in the County – Roseville) were almost put on rations as Folsom reservoir was near the point of being below the intake pumping capability (this is predicted to occur 2 out of every 10 years due to the State tunnel system, a drought would increase that during every year of a drought). Surface water for agriculture was cutback significantly and one year not available. On the east side cutbacks were enacted but they fared better as there are fewer people/business to support.

### Water Shortage

Figure 4-58 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 4-58 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. Placer County has been in and out of drought conditions since 2019.

## Likelihood of Future Occurrence

### Drought

**Likely**—Historical drought data for the Placer 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 Placer 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 been significant issues in Placer 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 change and its effect on avalanche in the County has been discussed by three sources:

- Placer County Sustainability Plan – 2020
- CAS – 2014
- Cal-Adapt – 2021

### Placer County Sustainability Plan

Although droughts are a regular feature of California's climate, scientists expect that climate change will lead to more frequent and more intense droughts statewide. Overall, precipitation levels are expected to stay similar, and may even increase in some places. However, the State's current data says that there will be more years with extreme levels of precipitation, both high and low, which is expected to cause more droughts that last longer and are more intense, compared to historical norms.

Drought conditions will likely be made worse by changes to Placer County's snowpack, which is the level of accumulated snow that builds up in the Sierra Nevada. Usually this snow melts slowly over the year, helping to provide a regular supply of water during dry months. However, because of climate change, less precipitation is expected to fall as snow and instead will fall as rain due to warmer temperatures, leading to a smaller snowpack. This may make water levels particularly low in late summer and early autumn, which are also often the hottest parts of the year.

### CAS

Climate scientists studying California find that drought conditions are likely to become more frequent and persistent over the 21st 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.

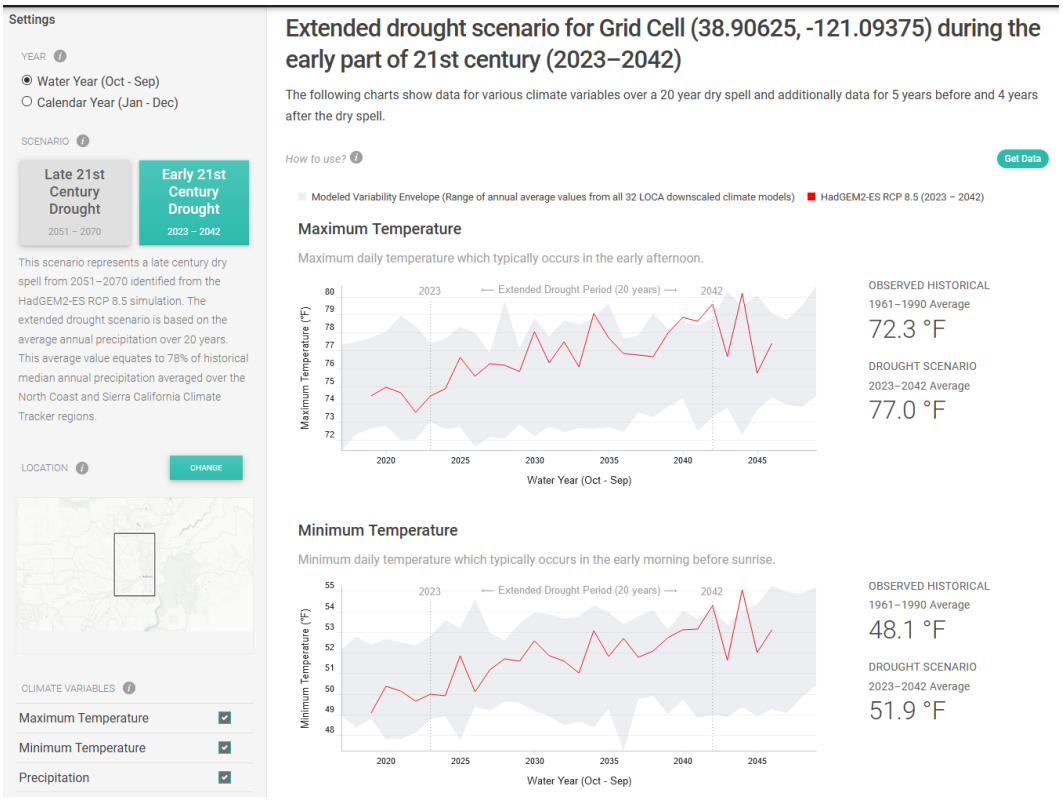
A report from the Public Policy Institute of California noted that thousands of Californians – mostly in rural, small, disadvantaged communities – already face acute water scarcity, contaminated groundwater, or complete water loss. Climate change would make these effects worse.

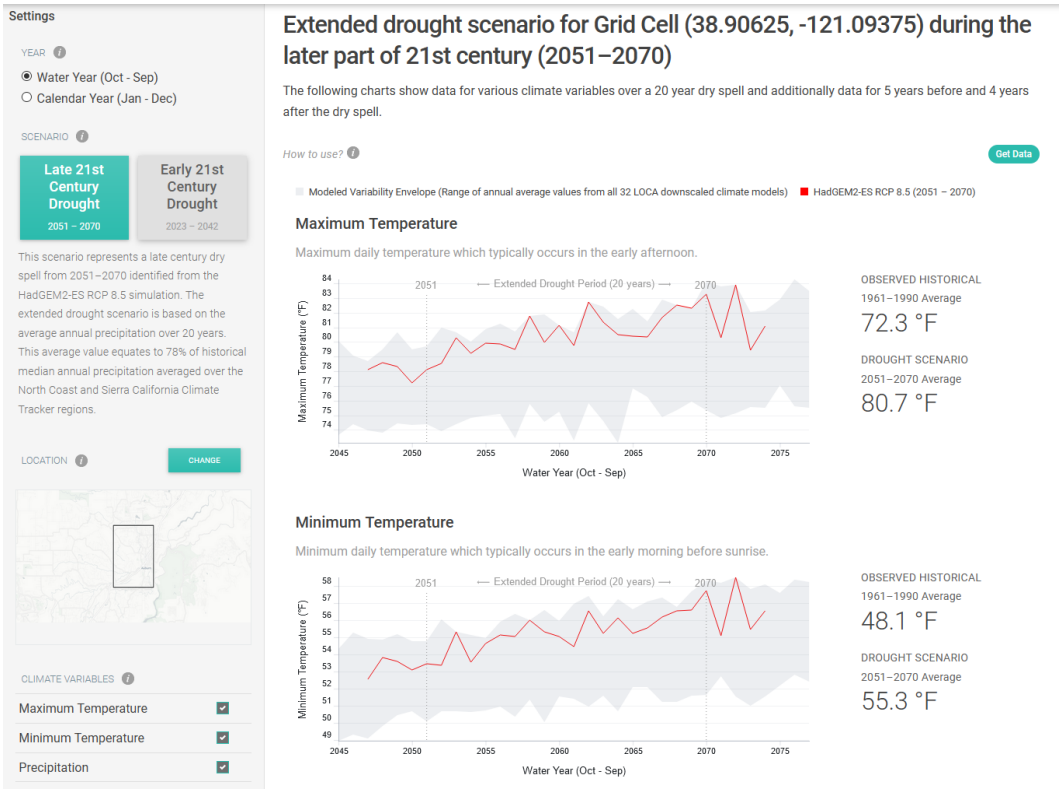
## Cal-Adapt

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 Auburn) derived from LOCA downscaled meteorological and hydrological simulations (Figure 4-59) – 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 4-59 Placer County – Future Extended Drought Scenarios*




Source: Cal Adapt – Extended Drought Scenarios. Retrieved 12/13/2020

## *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. In the populated areas of the County, community service districts provide water and sewer services. In the rural areas, wells and septic systems can be prevalent.

According to the HMPC, the risk of drought on the west side of the County is significant as the storage capability is limited by few and small reservoirs with state mandates to allow most of the water to flow into the Sacramento delta to support habitat and sea water intrusion. The groundwater basin suffered after three straight years of drought but has bounced back during the past three years of above normal and normal water years. In the east side cutbacks were enacted but the fared better as there are fewer people. Any future drought will result in cutbacks and likely rationing with significant loss of business revenue as well via agricultural and restaurant/hotel industry.

Most surface water on the west side of the county (where a significant majority of the population resides) is provided by Placer County Water Agency (PCWA) which has two main sources; 1) Water from the Middle Fork & North Fork of the American River (some comes from the Rubicon River) which flows into Folsom Reservoir and 2) Water from the PG&E Yuba/Bear river system by contract. In addition, the Nevada Irrigation District (NID) also supplies some water from the Yuba Bear river system. Groundwater is also used in the west side from a variety of agricultural, municipal, and individual pumps and the groundwater basin is very healthy. The east side of the county has multiple small surface water systems servicing most of the Lake Tahoe Basin and groundwater is utilized to serve most of the Martis valley and the groundwater basin is very healthy.

### Impacts

Based on historical information, the occurrence of drought in California, including Placer 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 Placer County to drought is countywide, but impacts may vary and may include reduction in water supply, agricultural losses, and an increase in dry fuels.

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. 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.

In addition, the County noted that drought leads to accelerated root intrusion into the sewers which leads to blockages.

### 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 4-69 show drought impacts for the Placer County Planning Area from 1850 to December 2020. The data represented is skewed, with the majority of these impacts from records within the past ten years.

*Table 4-69 Placer County Drought Impacts*

| Category | Number of Impacts |
|---|---|
| Agriculture | 39 |
| Business and Industry | 24 |
| Energy | 7 |
| Fire | 20 |
| Plants & Wildlife | 49 |
| Relief, Response, and Restrictions | 75 |
| Society and Public Health | 57 |
| Tourism and Recreation | 35 |
| Water Supply and Quality | 87 |

Source: National Drought Mitigation Center, 1/1/1850-12/1/2020

### CA DWR Impacts

Recently, a 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 Placer 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 4-70 was extracted from the Excel table from the report, and shows the systems in Placer County that were reviewed and their risk score for drought and water shortage.

### *Table 4-70 Placer County – Drought and Water Shortage Risk Factors for Small Water Suppliers*

| System Name | Risk Score |
|---|---|
| Camp Winthers | 94 |
| Emigrant Gap Mutual Water Co. | 86 |
| Meadow Vista CWD | 85 |
| Shady Glen Community Water System | 83 |
| Sierra Meadows Apartment | 82 |
| Alpine Meadows Property Owners Association | 77 |
| Auburn Mobile Home Village | 77 |
| Auburn Ridge Woods | 73 |
| Gold Hill Mobile Home Park | 71 |
| Weimar Water Company | 66 |
| Heather Glen Community Services District | 59 |
| Dutch Flat Mutual | 56 |
| Folsom Lake Mutual Water Co | 55 |
| North Eden Valley | 53 |
| Rosecrest Mutual | 52 |
| Madden Creek Water Company | 50 |
| Agate Bay Water Company | 48 |
| Sierra Lakes County Water District | 39 |
| Auburn Valley CSD | 39 |
| Baker Ranch Water Company | 37 |
| Midway Heights CWD | 36 |
| Talmont Resort Improvement District | 36 |
| McKinney Water District | 34 |
| Castle City MHP | 29 |
| Tahoe Cedars Water Company | 27 |
| Christian Valley Park CSD | 26 |

| System Name | Risk Score |
|---|---|
| Placer CSA – Sheridan | 26 |
| Alpine Springs County Water District | 24 |
| Ward Well Water Company | 23 |
| Tahoe City PUD – Timberland | 19 |
| Lakeview Hills Community Association | 19 |
| Fulton Water Company | 17 |

Source: CDAG Report
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 in Section 4.3.2.

### *Future Development*

According to the 2015 Urban Water Management Plan and input from the HMPC, Placer County has access to large quantities of water through surface water and water supplies purchased under an agreement with PG&E. However, population growth in the County will add additional pressure to water companies during periods of drought and water shortage. Water companies will need to continue to plan for and add infrastructure capacity for population growth. Population in the County in the future is expected to increase (see Table 4-22), 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.

## 4.3.11. Earthquake

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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 near the fault. Ground shaking generally has a much greater impact over a greater geographical area than ground breakage. The amount of breakage and shaking is a function of earthquake magnitude, type of bedrock, depth and type of soil, general topography, and groundwater.

### *Seismic Structural Safety*

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

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

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

### *Liquefaction Potential*

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

sinking or other major structural damage. Evidence of liquefaction may be observed in "sand boils," which are expulsions of sand and water from below the surface due to increased pressure below the surface.

#### *Settlement*

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

#### *Other Hazards*

Earthquakes can also cause seiches, landslides, and dam and levee failures. A seiche is a periodic oscillation of a body of water resulting from seismic shaking or other factors that could cause flooding. Earthquakes may cause landslides (discussed in Section 4.3.14), particularly during the wet season, in areas of high water or saturated soils. Finally, earthquakes can cause dams to fail (see Section 4.3.9 Dam Failure).

### 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.

Placer County itself is traversed by a series of northwest-trending faults, called the Foothill Fault Zone, that are related to the Sierra Nevada uplift. This was the source of Oroville's 1975 earthquake (and an earlier event in the 1940s). Subsequent research of these events led to the identification and naming of the zone and questions about the siting and design of the proposed Auburn Dam (which was never built). Earthquakes on nearby fault segments in the zone could be the source of ground shaking in the Placer County Planning Area.

Although portions of western and eastern Placer County are located in a seismically active region, no known faults actually go through any of the cities or towns. However, the Bear Mountain and the Melones faults are situated approximately three to four miles west and east of the City of Auburn respectively. Earthquakes on these two faults would have the greatest potential for damaging buildings in Auburn, especially the unreinforced masonry structures in the older part of the city and homes built before 1960 without adequate anchorage of framing and foundations. Similar lower magnitude but nearby earthquakes are capable of producing comparable damages in other Placer County communities.

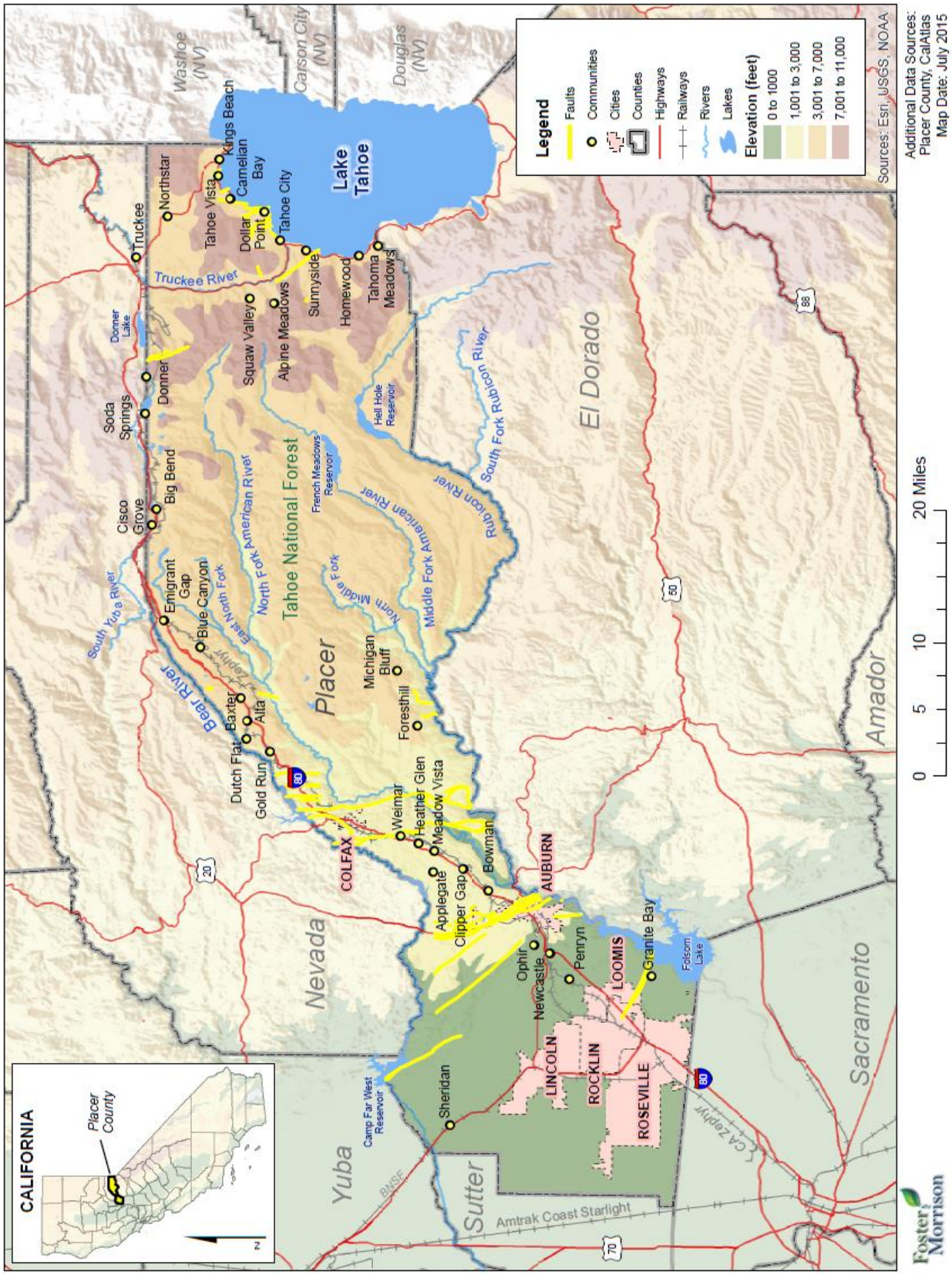
The closest recently active fault in the western Sierra Nevada foothills is the Cleveland Hills fault, which is situated approximately 36 miles northwest of Auburn. Another potential earthquake source is the Midland Fault Zone on the western side of the Sacramento Valley. This was the source of the 1892 Vacaville-Winters earthquake.

Further analysis using FEMA's HAZUS-MH (nationally applicable loss estimation software) shows that there are several potentially active faults east of the Placer County line in Nevada. The closest faults and estimated maximum earthquakes are the North Tahoe Fault (6.5 estimated maximum magnitude), Incline Village Fault (6.5 estimated maximum magnitude), and the East Tahoe Fault (7.0 estimated maximum magnitude).

Additionally, western Placer County may experience ground shaking from distant major to great earthquakes on faults to the west and east. For example, to the west, both the San Andreas Fault (source of the 8.0 estimated Richter magnitude San Francisco earthquake that caused damage in Sacramento in 1906, including the State Capitol, the full extent of which was not discovered until the mid-1970s) and the closer Hayward fault have the potential for experiencing major to great events. The US Geological Survey recently (February 2004) estimated that there is a 62 percent probability of at least one 6.7 or greater magnitude earthquake occurring that could cause widespread damage in the greater San Francisco Bay area before 2032.

Figure 4-60 shows the faults in and near Placer County.

## *Figure 4-60 Faults in and near Placer County*



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 4-71). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

### *Table 4-71 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 2002 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 Placer County area. Table 4-72 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 Auburn in western Placer County and Lake Tahoe in eastern Placer County. There are 51 events that are detailed in Table 4-73, and 66 events in Table 4-74.

### *Table 4-72 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 4-73 Magnitude 5.0 Earthquakes or greater within 90 Miles of Western Placer County**

| Date | Richter Magnitude | Location |
|---|---|---|
| 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 |
| 9/12/1994 | 5.1 | Northern California |
| 9/12/1994 | 5.7 | 11km SE of Gardnerville Ranchos, Nevada |
| 11/28/1980 | 5.1 | Northern California |
| 1/27/1980 | 5.4 | San Francisco Bay area, California |
| 1/24/1980 | 5.1 | San Francisco Bay area, California |
| 1/24/1980 | 5.8 | San Francisco Bay area, California |
| 2/22/1979 | 5.3 | Northern 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 |

| Date | Richter Magnitude | Location |
|---|---|---|
| 4/1/1959 | 5.6 | Northern California |
| 10/24/1955 | 5.4 | San Francisco Bay area, California |
| 9/26/1953 | 5.3 | Nevada |
| 3/22/1953 | 5 | Northern California |
| 5/9/1952 | 5.1 | Nevada |
| 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 |
| 4/5/1915 | 5 | Central California |
| 4/24/1914 | 6.4 | Nevada |
| 2/18/1914 | 6 | Nevada |
| 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 |
| 5/1/1889 | 6 | San Francisco Bay area, California |
| 4/29/1888 | 5.9 | Northern California |
| 6/3/1887 | 6.3 | Nevada |
| 1/7/1881 | 5.6 | Near Red Bluff, California |
| 7/10/1887 | 5.5 | Lake Tahoe area, California-Nevada border |
| 1/24/1875 | 6.2 | South of Janesville, Californiaa |
| 12/27/1869 | 6.2 | Near Carson City, Nevada |
| 12/27/1869 | 6.4 | Northwest of Virginia City, Nevada |
| 9/17/1868 | 5.6 | Near Markleeville, California |
| 5/30/1868 | 6 | Near Virginia City, Nevada |
| 7/15/1866 | 6 | Southwest of Stockton, California |
| 7/4/1861 | 5.8 | San Francisco Bay area, California |
| 9/3/1857 | 6 | California-Nevada Border east of Truckee |

Source: USGS

*Search dates 1/1/1850 – 12/20/2020

### *Table 4-74 Magnitude 5.0 Earthquakes or greater within 90 Miles of Eastern Placer County**

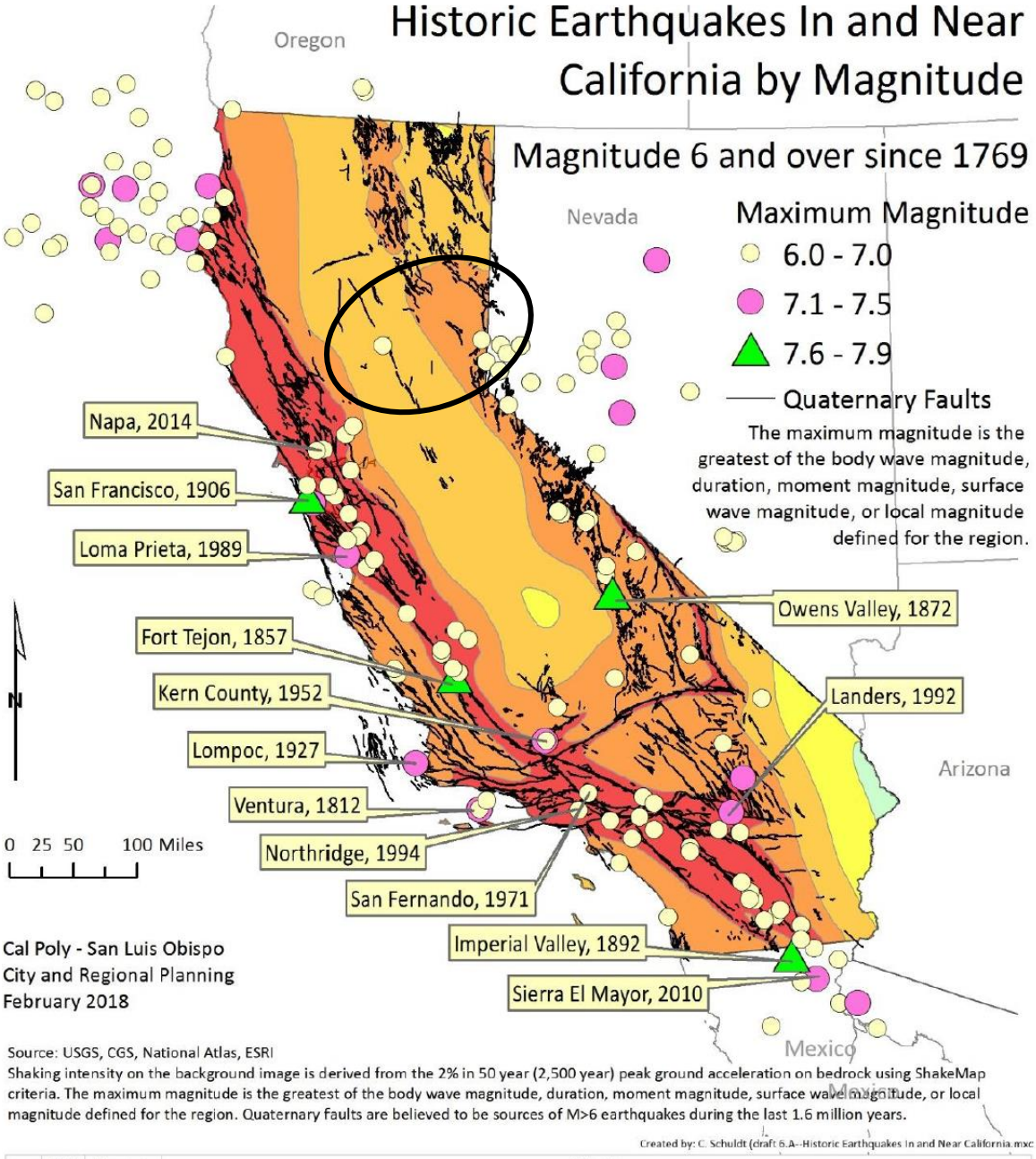
| Date | Richter Magnitude | Location |
|---|---|---|
| 12/28/2016 | 5.5 | 28km SW of Hawthorne, Nevada |
| 12/28/2016 | 5.6 | 26km SW of Hawthorne, Nevada |
| 12/28/2016 | 5.6 | 27km SW of Hawthorne, Nevada |
| 4/26/2008 | 5.1 | 1km NW of Mogul, Nevada |
| 8/10/2001 | 5.2 | Northern California |
| 9/12/1994 | 5.1 | Northern California |
| 9/12/1994 | 5.7 | 11km SE of Gardnerville Ranchos, Nevada |
| 10/24/1990 | 5.8 | Central California |
| 1/24/1985 | 5.2 | Central California |
| 11/28/1980 | 5.1 | Northern California |
| 10/7/1979 | 5 | Central California |
| 2/22/1979 | 5.3 | Northern 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 |
| 9/12/1966 | 5.91 | Northern California |
| 4/13/1962 | 5.1 | Central California |
| 6/23/1959 | 5.5 | Nevada |
| 6/23/1959 | 5.6 | Nevada |
| 4/1/1959 | 5.6 | Northern California |
| 12/31/1956 | 5.1 | Central California |
| 12/31/1956 | 5 | Central California |
| 7/26/1956 | 5.1 | Nevada |
| 8/8/1955 | 5.2 | Nevada |
| 6/19/1955 | 5 | Nevada |
| 9/1/1954 | 5.5 | Nevada |
| 8/31/1954 | 5.8 | Nevada |
| 8/24/1954 | 5.2 | Nevada |
| 8/24/1954 | 6.56 | Nevada |
| 8/2/1954 | 5.4 | Nevada |
| 7/30/1954 | 5.1 | Nevada |
| 7/8/1954 | 5.3 | Nevada |
| 7/6/1954 | 6.23 | Nevada |
| 7/6/1954 | 5.2 | Nevada |
| 7/6/1954 | 5.7 | Nevada |
| 7/6/1954 | 5.5 | Nevada |
| 7/6/1954 | 6.8 | Nevada |

| Date | Richter Magnitude | Location |
|---|---|---|
| 9/26/1953 | 5.3 | Nevada |
| 3/22/1953 | 5 | Northern California |
| 5/9/1952 | 5.1 | Nevada |
| 12/14/1950 | 5.6 | Northern California |
| 12/29/1948 | 6 | Northern California |
| 3/30/1943 | 5.3 | Northern California |
| 12/17/1942 | 5.1 | Northern California |
| 12/3/1942 | 5.5 | Nevada |
| 8/18/1942 | 5 | Nevada |
| 7/18/1941 | 5 | Nevada |
| 1/11/1939 | 5.5 | Nevada |
| 6/25/1933 | 6.1 | Nevada |
| 12/19/1919 | 5.2 | Central California |
| 4/5/1915 | 5 | Central California |
| 4/24/1914 | 6.4 | Nevada |
| 2/18/1914 | 6 | Nevada |
| 6/23/1909 | 5.7 | Northern California |
| 3/3/1909 | 5 | Northern California |
| 4/29/1888 | 5.9 | Northern California |
| 6/3/1887 | 6.3 | Nevada |
| 7/10/1877 | 5.5 | Lake Tahoe area, California-Nevada border |
| 1/24/1875 | 6.2 | South of Janesville, Californiaa |
| 12/27/1869 | 6.2 | Near Carson City, Nevada |
| 12/27/1869 | 6.4 | Northwest of Virginia City, Nevada |
| 9/17/1868 | 5.6 | Near Markleeville, California |
| 5/30/1868 | 6 | Near Virginia City, Nevada |
| 3/15/1860 | 6.5 | East of Reno, Nevada |
| 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 – 12/20/2020

Figure 4-61 shows major historical earthquakes in California from 1769 to 2017.

*Figure 4-61 Historic Earthquakes in California 1769 to 2017*




| | 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 instance 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

Historically, major earthquakes have not been an issue for Placer County. However, minor earthquakes have occurred in the County in the past. The HMPC has identified several earthquakes that were felt by area residents and/or caused damaging shaking in Placer County. Details on some of these events follow.

- **1892** – The Midland Fault Zone, the source of an 1892 earthquake centered between the cities of Vacaville and Winters, caused minor damage in the City of Lincoln.
- **1908** – An estimated 4.0+ Richter magnitude earthquake occurred between Auburn and Folsom with an epicenter possibly associated with the Bear Mountain fault.
- **1975** – The Cleveland Hills fault was the source of the Oroville earthquake (Richter Magnitude: 5.7), which was felt strongly in Placer County and neighboring areas.
- **2003**/**2004** – Volcanic magma (molten rock) migrating about 20 miles below the surface of the Sierra Nevada mountains caused a swarm of about 1,600 small earthquakes in late 2003 and early 2004. The 20 mile depth is about twice as deep as earthquakes caused by normal faulting in the region measured during the last 30 years. Placer County did not report any damages associated with these small earthquakes.
- **2008**, **2013**, **2014** – There were earthquakes in the Placer County vicinity in these years. No significant issues were reported in the County. Groundshaking was the primary concern.

OTHERS? DECEMBER 2016 NEVADA EVENTS? DATES? DAMAGES?

## Likelihood of Future Occurrence

**Occasional**— No major earthquakes have been recorded within the County; although the County has felt ground shaking from earthquakes with epicenters located elsewhere. Based on historical data and the location of the Placer County Planning Area relative to active and potentially active faults, the Planning Area will likely experience a significantly damaging earthquake occasionally.

## Mapping of Future Occurrences

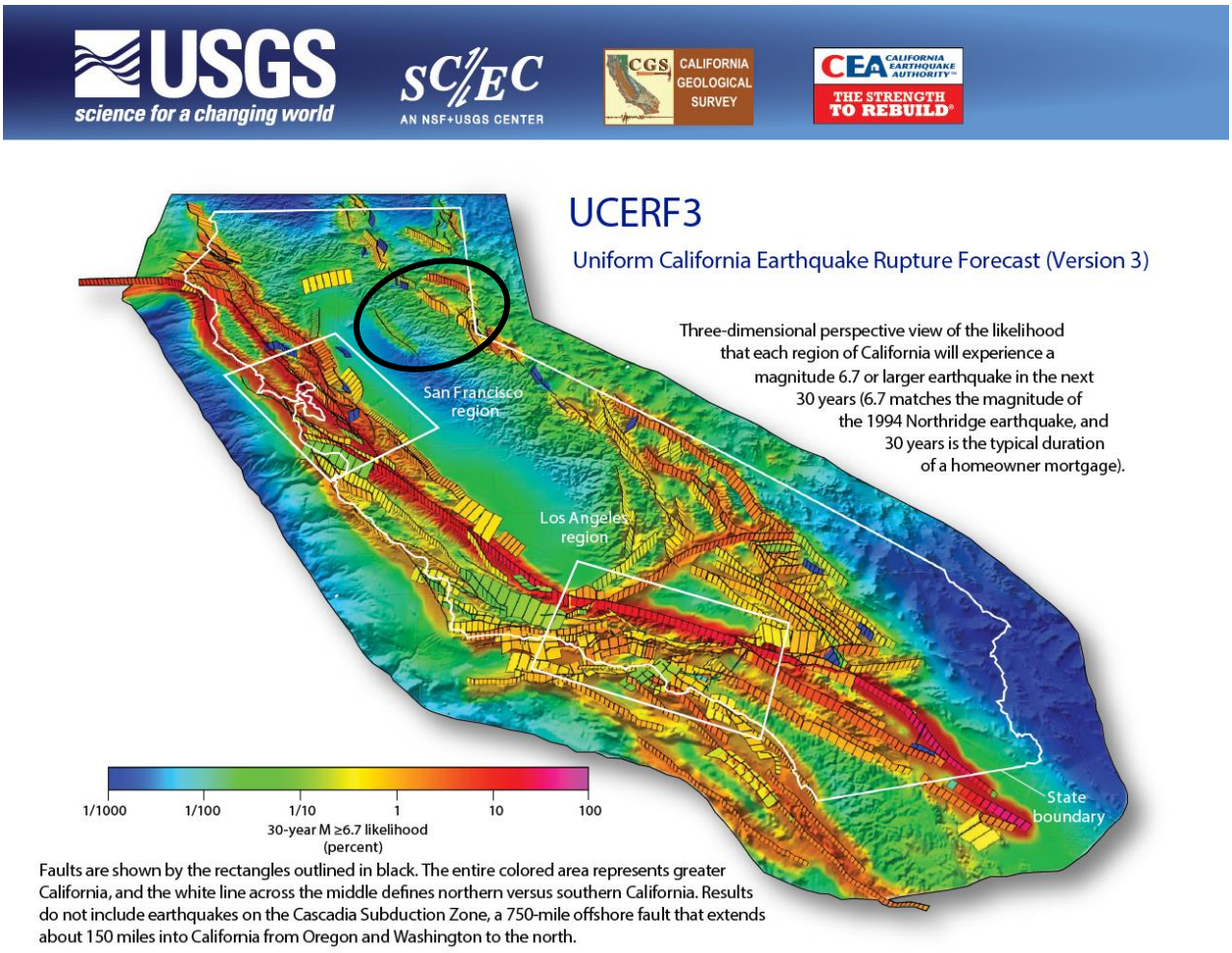
Maps indicating the maximum expectable intensity of ground shaking for the County are available through several sources. Figure 4-62, prepared by the California Division of Mines and Geology, shows the expected relative intensity of ground shaking and damage in California from anticipated future earthquakes. 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 Placer County falls within an area of mostly low to moderate seismic risk.

*Figure 4-62 Maximum Expectable Earthquake Intensity – 2% Chance in 50 Years*

Source: California Division of Mines and Geology

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 4-63 and indicates that Placer County has a low to moderate risk of earthquake occurrence, which coincides with the likelihood of future occurrence rating of occasional.

*Figure 4-63 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**—Medium

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 to moderate 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. Placer County is within the less hazardous Zone 3. IS THERE A URM OR OTHER SEISMIC INVENTORY OF VULNERABLE STRUCTURES?

## 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 Placer County, can strike without warning and cause dramatic changes to the landscape of an area that can have devastating impacts on the built environment, on agricultural production, and the environment.

## Estimating Potential Losses

Earthquake losses will vary across the Placer 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 6.9 earthquake event in the eastern portion of the County
- A probabilistic 5.7 earthquake event in the western portion of the County

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 Scenarios

#### *Probabilistic 6.9 Earthquake Event for Eastern Placer County*

HAZUS-MH 4.2 was utilized to model earthquake losses for the County. Specifically, the probabilistic magnitude used for Placer County utilized a 6.9 magnitude earthquake for the eastern portion of the County. 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 4-75 and shown on Figure 4-64. Key losses for the eastern portion of the County included the following:

- Total economic loss estimated for the earthquake was $1,650.45 million, 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 $1,128.12 million.
- 5,523 buildings in the eastern County were at least moderately damaged. 305 buildings were completely destroyed.
- Over 75 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 9.
- 2,030 households experienced a loss of potable water the first day after the earthquake.
- 4,567 households experienced a loss of electricity the first day after the earthquake.

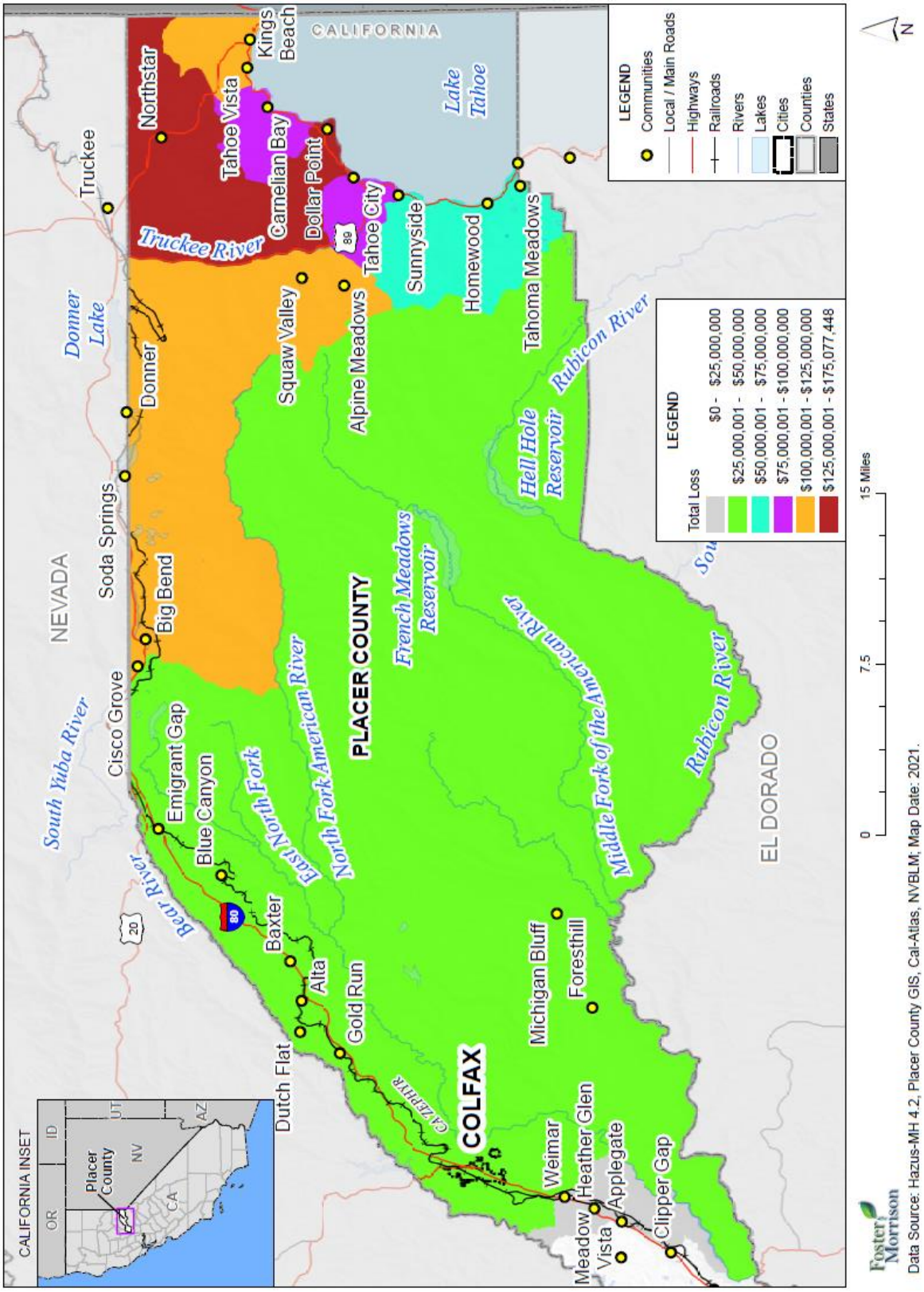
***Table 4-75 HAZUS-MH Earthquake Loss Estimation Probabilistic 2,500-Year Scenario Results for Eastern Placer County***

| Type of Impact | Impacts to County from 6.9 Probabilistic Earthquake | |
|---|---|---|
| Total Buildings Damaged<br>(based on 24,000 buildings) | Slight: 8,660<br>Moderate: 5,523<br>Extensive: 1,029<br>Complete: 305 | |
| Building and Income Related Losses | $1,128,120,000 | |
| Total Economic Losses<br>(Includes building, income and lifeline losses) | $1,650,450,000 | |
| Casualties<br>(Based on 2 a.m. time of occurrence) | Without requiring hospitalization: 55<br>Requiring hospitalization: 10<br>Life threatening: 1<br>Fatalities: 1 | |
| Casualties<br>(Based on 2 p.m. time of occurrence) | Without requiring hospitalization: 132<br>Requiring hospitalization: 33<br>Life threatening: 5<br>Fatalities: 9 | |
| Casualties<br>(Based on 5 p.m. time of occurrence) | Without requiring hospitalization: 96<br>Requiring hospitalization:23<br>Life threatening:4<br>Fatalities: 6 | |
| Damage to Transportation Systems | No infrastructure with at least moderate damage | |
| Damage to Essential Facilities | 7 schools and 2 fire stations with at least moderate damage | |
| Damage to Utility Systems | 6 facilities with at least moderate damage<br>275 potable water line breaks, 138 wastewater line breaks, and 1 natural gas line break | |
| Households without Power/Water Service | Power loss, Day 1: 4,567 | Water loss, Day 1: 2,030 |

| Type of Impact | Impacts to County from 6.9 Probabilistic Earthquake | |
|---|---|---|
| (Based on 13,475 total households) | Power loss, Day 3: 3,131<br>Power loss, Day 7: 1,508<br>Power loss, Day 30: 344<br>Power loss, Day 90: 6 | Power loss, Day 3: 1,314<br>Power loss, Day 7: 236<br>Water loss, Day 30: 0<br>Water loss, Day 90: 0 |
| Displaced Households | 288 displaced households | |
| Shelter Requirements | 162 persons | |
| Debris Generation | 149,000 tons | |

Source: HAZUS-MH 4.2, 2021

***Figure 4-64 Placer County – Total Loss Map from 6.9 Magnitude Probabilistic Hazus Earthquake Scenario for Eastern Placer County***



### *Probabilistic 5.7 Earthquake Event for Western Placer County*

HAZUS-MH 4.2 was utilized to model earthquake losses for the County. Specifically, the probabilistic magnitude used for Placer County utilized a 5.7 magnitude earthquake for the western portion of the County. 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 4-76 and shown on Figure 4-65. Key losses for the western portion of the County included the following:

- Total economic loss estimated for the earthquake was $3,322.78 million, 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 $2,488.07 million.
- 12,054 buildings in the County were at least moderately damaged. 385 buildings were completely destroyed.
- Over 68 percent of the building- and income-related losses were residential structures.
- 13 percent of the estimated losses were related to business interruptions.
- The mid-day earthquake had the highest number of casualties at 40.
- 28,954 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.

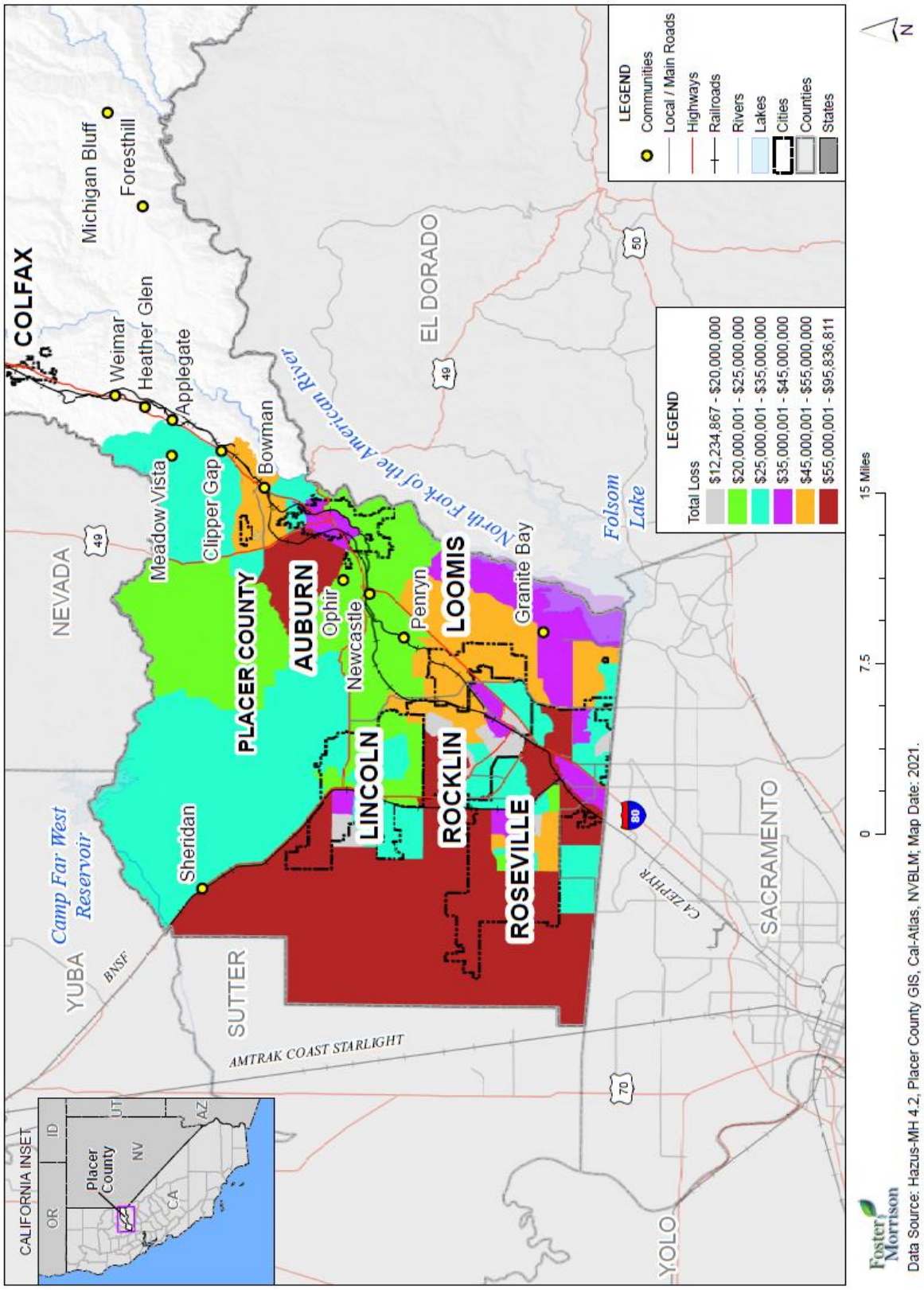
### *Table 4-76 HAZUS-MH Earthquake Loss Estimation Probabilistic 2,500-Year Scenario Results for Western Placer County*

| Type of Impact | Impacts to County from 5.7 Probabilistic Earthquake |
|---|---|
| Total Buildings Damaged<br>(based on 115,000 buildings) | Slight: 33,952<br>Moderate: 12,054<br>Extensive: 1,649<br>Complete: 385 |
| Building and Income Related Losses | $2,448,070,000 |
| Total Economic Losses<br>(Includes building, income and lifeline losses) | $3,322,780,000 |
| Casualties<br>(Based on 2 a.m. time of occurrence) | Without requiring hospitalization: 214<br>Requiring hospitalization: 31<br>Life threatening: 2<br>Fatalities: 4 |

| Type of Impact | Impacts to County from 5.7 Probabilistic Earthquake | |
|---|---|---|
| Casualties<br>(Based on 2 p.m. time of occurrence) | Without requiring hospitalization: 625<br>Requiring hospitalization: 143<br>Life threatening: 21<br>Fatalities: 40 | |
| Casualties<br>(Based on 5 p.m. time of occurrence) | Without requiring hospitalization: 416<br>Requiring hospitalization:96<br>Life threatening:24<br>Fatalities: 25 | |
| Damage to Transportation Systems | 1 bridge with at least moderate damage | |
| Damage to Essential Facilities | None with at least moderate damage | |
| Damage to Utility Systems | 1 facility with at least moderate damage<br>347 potable water line breaks, 174 wastewater line breaks, and 1 natural gas line break | |
| Households without Power/Water Service<br>(Based on 119,152 total households) | Power loss, Day 1: 0<br>Power loss, Day 3: 0<br>Power loss, Day 7: 0<br>Power loss, Day 30: 0<br>Power loss, Day 90: 0 | Water loss, Day 1: 28,954<br>Power loss, Day 3: 22,083<br>Power loss, Day 7: 9,025<br>Water loss, Day 30: 0<br>Water loss, Day 90: 0 |
| Displaced Households | 951 displaced households | |
| Shelter Requirements | 538 persons | |
| Debris Generation | 344,000 tons | |

Source: HAZUS-MH 4.2, 2021

***Figure 4-65 Placer County – Total Loss Map from 5.7 Magnitude Probabilistic Hazus Earthquake Scenario for Western Placer County***



### *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 areas will continue to occur.

## 4.3.12. Flood: 1%/0.5%/0.2% Annual Chance

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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 Placer County. Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. The Placer 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 Placer 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 4.3.12.
- **Dam failure flooding** – Flooding from failure of one or more upstream dams is also a concern to the Placer County Planning Area. A catastrophic dam failure could easily overwhelm local response capabilities and require mass evacuations to save lives. Residents could be displaced for an extended period of time. 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 injuries and associated health concerns. Dam failure is further addressed in Section 4.3.9 Dam Failure.

### *Streambank Erosion*

In addition to the damages to people and property from the above flooding issues, there can be issues along Placer 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.

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 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.

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. High velocity flows can erode material from the streambank. Erosion can occur at once or over time as a function of the storm cycle and the scale of the peak storms.

Erosion may also occur on the outboard or waterside of the few levees (see Section 4.2.13) in the Planning Area, which may lead to instability and failure The Bear River is highly incised so it takes a large flow to actually erode the levees in Placer County. Yuba County is completing a setback levee on the bear which will help with future flood events. As with any levee, there is always a potential for failure.

## Location and Extent

Placer County encompasses multiple rivers, streams, creeks, and associated watersheds. The County is situated in a region that dramatically drops in elevation from the eastern portion (Sierra Nevada) to the western portion, where excess rain on snow can contribute to downstream flooding. Damaging floods in Placer County occur primarily in the developed areas of the County extending westward from Colfax to Sacramento and Sutter Counties. Flood flows generally follow defined stream channels, drainages, and watersheds. Because flows within many of the creeks and rivers within Placer County can vary substantially from one another, the estimate for the average depth of the 100-year floodplain also varies and ranges anywhere from 1 foot to as high as 15 to 20 feet depending on numerous criteria.

Various flood protection measures are either in place or planned to protect Placer County from future flood events. Existing flood protection measures include a comprehensive system of dams, levees, overflow weirs, pumping plants, channel improvements, floodway bypasses, detention and retention structures, and other improvements. In addition, both the Placer County Flood Control and Water Conservation District and the City of Roseville maintain a system of ALERT Flood Warning gages, including multiple precipitation gages and stream level gages located throughout western Placer County that provide real time monitoring information on current flood conditions.

