2015

Ventura County Multi-Hazard Mitigation Plan

September 2015

Unincorporated Ventura County
City of Camarillo
City of Fillmore
City of Moorpark
City of Ojai
City of Oxnard
City of Port Hueneme
City of Santa Paula
City of Thousand Oaks
City of Ventura
Calleguas Municipal Water District
Casitas Municipal Water District
Channel Islands Beach Community Services District
Ojai Valley Sanitary District
United Water Conservation District
Ventura County Fire Protection District
Ventura County Watershed Protection District

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List of Acronyms and Abbreviations

ACP	Asian citrus psyllid
Cal FIRE	California Department of Forestry and Fire Protection
Cal OES	California Governor's Office of Emergency Services
CalARP	California Accidental Release Prevention
CFR	Code of Federal Regulations
cfs	cubic feet per second
CGS	California Geological Survey
CO_2	carbon dioxide
CPG 201	*Threat and Hazard Identification and Risk Assessment Guide: Comprehensive Preparedness Guide (CPG) 201*, Second Edition, August 2013
CRS	Community Rating System
DFIRM	Digital Flood Insurance Rate Map
DMA 2000	Disaster Mitigation Act of 2000
DSOD	Division of Safety of Dams
EnSo	El niño-Southern oscillation
EO	Executive Order
EPC	Emergency Planning Council
FEMA	Federal Emergency Management Agency
FHSZ	Fire Hazard Severity Zones
FIRM	Flood Insurance Rate Map
FMP	Floodplain Management Plan
GIS	Geographic Information System
HLB	Huanglongbing (disease)
HMA	Hazard Mitigation Assistance
IPCC	Intergovernmental Panel on Climate Change
LCR	Levee Certification Report
MHMP	Multi-Hazard Mitigation Plan
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
OES	Office of Emergency Services
PAL	Provisionally Accredited Levee
PGA	peak ground acceleration
PRR	PAL (Provisionally Accredited Levee)-Response Report

RL	Repetitive Loss
SFHA	Special Flood Hazard Areas
SRL	Severe Repetitive Loss
Stafford Act	Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988
STAS	State Threat Assessment System
USACE	United States Army Corps of Engineers
USGS	U.S. Geological Survey
VCFPD	Ventura County Fire Protection District
VCOE	Ventura County Office of Education
VCWPD	Ventura County Watershed Protection District

1.1 OVERVIEW

This 2015 Multi-Hazard Mitigation Plan (2015 MHMP) is written to (1) address the local mitigation planning requirements of the Disaster Mitigation Act of 2000 (DMA 2000) for Unincorporated Ventura County and other local participants (**Section 1.5**); and (2) address the 510 Floodplain Management Planning activities of the Community Rating System (CRS) for the Ventura County Watershed Protection District (VCWPD) on behalf of Unincorporated Ventura County and the City of Oxnard.

This section provides an introduction to hazard mitigation planning as well as a brief description of DMA 2000 and CRS. This section also identifies the other local participants, provides a brief narrative about Unincorporated Ventura County and the other local participants, and describes the various sections and appendices of the 2015 MHMP.

The 2015 MHMP supersedes the 2010 MHMP.

1.2 HAZARD MITIGATION PLANNING

As defined in Title 44 of the Code of Federal Regulations (CFR), Subpart M, Section 206.401, hazard mitigation is "any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards." As such, hazard mitigation is any work to minimize the impacts of any type of hazard event before it occurs. Hazard mitigation aims to reduce losses from future disasters. It is a process in which hazards are identified and profiled, the people and facilities at risk are analyzed, and mitigation actions to reduce or eliminate hazard risk are developed. The implementation of the mitigation actions, which include short- and long-term strategies that may involve planning, policy changes, programs, projects, and other activities, is the end result of this process.

1.3 DISASTER MITIGATION ACT OF 2000

In recent years, hazard mitigation planning has been driven by a new federal law known as DMA 2000. On October 30, 2000, Congress passed DMA 2000 (Public Law 106-390), which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act) (Title 42 of the United States Code Section 5121 et seq.) by repealing the act's previous mitigation planning section (409) and replacing it with a new mitigation planning section (322). This new section emphasized the need for state, tribal, and local entities to closely coordinate mitigation planning and implementation efforts. This new section also provided the legal basis for the Federal Emergency Management Agency's (FEMA's) mitigation plan requirements for mitigation grant assistance.

To implement these planning requirements, FEMA published an Interim Final Rule in the Federal Register on February 26, 2002 (44 CFR Part 201). The tribal planning requirements were updated in 44 CFR Part 201.7 in 2009. The local mitigation planning requirements are identified in their appropriate sections throughout the 2015 MHMP and also within the FEMA Plan Review Tool included in **Appendix A**.

1.4 COMMUNITY RATING SYSTEM – ACTIVITY 510 FLOODPLAIN MANAGEMENT PLANNING

CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum National Flood Insurance Program (NFIP) requirements. Under CRS, flood insurance premium rates are discounted to reflect the reduced flood risk that results when community actions meet the three goals of CRS: reducing flood damage to insurable property, strengthening and supporting the insurance aspects of the NFIP, and encouraging a comprehensive approach to floodplain management. In 2011, Unincorporated Ventura County joined CRS as a class 6 rating, entitling flood insurance policy holders to receive a 20 percent premium discount annually. In 2013, the City of Oxnard joined CRS as a class 9 rating, entitling flood insurance policy holders to receive a 5 percent discount annually.

There are 18 programs or "activities" in CRS that are intended to reduce or eliminate exposure to floods, including Activity 510 Floodplain Management Planning. To implement these activities, FEMA published the 2013 NFIP CRS Coordinators Manual (FIA 15-2013), which spells out the credit and credit criteria for CRS activities. The floodplain management planning activities for Unincorporated Ventura County (administered by the VCWPD) and the City of Oxnard are identified in their appropriate sections throughout the 2015 MHMP and also in the 510 FMP Checklist included in **Appendix A**.

1.5 LOCAL PARTICIPANTS

The participating jurisdictions and special districts, referred to in this plan as local participants, are listed below.

- Unincorporated Ventura County
- City of Camarillo
- City of Fillmore
- City of Moorpark
- City of Ojai
- City of Oxnard
- City of Port Hueneme
- City of Santa Paula
- City of Thousand Oaks
- City of Ventura
- Calleguas Municipal Water District
- Casitas Municipal Water District
- Channel Islands Beach Community Services District
- Ojai Valley Sanitary District
- United Water Conservation District

- Ventura County Fire Protection District (VCFPD)
- Ventura County Office of Education (VCOE), on behalf of the following school districts: Briggs Elementary School District, Conejo Valley Unified School District, Fillmore Unified School District, Hueneme School District, Mesa Union School District, Moorpark Unified School District, Moorpark Unified School District, Mupu Elementary School District, Oak Park Unified School District, Ocean View School District, Ojai Unified School District, Oxnard Elementary School District, Pleasant Valley School District, Rio School District, Santa Clara Elementary School District, Santa Paula Union High School, Simi Valley Unified School District, Somis Union School District, Ventura County Community College District, and Ventura Unified School District.
- Ventura County Watershed Protection District (VCWPD)

1.6 COMMUNITY PROFILE

1.6.1 Unincorporated Ventura County

Ventura County, one of 58 counties in the state, is located on southern California's Pacific coast, just northwest of Los Angeles. Ventura County is bordered by Kern County to the north; Santa Barbara County and the Pacific Ocean to the northwest and southwest, respectively; and Los Angeles County to the east and southeast. Ventura County stretches across 2,208 square miles, of which 1,845 square miles is land and 363 square miles is water. Anacapa Island of the Channel Islands National Park and San Nicholas Island are in Ventura County.

Ventura County consists of 10 cities and a number of unincorporated communities. The majority of the county's population resides in the cities. According to the U.S. Census Bureau, and using the Population Estimates Program which produces July 1 estimates for years after the last published decennial census (2010), Ventura County has a population of 846,178 as of July 1, 2014. In Unincorporated Ventura County, the population was 93,770 as of 2010, with 31,670 housing units.