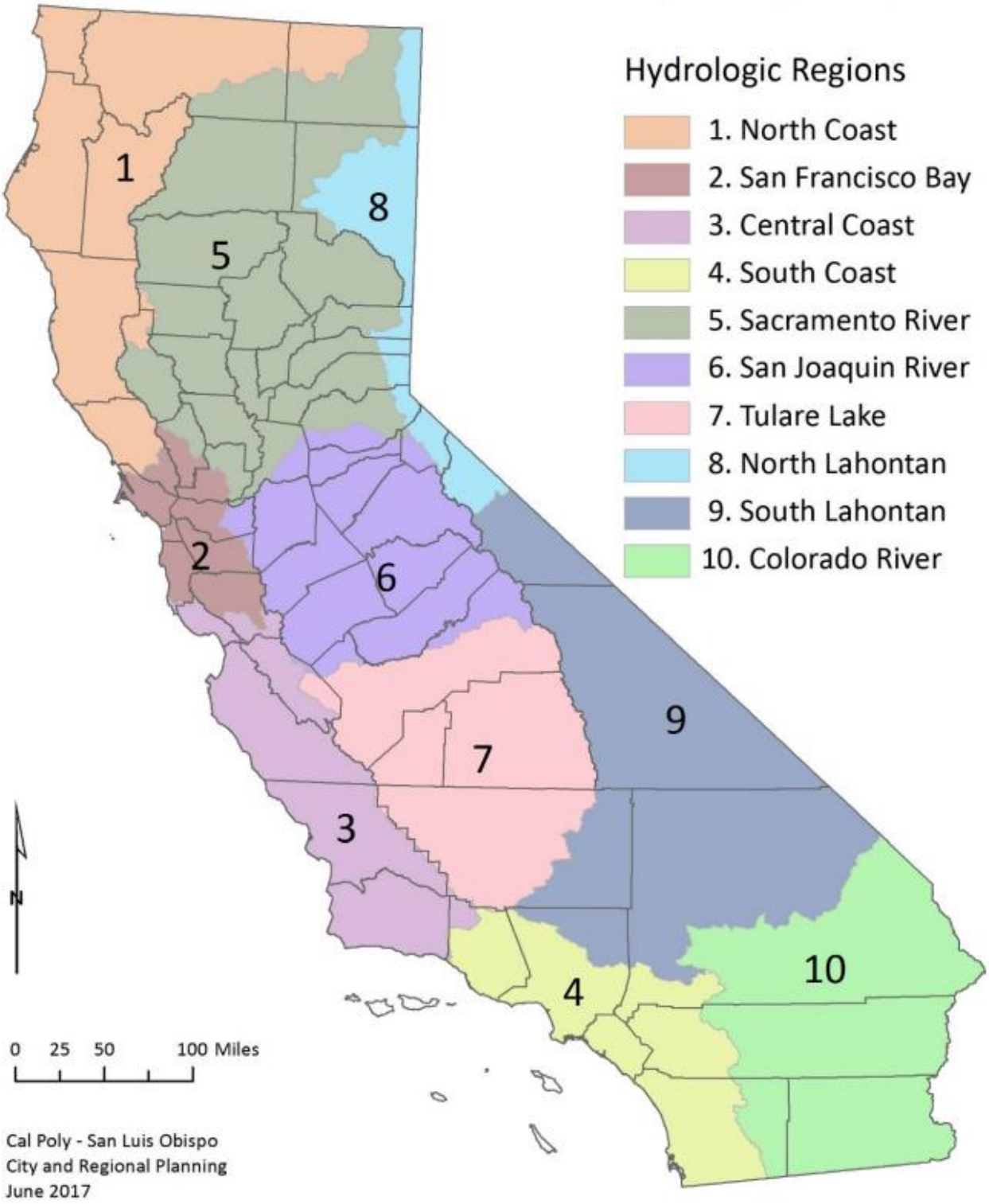
Historically, the Placer County Planning Area has always been at risk to flooding because of its high annual percentage of rainfall, the watercourses that bound the County, and the location of development adjacent to flood-prone areas. Drainage and stormwater runoff, in addition to natural and manmade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

### *Major Sources of Flooding*

California has 10 hydrologic regions. Placer County sits in the Sacramento River 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, Plumas, Butte, Colusa, Sutter, 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 4-66.

*Figure 4-66 California Hydrologic Regions*




Source: 2018 State of California Hazard Mitigation Plan

### *The Placer County Waterway System*

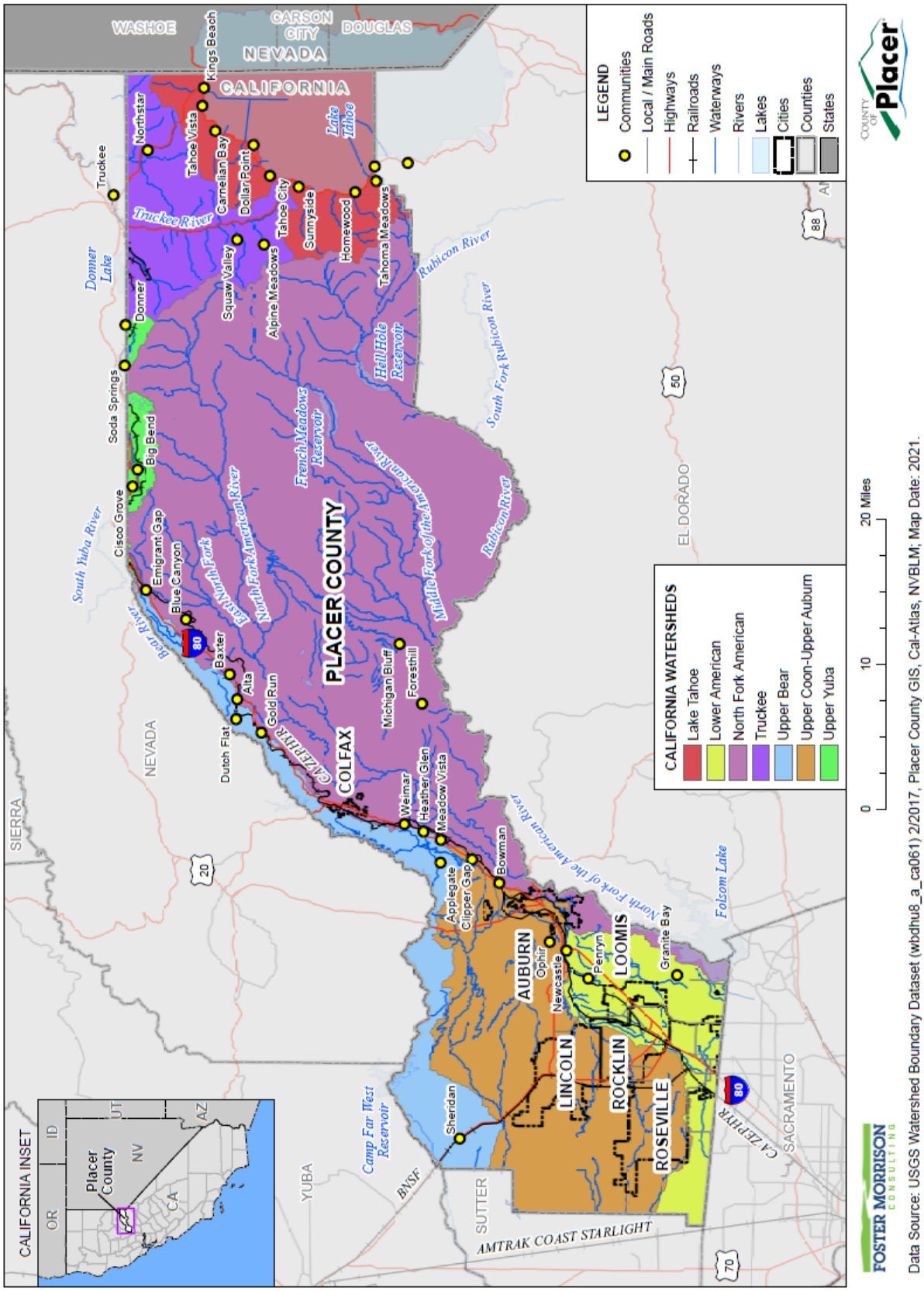
Placer County encompasses multiple rivers, streams, creeks, and associated watersheds. The County is situated in a region that dramatically drops in elevation from the eastern portion (Sierra Nevada) to the western portion, where excess rain on snow can contribute to downstream flooding. Damaging floods in Placer County occur primarily in the developed areas of the county. Flood flows generally follow defined stream channels, drainages, and watersheds.

Placer County crosses 14 watersheds. The watersheds of Placer County include a combined drainage area of approximately 1,515 square miles. Of the 14 watersheds, there are four main watersheds or areas that are the primary source of flooding within the County. These include the following watersheds as further described in the following paragraphs:

- Dry Creek Watershed
- Cross Canal Watershed
- Auburn/Bowman Area
- Truckee River Watershed

Figure 4-67 illustrates the primary watersheds of Placer County, as well as the primary waterways in the County.

*Figure 4-67 Primary Watersheds and Waterways of Placer County*



**Dry Creek Watershed**. Dry Creek watershed encompasses approximately 116 square miles in Placer and Sacramento Counties. In Placer County the watershed is located in the southwestern portion of the County, and includes the City of Rocklin and Town of Loomis. The headwaters of Dry Creek are located in the upper portions of the Loomis Basin, in the vicinity of Penryn and Newcastle, in unincorporated Placer County, in the Granite Bay area near Folsom Lake, and in Orangevale in Sacramento County. The headwaters are located in the Sierra Nevada foothills at elevations of 900-1200 feet above msl. The mouth of Dry Creek, at its confluence with the Natomas East Main Drainage Canal, is at an elevation of about 30 feet above msl. Major tributaries to Dry Creek include Antelope Creek, Clover Valley Creek, Secret Ravine, Miners Ravine, Strap Ravine Creek, Linda Creek, and Cirby Creek. Dry Creek drains to Steelhead Creek. Land use in the Dry Creek watershed varies widely, from agricultural to residential to commercial. The watershed is located in an area of rapid urbanization and population growth.

Incidences of flooding along Dry Creek and its tributaries are well documented. Floods in the Dry Creek watershed occur from October through April. The major flooding problems within this drainage basin occur where the north and south branches of Dry Creek converge. Flooding occurs when heavy rains and saturated soils cause streams to overflow their banks, flooding property and structures located adjacent to the streams. Streams also back up at culverts and bridges, blocking roads or making them unsafe. Continued development in both the upper and lower reaches of the watershed will likely make flooding problems worse.

According to the 1992 Dry Creek Watershed Flood Control Plan, substantial flood damages will continue to occur under existing conditions. Areas with the most extensive and frequent damages include areas along Miners Ravine in the vicinity of Joe Rodgers Road and upstream of Sierra College Boulevard; Paragon Court near Antelope Creek in Rocklin; and areas along Cirby, Linda and Dry Creeks in Roseville. Some of these same areas are susceptible to flooding from storms as frequent as the 10-year storm. Many of the bridges and culverts in the watershed are inadequate to pass the 100-year event (70 percent). Nearly 50 percent of the stream crossings are inadequate for even the 25-year flood. Based on 1989 land use, structures that will be impacted by the 100-year flood are essentially those that were flooded by the February 1986 flood. CAN THIS BE UPDATED?

Floods generally caused by a combination of prolonged rainfall leading to saturated soils and a short period of intense precipitation occur from October through April. Dry Creek and its tributaries have an extensive record of historic flood, especially in the Roseville area. According to the 1992 report, damaging floods occurred in December 1955, April 1958, October 1962, December 1964, March 1983, and February 1986. The 1955, 1983, and 1986 floods were the largest and most damaging on record. ADDITIONAL SIGNIFICANT YEARS TO NOTE?

**Cross Canal Watershed (Auburn Ravine/Coon Creek/Pleasant Grove Creek/Markham Ravine/Curry Creek)**. This watershed encompasses approximately 69,919 acres, and includes 6 dams. Auburn Ravine, Markham Ravine, Coon Creek, Pleasant Grove Creek, Curry Creek, and their tributaries drain approximately 292 square miles of northwestern and southeastern Sutter County (88 percent in Placer County and 12 percent in Sutter County) and are referred to as the Cross Canal Watershed. The Cross Canal, at the western portion of the watershed, carries the combined flow of the creeks to the Sacramento River. The watershed slopes from east to west with elevations ranging from 2,500 feet to 25 feet. The eastern portion of the watershed is located in the foothills of the Sierra Nevada. Stream channels in this area have

slopes of several hundred feet per mile. The eastern portion of the watershed is typified by the much flatter land of the Central Valley. Stream channels in this area have slopes of a few feet per mile. The City of Lincoln and portions of the Cities of Auburn, Rocklin, and Roseville are located within the watershed.

An extensive area upstream of the Cross Canal, in eastern Sutter County and western Placer County, is subject to periodic flooding. Major flooding in the watershed occurs as ponding and overland flow over many square miles of land east of the Cross Canal. Flooding also occurs adjacent to tributary streams where channel capacities are exceeded. Inadequately sized road crossings, land leveling, and channelization within the lower portion of the watershed have likely contributed to the frequency and degree of flooding. Future development in the watershed may also contribute to the flooding issue. The affected flooding area appears to be between 10,000 to 30,000 acres including the tributary streams. The Sutter-Placer Watershed Area Study by the Soil Conservation Service estimated approximately 31,000 acres of the watershed would be inundated during a 100-year frequency flood event. Approximately 95 percent of the potentially flooded area is west of Highway 65, in the flatter portion of the watershed. During major flooding, inundation along the individual streams combines upstream of the Cross Canal to form a continuous body of water approximately 10 miles by 3 miles. Several roads in the western portion of the watershed flood once or more each year on the average (Placer County Water Agency 2001). Several elements contribute to major flooding in the watershed including limited channel capacity, undersized bridges and culverts, high river stages in the Sacramento River, and historical land leveling and channel modifications. CAN THIS BE UPDATED?

**Auburn/Bowman Area**. The Auburn/Bowman area is a largely rural area located in the Sierra foothills in Placer County. The area covers approximately 41.5 square miles and is contained in portions of six different drainage basins (or watersheds): Bear River – 2.1 square miles, Orr Creek – 9.3 square miles, Dry Creek – 15.5 square miles (including Rock Creek – 4.3 square miles), Auburn Ravine – 10.8 square miles (including North Ravine – 4.6 square miles), Mormon Ravine – 1.4 square miles, Dutch Ravine – 1.0 square miles, the American River (North Fork) – 9.8 square miles, and Deadman's Canyon – 1.0 square miles. This area is characterized by relatively steep slopes and moderate relief. Elevations in the area range from approximately 800 feet above msl in the southern portion of the study area to over 2000 feet above msl in upper Dry Creek and Orr Creek watersheds. Overall, most of the Auburn/Bowman area has elevations ranging from 1000 to 1500 feet above msl.

Flooding occurs when heavy rains cause streams to overflow their banks, flooding property and structures located adjacent to the stream. Streams also back up at culverts and bridges, blocking roads or otherwise making them unsafe. Emergency services can also be restricted by the flooded roads. In addition, there are numerous open canals in the study area which can intercept sheet runoff from one area and spill it into another. Excessive spills from these canals may also increase the potential for downstream flooding. According to the 1992 Auburn/Bowman Community Plan Hydrology Study, approximately 70 percent of the bridges and culverts in the watershed are inadequate to pass the 100-year flows for both existing and future conditions, and flooding will occur with the 100-year flood under existing conditions along Dry Creek Road. Specifically, flooding of up to two to three feet has been known to occur on Dry Creek Road between Dry Creek Road Bridge and Twin Pines Trail Bridge during a major storm event (e.g., March 1986). The flood of 1986 caused the most severe flooding damage to date in the Auburn/Bowman area. In addition to the overtopping of bridges and culverts, at several locations, flooding of structures occurred in

the floodplains. Over 60 percent of the stream crossings are inadequate for even the 25-year flood. CAN THIS BE UPDATED?

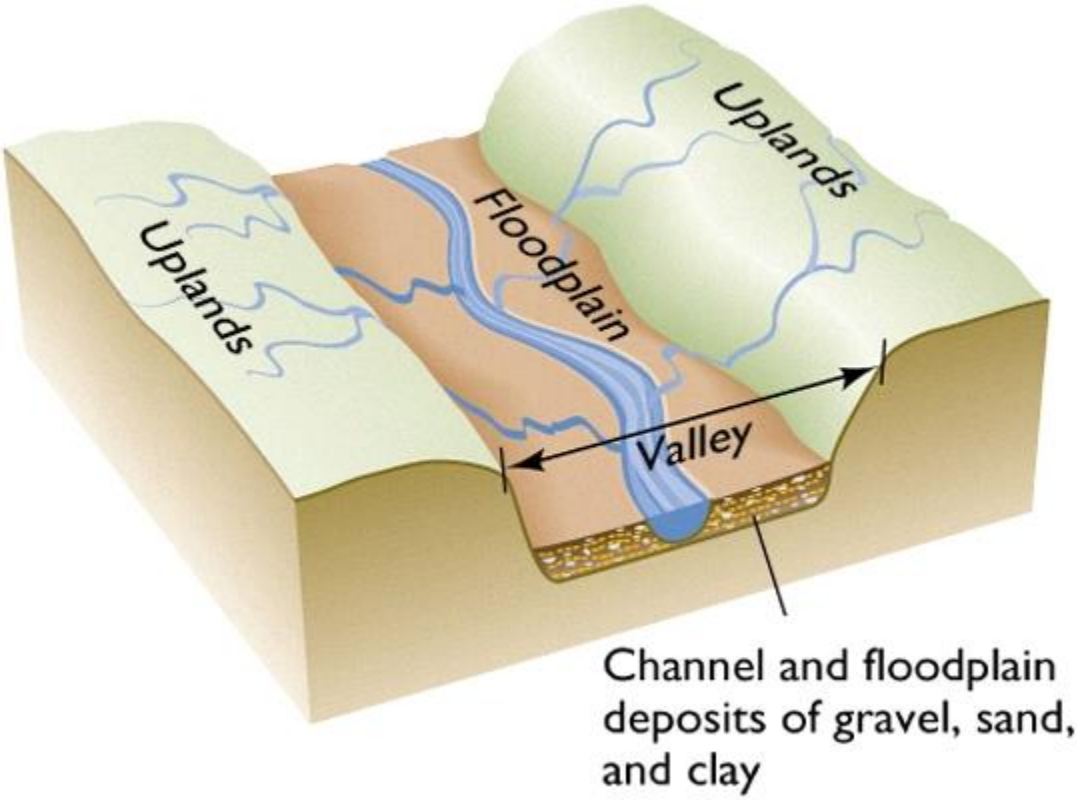
**Truckee River Watershed**. The Truckee River watershed, with an area of approximately 2,720 square miles, encompasses the entire Lake Tahoe, Truckee River, and Pyramid Lake systems. The major tributaries to the Truckee River in California include Bear Creek, Squaw Creek, Cabin Creek, Pole Creek, Donner Creek, Trout Creek, Prosser Creek, the Little Truckee River, Gray Creek, and Bronco Creek. Roughly the middle third of the Truckee River watershed is located within Placer County, in eastern Sierra Nevada, north of Lake Tahoe. A significant portion of the watershed is above 6,000 ft.

The overflowing and diversion of Squaw Creek (upper Truckee River Basin), is responsible for major flooding events, such as the January floods of 1997, in eastern Placer County. In the more urbanized areas, flood problems are intensified by the increased volume of water that must be carried away by streams. The volume is increased because rooftops of new homes and other structures, as well as new streets, driveways, parking lots, and other paved areas all decrease the amount of open land available to absorb rainfall and runoff. CAN THIS BE UPDATED?

### *Floodplains*

The area adjacent to a channel is the floodplain (see Figure 4-68). 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 4-68 Floodplain Schematic*




Source: FEMA

According to the 2018 Flood Insurance Study for Placer County, general rain floods can occur in the study area anytime during the period from November through April. This type of flood results from prolonged heavy rainfall and is 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 l-percent-annual-chance floodflows on all the study area waterways.

### *Placer County Flood Mapping*

As part of the County's ongoing efforts to identify and manage their flood prone areas, Placer County relies on a variety of different mapping efforts. What follows is a brief description of FEMA and DWR mapping efforts covering the Placer 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. The 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. SB5 requires levee protection in urban areas to a 200-year (or 0.5% annual chance flood. A general overview of floodplain mapping is provided in the following paragraphs.

### Flood Insurance 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 Placer County FIS is dated November 2, 2018. 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 chancer floodplains, floodways, and the locations of selected cross sections used in the hydraulic analysis and local floodplain regulation. The County FIRMs, for the south western portion of the County, have been replaced by digital flood insurance rate maps (DFIRMs) as part of FEMA's Map Modernization program, which is discussed further below.

### 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.

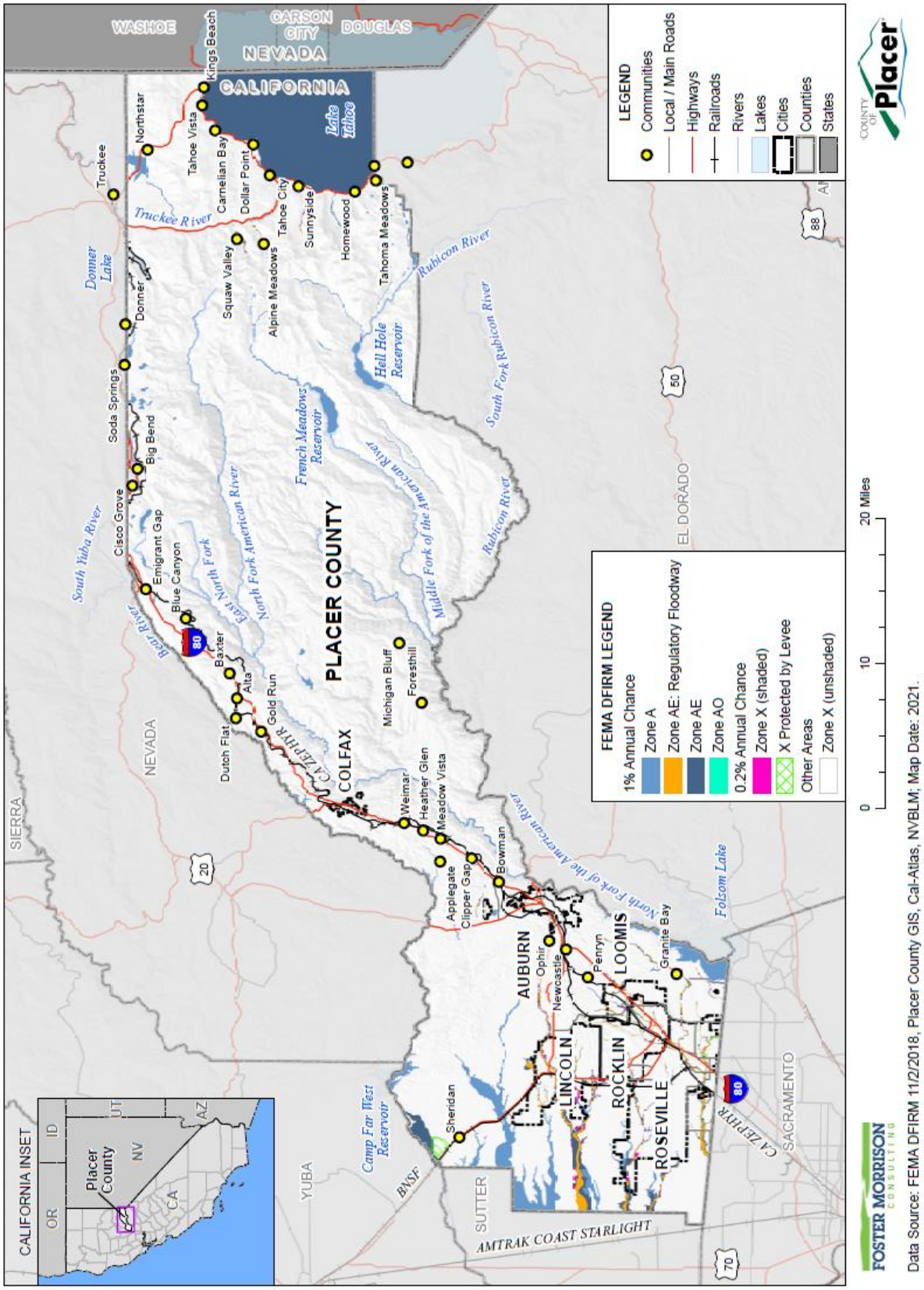
### Digital Flood Insurance Rate Maps (DFIRM)

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 2018 DFIRMs are being used for the flood analysis for this LHMP Update, and are shown on Figure 4-69.

## *Figure 4-69 Placer County – DFIRM Flood Zones*



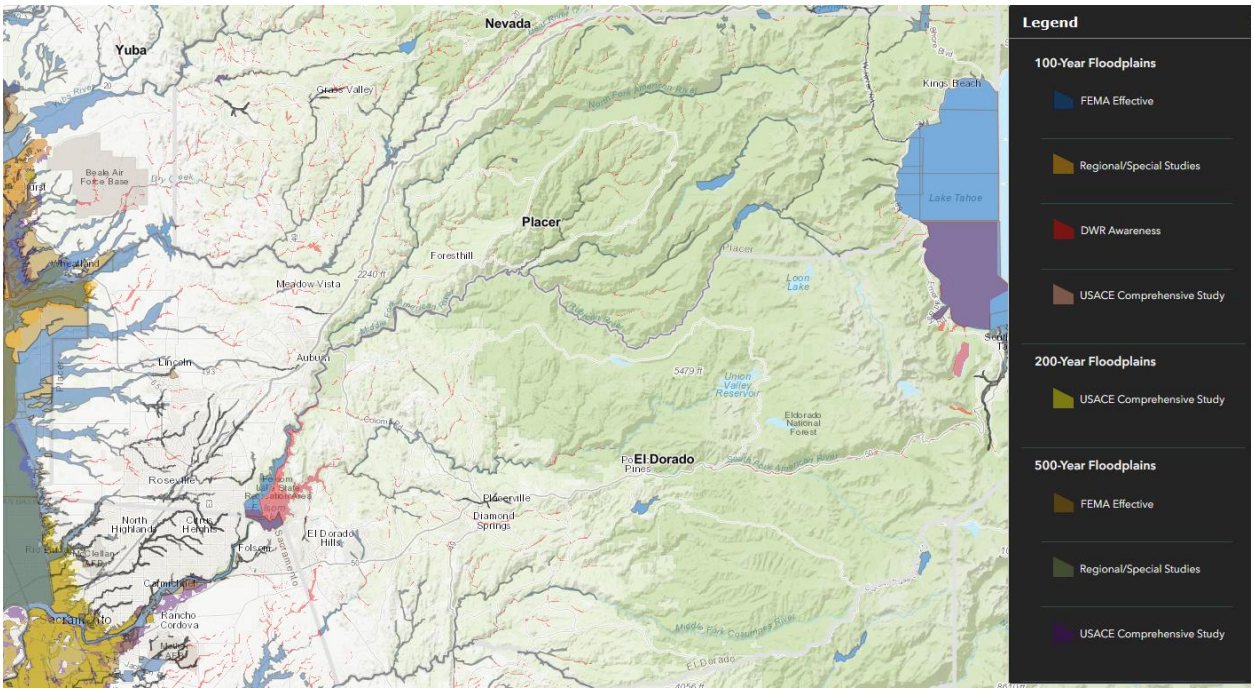
### California Floodplain Mapping

Also to be considered when evaluating the flood risks in Placer 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 Placer 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 4-70 shows the BAM for the Placer County Planning Area.

### *Figure 4-70 Placer 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%r (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 are shown later on Figure 4-71 and below in Table 4-77.

### *Table 4-77 Placer County Planning Area– 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 | 36,091 | 4.01% | 10,914 | 6.06% | 25,176 | 3.50% |
| 0.2% Annual Chance | 1,296 | 0.14% | 636 | 0.35% | 661 | 0.09% |
| Other Areas | 861,777 | 95.84% | 168,520 | 93.59% | 693,257 | 96.41% |
| **Total** | **899,164** | **100.00%** | **180,070** | **100.00%** | **719,094** | **100.00%** |

Source: 11/2/2018 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 Placer County from flooding, (including heavy rains and storms) is shown on Table 4-78. The County had no USDA disaster declarations since 2002 related to flood, as shown on Table 4-6. No disasters were related to streambank erosion.

*Table 4-78 Placer County – State and Federal Disaster Declaration from Flood 1950-2020*

| Disaster Type | State Declarations | | Federal Declarations | |
|---|---|---|---|---|
| | Count | Years | Count | Years |
| Flood (including heavy rains and storms) | 16 | 1950, 1955, 1958 (twice), 1962, 1963, 1969, 1973, 1980, 1983, 1986, 1995 (twice), 1997, 2008, 2017 | 13 | 1955, 1958, 1962, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 2006 (twice), 2017 |

Source: Cal OES, FEMA

### NCDC Events

The NCDC tracks flooding events for the County. Events have been tracked for flooding since 1993. Table 4-79 shows events in Placer 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 4.3.3. 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 4-79 NCDC Flood Events in Placer County 1993 to 7/31/2020**

| Event Type | Number of Events | Deaths | Injuries | Property Damage | Crop Damage | Deaths (indirect) | Injuries (indirect) |
|---|---|---|---|---|---|---|---|
| Flash Flood | 6 | 0 | 0 | $150,000 | $0 | 0 | 0 |
| Flood | 33 | 2 | 1 | $12,370,000 | $7,800,000 | 0 | 0 |
| Heavy Rain | 59 | 2 | 0 | $10,000 | $0 | 0 | 0 |
| **Total** | **98** | **4** | **1** | **$12,530,000** | **$7,800,000** | **0** | **0** |

Source: NCDC

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

### FIS Events

The FIS contained the following past occurrences of flood.

- Auburn Ravine - The February 1986 flood caused the most severe flooding on the study reach of Auburn Ravine of any event in the historic record. The only flood problem identified during the study that confirmed historic records, however, was overtopping of the roadway at Stonehouse Road, Forgotten Road, Highway 65 and Highway 193.
- Dry Creek – Floods occur in the Dry Creek watershed as a result of short, intense rainfall in the period from fall through spring. Historic flood events occurred in December 1955, April 1958, October 1962, December 1964, March 1983, and February 1986. The February 1986 flood is the historic flood of record, and has been estimated in this watershed as a 1-to-2-percent flow exceedance event, depending on the specific location. According to the Dry Creek Watershed Flood Control Plan, the February 1986 flood caused widespread damage throughout the watershed (Montgomery 1992b). Most bridges and culverts were overtopped, the crossing at Rocky Ridge was washed out, and 30 sustained embankment damage, including Cook Riolo Road. Many major streets were closed. Several homes along Dry Creek were flooded downstream of Roseville.
- Markham Ravine – Flooding of Gladding Road at Markham Ravine occurs even with frequent floods. No other history of flood hazards for Markham Ravine was available.
- Miners Ravine – Miners Ravine has headwater characteristics of steep gradient and high confining terrain along its upper reaches. Boulders and rock outcroppings limit most flooding to near the channel. Miners Ravine contributes to Dry Creek at Roseville. Sixteen homes were reportedly flooded near Joe Rodgers Road, during the February 1986 historic flood of record (Montgomery 1992b). The event has been estimated in this watershed as a 1-to-2-percent flow exceedance event, depending on the specific location. The most recent significant flooding occurred in 1997 and the area mostly affected was a residential area near the intersection of Douglas Boulevard and Auburn-Folsom Road. For about ½ mile, the stream banks are low with wide overbanks. Flooding is generally characterized by shallow depths. CAN THIS BE UPDATED?

### Hazard Mitigation Planning Committee Events

Historically, portions of Placer County have always been at risk to flooding because of its high annual percentage of rainfall, heavy snowfall in the winter, and the number of watercourses that traverse the County. Flooding events have caused severe damage in the very eastern and very western portions of the County, but are less of a threat within the center of the County. However, western Placer County is more likely to experience severe flooding than in other areas. With the exception of Colfax, portions of all other incorporated cities in western Placer are at least partially located within the 100-year floodplain. Existing watershed reports confirm that under existing conditions, flooding will continue to occur. As previously noted, localized stormwater flooding also continues to be a problem throughout the Planning Area.

The HMPC provided additional information on the following historical flood events in the County.

- **1852** – This was the first big flood to be noted in western Placer. Mining camps were just beginning to spring up in the Lincoln area, so hardly any structures were built which could be affected.
- **1860** – Rains began during the first week of October and culminated in a big storm March 23-28. Major damage was reported from farms and mines along Coon Creek, Auburn Ravine, and Bear River. Main roads remained impassable for weeks.
- **1861-62** – Lincoln had just been founded as a railroad and stagecoach center. The Lincoln-Folsom railroad was closed. The Auburn Ravine Turnpike was severely damaged and closed. Mining debris caused Bear River to change its channel to the south of its original course.

- **1875** – Floods occurred along Bear River and destroyed the bridge to Grass Valley from Sheridan.
- **1880** – Levees were finally being constructed along Bear River.
- **1955** – Listed on NOAA's website as one of the "top 15 weather/water/climate events, "significant and extended heavy rain and wind resulted in flooding throughout coastal and inland regions of northern California. Extensive flooding from overflowing small streams occurred in Placer County suburbs. Calculated damages for all areas affected within the State were 28 fatalities and $1.8 billion in losses.
- **March 1983** – The March 1983 flood damaged approximately 25 residences along Linda and Cirby Creeks in Roseville. Portions of Royer Park were under water as well as areas in the Sierra Lakes Mobile Home Park. Dry Creek overflowed the Darling Way and Riverside Avenue bridges, disrupting traffic and flooding six businesses along Riverside Avenue.
- **February 1986** – This flood was classified as an approximate 70-year event. Placer County was designated a Federal Disaster Area. The flooding caused widespread damage in most of the Dry Creek watershed. Flooding was significant in the Roseville, Rocklin and Loomis areas. Nearly all bridges and culverts were overtopped, with 30 sustaining embankment damage; the crossing at Rocky Ridge Drive was washed out. Two bridges over Dry Creek were damaged and street cave-ins occurred at a number of locations. Total damages within Placer County were estimated at 7.5 million; damage estimates specific to the Dry Creek Watershed are not available. One person was killed and 62 homes damaged or destroyed within the watershed based upon applications for disaster assistance. Other sources report around 100 homes flooded with water levels up to five feet above floor levels. Dozens of businesses in downtown Roseville were damaged or destroyed. According to information on file with Placer County, as part of the disaster declaration, FEMA reimbursed the County $376,611; no monies were reimbursed through the State.
- **1992** – Several days of continuous rain followed by a downpour caused Miners Ravine to overflow its banks and caused flooding that resulted in several dramatic rescues of people trapped in homes and vehicles.
- **January 1995** – This flood was classified as an approximate 100-year event. Placer County was designated a Federal Disaster Area. President Clinton toured the Tina/Elisa Way area of Roseville. The total damages within Placer County were estimated at $8.3 million with 750 damaged or destroyed structures. $4.2 million in damages were estimated for the Roseville area alone. Of the $4.2 million dollars in damages, $1 million was for road and bridge repairs, and $2 million was for utility repairs. Within the Roseville area of Placer County 385 homes, businesses, apartments, and mobile homes were damaged or destroyed; 2 sewage treatment plants were overtopped; and 1 landfill was damaged. Impassable roads caused the closure of most schools. According to information on file with Placer County, as part of the disaster declaration, FEMA reimbursed the County $882,158 and $166,735 was reimbursed through the State. As a result of the 1995 floods, a creek crossing (bridge-where Carolinda Drive crosses the Miners Ravine Creek) in the San Juan water district washed out in two separate incidents (January 9th and February or March). The first washout exposed main 10-inch ACP pipeline and made it vulnerable to high water and swift current. The crossing was rebuilt by the Carolinda Homeowner's Association and the line went back into service. The second wash out occurred in February or early March, again due to high water and swift currents. This time the pipe was removed and a new bridge was built with the pipeline now being supported by the new bridge. The cost of repairs and replacement was $30,400, of which $27,000 was received through disaster funds.
- **1996** – Heavy rain and clogged storm drains caused water to flow into the Cavitt School Gymnasium (Eureka Union School District) in southern Placer County. A wood floor was lost. The $85,976 in damages was covered by Emergency Services under a disaster declaration. The drainage system has since been modified.

- **January 1997** – A significant amount of rainfall and snowmelt runoff poured out of the Sierra Nevada from December 30, 1996 to January 1997. This was a very warm system and rain was falling at the 9,000 foot elevation. An estimated 25 inches of rain and snowmelt runoff occurred during this period on the Squaw Creek Basin (the upper Truckee River Basin in Placer County). This scenario was typical throughout the region and resulted in extensive flooding on the Truckee, Carson, Walker, and Susan Rivers. Consequently, record flooding occurred on much of the Truckee, Carson, and Walker Basins. In Placer County, flooding eroded away mountainsides, breaking sewer, water, and power lines. The south fork of Squaw Creek jumped its bank and burst through the lodge at the Squaw Valley Ski Resort. All bridges across Highway 89 were destroyed or severely damaged. Avalanches closed Highway 89 in both directions isolating Squaw Valley from the outside world. Log jams caused the creek to diverge and deposit 3,500 cubic yards of gravel, boulders, logs, and debris into the stream channel, piling the material up to six feet deep into homes and condominiums (USDA 1997). Mudslides blocked Squaw Valley Road and almost every other road in the area. In Placer County alone, damage estimates for public property were nearly $11 million. 137 homes and 22 businesses were damaged within the County. Total damage to private homes, businesses, agriculture, and private roads was near $10 million. Destruction to the Federal Highway System was nearly $7.7 million. According to information on file with Placer County, as part of the disaster declaration, FEMA reimbursed the County $717,754 and $177,451 was reimbursed through the State.
- **February 1998** – In Placer County, 4 homes in the City of Roseville and 1 home in the Town of Granite Bay were inundated on the 3rd. Specific damages in the County were unavailable. No deaths or injuries were reported.
- **February 2000** – Creek flooding in Auburn closed Gold Rush Plaza. Nine retail shops sustained minor damages. $45,000 in damages was reported.
- **December 31, 2005 to January 1, 2006** – A series of warm winter storms brought heavy rain, mudslides, flooding, and high winds to Northern California. Localized flooding was reported across eastern Placer County, especially on Blackwood and Ward Creeks, and the Truckee River. Blackwood Creek rose to its second highest level in the last 45 years. $1 million in property damage in the Tahoe City area was reported. Additionally, I-80 eastbound between Sacramento and Reno, NV, was closed for more than a day due to a massive mudslide, as was both directions of U.S. Highway 50 between Sacramento and South Lake Tahoe.
- **January 2008** – flooding of residential structures at two different property locations occurred in the Auburn area as a result of an intense storm event on January 1, 2008. Property damages were estimated at $10,000 for one property; minor damages were cited at the other property.
- **December 23, 2014** – Heavy rain showers and thunderstorms brought record rainfall and flooding issues to portions of the Central Valley and foothills. In Placer County, there were 10-12 homes flooded in Granite Bay, causing $50,000 in damages. In Roseville, roadway flooding at Douglas Blvd. and Sierra College Blvd occurred, with the westbound lanes submerged under two feet of water. 2 vehicles were stuck due to flooding near Gasoline Alley. Near Hidden Valley, an intersection was closed at County Club and Eureka, with vehicles stuck in that location. Flooding occurred at Dry Creek Road and I-80. Also, I-80 and Clipper Gap Rd. Lane 1 had 1-2 feet deep water, 75 feet across, flooding the entire off ramp. Damages occurred in the Placer Hills and Foresthill Fire Protection Districts, as well as the North Star Community Services District. More information on specific damages to these areas can be found in their respective annexes to this Plan.
- **January 31, 2016** – Heavy snows in the Serene Lakes area caused flooding to occur. A bridge was overtopped, rendering it impassible (see below). Front end loaders were used to transport residents from one side of the bridge to the other. No injuries or deaths were reported.

- **January 2017** – Two strong storms brought a range of significant weather impacts to northern interior California. The first storm was very wet and warm, the second not quite as wet but cooler with lower snow levels. Both storms brought strong, damaging winds. The heavy rain brought widespread flooding of small streams and rivers, with some flooding of main stem rivers, mountain snow many feet deep, and numerous trees down on roads, vehicles, and homes. Many roads, including major highways such as Interstate 80, were shut down due to mudslides, heavy snow, flooding, washouts or avalanche suppression. EF0 tornadoes were reported at Lincoln and Natomas. Other significant impacts include numerous accidents due to slippery roads, evacuations and rescues due to flooding. A 5,427-gallon sewer spill discharged to surface water leading to Rock Creek. The spill was unrecoverable due to heavy rain The bridge on Morton Rd. was washed out by flooding from Canyon Creek. This road is located next to the I80 exit in Alta. The incident isolated 15 homes. An alternative temporary access was established, traversing a steep, windy gravel road over private property. The Placer County Board of Supervisors approved two measures giving both short- and long-term assistance to the isolated community. A new temporary bridge, and then a permanent bridge will be constructed on the site. The estimated cost is $3 million dollars for the bridge construction. The total cost was estimated by the county to be $5 million. The Auburn Ravine Grinder station was damaged due to flooding. During the flooding, the three 30,000 fallon tanks could not handle the inundated amount of storm water, causing $70,000 in damages.
- **February 2017** -Storms brought additional rain and widespread flooding and debris flows, as well as mountain snow. Dry Creek flooding blocking Walerga Rd. near intersection with PFE Rd.
- **February 2019 -** Heavy snow fell over the mountains and extended down into lower elevations, causing widespread travel problems and road closures. Thunderstorms brought heavy rain and small hail with widespread road flooding. Gusty winds brought down trees and caused power outages. Via Twitter, Placer County reported that Dowd Road at Wise Road near Lincoln was closed due to flooding. Auburn Folsom Rd at Cavitt Atallman Rd. Roadway flooded and water had risen to edge of roadway.

## 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

Climate change and its effect on flood in the County has been discussed by two sources:

- Placer County Sustainability Plan –2020
- CAS – 2014

### Placer County Sustainability Plan

Although climate change may not change average precipitation levels very much, scientists expect that it will cause more years with particularly intense storm systems that drop enough precipitation over a short enough period to cause flooding. Because of this, floods are expected to occur more often in Placer County. Indirect effects of climate change may also increase flooding in Placer County due to the expected increase in the frequency and severity of droughts, which cause soil to dry out and become hard. When precipitation does return, more water runs off the surface rather than being absorbed into the ground, leading to floods. Wildfires, which are also expected to become more frequent due to climate change, cause a similar effect by baking the surface of the ground into a harder and less penetrable layer. Trees and other vegetation help slow water down, which lets the water absorb into the soil and prevents it from turning into runoff. The loss of trees and other plants from wildfires, pests, diseases, or other climate-related exposures can also increase flooding risk.

### CAS

According to the CAS, climate change may affect flooding in Placer County. While average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st 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 4-39 in Section 4.3.3. 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**—Extremely High

Historically, the Placer County Planning Area has always been at risk to flooding during the rainy season from November through April. Normally, wintertime storm floodwaters are kept within defined limits by levees, dykes, and open lowlands and cause no damage. But, occasionally, extended heavy rains result in floodwaters exceeding normal high-water boundaries and causing damage. 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.

## 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. Flooding causes instability and erosion along abutments that hold sewer pipes that cross waterways. A failure of the abutment can cause sewage spills in waterways. 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 can also include greater levee maintenance and increased risk of levee failure.

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.

## Warning and Evacuation Procedures

Placer County and its incorporated communities have a variety of systems and procedures established to protect its residents and visitors to plan for, avoid, and respond to a hazard event including those associated with floods and wildfires. This includes Pre-Disaster Public Awareness and Education information which is major component in successfully reducing loss of life and property in a community when faced with a potentially catastrophic incident. Much of this information is not specific to a given hazard event and is always accessible to the public on local County and City websites. Specific warning and evacuation systems and procedures include information relative to: Warning Systems, Everbridge, ALERT System, dam protocols, evacuation procedures, and sheltering in place. Additional information on these warning and evacuation procedures as well as post-disaster mitigation policies and procedures can be found in Section 4.4, Capabilities, of this Risk Assessment and in the Emergency Management discussions in Appendix C. WHAT NEW INFORMATION CAN BE ADDED TO THIS DISCUSSION?

## Flood Hazard Assessment

This risk assessment for the Placer County LHMP Update assessed the flood hazard specific to Placer 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; dam failure flooding; and mudflow flooding especially in significant post-burn areas. 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 or sea level rise. Existing studies, maps, historical data, and federal, state, and local community expertise and knowledge contributed to this current flood assessment for Placer 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 Placer 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 flood vulnerability assessment that follows focuses on the flood hazard based on FEMA DFIRMs. Other flood related vulnerability analysis and discussions are included throughout this LHMP Update.

### Flood Analysis

The Placer County Planning Area has mapped FEMA flood hazard areas. This section of the vulnerability assessment focuses on the Placer County Planning Area (the 5 incorporated communities and the unincorporated County). GIS was used to determine the possible impacts of flooding within the County and how the risk varies across the Planning Area.

Placer County has a FEMA effective DFIRM dated 11/2/2018, which was obtained from the National Flood Hazard Layer to perform the flood analysis. 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 4-80 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 Placer County Planning Area are shown on Figure 4-71 and Figure 4-72 for the east and west portion of the County, respectively.

### *Table 4-80 Placer County Planning Area – DFIRM Flood Hazard Zones*

| Flood Zone | Description | Flood Zone Present in City of Auburn | Flood Zone Present in City of Colfax | Flood Zone Present in City of Lincoln | Flood Zone Present in Town of Loomis | Flood Zone Present in City of Rocklin | Flood Zone Present in unincorporated County |
|---|---|---|---|---|---|---|---|
| A | 1% annual chance flooding: No base flood elevations provided | X | | X | | | X |
| AE | 1% annual chance flooding: Base flood elevations provided | X | | X | X | X | X |
| AE Floodway | 1% annual chance flood: Regulatory floodway; Base flood elevations provided | X | | X | X | X | X |
| AO | 1% annual chance flooding: sheet flow areas. BFEs derived from detailed hydraulic analyses are shown in this zone. | X | | | | X | 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 | X | 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 (unshaded) | No flood hazard | X | X | X | X | X | X |

Source: FEMA

The City of Roseville is not included in this LHMP Update. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

*Figure 4-71 Placer County East – DFIRM Flood Zones*

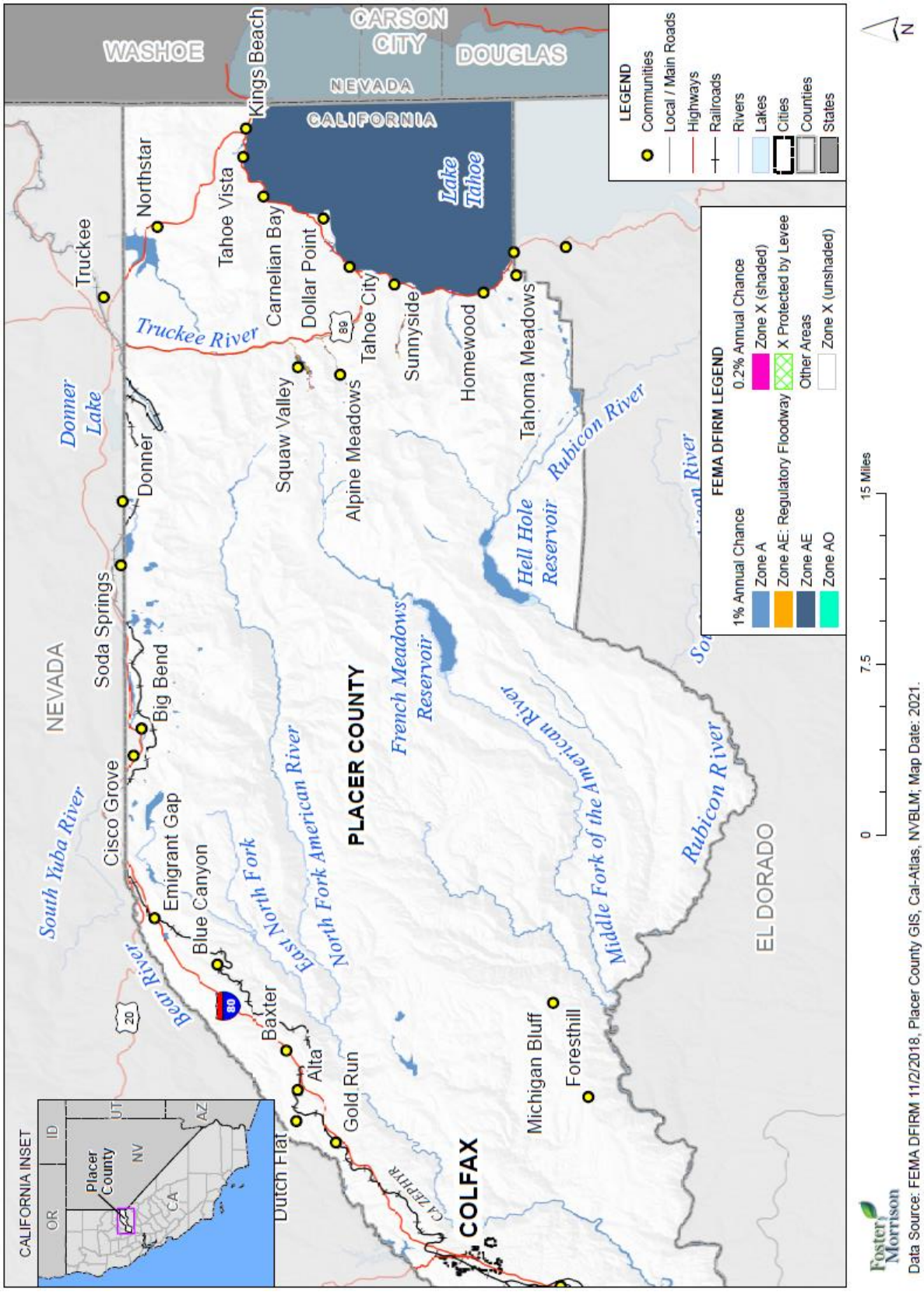
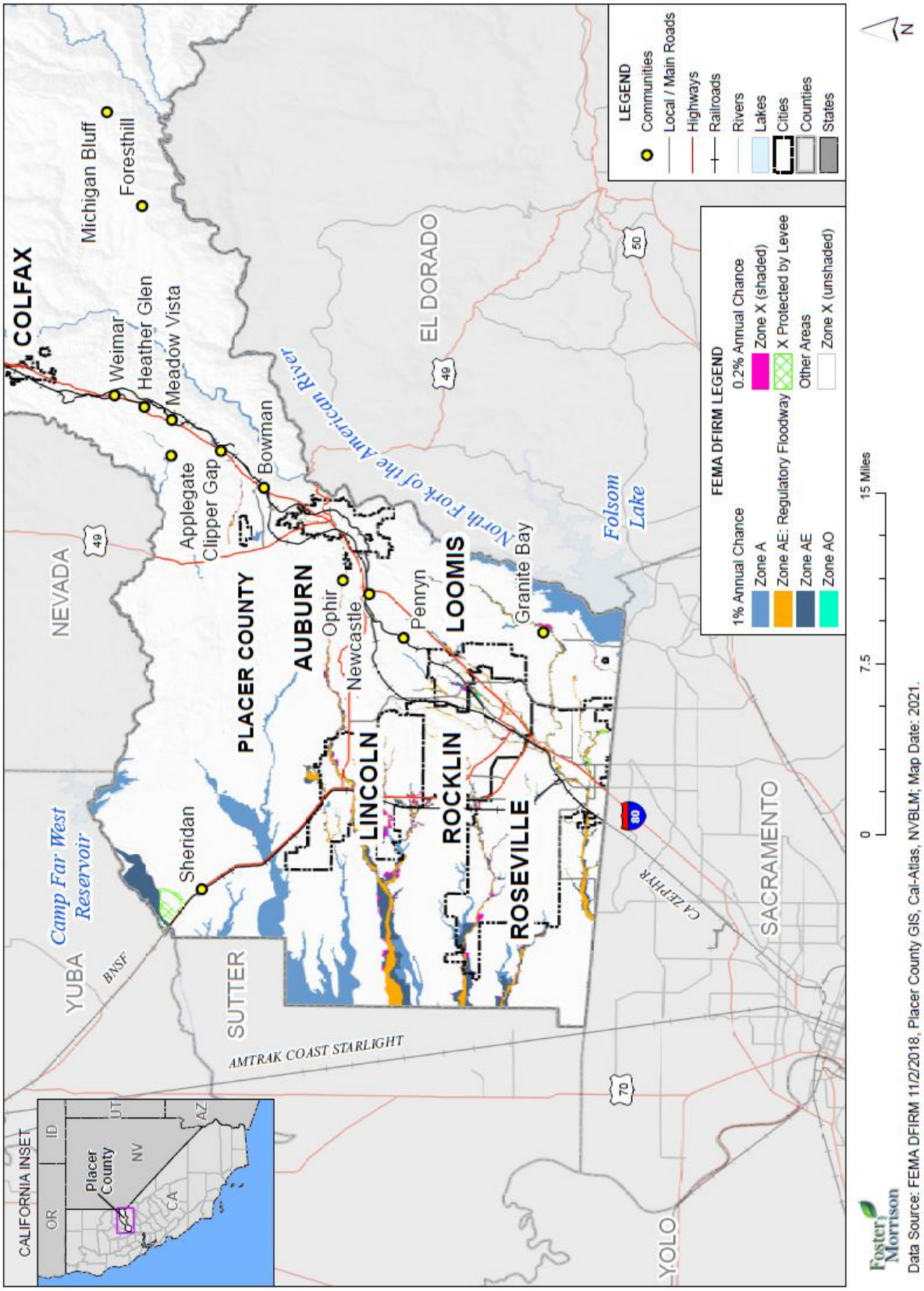


*Figure 4-72 Placer County West– DFIRM Flood Zones*



## 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 Placer County Planning Area to the flood hazard.

### *Methodology*

Placer County's 2020 Parcel and Assessor Data, obtained from Placer County, was used as the basis for the county inventory of parcels, values, and acres. Placer County has a FEMA DFIRM dated 11/2/2018 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 the Placer County Planning Area. 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 Placer County Planning Area and the unincorporated 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, and to a lesser extent, properties falling under the Williamson Act.