1.6.2 Participating Cities

Nine of the 10 Ventura County cities participated in the preparation of the 2015 MHMP. Key information about each city's area (square miles) and population (U.S. Census Bureau 2010) and building stock (Hazus 2.2 data, 2010) is provided below.

1.6.2.1 City of Camarillo

The City of Camarillo had an estimated population of 65,235 in 2010, with 21,980 housing units. The city has a total area of 19.75 square miles.

1.6.2.2 City of Fillmore

The City of Fillmore had an estimated population of 15,002 in 2010, with 3,959 housing units. The city has a total area of 3.36 square miles.

1.6.2.3 City of Moorpark

The City of Moorpark had an estimated population of 34,421 in 2010, with 9,393 housing units. The city has a total area of 12.47 square miles.

1.6.2.4 City of Ojai

The City of Ojai had an estimated population of 7,461 in 2010, with 2,885 housing units. The city has a total area of 4.37 square miles.

1.6.2.5 City of Oxnard

The City of Oxnard had an estimated population of 197,911 in 2010, with 40,914 housing units. The city has a total area of 27.08 square miles.

1.6.2.6 City of Port Hueneme

The City of Port Hueneme had an estimated population of 21,750 in 2010, with 5,530 housing units. The city has a total area of 4.51 square miles.

1.6.2.7 City of Santa Paula

The City of Santa Paula had an estimated population of 29,595 in 2010, with 7,162 housing units. The city has a total area of 5.71 square miles.

1.6.2.8 City of Thousand Oaks

The City of Thousand Oaks had an estimated population of 126,693 in 2010, with 39,847 housing units. The city has a total area of 55.41 square miles.

1.6.2.9 City of Ventura

The City of San Buenaventura (Ventura) is the county seat of Ventura County. The City had an estimated population of 107,195 in 2010, with 32,961 housing units. The city has a total area of 22.15 square miles.

1.6.3 Participating Special Districts

As noted previously, half of the participating communities are special districts. Information about each of the eight districts is provided below.

1.6.3.1 Calleguas Municipal Water District

The Calleguas Municipal Water District was formed in 1953. In 1960, the District joined the Metropolitan Water District of Southern California as a way of securing water from the state water system. In 1965, the District completed Lake Bard. The 2005 state-of-the-art treatment plant for Lake Bard treats 65 million gallons of water a day.

Communities served include the cities of Oxnard, Port Hueneme, Camarillo, Thousand Oaks, Moorpark, Simi Valley; the unincorporated areas of Oak Park, Santa Rosa Valley, Bell Canyon, Lake Sherwood, Somis, Camarillo Estates, Camarillo Heights, and Naval Base Ventura County.

The district serves an area of approximately 365 square miles and approximately 75 percent of Ventura County's population.

1.6.3.2 Casitas Municipal Water District

The Casitas Municipal Water District was formed in 1952. In 1956, the Ventura River Project was authorized by Congress, which included the Robles Diversion facility on the Ventura River, the Robles Canal, and the Casitas Dam.

Currently, the district supplies water to 60,000 to 70,000 people in western Ventura County and to hundreds of farms. The district boundaries encompass the City of Ojai, Upper Ojai, the Ventura River Valley area, the City of Ventura to Mills Road and the Rincon and beach area to the ocean and Santa Barbara County line. The district is governed by a five-member board of directors.

1.6.3.3 Channel Islands Beach Community Services District

Channel Islands Beach Community Services District was created on December 13, 1982, as a result of the demand of the citizens of the beach community for an independent governmental entity to provide solutions to their need for various services, including but not limited to water, sewer, and trash services.

1.6.3.4 Ojai Valley Sanitary District

The Ojai Valley Sanitary District was established in 1985 as the result of a consolidation of the Ventura Avenue, Oak View, and Meiners Oaks sanitary districts and the Sanitation Department of the City of Ojai. The district provides sanitary sewer service for about 20,000 residents of the City of Ojai and the unincorporated Ojai Valley. It collects and transports wastewater for treatment at the Ojai Valley Treatment Plant and disposes of effluent and sludge.

The district is a public agency organized under the Sanitary District Act of 1923 and is governed by an elected seven-member board. The district's collection system consists of approximately 120 miles of trunk and main sewer lines.

1.6.3.5 United Water Conservation District

Local landowners formed the Santa Clara River Water Conservation District in 1927. As cities and agricultural areas grew, water usage increased rapidly. By 1950, the district was reorganized and renamed the United Water Conservation District. The district constructed the Santa Felicia Dam, three spreading grounds, and distribution facilities, all of which were urgently needed to combat seawater intrusion.

The United Water Conservation District is governed by seven directors, one elected from each of the seven district divisions. The district administers a "basin management" program for the Santa Clara Valley and Oxnard Plain, using the surface flow of the Santa Clara River and its tributaries for replenishment of groundwater. Facilities include Santa Felicia Dam; Lake Piru Recreation Area; the Piru, Saticoy, and El Rio spreading grounds; the Pleasant Valley Pipeline and Reservoirs; the Oxnard-Hueneme Pipeline, Pumping Plant, and Pumping Trough Pipeline; and other facilities.

1.6.3.6 Ventura County Fire Protection District

In 1928, the VCFPD was formed to provide fire protection to the county, with the exception of the four established cities. Since that time, six additional cities have become incorporated. Today, the VCFPD acts as the Ventura County Fire Department for Unincorporated Ventura County and as the City fire department for six cities (Camarillo, Moorpark, Ojai, Port Hueneme, Thousand Oaks, and Simi Valley).

1.6.3.7 Ventura County Office of Education

Ventura County comprises 20 K-12 school districts. The VCOE provides facility planning, construction, and maintenance to the school districts. VCOE also operates specialized schools in the county. For the 2010 MHMP, the VCOE will represent all of 20 K-12 school districts in Ventura County, as well as the Ventura County Community College District.

1.6.3.8 Ventura County Watershed Protection District

The VCWPD, formerly known as the Ventura County Flood Control District, was formed on September 12, 1944, by an act of the California State Legislature. It is governed by the Ventura County Board of Supervisors. The District is the responsible sponsoring local agency for federal flood control projects throughout Ventura County. The entire county, except for the islands of Anacapa and San Nicholas, is within the District's sphere of influence and boundaries. The VCWPD also serves as the principal co-permittee and manages the implementation of the Ventura Countywide Stormwater Quality Management Program under the municipal National Pollutant Discharge Elimination System permit for urban stormwater runoff discharges in Ventura County. The VCWPD also manages FEMA's NFIP and CRS for Unincorporated Ventura County.

1.7 DESCRIPTION OF THE MULTI-HAZARD MITIGATION PLAN

The remainder of the 2015 MHMP consists of the sections and appendices described below.

1.7.1 Section 2: Record of Adoption

Section 2 addresses the adoption of the 2015 MHMP. The adoption resolution is provided in **Appendix B**.

1.7.2 Section 3: Planning Process

Section 3 describes the planning process. Specifically, this section describes major milestones achieved during the MHMP update process and identifies key stakeholders, including the members of the MHMP Committee and Floodplain Management Plan (FMP) Committee (**Appendix C**). This section also includes a description of the committee meetings held as part of the plan update process. Additionally, this section documents public outreach activities (**Appendix D**) and discusses the review and incorporation of relevant plans, reports, and other appropriate information.

1.7.3 Section 4: Hazard Analysis

Section 4 describes the process through which the Ventura County Project Management Team reviewed and re-selected the hazards to be profiled in the 2015 MHMP. The hazard analysis

includes the nature, history, location, extent, and probability of future events for each hazard. Location and historical hazard figures are provided in **Appendix F**.

1.7.4 Section 5: Vulnerability Analysis

Section 5 identifies the methodology for analyzing potentially vulnerable assets—population, residential building stock, Repetitive Loss (RL) properties, and critical facilities and infrastructure such as emergency response, government, and education facilities. This information was compiled by assessing the potential impacts from each hazard using Geographic Information System (GIS) data. The resulting information identifies the full range of hazards that Unincorporated Ventura County and the other local participants could face and the potential social impacts, damages, and economic losses.

1.7.5 Section 6: Capability Assessment

Section 6 includes the component of a capability assessment. The capability assessment evaluates the human and technical, financial, and legal and regulatory resources available for hazard mitigation. It also describes current, ongoing, and completed mitigation projects and programs. In addition, it includes an overview of local participation in the NFIP.