### *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 improvements and structure 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.

The property use categories for the County (derived from zoning code descriptions) were used to develop estimated content replacement values (CRVs) that are potentially at loss from hazards, using FEMA Hazus methodologies as previously described in Section 4.3.1. The CRVs were added to the improved parcel values.

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.

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 Placer County Planning Area and secondly for unincorporated County. Results for the incorporated jurisdictions are presented in their annexes to this Plan.

### Placer County Planning Area

Table 4-81 through Table 4-82 contain flood analysis results for the Placer County Planning Area. These tables show the number of parcels and values at risk to the 1% and 0.2% annual chance event for unincorporated Placer County. Table 4-81 shows a summary of the value of improved parcels by 1% and 0.2% annual chance flood zones in the Planning Area. Table 4-82 shows the total values in each flood zone by jurisdiction for the Planning Area.

***Table 4-81 Placer 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 | 2,157 | 1,097 | $384,502,094 | $395,121,846 | $250,723,546 | $1,030,347,486 |
| 0.2% Annual Chance Flood Hazard | 348 | 212 | $61,914,370 | $80,427,366 | $46,888,325 | $189,230,061 |
| Other Areas | 126,702 | 100,426 | $18,720,089,864 | $38,937,220,013 | $21,838,228,111 | $79,495,537,988 |
| **Grand Total** | **129,207** | **101,735** | **$19,166,506,328** | **$39,412,769,225** | **$22,135,839,982** | **$80,715,115,535** |

Source: FEMA 11/2/2018 DFIRM, Placer 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.

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### *Table 4-82 Placer County Planning Area – Count and Value of Parcels* by DFIRM Flood Zones by Jurisdiction*

| Jurisdiction/ Flood Zone | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| **Auburn** | | | | | | |
| 1% Annual Chance Flood Hazard | 60 | 23 | $4,128,747 | $7,908,824 | $6,111,916 | $18,149,487 |
| 0.2% Annual Chance Flood Hazard | 0 | 0 | $0 | $0 | $0 | $0 |
| Other Areas | 6,430 | 5,157 | $644,368,386 | $1,541,085,558 | $902,211,255 | $3,087,665,199 |
| **Auburn Total** | **6,490** | **5,180** | **$648,497,133** | **$1,548,994,382** | **$908,323,171** | **$3,105,814,686** |
| **Colfax** | | | | | | |
| 1% Annual Chance Flood Hazard | 0 | 0 | $0 | $0 | $0 | $0 |
| 0.2% Annual Chance Flood Hazard | 0 | 0 | $0 | $0 | $0 | $0 |
| Other Areas | 988 | 711 | $64,997,967 | $152,168,583 | $104,699,837 | $321,866,387 |
| **Colfax Total** | **988** | **711** | **$64,997,967** | **$152,168,583** | **$104,699,837** | **$321,866,387** |
| **Lincoln** | | | | | | |
| 1% Annual Chance Flood Hazard | 126 | 12 | $8,276,991 | $13,364,910 | $18,493,118 | $40,135,019 |
| 0.2% Annual Chance Flood Hazard | 191 | 110 | $23,320,645 | $43,414,916 | $25,929,214 | $92,664,775 |
| Other Areas | 21,504 | 18,584 | $2,399,605,088 | $6,387,701,619 | $3,515,640,807 | $12,302,947,514 |
| **Lincoln Total** | **21,821** | **18,706** | **$2,431,202,724** | **$6,444,481,445** | **$3,560,063,139** | **$12,435,747,308** |
| **Loomis** | | | | | | |
| 1% Annual Chance Flood Hazard | 117 | 98 | $12,400,680 | $30,205,234 | $21,027,153 | $63,633,067 |
| 0.2% Annual Chance Flood Hazard | 13 | 12 | $1,492,271 | $2,725,467 | $1,362,734 | $5,580,472 |
| Other Areas | 2,865 | 2,442 | $395,656,406 | $785,637,335 | $479,648,228 | $1,660,941,969 |
| **Loomis Total** | **2,995** | **2,552** | **$409,549,357** | **$818,568,036** | **$502,038,115** | **$1,730,155,508** |

| Jurisdiction/ Flood Zone | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| **Rocklin** | | | | | | |
| 1% Annual Chance Flood Hazard | 185 | 115 | $23,373,619 | $47,773,479 | $37,270,632 | $108,417,730 |
| 0.2% Annual Chance Flood Hazard | 47 | 40 | $4,015,333 | $7,975,437 | $4,436,746 | $16,427,516 |
| Other Areas | 23,425 | 20,854 | $3,078,318,160 | $8,111,424,358 | $4,798,444,657 | $15,988,187,175 |
| **Rocklin Total** | **23,657** | **21,009** | **$3,105,707,112** | **$8,167,173,274** | **$4,840,152,035** | **$16,113,032,421** |
| **Unincorporated Placer County** | | | | | | |
| 1% Annual Chance Flood Hazard | 1,669 | 849 | $336,322,057 | $295,869,399 | $167,820,727 | $800,012,183 |
| 0.2% Annual Chance Flood Hazard | 97 | 50 | $33,086,121 | $26,311,546 | $15,159,631 | $74,557,298 |
| Other Areas | 71,490 | 52,678 | $12,137,143,857 | $21,959,202,560 | $12,037,583,327 | $46,133,929,744 |
| **Unincorporated Placer County Total** | **73,256** | **53,577** | **$12,506,552,035** | **$22,281,383,505** | **$12,220,563,685** | **$47,008,499,225** |
| | | | | | | |
| **Grand Total** | **129,207** | **101,735** | **$19,166,506,328** | **$39,412,769,225** | **$22,135,839,982** | **$80,715,115,535** |

Source: FEMA 11/2/2018 DFIRM, Placer 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.

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

Table 4-83 shows a summary table of loss estimates by 1% and 0.2% annual chance flood zone for the Placer 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 4-83 Placer 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 Hazard | 2,157 | 1,097 | $395,121,846 | $250,723,546 | $645,845,392 | $129,169,078 | 0.22% |
| 0.2% Annual Chance Flood Hazard | 348 | 212 | $80,427,366 | $46,888,325 | $127,315,691 | $25,463,138 | 0.04% |
| **Grand Total** | **2,505** | **1,309** | **$475,549,212** | **$297,611,871** | **$773,161,083** | **$154,632,216** | **0.26%** |

Source: FEMA DFIRM 11/2/2018, Placer 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.

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

According to the information in Table 4-81 through Table 4-83, the Placer County Planning Area has 1,097 improved parcels and roughly $646 million of structure and contents value in the 1% annual chance flood zone. There are an additional 212 improved parcels and roughly $127 million of structure and contents value in the 0.2% annual chance flood event. These values can be refined a step further. Applying the 20 percent damage factor as previously described, there is a 1% chance in any given year of a flood event causing roughly $129.2 million in damage in the Placer County Planning Area. Applying the same factor, there is a 0.2% chance of a flood event causing approximately $25.5 million in damage in the Placer County Planning Area. A loss ratio of 0.26% indicates that while the Placer County Planning Area has values at risk in the floodplain, flood losses would be limited compared to the total built environment and the community would likely be able to recover adequately.

#### Unincorporated Placer County

Table 4-84, Table 4-85, and Table 4-86 contain information for unincorporated Placer County only. Table 4-84 is a summary table which shows improved parcels and structure values summarized by DFIRM flood type. Table 4-85 breaks down Table 4-84 and 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 4-86 shows potential losses summarized by 1% and 0.2% annual chance flood events with loss estimates and loss ratios.

### *Table 4-84 Unincorporated Placer County – Count and Value of Parcels* in DFIRM Flood Zones*

| Flood Zone | Total Parcel Count | Improved Parcel Count | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|
| 1% Annual Chance Flood Hazard | 1,669 | 849 | $295,869,399 | $167,820,727 | $800,012,183 |
| 0.2% Annual Chance Flood Hazard | 97 | 50 | $26,311,546 | $15,159,631 | $74,557,298 |
| Other Areas | 71,490 | 52,678 | $21,959,202,560 | $12,037,583,327 | $46,133,929,744 |
| **Unincorporated Placer County Total** | **73,256** | **53,577** | **$22,281,383,505** | **$12,220,563,685** | **$47,008,499,225** |

Source: FEMA DFIRM 11/2/2018, Placer 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 also includes all parcels in the 1% annual chance flood zone.

### *Table 4-85 Unincorporated Placer County – Count and Value of Parcels* and Detailed DFIRM 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 |
|---|---|---|---|---|---|---|
| **1% Annual Chance Flood Hazard** | | | | | | |
| **Zone A** | | | | | | |
| Agricultural | 56 | 13 | $24,928,810 | $2,326,061 | $2,326,061 | $29,580,932 |
| Commercial | 10 | 3 | $1,131,282 | $809,545 | $809,545 | $2,750,372 |
| Industrial | 4 | 1 | $547,853 | $259,782 | $389,673 | $1,197,308 |
| Institutional | 22 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 258 | 1 | $3,319,417 | $1,542 | $1,542 | $3,322,501 |
| Natural / Open Space | 66 | 16 | $8,644,312 | $3,625,687 | $3,625,687 | $15,895,686 |
| Residential | 316 | 253 | $104,128,683 | $96,037,629 | $48,018,817 | $248,185,129 |
| **Zone A Total** | **732** | **287** | **$142,700,357** | **$103,060,246** | **$55,171,325** | **$300,931,928** |
| **Zone AE Floodway** | | | | | | |
| Agricultural | 10 | 7 | $12,908,368 | $2,664,631 | $2,664,631 | $18,237,630 |
| Commercial | 2 | 0 | $112,806 | $0 | $0 | $112,806 |
| Industrial | 2 | 1 | $2,280,299 | $2,122,416 | $3,183,624 | $7,586,339 |
| Institutional | 19 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 72 | 1 | $3,039,477 | $172,269 | $172,269 | $3,384,015 |
| Natural / Open Space | 25 | 4 | $2,500,127 | $303,824 | $303,824 | $3,107,775 |

| Flood Zone / Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Residential | 99 | 94 | $16,584,495 | $33,816,322 | $16,908,164 | $67,308,981 |
| **Zone AE Floodway Total** | **229** | **107** | **$37,425,572** | **$39,079,462** | **$23,232,512** | $99,737,546 |
| **Zone AE** | | | | | | |
| Agricultural | 20 | 4 | $21,419,730 | $1,244,062 | $1,244,062 | $23,907,854 |
| Commercial | 5 | 2 | $2,443,670 | $1,972,827 | $1,972,827 | $6,389,324 |
| Industrial | 4 | 1 | $2,178,454 | $863,673 | $1,295,510 | $4,337,637 |
| Institutional | 31 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 120 | 1 | $6,231,390 | $549,403 | $549,403 | $7,330,196 |
| Natural / Open Space | 230 | 167 | $5,144,571 | $19,610,450 | $19,610,450 | $44,365,471 |
| Residential | 296 | 278 | $118,612,627 | $129,079,543 | $64,539,771 | $312,231,941 |
| **Zone AE Total** | **706** | **453** | **$156,030,442** | **$153,319,958** | **$89,212,023** | **$398,562,423** |
| **Zone AO** | | | | | | |
| Residential | 2 | 2 | $165,686 | $409,733 | $204,867 | $780,286 |
| **Zone AO Total** | **2** | **2** | **$165,686** | **$409,733** | **$204,867** | **$780,286** |
| **1% Annual Chance Flood Hazard Total** | **1,669** | **849** | **$336,322,057** | **$295,869,399** | **$167,820,727** | **$800,012,183** |
| **0.2% Annual Chance Flood Hazard** | | | | | | |
| **Zone X (shaded)** | | | | | | |
| Agricultural | 1 | 0 | $61,638 | $0 | $0 | $61,638 |
| Commercial | 2 | 1 | $4,377,518 | $2,538,191 | $2,538,191 | $9,453,900 |
| Industrial | 2 | 0 | $833,701 | $0 | $0 | $833,701 |
| Institutional | 7 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 17 | 0 | $679,539 | $0 | $0 | $679,539 |
| Natural / Open Space | 6 | 1 | $495,852 | $1,065,900 | $1,065,900 | $2,627,652 |
| Residential | 51 | 43 | $24,746,750 | $22,044,787 | $11,022,394 | $57,813,931 |
| **Zone X (shaded) Total** | **86** | **45** | **$31,194,998** | **$25,648,878** | **$14,626,485** | **$71,470,361** |
| **X Protected by Levee** | | | | | | |
| Agricultural | 1 | 1 | $584,704 | $49,939 | $49,939 | $684,582 |
| Miscellaneous | 3 | 0 | $0 | $0 | $0 | $0 |
| Natural / Open Space | 6 | 3 | $1,070,925 | $353,685 | $353,685 | $1,778,295 |
| Residential | 1 | 1 | $235,494 | $259,044 | $129,522 | $624,060 |

| Flood Zone / Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| **X Protected by Levee Total** | **11** | **5** | **$1,891,123** | **$662,668** | **$533,146** | **$3,086,937** |
| **0.2% Annual Chance Flood Hazard Total** | **97** | **50** | **$33,086,121** | **$26,311,546** | **$15,159,631** | **$74,557,298** |
| **Other Areas** | | | | | | |
| **Zone X (unshaded)** | | | | | | |
| Agricultural | 1,241 | 242 | $335,183,771 | $54,965,032 | $54,965,032 | $445,113,835 |
| Commercial | 1,514 | 945 | $516,795,400 | $787,872,413 | $787,872,413 | $2,092,540,226 |
| Industrial | 692 | 351 | $228,653,940 | $385,986,269 | $578,979,407 | $1,193,619,616 |
| Institutional | 617 | 113 | $50,761,281 | $274,504,591 | $274,504,591 | $599,770,463 |
| Miscellaneous | 10,258 | 237 | $583,668,152 | $33,562,194 | $33,562,194 | $650,792,540 |
| Natural / Open Space | 2,187 | 267 | $176,032,987 | $193,087,442 | $193,087,442 | $562,207,871 |
| Residential | 54,981 | 50,523 | $10,246,048,326 | $20,229,224,619 | $10,114,612,248 | $40,589,885,193 |
| **Zone X (unshaded) Total** | **71,490** | **52,678** | **$12,137,143,857** | **$21,959,202,560** | **$12,037,583,327** | **$46,133,929,744** |
| **Other Areas Total** | **71,490** | **52,678** | **$12,137,143,857** | **$21,959,202,560** | **$12,037,583,327** | **$46,133,929,744** |
| | | | | | | |
| **Unincorporated Placer County Grand Total** | **73,256** | **53,577** | **$12,506,552,035** | **$22,281,383,505** | **$12,220,563,685** | **$47,008,499,225** |

Source: FEMA DFIRM 11/2/2018, Placer 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 also includes all parcels in the 1% annual chance flood zone.

### *Table 4-86 Unincorporated Placer County – Flood Loss Estimates*

| 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 | 1,669 | 849 | $295,869,399 | $167,820,727 | $463,690,126 | $92,738,025 | 0.158% |

| Flood Zone | Total Parcel Count | Improved Parcel Count | Improved Structure Value | Estimated Contents Value | Total Value | Loss Estimate | Loss Ratio |
|---|---|---|---|---|---|---|---|
| 0.2% Annual Chance Flood Hazard | 97 | 50 | $26,311,546 | $15,159,631 | $41,471,177 | $8,294,235 | 0.014% |
| **Grand Total** | **1,766** | **899** | **$322,180,945** | **$182,980,358** | **$505,161,303** | **$101,032,260** | **0.17%** |

Source: FEMA DFIRM 11/2/2018, Placer 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 also includes all parcels in the 1% annual chance flood zone.

According to Table 4-85 and Table 4-86, unincorporated Placer County has 849 improved parcels and roughly $464 million of structure and contents value in the 1% annual chance flood zone. The unincorporated County has 50 improved parcels and roughly $41.5 million in structure and contents values in the 0.2% annual chance flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described, there is a 1% chance in any given year of a flood event causing roughly $92.7 million in damage in the unincorporated areas of Placer County. Applying the same factor, there is a 0.2% chance of a flood event causing $8.3 million in damage to the unincorporated County. A loss ratio of 0.17% indicates that while the unincorporated County has values at risk in the floodplain, flood losses would be limited compared to the total built environment and the community would likely be able to recover adequately.

## 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 Placer 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 4-87 gives summary information for the Planning Area by 1% and 0.2% annual chance flood zone for the entire Placer County Planning Area. Table 4-88 shows the specific DFIRM flood zone designations that make up the 1% and 0.2% annual chance flood zones for the unincorporated County. Details on flooded acres by detailed flood zone for the incorporated jurisdictions in the County are shown in their respective annexes to this Plan Update. In all of these tables, the Other Areas are areas (Zone X Unshaded – areas outside mapped flood hazard areas) where there is no mapped flood hazard area.

### *Table 4-87 Placer 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* |
|---|---|---|---|---|---|---|
| **City of Auburn** | | | | | | |
| 1% Annual Chance Flood Hazard | 88 | 0.01% | 21 | 0.01% | 67 | 0.01% |
| 0.2% Annual Chance Flood Hazard | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Other Areas | 4,429 | 0.49% | 1,900 | 1.06% | 2,529 | 0.35% |
| **Total** | **4,517** | **0.50%** | **1,922** | **1.07%** | **2,596** | **0.36%** |
| **City of Colfax** | | | | | | |
| 1% Annual Chance Flood Hazard | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| 0.2% Annual Chance Flood Hazard | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Other Areas | 794 | 0.09% | 347 | 0.19% | 447 | 0.06% |
| **Total** | **794** | **0.09%** | **347** | **0.19%** | **447** | **0.06%** |
| **City of Lincoln** | | | | | | |
| 1% Annual Chance Flood Hazard | 1,282 | 0.14% | 118 | 0.07% | 1,164 | 0.16% |
| 0.2% Annual Chance Flood Hazard | 336 | 0.04% | 47 | 0.03% | 289 | 0.04% |

| Jurisdiction/ Flood Zone | Total Acres | % of Total Acres* | Improved Acres | % of Total Improved Acres* | Unimproved Acres | % of Total Unimproved Acres* |
|---|---|---|---|---|---|---|
| Other Areas | 13,648 | 1.52% | 4,940 | 2.74% | 8,708 | 1.21% |
| **Total** | **15,267** | **1.70%** | **5,106** | **2.84%** | **10,161** | **1.41%** |
| **Town of Loomis** | | | | | | |
| 1% Annual Chance Flood Hazard | 224 | 0.02% | 155 | 0.09% | 69 | 0.01% |
| 0.2% Annual Chance Flood Hazard | 26 | 0.00% | 23 | 0.01% | 3 | 0.00% |
| Other Areas | 4,310 | 0.48% | 3,068 | 1.70% | 1,243 | 0.17% |
| **Total** | 4,561 | 0.51% | 3,246 | 1.80% | 1,315 | 0.18% |
| **City of Rocklin** | | | | | | |
| 1% Annual Chance Flood Hazard | 602 | 0.07% | 132 | 0.07% | 470 | 0.07% |
| 0.2% Annual Chance Flood Hazard | 46 | 0.01% | 11 | 0.01% | 34 | 0.00% |
| Other Areas | 11,877 | 1.32% | 5,600 | 3.11% | 6,277 | 0.87% |
| **Total** | 12,524 | 1.39% | 5,743 | 3.19% | 6,781 | 0.94% |
| **Unincorporated Placer County** | | | | | | |
| 1% Annual Chance Flood Hazard | 33,895 | 3.77% | 10,488 | 5.82% | 23,407 | 3.26% |
| 0.2% Annual Chance Flood Hazard | 888 | 0.10% | 554 | 0.31% | 334 | 0.05% |
| Other Areas | 826,718 | 91.94% | 152,665 | 84.78% | 674,054 | 93.74% |
| **Total** | **861,501** | **95.81%** | **163,706** | **90.91%** | **697,795** | **97.04%** |
| | | | | | | |
| **Grand Total** | **899,164** | **100.00%** | **180,070** | **100.00%** | **719,094** | **100.00%** |

Source: FEMA DFIRM 11/2/2018, Placer County 2020 Parcel/Assessor's Data

*Percentage of each jurisdiction in the flooded area

The City of Roseville is not included in the calculations of acres at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### *Table 4-88 Unincorporated Placer County – Flooded Acres by Detailed DFIRM Flood Zones by Property Use*

| Flood Zone / Property Use | Total Acres | % of Total Acres | Improved Acres | % of Total Improved Acres | Unimproved Acres | % of Total Unimproved Acres |
|---|---|---|---|---|---|---|
| **1% Annual Chance Flood Hazard** | | | | | | |
| **Zone A** | | | | | | |
| Agricultural | 5,649 | 0.628% | 2,073 | 1.151% | 3,576 | 0.497% |
| Commercial | 14 | 0.002% | 8 | 0.004% | 7 | 0.001% |
| Industrial | 73 | 0.008% | 20 | 0.011% | 53 | 0.007% |
| Institutional | 917 | 0.102% | 0 | 0.00% | 917 | 0.128% |
| Miscellaneous | 11,519 | 1.281% | 38 | 0.021% | 11,481 | 1.597% |
| Natural / Open Space | 4,699 | 0.523% | 2,059 | 1.144% | 2,639 | 0.367% |
| Residential | 1,962 | 0.218% | 1,641 | 0.912% | 320 | 0.045% |
| **Zone A Total** | **24,832** | **2.762%** | **5,840** | **3.243%** | **18,993** | **2.641%** |
| **Zone AE Floodway** | | | | | | |
| Agricultural | 1,343 | 0.149% | 969 | 0.538% | 375 | 0.052% |
| Commercial | 16 | 0.002% | 8 | 0.004% | 8 | 0.001% |
| Industrial | 24 | 0.003% | 4 | 0.002% | 21 | 0.003% |
| Institutional | 56 | 0.006% | 1 | 0.000% | 56 | 0.008% |
| Miscellaneous | 437 | 0.049% | 1 | 0.001% | 436 | 0.061% |
| Natural / Open Space | 931 | 0.104% | 381 | 0.211% | 551 | 0.077% |
| Residential | 541 | 0.060% | 521 | 0.289% | 21 | 0.003% |
| **Zone AE Floodway Total** | **3,350** | **0.373%** | **1,884** | **1.046%** | **1,467** | **0.204%** |
| **Zone AE** | | | | | | |
| Agricultural | 2,052 | 0.228% | 1,224 | 0.680% | 828 | 0.115% |
| Commercial | 16 | 0.002% | 9 | 0.005% | 7 | 0.001% |
| Industrial | 60 | 0.007% | 10 | 0.006% | 50 | 0.007% |
| Institutional | 102 | 0.011% | 0 | 0.000% | 102 | 0.014% |
| Miscellaneous | 1,075 | 0.120% | 56 | 0.031% | 1,019 | 0.142% |
| Natural / Open Space | 1,590 | 0.177% | 679 | 0.377% | 911 | 0.127% |
| Residential | 816 | 0.091% | 785 | 0.436% | 31 | 0.004% |
| **Zone AE Total** | **5,711** | **0.635%** | **2,764** | **1.535%** | **2,947** | **0.410%** |
| **Zone AO** | | | | | | |
| Agricultural | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Commercial | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |

| Flood Zone / Property Use | Total Acres | % of Total Acres | Improved Acres | % of Total Improved Acres | Unimproved Acres | % of Total Unimproved Acres |
|---|---|---|---|---|---|---|
| Industrial | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Institutional | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Miscellaneous | 0 | 0.000% | 0 | 0.00% | 0 | 0.000% |
| Natural / Open Space | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Residential | 1 | 0.000% | 1 | 0.000% | 0 | |
| **Zone AO Total** | **1** | **0.000%** | **1** | **0.000%** | **0** | **0.000%** |
| **1% Annual Chance Flood Hazard Total** | **33,895** | **3.770%** | **10,488** | **5.824%** | **23,407** | **3.255%** |
| **0.2% Annual Chance Flood Hazard** | | | | | | |
| **Zone X (shaded)** | | | | | | |
| Agricultural | 138 | 0.015% | 67 | 0.037% | 71 | 0.010% |
| Commercial | 6 | 0.001% | 3 | 0.002% | 3 | 0.000% |
| Industrial | 14 | 0.002% | 2 | 0.001% | 12 | 0.002% |
| Institutional | 14 | 0.002% | 0 | 0.000% | 14 | 0.002% |
| Miscellaneous | 47 | 0.005% | 0 | 0.000% | 47 | 0.007% |
| Natural / Open Space | 149 | 0.017% | 74 | 0.041% | 75 | 0.010% |
| Residential | 80 | 0.009% | 76 | 0.042% | 4 | 0.001% |
| **Zone X (shaded) Total** | **448** | **0.050%** | **222** | **0.124%** | **226** | **0.031%** |
| **X Protected by Levee** | | | | | | |
| Agricultural | 108 | 0.012% | 82 | 0.046% | 26 | 0.004% |
| Commercial | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Industrial | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Institutional | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Miscellaneous | 34 | 0.004% | 0 | 0.00% | 34 | 0.005% |
| Natural / Open Space | 285 | 0.032% | 236 | 0.131% | 48 | 0.007% |
| Residential | 13 | 0.001% | 13 | 0.007% | 0 | 0.00% |
| **X Protected by Levee Total** | **440** | **0.049%** | **332** | **0.184%** | **108** | **0.015%** |
| **0.2% Annual Chance Flood Hazard Total** | **888** | **0.099%** | **554** | **0.308%** | **334** | **0.046%** |
| **Other Areas** | | | | | | |
| **Zone X (unshaded)** | | | | | | |
| Agricultural | 178,889 | 19.895% | 16,285 | 9.044% | 162,604 | 22.612% |

| Flood Zone / Property Use | Total Acres | % of Total Acres | Improved Acres | % of Total Improved Acres | Unimproved Acres | % of Total Unimproved Acres |
|---|---|---|---|---|---|---|
| Commercial | 2,213 | 0.246% | 1,505 | 0.836% | 707 | 0.098% |
| Industrial | 4,566 | 0.508% | 1,041 | 0.578% | 3,525 | 0.490% |
| Institutional | 21,887 | 2.434% | 913 | 0.507% | 20,974 | 2.917% |
| Miscellaneous | 453,440 | 50.429% | 3,590 | 1.993% | 449,850 | 62.558% |
| Natural / Open Space | 46,156 | 5.133% | 16,716 | 9.283% | 29,440 | 4.094% |
| Residential | 119,567 | 13.298% | 112,615 | 62.539% | 6,953 | 0.967% |
| **Zone X (unshaded) Total** | **826,718** | **91.943%** | **152,665** | **84.781%** | **674,054** | **93.736%** |
| **Other Areas Total** | **826,718** | **91.943%** | **152,665** | **84.781%** | **674,054** | **93.736%** |
| | | | | | | |
| **Unincorporated Placer County Grand Total** | **861,501** | **95.811%** | **163,706** | **90.912%** | **697,795** | **97.038%** |

Source: FEMA DFIRM 11/2/2018, Placer County 2020 Parcel/Assessor's Data

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

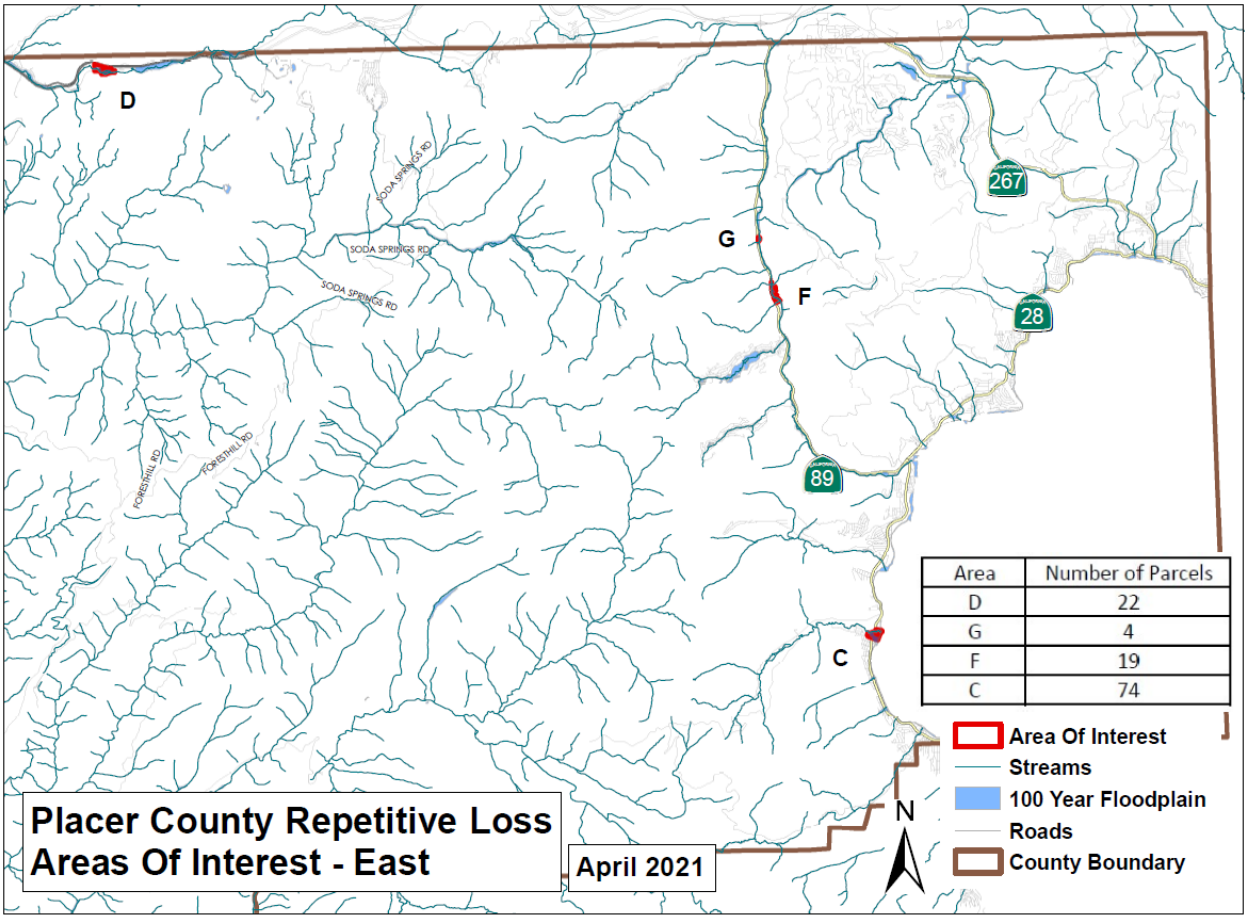
Standard property insurance does not include flood coverage because of the relatively high risk. The National Flood Insurance Program (NFIP) provides flood insurance to residents in those communities that participate in the NFIP. Federal financial assistance requires the purchase of flood for structures 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.

Unincorporated Placer County joined the NFIP on April 18, 1983, and the CRS on October 1, 1991. According to the CRS listing of eligible communities dated October 1, 2020, the County is currently a Class 5, which provides a 25 percent discount on flood insurance for those located within the special flood hazard area (SFHA) and a 10 percent discount for those located in non-SFHA areas. This results in savings of $107,797 for residents in Placer County.

NFIP insurance data indicates that as of August 21, 2020, there were 817 policies in force in the unincorporated County, resulting in $233,180,600 of insurance in force. Of these, 802 are for residential properties; 15 are nonresidential. 249 of these are in A zones; 568 policies are for parcels in the B, C, & X zones. There have been 236 closed paid losses totaling $4,788,314.79; 229 of these were for residential properties and 7 were nonresidential. Of these 236 paid losses, 102 were parcels in A zones and 120 parcels were in B, C, & X zones. Information was not provided on the other 4 claims. There are 44 repetitive loss (RL) structures, and 0 severe repetitive loss (SRL) structures in the County – with 60 paid losses totaling $$1,590,452.20. Of these RL buildings, 22 are in the A zones and 22 are in the B, C, or X zone. Only one of these RL buildings is a post-FIRM building. There have been 25 substantial damage claims since 1978.

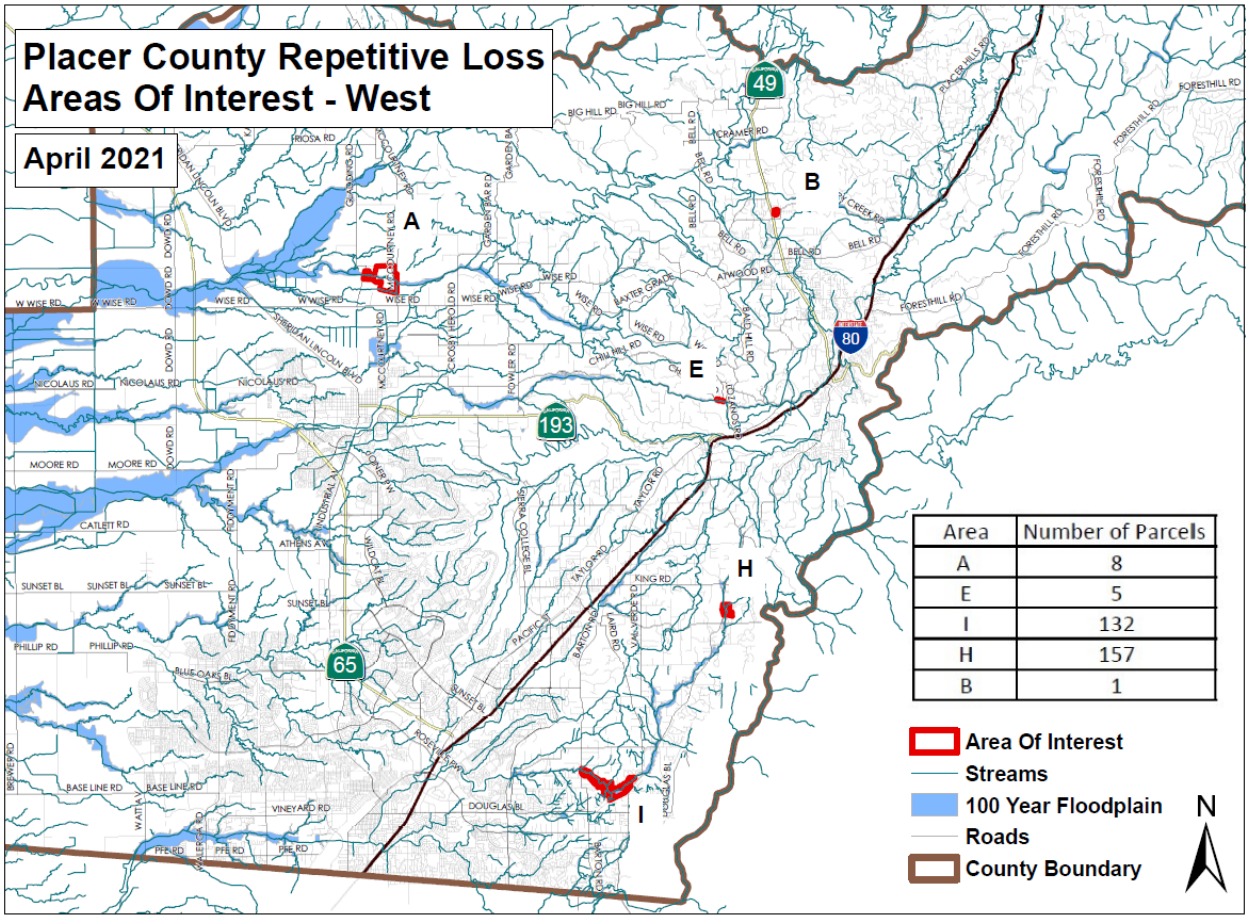
Placer County tracks repetitive loss areas. Areas of repetitive loss for the east and west portions of the County are shown on Figure 4-73 and Figure 4-74, respectively.

### *Figure 4-73 Placer County Repetitive Loss Areas of Interest – East*




Source: Placer County

*Figure 4-74 Placer County Repetitive Loss Areas of Interest – West*




Source: Placer County

Based on this analysis of insurance coverage, Placer County has significant values at risk to the 1% annual chance and greater floods. Of the 849 improved parcels within the 1% annual chance flood zone, only 249 (or 29.3 percent) of those parcels maintain flood insurance. This can be seen on Table 4-89, along with insurance information from the 5 incorporated communities in the County.

*Table 4-89 Placer 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 Auburn | 23 | 12 | 52.2% |
| City of Colfax | 0 | 0 | – |
| City of Lincoln | 12 | 0 | 0.0% |
| Town of Loomis | 98 | 39 | 33.9% |
| City of Rocklin | 115 | 39 | 39.8% |

| 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 |
|---|---|---|---|
| Unincorporated County | 849 | 249 | 29.3% |

Source: FEMA DFIRM 11/2/2018, Placer County 2020 Parcel/Assessor's Data

The City of Roseville is not included in the CRS table above. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

## Population at Risk

A separate analysis was performed to determine populations that reside in flood zones. Using GIS, the DFIRM Flood dataset was overlayed 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 4-90). According to this analysis, there is a population of 2,152 in the 1% annual chance flood zone, and 403 in the 0.2% annual chance flood zone for the entire Placer County Planning Area. Of these, in unincorporated Placer County, there is a population of 1,613 and 6 respectively in the 1% and 0.2% annual chance floodplains.

### *Table 4-90 Placer 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 |
| Auburn | 18 | 44 | 0 | 0 |
| Colfax | 0 | 0 | 0 | 0 |
| Lincoln | 3 | 8 | 104 | 267 |
| Loomis | 95 | 247 | 12 | 31 |
| Rocklin | 106 | 284 | 37 | 99 |
| Unincorporated Placer County | 625 | 1,613 | 44 | 6 |
| **Total** | **847** | **2,196** | **197** | **403** |

Source: FEMA DFIRM 11/2/2018, US Census Bureau Average Household Sizes: Auburn (2.19); Colfax (2.30); Lincoln (2.57); Loomis (2.60), Rocklin (2.68); and unincorporated Placer County (2.58)

*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

The City of Roseville is not included in the calculations of populations at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

## Critical Facilities at Risk

A separate analysis was performed on the critical facility inventory in Placer 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 overlayed on the critical facility GIS layer. Figure 4-75 shows critical facilities, as well as the DFIRM flood zones. Figure 4-76 and Figure 4-77 zoom in to show critical facilities and DFIRM flood zones in the east and west portions of the County, respectively. Table 4-91 summarizes the critical facilities

in the County by DFIRM flood zone. Table 4-92 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 4-75 Placer County – Critical Facilities in DFIRM Flood Zones*

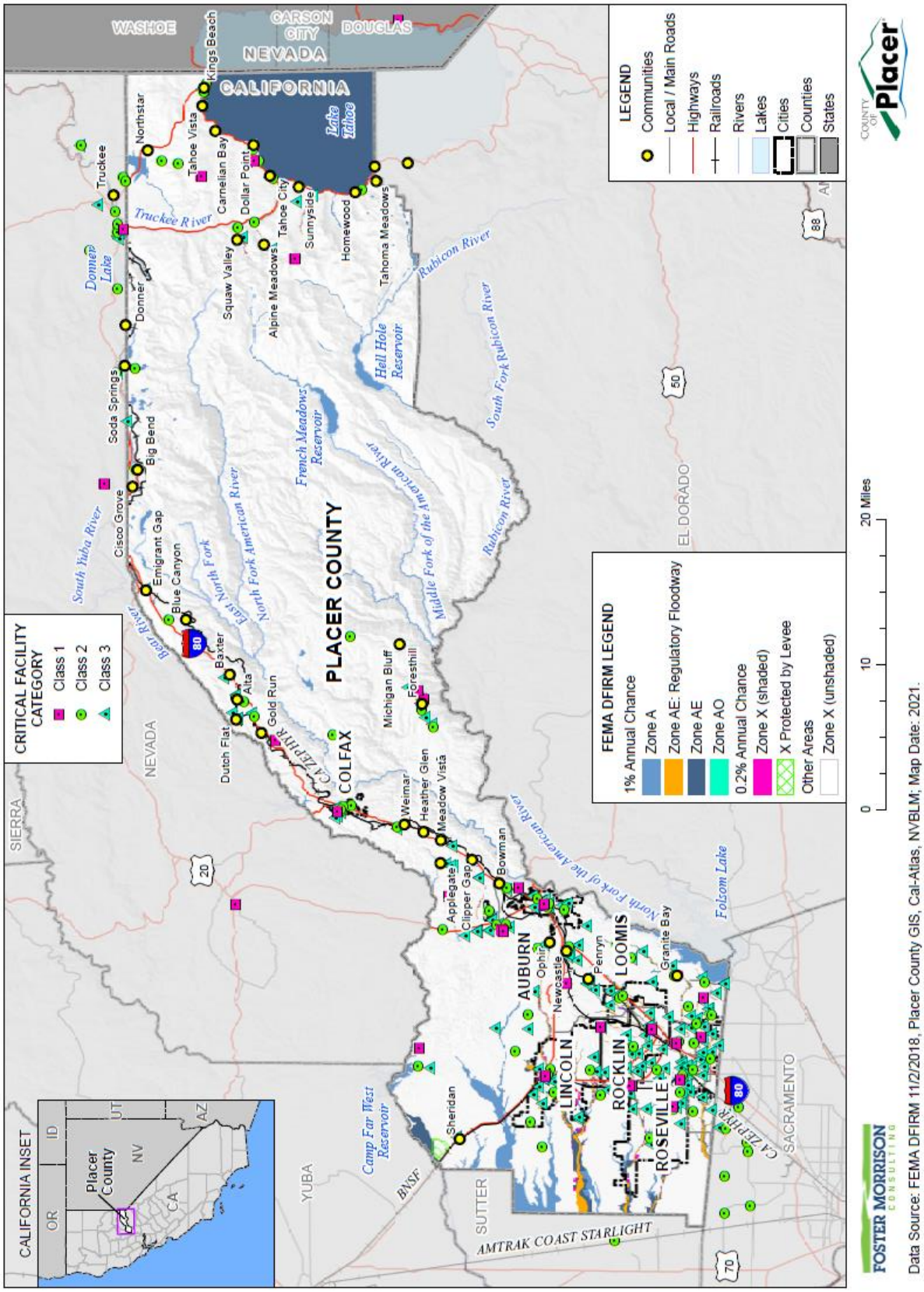


*Figure 4-76 Placer County Planning Area East – Critical Facilities and DFIRM Flood Zones*

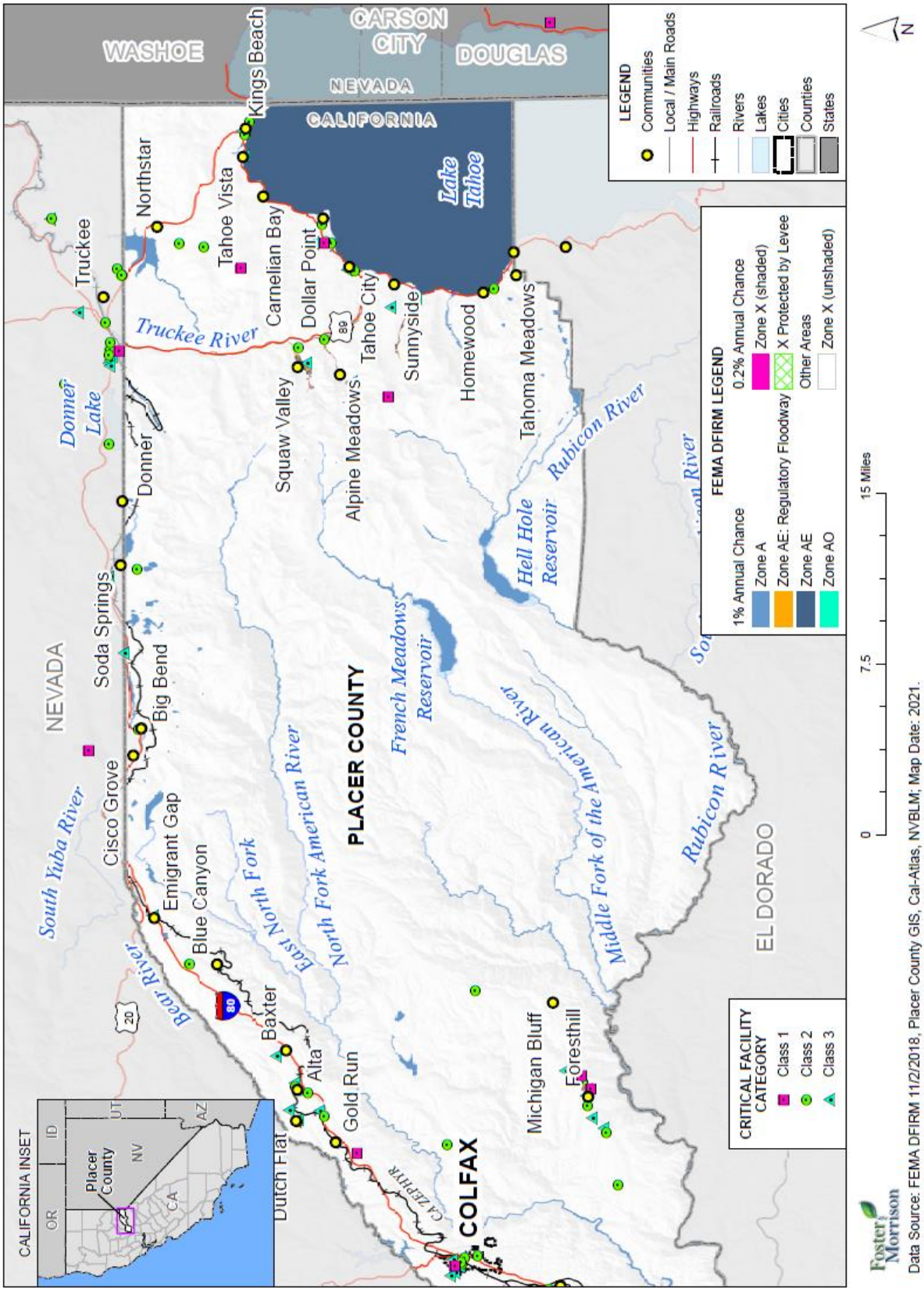
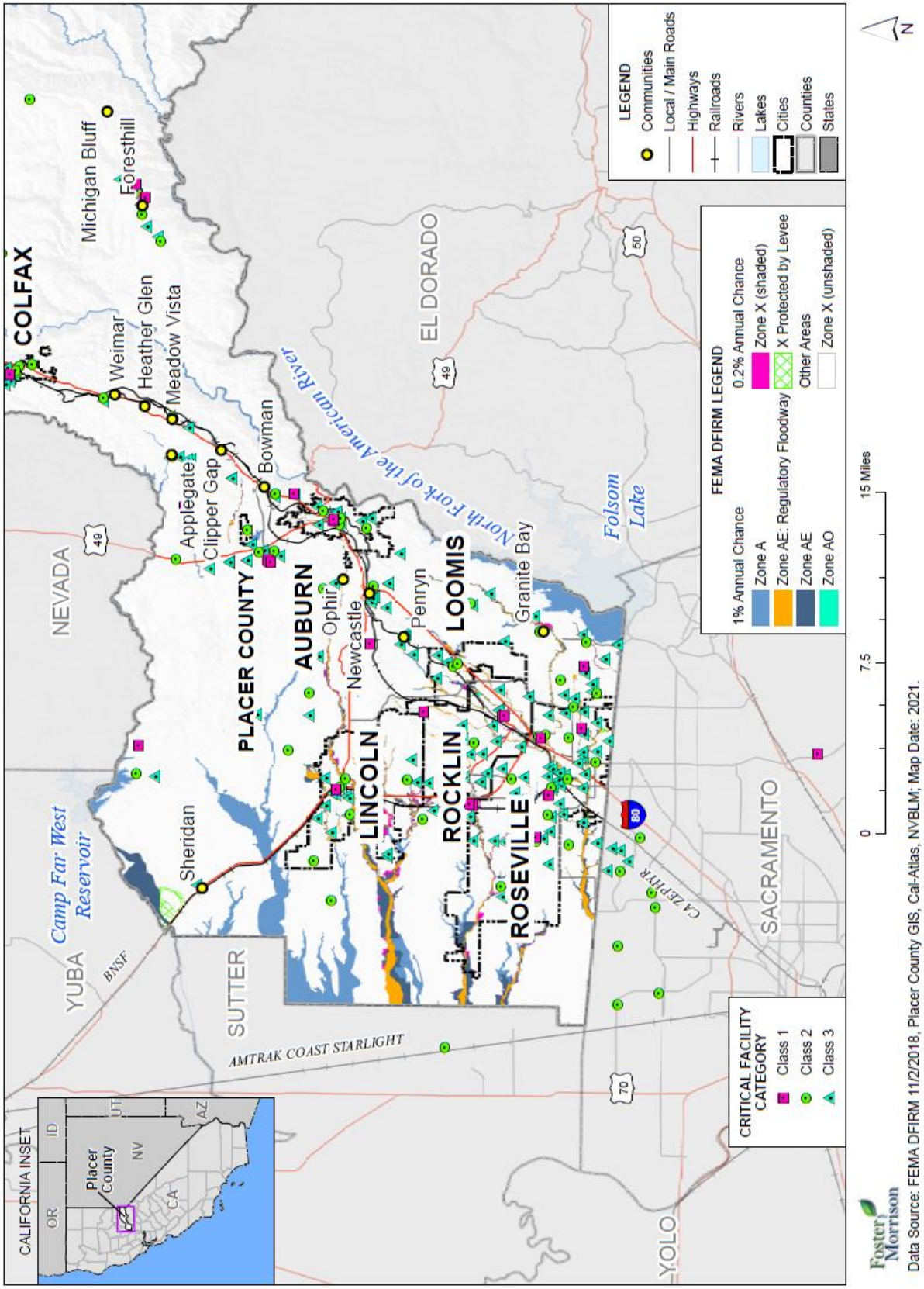