1.7.6 Section 7: Mitigation Strategy

Section 7 provides a blueprint for reducing the potential losses identified in the vulnerability analysis. This process included a review of each local participant's 2010 MHMP mitigation action plan; development of a list of potential mitigation actions for each local participant; and selection and prioritization of a new mitigation action plan for each local participant. In addition, Unincorporated Ventura County (as detailed in the VCWPD mitigation strategy) and the City of Oxnard addressed additional CRS activities, including the review of each potential mitigation action.

1.7.7 Section 8: Plan Maintenance

Section 8 describes the formal plan maintenance process to ensure that the 2015 MHMP remains an active and applicable document. The plan maintenance process consists of monitoring, evaluating, and updating the plan; monitoring mitigation projects and closeout procedures; implementing the plan through existing planning mechanisms; and achieving continued public involvement. Forms to assist in plan maintenance are found in **Appendix X**. In addition, **Appendix X** includes the annual plan maintenance review performed by the VCWPD from 2011 to 2014.

1.7.8 Section 9: References

Section 9 includes references used to develop this document.

1.7.9 Appendices

The following appendices follow the main body of the plan:

- A FEMA Compliance
- B Adoption Resolutions

- C MHMP Committee
- D FMP Committee
- E Public Outreach and Stakeholder Involvement
- F Figures
- G Unincorporated Ventura County
- H City of Camarillo
- I City of Fillmore
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- K City of Ojai
- L City of Oxnard
- M City of Port Hueneme
- N City of Santa Paula
- O City of Thousand Oaks
- P City of Ventura
- Q Calleguas Municipal Water District
- R Casitas Municipal Water District
- S Channel Islands Beach Community Services District
- T United Water Conservation District
- U Ventura County Fire Protection District
- V Ventura County Office of Education
- W Ventura County Watershed Protection District
- X Plan Maintenance

1.7.10 Annex

The following annex follows the appendices:

- Annex A: Activity 610 – Flood Warning Program

2.1 OVERVIEW

This section describes the adoption requirements for the 2015 MHMP.

2.2 ADOPTION DOCUMENTATION

The local hazard mitigation planning requirements and floodplain management planning activities for the adoption of the 2015 MHMP are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element E: Plan Adoption
E1. Does the Plan include documentation that the Plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement § 201.6(c)(5))
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 9: Adopt the Plan
No additional information.

Unincorporated Ventura County; the cities of Camarillo, Moorpark, Ojai, Oxnard, Port Hueneme, Santa Paula, Thousand Oaks, and Ventura; and the participating special districts of Calleguas Water District, Casitas Municipal Water District, Channel Islands Beach Community Services District, United Water Conservation District, VCFPD, VCOE, and VCWPD are the local participants represented in this MHMP and meet the requirements of Section 409 of the Stafford Act and Section 322 of the DMA 2000.

Each local participant's governing body has adopted this 2015 MHMP by resolution. A scanned copy of each resolution is included in **Appendix B.**

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3.1 OVERVIEW

This section summarizes:

- MHMP review and revision, including the incorporation of existing plans and other relevant information and coordination with other agencies
- MHMP update process
- Planning committees
- Public outreach and stakeholder involvement

Supporting information is provided in **Appendix E**.

3.2 MHMP REVIEW AND REVISION

The local hazard mitigation planning and floodplain management planning requirements for the plan review and evaluation as well as coordination with communities and other agencies are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element D: Plan Review, Evaluation, and Implementation
D1. Was the Plan revised to reflect changes in development? (Requirement § 201.6(d)(3))

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element A: Planning Process
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement § 201.6(b)(3))

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 3: Coordinate with Other Agencies
A. Review of existing studies and plans. **B.** Coordinating with other communities and agencies.

3.2.1 MHMP Review and Recommendations

This 2015 MHMP is the third iteration of the plan. The MHMP was originally developed for Ventura County in 2005, and a second version was developed in 2010. Prior to developing the 2015 version of the plan, the consultant, and the MHMP and FMP committees reviewed the 2010 MHMP to identify the areas that require updating. Key recommendations for the 2015 MHMP are noted in **Table 3-1**.

Table 3-1. 2010 MHMP Review and Recommendations

Section Reviewed	Recommendation (for 2015 MHMP)
Overall	Include CRS information per the updated CRS Manual (2013 version), and include call out boxes indicating where CRS 510 steps are met throughout the MHMP.
Section 1: Introduction	Streamline this section for a more efficient read, and update demographic information using the most recent census report (2010).
Section 2: Prerequisites	None.
Section 3: Planning Process	Provide more details about who the MHMP Committee members coordinated with within their jurisdictions. Include a description of the FMP Committee.
Section 4: Hazard Analysis	Add two hazards to the hazard analysis: Climate Change and Drought.
Section 5: Vulnerability Analysis	To be developed based on updated critical facilities and the most up-to-date hazard data available. Streamline the section by including Summary of Impact tables for each hazard that very simply but effectively illustrate the impact of each hazard.
Section 6: Capability Assessment	Update based on any changes that may have occurred since the last MHMP.
Section 7: Mitigation Strategy	Incorporate the Hazard Mitigation Assistance Program requirements into the prioritization process for choosing mitigation actions.
Section 8: Plan Maintenance	Update the Mitigation Project Progress Report to include more information about the project's status, including major project milestones, plan goals, project status, and cost status.
Section 9: References	Update to include new references.

During the planning process, the consultant reviewed and incorporated information from existing plans, studies, and reports. Key information sources integrated into this document are listed in **Table 3-2**; additional references are provided in **Section 9**.

Table 3-2. Review and Incorporation of Other Studies and Plans

Study/Plan	Key Information
2013 California Hazard Mitigation Plan	Disaster declaration information
Ventura County General Plan: Goals, Policies and Programs (last amended on March 24, 2015)	Community mitigation-related goals and programs
Ventura County General Plan: Hazards Appendix (last amended on October 22, 2013)	Historical hazard and location information
FEMA Flood Insurance Study, Ventura County, CA and Incorporated Areas (Revised January 7, 2015)	Historical flood information
Coastal Resilience Ventura Technical Report for Coastal Hazards Mapping (July 31, 2013)	Rising tide inundation and coastal storm flood hazard information
California Tsunami Evacuation Playbook, City of Ventura – Ventura County (No. 2014-Vent-01)	Tsunami warning and tsunami inundation information
U.S. Geological Survey (USGS) Emergency Assessment of Post-Fire Debris-Flow Hazards for the 2013 Springs Fire, Ventura County, CA (OFR 2014-1001)	Recent post-fire debris flow hazard information
Ventura County Resource Conservation District Long Range Plan 2012 – 2017	Community conservation goals and strategies
2013 VCFPD Unit Strategic Fire Plan	Fire prevention information, unit goals, and objectives

3.2.2 Floodplain Management Coordination with Communities and Other Agencies

Shortly after the plan update kick-off process, the VCWPD reached out to several local, state, and federal floodplain management stakeholders to notify them of the 2015 MHMP process; request additional relevant flood data, mapping, and/or information on flood projects; and invite them to participate in the plan update process. The VCWPD mailed personalized letters to 10 city floodplain managers on April 1, 2015, and an additional seven personalized letters to state and federal partners on April 11, 2015. The agencies contacted are listed in **Table 3-3**, and a copy of each mailed letter is included in **Appendix E**. The VCWPD followed up with five city floodplain managers and one federal agency (FEMA) at the Ventura County Floodplain Managers Meeting in Camarillo, California, on May 20, 2015. At this meeting, the consultant presented an overview of the MHMP, including updated flood hazard figures and potential flood mitigation actions; and the group discussed flood hazard data information, including Letter of Map Revisions for levees and The Nature Conservancy's Coastal Resilience project. The meeting agenda and sign-in sheet are included in **Appendix E**.

Table 3-3. Floodplain Management Coordination with Communities and Other Agencies

Communities/Agencies	
Camarillo Floodplain Manager*	(City of) Ventura Floodplain Manager*
Fillmore Floodplain Manager	FEMA*
Moorpark Floodplain Manager	U.S. Army Corps of Engineers
Ojai Floodplain Manager	National Oceanic and Atmospheric Administration (NOAA) – National Weather Service (NWS) Forecast Office Los Angeles/Oxnard
Oxnard Floodplain Manager*	NOAA – California-Nevada River Forecast Center
Port Hueneme Floodplain Manager	California Department of Water Resources – Division of Integrated Regional Water Management, Southern Region
Santa Paula Floodplain Manager*	California Department of Water Resources State-Federal Flood Operations Center
Simi Valley Floodplain Manager*	California Department of Water Resources Flood Operations Branch
Thousand Oaks Floodplain Manager	

* Follow-up on May 20, 2015.

3.3 MHMP UDPATE PROCESS

The local hazard mitigation planning requirements to document the planning process are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element A: Planning Process
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement § 201.6(c)(1))

In March 2015, the Ventura County Sheriff's Office of Emergency Services (Ventura County Sheriff's OES) kicked off the 2015 MHMP update process. For the 2015 MHMP update, the Ventura County Project Management Team included Dale Carnathan and Kevin McGowan from the Ventura County Sheriff's OES and Brian Trushinski from the Ventura County Watershed Protection District. The major tasks the Ventura County Project Management Team is responsible for include preparing for the project kick-off, developing the public outreach process, coordinating and developing planning committee meetings, and providing input to and review of plan deliverables. The Ventura County Project Management Team will also be responsible for maintaining the plan. **Table 3-4** shows the key planning tasks and the timeline associated with each task.

Table 3-4. Plan Update Schedule

Major Milestones	Month – 2015						
	Mar	April	May	June	July	Aug	Sept
Stakeholder Outreach							
Project Management							
MHMP and FMP Planning Committee Meetings							
Public Outreach							
Project kick-off flyer and media release							
Online Survey							
Public Presentations							
Hazard Analysis							
Draft Hazard Analysis							
Vulnerability Analysis							
Draft Vulnerability Analysis							
Mitigation Strategy							
2010 Capability Assessment and Mitigation Action Plan Review							
2015 Mitigation Action Plan							
Final Draft MHMP							
Administrative Draft MHMP							
Public Review Draft MHMP							
Final Draft MHMP							
California Governor's Office of Emergency Services (Cal OES)/ISO/FEMA Review							

3.4 PLANNING COMMITTEES

The local hazard mitigation planning and floodplain management requirements for documenting who was involved in the planning process, including planning committee members, are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element A: Planning Process
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement § 201.6(c)(1))

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 2: Involvement the Public
A. A. Planning process conducted through a planning committee.

3.4.1 MHMP Committee

Similar to the past two versions of the plan, a MHMP Committee was formed to help guide development of the 2015 MHMP. The membership of the 2010 MHMP Committee was used as a starting point for the 2015 MHMP Committee. The 2015 MHMP Committee includes staff from relevant County departments and agencies, representatives for each participating city and special district, and other entities including Cal OES. The 2015 MHMP Committee is shown in **Table 3-5**. Committee meetings (including time, date, location, and agenda) were listed on the 2015 MHMP website and were open to the public for any interested stakeholders to attend.

The MHMP Committee met two times during the plan update process to discuss the following:

- **April 9, 2015:** introduction of the project; overview of hazard mitigation planning in general; climate change; 2010 critical facilities and infrastructure review; 2010 capability assessment review
- **May 19, 2015:** hazard maps, vulnerability analysis process; 2015 MHMP potential mitigation actions; 2015 MHMP mitigation strategy process

Detailed meeting agendas and minutes are provided in **Appendix D**.

Table 3-5. MHMP Committee

City/District/Agency	Name	Title
Cal OES	Yvette Laduke	Emergency Services Coordinator
California State University Channel Islands	Maggie Tougas	Emergency Manager
Calleguas Municipal Water District	Julio Reyes	Operations Supervisor
Camrosa Water District	Bill Keyes	Technical Services Manager
Casitas Municipal Water District	Neil Cole	Civil Engineer
Channel Islands Beach Community Services District	Jared Bouchard	General Manager
City of Camarillo	Heidi Zahrt	Community Emergency Response Team Coordinator
City of Camarillo	John Fraser	Sr. Management Analyst
City of Fillmore	Rigo Landeros	Fire Chief
City of Moorpark	Teri Davis	Senior Management Analyst
City of Ojai	Steve McClary	Deputy City Manager
City of Oxnard	Robert Hearne	Civil Engineer/Floodplain Manager

Table 3-5. MHMP Committee

City/District/Agency	Name	Title
City of Port Hueneme	Greg Brown	Community Development Director
City of Santa Paula	Dustin Lazenby	Assistant Chief
City of Thousand Oaks	Jim Taylor	Public Works, Senior Civil Engineer
City of Thousand Oaks	Grahame Watts	Special Projects Manager
City of Ventura	Brian Clark	Fire Marshal
Ojai Valley Sanitary District	Ronald Sheets	Operations Superintendent
United Water Conservation District	Kaili Taniguchi	Assistant Engineer
Ventura County Fire Protection District	Dustin Gardner	Division Chief
Ventura County School's Self-Funding Authority (Office of Education)	Russ Olsen	Director of Risk Management
Ventura County Sheriff's OES	Dale Carnathan – Committee Chair	Program Administrator III
Ventura County Sheriff's OES	Kathy Gibson	Program Assistant
Ventura County Sheriff's OES	Kevin McGowan	Assistant Director
Ventura County Watershed Protection District	Bruce Rindahl	Manager, Watershed Resources and Technology Division
Ventura County Watershed Protection District	Brian Trushinski	Floodplain Manager

The MHMP Committee members were considered initial points of contact for the jurisdictions and special districts they represented. All MHMP Committee members had the responsibility of attending meetings, participating in meeting discussions, providing jurisdiction/special district information, reviewing draft material and serving as a liaison for their jurisdiction/special district. As a liaison, MHMP Committee members were the face of the project for their jurisdiction, but throughout the planning process MHMP Committee members worked with their colleagues from other departments. These additional stakeholders were contacted throughout the planning processes and provided input as appropriate based on their area of expertise. Table 3-6 illustrates these additional contacts.

Table 3-6. MHMP Stakeholders – City/District Contacts

City/District	Additional Participant
City of Camarillo, City Manager's Office	Kathy Talley
City of Fillmore, Administrative Services Department	David Rowlands, City Manager
City of Fillmore, Building & Safety Department	Michal Lapraik, City Engineer
City of Fillmore, Building & Safety Department	Michael Koroknay, Building & Safety

Table 3-6. MHMP Stakeholders – City/District Contacts

City/District	Additional Participant
City of Fillmore, Finance Department	Gaylynn Brien, Finance Director
City of Fillmore, Fire Department	Bill Herrera, Assistant Fire Chief
City of Fillmore, Fire Department	Billy Gabriel, Fire Captain
City of Fillmore, Planning Department	Kevin McSweeney, City Planner
City of Moorpark, City Manager's Office	Deborah Traffenstedt, Assistant City Manager
City of Moorpark, Community Development Department	Dave Bobardt, Community Development Director
City of Moorpark, Public Works Department	Dave Klotzle, City Engineer/Public Works Director
City of Moorpark, Parks, Recreation & Community Services	Jeremy Laurentowski, Parks and Recreation Director
City of Port Hueneme – Police	Pete Freiberg, Sergeant
City of Thousand Oaks - Community Development Department	Jeff Spector, Senior Planner
City of Thousand Oaks - Human Resources Department	Kevin Fishman, Health & Safety Specialist
Conejo Recreation and Park District	Matt Kouba, Park Superintendent
Oxnard Union High School District	Steve Dickinson, Assistant Superintendent Administrative Services
Santa Paula High School District	Jeff Argend, District Safety Manager
United Water Conservation District	James Grisham, Engineering Department
United Water Conservation District	Craig Morgan, Engineering Department
United Water Conservation District	Michael Ellis, Operations and Maintenance Department
United Water Conservation District	John Carmen, Operations and Maintenance Department
United Water Conservation District	Brian Collins, Operations and Maintenance Department
Ventura County Community College District Police	Lt. Greg Beckley, Supervisor
Ventura County Community College District Police	Joel Justice, Chief of Police
Ventura County Community College District Police	Lt. Cesar Romero, Supervisor
Ventura County Division of Building and Safety	Matt Wyatt, Supervising Building Inspector
Ventura County Public Works Agency	Phil Raba, Safety Manager
Ventura County Sheriff's OES	Bill Boyd, Program Administrator II
Ventura County Sheriff's OES	Ken Carter, Staff Services Manager II
Ventura County Sheriff's OES	Ivan Rodriguez, Administrative Aid
Ventura County Sheriff's OES	Darryl Smith, Emergency Manager
Ventura County Sheriff's OES	Gil Zavlodaver, Program Administrator II

3.4.2 FMP Committee

For the 2015 MHMP, the Ventura County Project Management Team formed a separate FMP Committee to focus on CRS 510 Floodplain Management Planning activities. As listed in **Table 3-7**, committee members consisted of representatives from various Ventura County departments and agencies, including the Ventura County Resource Management Agency's Planning Division and the City of Oxnard. The City of Oxnard and the VCWPD also participated on the MHMP Committee.