*Figure 4-77 Placer County Planning Area West – Critical Facilities and DFIRM Flood Zones*



### *Table 4-91 Placer County Planning Area– Summary of Critical Facilities in DFIRM Flood Zones*

| Critical Facility Class | Facility Count |
|---|---|
| **1% Annual Chance Flood** | |
| Class 1 | 0 |
| Class 2 | 0 |
| Class 3 | 1 |
| **Total** | **1** |
| **0.2% Annual Chance Flood** | |
| Class 1 | 0 |
| Class 2 | 0 |
| Class 3 | 0 |
| **Total** | **0** |
| **Other Areas** | |
| Class 1 | 31 |
| Class 2 | 84 |
| Class 3 | 175 |
| **Total** | **290** |
| **Unknown – Located in Adjacent County** | |
| Class 1 | 6 |
| Class 2 | 19 |
| Class 3 | 12 |
| Total | **37** |
| | |
| **Grand Total** | **328** |

Source: Placer County GIS, FEMA 11/2/2018 DFIRM

### *Table 4-92 Placer County Planning Area– Critical Facilities in DFIRM Flood Zones by Jurisdiction and Facility Category*

| Jurisdiction/Flood Zone | Critical Facility Class | Critical Facility Type | Facility Count |
|---|---|---|---|
| **Auburn** | | | |
| **Other Areas** | | | |
| Zone X (unshaded) | Class 1 | Dispatch Center | 1 |
| | | Emergency Operation Center | 1 |
| | Class 2 | Airport | 1 |
| | | Fire Station | 3 |
| | | National/Coast Guard | 1 |

| Jurisdiction/Flood Zone | Critical Facility Class | Critical Facility Type | Facility Count |
|---|---|---|---|
| | | Police Station | 1 |
| | Class 3 | Fairground | 1 |
| | | Hall | 5 |
| | | School | 5 |
| **Zone X (unshaded) Total** | | | **19** |
| **Other Areas Total** | | | **19** |
| **Auburn Total** | | | **19** |
| **Colfax** | | | |
| **Other Areas** | | | |
| Zone X (unshaded) | Class 2 | Fire Station | 2 |
| | | Police Station | 1 |
| | Class 3 | Hall | 1 |
| | | Water Treatment Plant | 1 |
| **Zone X (unshaded) Total** | | | **5** |
| **Other Areas Total** | | | **5** |
| **Colfax Total** | | | **5** |
| **Lincoln** | | | |
| **Other Areas** | | | |
| Zone X (unshaded) | Class 1 | Dispatch Center | 1 |
| | | Emergency Operation Center | 1 |
| | Class 2 | Airport | 1 |
| | | Fire Station | 3 |
| | | Police Station | 1 |
| | Class 3 | Hall | 3 |
| | | Hazardous Materials Facility | 1 |
| | | School | 12 |
| | | Water Treatment Plant | 1 |
| **Zone X (unshaded) Total** | | | **24** |
| **Other Areas Total** | | | **24** |
| **Lincoln Total** | | | **24** |
| **Loomis** | | | |
| **Other Areas** | | | |
| Zone X (unshaded) | Class 2 | Fire Station | 1 |
| | | Police Station | 1 |
| | Class 3 | School | 3 |

| Jurisdiction/Flood Zone | Critical Facility Class | Critical Facility Type | Facility Count |
|---|---|---|---|
| **Zone X (unshaded) Total** | | | **5** |
| **Other Areas Total** | | | **5** |
| **Loomis Total** | | | **5** |
| **Rocklin** | | | |
| **Other Areas** | | | |
| Zone X (unshaded) | Class 1 | Communication Transmission Sites | 1 |
| | | Dispatch Center | 1 |
| | | Emergency Operation Center | 1 |
| | Class 2 | Fire Station | 3 |
| | | Police Station | 1 |
| | Class 3 | Hall | 2 |
| | | Hazardous Materials Facility | 1 |
| | | School | 19 |
| | | Water Treatment Plant | 1 |
| **Zone X (unshaded) Total** | | | **30** |
| **Other Areas Total** | | | **30** |
| **Rocklin Total** | | | **30** |
| **Unincorporated Placer County** | | | |
| **1% Annual Chance Flood Hazard** | | | |
| Zone AE | Class 3 | Hall | 1 |
| **Zone AE Total** | | | **1** |
| **1% Annual Chance Flood Hazard Total** | | | **1** |
| **Other Areas** | | | |
| Zone X (unshaded) | Class 1 | Communication Transmission Sites | 13 |
| | | Computer Information Systems Infrastructure | 2 |
| | | Dispatch Center | 2 |
| | | Emergency Operation Center | 3 |
| | | Fire Station | 1 |
| | | Hospital Control Facility | 1 |
| | | Telecommunications | 2 |
| | Class 2 | Airport | 1 |
| | | CHP Station | 2 |
| | | Fire Station | 51 |

| Jurisdiction/Flood Zone | Critical Facility Class | Critical Facility Type | Facility Count |
|---|---|---|---|
| | | Hospital | 3 |
| | | National/Coast Guard | 2 |
| | | Police Station | 6 |
| | Class 3 | Fairground | 1 |
| | | Hall | 28 |
| | | Hazardous Materials Facility | 8 |
| | | School | 65 |
| | | Water Treatment Plant | 16 |
| **Zone X (unshaded) Total** | | | **207** |
| **Other Areas Total** | | | **207** |
| **Unincorporated Placer County Total** | | | **208** |
| **Adjacent Counties** | | | |
| Unknown - Located in Adjacent County | Class 1 | Communication Transmission Sites | 3 |
| | | Dispatch Center | 3 |
| | Class 2 | Airport | 1 |
| | | CHP Station | 1 |
| | | Fire Station | 16 |
| | | Hospital | 1 |
| | Class 3 | School | 11 |
| | | Water Treatment Plant | 1 |
| **Unknown - Located in Adjacent County Total** | | | **37** |
| **Adjacent Counties Total** | | | **37** |
| | | | |
| **Grand Total** | | | **328** |

Source: Placer County GIS, FEMA 11/2/2018 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 Placer 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. Placer 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 are 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 Flood Conditions: The Effects of Climate Change

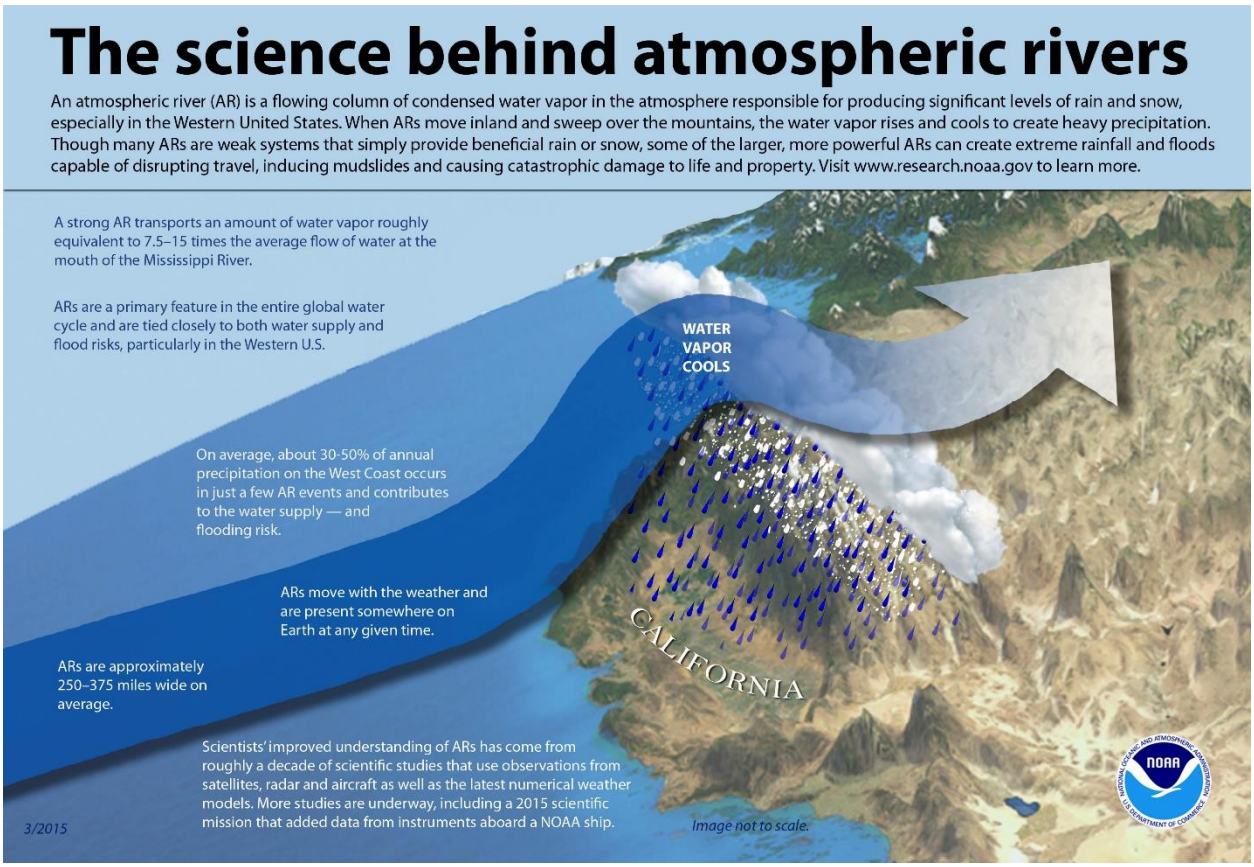
The effects of climate change on future flood conditions should also be considered. While the risk and associated short and long-term impacts of climate change are uncertain, experts in this field tend to agree that among the most significant impacts include those resulting from increased heat and precipitation 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. Increases in insurance rates or restriction of coverage in vulnerable areas may also result.

Placer 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 strategies for the Placer County Planning Area.

## Future Flood Conditions: Atmospheric Rivers

Placer 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 4-78.

*Figure 4-78 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.

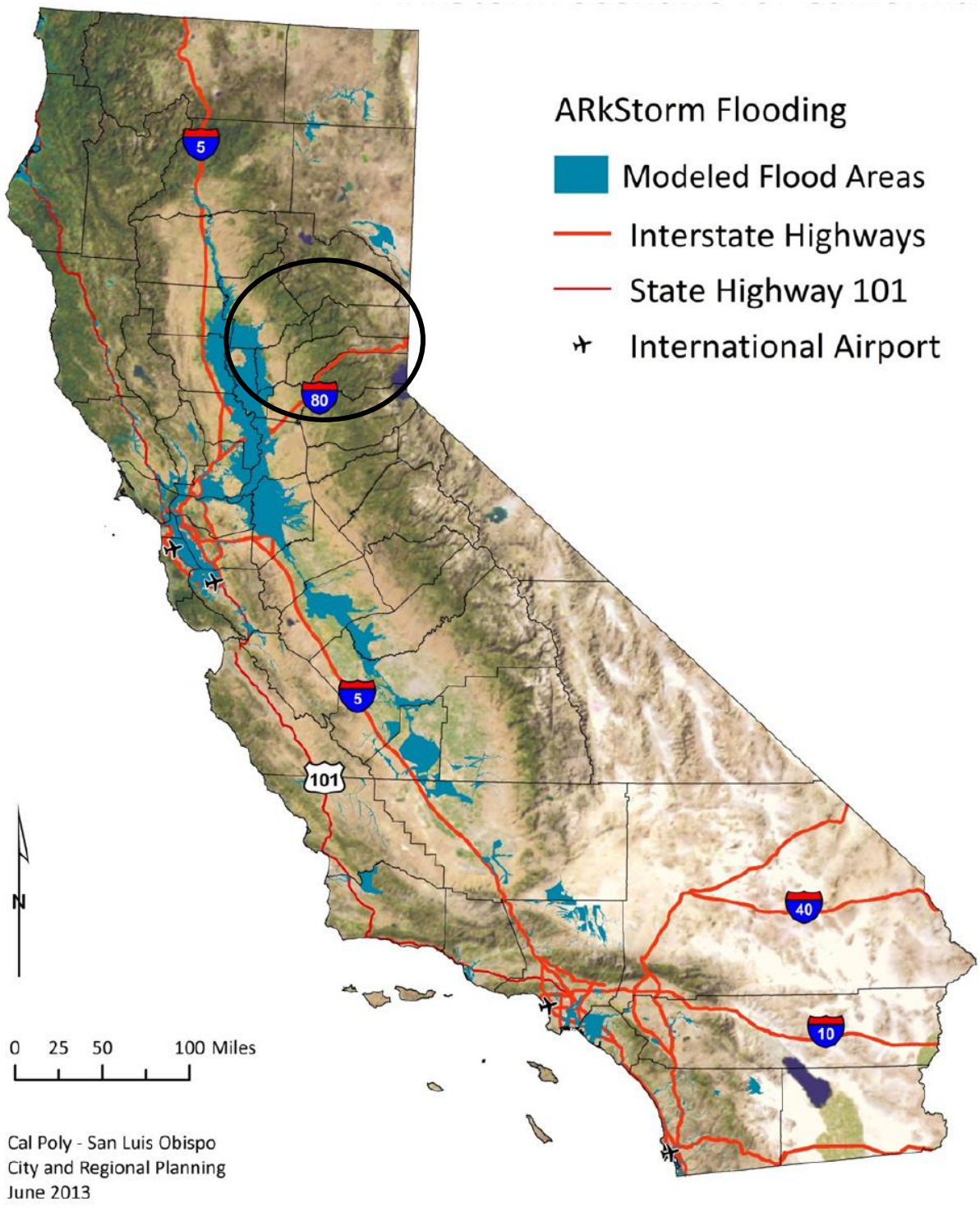
The ARkStorm produces precipitation in many places exceeding levels experienced on average every 500 to 1,000 years. Extensive flooding in many cases overwhelms the state's flood protection system, which is at best designed to resist 100- to 200-year runoffs (many flood protection systems in the state 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 4-79 depicts an ARkStorm modeled scenario showing the potential for flooding primarily in the Central Valley as the result of a large storm. In Placer County, the modeled scenario suggests the County could be inundated in the western portion of the County in this ARkStorm model scenario.

*Figure 4-79 Projected ARkStorm Flooding in California*




Source: USGS ArkStorm

### Future Development: GIS Analysis

INSERT

## 4.3.13. Flood: Localized Flooding

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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 stations 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 Placer County, numerous parcels and roads throughout the County not included in the FEMA 1% and 0.2% annual chance floodplains 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 4-62. UPDATE TABLE WITH ANY NEW AREAS OR AREAS MISSED IN THE PREVIOUS PLAN

### *Table 4-93 Placer County Localized Flooding Areas*

| Road Name |
|---|
| **Flooding** |
| Industrial Ave, South of Athens |
| PFE Road, 1 mile west of Walegra |
| Bianchi Estates – Muirwood Lane, Blackwood Lane, Kenwood Way |
| Watt Avenue – south of Dyer Lane |
| Walerga Road Bridge at Dry Creek |
| Barton Road – at Linda Creek |
| Dry Creek Road – at Black Oak Road |

| Road Name |
|---|
| Dry Creek Road – between Greenstone Ct and parkway |
| Ayers Holmes Road |
| Soda Springs Road – at Wabena Creek |
| Brewer Road – south of Jackson Road |
| Locust Road – south of Jackson Road |
| **Landslides/Mudslides** |
| Old Foresthill Road |
| Yankee Jims Road |
| **Downed Trees** |
| Virginiatown Rd (Fowler Rd – Gold Hill Rd) |
| Fruitvale Road (Garden Bar Rd – Gold Hill Rd) |
| Mt. Pleasant Rd (Mt Vernon Rd – Crosby Harold Rd) |
| Mt. Vernon Road (Collins Dr – Wise Rd) |
| Gold Hill Road (Hwy 193 – Wise Rd) |
| Baxter Grade Road (Wise Rd – Mt. Vernon Rd) |
| Val Verde Road (Horseshoe Bar Rd – Wells Rd) |
| Auburn-Folsom Road (Auburn City Limits – King Rd) |
| Auburn-Folsom Road (Los Lagos – Douglas Blvd) |
| Wise Road (Ophir Rd – Garden Bar Rd) |

Source: Placer County

## 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 2002 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 hazard profile in Section 4.2.10.

### Hazard Mitigation Planning Committee Events

INSERT ANY PAST EVENTS OF LOCALIZED FLOODING

### 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 21st 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 Placer 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.

### 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.

## *Future Development*

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. 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.

## 4.3.14. Landslides, Mudslides, and Debris Flows

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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 California Geological Survey, landslides refer to a wide variety of processes that result in the perceptible downward and outward movement of soil, rock, and vegetation under gravitational influence. Common names for landslide types include slump, rockslide, debris slide, lateral spreading, debris avalanche, earth flow, and soil creep. Landslides may be triggered by both natural and human-induced changes in the environment that result in slope instability.

The susceptibility of an area to landslides depends on many variables including steepness of slope, type of slope material, structure and physical properties of materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage areas. Landslide events can be determined by the composition of materials and the speed of movement. A rockfall is dry and fast while a debris flow is wet and fast. Regardless of the speed of the slide, the materials within the slide, or the amount of water present in the movement, landslides are a serious natural hazard. Another type of landslide, debris flows, also occur in some areas of the County. These debris flows generally occur in the immediate vicinity of existing drainage swales or steep ravines. Debris flows occur when near surface soil in or near steeply sloping drainage swales becomes saturated during unusually heavy precipitation and begins to flow downslope at a rapid rate. Debris flows also occur in post-wildfire burn areas.

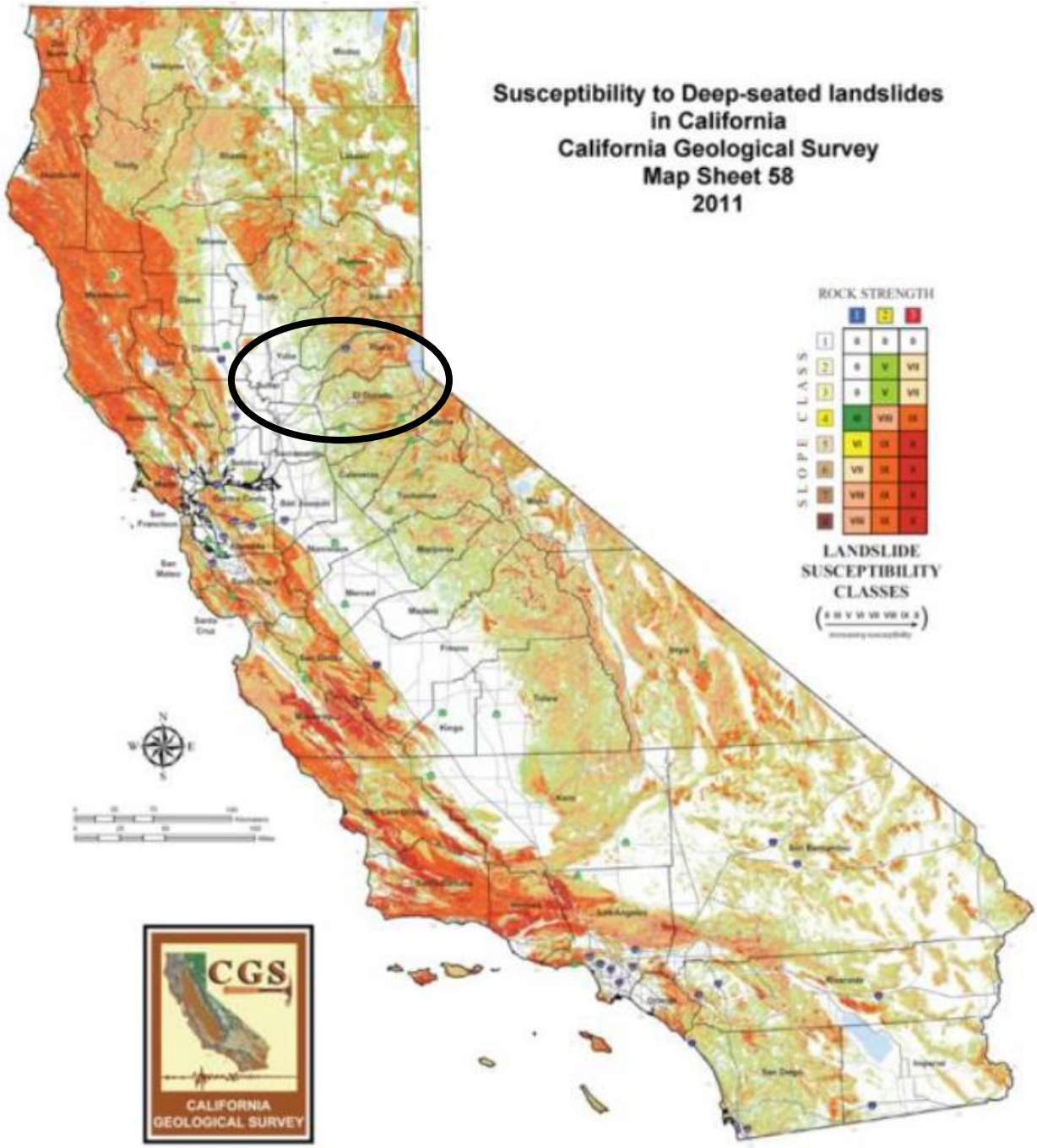
Landslides often accompany or follow other natural hazard events, such as floods, wildfires, or earthquakes. A discussion on the effects of wildfire on landslides and debris flows is included in the wildfire profile in Section 4.3.17. Landslides can occur slowly or very suddenly and can damage and destroy structures, roads, utilities, and forested areas, and can cause injuries and death.

Soil erosion is another common form of soil instability. Erosion is a function of soil type, slope, rainfall intensity, and groundcover. It accounts for a loss in many dollars of valuable soil, is aesthetically displeasing, and often induces even greater rates of erosion and sedimentation. Sedimentation is simply the accumulation of soil as a result of erosion. Construction activities often contribute greatly to erosion and sedimentation. Besides being a pollutant in its own right, sediment acts as a transport medium for other pollutants, especially nutrients, pesticides, and heavy metals, which adhere to the eroded soil particles. As the sediment drains into watercourses, the combination of these pollutants adversely affects water quality.

## Location and Extent

The California Geologic Survey has created maps showing areas of landslide susceptibility. According to the CGS, risk is a combination of slope class and rock strength. This can be seen on Figure 4-80. A measure of risk is shown in the legend, while areal extents for the County are shown as well.

### *Figure 4-80 Landslide Susceptibility*




Source: California Geologic Survey

The speed of onset of landslide is often short, especially in post-wildfire burn scar areas, but it can also take years for a slope to fail. Landslide duration is usually short, though digging out and repairing landslide areas can take some time.

Landslides, or ground failure, are dependent on slope, geology, rainfall, excavation or seismic activity. Mudslides are often caused by heavy rainfall. Areas that have recently been subject to wildfire are susceptible to mud slides. The Placer County General Plan Background Report describes areas in Placer County that are particularly prone to landslides. Slope instability and landslide hazards are generally found in areas of eastern Placer County, as seen in active and inactive landslide deposits. Two specific Rock Units identified in the Background Report which show evidence of past landslide activity (and are still considered active landslide areas) include the Valley Springs Tuff, located at Alta and Interstate 80, and Metavolcanic Flows, located in the canyons of the North Fork of the American River. The inactive landslide deposit areas in Placer County include the metavolcanic flow rock units along the canyon slopes of the North and Middle Forks of the American River, and along the Truckee River. Although these landslide areas are no longer active, they could be reactivated by either natural erosion or human activities. Other potential landslide areas identified by the HMPC include Interstate 80 east of Colfax and State Route 49 south of Auburn.

With heavy rain events, landslides/mudslides occur causing road closures for hours and days at a time in some areas. Foresthill road, Old Foresthill road, and Iowa Hill road are areas of recent landslides. Also post fire conditions in any burn scar areas are a concern. Identified by the HMPC, recent landslide areas of concern include the following:

- Old Foresthill Road
- Ophir Road (two sites) – (1) near Stonehouse Road and (2) near Wise Road
- Yankee Jim/s Road
- Middle Fork American River / North Fork American River / Rubicon River canyons Fires burn the material and soils which cause landslides and debris flow into the river and to downstream electric powerhouses and water treatment facilities

OTHERS?

## Past Occurrences

### Disaster Declaration History

There have been no disaster declarations associated with landslides in Placer County, as shown in Table 4-4. The County had no USDA disaster declarations since 2002 related to landslides, as shown on Table 4-6.

### NCDC Events

The NCDC contains no records for landslides in Placer County.

## Hazard Mitigation Planning Committee Events

The HMPC reported the following events of landslide in the County:

Notable landslides of record include the following landslides in the Tahoe area along the Truckee River, Squaw Creek, and Bear Creek rivers associated with the 1997 Flood event:

- **Wayne Road Landslide** – The Wayne Road Landslide was the most significant of the three landslides. The Wayne Road Landslide is actually the result of two separate failures occurring in separate drainages. The drainages meet just upslope of the impacted area directly west of the intersection of Sandy Way and Wayne Road. Based on information provided by local residents and Placer County personnel, the homes in the area were also impacted by landsliding in 1982 and in 1986. The 1982 event was larger than the 1986 event. Placer County personnel stated that, following the 1986 landslide, several small sedimentation basins were constructed north of Sandy Way in an attempt to contain future slide debris. These sedimentation basins were obliterated by slide debris during the 1997 event. Slide debris consisted of saturated, loose, silty sand and sandy silt with rock ranging in size from gravel to boulders up to 4 feet in diameter. The debris plugged existing culverts and several feet of slide debris were deposited against the sides of several residences.
- **Sandy Way Landslide** – The Sandy Way Landslide occurred approximately one-quarter mile west of the Wayne Road Landslide, originating just west of Squaw Summit Road, and deposited significant debris upslope of several residences on Sandy Way.
- **Navajo Court Landslide** – The Navajo Court Landslide originated just east of a 300,000-gallon water storage tank located above the intersection of Navajo Court and Squaw Summit Road. The landslide debris flowed downslope, inundating the intersection of Navajo Court and Squaw Summit Road and plugged two culverts beneath Squaw Summit Road. The channel was rerouted to the west and flowed down both sides of Navajo Court, eroding new gullies on both sides of the road. Debris continued downslope, plugged two culverts beneath Christy Lane and deposited a significant amount of debris in the parking lot behind the post office on Squaw Valley Road.
- The County noted that there were post-wildfire landslides after the **2004** Star and **2014** Kings fire issues that PCWA is still cleaning out of waterways yearly as of 2021.
- **2011** – A landslide event occurred which damaged PG&E canals inside the County.
- On **February 10, 2017** heavy rains lead to a mudslide and rockslide that closed all lanes of traffic on Interstate 80 in the Alta, CA area. It took CalTrans several days to clean-up the slide and put in temporary barriers and fixes in place until the ground dried up enough to make more permanent fixes. The barriers still exist, but slope stabilization techniques were utilized to reduce but not eliminate the risk of slope failure in this specific location.
- **2018** – Two slides occurred. One at Blacksmith Flat, and the other at Interbay Road. This can be seen on Figure 4-80 and Figure 4-81 . More info can be found in the PCWA Annex to the Plan Update.

### *Figure 4-81 2018 Blacksmith Road Landslide*

Source: PCWA

*Figure 4-82 2018 Interbay Road Landslide*

Source: PCWA

The County noted that other recent landslides areas include: Old Foresthill Road, Ophir Road (two sites - one near Stonehouse Road and another near Wise Road), and around Yankee Jims Road.

## Likelihood of Future Occurrence

**Likely**—Based on data provided by the HMPC, minor landslides have occurred in the past, probably over the last several hundred years, as evidenced both by past deposits exposed in erosion gullies and recent landslide events. With significant rainfall, additional failures are likely to occur within the identified landslide hazard areas. Given the nature of localized problems identified within the County, minor landslides will likely continue to impact the area when heavy precipitation occurs, as they have in the past.

## Climate Change and Landslide and Debris Flows

Climate change and its effect on landslide and debris flows in the County has been discussed by two sources:

- Placer County Sustainability Plan – 2020
- CAS – 2014

### Placer County Sustainability Plan

Climate change is expected to cause an increase in intense levels of precipitation, and heavy rainfall or snowfall could increase the number of landslides or make landslides larger than normal. Vegetation, which helps to hold the material of a hillside together, can be stripped away by climate exposures such as increased wildfires, droughts, or disease/pest infestations. Without vegetation to help stabilize the slope, hills may be more likely to slide.

### CAS

According to the CAS, climate change may result in precipitation extremes (i.e., wetter wet periods and drier dry periods). More information on precipitation increases can be found in Section 4.3.3. While total average annual rainfall may decrease only slightly, rainfall is predicted to occur in fewer, more intense precipitation events. The combination of a generally drier climate in the future, which will increase the chance of drought and wildfires, and the occasional extreme downpour is likely to cause more mudslides, landslides, and debris flows.

## *Vulnerability Assessment*

**Vulnerability**—Low

Landslides in Placer County include a wide variety of processes resulting in downward and outward movement of soil, rock, and vegetation. Although landslides are primarily associated with slopes greater than 15 percent, they can also occur in relatively flat areas and as cut-and-fill failures, river bluff failures, lateral spreading landslides, collapse of wine-waste piles, failures associated with quarries, and open-pit mines. Due to the low significance rating for landslide in Placer County, no mapped or tabular analysis was performed.

However, members of the HMPC did note that with the increasing amount of catastrophic fires that Placer County (and the West Coast) has seen in recent years the County has been inundated with a new type of land slide and the costs are tremendous. After both of two recent fires the County has seen the areas within river canyons burn and the materials (both soil and tree remains) slide into the waterways and cause damage to our hydroelectric power system and the water treatment. In addition, it was required to dredge the rivers in successive years as well as remove the logs that cause damage. Overall, approximately $15 million has been spent to repair the damage and loss of income from the aftereffects. It is also anticipated that there will be a need to perform this work for several more years as the soil and logs continue to slide into the river ways.

### Impacts

Impacts from landslides in the County can vary greatly. In unpopulated areas, landslides have little effect except to the extent they fill in waterways and create flooding issues, water conveyance and introduce contaminants. However, if landslides occur in populated areas, damages can be sustained by buildings, critical facilities, infrastructure, and injuries, and in extreme cases deaths, can occur. Landslide can affect ingress and egress routes. Many locations in the County have limited ingress and egress routes. Cutting

off one of these routes can cause multiple issues, from issues with elderly and those who are sick, to limiting emergency response to hazards from police, fire, and other County entities.

### *Future Development*

Although new growth and development corridors could fall in the area affected by moderate risk of landslide, given the small chance of a major landslide and the building codes and erosion ordinance in effect, development in the landslide areas will continue to occur.

## 4.3.15. Levee Failure

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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.

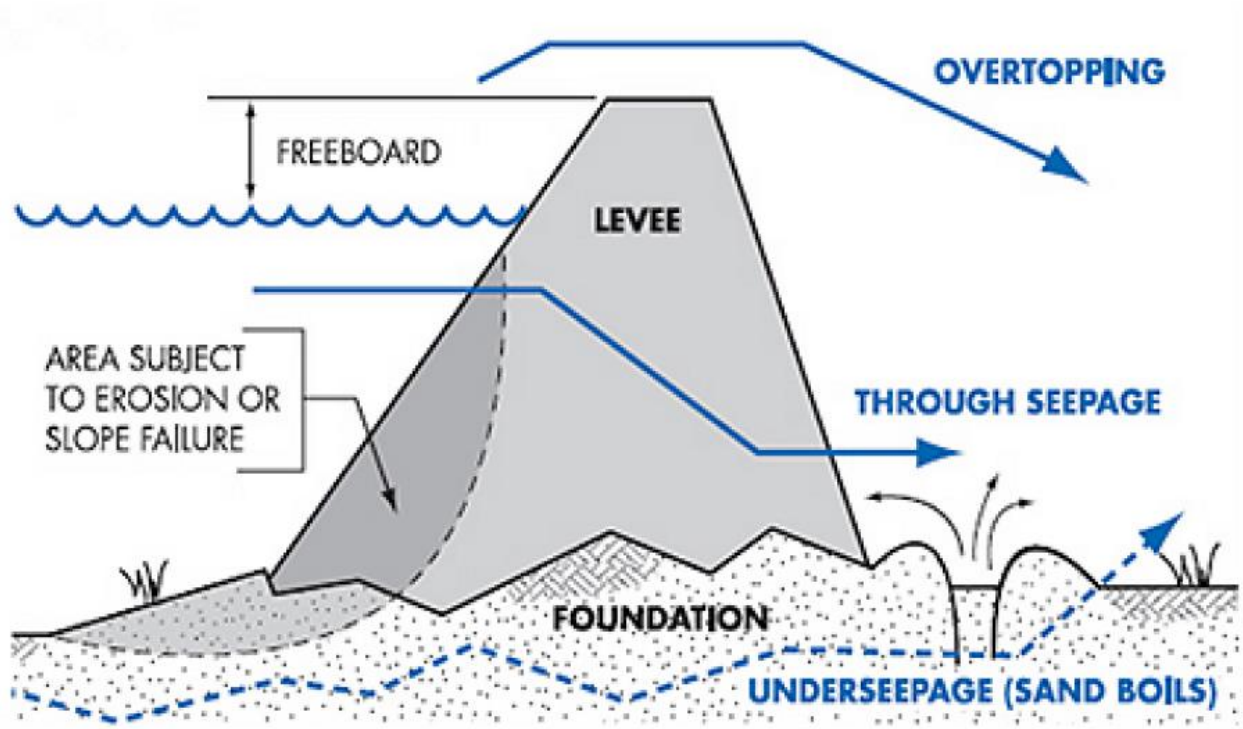
#### Hazard/Problem Description

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 steam 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 4-83 depicts potential of levee failure.

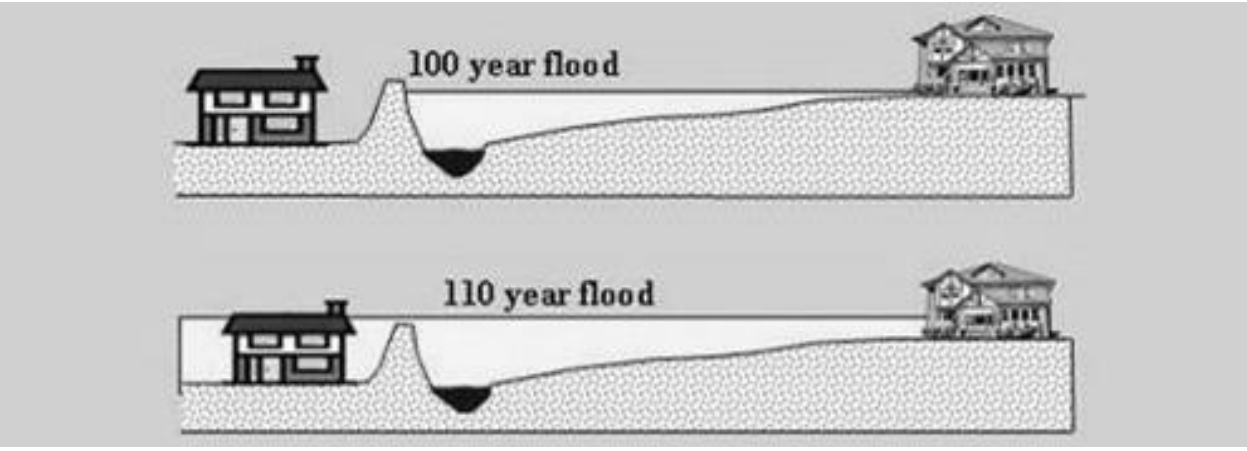
*Figure 4-83 Potential Causes of Levee Failure*




Source: USACE

Overtopping failure occurs when the flood water level rises above the crest of a levee. As shown in Figure 4-84, overtopping of levees can cause greater damage than a traditional flood due to the often lower topography behind the levee.

*Figure 4-84 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 4.3.12.

### Location and Extent

The 2018 FIS contained a list of levees in the County. FEMA coordinated with the USACE, the local jurisdictions, and other organizations to compile a list of levees that exist within Placer County. Table 4-94 lists all accredited levees, PALs, and de-accredited levees shown on the FIRM for the FIS. Other categories of levees may also be included in the table. It should be noted that there are levees in the City of Roseville; however, since they are not a participant to this Plan Update, they are not included here.

*Table 4-94 Placer County – Levees in FIS*

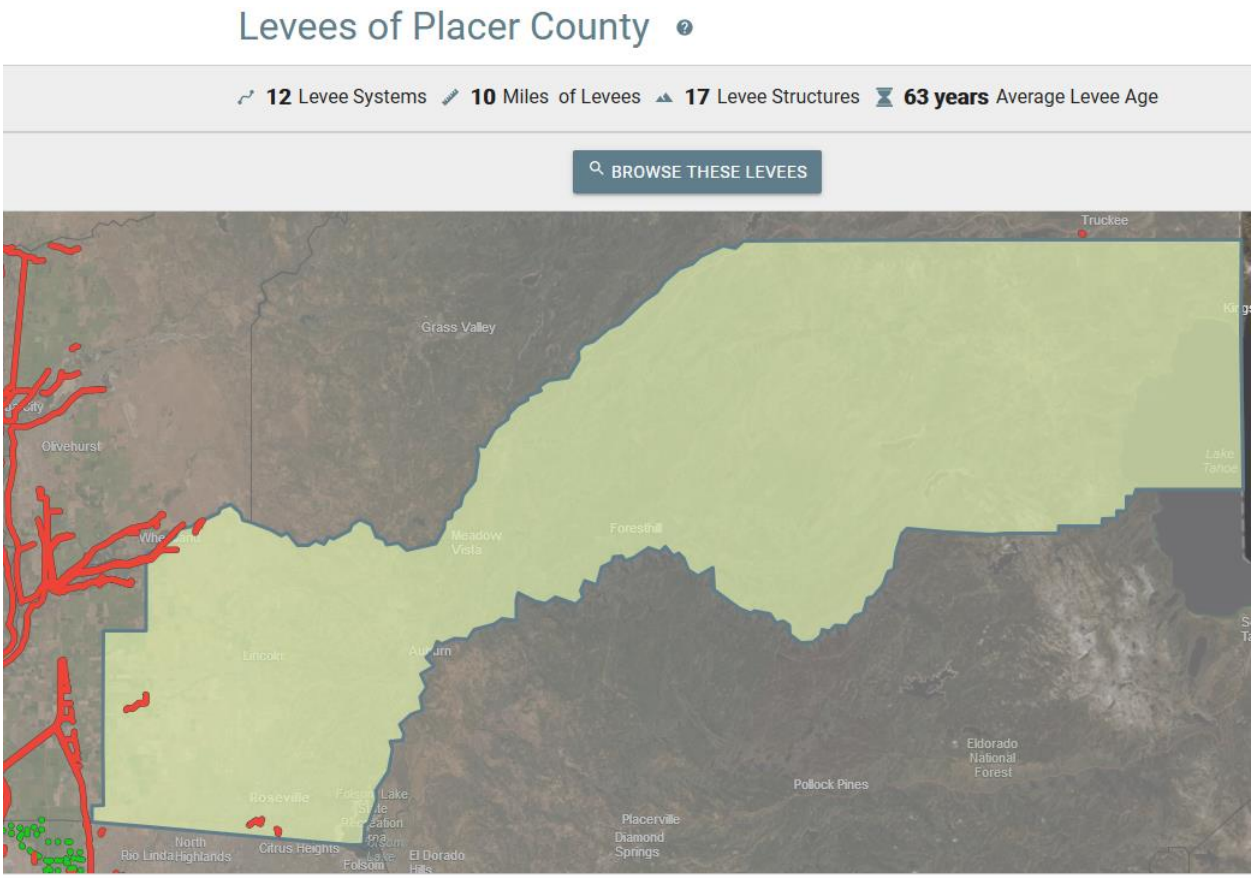
| Jurisdictions | Flooding Source | Levee Location | Levee Owner | USACE Levee | Levee ID | Covered under PL84-99 Program? | FIRM Panel |
|---|---|---|---|---|---|---|---|
| City of Lincoln | Auburn Ravine | Right Bank | City of Lincoln | No | 1905047042 | No | 06061C0718H |
| Placer County | Bear River | Left Bank | RD 1001 | No | 1901047016 | No | 06061C0395H<br>06061C0685H |
| Placer County | Bear River | Right Bank | RD 2103 | No | 1905047000 | No | 06061C0395H |
| City of Roseville | Linda Creek | Right Bank | City of Roseville | No | 1905047001 | No | 06061C1032H |
| City of Roseville | Linda Creek | Right Bank | City of Roseville | No | 1905047039 | No | 06061C1032H |
| City of Roseville | Linda Creek | Left Bank | City of Roseville | No | 1905047040 | No | 06061C1051H |
| City of Roseville | Linda Creek | Right Bank | City of Roseville | No | 1905047012 | No | 06061C1051H |

Source: Placer County 11/2/2018 Flood Insurance Study

A map of the levees from the National Levee Database (NLD) in the County is shown on Figure 4-85.

IS THERE A BETTER LEVEE MAP TO INCLUDE HERE OF COUNTY LEVEES?

*Figure 4-85 Placer County – Levee Locations*




Source: National Levee Database, retrieved 12/20/2020

## Past Occurrences

### Disaster Declaration History

There have been no disasters declarations related to levee failure in Placer County, as shown on Table 4-5. 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 Placer County.

### Hazard Mitigation Planning Committee Events

HAS THERE BEEN PAST LEVEE FAILURES IN THE COUNTY?

### Likelihood of Future Occurrence

**Unlikely** – Due to the low number of past events and the small volume of levees in Placer County, future levee failures should be considered unlikely. It should be noted that the average age of levees in the County is 63 years, according to the NLD.

### 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**—Low

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.

### Vulnerability Analysis

There are two analyses sections below:

- DFIRM X Protected by Levee GIS Analysis
- National Levee Database Analysis

### DFIRM X Protected by Levee GIS Analysis

This risk assessment for the Placer County LHMP Update assesses the levee failure hazard specific to Placer County. Existing studies, maps, historical data, and federal, state, and local community expertise and knowledge contributed to this current levee failure assessment for Placer 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 Placer 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.

Placer County has a FEMA effective DFIRM dated 11/2/2018, 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 were shown on Figure 4-69 in the Flood:1%/0.5%/0.2% Annual Chance discussion above.

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 Placer County Planning Area to the levee failure hazard. The following methodology was followed in determining improved parcel counts and values at risk to levee failure events.

Placer County's 2020 Parcel and Assessor Data, obtained from Placer County, was used as the basis for the county inventory of parcels, values, and acres. Placer County has a FEMA Q3/DFIRM dated 6/16/2015 which was utilized to perform the levee analysis. This analysis follows the same methodology provided in Section 4.3.10 for the flood hazard. Based on this analysis, values at risk to a levee failure in the County is provided for Placer County Planning Area and the unincorporated County in the below results section.

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 levee failure flooding. Results are presented here first for the Placer County Planning Area and secondly for unincorporated County. Results for the incorporated jurisdictions are presented in their annexes to this Plan.

### *Placer County Planning Area Assets at Risk*

Table 4-95 contain levee failure flood analysis results for Placer County. These tables show the number of parcels and values at risk in the X Protected by Levee flood zone for Placer County. Table 4-81 shows a summary of the value of improved parcels in levee protected flood zones in the Planning Area. More details regarding levee flood zones in each jurisdiction can be found in their respective annexes to this Plan Update.

### *Table 4-95 Placer 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 |
|---|---|---|---|---|---|---|
| **City of Lincoln** | | | | | | |
| X Protected by Levee | 51 | 48 | $3,615,466 | $9,117,055 | $4,558,526 | $17,291,047 |
| **Unincorporated Placer County** | | | | | | |
| X Protected by Levee | 97 | 50 | $33,086,121 | $26,311,546 | $15,159,631 | $74,557,298 |

Source: FEMA 6/16/2015 DFIRM, Placer 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

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### *Unincorporated Placer County Assets at Risk*

Table 4-96 contain levee failure flood analysis results for unincorporated Placer County. These tables show the number of parcels and values at risk to the 1% and 0.2% annual chance event for unincorporated Placer County. Table 4-96 breaks down the unincorporated Placer County line from Table 4-95 and 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 4-96 Unincorporated Placer 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 |
|---|---|---|---|---|---|---|
| **0.2% Annual Chance Flood** | | | | | | |
| **X Protected by Levee** | | | | | | |
| Agricultural | 1 | 1 | $584,704 | $49,939 | $49,939 | $684,582 |
| Miscellaneous | 3 | 0 | $0 | $0 | $0 | $0 |
| Natural / Open Space | 6 | 3 | $1,070,925 | $353,685 | $353,685 | $1,778,295 |
| Residential | 1 | 1 | $235,494 | $259,044 | $129,522 | $624,060 |
| **X Protected by Levee Total** | **11** | **5** | **$1,891,123** | **$662,668** | **$533,146** | **$3,086,937** |

Source: FEMA 6/16/2015 DFIRM, Placer 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

### *Population at Risk*

A separate analysis was performed to determine populations that reside in flood zones. Using GIS, the DFIRM flood dataset was overlayed on the improved residential parcel data. Those parcel centroids that intersect an X Protected by Levee flood zone were counted and multiplied by the Census Bureau average household size; and tabulated by flood zone (see Table 4-90).

### *Table 4-97 Placer County Planning Area – Residential Population at Risk in DFRIM Levee Protected Areas*

| Jurisdiction | X Protected by Levee | |
|---|---|---|
| | Improved Residential Parcels | Population at Risk |
| Auburn | 0 | 0 |
| Colfax | 0 | 0 |
| Lincoln | 3 | 8 |
| Loomis | 0 | 0 |
| Rocklin | 0 | 0 |

| Jurisdiction | X Protected by Levee | |
|---|---|---|
| | Improved Residential Parcels | Population at Risk |
| Unincorporated Placer County | 1 | 3 |
| **Total** | **847** | **2,196** |

Source: FEMA DFIRM 11/2/2018, US Census Bureau Average Household Sizes: Auburn (2.19); Colfax (2.30); Lincoln (2.57); Loomis (2.60), Rocklin (2.68); and unincorporated Placer County (2.58)

*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

The City of Roseville is not included in the calculations of populations at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### *Critical Facilities at Risk*

No critical facilities fall in the X Protected by Levee DFIRM flood zone. As such, no analysis (maps or tables) are presented here. DFIRM flood zones and critical facilities were shown in the Flood Vulnerability section of this Plan Update on Figure 4-75, Figure 4-76, and Figure 4-77.

## National Levee Database Analysis

In addition, the NLD has performed a basic analysis for each levee in the County. Information by levee follows. It is important to note, that although the National Levee Database identifies areas that the levee is protecting; these levee protected areas are not areas certified as providing protection against the 1% annual chance or other flood. It only represents those areas that the levee was designed to protect, but as they are not certified, they do not remove anyone within the protected area from the floodplain as represented in FEMA DFIRMs.

***Note***: Though levees protect the City of Roseville, the City is not participating in this LHMP Update. Levees in the unincorporated County and those protecting participating jurisdictions to this LHMP Update are discussed below. There is also an area in the County that is protected by the Bear River and Yankee Slough levees. This area contains only farmland, protects a small area in Placer County, and is maintained by an agency outside the County. It is not included in the discussion below.

## Placer County Levee 1

Placer County Levee 1 is located near Wheatland. This levee is not accredited by FEMA as providing 1% annual chance flood protection. The levee is 0.46 miles long. Protected areas were not quantified by the National Levee Database. The NLD noted that the levee was maintained by Reclamation District 2103. Protected areas can be seen on Figure 4-86.

*Figure 4-86 Placer County Levee 1 Protected Areas*

Source: National Levee Database

An assessment was performed on January 1, 2017 of this levee. That risk analysis showed the following:

- People at Risk 0
- Structures at Risk 0
- Property Value $0

### Placer County Levee 5

Placer County Levee 5 is located in the unincorporated County. This levee is not accredited by FEMA as providing 1% annual chance flood protection. The levee is 2.12 miles long. Protected areas were not quantified by the National Levee Database. The NLD did not contain a maintaining organization. Protected areas can be seen on Figure 4-87.