The FMP Committee met three times during the plan update process to discuss the following:

- **April 9, 2015:** hazard identification; climate change; 2010 critical facilities and infrastructure review; 2010 capability assessment review
- **April 30, 2015:** draft hazard figures; 2010 MHMP mitigation strategy review; CRS 510 Floodplain Management Planning Activity Step 7 overview
- **June 18, 2015:** updated draft hazard figures; RL property dataset; 2015 MHMP potential mitigation actions; 2015 MHMP mitigation strategy ranking process; 2015 VCWPD/ Oxnard mitigation action plan selection

Similar to the MHMP Committee meetings, all meetings were open to the public, and the details for each meeting (including time, date, location, and agenda) were posted on the MHMP website. Detailed meeting agendas and minutes are provided in **Appendix D**.

Table 3-7. FMP Committee

Local Participant	Name
VCWPD – Advance Planning: Floodplain Manager & CRS Coordinator	Brian Trushinski – Committee Chair
VCWPD – Advance Planning: Watershed Planning and Permits	Sergio Vargas
VCWPD – Watershed Resources and Technology	Bruce Rindahl
VCWPD – Strategic Decision Group	Gerard Kapuscik
Ventura County Public Works Agency: Development & Inspection Services	Jim O'Tousa
Ventura County Public Works Agency: Safety Officer	Phil Raba
Ventura County Public Works Agency: Transportation Division	Howard De Leon
Ventura County Resource Management Agency: Planning Division	Daniel Klemann
Ventura County Resource Management Agency: Building and Safety Division	Matt Wyatt
Ventura County Sheriff's OES	Dale Carnathan
City of Oxnard Public Works Agency	Robert Hearne

3.5 PUBLIC OUTREACH AND STAKEHOLDER INVOLVEMENT

The local hazard mitigation planning and floodplain management planning requirements for public outreach and stakeholder involvement are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element A: Planning Process
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement § 201.6(b)(2))
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement § 201.6(b)(1))

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 2: Involve the Public
B. Public meetings held at the beginning of the planning process.
C. Public meeting held on the draft plan.
D. Other public information activities to encourage input.

3.5.1 Multi-Media Releases

At the project's initiation, media releases were distributed that announced the project's start, described the purpose of the project, and provided points of contact for anyone who wanted to participate in the planning process or wanted more information about the project. A media release was distributed by the Ventura County Sheriff's Office; information regarding the 2015 MHMP project could also be found on the follow media outlets: Ventura County Sheriff's Office Facebook page, Ventura County Sheriff's Office Nixle account, Ventura County Sheriff's Office Twitter account, Ventura edhat website, and the Ventura County Star (newspaper). Screenshots of the media releases are included in **Appendix E**.

3.5.2 MHMP Website

A website was developed to provide continual public access to information on the 2015 MHMP project: http://www.venturacountymhmp.com/. The website provides an overview of the project, points of contact for the consultants and the County project leads, information on all upcoming meetings (including date, time, location, and agenda), and draft pieces of the plan for review. Screenshots of the MHMP website are included in **Appendix E**. The County's CRS website (www.vcfloodinfo.com) is also linked to the MHMP website.

3.5.3 Online Questionnaire

A questionnaire was developed for the public to provide feedback on their concerns about natural and human-caused hazards. The questionnaire could be found on the project website under the tab of "Plan Participation". A copy of the questionnaire is included in **Appendix E**.

3.5.4 Web Portal

At the conclusion of the project, a web portal was implemented that allows the user to view and manipulate the various hazard maps developed for the 2015 MHMP. The web portal uses Google Earth; each hazard map is a separate layer that can be added to the general Google Earth base map. Multiple hazard layers can be viewed at a time to better understand the relationships between hazards, and the search and zoom functions allow users to personalize their views. The web portal will remain accessible after completion of the plan for continued public use. An example of the web portal is included in **Appendix E**.

3.5.5 Emergency Planning Council

As part of the public outreach process, Ventura County Sheriff's OES and the consultant made two presentations about the 2015 MHMP at the Ventura County Emergency Planning Council (EPC). The Ventura County EPC is an advisory body whose mission is to lead a unified effort in improving disaster preparedness, mitigation, response, and recovery countywide. These efforts are achieved through a partnership of cooperation and collaboration with all levels of government, non-government organizations, and the private sector. The 2015 EPC members include representatives from Ventura County Sheriff's OES, VCFPD, American Red Cross of Ventura County, Ventura County Voluntary Organizations Active in Disasters, Ventura County Economic Development Agency, and the California Air National Guard. The Ventura County EPC meetings are open to the public, and the details for each meeting (including time, date, location, and agenda) are posted on the county website. The first presentation (April 30, 2015) was held at the beginning of the planning process. At this presentation, the consultant discussed new information to be included in the 2015 MHMP, including climate change and drought, and answered any questions and comments about the update process. At the July 30 presentation, the consultant discussed the Final Draft 2015 MHMP and the Cal OES and FEMA review and upcoming plan adoption process. The EPC and the general public were also given the opportunity to ask questions, and were encouraged to read the Final Draft 2015 MHMP online and submit comments over a 3-week public comment period from July 24 through August 14, 2015. Agenda's from the EPC meetings are included in **Appendix E**.

3.5.6 Town Hall

On July 25, 2015, a town hall was hosted at the Camarillo Police Department. The town hall lasted 2 hours, with a formal presentation scheduled on the hour for each hour. The remainder of each hour was an open forum for attendees to ask questions, view the hazard maps, and interact with the project staff. Attendees were able to provide feedback/comments verbally, by completing a written questionnaire, and through an online web forum that allows anonymous submittals if the participant desires. Images from the town hall are found in **Appendix E**.

3.5.7 Virtual Town Hall

From June 25, 2015, to September 4, 2015, a website was created to provide the public with a platform to review and comment on a digital version of the Public Draft 2015 MHMP and engage with planning team staff. An option to review printed copies of the plan, which were distributed to public facilities around the county, and comment on the plan via the website was also made available. The community was informed about the Virtual Town Hall through various marketing platforms, including printed flyers that were distributed at venues and events such as

the Ventura County Fair; digital ads displayed on websites, social media sites, and movie theaters; and traditional print media such as the VC Star.

3.5.8 Brochure

On June 11, 2015, the VCWPD and County sent a CRS information brochure (Activity 330) by first-class mail to all 4,675 floodplain property owners in Unincorporated Ventura County. The brochure included a 1-page flyer announcing the MHMP update process, and inviting all floodplain property owners to participate the update process. A copy of this brochure is included in **Appendix E**.

4.1 OVERVIEW

A hazards analysis includes identifying, screening, and profiling each hazard. The hazards analysis encompasses natural, human-caused, and technological hazards. Natural hazards result from unexpected or uncontrollable natural events of significant size and destructive power. Human-caused hazards result from human activity and include technological hazards. Technological hazards are generally accidental or result from events with unintended consequences (for example, an accidental hazardous materials release).

This hazards analysis consists of the following two steps:

- Hazard identification and screening
- Hazard profiles

4.2 HAZARD IDENTIFICATION AND SCREENING

As the initial step in this hazards analysis, the Ventura County Project Management Team and planning committees reviewed the list of hazards identified in the 2010 MHMP and considered the following factors:

- Is the hazard included in the 2010 MHMP?
- Is the hazard included in the Ventura County General Plan: Hazard Appendix (2013)?
- Is the hazard included in the 2013 State of California MHMP?
- Has the hazard occurred in Ventura County and been declared a Presidential or state emergency or disaster in the past 15 years?

Based on the above analysis, the Ventura County Project Management Team and planning committees determined that all hazards identified in the 2010 MHMP should be included in the 2015 MHMP. In addition, it was decided that two additional hazards, climate change and drought, should be profiled in the 2015 MHMP, based on recent disaster declarations and hazards addressed in the 2013 State of California Multi-Hazard Mitigation Plan.

As such, the following 12 hazards are profiled in the 2015 MHMP.

- Agricultural Biological
- Climate Change
- Dam Failure Inundation
- Drought
- Earthquake
- Flood
- Landslide
- Levee Failure Inundation
- Post-Fire Debris Flow
- Tsunami
- Wildfire
- Winter Storm

Hazards that were brought up for discussion, but were not included in the 2015 MHMP should be re-reviewed for possible inclusion in the next (2020) iteration of the plan. Ventura County will continue to assess these hazards and as whether or not they are appropriate to include in the County's hazard mitigation plan. The hazards to be re-reviewed are listed below.

Hazards to be Re-Reviewed for the 2020 MHMP

Hazard	Description
Hazardous Materials Release	Hazardous materials are substances that may have negative effects on health or the environment. Exposure to hazardous materials may cause injury, illness, or death. Recent hazardous materials releases in Ventura County include the Mission Incident (Santa Paula) and the Cochran Incident (Simi Valley). The California Accidental Release Prevention (CalARP) program is intended to prevent accidental releases of substances and to minimize the damage if releases do occur.
Epidemic	An epidemic is when a disease affects a disproportionately large number of individuals within a population, community, or region at the same time. The recent measles outbreak (of which a few cases were identified in Ventura County) and Ebola scare heightened awareness of an epidemic.
Train Derailment	Train derailments are of most concern when there are volatile or flammable substances on the train and when the train is in a highly populated area. Recent incidents in Ventura County include the Metrolink incident in Oxnard and the derailment that occurred in Chatsworth. The concern is also heightened by reports of potential transport of Bakken crude oil on railways within California.
Cyber-Attack	A cyber-attack is deliberate exploitation of computer systems, technology-dependent enterprises, and networks. Cyber-attacks use malicious code to alter computer code, logic, or data, resulting in disruptive consequences that can compromise data and lead to cybercrimes, such as information and identity theft. Cyber-attack is an ongoing concern that has been increasing in frequency and magnitude.
Aircraft Incident	Aircraft incidents include the Alaska Air crash off the coast of Ventura County in 2000. Efforts directed at preparedness, planning, response, and mitigation of an aircraft incident is generally coordinated, maintained, and exercised by local area airports, along with area fire departments. The Federal Aviation Administration has authority over events resulting from this hazard.
Civil Disturbance	A civil disturbance results from civil unrest, when individuals or groups in the general population feel they are being discriminated against or that their rights are not being upheld. Civil disturbance spans a variety of actions including strikes, demonstrations, riots, and rebellion. Recently there was a small-scale protest incident at the base regarding the housing of children who recently entered the U.S. Preparedness, planning, response, and mitigation efforts pertaining to civil disturbance typically are jointly coordinated by area law enforcement agencies.
Terrorism	In general, terrorism is violence against civilians to achieve a political or ideological objective through fear. Terrorism can occur in various forms: assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear, or radiological weapons. The State of California has a Homeland Security Advisor, who oversees statewide public safety, emergency management, emergency communication, counterterrorism efforts, and the State Threat Assessment System (STAS).
Invasive Species	Inclusion of non-native biological species that are threatening water supplies in Ventura County. Recently, there was a discovery of quagga mussels in Lake Piru that has resulted in much concern about water supply and infrastructure impacts. The Ventura County Watershed Protection District has implemented procedures to prevent the spread of New Zealand mudsnails from the Santa Clara River.

4.3 HAZARD PROFILES

The local hazard mitigation planning and floodplain management planning requirements for hazard profiles are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element B: Hazard Identification and Risk Assessment
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement § 201.6(c)(2)(ii))
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement § 201.6(c)(2)(i))

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 4: Assess the Hazard
A. Plan includes the assessment of the flood hazard with: (1) A map of known flood hazards. (2) A description of known flood hazards. (3) A discussion of past floods.
B. Plan includes an assessment of less frequent floods.
C. Plan includes an assessment of areas likely to flood.
D. The plan describes other natural hazards.

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 5: Assess the Problem
D. Areas that provide natural floodplain functions.

The hazards selected were profiled based on existing available information. The hazard profiling consists of describing the nature of the hazard, disaster history, location of hazard, and extent and probability of future events. The sources of information are listed in **Section 9** of this document.

According to the *Threat and Hazard Identification and Risk Assessment Guide: Comprehensive Preparedness Guide (CPG) 201*, Second Edition, August 2013 (CPG 201), drought, earthquake, flood, landslide, tsunami, wildfire, and winter storm are classified as natural hazards, and dam failure and levee failure inundation are classified as technological hazards. CPG 201 does not classify agricultural biological, climate change, or post-fire debris flow hazards. Therefore, the hazards profiled for this MHMP are discussed in alphabetical order and not by CPG 201 classification. The order of discussion does not signify level of risk.

4.3.1 Agricultural Biological

Nature: Agricultural infestation generally involves the artificial introduction of an insect, disease, vertebrate, or weed pest. These pests are particularly destructive to the local agricultural crops because they have no natural enemies to keep them under control. The type and severity of an agricultural infestation will vary based on many factors, including weather, crop diversity, and proximity to urban areas.

The onset for an agricultural infestation can be rapid. Controlling its spread is critical to limiting the impacts of the infestation. Methods for detecting, limiting, and eradicating exotic pests include delimitation trapping, quarantining the area and preventing the shipment of products from the designated area, aerial and ground application of pesticides, and in extreme cases, premature harvest and/or crop destruction. Duration is largely affected by the degree to which the infestation is aggressively controlled, but is commonly more than 1 week. The warning time needed to control infestation is typically more than 24 hours. Maximizing warning time is also critical for reducing damage from this hazard.

The County's agriculture industry provides a very significant base to the County's economy. The agricultural output of Ventura County in 2013 reached almost $2.1 billion annually and encompasses more than 92,000 acres of irrigated cropland. Ventura County is one of the top 10 agricultural counties in California. The impact of infestation of a particular pest or disease would include economic losses due to crop losses from pest damage, limitations on the ability to export products from the area, and increased costs for pest control. The diversity and location of crops produced in the County is shown on **Figure F-1.** Many of the agricultural areas shown may be affected by the insect pests and agriculture biological diseases described in this section.

Many pests not only damage the agricultural economy but also affect residential areas and open space. Damage to landscape plants and vegetable gardens can be significant. Pests such as the gypsy moth damage primarily hardwood trees in open space areas such as Oak Woodlands.

History: In 1994, the Mediterranean fruit fly affected 11 counties in California, including Ventura County. The loss in Ventura County was about $22 million. In 2007, four gypsy moths were trapped in Ojai; then in October 2008, a 5-square-mile quarantine area was established in the City of Ojai, centered around two egg mass sites on South Rice Road. Since 2008, no gypsy moths have been detected. In 2007 and 2008, the charcoal rot disease suddenly affected strawberry plants in several fields throughout Ventura County, but the loss of crops was limited. The fungus was limited when growers routinely fumigated fields, but because of restrictions on some fumigation chemicals, many growers have turned to less-potent chemical alternatives. Fields afflicted by charcoal rot have typically been fumigated for several successive seasons with these less-potent chemicals; the effectiveness of the chemicals is still being determined. Research is underway in Ventura County on epidemiology and fungicide treatment.

The Asian citrus psyllid (ACP) pest, which carries Huanglongbing (HLB) disease, was identified in San Diego County in 2008, and by 2009 was also found in Imperial, Orange, and Los Angeles counties. All of Ventura County was declared under quarantine for ACP and HLB in December 2010. There have been zero detections of HLB in Ventura County.