### *Figure 4-87 Placer County Levee 5 Protected Areas*

Source: National Levee Database

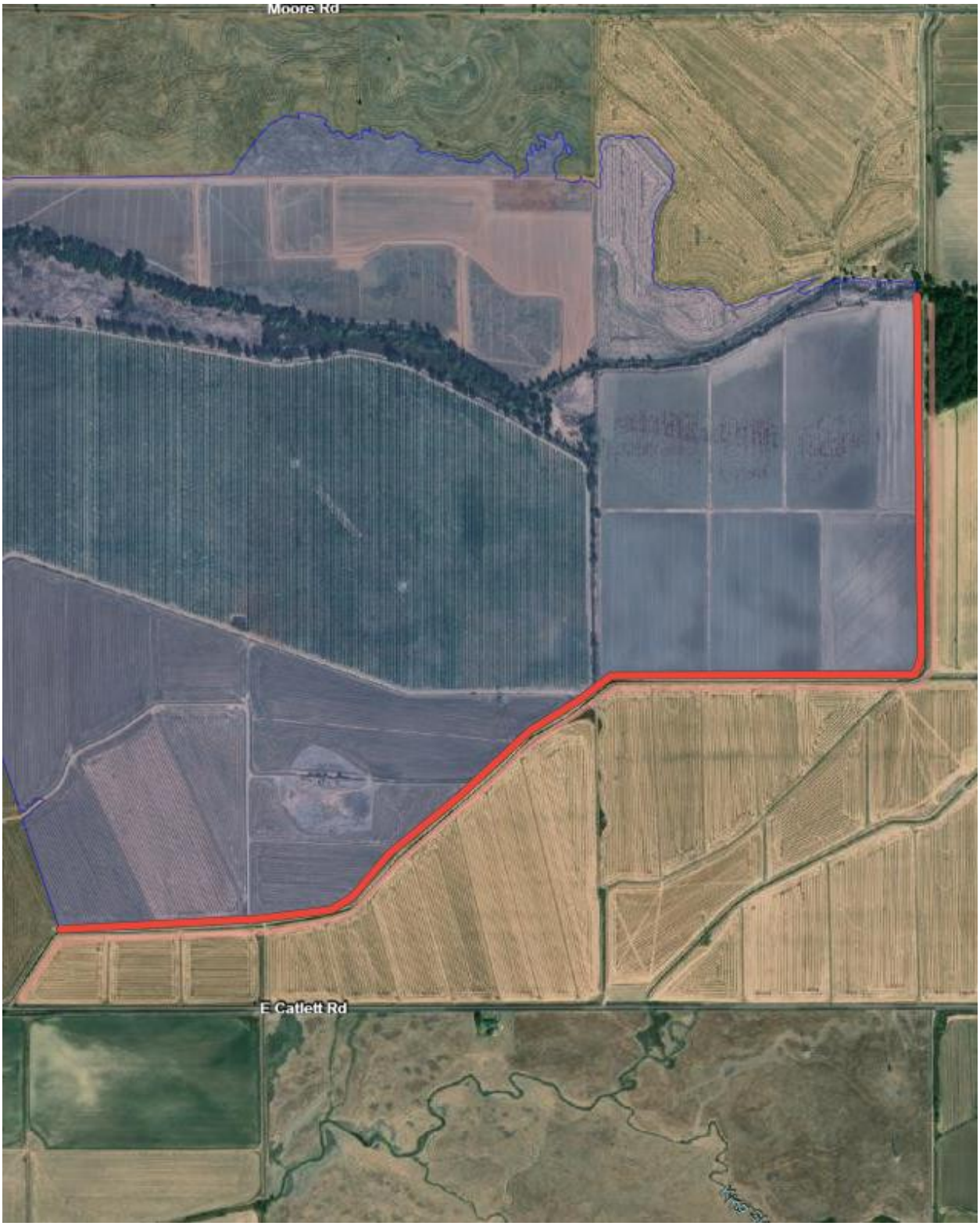
An assessment was performed on January 1, 2017 of this levee. That risk analysis showed the following:

- People at Risk 1
- Structures at Risk 1
- Property Value $444,000

### Placer County Levee 6

Placer County Levee 6 is located in the unincorporated County. This levee is not accredited by FEMA as providing 1% annual chance flood protection. The levee is 1.99 miles long. Protected areas were not quantified by the National Levee Database. The NLD did not contain a maintaining organization. Protected areas can be seen on Figure 4-88.

### *Figure 4-88 Placer County Levee 6 Protected Areas*




Source: National Levee Database

An assessment was performed on January 1, 2017 of this levee. That risk analysis showed the following:

- People at Risk 0
- Structures at Risk 0
- Property Value $0

### Placer County Levee 8

Placer County Levee 8 is located near Wheatland. This levee is not accredited by FEMA as providing 1% annual chance flood protection. The levee is 0.5 miles long, and the levee protects 0.57 $mi^2$. The NLD noted that the levee was maintained by Reclamation District 2103. Protected areas can be seen on Figure 4-89.

### *Figure 4-89 Placer County Levee 8 Protected Areas*

Source: National Levee Database

An assessment was performed on January 1, 2017 of this levee. That risk analysis showed the following:

- People at Risk 0
- Structures at Risk 0
- Property Value $0

### Placer County Levee 9

Placer County Levee 9 is located near Wheatland. This levee is not accredited by FEMA as providing 1% annual chance flood protection. The levee is 0.27 miles long, and protects 0.018mi$^2$. The NLD noted that the levee was maintained by Reclamation District 2103. Protected areas can be seen on Figure 4-90.

*Figure 4-90 Placer County Levee 9 Protected Areas*

Source: National Levee Database

An assessment was performed on January 1, 2017 of this levee. That risk analysis showed the following:

- People at Risk 0
- Structures at Risk 0
- Property Value $0

### 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.

### *Future Development*

With limited levees in the unincorporated County, future development will likely not be affected by this hazard. Should levees be built, future development built in the levee areas would be subject to the building standards in the Placer County Floodplain Ordinance.

## 4.3.16. Pandemic

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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, and 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 as well as the current COVID-19 pandemic. 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 has been one state and federal disaster declaration due to pandemic, as shown in Table 4-98. The County had no USDA disaster declarations since 2012 related to pandemic, as shown on Table 4-6.

*Table 4-98 Placer County – State and Federal Pandemic Disaster Declarations 1950-2020*

| 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.

- 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 April 2021, there had been roughly 138 million cases worldwide, with 3 million deaths.

### HMPC Events

SPECIFIC TROUBLES/ISSUES IN THE COUNTY?

As of mid-May 2021, there had been over 22,600 cases of Covid-19 in the County and around 292 deaths.

### 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 Update 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

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. It will be important to learn more about the underlying complex causal relationships, and apply this information to the prediction of future impacts, using more complete, better validated, and 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 pandemic by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the County, but can have a significant econmonic impact on small businesses and others in a community . Pandemic can have varying levels of impact to the citizens of the County, depending on the nature of the pandemic.

### Impacts

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. Overall, a Pandemic can result in significant economic impacts to affected communities.

### *Future Development*

Future development is not expected to be significantly impacted by this hazard, though population growth in the County could increase exposure to 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 as well as more vulnerable popultations. 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.

## 4.3.17. Seiche

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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

U.S. Army Corps of Engineers defines seiche as:

- A standing wave oscillation of an enclosed water body that continues, pendulum fashion, after the cessation of the originating force, which may have been either seismic or atmospheric.
- An oscillation of a fluid body in response to a disturbing force having the same frequency as the natural frequency of the fluid system. Tides are now considered to be seiches induced primarily by the periodic forces caused by the sun and moon.
- In the Great Lakes area, any sudden rise in the water of a harbor or a lake whether or not it is oscillatory (although inaccurate in a strict sense, this usage is well established in the Great Lakes area).

Seiches can be generated when the water is subject to changes in wind or atmospheric pressure gradients or, in the case of semi-enclosed basins, by the oscillation of adjacent connected water bodies having a periodicity close to that of the seiche or of one of its harmonics. Other, less frequent causes of seiches include heavy precipitation over a portion of the lake, flood discharge from rivers, seismic disturbances, submarine mudslides or slumps, and tides. The most dramatic seiches have been observed after earthquakes.

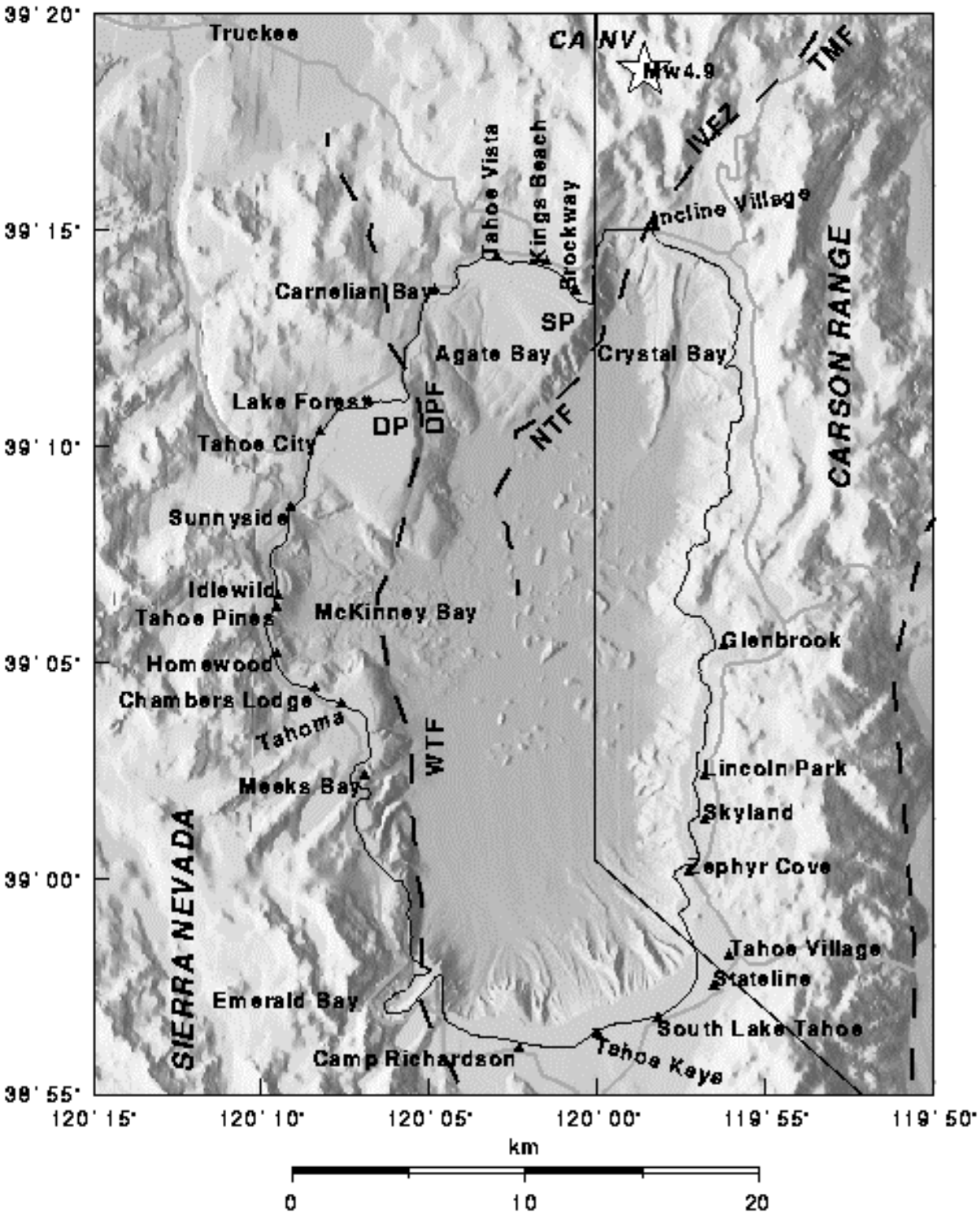
Another way a seiche can occur is a sudden land tilt or drop as a result of fault rupture or other seismic activity. Computer modeling by a group at the University of Nevada at Reno working with a Japanese tsunami expert showed ruptures along either fault could lift or drop the bottom the lake and possibly generate a tsunami. The tsunami in turn could trigger seiche waves within seconds that could crisscross the lake, reach heights of 30 feet or more, and persist for hours.

## Location and Extent

Within Placer County, locations with the highest probability of impact are shore areas of Lake Tahoe from 0 to 30 feet above mean lake water level. Speed of onset of seiche is short. The duration of the event tends to be short as well, continuing until the waves naturally dissipate.

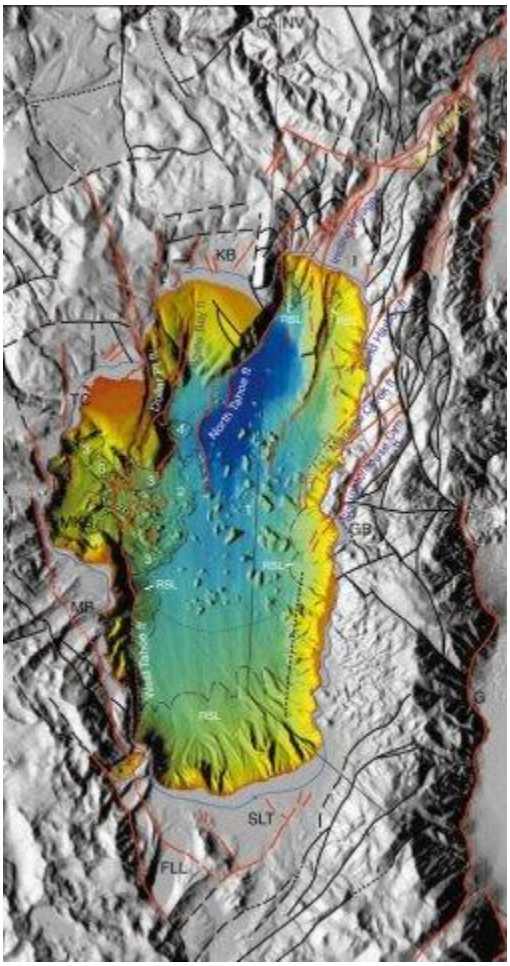
Japanese scientist Kenji Satake had created computer models that suggest the largest waves of a seiche event could hit Sugar Pine Point, Rubicon Point, and the casinos in South Lake Tahoe. Figure 4-91 shows the topography of the Lake Tahoe Basin. Figure 4-92 shows lake bathymetry, while Figure 4-93 shows fault locations.

*Figure 4-91 Lake Tahoe Basin Topography*



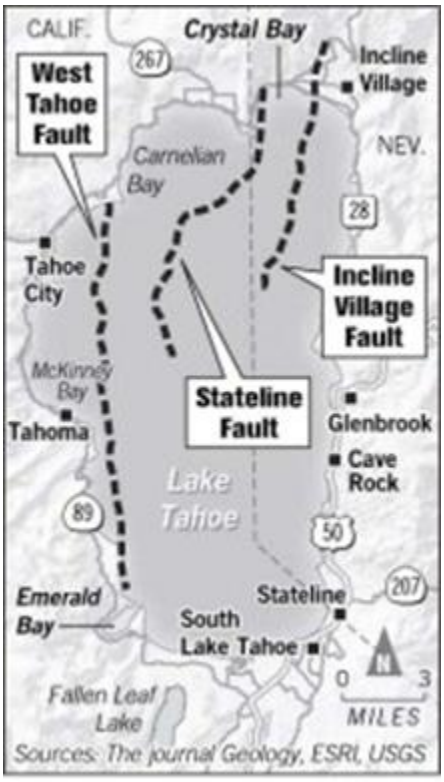

Source: The Potential Hazard from Tsunami and Seiche Waves Generated by Future Large Earthquakes within the Lake Tahoe Basin, California-Nevada, 1999-2000; Gene A. Ichinose, Kenji Satake, John G. Anderson, Rich A. Schweickert, and Mary M. Lahren; Nevada Seismological Laboratory; University of Nevada; (University of Nevada 2000 study)

### *Figure 4-92 Lake Tahoe Bathymetry*




Source: University of Nevada Seismic Laboratory, (Schweickert); USGS

*Figure 4-93 Lake Tahoe Fault Locations*




Source: ESRI, USGS

Research from the University of Nevada estimates that an earthquake must be at least a magnitude 6.5 to cause a damaging seiche at Lake Tahoe. The three faults directly underneath the lake are considered capable of generating magnitude 7.0 or larger earthquakes. Computer models of seiche activity at Lake Tahoe prepared by the University of Nevada research team estimate that waves as high as 30 feet could strike the shore. These projections suggest largest waves might hit Sugar Pine Point, Rubicon Point, and the casinos in South Lake Tahoe.

In the event of a magnitude 7 earthquake occurring on either of two major faults under the lake, the lake bottom could drop as much as 4 meters. Water supported by the lake floor could drop a corresponding distance and generate waves that heavily impact the shoreline.

Figure 4-94 below shows three potential vertical displacement (uplift or subsidence) scenarios that could be caused by magnitude 7+ earthquakes along the three discrete fault systems in the Lake Tahoe region. These scenarios were done prior to the 2006 finding of the Stateline fault that traverses Lake Tahoe. It was not included in these scenarios.

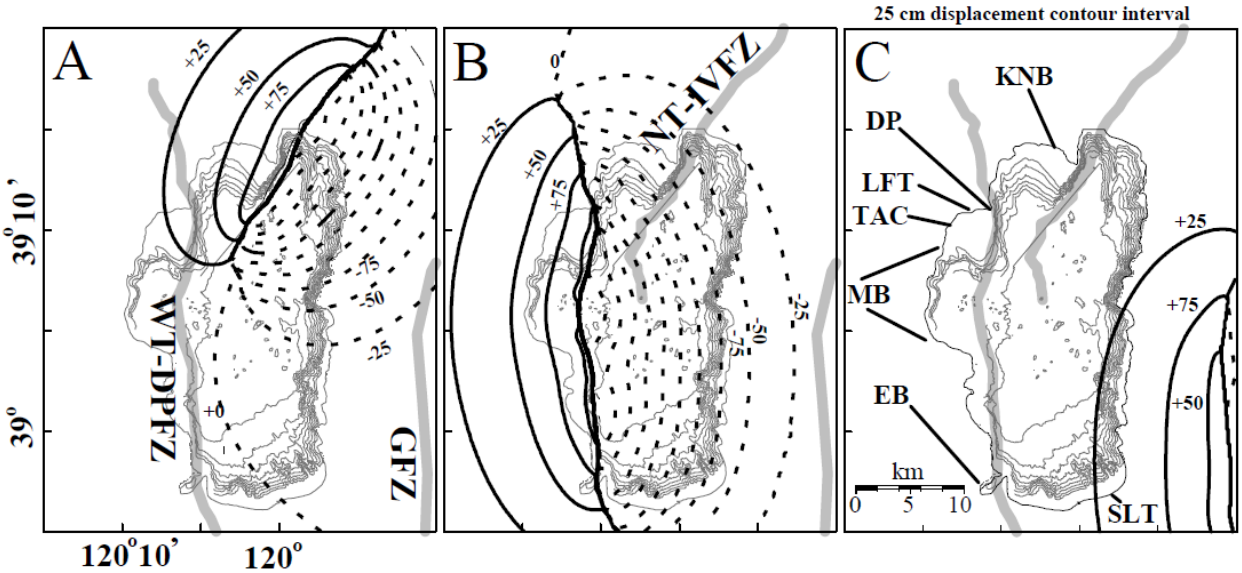
Scenario A represents an earthquake event along the North Tahoe-Incline Village Fault Zone (NT-IVFZ). This scenario projects significant subsidence (0.5-4.0 meters) to the east of the fault in the vicinity of Incline Village and across Crystal Bay and moderate uplift (0.25-1.0 meter) to the west and away from the lake. Shoreline areas near the fault rupture would be inundated due to permanent ground subsidence. Other shoreline areas would be temporarily inundated by tsunami and seiche waves. Seiche wave heights could

exceed 3 meters within shallow bays and shores between Incline Village and Carnelian Bay, and exceed 6 meters at some locations in the South Lake area.

Scenario B represents an earthquake event along the West Tahoe-Dollar Point Fault Zone (WTFZ). This scenario projects significant subsidence (0.5-4.0 meters) across the lake bottom to the east of the fault and moderate uplift (0.25-1.0 meter) to the west across McKinney Bay and away from the lake. Scenario B projects a similar pattern of seiche wave heights as Scenario A except that wave heights in some areas could be as high as 10 meters.

Scenario C represents an earthquake event along the Genoa Fault Zone (GFZ) 7-10 miles east of the lake shore. This scenario projects minor to moderate uplift (0.25-0.75 meter) to the southwest of the lake. Scenario C produces waves with average heights of 0.5 meters, indicating that magnitude 7 earthquakes along faults outside of the lake are not likely to create a large seiche event.

*Figure 4-94 Contours of Vertical Component Ground and Lake Bottom Displacements*




Source: The Potential Hazard from Tsunami and Seiche Waves Generated by Future Large Earthquakes within the Lake Tahoe Basin, California-Nevada, 1999-2000; Gene A. Ichinose, Kenji Satake, John G. Anderson, Rich A. Schweickert, and Mary M. Lahren; Nevada Seismological Laboratory; University of Nevada; (University of Nevada 2000 study)

## Past Occurrences

### Disaster Declaration History

There have been no federal or state disasters from seiche in Placer County, as shown in Table 4-4. The County had no USDA disaster declarations since 2002 related to seiche, as shown on Table 4-6.

### NCDC Events

The NCDC does not track seiche events.

### HMPC Events

There have been no occurrences of major seiche activity at Lake Tahoe in recent years. University of Nevada geologists have found deposits that extend for 10 miles along the McKinney Bay shore from Sunnyside through Tahoma. These deposits indicate a tsunami or seiche with 30-foot-high waves occurred approximately 7,000 years ago.

Research performed by the Scripps Institute of Oceanography in 2005 using acoustic trenching to research the lake's topography indicates that McKinney Bay was formed when a massive landslide slipped into Lake Tahoe which likely caused major seiche activity at that time. Research from the University of Nevada shows evidence of a massive landslide that tumbled from Homewood on the Nevada side.

In 1955, a landslide occurred in Emerald Bay. Seiche activity occurred. Evidence of the landslide can still be seen on the hillside near Emerald Bay.

Recent occurrences of potential causal factors include a magnitude 4.9 earthquake near Incline Village in 1998.

ANYTHING TO ADD?

### Likelihood of Future Occurrences

**Unlikely**—There have been no occurrences of major seiche activity at Lake Tahoe in recent years. Based on past occurrences, the likelihood of future occurrence in the near future is unlikely. However, given the evidence of past historical events and the location of faults within the Tahoe area, and the more recent seismic activity in the Tahoe region, a future seiche event at Lake Tahoe is a possibility.

### Climate Change and Seiche

Climate change is unlikely to affect earthquake caused seiche; however, landslide caused seiche may be affected by climate change. A discussion on climate change and landslide can be found in Section 4.3.14.

## *Vulnerability Assessment*

Research from the University of Nevada estimates that an earthquake must be at least a magnitude 6.5 to cause a damaging seiche at Lake Tahoe. The two faults directly underneath the lake are considered capable of generating magnitude 7.1 earthquakes. Computer models of seiche activity at Lake Tahoe prepared by the University of Nevada research team estimate that waves as high as 30 feet could strike the shore. These projections suggest largest waves might hit Sugar Pine Point, Rubicon Point and the casinos in South Lake Tahoe. The seiche risk is potentially devastating as hundreds of houses are built along the lake and more than 17,000 people enjoy the Lake Tahoe shoreline every day in the summer.

In a recent 2008 California Statewide Exercise conducted to evaluate state and regional response capabilities, a seiche scenario was conducted on the Lake Tahoe Basin Area. The potential scenario was developed with input from researchers from the University of Nevada. This exercise scenario provides

information on the potential risk and vulnerability of a seiche occurring on Lake Tahoe. The exercise timeline and ground truths provided is reproduced below:

### *Golden Guardian 2008 Exercise*

### Timeline and Ground Truths

### TIMELINE:

- 8:55 am on November 6 - Mt. Rose is hit with a subterranean magnitude 6.8 earthquake, which causes minor to major damage in the Lake Tahoe Basin. An underwater shelf, in the Crystal Bay area, experiences a sluffing of a large mass of earth, which pushes a large volume of water southward and a smaller amount northward (generating seiche waves). The first wave at 6 ft in height begins to travel southward the width of the lake in Lake Tahoe at 180 miles per hour. As the wave approaches the southern part of Lake Tahoe it meets the rising floor of the lake and pushes up the wave's height to 18-20 feet. It will take the first wave 5 minutes to travel the length of the lake. The wave has pushed 6 ft of water back into Crystal Basin and the Tahoe City area. The wave caused overflow of the dam at "Fannie Bridge" causing the overflowing water downstream into the Truckee River picking up and depositing large amount of debris along the way. A large portion of Tahoe City is underwater. The South Lake Tahoe area is also heavily impacted and underwater, specifically the City of South Lake Tahoe and Tahoe Keys areas.
- 9:03 am - The second wave strikes the South Lake Tahoe area. This wave is moving at 80 miles per hour and is 18-20 feet or better in height. The water continues to push into the already damaged and submerged areas.
- 9:08 am - The second wave strikes the northern area of Lake Tahoe. There is considerable damage and debris into the lake. Any low areas around the lake are reporting damage, flooding and debris (including people and animals).
- 9:13 am - The third wave has traveled the length of the lake and struck the South Lake Tahoe area again. This one was traveling less than 80 miles per hour and is 15-19 feet in height.
- 9:18 am - The third wave strikes the northern end of Lake Tahoe. This time the wave is only traveling at 50 miles per hour and is only 12 feet in height.
- 9:23 am - The fourth and last wave strikes the South Lake Tahoe area and is traveling 30 miles per hour and only 9-12 feet in height.
- 9:28 am - The fourth and last wave strike the North Lake Tahoe area traveling 15 miles per hour and only 3-6 feet in height.

The seiche wave has traveled north to south on Lake Tahoe much like a bathtub wave. There is considerable damage in all low areas near the lake.

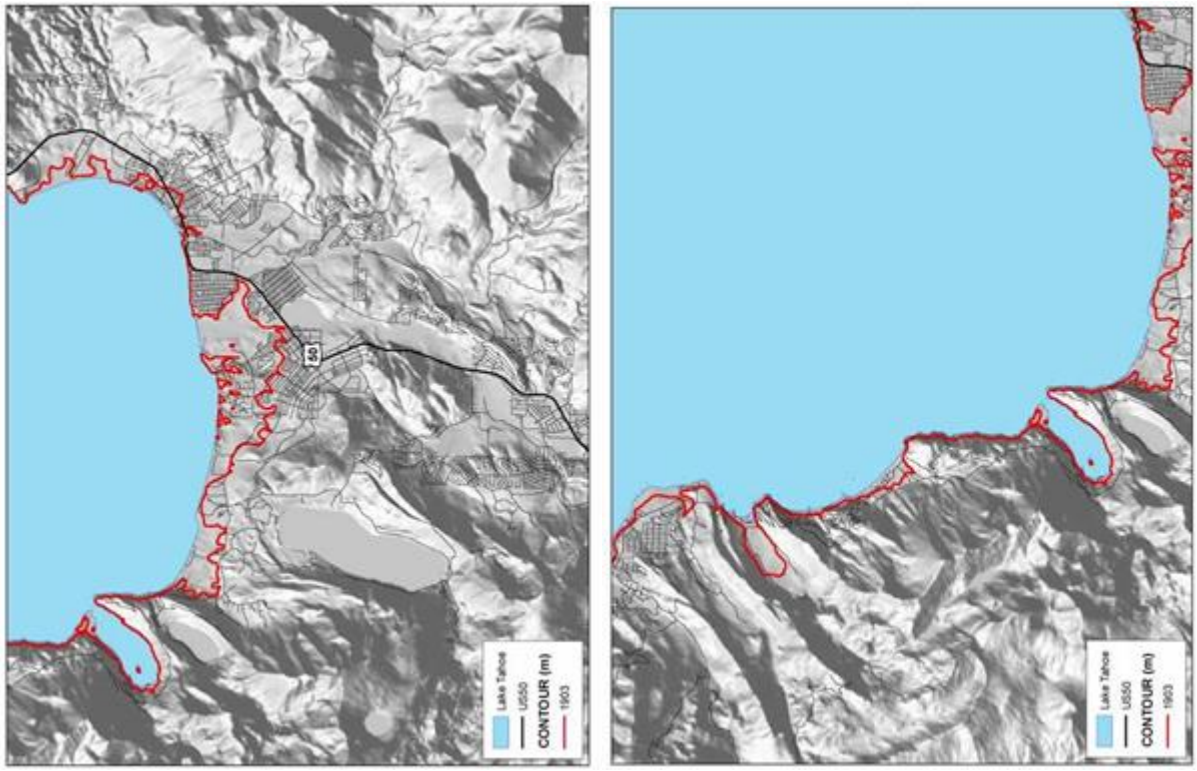
### GROUND TRUTHS:

- Shoreline and nearby inland low lying areas of north Lake Tahoe of Placer County will be impacted, specifically west shores, Tahoe City and King Beach.
- HWY 89 from the "Y south will be closed in certain sections for a minimum of 24-48 hrs due to washout of the highway and or blockage from debris.

- The large & strong waves overflowed the dam located near "Fannie Bridge" resulting HWY 89 from the "Y" north along the Truckee River corridor to close for 24-48 hrs due blockage of the highway from debris and a landslide near Alpine Meadows Road/River Ranch Inn.
- HWY 28 will be close for approx. 24 hrs due to blockage of debris, but unlike HWY 89 no damage/washout of sections of the highway.
- HWY 28 & HWY 267 junction temporarily close for approx. 12 hrs due to blockage by debris; however, HWY 267 remain open.

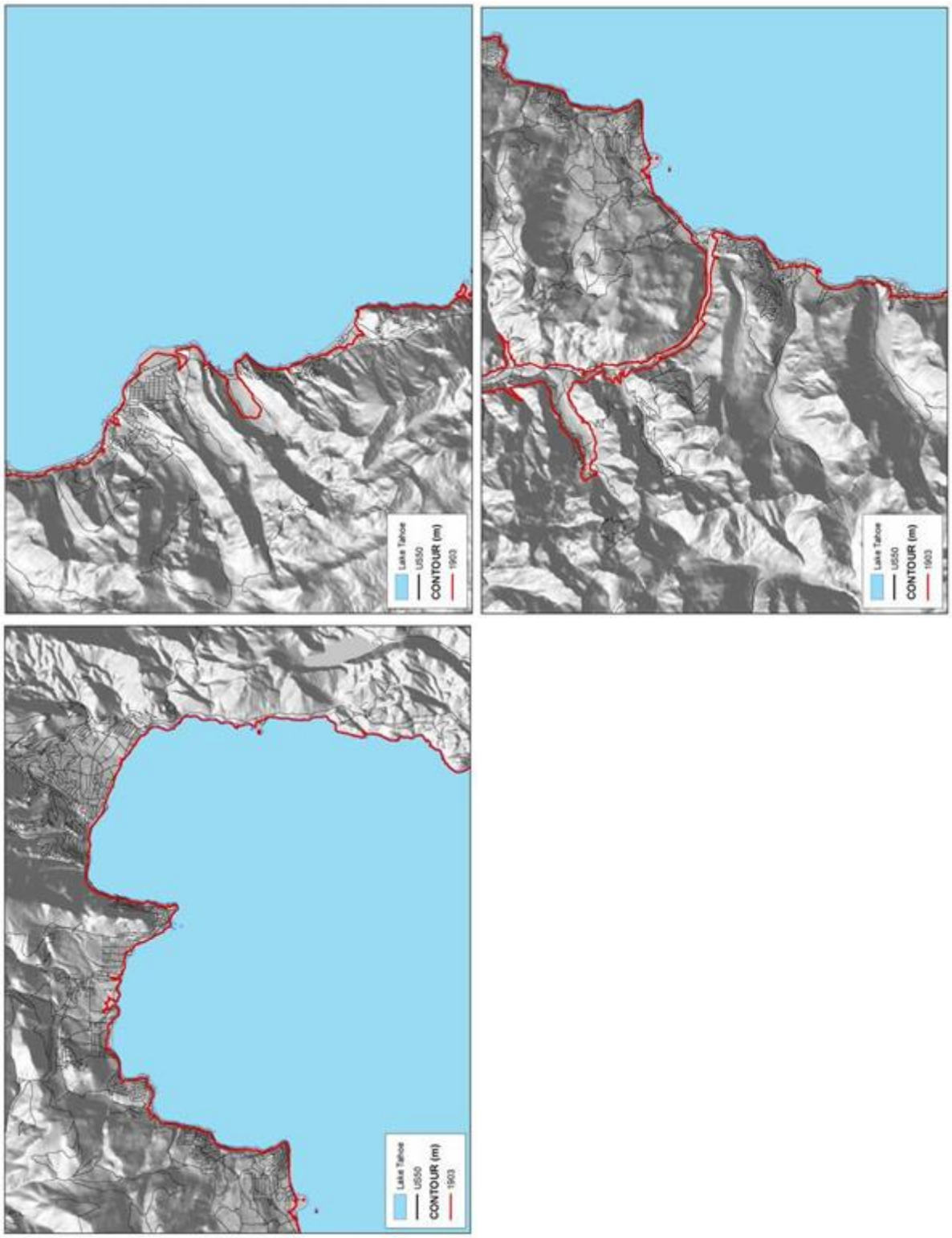
The magnitude 6.8 earthquake modeled for this exercise resulted in a peak acceleration of 0.1 to 0.2 g, a peak velocity of 5-10 cm/s, with felt effects being estimated at a Modified Mercalli Intensity Scale of VI to VII. The seiche was generated by a landslide at the north end of Lake Tahoe. This scenario estimated run-up of waters to elevations 6 m above lake level, with water arriving at shoreline 5 minutes after the earthquake. Inundation mapping of the seiche scenario done as part of the exercise identifies those areas most vulnerable to damage including loss of life and property damage. Figure 4-95 and Figure 4-96 illustrate these inundation areas along Lake Tahoe. The red line on the maps defines the 1903 contour line where floodwaters are expected to reach. It is estimated that about 4,200 people live below the 1903 m countour line using 2002 census data. Estimates indicated that flooding to the 1,903 m elevation will only flood the ground-level floor of structures with entrances near 1,903 m, but will flood more in structures with entrances closer to the lake elevation. Again, depending on the time of day, the potential exists for many more people to be present recreating in the shoreline areas.

***Figure 4-95 Placer Seiche Scenario 2008 Exercise: Tahoe Inundation Areas***




Source: Placer County

### *Figure 4-96 Placer Seiche Scenario 2008 Exercise: Tahoe Inundation Areas*




Source: Placer County

### *Future Development*

Development in areas located around the lake in potential seiche impact areas consist of primarily infill and redevelopment of both residential and commercial areas.

## 4.3.18. Tree Mortality

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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

One of the many vulnerabilities of drought in Placer County is the increased risk of widespread tree mortality events that pose hazards to people, homes, and community infrastructure, create a regional economic burden to mitigate, and contribute to future fuel loads in forests surrounding communities. During extended drought, tree mortality is driven by a build-up in endemic bark beetle populations and exacerbated by latent populations of a suite of native insects and disease. Non-native forest pests (insects and/or pathogens) can also contribute to tree mortality events.

The most common driver of tree morality are forest pests in the bark beetle category. Bark beetles mine the inner bark (the phloem-cambial region) on twigs, branches, or trunks of trees and shrubs. Bark beetles frequently attack trees weakened by drought, disease, injuries, or other factors that may stress the tree. Bark beetles can contribute to the decline and eventual death of trees; however only a few aggressive beetle species are known to be the sole cause of tree mortality. Bark beetle mortality and the scope and scale of mortality is closely linked with two common factors: high stand densities of trees and extended drought – both of which are common occurrences in the forests of Placer County.

Commonly tree mortality incidences have been within endemic background levels and highly localized and dispersed in nature; however, in the past two decades, larger more widespread tree mortality events have occurred in various parts of California creating land management challenges that have notable socio-economic impacts to mountain communities. Forests with high densities of trees are particularly vulnerable during extended drought where endemic bark beetle populations can explode to epidemic proportions in a short amount of time, as recently experienced during the 2012-2016 tree mortality event in the central and southern Sierra Nevada counties (see Figure 4-97).

***Figure 4-97 Examples of Widespread Tree Mortality Induced by Drought in the Southern Sierra Nevada in May 2015 (left) and February 2016 (right).***

Source: CAL FIRE 2021

In addition to bark beetles, many tree mortality factors include a complex of pathogens and insects. For example, various types of fungal root diseases and trunk rots can create water stress on trees that contribute to susceptibility to bark beetle mortality. Outbreaks of forest defoliator insects have also occurred throughout the county. While defoliation events are not huge drivers of mortality, these incidents have contributed to localized areas of concern. These defoliation events make true fir forest stands more vulnerable to fir engraver bark beetle mortality (see Figure 4-98).

***Figure 4-98 Tree Mortality as the Result of Pathogen and Insect Complexes***

Source: University of California, 2015

Sierra Nevada mixed conifer forests evolved with and are adapted to periodic drought; however high stand densities – in combination with periodic drought and pest/pathogen complexes – make trees particularly susceptible to larger scale mortality events. Widespread mortality events contribute to hazardous fuel accumulations which, in turn, contribute to elevated wildfire hazard. Elevated tree mortality within striking

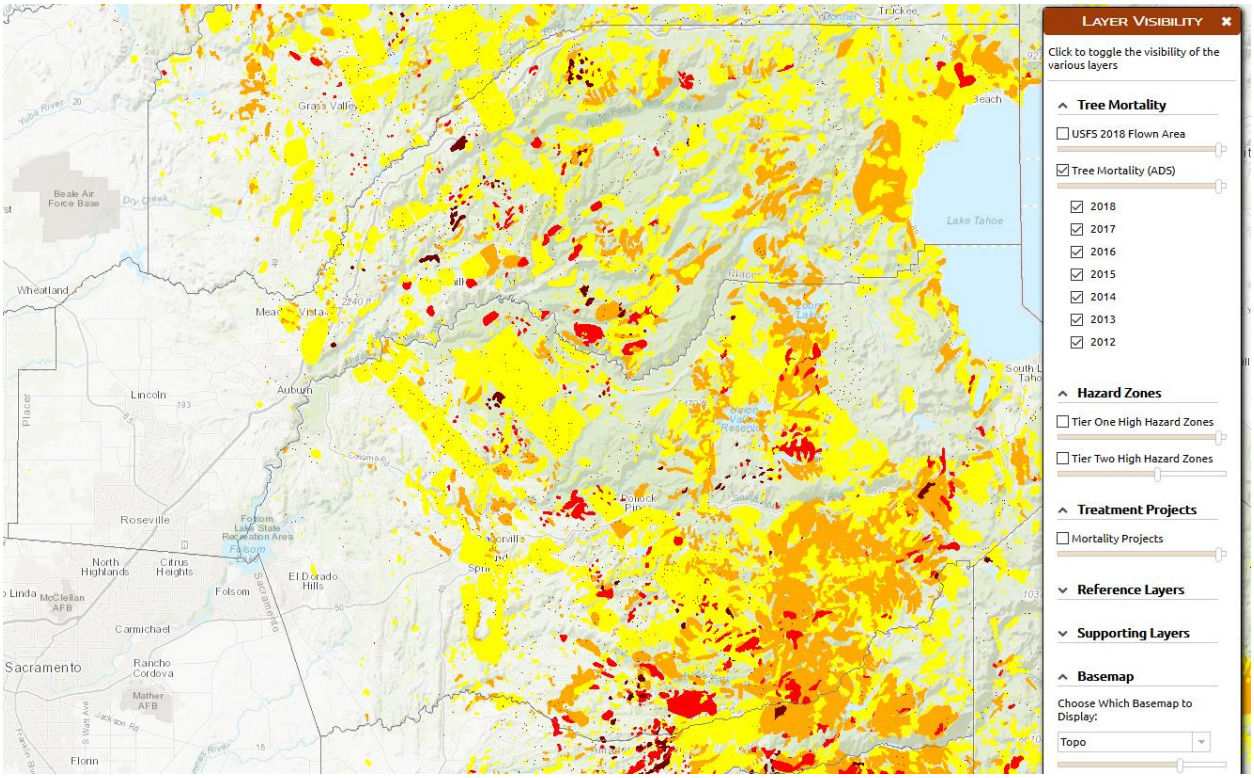
distance of homes, roads, and community infrastructure also contribute to operational complexities and economic burden on rural forested counties.

## Location and Extent

Onset of tree mortality events can be relatively fast as seen in Figure 4-99; however conditions – such as high stand densities – that lead to tree mortality accumulate slowly over time. Duration of tree mortality is lengthy, as once the tree dies, it remains in place until removed by human activity, wildfire, or breakdown of the wood by nature. Many areas in Placer County have seen increases in tree mortality. The County has mapped these areas, and that map is shown in Figure 4-99. Shown are results of 2012-2018 aerial tree-mortality surveys. Using a color legend, the map shows a scale of:

- Deep burgundy depicting areas with more than 40 dead trees per acre
- Red depicting 15 - 40 dead trees per acre
- Orange depicting 5 -15 dead trees per acre
- Yellow depicting 5 or less dead trees per acre

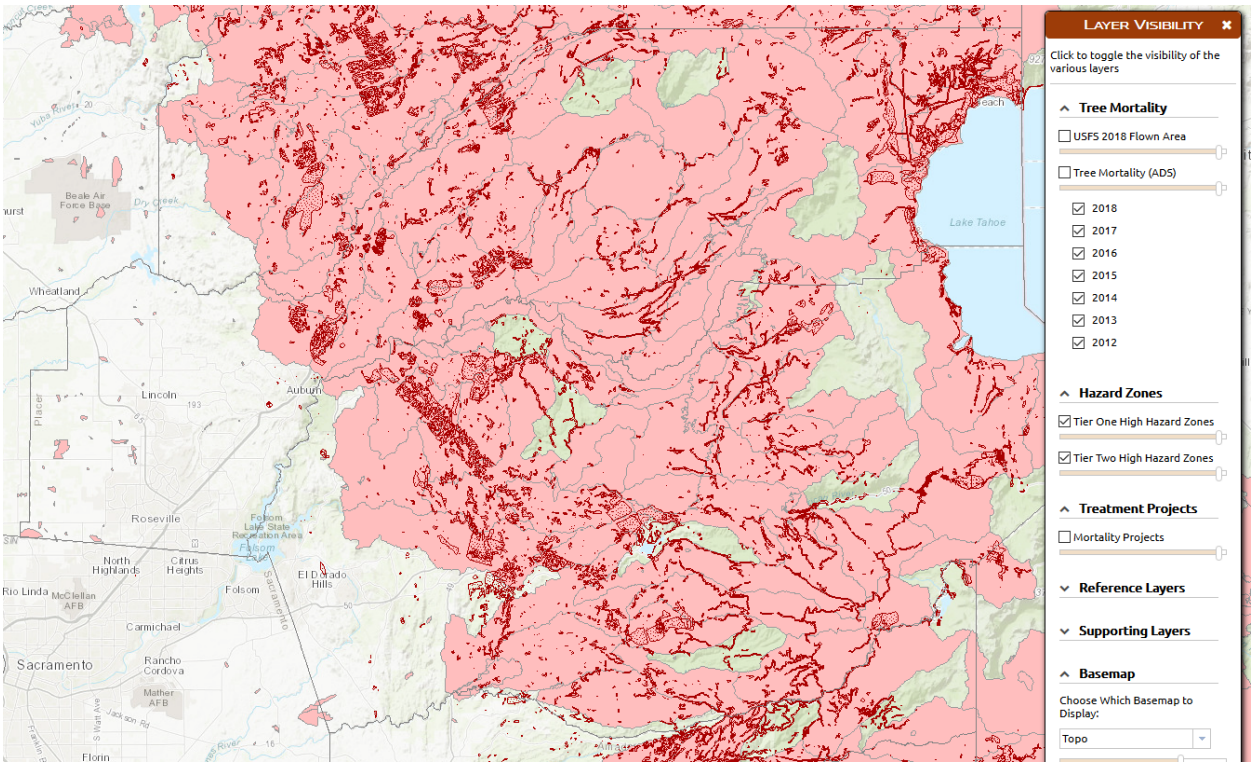
### *Figure 4-99 Placer County – Tree Mortality Areas*




Source: CAL FIRE, map retrieved 12/17/2020

In the past decade, mortality has increased in the eastern portion of Placer County. Placer County is designated as Tier 2 High mortality hazard on the watershed scale along with numerous Tier 1 High hazard "hot spots". These can be seen on Figure 4-100. The light red areas on the map depict the Tier 1 areas of the County, while the dark red areas on the map depict the Tier 2 areas.

*Figure 4-100 Placer County – Tree Mortality Hazard Zones*




Source: CAL FIRE, map retrieved 12/17/2020

## Past Occurrences

### Disaster Declaration History

There have been no federal or state disaster declarations due to tree mortality, as shown in Table 4-4. No USDA disaster declarations have been declared either, as shown in Table 4-6. While not a disaster declaration, on October 30, 2015, Governor Brown proclaimed a State of Emergency and included provisions to expedite the removal and disposal of dead and dying hazardous trees. As a result, costs related to identification, removal, and disposal of dead and dying trees caused from drought conditions may be eligible for California Disaster Assistance Act (CDAA) reimbursement.

### NCDC Events

The NCDC does not track tree mortality events in Placer County.

### Hazard Mitigation Planning Committee Events

Widespread tree mortality events have occurred in Placer County primarily due to high tree densities and drought episodes that facilitate a build-up of endemic bark beetle populations. Tree mortality events have also occurred from defoliation insects, plant diseases and from introduction of non-native forest pests. The HMPC noted that there have been a number of tree mortality events in Placer County. Notable events include:

- Douglas-fir tussock moth outbreak in the 1980's
- Late 1980's/Early 1990's mortality of white fir across the Tahoe and Plumas National Forests
- 2012-2018 Drought Related Tree Mortality Event in both pine and fir
- 2014-2016 Sawfly and Douglas-fir tussock moth outbreak

VERIFY THESE. ANY OTHERS?

The HMPC noted other events that occurred outside of Placer County. Past tree mortality events in the northern Sierra Nevada have been well documented in scientific literature (Macomber and Woodcock 1994; Ferrell et al 1994; Guarin and Taylor 2005; Preisler et al 2017). Over the past two decades tree mortality events in California forests have impacted numerous forested communities with widespread and large scale economic and social impacts. Examples include:

- Bark beetle outbreak in Southern California: San Bernadino and Lake Arrowhead 2003-2006
- Bark Beetle outbreak in the central and southern Sierra Nevada 2010-2018
- Sudden Oak Death in the Northern California Coast Range 2001-ongoing
- Golden Spotted Oak Borer mortality of Black Oak in Southern California

## Likelihood of Future Occurrence

**Likely** – There have been four (multi-year) tree mortality events in the County since 1980. Given the past events, the lingering drought conditions in California, and the heavily wooded nature of much of the County, tree mortality is considered likely in the future.

## Climate Change and Tree Mortality

The Placer County Sustainability Plan noted that climate change is likely to worsen bark beetle infestations. The warmer temperatures and shorter periods of cold weather create a longer period for bark beetles to be active and reproduce. Drought and extreme heat also stress and weaken trees, making them more susceptible to bark beetle infestation.

Tree mortality events are inevitable, particularly considering the climate change predictions for Placer County. Trends, noted by the US Forest Service, suggest that the northern Sierra Nevada may become generally warmer and wetter, with longer periods of prolonged summer drought.

While warmer and wetter weather patterns may increase forest growth, warmer temperatures – in combination with longer periods of prolonged summer drought – will likely increase forest insect and disease outbreaks and the occurrence of high severity fire. High-intensity wildfires, drought, and declining forest health are some effects of climate change that are worsening the threats to forests and reducing forest productivity.

Hotter and drier weather alter forest hydrology and water balance available to forest communities. Increased temperatures alter the timing of snowmelt, affecting the seasonal availability of water with earlier dry conditions which then provides fuel to earlier and hotter fires from stressed trees and shrubs. Drought also reduces trees' ability to produce sap, which protects them from destructive insects and diseases. Research by the US Forest Service has found that large trees may be most susceptible to climate driven

mortality – which the authors suggested can also be compounded by high stand densities of small trees due to fire suppression. Others suggest that "regional warming and consequent increases in water deficits are likely contributors to the increase in mortality rates," and suggest that exogenous warming trends may be more of a driver of mortality, particularly in large diameter trees, than increasing stand density. Nonetheless, research indicates that warming climate is driving changes in forest structure.

Battles et al. (2008) evaluated the impacts of climate change on the mixed-conifer region in California and provide insight to forest health concerns and management implications for forest managers. This study and others found that changes in climate could "exacerbate forest health concerns" by increasing weakened tree susceptibility to mortality as a result of fire, disease epidemics and insect outbreaks and potentially enabling forest insects and disease to expand ranges or increase potential for widespread damage (Battles et al 2008; Allen et al 2015). These predictions were realized the following decade in the central and southern Sierra Nevada wherein vast stretches of ponderosa pine forest were decimated in a drought driven epidemic. Other research suggest that landscape level tree mortality may drive extreme fire behavior and high severity of future fire events in these forests – emphasizing that tree morality events have consequences for Placer County communities.

### *Vulnerability Assessment*

**Vulnerability**—High

Dead trees are a hazard to the general public and forest visitors, but the risk of injury, death, property damage or infrastructure damages varies depending how the hazard interacts with potential targets. Dead trees within the wildland urban intermix or wildland urban interface or urban areas therefore pose a greater risk to due to their proximity to residents, businesses, and road, power, and communication infrastructure.

Dead trees may fall or deteriorate in their entirety or in part – either mechanism has the potential for injury, death, or inflicting severe damage to targets. As the time since tree mortality increases, so does the deterioration of wood and the potential for tree failure. During the 2012-2018 drought, the state of California Tree Mortality Task force designated multiple Tier 1 and Tier 2 High Hazard Zones where tree morality posed an elevated risk to human health, properties, and resource values. A number of Placer County areas were designated during this event and the majority of Placer County watersheds were designated as Tier 2 high hazard zones because of the significant levels of tree mortality. These areas were shown on Figure 4-100.

Placer County is unique in that many residential and business areas of the community are in the wildland urban interface/intermix with the forest. Trees in these interface/intermix areas are particularly vulnerable to insect and/or drought driven mortality because of the additional stressors that urban environments impose on trees (ie. Soil compaction, altered hydrology, physical damage, heat islands etc.). This exacerbates the occurrence of tree mortality within the populated settings of the County.

The HMPC noted that most of the tree mortality resides in the vast forested area of the County on federal lands. Much of this will not be cleaned up as there are too many acres and too little funds to allow for projects to be complemented. There are approximately 500,000 acers of forests and a large portion of them have tree mortality issues, but these are not located near roads to be able to harvest and transport the material

top protect form the risk of wildfire. Furthermore, most of these acres are overgrown and have not been treated in decades if at all.

### Impacts

Tree mortality affects industrial and non-industrial timber land owners by reducing inventory and degrading timber quality and yield from forest properties. As seen in the central and southern Sierras during the 2012-2018 tree mortality event, the glut of dead timber creates an oversupply beyond what sawmills can handle and process, thereby reducing or eliminating the value of dead trees for salvage. In these cases, tree mortality can create economic hardship on forest landowners of all sizes as they try to mitigate safety hazards posed by standing dead and deteriorating trees and development of future fuel accumulations – which leads to increase fire risk.

During tree mortality events, the cost of removing dead trees far exceeds the salvage value of the tree. This can create an undue burden on forest landowners of all sizes, particularly for residential areas where there are many complexities in removing trees such as power infrastructure, homes, water lines, and other assets that need to be protected.

### *Future Development*

Development standards in California take wildfire into account; however, there are no standards developed for reducing the risk of tree mortality. Areas of Very High Fire Hazard Severity have increased scrutiny regarding development standards and siting. An increase in tree mortality may increase the fire risk and be a factor in development in areas of high tree morality and wildfire risk as an increase in dead and dry fuels may increase the wildfire risk in the future. Future development could consider mitigating tree hazards within infrastructure (i.e. power and road corridors) to mitigate potential for dead tree hazards in the future.

## 4.3.19. Wildfire

### *Hazard Profile*

This hazard profile contains multiple sections that detail how this hazard can affect Placer 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 Placer County Planning Area. Generally, the fire season extends from June through October of each year during the hot, dry months; however, recently the fire season has been nearly year around. 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 Placer County varies by location. According to the HMPC, within the County, the middle and upper elevations of the County are the primary concern when considering the wildland fire hazard, with their limited access, steep terrain and remote location. Factors contributing to the wildfire risk in Placer County include

- Overstocked forests, severely overgrown vegetation, and lack of defensible space around structures;
- Excessive vegetation along roadsides and hanging over roads, fire engine access, and evacuation routes;
- Drought and overstocked forests with increased beetle infestation or kill in weakened and stressed trees;
- Narrow and often one-lane and/or dead-end roads complicating evacuation and emergency response as well as the many subdivisions that have only one means of ingress/egress;
- Inadequate or missing street signs on private roads and house address signs;
- Nature and frequency of lightning ignitions; and
- Increasing population density leading to more ignitions.

### *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 wildland urban interface 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. The WUI for Placer County consists of communities at risk (discussed in the Vulnerability Assessment below) as well as the area around the communities that pose a fire threat.

There are two types of WUI environments. The first is the true urban interface where development abruptly meets wildland. The second WUI environment is referred to as the wildland urban intermix. Wildland urban intermix communities are rural, low density communities where homes are intermixed in wildland areas. Wildland urban intermix communities are difficult to defend because they are sprawling communities over a large geographical area with wild fuels throughout. This profile makes access, structure protection, and fire control difficult as fire can freely run through the community.

WUI fires are the most damaging. WUI fires occur where the natural and urban development intersect. Even relatively small acreage fires may result in disastrous damages. WUI fires occur where the natural forested landscape and urban-built environment meet or intermix. The damages are primarily reported as damage to infrastructure, built environment, loss of socio-economic values and injuries to people.

The pattern of increased damages is directly related to increased urban spread into historical forested areas that have wildfire as part of the natural ecosystem. Many WUI fire areas have long histories of wildland

fires that burned only vegetation in the past. However, with new development, a wildland fire following a historical pattern now burns developed areas. WUI fires can occur where there is a distinct boundary between the built and natural areas or where development or infrastructure has encroached or is intermixed in the natural area. WUI fires may include fires that occur in remote areas that have critical infrastructure easements through them, including electrical transmission towers, railroads, water reservoirs, communications relay sites or other infrastructure assets. Human impact on wildland areas has made it much more difficult to protect life and property during a wildland fire. This home construction has created a new fuel load within the wildland and shifted firefighting tactics to life safety and structure protection.

### *Placer 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 manmade 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. As a result of effective fire suppression since the 1930s, vegetation throughout the county has continued to grow and accumulate, and hazardous fuels have increased. As such, certain areas in and surrounding Placer County are extremely vulnerable to fires as a result of dense vegetation combined with a growing number of structures being built near and within rural lands. These high fuel hazards, coupled with a greater potential for ignitions, increases the susceptibility of the County to a catastrophic wildfire.
- **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 wildfires, creating a situation where fuel will ignite more readily and burn more intensely. Thus, during periods of drought, the threat of wildfire increases. 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 Placer County. North winds in Placer County are especially conducive to hot, dry conditions, which can lead to "red flag" days indicating extreme fire danger. In addition to wind speed, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. Lightning also ignites wildfires, often in difficult to reach terrain for firefighters.
- **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.

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 4-99.

### *Table 4-99 Placer 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 | 616,198 | 68.53% | 47,276 | 26.25% | 568,921 | 79.12% |
| High | 39,675 | 4.41% | 7,394 | 4.11% | 32,281 | 4.49% |
| Moderate | 179,849 | 20.00% | 94,466 | 52.46% | 85,383 | 11.87% |
| Non-Wildland/Non-Urban | 44,309 | 4.93% | 19,367 | 10.76% | 24,942 | 3.47% |
| Urban Unzoned | 19,134 | 2.13% | 11,567 | 6.42% | 7567 | 1.05% |
| **Unincorporated Placer County Total** | **899,164** | **100.00%** | **180,070** | **100.00%** | **719,094** | **100.00%** |

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, many weeks, or more.

### *Post-Wildfire Landslides and Debris Flows*

Post-wildfire landslides and debris flows are not generally a concern in Placer County due to the lack of sloped areas. 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 events has taken place since 2013. Those mapped areas in the County are presented below.

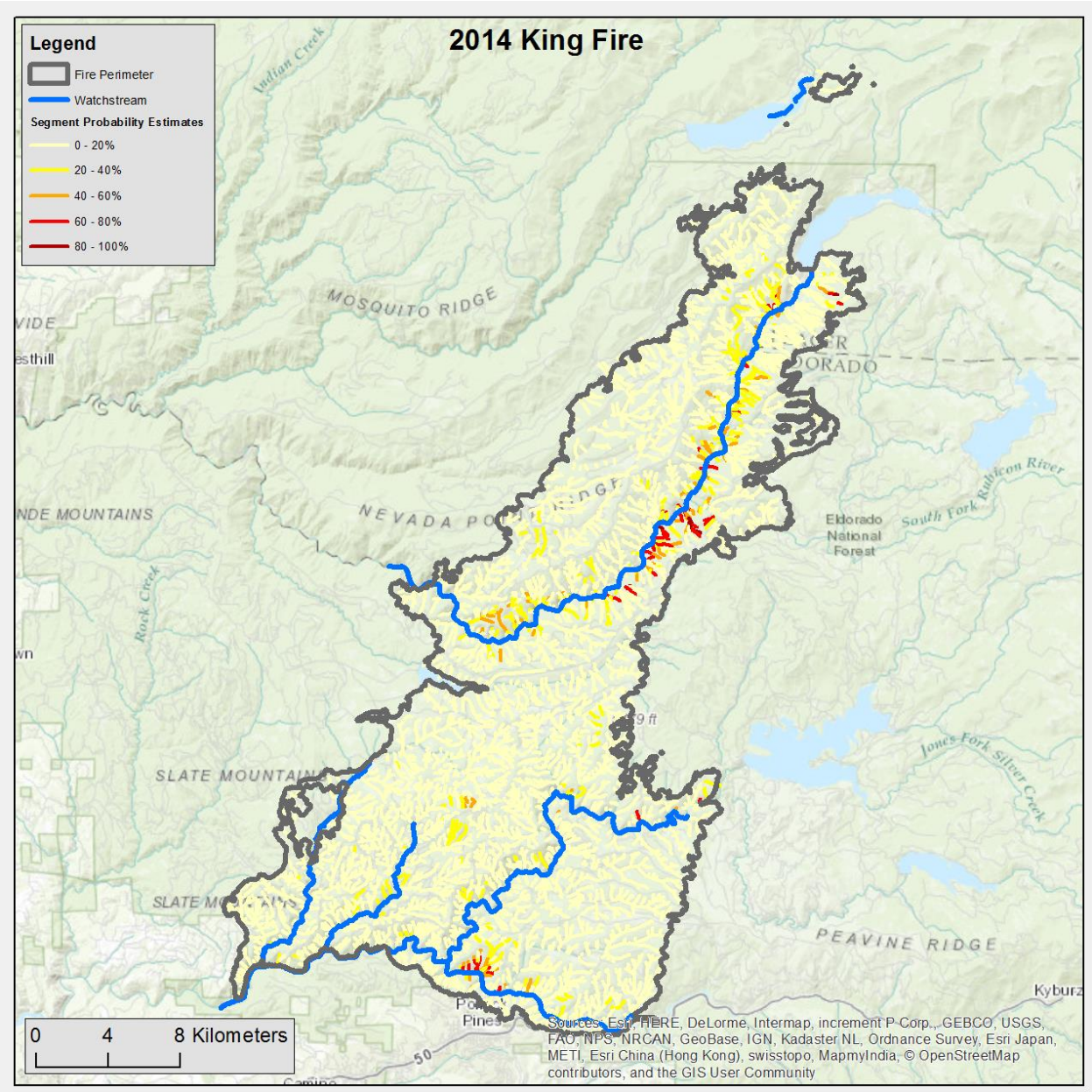
The County noted that there were post-wildfire landslides after the **2004** Star and **2014** Kings fire issues that PCWA is still cleaning out of waterways yearly as of 2021.

### *2014 King Fire Landslide and Debris Flow Mapping*

Post-fire debris flow hazard assessments for the King 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 4-101 estimates of the likelihood of debris flow (in %), potential volume of debris flow (in $m^3$), and combined relative debris flow hazard from the Pawnee 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 4-101 2014 King Fire Landslide Debris Flow Probabilities*




Source: USGS (https://landslides.usgs.gov/hazards/postfire_debrisflow/detail.php?objectid=61)

## Past Occurrences

### Disaster Declaration History

Placer County has had five state and six federal disaster declaration from fire events, as shown on Table 4-100. The County had no USDA disaster declarations since 2012 related to wildfire, as shown on Table 4-6.

*Table 4-100 Placer County – State and Federal Disaster Declarations Summary 1950-2020*

| Disaster Type | State Declarations | | Federal Declarations | |
|---|---|---|---|---|
| | Count | Years | Count | Years |
| Fire | 5 | 1961, 1965, 1973, 1987, 2010 | 6 | 2002, 2004, 2008, 2009, 2014 (twice) |

Source: Cal OES, FEMA

## NCDC Events

The NCDC has tracked wildfire events in the County dating back to 1993. Events in Placer County in the database are shown in Table 4-101.

*Table 4-101 NCDC Wildfire Events in Placer County 1993 to 7/31/2020**

| Event Type | Number of Events | Deaths | Deaths (indirect) | Injuries | Injuries (indirect) | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|---|
| Wildfire | 22 | 3 | 22 | $500,525,000 | $0 | 21 | 0 |

Source: NCDC

*Deaths, injuries, and damages are for the entire event, and may not be exclusive to the County.

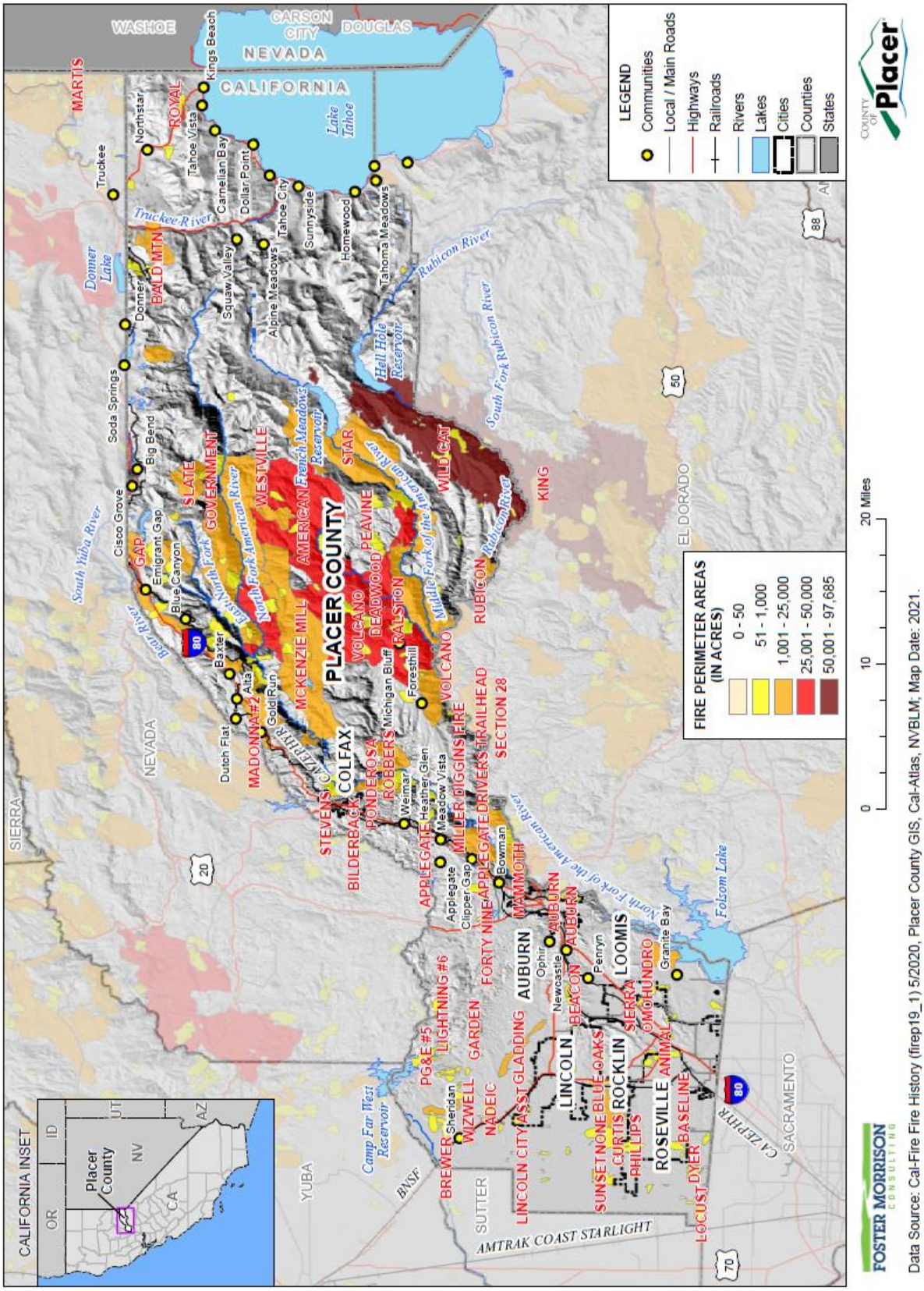
## CAL FIRE Events

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 Placer County since 1950 were extracted. Fires greater than 250 acres inside Placer County are listed in Table 4-102, while a complete list of fires that affected the County are detailed in Appendix G. Each of them was tracked by CAL FIRE. Figure 4-102 shows the fires in the CAL FIRE database for the County from 1950 to 2020, colored by the size of the acreage burned.

*Figure 4-102 Placer County – Wildfire History CAL FIRE 1950 to 2020*



### *Table 4-102 Placer County – Wildfires by Acres Burned 1950-2020*

| Wildfire Name | Date | Cause Description | Total Acres Burned by Fire | Acres Burned in Placer County |
|---|---|---|---|---|
| Volcano | | Smoking | 144,798 | 42,528.97 |
| (blank) | | Unknown / Unidentified | 155,791 | 31,957.67 |
| King | 9/13/2014 | Arson | 59,583 | 29,488.87 |
| Deadwood | (blank) | Unknown / Unidentified | 94,293 | 27,875.51 |
| American | 8/10/2013 | Miscellaneous | 67,099 | 27,425.87 |
| Mckenzie Mill | (blank) | Unknown / Unidentified | 56,683 | 21,284.78 |
| Star | 8/25/2001 | Miscellaneous | 35,844 | 16,461.80 |
| Westville | 6/21/2008 | Lightning | 33,876 | 11,088.30 |
| Government | 6/21/2008 | Lightning | 31,424 | 9,218.21 |
| Ralston | 9/5/2006 | Miscellaneous | 30,115 | 8,410.01 |
| (blank) | (blank) | Miscellaneous | 26,593 | 4,714.96 |
| Applegate | 9/16/1965 | Unknown / Unidentified | 4,531 | 3,528.69 |
| Roadside #51 | 9/19/1964 | Unknown / Unidentified | 7,727 | 3,450.80 |
| Madonna #2 | 10/30/1959 | Unknown / Unidentified | 4,677 | 3,163.71 |
| Ponderosa | 8/17/2001 | Vehicle | 6,709 | 2,777.60 |
| Robbers | 7/11/2012 | Arson | 4,759 | 2,634.76 |
| Deadman's Flat | 7/18/1925 | Miscellaneous | 11,802 | 2,587.41 |
| Gap | 8/12/2001 | Campfire | 8,273 | 2,408.08 |
| Slate | 6/11/1986 | Lightning | 9,713 | 2,039.91 |
| Omohundro | 7/29/1954 | Unknown / Unidentified | 2,712 | 2,025.69 |
| Roadside 3 4 5 6 | 7/3/1985 | Unknown / Unidentified | 8,979 | 1,853.82 |
| Bald Mtn | 9/26/1949 | Smoking | 5,517 | 1,464.29 |
| Blue Oaks | 9/15/2001 | Miscellaneous | 9,694 | 1,426.85 |
| Rubicon | 8/9/1931 | Unknown / Unidentified | 4,724 | 1,274.03 |
| North | 9/3/2018 | Campfire | 14,499 | 1,119.59 |
| Gladding | 9/1/2008 | Arson | 2,947 | 1,089.68 |
| Wizwell | 7/22/1951 | Unknown / Unidentified | 3,143 | 1,049.62 |
| Gillis Hill | 9/13/1961 | Unknown / Unidentified | 2,525 | 953.58 |

| Wildfire Name | Date | Cause Description | Total Acres Burned by Fire | Acres Burned in Placer County |
|---|---|---|---|---|
| Phillips | 7/16/2007 | Equipment Use | 2,171 | 935.49 |
| Stevens | 8/8/2004 | Structure | 2,632 | 934.24 |
| Big | 8/31/1987 | Lightning | 6,540 | 894.42 |
| Curtis | 6/29/1984 | Unknown / Unidentified | 1,773 | 876.48 |
| Codfish | 8/31/2003 | Lightning | 5,189 | 841.28 |
| None | 9/13/1983 | Unknown / Unidentified | 3,332 | 820.78 |
| PG&E #5 | 6/14/1981 | Equipment Use | 1,678 | 812.35 |
| Animal | 6/7/1979 | Unknown / Unidentified | 1,463 | 771.40 |
| Sunset | 8/1/2018 | Unknown / Unidentified | 2,044 | 692.44 |
| Auburn | 7/17/1961 | Unknown / Unidentified | 940 | 653.01 |
| Helester | 8/11/1995 | Equipment Use | 4,518 | 627.27 |
| Mammoth | 7/15/2009 | Miscellaneous | 1,627 | 624.93 |
| Sierra | 9/18/2002 | Vehicle | 1,117 | 594.25 |
| Locust | 7/27/2015 | Arson | 736 | 587.46 |
| Peavine | 6/21/2008 | Lightning | 5,580 | 580.54 |
| (blank) | 10/29/1986 | Debris | 1,874 | 551.57 |
| Lightning #6 | 7/28/1958 | Unknown / Unidentified | 1,783 | 551.16 |
| Green Valley | 10/1/1961 | Unknown / Unidentified | 2,722 | 526.76 |
| Halsey | 8/12/1951 | Unknown / Unidentified | 813 | 480.55 |
| Baseline | 8/20/2010 | Unknown / Unidentified | 737 | 478.84 |
| Iowa Hill | 8/9/1969 | Unknown / Unidentified | 1,962 | 464.33 |
| Applegate | 10/8/2014 | Unknown / Unidentified | 1,477 | 458.90 |
| Andressen | 6/27/1982 | Equipment Use | 992 | 439.41 |
| Nadeic | 6/2/1981 | Miscellaneous | 851 | 425.16 |
| Beacon | 9/3/1950 | Unknown / Unidentified | 800 | 406.95 |
| Wild Cat | 6/12/1918 | Lightning | 2,710 | 386.78 |
| Jacinto | 6/5/1970 | Unknown / Unidentified | 2,473 | 385.11 |
| Lincoln City Asst | 5/30/2001 | Arson | 1,597 | 372.04 |

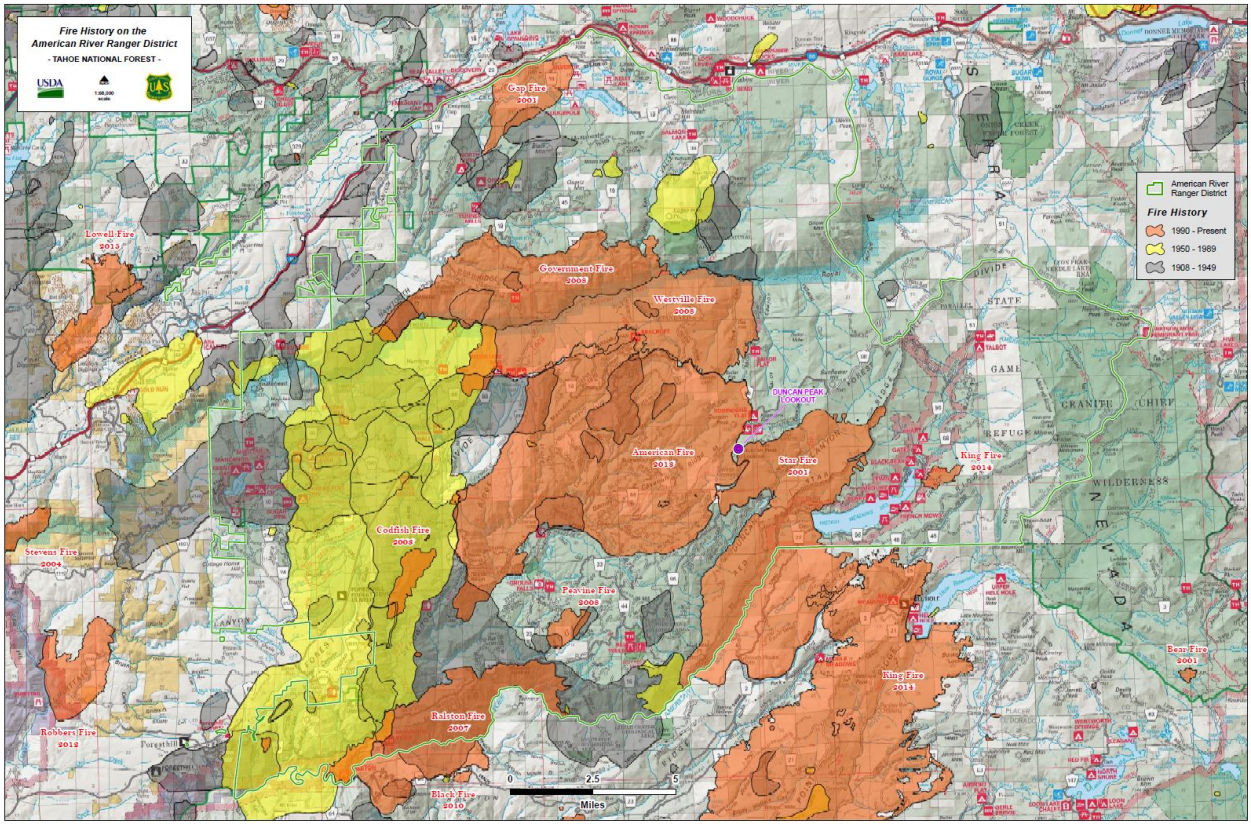
| Wildfire Name | Date | Cause Description | Total Acres Burned by Fire | Acres Burned in Placer County |
|---|---|---|---|---|
| Drivers | 8/2/2000 | Smoking | 1,233 | 348.87 |
| Forty Nine | 8/30/2009 | Arson | 705 | 343.28 |
| Elliot Ranch | 9/8/1949 | Lightning | 2,164 | 342.37 |
| Royal | 11/17/2003 | Debris | 1,031 | 338.75 |
| (blank) | | Lightning | 4,850 | 324.25 |
| Sam Babb | 9/5/1956 | Unknown / Unidentified | 2,117 | 316.52 |
| Big Reservoir | 9/8/1959 | Campfire | 837 | 299.20 |
| Ponderosa | 7/19/1970 | Unknown / Unidentified | 855 | 296.64 |
| Brewer | 6/19/1964 | Unknown / Unidentified | 508 | 292.99 |
| Garden | 6/9/2002 | Powerline | 719 | 284.20 |
| Pennsylvania | 10/4/1921 | Miscellaneous | 1,601 | 273.39 |
| SPRR #71 | 9/16/1965 | Unknown / Unidentified | 587 | 268.40 |
| Dyer | 7/20/2009 | Unknown / Unidentified | 1,478 | 262.24 |
| Mooney | 8/5/1953 | Unknown / Unidentified | 353 | 258.52 |

Source: CAL FIRE

### US Forest Service Events

The US Forest Service owns land in the County that have seen historic wildfires. These wildfires are not all captured in the CAL FIRE database (though fires that affected the USFS lands may have also affected areas outside USFS lands where CAL FIREs database would contain the fire perimeter). Fire perimeters from USFS are shown on Figure 4-103.

*Figure 4-103 Placer County – USFS Fire Events on Federal Lan*




Source: USFS

## Hazard Mitigation Planning Committee

The HMPC also provided the following information on historical fires in the County.

- **1975/1977 Sawmill Fire** – The Sawmill Fire and another fire occurred in the area of Cape Horn and the Alpine Meadows subdivision, just three miles northeast of Colfax.
- **1990 Placer County Fire** – This fire burned approximately 300 acres of grass, brush, and oaks in the area of Placer Canyon. The fire resulted in evacuations and destroyed several outbuildings.
- **2000 Heather Glen Fire** – The Heather Glen Fire, caused by sparks from a lost trailer wheel along Interstate 80, destroyed one home and forced a neighborhood evacuation in Applegate. While only ten acres in size, this fire resulted in $350,000 in damage.
- **August 12-20, 2001 Narrow Gauge Fire** – This fire near Colfax burned 30 acres and forced closure of I-80 for about an hour due to dense smoke. This fire, blamed on a catalytic converter, was quickly contained as California Department of Forestry air tankers were already in the area and able to respond quickly.
- **August 2001 Gap Fire** – The Gap Fire near Blue Canyon burned 2,462 acres of forest land and caused the closure of Interstate 80.
- **August 17-23, 2001 Ponderosa Fire** – This fire burned 2,780 acres.
- **August 25-September 13, 2001 Star Fire** – The Star Fire started in Eldorado National Forest and spread to Tahoe National Forest and burned approximately 16,761 acres. This can be seen on Figure 4-104.

*Figure 4-104 Placer County – Star Fire*

Star Fire, August 26, 2001. Eldorado National Forest. Photo Courtesy of USFS.

- **2001 Martis Fire** – This fire east of Truckee burned 20,000 acres; threatened homes; shut down Interstate 80; and damaged railway trestles affecting Amtrak passenger train service. The heavy smoke caused poor air quality and raised health issues for individuals with respiratory problems. While the Martis Fire itself was not in Placer County, there were significant impacts to the County as a result of this fire. The County also contributed major firefighting assistance.
- **2002 Sierra Fire** – Within the communities of Loomis and Granite Bay approximately 595 acres of grass, brush, and oaks burned in the area of Interstate 80, Barton Road, Wells Avenue, Morgan Place, Indian Springs, and Cavitt-Stallman Road. The fire destroyed six structures and threatened two schools. One hundred homes were evacuated, and more than 1,000 homes in both communities were threatened. FEMA provided federal funds to assist in fighting this wildfire.
- **2004 Stevens Fire** – The Stevens Fire located at Cape Horn/Iowa Hill near Colfax, was 100 percent contained at 934 acres.
- **2004 Numerous fires** – Numerous fires of varying sizes occurred in Placer County during the 2004 fire season. These include fires caused by equipment sparks, abandoned campfires, arson and undetermined causes.

*Figure 4-105 2004 Fires*

Photos from website: http://yubanet.com/stevenstrail.html; courtesy of Roger Burdick and Robin Yonash.

- **September 2006 Ralston Fire** – The Ralston Fire was a large wildland fire in the area of the North Fork of the Middle Fork of the American River. Approximately 8,400 acres burned.
- **June 2007 Angora Fire** – Although not occurring in Placer County, the Angora fire in nearby El Dorado County (in the Lake Tahoe Basin) burned 3,100 acres of forest and wooded subdivisions and destroyed more than 250 homes as well as 75 commercial and other structures.
- **August 2007 Washoe Fire** – The Washoe Fire started with a structure fire of a home located on the West Shore of Lake Tahoe near the Sunnyside Resort. The fire quickly engulfed one residence, spread to two others and moved into forestlands. The fire spread to two other homes and destroyed them as well. In all, 5 homes were destroyed and 20 acres of forestland burned. Extreme wind fueled and drove the fire, which significantly contributed to the rapid spread.
- **June-July 2008 American River Complex Fire -** Several large wildland fires resulted from a system of major lightning storms that impacted the entire Northern CA region. In Placer County, approx. 10 wildland fires resulted from the lighting storm, and 4 grew to major fires, which later were collectively labeled the American River Complex (ARC) fires. The ARC fires were located in Tahoe National Forest in the North Fork American River watershed northeast of Foresthill, California. The fires consumed approx. 20,500 acres of forest land.
- **September 2008 Gladding Fire -** The wind driven fire started northeast of Lincoln and consumed approximately 960 acres, six residences, and 10 outbuildings.
- **September 2009 49 Fire** – The wind driven fire started about 2 pm near Highway 49 and Rock Creek Road near Auburn. The fire burned 343 acres before being contained. 63 residences and 3 commercial buildings were destroyed, and another 3 residences and 6 commercial properties were severely damaged. The damages were concentrated in neighborhoods east and south of Dry Creek Road. Three people were injured in the wildfire. Most notable about this fire was its location in a well developed area and the speed at which the fire consumed nearby structures. The following photos illustrate the damaging nature of this fire.

### *Figure 4-106 49er Fire Burn Area*

Source: Placer County

### *Figure 4-107 49er Fire Burn Area*

Source: Placer County

- **2012 Robbers Fire** – The Robbers Fire was a human caused fire that was ignited on July 11, 2012. The fire was located northwest of Foresthill, near Shirttail Canyon Road and Yankee Jims Road. The fire burned 2,650 acres, destroyed 1 residence and 4 outbuildings, and caused 12 injuries. Although 1 residence was destroyed, 170 were considered threatened. 912 fire personnel were involved in the firefighting efforts, as were 36 fire engines, 18 water tenders, 7 bulldozers, and 10 helicopter. A 28 year old Sacramento man was charged with unlawfully causing a fire. Firefighting costs and damages were estimated at $12.4 million.
- **2013 American Fire** – On August 10, the American Fire was ignited near Deadwood Ridge, northeast of Foresthill. Located in Tahoe National Forest, the American Fire burned in steep and hazardous terrain as well as timber fuels that had not burned in several decades. Consumption of heavy fuels contributed to heavy smoke in the surrounding areas. Approximately 540 Forest Service and Cal Fire personnel were assigned to the fire, including 20 hand crews, 13 engines, 11 water tenders, six helicopters, two dozers, and air tankers as available. 27,440 acres were burned in the fire. The burn area from the fire is shown in Figure 4-108.
- **2014 King Fire**– HMPC representatives from Placer Hills and Foresthill Fire Protection Districts noted damaging wildfires that occurred in the Foresthill and Applegate areas during the winter of 2014. Specific information on this can be found in their respective annexes to this plan. The fire started in El Dorado County and crossed into Placer County. 97,717 acres were estimated to have burned. 12 residences were destroyed, as well as 68 other minor structures. 12 injuries occurred that can be attributed to the fire. The burn area from the fire is shown in Figure 4-108.

*Figure 4-108 Fire Perimeters from American and King Fires*

Source: NOAA/NWS

**2014 Applegate Fir**e – A fire occurred on the east side of I-80 in the Applegate area of Placer County. The fire started on October 8, and its cause was unknown. The fire burned 459 acres before being contained. 6 residences and 4 outbuildings were destroyed. 2 injuries were reported; however, no deaths were reported.

### *Figure 4-109 Applegate Fire*

Source: Placer County

**2016 Trail Head Fire** – Placer County OES activated the EOC (Level 1 - highest) for this fire in the Todd Valley/Foresthill area on June 28, 2016.

**2018 North Fire** - Placer County OES activated the EOC (Level 3) for this fire on September 3, 2018.

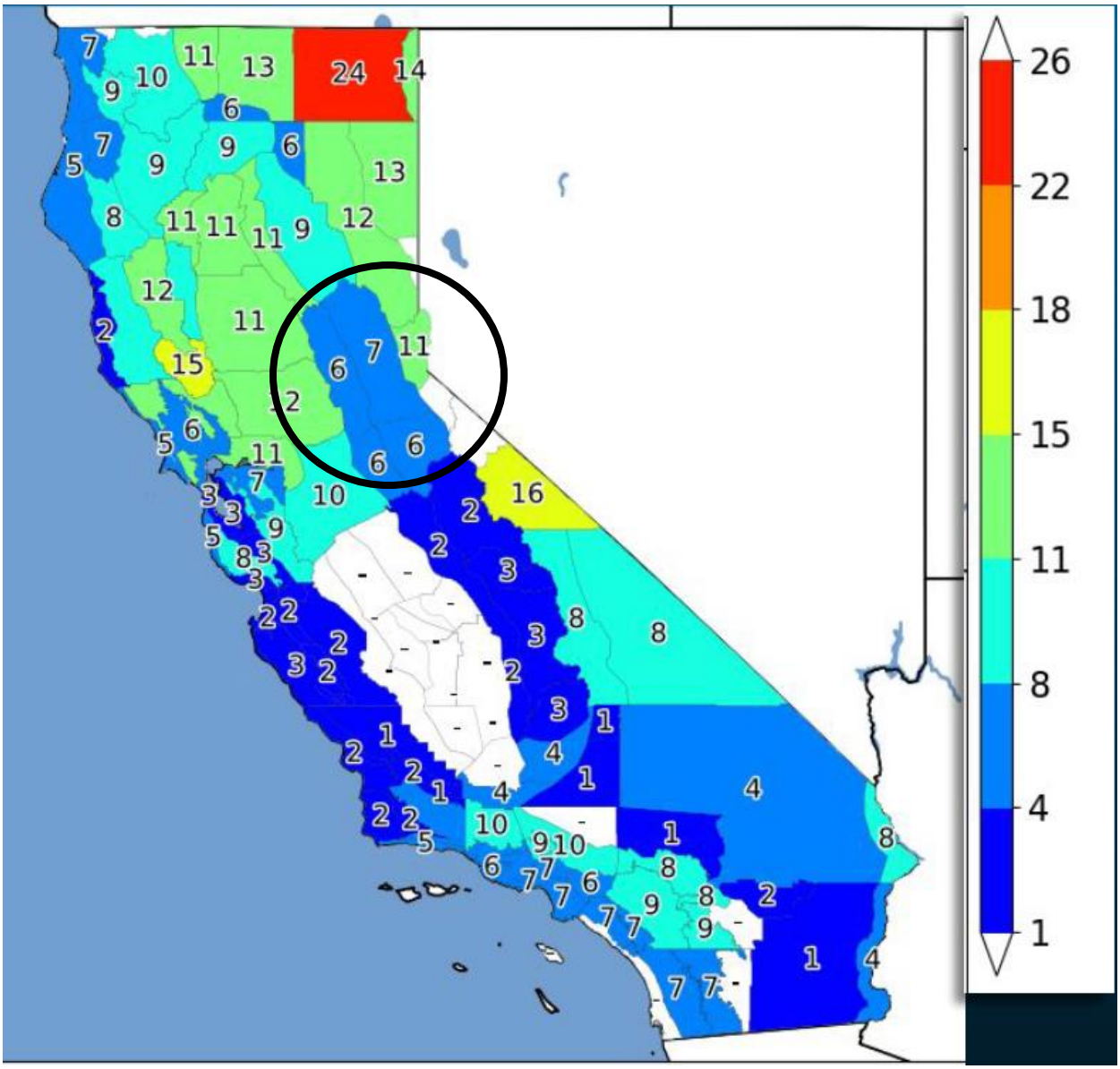
**2018 Sliger Fire** - Placer County OES activated the EOC (Level 3) for this fire on September 4, 2018.

**2018 Camp Fire (Butte County)** – While not in Placer County, Placer County OES activated the EOC (Level 3) for his fire on November 14, 2018. The County provided evacuation and mutual aid support to Butte County and other affected nearby counties. Smoke from the fire was also an issue in Placer County. TRUE, OTHER ISSUES/IMPACTS?

**2020 Fork Fire (El Dorado County)** – While not in Placer County, Placer County OES activated the EOC (Level 3) for this on September 8, 2020.

It was noted that 2020 high a high number of red flag warnings. This can be seen on Figure 4-110. While western Placer County has 6 or 7 red flag days, eastern Placer County had 11 in 2020.

***Figure 4-110 Placer County Red Flag Days***




Source: NWS – Reno

INSERT OTHER NOTABLE WILDFIRES SINCE THE 2016 LHMP – INCLUDE DATES, DAMAGES, NARRATIVE, PICTURES

### Public Safety Power Shutoff Events

The County noted that there have been events in the past where wildfires have not occurred, but wildfire conditions were high. During these times of high winds, high temps, and high wildfire risk, a PSPS occurred in the County. Past events of PSPS in the County are discussed below:

- PSPS, 10/14/2018 – Level 3
- PSPS, 11/8/2018 – Level 3
- PSPS, 9/13/2019 – Level 3
- PSPS, 9/21/2019 – Level 3
- PSPS, 10/2/2019 – Level 3
- PSPS, 10/23/2019 – Level 3
- PSPS, 10/26/2019 – Level 3
- PSPS, 10/28/2019– Level 3
- PSPS, 11/20/2019 – Level 3
- PSPS, 9/7/2020 -Level 3
- PSPS, 9/26/2020 – Level 3
- PSPS, 10/14/2020 – Level 3
- PSPS, 10/21/2020 – Level 3
- PSPS, 10/25/2020 – Level 3

The California System Operator (CAISO) has informed the County (via the Middle Fork Project a hydroelectric operation between PCWA and Placer County) that it can expect in the future to have many more brown out/black out events from the unreliability of wind and solar resources and the reduction of fossil fuel 24 hour operations during the summer high demand months/days/hours.

## Likelihood of Future Occurrence

**Highly Likely** — From May to October of each year, Placer County faces a wildfire threat. Fires will continue to occur on an almost annual basis in the Placer 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

Climate change and its effect on wildfire in the County has been discussed by two sources:

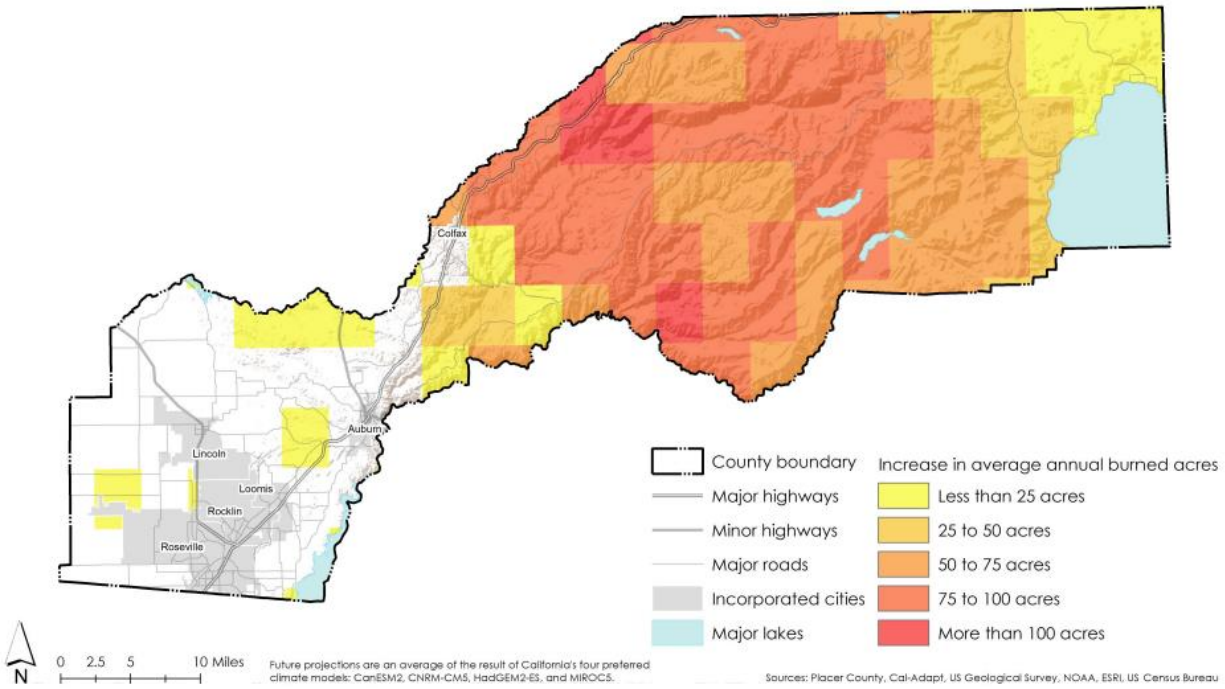
- Placer County Sustainability Plan – 2020
- Cal-Adapt - 2014

## Placer County Sustainability Plan

According to the Placer County Sustainability Plan, climate change is expected to lead to an increase in wildfires throughout California. Warmer temperatures and an increase in drought conditions are likely to create more fuel for fires in the state's wildlands, leading to a greater chance that a spark will grow into a potentially dangerous blaze. The biggest increase in wildfires is projected to occur along the western slope of the Sierra, although areas closer to Lake Tahoe are also likely to see more areas burned by wildfires. Because wildfires burn the trees and other vegetation that help stabilize a hillside and absorb water, more areas burned by fire may also lead to an increase in landslides and floods. Historically, an average of approximately 2,500 acres of Placer County burns each year.

Under a scenario of moderate GHG emissions, this average is expected to increase to approximately 3,100 acres burned each year between 2040 and 2060, and approximately 3,800 acres burned annually from 2070 to 2099. Under a scenario of high GHG emissions, Placer County is projected to see an average of approximately 3,500 acres burned annually between 2040 and 2060, and approximately 5,800 acres burned annually from 2070 to 2099. Figure 4-111 shows the average annual increase in burned acreage for locations across Placer County.

***Figure 4-111 Placer County – Projected Increase in Wildfire Burn Areas***




Source: Placer County Sustainability Plan 2020

## Cal Adapt

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. Based on this model, Cal-Adapt predicts that wildfire risk in Placer 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 Placer County, precipitation patterns, high levels of heat, topography, and fuel load will determine the frequency and intensity of future wildfire.

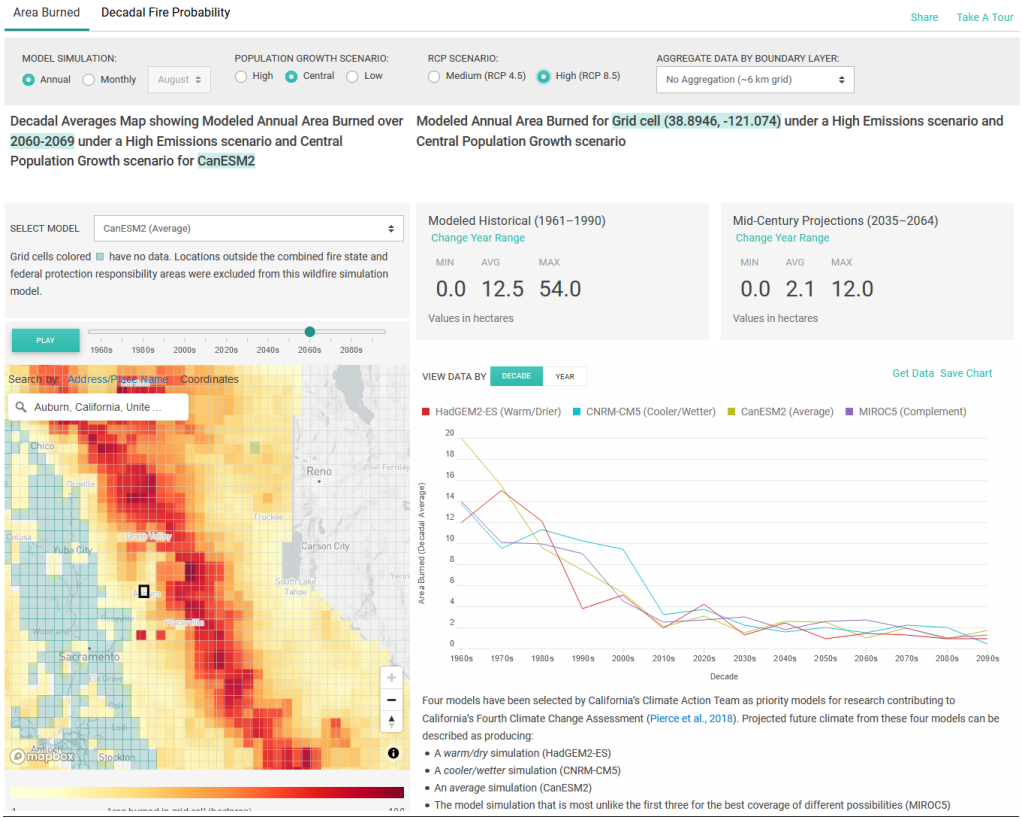
Cal-Adapt has also sought to model annual averages of area burned in the State. Four models have been selected by California's Climate Action Team Research Working Group as priority models for research contributing to California's Fourth Climate Change Assessment. Projected future climate from these four models can be described as producing:

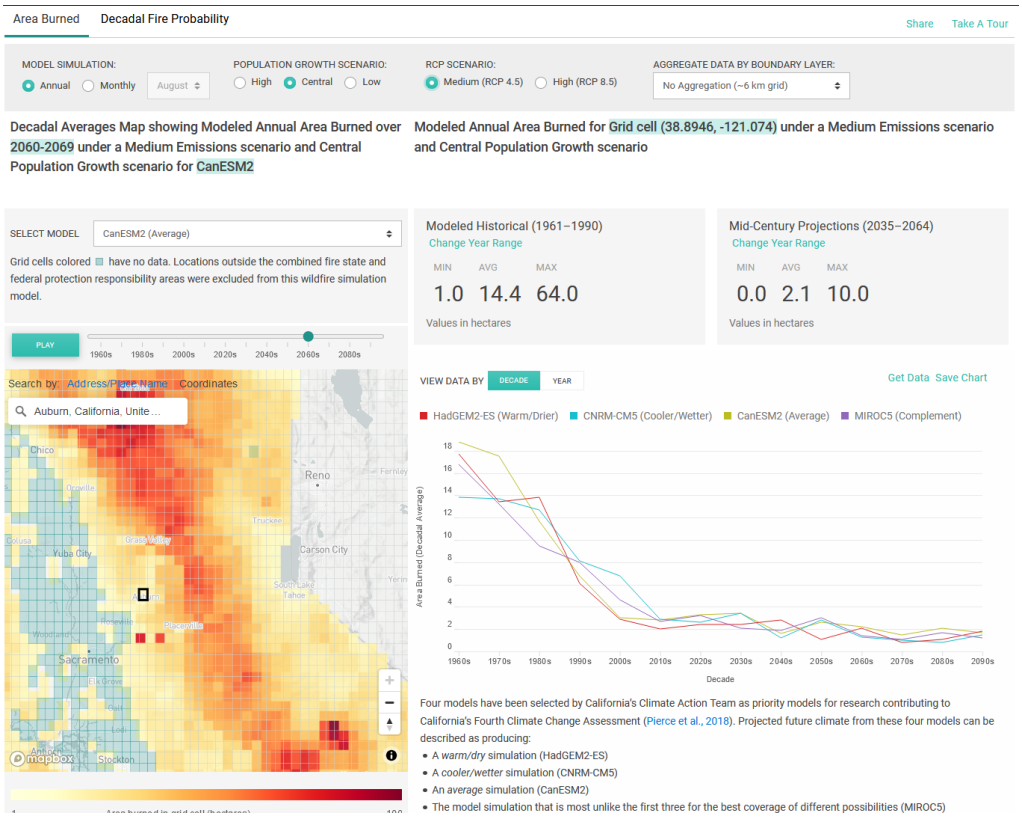
- A warm/dry simulation (HadGEM2-ES) – shown by the red line on the below charts
- A cooler/wetter simulation (CNRM-CM5) – shown by the blue line on the below charts
- An average simulation (CanESM2) – shown by the green line on the below charts
- The model simulation that is most unlike the first three 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 Placer County Planning (using the quad that contains Auburn) are shown in Figure 4-112. 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 4-112 Placer County – Future Acreage Burned: High and Low Emission Scenarios*




Source: Cal-Adapt – Annual Average of Acres Burned, Retrieved 12/20/2020

## *Vulnerability Assessment*

**Vulnerability**—Extremely High

Risk and vulnerability to the Placer 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 May to October 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.

### Placer County 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 39 “Communities at Risk” in Placer County. These are shown in Table 4-103.

#### *Table 4-103 Placer County Communities at Risk to Wildfire*

| Communities at Risk | | |
|---|---|---|
| Alpine Meadows (Rampart) | Foresthill | North Auburn |
| Alta | Gold Hill | Northstar |
| Auburn | Gold Run | Ophir |
| Baxter | Heather Glen - Applegate | Penryn |
| Bowman | Homewood | Rocklin |
| Cape Horn | Iowa Hill | Roseville |
| Carnelian Bay | Kings Beach | Secret Town |
| Casa Loma | Lincoln | Shady Glen |
| Christian Valley (Nielsburg) | Loomis | Sunnyside-Tahoe City |
| Colfax | Magra | Tahoe Pines |
| Dollar Point | Meadow Vista | Tahoe Vista |
| Dutch Flat | Michigan Bluff | Twin Pines – Weimar |

| Communities at Risk | | |
|---|---|---|
| Emigrant Gap | Newcastle | Virginiatown |

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.

### 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 2013 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.

With respect to wildfire smoke, in the last few years, the Sacramento area Air Districts have requested the U.S. EPA several times to determine an Exceptional Event finding for the Sacramento Region to exclude data from attainment emissions. Without these Exceptions, the County will most likely not be able to meet the PM standard by the U.S. EPA's deadline which could result in repercussions for the area.

From an air quality perspective, Placer County was impacted by the Mendocino Complex Fire (2018), Carr Fire (2018), Ferguson (2018), August Complex Fire (2020), LNU Lighting Fire (2020), Loyalton Fire (2020) Detwiler (2017), County Fire (2018), and Caples (2019). 10 joint Air Quality and Public Health

Advisories were issued in 2018 and 5 were issued in 2020. The County also had 1 advisory for 2016, 1 advisory for 2017, 1 advisory in 2019.

### Insurance in WUI Areas

The HMPC noted that in the WUI areas, there has been increased difficulty in obtaining home insurance and the cost of insurance premiums. Some residents have experienced cancellations of their policies due to catastrophic and recent wildfires occurring throughout California which has reduced the risk tolerance of many insurance companies. This increases costs to those who live in the WUI, and in some circumstances limits where people choose to live.

The HMPC noted additionally that insurance premium increases and policy cancellations not only increase the cost of living (a particular challenge for those in DAC and SDAC communities) it also affects the real estate industry and, in turn, the tax base. This can have implications for schools and infrastructure in the County.

### Wildfire – Green Waste and Hazardous Materials

The County noted that during wildfire clean up, large amounts of green waste may need to be dealt with. Green waste is a term that was coined to refer to organic waste that can decompose and has a high concentration of nitrogen. The waste is also commonly referred to as biological waste. Some of the materials that make up green waste include leaves and grass clippings. If these are allowed to dry out, they can create fuels for additional wildfires.

The County also noted that after large wildfires, household hazardous waste if often disposed of. This can cause issues for landfills, as well as for those who handle waste between a household and the landfill. It was noted that the Camp Fire in nearby Butte County had significant issues with hazardous waste.

### Wildfire and Power Shortage/PSPS

During periods of wildfire (or during periods of elevated risk due to high temperatures, low humidities, and high winds), PSPS events may be declared in the County. More information on power shortage and failure can be found in Section 4.3.2.

## Wildfire Analysis

The Placer 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).