Location: Ventura County's agricultural areas are most susceptible to insect pests and agriculture biological diseases, such as those described above. The County's farm landscape is illustrated on **Figure F-1**. In addition to agricultural areas, the entire county is susceptible to the

gypsy moth. In 2008, a quarantine area for the gypsy moth was centered on a 6-square-mile area in Ojai. In the spring of 2009, hundreds of gypsy moth traps were placed in the same area; no adult gypsy moths were detected in 2009. Visual inspection in the quarantined area began in the fall of 2009; the regulatory quarantine enforcement ceased on October 4, 2010 for Ventura County.

Extent: Future agricultural infestations in Ventura County are likely based on past occurrences. Based on previous history, infestations causing widespread damage have occurred about once every 10 to 20 years. Another factor increasing the likelihood of future infestations is the mild climate in Ventura County, which increases the ability of pests to proliferate. However, the extent and probability of a devastating event are unknown. Other factors that influence agricultural infestations are described below.

Injurious pests commonly enter Ventura County in a number of ways. They may, for example, be inadvertently shipped by a private individual in an infested plant, fruit, or vegetable. When the package is received and the article is found to contain pests, the recipient throws it out and the pests multiply and infest nearby agricultural crops or urban properties. Pests can also travel easily on plants and plant parts shipped from uncertified and unlicensed nurseries; on plants offered for sale at swap meets and other open air markets; or in vehicles or luggage. Inspectors from the Agricultural Commissioner's office inspect incoming plants at nurseries, farmer's markets, and swap meets to check for the presence of pests not occurring in this area. As the state of California experiences budget shortfalls, the usual points of entry at the state border are no longer staffed with inspectors, so this program at the local level becomes one of the main lines of defense against injurious pests.

Methyl bromide has been the fumigant of choice for controlling soil-borne insect and disease pests in many of the county's highest value crops, including bell peppers, tomatoes, berries (including strawberries, raspberries, and blueberries), and cut flowers. With the phase out of methyl bromide, control of diseases such as charcoal rot will depend on the availability of alternative methods, including fumigants such as choropicrin, 1,3-dichloropropene, metam/ potassium sodium, and methyl iodide.

Probability of Future Events: The probability and extent of a devastating event would depend on many factors, including the specific pest introduced, climactic conditions at the time of introduction, fluctuations in funding for pest detection and eradication, and public pressure regarding aerial and ground applications of pesticides proximate to urban areas.

4.3.2 Climate Change

Nature: Climate is defined as the average statistics of weather, which includes temperature, precipitation, and seasonal patterns in a particular region. Climate change refers to a long-term and irrevocable shift in weather-related patterns, either regionally or more globally. The Earth and its natural ecosystem are closely tied to the climate, and any permanent climate change will lead to an imbalance in the existing ecosystem, impacting the way people live, the food they grow, their health, the wildlife, the availability of water, and many other aspects. Research indicates that much of this warming is due to human activities—primarily burning fossil fuels and clearing forests—that release carbon dioxide (CO_2) and other gases into the atmosphere, trapping heat that would otherwise escape into space. Once in the atmosphere, these heat-trapping emissions remain there for many years—CO_2, for example, lasts about 100 years. If left unchecked, by the end of the century CO_2 concentrations could reach levels three times higher than the levels in pre-industrial times.

According to most climatologists, the planet is starting to experience shifts in climate patterns and an increased frequency of extreme weather events at both the global level and the local level. Over the next century, increasing atmospheric greenhouse gas concentrations are expected to cause a variety of changes to local climate conditions, including sea-level rise and storm surges in coastal areas; reduced mountain snowpack; increased riverine flooding throughout the county; more frequent, higher temperatures (leading to extreme heat events and wildfires), particularly inland; decreasing air quality; and extended periods of drought.

These effects of climate change are expected to negatively impact water and electricity demand and supplies in Ventura County. Also, rising sea levels will threaten cities along the Ventura County coast and its rivers, decreasing air quality and extreme heat days will degrade public health, wildfire risk will increase (particularly in the grassland hills and mountainous areas of the County), and the County's over $2 billion agricultural industry could decline significantly.

History: The history of the scientific discovery of climate change began in the early nineteenth century, when ice ages and other natural changes in paleoclimate were first suspected and the natural greenhouse effect was first identified. In the late nineteenth century, scientists first argued that human emissions of greenhouse gases could change the climate. Many other theories of climate change were advanced, involving forces from volcanism to solar variation. In the 1960s, the warming effect of CO_2 gas became increasingly convincing, although some scientists also pointed out that human activities, in the form of atmospheric aerosols (e.g., "pollution"), could have cooling effects as well. During the 1970s, scientific opinion increasingly favored the warming viewpoint. By the 1990s, as a result of improving fidelity of computer models and observational work confirming the Milankovitch theory of ice ages, a consensus position formed: greenhouse gases were deeply involved in most climate changes, and human emissions were bringing serious global warming.

Since the 1990s, scientific research on climate change has included multiple disciplines and has expanded, significantly increasing our understanding of causal relations, links with historical data, and our ability to numerically model climate change. The most recent work has been summarized in the Assessment Reports by the Intergovernmental Panel on Climate Change (IPCC). Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions or in the distribution of weather around the average conditions (i.e.,

more or fewer extreme weather events). Climate change is caused by factors that include oceanic processes (such as oceanic circulation), biotic processes, variations in solar radiation received by Earth, plate tectonics and volcanic eruptions, and human-induced alterations of the natural world. This last type of effect is currently causing global warming, and "climate change" is often used to describe human-specific impacts.

Location: The location of climate change effects in Ventura County is, in general, countywide, with specific effects and their severity focused in particular parts of the County (e.g., coastal inundation from rising tides and storm surge.) **Figures F-2** and **F-3** show projected coastal inundation areas in 2030 from rising tides and combined storm floods, which can result in coastal erosion, fluvial storm flooding, wave impacts, and coastal storm floods. The County will also experience increases in wildfire risk in hillside and mountainous areas and an increase in riverine flooding along rivers and creeks.

Extent: The extent of climate risk includes Combined Coastal Storm Hazard Zones of 28.43 square miles and a Rise Tide Inundation Area of 6.49 square miles. Under a low emissions scenario, wildfire risk could increase roughly two- to fourfold from its current extent in mountainous and hillside areas of the County, and average temperatures could rise four to six degrees Fahrenheit by 2080, resulting in a 17 percent decrease in mountain snowpack.

Countywide, 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.

Probability of Future Events: The specific probability of the extent and frequency of climate change-induced impacts is uncertain and depends on various climate-modeling assumptions. Although there is some uncertainty about the rate of climate change and the severity and frequency of extreme weather events, the IPCC, in its Fifth Assessment of climate change (2014), concluded that:

> …warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased…. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.

California Governor Jerry Brown, in his Executive Order B-30-15, reiterated the 2014 IPCC finding and further stated that:

> …climate change poses an ever-growing threat to the well-being, public health, natural resources, economy, and the environment of California, including loss of snowpack, drought, sea level rise, more frequent and intense wildfires, heat waves, more severe smog, and harm to natural and working lands, and these effects are already being felt in the state…

The consensus of the scientific community—and the position of the State of California—is that climate change is occurring and will continue to occur, perhaps at an increasing rate.

4.3.3 Dam Failure Inundation

Nature: Dam failure involves unintended releases or surges of impounded water, resulting in downstream flooding. The high-velocity, debris-laden wall of water released from dam failure results in the potential for human causalities, economic loss, lifeline disruption, and environmental damage. Although dam failure may involve the total collapse of a dam, this is not always the case, because damaged spillways, overtopping from prolonged rainfall, or other problems—including the unintended consequences from normal operations—can result in the creation of a hazardous situation. Because they occur without advance warning, failures from natural events such as earthquakes or landslides may be particularly severe.

Dam failure may be caused by a variety of natural events, human-caused events, or a combination thereof. Dam failure usually occurs when the spillway capacity is inadequate and water overtops the dam, or when internal erosion through the dam foundation occurs (also known as piping). Factors contributing to dam failure events may include structural deficiencies from poor initial design or construction, lack of maintenance or repair, and the gradual weakening of the dam through the normal aging process.