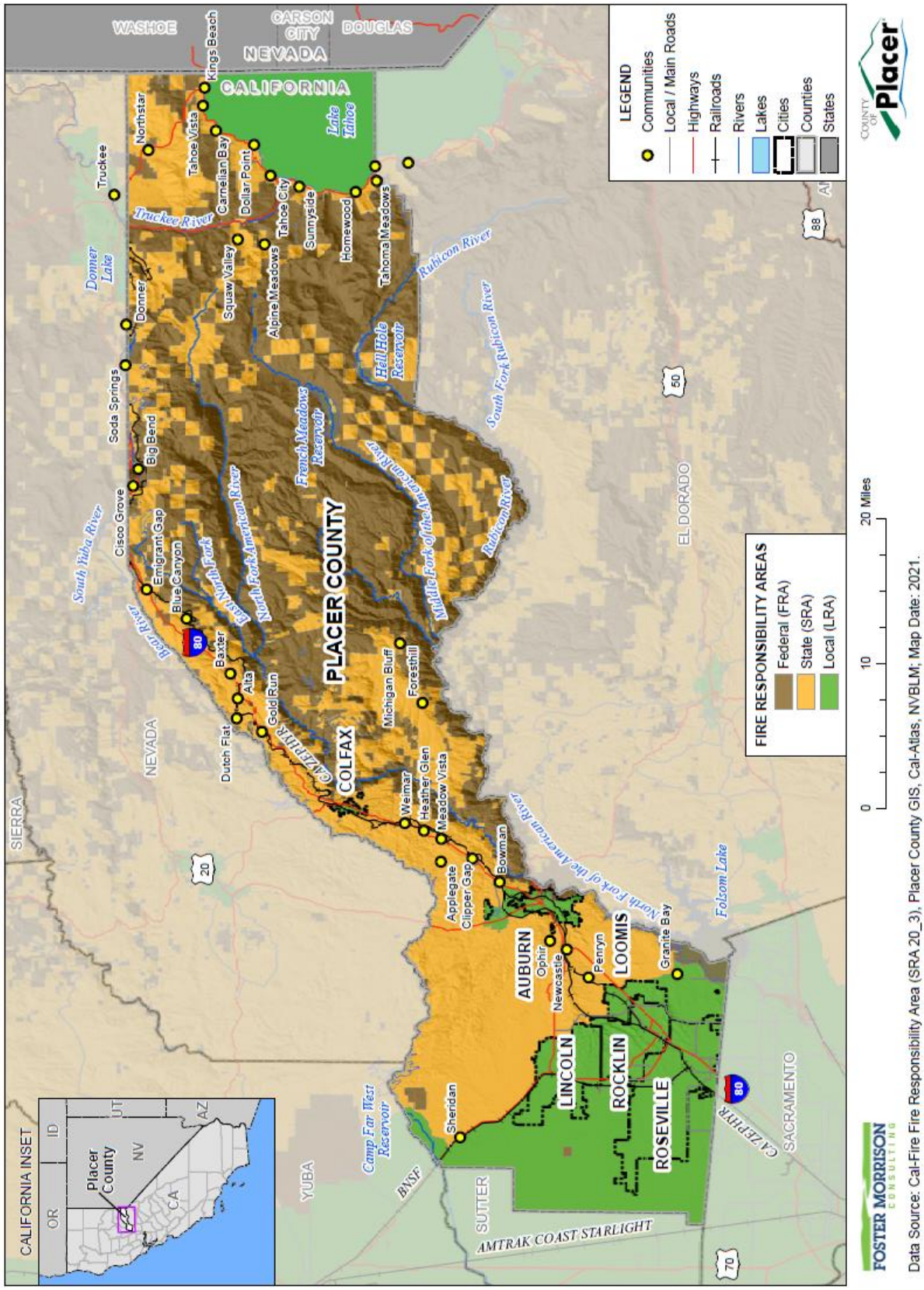
The CAL FIRE data, detailing Fire Responsibility Areas within the County Planning Area, was utilized to determine the locations, numbers, types, and values of land and structures falling within each Fire Responsibility Area. The following sections provide details on the methodology and results for this 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 Placer 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 Placer 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 4-113.

*Figure 4-113 Placer County Planning Area – Fire Responsibility Areas by FRA, SRA, LRA*



### *Fire Responsibility Areas and Values at Risk Results*

Most all of the physical area of Placer County falls in the SRA and FRA. Most of the values at risk associated with the built environment fall in the LRA. 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 4-104 for the entire Placer 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 and to a lesser extent properties falling under the Williamson Act.

*Table 4-104 Placer County Planning Area – Count and Value of Parcels by Local, State, and Federal Responsibility Areas by Jurisdiction*

| Jurisdiction / Fire Responsibility Area | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Total Value |
|---|---|---|---|---|---|
| Auburn | | | | | |
| FRA | 76 | 0 | $0 | $0 | $0 |
| SRA | 0 | 0 | $0 | $0 | $0 |
| LRA | 6,414 | 5,180 | $648,497,133 | $1,548,994,382 | $2,197,491,515 |
| **Auburn Total** | **6,490** | **5,180** | **$648,497,133** | **$1,548,994,382** | **$2,197,491,515** |
| Colfax | | | | | |
| FRA | 0 | 0 | $0 | $0 | $0 |
| SRA | 0 | 0 | $0 | $0 | $0 |
| LRA | 988 | 711 | $64,997,967 | $152,168,583 | $217,166,550 |
| **Colfax Total** | **988** | **711** | **$64,997,967** | **$152,168,583** | **$217,166,550** |
| Lincoln | | | | | |
| FRA | 0 | 0 | $0 | $0 | $0 |
| SRA | 0 | 0 | $0 | $0 | $0 |
| LRA | 21,821 | 18,706 | $2,431,202,724 | $6,444,481,445 | $8,875,684,169 |
| **Lincoln Total** | **21,821** | **18,706** | **$2,431,202,724** | **$6,444,481,445** | **$8,875,684,169** |
| Loomis | | | | | |
| FRA | 0 | 0 | $0 | $0 | $0 |
| SRA | 0 | 0 | $0 | $0 | $0 |
| LRA | 2,995 | 2,552 | $409,549,357 | $818,568,036 | $1,228,117,393 |
| **Loomis Total** | **2,995** | **2,552** | **$409,549,357** | **$818,568,036** | **$1,228,117,393** |
| Rocklin | | | | | |
| FRA | 0 | 0 | $0 | $0 | $0 |
| SRA | 0 | 0 | $0 | $0 | $0 |

| Jurisdiction / Fire Responsibility Area | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Total Value |
|---|---|---|---|---|---|
| LRA | 23,657 | 21,009 | $3,105,707,112 | $8,167,173,274 | $11,272,880,386 |
| **Rocklin Total** | **23,657** | **21,009** | **$3,105,707,112** | **$8,167,173,274** | **$11,272,880,386** |
| Unincorporated Placer County | | | | | |
| FRA | 2,421 | 0 | $55,451 | $0 | $55,451 |
| SRA | 56,473 | 41,610 | $9,753,417,881 | $16,729,476,718 | $26,482,894,599 |
| LRA | 14,362 | 11,967 | $2,753,078,703 | $5,551,906,787 | $8,304,985,490 |
| **Unincorporated Placer County Total** | **73,256** | **53,577** | **$12,506,552,035** | **$22,281,383,505** | **$34,787,935,540** |
| | | | | | |
| **Grand Total** | **129,207** | **101,735** | **$19,166,506,328** | **$39,412,769,225** | **$58,579,275,553** |

Source: CAL FIRE, Placer County 2020 Parcel/Assessor's Data
The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

## 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 Placer 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 (c31fhszl06_1) dated September 2007 layer and the Adopted SRA FHSZ (fhszs06_3_31) dated November 2007 were used to get a complete coverage of Fire Hazards. Additionally, for the City of Auburn and the City of Colfax, the recommended Very High Fire Hazard Severity Zones (c31fhszl06_3) dated December 2008 were used.

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.

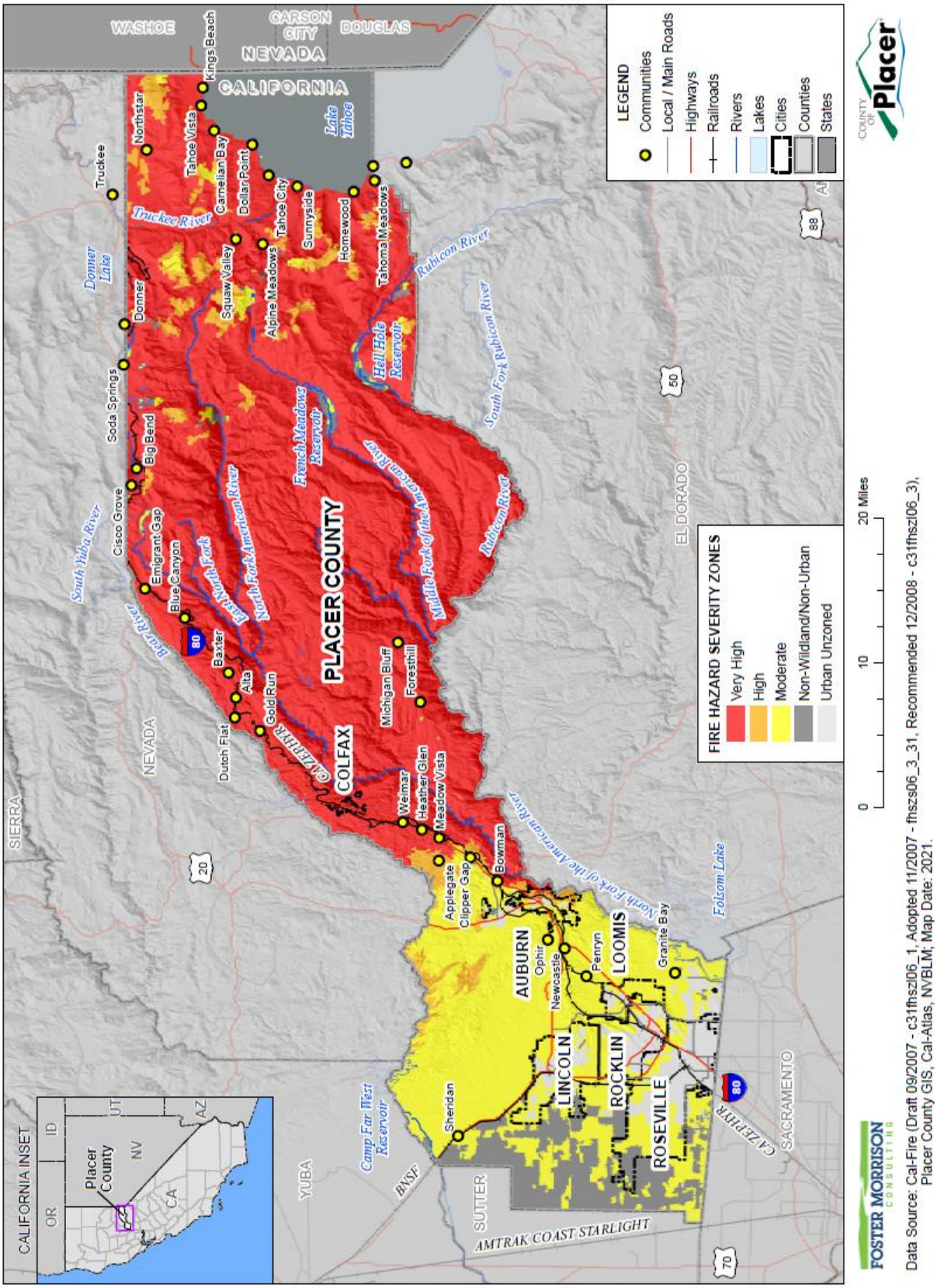
### *Fire Hazard Severity Zones Analysis Results: Values at Risk*

Results are presented in this section for the Placer County Planning Area and the unincorporated County. Detail tables for the incorporated communities are included in their respective annexes to this LHMP Update.

#### Placer County Planning Area

The FHSZs in Placer County are shown in Figure 4-114. Analysis results for Placer County are summarized in and detailed by property use in Table 4-106. 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 4-114 Placer County Planning Area – Fire Hazard Severity Zones*



### *Table 4-105 Placer County Planning Area – Summary of Count and Value of Parcels in Fire Hazard Severity Zones*

| Fire Hazard Severity Zone | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Very High | 38,987 | 26,081 | 6,761,268,615 | 11,034,237,290 | 5,803,504,979 | 23,599,010,884 |
| High | 6,350 | 4,923 | 775,345,209 | 1,718,778,348 | 942,577,602 | 3,436,701,159 |
| Moderate | 45,905 | 36,574 | 6,595,402,045 | 14,321,453,603 | 8,065,183,811 | 28,982,039,459 |
| Non-Wildland/Non-Urban | 1,607 | 908 | 389,324,100 | 297,161,753 | 179,440,526 | 865,926,379 |
| Urban Unzoned | 36,358 | 33,249 | 4,645,166,359 | 12,041,138,231 | 7,145,133,064 | 23,831,437,654 |
| **Total** | **129,207** | **101,735** | **$19,166,506,328** | **$39,412,769,225** | **$22,135,839,982** | **$80,715,115,535** |

Source: CAL FIRE, Placer County 2020 Parcel/Assessor's Data

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### *Table 4-106 Placer 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 |
|---|---|---|---|---|---|---|
| **Auburn** | | | | | | |
| Very High | 110 | 44 | $6,991,388 | $12,939,355 | $6,469,675 | $26,400,418 |
| High | 2,248 | 1,840 | $191,122,318 | $434,796,230 | $224,123,577 | $850,042,125 |
| Moderate | 2,897 | 2,340 | $310,739,956 | $750,722,502 | $425,810,068 | $1,487,272,526 |
| Urban Unzoned | 1,235 | 956 | $139,643,471 | $350,536,295 | $251,919,851 | $742,099,617 |
| **Auburn Total** | **6,490** | **5,180** | **$648,497,133** | **$1,548,994,382** | **$908,323,171** | **$3,105,814,686** |
| **Colfax** | | | | | | |
| Very High | 988 | 711 | $64,997,967 | $152,168,583 | $104,699,837 | $321,866,387 |
| **Colfax Total** | **988** | **711** | **$64,997,967** | **$152,168,583** | **$104,699,837** | **$321,866,387** |
| **Lincoln** | | | | | | |
| Moderate | 10,035 | 8,008 | $1,183,203,408 | $3,019,599,769 | $1,651,154,114 | $5,853,957,291 |
| Non-Wildland/Non-Urban | 985 | 638 | $107,063,552 | $204,238,966 | $122,079,620 | $433,382,138 |
| Urban Unzoned | 10,801 | 10,060 | $1,140,935,764 | $3,220,642,710 | $1,786,829,405 | $6,148,407,879 |
| **Lincoln Total** | **21,821** | **18,706** | **$2,431,202,724** | **$6,444,481,445** | **$3,560,063,139** | **$12,435,747,308** |
| **Loomis** | | | | | | |
| High | 37 | 27 | $2,940,043 | $7,221,400 | $3,610,697 | $13,772,140 |
| Moderate | 1,288 | 1,074 | $234,388,266 | $454,276,302 | $250,620,297 | $939,284,865 |

| Jurisdiction / Fire Hazard Severity Zone | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Non-Wildland/Non-Urban | 7 | 6 | $894,956 | $1,176,959 | $855,411 | $2,927,326 |
| Urban Unzoned | 1,663 | 1,445 | $171,326,092 | $355,893,375 | $246,951,710 | $774,171,177 |
| **Loomis Total** | **2,995** | **2,552** | **$409,549,357** | **$818,568,036** | **$502,038,115** | **$1,730,155,508** |
| **Rocklin** | | | | | | |
| High | 80 | 52 | $29,058,654 | $77,794,570 | $71,806,255 | $178,659,479 |
| Moderate | 8,160 | 6,686 | $1,199,256,172 | $3,194,734,621 | $1,928,183,688 | $6,322,174,481 |
| Non-Wildland/Non-Urban | 4 | 0 | $2,638,707 | $0 | $0 | $2,638,707 |
| Urban Unzoned | 15,413 | 14,271 | $1,874,753,579 | $4,894,644,083 | $2,840,162,092 | $9,609,559,754 |
| **Rocklin Total** | **23,657** | **21,009** | **$3,105,707,112** | **$8,167,173,274** | **$4,840,152,035** | **$16,113,032,421** |
| **Unincorporated Placer County** | | | | | | |
| Very High | 37,889 | 25,326 | $6,689,279,260 | $10,869,129,352 | $5,692,335,467 | $23,250,744,079 |
| High | 3,985 | 3,004 | $552,224,194 | $1,198,966,148 | $643,037,073 | $2,394,227,415 |
| Moderate | 23,525 | 18,466 | $3,667,814,243 | $6,902,120,409 | $3,809,415,644 | $14,379,350,296 |
| Non-Wildland/Non-Urban | 611 | 264 | $278,726,885 | $91,745,828 | $56,505,495 | $426,978,208 |
| Urban Unzoned | 7,246 | 6,517 | $1,318,507,453 | $3,219,421,768 | $2,019,270,006 | $6,557,199,227 |
| **Unincorporated Placer County Total** | **73,256** | **53,577** | **$12,506,552,035** | **$22,281,383,505** | **$12,220,563,685** | **$47,008,499,225** |
| | | | | | | |
| **Grand Total** | **129,207** | **101,735** | **$19,166,506,328** | **$39,412,769,225** | **$22,135,839,982** | **$80,715,115,535** |

Source: CAL FIRE, Placer County 2020 Parcel/Assessor's Data

The City of Roseville is not included in the calculations of assets at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

### Unincorporated Placer County

Analysis results for unincorporated Placer County are summarized by FHSZ in Table 4-107 and broken out by property use in Table 4-108. 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 4-107 Unincorporated Placer County – Summary of Count and Value of Parcels in Fire Hazard Severity Zones*

| Fire Hazard Severity Zone | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| Very High | 37,889 | 25,326 | $6,689,279,260 | $10,869,129,352 | $5,692,335,467 | $23,250,744,079 |
| High | 3,985 | 3,004 | $552,224,194 | $1,198,966,148 | $643,037,073 | $2,394,227,415 |
| Moderate | 23,525 | 18,466 | $3,667,814,243 | $6,902,120,409 | $3,809,415,644 | $14,379,350,296 |
| Non-Wildland/Non-Urban | 611 | 264 | $278,726,885 | $91,745,828 | $56,505,495 | $426,978,208 |
| Urban Unzoned | 7,246 | 6,517 | $1,318,507,453 | $3,219,421,768 | $2,019,270,006 | $6,557,199,227 |
| **Unincorporated Placer County Total** | **73,256** | **53,577** | **$12,506,552,035** | **$22,281,383,505** | **$12,220,563,685** | **$47,008,499,225** |

Source: CAL FIRE, Placer County 2020 Parcel/Assessor's Data

### *Table 4-108 Unincorporated Placer 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 |
|---|---|---|---|---|---|---|
| **Very High** | | | | | | |
| Agricultural | 560 | 27 | $24,176,370 | $3,767,920 | $3,767,920 | $31,712,210 |
| Commercial | 797 | 434 | $231,469,772 | $270,774,812 | $270,774,812 | $773,019,396 |
| Industrial | 257 | 64 | $22,738,935 | $22,511,992 | $33,767,990 | $79,018,917 |
| Institutional | 445 | 32 | $10,704,643 | $28,049,854 | $28,049,854 | $66,804,351 |
| Miscellaneous | 6,428 | 111 | $248,980,080 | $7,971,074 | $7,971,074 | $264,922,228 |
| Natural / Open Space | 1,403 | 254 | $120,951,394 | $159,953,796 | $159,953,796 | $440,858,986 |
| Residential | 27,999 | 24,404 | $6,030,258,066 | $10,376,099,904 | $5,188,050,021 | $21,594,407,991 |
| **Very High Total** | **37,889** | **25,326** | **$6,689,279,260** | **$10,869,129,352** | **$5,692,335,467** | **$23,250,744,079** |
| **High** | | | | | | |
| Agricultural | 69 | 3 | $9,402,869 | $1,096,254 | $1,096,254 | $11,595,377 |
| Commercial | 112 | 73 | $24,727,328 | $41,769,237 | $41,769,237 | $108,265,802 |
| Industrial | 21 | 14 | $8,325,946 | $14,226,407 | $21,339,612 | $43,891,965 |
| Institutional | 38 | 8 | $1,612,817 | $5,651,621 | $5,651,621 | $12,916,059 |
| Miscellaneous | 454 | 14 | $24,190,589 | $1,943,012 | $1,943,012 | $28,076,613 |
| Natural / Open Space | 91 | 14 | $8,057,690 | $8,195,011 | $8,195,011 | $24,447,712 |
| Residential | 3,200 | 2,878 | $475,906,955 | $1,126,084,606 | $563,042,326 | $2,165,033,887 |

| Fire Hazard Severity Zone / Property Use | Total Parcel Count | Improved Parcel Count | Total Land Value | Improved Structure Value | Estimated Contents Value | Total Value |
|---|---|---|---|---|---|---|
| **High Total** | **3,985** | **3,004** | **$552,224,194** | **$1,198,966,148** | **$643,037,073** | **$2,394,227,415** |
| **Moderate** | | | | | | |
| Agricultural | 547 | 175 | $208,595,488 | $45,898,299 | $45,898,299 | $300,392,086 |
| Commercial | 282 | 162 | $89,362,007 | $119,421,301 | $119,421,301 | $328,204,609 |
| Industrial | 293 | 167 | $109,781,412 | $185,355,420 | $278,033,126 | $573,169,958 |
| Institutional | 175 | 52 | $26,669,598 | $131,918,758 | $131,918,758 | $290,507,114 |
| Miscellaneous | 3,300 | 108 | $287,574,395 | $18,692,660 | $18,692,660 | $324,959,715 |
| Natural / Open Space | 732 | 139 | $30,780,989 | $30,069,268 | $30,069,268 | $90,919,525 |
| Residential | 18,196 | 17,663 | $2,915,050,354 | $6,370,764,703 | $3,185,382,232 | $12,471,197,289 |
| **Moderate Total** | **23,525** | **18,466** | **$3,667,814,243** | **$6,902,120,409** | **$3,809,415,644** | **$14,379,350,296** |
| **Non-Wildland/Non-Urban** | | | | | | |
| Agricultural | 153 | 62 | $152,912,294 | $10,487,252 | $10,487,252 | $173,886,798 |
| Commercial | 2 | 1 | $22,983 | $155,952 | $155,952 | $334,887 |
| Industrial | 3 | 0 | $32,121,172 | $0 | $0 | $32,121,172 |
| Institutional | 6 | 0 | $0 | $0 | $0 | $0 |
| Miscellaneous | 141 | 2 | $15,841,695 | $1,372,897 | $1,372,897 | $18,587,489 |
| Natural / Open Space | 124 | 47 | $28,974,731 | $9,249,056 | $9,249,056 | $47,472,843 |
| Residential | 182 | 152 | $48,854,010 | $70,480,671 | $35,240,338 | $154,575,019 |
| **Non-Wildland/Non-Urban Total** | **611** | **264** | **$278,726,885** | **$91,745,828** | **$56,505,495** | **$426,978,208** |
| **Urban Unzoned** | | | | | | |
| Agricultural | 0 | 0 | $0 | $0 | $0 | $0 |
| Commercial | 340 | 281 | $179,278,586 | $361,071,674 | $361,071,674 | $901,421,934 |
| Industrial | 130 | 109 | $61,526,782 | $167,138,321 | $250,707,486 | $479,372,589 |
| Institutional | 32 | 21 | $11,774,223 | $108,884,358 | $108,884,358 | $229,542,939 |
| Miscellaneous | 405 | 5 | $20,351,216 | $4,305,765 | $4,305,765 | $28,962,746 |
| Natural / Open Space | 170 | 4 | $5,123,970 | $10,579,857 | $10,579,857 | $26,283,684 |
| Residential | 6,169 | 6,097 | $1,040,452,676 | $2,567,441,793 | $1,283,720,866 | $4,891,615,335 |
| Urban Unzoned Total | 7,246 | 6,517 | $1,318,507,453 | $3,219,421,768 | $2,019,270,006 | $6,557,199,227 |
| **Unincorporated Placer County Total** | **73,256** | **53,577** | **$12,506,552,035** | **$22,281,383,505** | **$12,220,563,685** | **$47,008,499,225** |

Source: CAL FIRE, Placer 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 overlayed 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 4-109). According to this analysis, there is a population of 88, 096 in the Moderate FHSZ, 4,740 in the High, 0 and 64,459 in the Very High FHSZ in the County.

***Table 4-109 Placer County Planning Area – Residential Populations at Risk in Moderate or Higher Fire Hazard Severity Zones by Jurisdiction***

| Jurisdiction | Very High | | High | | Moderate | |
|---|---|---|---|---|---|---|
| | Improved Residential Parcels | Population at Risk | Improved Residential Parcels | Population at Risk | Improved Residential Parcels | Population at Risk |
| Auburn | 44 | 96 | 1,806 | 3,955 | 2,205 | 4,829 |
| Colfax | 609 | 1,401 | 0 | 0 | 0 | 0 |
| Lincoln | 0 | 0 | 0 | 0 | 7,923 | 20,362 |
| Loomis | 0 | 0 | 27 | 70 | 3 | 8 |
| Rocklin | 0 | 0 | 29 | 78 | 6,465 | 17,326 |
| Unincorporated Placer County | 24,404 | 62,962 | 2,878 | 7,713 | 17,663 | 45,571 |
| **Total** | **25,057** | **64,459** | **4,740** | **11,816** | **34,259** | **88,096** |

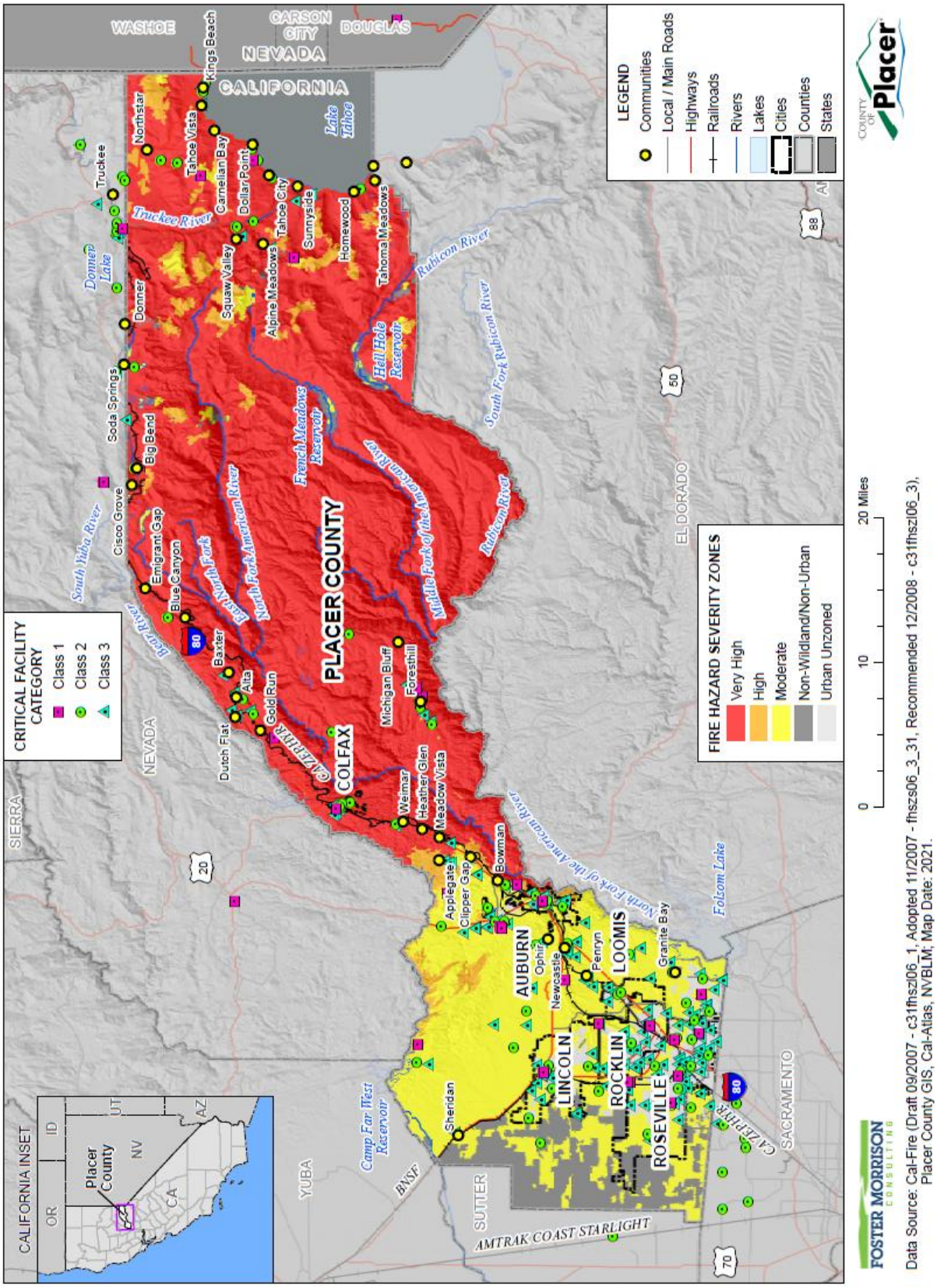
Source: CAL FIRE, US Census Bureau Average Household Sizes: Auburn (2.19); Colfax (2.30); Lincoln (2.57); Loomis (2.60), Rocklin (2.68); and unincorporated Placer County (2.58)

The City of Roseville is not included in the calculations of populations at risk. The City maintains its own Hazard Mitigation Plan, which can be found on the City's website.

## Critical Facilities at Risk

A separate analysis was performed on the critical facility inventory in Placer County to determine critical facilities in the Fire Hazard Severity Zones. Using GIS, the CAL FIRE, Fire Hazard Severity Zones were overlayed on the critical facility GIS layer. Figure 4-115 shows critical facilities, as well as the Fire Hazard Severity Zones. Table 4-110 details critical facilities by jurisdiction, 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 4-115 Placer County – Critical Facilities in FHSZs*




Data Source: Cal-Fire (Draft 09/2007 - c31fhszl06_1, Adopted 11/2007 - fhszs06_3_31, Recommended 12/2008 - c31fhszl06_3), Placer County GIS, Cal-Atlas, NVBLM; Map Date: 2021.

### *Table 4-110 Placer County – Critical Facilities in FHSZs*

| Fire Hazard Severity Zone / Jurisdiction | Critical Facility Class | Critical Facility Type | Facility Count |
|---|---|---|---|
| **Auburn** | | | |
| High | Class 3 | School | 2 |
| **High Total** | | | **2** |
| Moderate | Class 2 | Fire Station | 2 |
| | Class 3 | Hall | 3 |
| **Moderate Total** | | | **5** |
| Urban Unzoned | Class 1 | Dispatch Center | 1 |
| | | Emergency Operation Center | 1 |
| | Class 2 | Airport | 1 |
| | | Fire Station | 1 |
| | | National/Coast Guard | 1 |
| | | Police Station | 1 |
| | Class 3 | Fairground | 1 |
| | | Hall | 2 |
| | | School | 3 |
| **Urban Unzoned Total** | | | **12** |
| **Auburn Total** | | | **19** |
| **Colfax** | | | |
| Very High | Class 2 | Fire Station | 2 |
| | | Police Station | 1 |
| | Class 3 | Hall | 1 |
| | | Water Treatment Plant | 1 |
| **Very High Total** | | | **5** |
| **Colfax Total** | | | **5** |
| **Lincoln** | | | |
| Moderate | Class 2 | Airport | 1 |
| | Class 3 | Fire Station | 2 |
| | | School | 6 |
| **Moderate Total** | | | **9** |
| Non-Wildland/Non-Urban | Class 3 | Hall | 1 |
| | | School | 1 |
| | | Water Treatment Plant | 1 |
| **Non-Wildland/Non-Urban Total** | | | **3** |
| Urban Unzoned | Class 1 | Dispatch Center | 1 |
| | | Emergency Operation Center | 1 |

| Fire Hazard Severity Zone / Jurisdiction | Critical Facility Class | Critical Facility Type | Facility Count |
|---|---|---|---|
| | Class 2 | Fire Station | 1 |
| | | Police Station | 1 |
| | Class 3 | Hall | 2 |
| | | Hazardous Materials Facility | 1 |
| | | School | 5 |
| **Urban Unzoned Total** | | | **12** |
| **Lincoln Total** | | | **24** |
| **Loomis** | | | |
| Moderate | Class 2 | Police Station | 1 |
| **Moderate Total** | | | **1** |
| Urban Unzoned | Class 2 | Fire Station | 1 |
| | Class 3 | School | 3 |
| **Urban Unzoned Total** | | | **4** |
| **Loomis Total** | | | **5** |
| **Rocklin** | | | |
| Moderate | Class 1 | Communication Transmission Sites | 1 |
| | Class 2 | Fire Station | 1 |
| | Class 3 | School | 1 |
| | | Water Treatment Plant | 1 |
| **Moderate Total** | | | **4** |
| Urban Unzoned | Class 1 | Dispatch Center | 1 |
| | | Emergency Operation Center | 1 |
| | Class 2 | Fire Station | 2 |
| | | Police Station | 1 |
| | Class 3 | Hall | 2 |
| | | Hazardous Materials Facility | 1 |
| | | School | 18 |
| **Urban Unzoned Total** | | | **26** |
| **Rocklin Total** | | | **30** |
| **Unincorporated Placer County** | | | |
| Very High | Class 1 | Communication Transmission Sites | 5 |
| | | Emergency Operation Center | 1 |
| | Class 2 | Airport | 1 |
| | | CHP Station | 1 |
| | | Fire Station | 23 |
| | | National/Coast Guard | 1 |

| Fire Hazard Severity Zone / Jurisdiction | Critical Facility Class | Critical Facility Type | Facility Count |
|---|---|---|---|
| | | Police Station | 3 |
| | Class 3 | Hall | 9 |
| | | School | 13 |
| | | Water Treatment Plant | 4 |
| **Very High Total** | | | **61** |
| High | Class 1 | Communication Transmission Sites | 1 |
| | Class 2 | Fire Station | 2 |
| | Class 3 | Hall | 1 |
| | | Hazardous Materials Facility | 2 |
| | | School | 1 |
| | | Water Treatment Plant | 2 |
| **High Total** | | | **9** |
| Moderate | Class 1 | Communication Transmission Sites | 6 |
| | | Computer Information Systems Infrastructure | 1 |
| | | Emergency Operation Center | 1 |
| | | Hospital Control Facility | 1 |
| | | Telecommunications | 2 |
| | Class 2 | CHP Station | 1 |
| | | Fire Station | 18 |
| | | Hospital | 1 |
| | Class 3 | Hall | 12 |
| | | Hazardous Materials Facility | 6 |
| | | School | 21 |
| | | Water Treatment Plant | 7 |
| **Moderate Total** | | | **77** |
| Non-Wildland/Non-Urban | Class 1 | Communication Transmission Sites | 1 |
| | Class 2 | Fire Station | 1 |
| **Non-Wildland/Non-Urban Total** | | | **2** |
| Urban Unzoned | Class 1 | Computer Information Systems Infrastructure | 1 |
| | | Dispatch Center | 2 |
| | | Emergency Operation Center | 1 |
| | | Fire Station | 1 |
| | Class 2 | Fire Station | 7 |
| | | Hospital | 2 |
| | | National/Coast Guard | 1 |

| Fire Hazard Severity Zone / Jurisdiction | Critical Facility Class | Critical Facility Type | Facility Count |
|---|---|---|---|
| | | Police Station | 3 |
| | Class 3 | Fairground | 1 |
| | | Hall | 7 |
| | | School | 30 |
| | | Water Treatment Plant | 3 |
| **Urban Unzoned Total** | | | **59** |
| **Unincorporated Placer County Total** | | | **208** |
| **Adjacent Counties** | | | |
| Unknown - Located in Adjacent County | Class 1 | Communication Transmission Sites | 3 |
| | | Dispatch Center | 3 |
| | Class 2 | Airport | 1 |
| | | CHP Station | 1 |
| | | Fire Station | 16 |
| | | Hospital | 1 |
| | Class 3 | School | 11 |
| | | Water Treatment Plant | 1 |
| **Adjacent Counties Total** | | | **37** |
| | | | |
| **Grand Total** | | | **328** |

Source: Placer 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 Placer County has recently slowed slightly; 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.

**GIS Analysis**

INSERT

## 4.3.20. Natural Hazards Summary

Table 4-111 summarizes the results of the hazard identification, hazard profile, and vulnerability assessment for the Placer 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 Placer 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 Placer County Planning Area, enabling the County to focus resources where they are most needed.

*Table 4-111 Hazard Identification/Profile Summary and Determination of Priority Hazards*

| Hazard | Likelihood of Future Occurrence | Priority Hazard |
|---|---|---|
| Agriculture Pests and Diseases | Highly Likely | Y |
| Avalanche | Likely | N |
| Climate Change | Likely | Y |
| Dam Failure | Occasional | Y |
| Drought & Water Shortage | Likely | Y |
| Earthquake | Occasional | Y |
| Floods: 1%/0.2% annual chance | Occasional | Y |
| Floods: Localized Stormwater | Occasional/Highly Likely | Y |
| Landslides, Mudslides, and Debris Flows | Occasional | N |
| Levee Failure | Unlikely | N |
| Pandemic | Likely | Y |

| Hazard | Likelihood of Future Occurrence | Priority Hazard |
|---|---|---|
| Seiche | Unlikely | Y |
| Severe Weather: Extreme Heat | Highly Likely | Y |
| Severe Weather: Freeze and Snow | Highly Likely | Y |
| Severe Weather: Heavy Rains and Storms | Occasional | Y |
| Severe Weather: High Winds and Tornadoes | Highly Likely | Y |
| Tree Mortality | 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 Placer 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. Placer County's Regulatory Mitigation Capabilities

Table 4-112 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Placer County. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing

mitigation capabilities. THIS TABLE IS FROM THE LAST PLAN. UPDATED AS NEEDED. MAKE SURE TO FILL OUT THE LAST CELL.

### *Table 4-112 Placer County Regulatory Mitigation Capabilities*

| Plans | Y/N<br>Year | Does the plan/program address hazards?<br>Does the plan identify projects to include in the mitigation strategy?<br>Can the plan be used to implement mitigation actions? |
|---|---|---|
| General Plan | Y<br>2016<br>2021 update currently underway | The General Plan Safety Element contains a program to address hazards. The Plan identifies mitigation actions and can be used to implement mitigation actions. Please note that this element is currently being updated to incorporate the adaptation strategies provided in the PCSP pursuant to SB 379. The update will reflect the 2016 LHMP and 2012 CWPP and will address the current regulatory requirements as specified in Sections 65302(g)(1)-(5). |
| Capital Improvements Plan | Y | The CIP addresses facilities that are in need of repair or replacement to protect and improve critical infrastructure. Mitigation projects are considered and included in annual CIPs as feasible. |
| Economic Development Plan | Y | |
| Local Emergency Operations Plan | Y<br>2010 | The Placer County EOP update is in progress. It is scheduled to be completed by the end of July 2016. |
| Continuity of Operations Plan | | |
| Transportation Plan | Y | Regional Plan |
| Stormwater Management Plan/Program | Y<br>2004 | |
| Engineering Studies for Streams | | |
| Community Wildfire Protection Plan | Y<br>2015 | This project addresses fire hazards in the County. It contains mitigation actions and a mitigation strategy to reduce fire risk in the County. |
| Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation) | Y<br>2015 | Oil by Rail plan for the County. The plan details risk to the County and how the County will respond to any oil by rail spill. |
| **Building Code, Permitting, and Inspections** | **Y/N** | **Are codes adequately enforced?** |
| Building Code | Y | Version/Year: CBC 2013. It is enforced by the building department. |
| Building Code Effectiveness Grading Schedule (BCEGS) Score | | Score: 2/2 |
| Fire department ISO rating: | | Rating: |
| Site plan review requirements | | The floodplain is identified through County GIS database |

| Land Use Planning and Ordinances | | |
|---|---|---|
| Zoning ordinance | Y | This is an effective measure and is adequately administered and enforced. |
| Subdivision ordinance | Y | This is an effective measure and is adequately administered and enforced. |
| Floodplain ordinance | Y | The ordinance limits development in the floodplain and follows FEMAs guidelines. County staff administers and enforces ordinance |
| Natural hazard specific ordinance (stormwater, steep slope, wildfire) | Y | County enforces a Stormwater Quality Ordinance and WUI ordinance. There are also defensible space programs. |
| Flood insurance rate maps | Y | Maps are maintained at the County. New maps are being developed to better identify flood hazard. Mapping is part of County GIS database |
| Elevation Certificates | Y | All elevation certificates are maintained at the county. New development is required to provide an elevation certificate for any new or substantially improved structure that is within the special flood hazard area |
| Acquisition of land for open space and public recreation uses | Y | The County has a program to purchase open space and general and specific plans which detail uses |
| Erosion or sediment control program | Y | The County has a stormwater quality program and ordinance |
| Other | | |
| **How can these capabilities be expanded and improved to reduce risk?** | | |
| PROVIDE SPECIFIC DETAILS OF AREAS FOR IMPROVEMENT OF THESE TYPES OF CAPABILITIES AND HOW/WHY IT WILL HELP YOUR JURISDICTION | | |

As indicated in the tables above, Placer County has several plans and programs that guide the County's mitigation of development of hazard-prone areas. Starting with the Placer 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.

### *Placer County General Plan (2013)*

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 are the following:

## Land Use Element

| Goals/Policy | Explanation |
|---|---|
| **Land Use Element** | |
| **Goal 1.A:** | **To promote the wise, efficient, and environmentally-sensitive use of Placer County lands to meet the present and future needs of Placer County residents and businesses.** |
| Policy 1.A.1. | The County will promote the efficient use of land and natural resources. |
| Policy 1.A.2. | The County shall permit only low-intensity forms of development in areas with sensitive environmental resources or where natural or human-caused hazards are likely to pose a significant threat to health, safety, or property. |
| **Goal 1.F:** | **To designate adequately-sized, well-located areas for the development of public facilities to serve both community and regional needs.** |
| Policy 1.F.2. | The County shall seek to locate new public facilities necessary for emergency response, health care, and other critical functions outside areas subject to natural or built environment hazards. |
| **Goal 1.K:** | **To protect the visual and scenic resources of Placer County as important quality-of-life amenities for County residents and a principal asset in the promotion of recreation and tourism.** |
| Policy 1.K.6. | The County shall require that new development on hillsides employ design, construction, and maintenance techniques that:<br>a. Ensure that development near or on portions of hillsides do not cause or worsen natural hazards such as erosion, sedimentation, fire, or water quality concerns;<br>b. Include erosion and sediment control measures including temporary vegetation sufficient to stabilize disturbed areas;<br>c. Minimize risk to life and property from slope failure, landslides, and flooding; and,<br>d. Maintain the character and visual quality of the hillside. |

## Public Facilities Element

| Goals/Policy | Explanation |
|---|---|
| **Public Facilities Element** | |
| **Goal 4.E** | **To manage rainwater and stormwater at the source in a sustainable manner that least inconveniences the public, reduces potential water-related damage, augments water supply, mitigates storm water pollution, and enhances the environment.** |
| Policy 4.E.1 | The County shall encourage the use of natural stormwater drainage systems to preserve and enhance natural features. |
| Policy 4.E.2. | The County shall support efforts to acquire land or obtain easements for drainage and other public uses of floodplains where it is desirable to maintain drainage channels in a natural state. |
| Policy 4.E.3. | The County shall consider using stormwater of adequate quality to replenish local groundwater basins, restore wetlands and riparian habitat, and irrigate agricultural lands. |
| Policy4.E.4. | The County shall ensure that new storm drainage systems are designed in conformance with the Placer County Flood Control and Water Conservation District's Stormwater Management Manual and the County Land Development Manual. |
| Policy 4.E.5. | The County shall continue to implement and enforce its Grading, Erosion and Sediment Control Ordinance and Flood Damage Prevention Ordinance. |
| Policy 4.E.6. | The County shall continue to support the programs and policies of the watershed flood control plans developed by the Flood Control and Water Conservation District. |

| Goals/Policy | Explanation |
|---|---|
| Policy 4.E.7. | The County shall prohibit the use of underground storm drain systems in rural and agricultural areas, unless no other feasible alternatives are available for conveyance of stormwater from new development or when necessary to mitigate flood hazards. |
| Policy 4.E.8. | The County shall consider recreational opportunities and aesthetics in the design of stormwater ponds and conveyance facilities. |
| Policy 4.E.9. | The County shall encourage good soil conservation practices in agricultural and urban areas and carefully examine the impact of proposed urban developments with regard to drainage courses. |
| Policy4.E.10. | The County shall strive to improve the quality of runoff from urban and suburban development through use of appropriate site design measures including, but not limited to vegetated swales, infiltration/sedimentation basins, riparian setbacks, oil/grit separators, rooftop and impervious area disconnection, porous pavement, and other best management practices (BMPs). |
| Policy 4.E.11. | The County shall require new development to adequately mitigate increases in stormwater peak flows and/or volume. Mitigation measures should take into consideration impacts on adjoining lands in the unincorporated area and on properties in jurisdictions within and immediately adjacent to Placer County. |
| Policy 4.E.12. | The County shall encourage project designs that minimize drainage concentrations and impervious coverage and maintain, to the extent feasible, natural site drainage conditions. |
| Policy 4.E.13. | The County shall require that new development conforms with the applicable programs, policies, recommendations, and plans of the Placer County Flood Control and Water Conservation District. |
| Policy 4.E.14. | The County shall require projects that have significant impacts on the quantity and quality of surface water runoff to allocate land as necessary for the purpose of detaining post-project flows, evapotranspiring, infiltrating, harvesting/using, and biotreating stormwater, and/or for the incorporation of mitigation measures for water quality impacts related to urban runoff. |
| Policy 4.E.15. | The County shall require that new development in primarily urban development areas incorporate low impact development measures to reduce the amount of runoff, to the maximum extent practicable, for which retention and treatment is required. |
| Policy 4.E 16. | The County shall identify and coordinate mitigation measures with responsible agencies for the control of storm drainage systems, monitoring of discharges, and implementation of measures to control pollutant loads in urban storm water runoff (e.g., California Regional Water Quality Control Board, Placer County Environmental Health Division, Placer County Department of Public Works and Facilities, CDRA Engineering and Surveying Division, Placer County Flood Control and Water Conservation District). |
| Policy 4.E.17. | The County shall strive to protect domestic water supply canal systems from contamination resulting from spillage or runoff. |
| Policy 4.E.18 | The County shall, wherever feasible, require that proponents of new projects encase, or otherwise protect from contamination, domestic water supply canals where they pass through developments with lot sizes of 2.3 acres or less; where subdivision roads are constructed within 100 feet upslope or upstream from canals; and within all commercial, industrial, institutional, and multi-family developments. |
| Policy 4.E.19. | The County shall require that proponents of new projects fence domestic water supply canals where they pass through development with lot sizes between 2.3 and 4.6 acres; and on a case-by-case basis as determined by the entity responsible for the canal. This fencing shall be installed inside the project property line, and the proponent or subsequent landowner shall be responsible for fence maintenance. Said fencing shall be designed to impede pedestrian trespass of the canal area and to impede any dumping of materials into the canal. |
| Policy 4.E.20. | The County shall continue to implement and enforce its Stormwater Quality Ordinance. |
| **Goal 4.F** | **To protect the lives and property of the citizens of Placer County from hazards associated with development in floodplains and manage floodplains for their natural resource values.** |

| Goals/Policy | Explanation |
|---|---|
| Policy 4.F.1. | The County shall require that arterial roadways and expressways, residences, commercial and industrial uses and emergency facilities be protected, at a minimum, from a 100-year storm event. |
| Policy 4.F.2. | The County shall recognize floodplains as a potential public resource to be managed and maintained for the public's benefit. |
| Policy 4.F.3. | The County shall continue to work closely with the U.S. Army Corps of Engineers, the Resource Conservation District, the Federal Emergency Management Agency, the State Department of Water Resources, the Central Valley Flood Protection Board, and the Placer County Flood Control and Water Conservation District, in defining existing and potential flood problem areas. |
| Policy 4.F.4. | The County shall require evaluation of potential flood hazards prior to approval of development projects. The County shall require proponents of new development to submit accurate topographic and flow characteristics information and depiction of the 100-year floodplain boundaries under fully developed, unmitigated runoff conditions. |
| Policy 4.F.5. | The County shall attempt to maintain natural conditions within the 100-year floodplain of all rivers and streams except under the following circumstances:<br>a. Where work is required to manage and maintain the stream's drainage characteristics and where such work is done in accordance with the Placer County Flood Damage Prevention Ordinance, California Department of Fish and Wildlife regulations, and Clean Water Act provisions administered by the U.S. Army Corps of Engineers. |
| Policy 4.F.6. | The County shall continue to coordinate efforts with local, state, and federal agencies to achieve adequate water quality and flood protection. |
| Policy 4.F.7. | The County shall cooperate with the Placer County Flood Control and Water Conservation District, surrounding jurisdictions, the cities in the County, and other public agencies in planning and implementing regional flood control improvements, plans, and programs. |
| Policy 4.F.8. | The County shall, where possible, view flood waters as a resource to be used for waterfowl habitat, aquifer recharge, fishery enhancement, agricultural water supply, and other suitable uses. |
| Policy 4.F.9 | The County shall continue to implement floodplain zoning and undertake other actions required to comply with state floodplain requirements, and to maintain the County's eligibility under the Federal Flood Insurance Program. |
| Policy 4.F.10. | The County shall preserve or enhance the aesthetic qualities of natural drainage courses in their natural or improved state compatible with flood control requirements and economic, environmental, and ecological factors. |
| Policy 4.F.11. | To the extent that funding is available, the County shall work to solve flood control problems in areas where existing development has encroached into a floodplain. |
| Policy 4.F.12. | The County shall promote the use of natural or non-structural flood control facilities, including off-stream flood control basins, to preserve and enhance creek corridors. |
| Policy 4.F.13. | The County shall continue to implement and enforce its Grading, Erosion and Sediment Control Ordinance and Flood Damage Prevention Ordinance. |
| Policy 4.F.14. | The County shall ensure that new storm drainage systems are designed in conformance with the Placer County Flood Control and Water Conservation District's Stormwater Management Manual and the County's Land Development Manual. |
| **Goal 4.I:** | **To protect residents of and visitors to Placer County from injury and loss of life and to protect property and watershed resources from fires.** |
| Policy 4.I.1. | The County shall encourage local fire protection agencies in Placer County to maintain the following minimum fire protection standards (expressed as Insurance Service Organization (ISO) ratings):<br>a. ISO 4 in urban areas<br>b. ISO 6 in suburban areas<br>c. ISO 8 in rural areas |

| Goals/Policy | Explanation |
|---|---|
| Policy 4.I.2. | The County shall encourage local fire protection agencies in the County to maintain the following standards (expressed as average response times to emergency calls):<br>a. 4 minutes in urban areas<br>b. 6 minutes in suburban areas<br>c. 10 minutes in rural areas |
| Policy 4.I.3. | The County shall require new development to develop or fund fire protection facilities, personnel, and operations and maintenance that, at a minimum, maintains the above service level standards. |
| Policy 4.I.4. | The County shall work with local fire protection agencies to identify key fire loss problems and design appropriate fire safety education programs to reduce fire incidents and losses. |
| Policy 4.I.5. | The County shall work with local fire protection agencies and implement ordinances to control fire losses and fire protection costs through continued use of automatic fire detection, control, and suppression systems. |
| Policy 4.I.6. | The County shall continue to promote standardization of operations among fire protection agencies and improvement of fire service levels. |
| Policy 4.I.7. | The County shall maintain and strengthen automatic aid agreements to maximize efficient use of available resources. |
| Policy 4.I.8. | The County shall work with local fire protection agencies to maintain a pre-fire planning program with selected high-risk occupancies reviewed at least annually. |
| Policy 4.I.9. | The County shall ensure that all proposed developments are reviewed for compliance with fire safety standards by responsible local fire agencies per the Uniform Fire Code and other County and local ordinances. |
| Policy 4.I.10. | The County shall work with local fire protection agencies to inventory and eliminate structurally unsafe and fire-hazardous housing units that are beyond repair or rehabilitation. |
| Policy 4.I.11. | The County shall encourage local fire protection agencies to provide and maintain advanced levels of emergency medical services (EMS) to the public. |

## Natural Resources Element

| Goals/Policy | Explanation |
|---|---|
| **Natural Resources Element** | |
| **Goal 6.A:** | **To protect and enhance the natural qualities of Placer County's rivers, streams, creeks and groundwater.** |
| Policy 6.A.2 | The County shall require all development in the 100-year floodplain to comply with the provisions of the Placer County Flood Damage Prevention Ordinance. |

| Goals/Policy | Explanation |
|---|---|
| Policy 6.A.4. | Where stream protection is required or proposed, the County should require public and private development to:<br>a. Preserve stream zones and stream setback areas through easements or dedications. Parcel lines (in the case of a subdivision) or easements (in the case of a subdivision or other development) shall be located to optimize resource protection. If a stream is proposed to be included within an open space parcel or easement, allowed uses and maintenance responsibilities within that parcel or easement should be clearly defined and conditioned prior to map or project approval;<br>b. Designate such easement or dedication areas (as described in a. above) as open space;<br>c. Protect stream zones and their habitat value by actions such as: 1) providing an adequate stream setback, 2) maintaining creek corridors in an essentially natural state, 3) employing stream restoration techniques where restoration is needed to achieve a natural stream zone, 4) utilizing riparian vegetation within stream zones, and where possible, within stream setback areas, 5) prohibiting the planting of invasive, non-native plants (such as Vinca major and eucalyptus) within stream zones or stream setbacks, and 6) avoiding tree removal within stream zones;<br>d. Provide recreation and public access near streams consistent with other General Plan policies;<br>e. Use design, construction, and maintenance techniques that ensure development near a creek will not cause or worsen natural hazards (such as erosion, sedimentation, flooding, or water pollution) and will include erosion and sediment control practices such as: 1) turbidity screens and other management practices, which shall be used as necessary to minimize siltation, sedimentation, and erosion, and shall be left in place until disturbed areas; and/or are stabilized with permanent vegetation that will prevent the transport of sediment off site; and 2) temporary vegetation sufficient to stabilize disturbed areas. |
| Policy 6.A.10 | The County shall discourage grading activities during the rainy season, unless adequately mitigated, to avoid sedimentation of creeks and damage to riparian habitat. |
| Policy 6.A.11. | Where the stream zone has previously been modified by channelization, fill, or other human activity, the County shall require project proponents to restore such areas by means of landscaping, revegetation, or similar stabilization techniques as a part of development activities. |
| Policy 6.A.15. | The County shall encourage the protection of floodplain lands and, where appropriate, acquire public easements for purposes of flood protection, public safety, wildlife preservation, groundwater recharge, access and recreation. |
| **Goal 6.B** | **To protect wetland communities and related riparian areas throughout Placer County as valuable resources.** |
| Policy 6.B.1. | The County shall support the "no net loss" policy for wetland areas regulated by the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the California Department of Fish and Wildlife. Coordination with these agencies at all levels of project review shall continue to ensure that appropriate mitigation measures and the concerns of these agencies are adequately addressed. |
| Policy 6.B.2. | The County shall require new development to mitigate wetland loss in both federal jurisdictional and non-jurisdictional wetlands to achieve "no net loss" through any combination of the following, in descending order of desirability: (1) avoidance; (2) where avoidance is not possible, minimization of impacts on the resource; or (3) compensation, including use of a mitigation and conservation banking program that provides the opportunity to mitigate impacts to special status, threatened, and endangered species and/or the habitat which supports these species in wetland and riparian areas. Non-jurisdictional wetlands may include riparian areas that are not federal "waters of the United States" as defined by the Clean Water Act. |
| **Goal 6.D:** | **To preserve and protect the valuable vegetation resources of Placer County.** |
| Policy 6.D.1 | The County shall encourage landowners and developers to preserve the integrity of existing terrain and natural vegetation in visually-sensitive areas such as hillsides, ridges, and along important transportation corridors. |
| Policy 6.D.2. | The County shall require developers to use native and compatible non-native species, especially drought-resistant species, to the extent possible in fulfilling landscaping requirements imposed as conditions of discretionary permits or for project mitigation. |

| Goals/Policy | Explanation |
|---|---|
| Policy 6.D.3. | The County shall support the preservation of outstanding areas of natural vegetation, including, but not limited to, oak woodlands, riparian areas, and vernal pools. |
| Policy 6.D.7. | The County shall support the management of wetland and riparian plant communities for passive recreation, groundwater recharge, nutrient catchment, and wildlife habitats. Such communities shall be restored or expanded, where possible. |
| Policy 6.D.9. | The County shall require that development on hillsides be limited to maintain valuable natural vegetation, especially forests and open grasslands, and to control erosion. |
| **Goal 6.E:** | **To preserve and enhance open space lands to maintain the natural resources of the County.** |
| Policy 6.E.1. | The County shall support the preservation and enhancement of natural land forms, natural vegetation, and natural resources as open space to the maximum extent feasible. The County shall permanently protect, as open space, areas of natural resource value, including wetlands, riparian corridors, unfragmented woodlands, and floodplains. |
| Policy 6.E.2 | . The County shall require that new development be designed and constructed to preserve the following types of areas and features as open space to the maximum extent feasible:<br>a. High erosion hazard areas;<br>b. Scenic and trail corridors;<br>c. Streams, riparian vegetation;<br>d. Wetlands;<br>e. Significant stands of vegetation;<br>f. Wildlife corridors; and<br>g. Any areas of special ecological significance. |

## Agriculture/Forestry Element

| Goals/Policy | Explanation |
|---|---|
| **Agriculture/Forestry Element** | |
| **Goal 7.A** | **To provide for the long-term conservation and use of agriculturally-designated lands.** |
| Policy 7.A.4. | The County shall provide protection from flooding for agricultural and related activities from flooding. |
| **Goal 7.D:** | **To maximize the productivity of Placer County's agriculture uses by ensuring adequate supplies of water.** |
| Policy 7.D.1. | The County shall support efforts to deliver adequate surface water to agricultural areas with deficient water supplies. |
| Policy 7.D.2. | The County shall encourage water conservation by farmers. To this end, the County shall, through the Agricultural Commissioner and U.C. Cooperative Extension, continue to provide information on irrigation methods and best management practices. The County shall also support conservation efforts of the California Farm Bureau, resource conservation districts, Natural Resources Conservation Service, and irrigation districts. |
| Policy 7.D.3. | The County should participate with cities and special districts in establishing programs for the agricultural re-use of treated wastewater in a manner that would be economically beneficial to agriculture. |
| Policy 7.D.4. | The County shall participate and encourage multi-agency participation in water projects where such coordination can improve the likelihood of providing affordable irrigation water to areas of Placer County with deficient water supplies. |

| Goals/Policy | Explanation |
|---|---|
| Policy 7.D.5. | The County will work with local irrigation districts to preserve local water rights to ensure that water saved through conservation may be stored and used locally, rather than appropriated and used outside of Placer County. |
| Policy 7.D.6. | The County shall encourage the use of reclaimed water where appropriate for agricultural production. |

## Safety Element

| Goals/Policy | Explanation |
|---|---|
| **Safety Element – Seismic and Geologic Hazards** | |
| **Goal 8.A** | **To minimize the loss of life, injury, and property damage due to seismic and geological hazards.** |
| Policy 8.A.1 | The County shall require the preparation of a soils engineering and geologic-seismic analysis prior to permitting development in areas prone to geological or seismic hazards (i.e., ground shaking, landslides, liquefaction, critically expansive soils, avalanche). |
| Policy 8.A.2 | The County shall require submission of a preliminary soils report, prepared by a California registered civil engineer and based upon adequate test borings, for every major subdivision and for each individual lot where critically expansive soils have been identified or are expected to exist. |
| Policy 8.A.3 | The County shall prohibit the placement of habitable structures or individual sewage disposal systems on or in critically expansive soils unless suitable mitigation measures are incorporated to prevent the potential risks of these conditions. |
| Policy 8.A.4 | The County shall ensure that areas of slope instability are adequately investigated and that any development in these areas incorporates appropriate design provisions to prevent landsliding. |
| Policy 8.A.5 | In landslide hazard areas, the County shall prohibit avoidable alteration of land in a manner that could increase the hazard, including concentration of water through drainage, irrigation, or septic systems; removal of vegetative cover; and steepening of slopes and undercutting the bases of slopes. |
| Policy 8.A.6 | The County shall require the preparation of drainage plans for development in hillside areas that direct runoff and drainage away from unstable slopes. |
| Policy 8.A.7 | In areas subject to severe ground shaking, the County shall require that new structures intended for human occupancy be designed and constructed to minimize risk to the safety of occupants. |
| Policy 8.A.8 | County shall continue to support scientific geologic investigations which refine, enlarge, and improve the body of knowledge on active fault zones, unstable areas, severe ground shaking, avalanche potential, and other hazardous conditions in Placer County. |
| Policy 8.A.9 | The County shall require that the location and/or design of any new buildings, facilities, or other development in areas subject to earthquake activity minimize exposure to danger from fault rupture or creep. |
| Policy 8.A.10 | The County shall require that new structures permitted in areas of high liquefaction potential be sited, designed, and constructed to minimize the dangers from damage due to earthquake-induced liquefaction. |
| Policy 8.A.11 | The County shall limit development in areas of steep or unstable slopes to minimize hazards caused by landslides or liquefaction. |
| **Safety Element – Flood Hazards** | |
| **Goal 8.B** | **To minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from flood hazards.** |

| Goals/Policy | Explanation |
|---|---|
| Policy 8.B.1 | The County shall promote flood control measures that maintain natural conditions within the 100-year floodplain of rivers and streams. |
| Policy 8.B.2 | The County shall continue to participate in the Federal Flood Insurance Program. |
| Policy 8.B.3 | The County shall require flood proofing of structures in areas subject to flooding. |
| Policy 8.B.4 | The County shall require that the design and location of dams and levees be in accordance with all applicable design standards and specifications and accepted state-of-the-art design and construction practices. |
| Policy 8.B.5 | The County shall coordinate with neighboring jurisdictions to mitigate the impacts of new development in Placer County that could increase or potentially affect runoff onto parcels downstream in a neighboring jurisdiction. |
| Policy 8.B.6 | The County shall prohibit the construction of facilities essential for emergencies and large public assembly in the 100-year floodplain, unless the structure and access to the structure are free from flood inundation. |
| Policy 8.B.7 | The County shall require flood control structures, facilities, and improvements to be designed to conserve resources, incorporate and preserve scenic values, and to incorporate opportunities for recreation, where appropriate. |
| Policy 8.B.8 | The County shall require that flood management programs avoid alteration of waterways and adjacent areas, whenever possible. |
| **Safety Element – Fire Hazards** | |
| **Goal 8.C** | **To minimize the risk of loss of life, injury, and damage to property and watershed resources resulting from unwanted fires.** |
| Policy 8.C.1 | The County shall ensure that development in high-fire-hazard areas is designed and constructed in a manner that minimizes the risk from fire hazards and meets all applicable state and County fire standards. |
| Policy 8.C.2 | The County shall require that discretionary permits for new development in fire hazard areas be conditioned to include requirements for fire-resistant vegetation, cleared fire breaks, or a long-term comprehensive fuel management program. Fire hazard reduction measures shall be incorporated into the design of development projects in fire hazard areas. |
| Policy 8.C.3 | The County shall require that new development meets state, County, and local fire district standards for fire protection. |
| Policy 8.C.4 | The County shall refer development proposals in the unincorporated County to the appropriate local fire agencies for review for compliance with fire safety standards. If dual responsibility exists, then both agencies shall review and comment relative to their area of responsibility. If standards are different or conflicting, the more stringent standards shall be applied. |
| Policy 8.C.5 | The County shall ensure that existing and new buildings of public assembly incorporate adequate fire protection measures to reduce the potential loss of life and property in accordance with state and local codes and ordinances. |
| Policy 8.C.6 | The County shall encourage fire protection agencies to continue education programs in schools, service clubs, organized groups, industry, utility companies, government agencies, press, radio, and television in order to increase public awareness of fire hazards within the County. |
| Policy 8.C.7 | The County shall work with local fire protection agencies, the California Department of Forestry and Fire Protection, and the U.S. Forest Service to promote the maintenance of existing fuel breaks and emergency access routes for effective fire suppression. |
| Policy 8.B.8 | The County shall encourage and promote installation and maintenance of smoke detectors in existing residences and commercial facilities that were constructed prior to the requirement for their installation. 8.C.9. The County shall work with local fire agencies. |

| Goals/Policy | Explanation |
|---|---|
| Policy 8.B.9 | The County shall work with local fire agencies to develop high-visibility fire prevention programs, including those offering voluntary home inspections and promoting awareness of home fire prevention measures. |
| Policy 8.B.10 | The County shall continue to implement state fire safety standards through enforcement of the applicable standards contained in the Placer County Land Development Manual. |
| Policy 8.B.11 | The County shall continue to work cooperatively with the California Department of Forestry and Fire Protection and local fire protection agencies in managing wildland fire hazards. |
| Policy 8.B.12 | The County shall support annexations and consolidations of fire districts and services to improve service delivery to the public. |
| **Safety Element – Airport Hazards** | |
| **Goal 8.D** | **To minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from airport hazards.** |
| Policy 8.D.1 | The County shall ensure that new development around airports does not create safety hazards such as lights from direct or reflective sources, smoke, electrical interference, hazardous chemicals, or fuel storage in violation of adopted safety standards. |
| Policy 8.D.2 | The County shall limit land uses in airport safety zones to those uses listed in the applicable airport comprehensive land use plans (CLUPs) as compatible uses. Exceptions shall be made only as provided for in the CLUPs. Such uses shall also be regulated to ensure compatibility in terms of location, height, and noise. |
| Policy 8.D.3 | The County shall ensure that development within the airport approach and departure zones complies with Part 77 of the Federal Aviation Administration Regulations (objects affecting navigable airspace). |
| **Safety Element – Emergency Management** | |
| **Goal 8.E** | **To ensure the maintenance of an Emergency Management Program to effectively prepare for, respond to, recover from, and mitigate the effects of natural or technological disasters.** |
| Policy 8.E.1 | The County shall continue to maintain, periodically update, and test the effectiveness of its Emergency Operations Plan. |
| Policy 8.E.2 | The County shall continue to coordinate emergency preparedness, response, recovery, and mitigation activities with special districts, service agencies, voluntary organizations, cities within the County, surrounding cities and counties, and state and federal agencies. |
| Policy 8.E.3 | The County shall continue to provide promotional programs that inform the general public of emergency preparedness and disaster response procedures. |
| Policy 8.E.4 | The County shall, through its Office of Emergency Services, maintain the capability to effectively respond to emergency incidents. |
| Policy 8.E.5 | The County shall maintain an emergency operations center to coordinate emergency response, management, and recovery activities. |
| Policy 8.E.6 | The County shall ensure that the siting of critical emergency response facilities such as hospitals, fire stations, sheriff's offices and substations, dispatch centers, emergency operations centers, and other emergency service facilities and utilities have minimal exposure to flooding, seismic and geological effects, fire, avalanche, and explosions. |
| **Safety Element – Public Safety and Emergency Management Facilities** | |
| **Goal 8.F** | **To protect public health and safety through safe location of structures necessary for the protection of public safety and/or the provision of emergency services.** |

| Goals/Policy | Explanation |
|---|---|
| Policy 8.F.1 | The County shall not locate new County structures necessary for the protection of public safety and/or the provision of emergency services in areas subject to inundation, subsidence, slope failure, surface rupture, or ground failure in a seismic event. Exception to this policy may be granted if the only alternative location would be so distant as to jeopardize the safety of the community, given that adequate precautions are taken to protect the facility. |
| Policy 8.F.2 | The County shall, within its authority, ensure that emergency dispatch centers, emergency operations centers, communications systems, vital utilities, and other essential public facilities necessary for the continuity of government be designed in a manner that will allow them to remain operational during and following an earthquake or other disaster. |
| **Safety Element – Hazardous Materials** | |
| **Goal 8.G** | **To minimize the risk of loss of life, injury, serious illness, damage to property, and economic and social dislocations resulting from the use, transport, treatment, and disposal of hazardous materials and hazardous materials wastes.** |
| Policy 8.G.1 | The County shall ensure that the use and disposal of hazardous materials in the County complies with local, state, and federal safety standards. |
| Policy 8.G.2 | The County shall discourage the development of residences or schools near known hazardous waste disposal or handling facilities. |
| Policy 8.G.3 | The County shall review all proposed development projects that manufacture, use, or transport hazardous materials for compliance with the County's Hazardous Waste Management Plan (CHWMP). |
| Policy 8.G.4 | The County shall ensure that the mining and processing of toxic metals in the County is conducted in compliance with applicable environmental protection standards and minimizes impacts on adjacent lands and the surrounding natural environment. |
| Policy 8.G.5 | The County shall strictly regulate the storage of hazardous materials and wastes. |
| Policy 8.G.6 | The County shall require secondary containment and periodic examination for all storage of toxic materials. |
| Policy 8.G.7 | The County shall ensure that industrial facilities are constructed and operated in accordance with current safety and environmental protection standards. |
| Policy 8.G.8 | The County shall require that new industries that store and process hazardous materials provide a buffer zone between the installation and the property boundaries sufficient to protect public safety. The adequacy of the buffer zone shall be determined by the County. |
| Policy 8.G.9 | The County shall require that applications for discretionary development projects that will generate hazardous wastes or utilize hazardous materials include detailed information on hazardous waste reduction, recycling, and storage. |
| Policy 8.G.10 | The County shall require that any business that handles a hazardous material prepare a plan for emergency response to a release or threatened release of a hazardous material. |
| Policy 8.G.11 | The County shall encourage the State Department of Health Services and the California Highway Patrol to review permits for radioactive materials on a regular basis and to promulgate and enforce public safety standards for the use of these materials, including the placarding of transport vehicles. |
| Policy 8.G.12 | The County shall identify sites that are in appropriate for hazardous material storage, maintenance, use, and disposal facilities due to potential impacts on adjacent land uses and the surrounding natural environment. |
| Policy 8.G.13 | The County shall work with local fire protection and other agencies to ensure an adequate Countywide response capability to hazardous materials emergencies. |
| **Safety Element – Avalanche Hazards** | |
| **Goal 8.H** | **To minimize the risk of loss of life, injury, and damage to property due to avalanche.** |

| Goals/Policy | Explanation |
|---|---|
| Policy 8.H.1 | The County shall maintain maps of potential avalanche hazard areas. |
| Policy 8.H.2 | The County shall require new development in areas of avalanche hazard to be sited, designed, and constructed to minimize avalanche hazards. |
| Policy 8.H.3 | The County shall not issue permits for new development in potential avalanche hazard areas (PAHA) as designated in the Placer County Avalanche Management Ordinance unless project proponents can demonstrate that such development will be safe under anticipated snow loads and conditions of an avalanche. |
| **Safety Element – Public Health** | |
| **Goal 8.I** | **To provide municipal-type environmental health services to the unincorporated urban development areas in Western Placer County.** |
| Policy 8.I.1 | Within overall County budgetary constraints, the County shall strive to provide one environmental health specialist per every 9,000 persons in the Western Placer County. |
| Policy 8.I.2 | The County shall endeavor to identify and control important diseases transmitted by environmental factors in the Western Placer County. |

## *Placer County Ordinances*

The Placer County General Plan provides policy direction for land use, development, open space protection, and environmental quality; however, this policy direction must be carried out through numerous ordinances, programs, and agreements. The following ordinances are among the most important tools for implementing the General Plan and/or are critical to the mitigation of hazards identified in this plan.

### Emergency Services (Chapter 2, Title 2.88)

The declared purposes of this article are to provide for the preparation and carrying out of plans for the protection of persons and property within this county in the event of an emergency; the direction of the emergency organization; and the coordination of the emergency functions of this county with all other public agencies, corporations, organizations, and affected private persons. As used in this article, "emergency" means the actual or threatened existence of conditions of disaster or of extreme peril to the safety of persons and property within the county caused by such conditions as air pollution, fire, flood, storm, epidemic, riot, drought, sudden and severe energy shortage, or earthquake or other conditions including conditions resulting from war or imminent threat of war, but other than conditions resulting from a labor controversy, which conditions are or are likely to be beyond the control of the services, personnel, equipment, and facilities of the county, requiring the combined forces of other political subdivisions to combat, or with respect to regulated energy utilities, a sudden and severe energy shortage requiring extraordinary measures beyond the authority vested in the California Public Utilities Commission.

The Placer County disaster council is created and shall consist of the following:

- The county executive officer, who shall be chairperson;
- The assistant director of emergency services, who shall be vice-chairperson;
- Such chiefs of emergency services as are appointed by the board of supervisors, provided for in a current emergency plan of the county;

- Such representative of civic, business, labor, veterans, professional, or other organizations having an official emergency responsibility, as may be appointed by the board of supervisors.

It shall be the duty of the Placer County disaster council, and it is empowered, to develop and recommend for adoption by the board of supervisors, emergency and mutual aid plans and agreements and such ordinances and resolutions and rules and regulations as are necessary to implement such plans and agreements.

## Fire Prevention (Chapter 9, Article 9.32)

### Part 3, Fire Hazards

This fire hazards ordinance requires all structures to maintain a fire break or clearing for a distance of 30 feet from the structure and keep the roofs free from all flammable debris. This part also sets requirements for burning permits, smoking restrictions in fire danger areas, and for the use and possession of fireworks.

### Part 4, Hazardous Vegetation Abatement on Unimproved Parcels

This Fire Prevention ordinance applies to areas defined as the North Tahoe Fire Protection District, Alpine Springs County Water District, Squaw Valley Public Service District and Northstar Community Services District.

The Placer County BOS supports the improved parcel defensible space obligations found in Public Resources Code (PRC) 4291. PRC 4291 does not address hazardous vegetation abatement on unimproved parcels and the potential impact that hazardous vegetation on an unimproved parcel could have on an adjacent improved parcel. This part extends and supplements state law to ensure defensible space activities are accomplished on unimproved parcels adjacent to improved parcels and along roadways and fire access easements so that land owners benefit from the application of PRC 4291 on unimproved parcels.

## Drainage of Water, Obstructing Natural Watercourse, Causing Flooding or Damage to County Highway Prohibited (Chapter 12, Article 12.12)

This article makes unlawful the draining of water from private land onto a public highway which results in flooding or damage to the highway. Also prohibited is obstruction of a natural watercourse so as to cause interference with, or damage or hazard to, public highways.

## Avalanche Management Areas (Chapter 12, Article 12.40)

This article identifies potential avalanche hazard areas (PAHA) in order to give notice to the public of identified PAHAs; to minimize health and safety hazards, disruption of commerce, and extraordinary public expenditures; and to detail proper siting, design, and construction safeguards for constructing in PAHAs.

## Water Conservation Requirements (Chapter 13, Article 13.04)

This article sets forth water conservation requirements applicable to all new and existing construction in the portion of Placer County lying east of the crest of the Sierra Nevada Range.

### Dry Creek Watershed Drainage Improvement Zone (Chapter 15, Article 15.32)

This article specific to the Dry Creek Watershed area supplements existing County policies of requiring on- and off-site drainage improvements to accommodate increased runoff resulting from new development and the expansion of existing development. This article establishes a drainage improvement zone for the Dry Creek watershed area. It requires the payment of specified fees and annual assessments as a condition of new development and the expansion of existing development within the watershed area for the installation and maintenance of roadway drainage and stormwater drainage improvements.

### Development Fees for Fire Protection (Chapter 15, Article 15.36)

The purpose of this article is to authorize the collection of development impact mitigation fees in any unincorporated area of Placer County to ensure the provision of the capital facilities necessary to maintain current levels of fire protection services necessitated by new development.

### Grading, Erosion, and Sediment Control (Chapter 15, Article 15.48)

The purpose of this article is to regulate grading on property within the unincorporated area of Placer County to safeguard life, limb, health, property and public welfare; to avoid pollution of watercourses with hazardous materials, nutrients, sediments, or other earthen materials generated on or caused by surface runoff on or across the permit area; and to ensure that the intended use of a graded site is consistent with the Placer County general plan, any specific plans adopted thereto and applicable Placer County ordinances including the zoning ordinance, flood damage prevention ordinance, (Article 15.52) environmental review ordinance (Chapter 18 Placer County Code) and applicable chapters of the California Building Code.

### Flood Damage Prevention Regulations (Chapter 15, Article 15528)

It is the purpose of this article to promote public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;
- Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;
- Insure that potential buyers are notified that property is in an area of special flood hazard; and
- Insure that those who occupy the areas of special flood hazard assume responsibility for their actions (Prior code § 4.1310.30).

In order to accomplish its purpose, this article includes methods and provisions for:

- Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in increasing damage in erosion, flood heights, or flood velocities;
- Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;
- Controlling fill, grading, dredging, and other development which may increase flood damage; and
- Preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or may increase flood hazards in other areas (Prior code § 4.1310.40).

Of specific interest are the construction requirements for elevation and flood-proofing. Specifically, these require new construction and substantial improvements to have the lowest floor, including basement, elevated a minimum of base flood elevation plus one foot. It is further recommended that the finish floor be a minimum of two feet above the base flood elevation.

### Subdivisions: Design Standards and Improvements (Chapter 16, Article 16.08)

Placer County's subdivision ordinance regulates the design and improvement of land divisions and the dedication of public improvements needed in connection with land divisions. The ordinance includes provisions for the following hazard-related issues: erosion control, flooding and drainage, water supply, and fire suppression.

### Zoning Ordinance (Chapter 17)

The purpose of the zoning ordinance is to classify and regulate the best use of buildings, structures, and land in the unincorporated area of Placer County in a manner consistent with the Placer County General Plan. This ordinance is designed to ensure management of land use in a manner that will assure the orderly development and beneficial use of the unincorporated areas of Placer County for residential, commercial, industrial, agricultural, forestry, open space and other purposes. To further these objectives, this ordinance includes requirements for reducing hazards to the public resulting from the inappropriate location, use or design of buildings and land uses in relation to natural and built hazards. It addresses setbacks, buffers, natural resources protection and drainage. For example, the flood hazard combining district identifies areas subject to the 100-year floodplain and requires that new development in this combining zone abide by standards within the Placer County Flood Damage Prevention Ordinance (Article 15.52). Likewise, the geological hazard combining district was established to identify areas where geological and soil conditions may present hazards to life or property. All land use permit applications for projects located within this district require a report describing all geological and avalanche hazards in the region proposed for development.

### Building and Construction Codes Adopted (Title 15, Chapter 15.04)

This article adopts the California Building Code, 2013 Edition Volumes 1 and 2, based on the 2012 International Building Code including, the administrative provisions in Chapter 1, Division II and among the Appendices, Appendix C Group U - Agricultural Buildings and Appendix J - Grading, as published by the International Code Council (ICC) as adopted and amended by the California Building Standards

Commission in the California Building Standards Code, Title 24 of the California Code of Regulations, Part 2. (Ord. 5731-B § 4, 2013; Ord. 5629-B § 3, 2010).

This article adopts the California Fire Code, 2013 Edition Volumes 1 and 2, including, the administrative provisions in the California Building Code, Chapter 1, Division II based on the 2012 International Fire Code including the Appendices, as published by the International Code Council (ICC) as adopted and amended by the California Building Standards Commission in the California Building Standards Code, Title 24 of the California Code of Regulations, Part 9. (Ord. 5731-B § 18, 2013; Ord. 5629-B § 3, 2010)

## *Placer County Plans/Studies*

### Debris Management Plan (2019)

For the protection of the public health, safety, and welfare of residents and visitors, Placer County recognizes the responsibility to be prepared for a debris-generating incident.

Disasters can produce substantial volumes of debris, creating hazardous conditions that endanger the public and disrupt the essential daily lifestyle and economy of the community.

Disasters will result in large expenditures of labor, equipment, materials, and supplies at substantial cost. It is imperative that Placer County is prepared to provide an early, safe, and quick response to restoring environmentally safe and economically viable conditions to the disaster-affected areas. It is to this end that Placer County developed this Debris Management Plan (DMP).

The DMP addresses how response to a debris-generating incident will be coordinated at the local and regional level. The DMP does not address routine debris incidents that the County can manage; the operational concepts reflected in this plan focus on potential large-scale disasters that can generate significant volumes of debris requiring an unusual or extraordinary response.

### Groundwater Sustainability Plan (western County- expected to be completed in 2022)

The groundwater plan will identify management actions that would be triggered if groundwater levels fall below defined levels, enabling us to mitigate declines in groundwater capacity. We are currently conducting modeling of the basin that will factor in future climate change impacts. Data on that will be available in the coming months, and we can provide drafts as they are available. The final report is due for completion in January 2022. Meeting materials, past reports, and updates are found here: https://westplacergroundwater.com/get-involved/.

### Stormwater Management Plan, 2003-2008 (Revised March 1, 2004).

This comprehensive plan is designed to ultimately reduce pollution in stormwater runoff in compliance with the County's National Pollutant Discharge Elimination System (NPDES) stormwater permit within portions of western Placer County (excludes Foresthill and Colfax). The plan includes processes for accomplishing the goals of minimizing construction site runoff as well as post-construction stormwater management in newly developed and redeveloped areas.

### Placer County Flood Control and Water Conservation District's Stormwater Management Manual, 1990.

The primary purpose of the District is to protect lives and property from the effects of flooding through comprehensive, coordinated flood prevention planning, using consistent standards to evaluate flood risk, and by implementing flood control measures such as requiring new development to construct detention basins and operation and management of a flood warning system. This manual presents policy, guidelines, and specific criteria for the development and management of natural resources, facilities and infrastructure for stormwater management. Flooding is recognized as the primary problem associated with development occurring adjacent to streams and the consequent increase in stormwater runoff. The plan refers to the Basic Drainage Law Requirements which include four general principles that apply to development projects in general. The principles dictate what upstream and downstream property owners must do to minimize alteration to existing, functional drainage patterns in the region of their property.

### Watershed Management Plans

A watershed management plan is a document that guides efforts to control pollution, manage stormwater, and protect and improve local streams and the uplands that surround them. These plans also provide collaborative agreement among government, other local stakeholders, and citizens during the planning process. Placer County has been involved in the development of a number of comprehensive watershed management plans. These watershed plans guide the County and other stakeholders in protecting, managing, and improving environmental resources and habitat. Watershed Management Plans in Placer County include:

- Dry Creek Coordinated Management Plan;
- Dry Creek Watershed Control Plan
- Auburn Ravine/Coon Creek Ecosystem Restoration Plan;
- Cross Canal Watershed Flood Control Plan
- Pleasant Grove/Curry Creek Ecosystem Restoration Plan;
- Auburn Ravine Restoration Plan;
- Auburn Bowman Community Plan Hydrology Study
- Rock Creek Restoration Plan; and
- Squaw Creek Restoration Plan.

### Auburn/Bowman Community Plan, Hydrology Study, JMM 1992

This study covers the Auburn/Bowman area and includes flood mitigation recommendations.

### Dry Creek Watershed Flood Control Plan, 2011 (Updated)

This plan covers the Dry Creek Watershed area and includes flood mitigation recommendations. The primary purposes of this Update to the Dry Creek Watershed Flood Control Plan, prepared for the Placer County Flood Control and Water Conservation District, are to update the hydrologic analysis of the watershed, provide recommendations for feasible means to reduce future flood damages, identify possible means to mitigate development impacts on flooding, and recommend an updated funding plan. The 1992

Dry Creek Watershed Flood Control Plan recommended structural and non-structural measures to correct existing deficiencies and mitigate for impacts of future development. Some of the recommendations have been implemented while many have not due to environmental and/or economic constraints. This Plan Update evaluates the hydrology of the watershed and provides recommendations to correct existing deficiencies and mitigate impacts of future development using an overall watershed approach with the objective of identifying measures that will be both feasible and effective.

### Placer County Conservation Plan (PCCP)

As part of the Placer Legacy Program, County staff initiated the preparation of a Natural Community Conservation Plan and Habitat Conservation Plan to comply with the State and Federal Endangered Species Act, and to programmatically comply with the Federal Clean Water Act related to wetlands. This effort, now referred to as the Placer County Conservation Plan (PCCP), is proceeding for the first phase of the PCCP covering western Placer County.

The PCCP is intended to address the impacts associated primarily with unincorporated growth in west Placer and growth associated with the build out of Lincoln's updated General Plan. Development in western Placer County will require the preservation of approximately 54,300 acres of land between now and 2050.

### Placer County Community Wildfire Protection Plan 2012

The Placer County CWPP provides recommendations to reduce the threat of wildfire-related damage to people, property, and ecological elements within the County. This document estimates the hazards and risks associated with wildland fire in proximity to WUI within each applicable Fire Safe Council areas. This information, in conjunction with identification of the values at risk, defines areas of special interest and allows for prioritization of mitigation efforts. From the analysis of the data presented, solutions and mitigation recommendations are offered that aid homeowners, land managers, and other interested parties in developing short-term and long-term planning efforts.

### Lake Tahoe Basin Community Wildfire Protection Plan 2015

This Community Wildfire Protection Plan was developed by the Tahoe Fire and Fuels Team (TFFT), an action-oriented forum of organizations involved in implementing the Lake Tahoe Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy. It builds on previous planning efforts, and covers the wildland-urban interface for all Lake Tahoe Basin fire protection districts and departments. The CWPP examines common issues faced by Lake Tahoe communities and general strategies for mitigation. And provides an in-depth assessment of each TFFT geographic division and provide specific recommendations, actions, and projects for improving community resiliency to wildfire.

### Placer County Emergency Operations Plan (2010)

The Emergency Operations Plan, including the Placer Operational Area, includes information on hazards facing the County and associated response and recovery information.

There are multiple annexes to the EOP. They include:

- Continuity of Government/Continuity of Ops
- Rescue/Search and Rescue Operations
- Mass Evacuation
- Recovery
- Hazardous Materials
- Public Health Emergencies
- Dam Failure and Flood
- Avalanche
- Terrorism

## Placer County Warning and Evacuation Procedures

Placer County and its incorporated communities have a variety of systems and procedures established to protect its residents and visitors to plan for, avoid, and respond to a hazard event including those associated with floods and wildfires. This includes Pre-Disaster Public Awareness and Education information which is major component in successfully reducing loss of life and property in a community when faced with a potentially catastrophic incident. Much of this information is not specific to a given hazard event and is always accessible to the public on local County and City websites. An overview of specific warning and evacuation systems and procedures are summarized further below.

### Warning Systems

Flooding and wildfires can occur quickly and with little warning. In the event of a severe flood, wildfire or other natural hazard event, the Placer County OES webpage will identify current emergencies and associated protocols at: http://www.placer.ca.gov/Departments/CEO/Emergency/CurrentEmergencyInfo.aspx. The County will also provide emergency information and broadcast warnings on local radio and television stations as well as on social media websites such as Facebook and Twitter. The new Everbridge system may be activated and helicopters may be used to broadcast warnings/alerts via a PA system. If time and condition/safety permits, vehicle patrol units may also broadcast warnings in affected areas. County OES also works closely with the National Weather Service for issuing an Emergency Alert System (EAS).

### Everbridge

In 2015, Placer County and all participating cities to this plan established the Everbridge Alert System employed for issuing flood warnings, alerts and evacuation notices to the public. The Placer County Flood Control and Water Conservation District coordinated with County OES, Sheriff, County Planning, and Department of Public Works and Facilities for this system. Flood warning zones across the County were created and Sheriff's dispatch will take the lead in employing Everbridge and issuing specific flood event warnings as necessary. The District will continue to assist during an event by providing technical input to OES as to the need for a warning issuance as well as any resulting evacuations.

### ALERT System

The County's network of ALERT Flood Warning gauges, including numerous precipitation gages and stream level gages located throughout western Placer County provide real time monitoring information on

current flood conditions which assist in informing the activation of additional warning and evacuation of affected areas. Currently the County is proposing ALERT 2 type upgrades to be funded by the State DWR FERP program over the next several years. This stream level information is broadcast as necessary throughout the County during heavy rain events where a potential for flooding exists.

### Dam Protocols

Placer County OES and Placer County Sheriff's Office (PCSO) Dispatch receive printed copies of Emergency Action Plans from FERC regulated dams as well as non-FERC dams such as those owned by PCWA and PG&E. The County receives annual updates for the EAPs and participates in their scheduled annual drills and exercises. The EAPs contain maps of affected downstream areas and include warning levels and protocols/procedures for making notifications and evacuations. Should an event trigger the activation of the EAP including notification protocols, county OES receives this information via direct phone calls from the originating source/agency or from PCSO Dispatch and/or Cal OES. County OES then follows the notification and evacuation procedures called for in the EAP.

### Evacuation Procedures

The 2010 Placer County Emergency Operations Plan includes addresses the planned response to emergency situations associated with natural disasters and emergencies in or affecting Placer County. The EOP is intended to facilitate multi-agency and multi-jurisdictional coordination in emergency operations. It seeks to mitigate the effects of hazards, prepare for measures to be taken which will preserve life and minimize damage, enhance response during emergencies and provide necessary assistance, and establish a recovery system to return the County the local jurisdictions to their normal state of affairs.

The EOP includes multiple annexes, one of which is the Mass Evacuation Annex. This Annex addresses evacuation policies and procedures due to natural hazards and other events. Emergency evacuation planning involves multiple governmental agencies and private organizations performing such functions as threat identification, warning, evacuation decision making, communications, traffic control, and shelter and medical needs management.

In addition to the Mass Evacuation Annex to the EOP, the County has several evacuation plans covering various areas of the County:

- East Side Emergency Evacuation Plan
- Emergency Evacuation Plan for Rural Lincoln Communities
- Greater Colfax Area Emergency Action Plan
- Foresthill Divide Iowa Hill Divide Emergency Plan

The purpose of these area-specific Evacuation Plans is to help increase preparedness and to facilitate the efficient and rapid evacuation of threatened communities. These plans include maps and prescribe specific responsibilities for first responders, County staff and other state, federal and non-profit contributing agencies for conducting an emergency evacuation of one or more communities as part of a larger natural disaster or human-caused incident. An overview of a sample evacuation plan, the East Side Evacuation Plan is provided below.

### *East Side Evacuation Plan*

This is a plan for a physical evacuation of one or more communities in the unincorporated Placer County area on the eastern side of the County that is necessitated by a larger incident, most probably a forest fire or flood. For the purposes of this plan, the "eastern side" comprises all of Placer County from just west of Cisco Grove to the Nevada State line not including the areas within the Tahoe National Forest and the Lake Tahoe Basin Management Unit. The dense forests, rugged terrain, and the scarcity of roads in the area – problems that present difficulties for first responders and residents/transients alike - complicate any evacuation. Many agencies helped to develop this plan to help increase preparedness, and facilitate the efficient and rapid evacuation of threatened communities in the far eastern end of the County. While focusing on fire-induced evacuations, the plan remains applicable to all evacuations in general.

## Placer County Post Disaster Mitigation Policies and Procedures

The Placer County EOP is intended to facilitate multi-agency and multi-jurisdictional coordination during emergencies including hazard events. Through it policies and procedures it seeks to mitigate the effects of hazards, prepare for measures to be taken which will preserve life and minimize damage, enhance response during emergencies and provide necessary assistance, and establish a recovery system in order to return the community to their normal state of affairs. The County is in the process of updating the EOP and annexes by July 2016.

Post disaster recovery procedures for all hazards, including flood, are primarily addressed the Recovery Annex to the EOP. As detailed in the EOP, the goal of the recovery phase of an emergency incident or natural disaster is to return the residents, public services and private sector in an impacted area to their pre-disaster state, and through implementation of hazard mitigation measures, seek to prevent, as much as possible, similar damage, destruction or chaos after incidents and disasters in the future. The Recovery Annex includes detailed objectives, responsibilities and procedures for restoration of services and returning of the affected area to its pre-emergency condition. Mitigation is emphasized as a major component of recovery efforts. As part of the recovery planning, a Cal OES approved Debris Management Plan is also being developed for incorporation into the emergency management program for the County.

The Recovery Annex includes and is divided into two parts:

- Part One identifies the organization for and responsibilities of County agencies and Departments specifically for recovery. Since most large incidents are multi-jurisdictional, in all probability, recovery will be coordinated by the County working in its Operational Area (OA) role which allows it to coordinate emergency activities with all political entities in the County, i.e., the cities and special districts. Whereas overall recovery will be coordinated by the OA, in single jurisdiction incidents or disasters as well as multijurisdictional incidents, individual jurisdiction's always work directly with state and federal organizations for much of the recovery effort.
- Part Two is a compendium of information on recovery and provides definitions of the various types, levels and providers of recovery aid and assistance. Numerous types and levels of disaster assistance from federal, state and county sources are available to individuals, businesses and government agencies. The type and extent of the emergency or declared disaster determines which sort and how much of each type assistance is ultimately provided.

The post-disaster recovery annex details roles, responsibilities, and protocols for both short and long term recovery and includes information for:

- Initial Damage Assessment (windshield survey and safety assessment)
- Detailed Damage Assessment, with an initial priority on public and critical infrastructure and services
- Establishing Recovery Assistance Facilities and Information Centers
- Procedures for Individual Assistance, Public Assistance, and Post-disaster Mitigation

## Sheltering in Place

All stakeholders (i.e. county, fire districts/departments, special districts, utility districts, ARC, and the community at large) agreed on the need for emergency shelters. Stakeholders participated in regular meetings (monthly, quarterly, or semi-annually) and drills/exercises (annually or bi-annually) where emergency shelter is discussed as one of the topics. Stakeholders conduct planning meetings or phone/televideo conferences for forecasted/anticipated event such as severe weathers as well as unscheduled events wild land fires, floods, and earthquake. These forums foster education and collaborative efforts amongst the stakeholders and better prepare them to respond to emergency events. Good progress has been made in the initiative over the past several years. Some of the significant completed work includes:

Western Placer: Development of the Foresthill Divide & Iowa Hill Divide Emergency Plan first published and disseminated by PCOES in August 2006, updated in January 2009, and is currently being updated. The primary purpose of the plan is to pre-establish evacuation protocols and pre-identified evacuation routes and sites for the emergency responders, local residents, and general public in case of large wildland fires occurring in the areas. Due to the remote location of the two areas and limited road access, the plan provides a contingency plan for the community. Although the plan does not address shelter in place for the individual residents in their home, it does address a contingency plan for the communities to shelter in place in pre-identified sites; thereby minimizing risk and danger due to limited road accesses. Furthermore, the plan addresses facilities and supporting resources for each of the pre-identified sites (e.g. food, water, medical, etc.).

Placer County Water Agency (a special district and not a county department/agency) built a facility in Foresthill. The agency worked with the County to identify the facility as a potential site for use as an emergency shelter.

Eastern Placer: The County worked closely with the American Red Cross (ARC) to identify facilities in the North Tahoe area (including Truckee) for use as emergency shelters. Schools in Tahoe City, Kings Beach, and Truckee have been identified and the ARC continues to conduct on-site assessments of the facilities for suitability as emergency shelters. Additionally, the ARC has fielded three trailers in the areas with each trailer containing 50 cots, blankets, pillows, and a generator to support each shelter.

The County is planning to build a government facility in the North Tahoe area in the future. Discussion are underway to designate the facility as an emergency shelter, equipped with generators and supporting resources.

## Crude Oil/Hazmat by Rail Operational Guide, 2015

The production of crude oil in North America has increased by over 500% in the last 5 years - the majority of this product is being transported by rail. First Responders and Emergency Managers are scrambling to address the increased volume over rail. Placer and portions of Nevada County are situated in a rail corridor that connects the Sierra Nevada Mountains to the San Francisco Bay area. While crude oil is not currently traveling via this route, many believe that when the refineries in the Bay Area are retrofitted to accept Bakken crude, the Sierra Nevada route will be used to bring crude to Bay Area refineries.

Cooperation from the Railroad officials including Union Pacific (UP) and Burlington Northern Santa Fe (BNSF) is essential for any coordinated response plan. Through a Unified Command, the railroad will bring a wealth of specialized equipment and personnel through on-call staff and regional contractors. These resources take time to assemble and respond. First Responders will be on scene for a period of time and charged with scene stabilization and the protection of the public. This operational guide will cover the first two operational periods while more definitive resources are being mobilized.

## Community Plans

Placer County has developed numerous community plans. The following are available online:

- Alpine Meadows General Plan
- Auburn/Bowman Community Plan
- Carnelian Bay Community Plan
- Colfax General Plan
- Dry Creek/West Placer Community Plan
- Foresthill Divide Community Plan
- Granite Bay Community Plan
- Horseshoe Bar/Penryn Community Plan
- Kings Beach Community Plan and Industrial Plan
- Martis Valley Community Plan
- Meadow Vista Community Plan
- Newcastle/Ophir Area General Plan
- North Stateline Community Plan
- North Tahoe Area General Plan
- Ophir General Plan
- Sheridan Community Plan
- Squaw Valley Area General Plan
- Sunset Industrial Area Plan Update (in process)
- Tahoe Basin Community Plan Update (in process)
- Tahoe City Area General Plan
- Tahoe City Community Plan
- Tahoe Vista Community Plan
- Weimar/Applegate/Clipper Gap General Plan
- West Shore Area General Plan
- Sunset Industrial Plan.

### Watershed Restoration Plans and Projects

Watershed planning and restoration includes all of the activities related to preserving, protecting and restoring the streams, wetlands, forests and other natural resources within a watershed.

The Natural Resources Division is managing a number of grants that are affiliated with the implementation of the Placer Legacy Program and watershed restoration projects. The majority of the funding applies to watershed-based planning efforts associated with CALFED Bay-Delta Program (to restore the ecological health and improve water management for beneficial uses in the Bay-Delta System) or Proposition 204 (The Safe, Clean, Water Supply Act of 1996). Specific restoration projects include:

- Auburn Ravine Restoration Plan
- Miners Ravine Restoration Project
- Miners Ravine Fish Passage Project
- Rock Creek Restoration Plan
- Squaw Creek Restoration Plan
- Sundance Properties Wetlands Restoration Project

### Greenway Plans

Placer County has two Greenway plans under development – one in the Dry Creek watershed in south Placer County, the second along the Truckee River in the Sierra. Greenways are corridors of linear open space established for wildlife habitat and open space conservation and/or recreation. Greenways may be held on public land, voluntarily retained on private land, or conserved through public-private partnerships.

The plans signal the start of a multi-year effort to create new public recreational opportunities, increase the mobility of cyclists, walkers, and joggers, and enrich the lives of Placer's residents and visitors. The plans are:

- Dry Creek Greenway Regional Vision
- Truckee River Corridor Access Plan

## 4.4.2. Placer County's Administrative/Technical Mitigation Capabilities

Table 4-113 identifies the County personnel responsible for activities related to mitigation and loss prevention in the County. THIS TABLE IS FROM THE LAST PLAN. UPDATED AS NEEDED. MAKE SURE TO FILL OUT THE LAST CELL.

*Table 4-113 Placer County Administrative/Technical Mitigation Capabilities*

| Administration | Y/N | Describe capability<br>Is coordination effective? |
|---|---|---|
| Planning Commission | | |
| Disaster Council | Y | Developed for this planning process. |

| | | |
|---|---|---|
| Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems) | | |
| Mutual aid agreements | Y | There are cooperative fire agreements among departments inside and bordering the County. |
| Other | | |
| **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 adequately trained to enforce regulations regarding hazards. Staff coordinates with other departments on an as needed basis. |
| Floodplain Administrator | Y/FT | The floodplain administrator is a CFM |
| Emergency Manager | Y/FT | Staff is adequately trained to enforce regulations regarding hazards. Staff coordinates with other departments on an as needed basis. |
| Community Planner | T/FT | Staff is adequately trained to enforce regulations regarding hazards. Staff coordinates with other departments on an as needed basis. |
| Civil Engineer | Y/FT | Staff is adequately trained to enforce regulations regarding hazards. Staff coordinates with other departments on an as needed basis. |
| GIS Coordinator | Y/FT | Staff is adequately trained to enforce regulations regarding hazards. Staff coordinates with other departments on an as needed basis. |
| Other | | |
| **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 | Everbridge (Reverse 911) |
| Hazard data and information | | |
| Grant writing | | |
| Hazus analysis | | |
| Other | | |
| **How can these capabilities be expanded and improved to reduce risk?** | | |
| PROVIDE SPECIFIC DETAILS OF AREAS FOR IMPROVEMENT OF THESE TYPES OF CAPABILITIES AND HOW/WHY IT WILL HELP YOUR JURISDICTION | | |

### 4.4.3. Placer County's Fiscal Mitigation Capabilities

Table 4-114 identifies financial tools or resources that the County could potentially use to help fund mitigation activities. THIS TABLE IS FROM THE LAST PLAN. UPDATED AS NEEDED. MAKE SURE TO FILL OUT THE LAST CELL.

*Table 4-114 Placer 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 | N | |
| Authority to levy taxes for specific purposes | N | |
| Fees for water, sewer, gas, or electric services | Y | Funding for mitigation projects is limited to projects associated with providing service in that fee area. A portion of sewer fees go to replacing portable generators that CARB requires to be phased out to comply with applicable laws and regulations. Generators ensure that we retain the needed temporary power supplies at critical facilities during power outages. |
| Impact fees for new development | Y | |
| Storm water utility fee | N | Prop 218 limits the ability to create a stormwater utility. |
| Incur debt through general obligation bonds and/or special tax bonds | Y | |
| Incur debt through private activities | Y | |
| Community Development Block Grant | N | |
| Other federal funding programs | Y | |
| State funding programs | Y | |
| Other | N | |
| **How can these capabilities be expanded and improved to reduce risk?** | | |
| PROVIDE SPECIFIC DETAILS OF AREAS FOR IMPROVEMENT OF THESE TYPES OF CAPABILITIES AND HOW/WHY IT WILL HELP YOUR JURISDICTION | | |

### 4.4.4. Placer County Mitigation Education, Outreach, and Partnerships

Table 4-115 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. THIS TABLE IS FROM THE LAST PLAN. UPDATED AS NEEDED. MAKE SURE TO FILL OUT THE LAST CELL.

*Table 4-115 Placer 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 | |
| Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education) | Y | See the action in Chapter 5 for more information. |
| Natural disaster or safety related school programs | N | |
| StormReady certification | N | |
| Firewise Communities certification | Y | |
| Public-private partnership initiatives addressing disaster-related issues | Y | In the fall of 2015, the County commenced a joint effort with Valley Vision on a Business Resiliency Initiative in the County for outreach, education, and general preparedness. |
| Other | Y | Building inspectors attend a minimum of two-four technical trainings each year. Many inspectors are certified by CALEMA for damage assessment efforts. Handouts are available for Wildland-Urban Interface standards as well as defensible space and safe residential driveway access standards. |
| **How can these capabilities be expanded and improved to reduce risk?** | | |
| PROVIDE SPECIFIC DETAILS OF AREAS FOR IMPROVEMENT OF THESE TYPES OF CAPABILITIES AND HOW/WHY IT WILL HELP YOUR JURISDICTION | | |

## 4.4.5. Other Mitigation Efforts

PLEASE PROVIDE A LISTING AND BRIEF DESCRIPTION OF ONGOING AND PAST (SINCE 2016) HAZARD MITIGATION PROJECTS UNDERTAKEN BY JURISDICTION.

The County has data on tree mortality and formed a task force. The state also formed a tree mortality task force.