History: Although it was located elsewhere, the failure of one dam had catastrophic effects in Ventura County. The St. Francis Dam in the San Francisquitos Canyon in Los Angeles County (within the Santa Clara River watershed) was constructed to provide 38,000 acre-feet of storage for water from the Los Angeles–Owens River Aqueduct. The midnight collapse of the dam in March 1928 occurred after the newly constructed concrete-arch dam was completely filled for the first time. The resulting flood swept through the Santa Clara Valley in Ventura County toward the Pacific Ocean, about 54 miles away. At its peak, the wall of water was reported to be 78 feet high; by the time it hit Santa Paula, 42 miles south of the dam, the water was estimated to be 25 feet deep. Almost everything in its path was destroyed, including structures, railways, bridges, livestock, and orchards. By the time the flood subsided, parts of Ventura County lay under 70 feet of mud and debris. Nearly 500 people were killed, and damage estimates exceeded $20 million. The communities of Piru, Fillmore, Santa Paula, Bardsdale, Saticoy, Montalvo, and El Rio sustained extensive life and property loss from the flood.

There is no record of a failure of any dam located in Ventura County.

Location: Table 4-1 includes the name, year built, capacity, and type for the dams that constitute failure hazards for Ventura County.

Figure F-4A shows the name, location, and extent of the dam failure inundation areas for every dam failure that would affect Ventura County. It is not anticipated that every dam would fail at the same time; this map is designed to simply provide an approximate assessment of total risk for the County. **Figure F-4B** illustrates dam failure inundation areas for particular dams. In some instances, if one dam fails there is potential that another dam downstream will also fail (for example if the Pyramid Dam fails, the Santa Felicia Dam will likely fail too). **Figure F-4B** does not illustrate cumulative effects. Additional information on specific dam inundation areas may be obtained from the agency that owns the dam. The map shows that dam failures may occur outside Ventura County but still pose a threat of inundation within the County. In particular, if dams in the Santa Clara River watershed in Los Angeles County fail, the resulting flood would affect the Santa Clara River corridor, which includes the cities of Santa Paula and Oxnard, as demonstrated by the 1928 event (mentioned above).

Table 4-1. Dams Under State Jurisdiction with Inundation Areas within Ventura County*

Dam	Year Built	Capacity	Type
Bouquet Canyon	1934	36,505	earth
Casitas	1958	254,000	earth
Castaic	1973	323,700	earth
Ferro Debris	1986	24	earth
Lake Eleanor 1763	N/A	128	earth
Lake Sherwood	1904	2,694	constant radius arch
Lang Ranch Detention Basin	2004	263	earth
Las Llajas	1981	1250	earth
Matilija	1949	1800	variable radius arch
Pyramid	1973	178,700	earth and rock
Runkle	1949	100	earth
Santa Felicia Dam	1955	100,000	earth
Sinaloa Lake	1925	205	earth
Stewart Canyon	1963	67	earth
Westlake Reservoir	1972	9200	earth
Wood Ranch	1965	11,000	earth

Source: DSOD 2015.

* This table includes federal dams and reservoirs that are in the State of California but are not under state jurisdiction.

Extent: FEMA characterizes a dam as a high hazard if it stores more than 1,000 acre-feet of water, is taller than 150 feet, and has the potential to cause downstream property damage. The hazard ratings for dams are set by FEMA and confirmed with site visits by engineers. Most dams in the county are characterized by increased hazard potential because of downstream development and increased risk as a result of structural deterioration or inadequate spillway capacity.

The Division of Safety of Dams (DSOD) regulates state-size dams and inspects them annually to ensure that they are in good operating condition. Also, as required by DSOD regulations, the flood inundation limits resulting from a dam breach during the design storm are established for each state-size dam. The resultant maps contain flood-wave arrival time estimates and flood inundation areas. These maps are developed by Cal OES and provided to DSOD and local communities. Inundation areas are shown in **Table 4-2**.

Table 4-2. Dam Inundation Areas

Dam	Inundation Area (Square Miles)
Bouquet Canyon	109.67
Casitas	5.09
Castaic	163.41
Ferro Debris	0.06
Lake Eleanor	0.32
Lake Sherwood	2.01
Lang Ranch Detention Basin	0.48
Las Llajas	8.13
Matilija	3.85
Pyramid	13.94
Runkle	0.65
Santa Felica	121.19
Sinaloa Lake	2.32
Stewart Canyon	0.06
Westlake Reservoir	2.65
Wood Ranch	33.61

Source: DSOD, 2015.

Probability of Future Events: The probability of dam failure inundation is unknown, but such an event would likely be the result of an extreme storm.

4.3.4 Drought

Nature: Drought is a normal, recurrent feature of virtually all climatic zones, including areas of both high and low rainfall, although the characteristics of a drought will vary significantly from one region to another. There is no universally accepted quantitative definition of drought from a scientific or engineering point of view. However, in common terms drought is defined as natural deficit of water supply in a region due to below-average precipitation over a seasonal period or several years, causing a serious hydrological imbalance that results in biological losses and/or economic losses. Drought differs from normal aridity, which is a permanent feature of the climate in areas of low rainfall. Drought is the result of a natural decline in the expected precipitation over an extended period, typically one or more seasons in length. Other climatic characteristics (e.g., high temperature, high wind, low relative humidity) impact the severity of drought conditions.

Four scientific/engineering definitions of drought are listed below:

- Meteorological drought is defined solely by the degree of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- Hydrological drought relates to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- Agricultural drought is defined principally in terms of soil moisture deficiencies relative to the water demands of plant life, usually crops.
- Socioeconomic drought associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of weather-related supply shortfall.

A drought's severity depends on numerous factors, including duration, intensity, and geographic extent as well as regional water supply demands by humans and vegetation. Due to its multi-dimensional nature, drought is difficult to define in exact terms and thus poses difficulties in terms of comprehensive risk assessments.

Drought differs from other natural hazards in three ways. First, both the onset and the end of a drought are difficult to determine due to the slow accumulation and lingering effects of an event after its apparent end. Second, the lack of an exact and universally accepted definition of drought adds to confusion about its existence and severity. Third, in contrast with other natural hazards, the impact of drought is less obvious and may be spread over a large geographic area. These characteristics have hindered the preparation of drought contingency or mitigation plans by many governments.

The effects of drought increase with duration as more moisture-related activities are impacted. Non-irrigated croplands are most susceptible to precipitation shortages. Rangeland and irrigated agricultural crops may not respond to moisture shortage as rapidly, but yields during periods of drought can be substantially affected. During periods of severe drought, lower moisture in plant and forest fuels create an increased potential for devastating wildfires. In addition, lakes, reservoirs, and rivers can be subject to water shortages that impact recreational opportunities, irrigated crops, availability of water supplies for activities such as fire suppression and human

consumption, and natural habitats of animals. Insect infestation can also be a particularly damaging impact from severe drought conditions.

History: Drought is a cyclic part of the climate of California, occurring in both summer and winter, with an average recurrence interval between 3 and 10 years. Recent droughts in California history are listed in **Table 4-3**.

Table 4-3. Recent Droughts in California

Year(s)	Areas Affected	Disaster Proclamation
1917-1921	Statewide except central Sierra Nevada and north coast	No
1922-1926	Statewide except central Sierra Nevada	No
1928-1937	Statewide	No
1943-1951	Statewide	No
1959-1962	Statewide	No
1976-1977	Statewide, except for southwestern deserts	Statewide disaster proclamation
1987-1992	Statewide	No
2007-2009	Statewide, particularly the central coast	Statewide disaster proclamation
2012-2015	Statewide	Statewide disaster proclamation (2014)

Source: Paulson et al 1991; Cal OES, 2015.

The State of California is in the midst of the fourth year of a drought at the time of the writing of this MHMP. According to University of California, Berkeley, Professor B. Lynn Ingram, California is “on track for having the worst drought in 500 years.”

Location: The occurrence of drought is regional in nature and scope, which holds true for Ventura County. As illustrated on **Figure 4-1**, when drought occurs it typically affects the entire county.

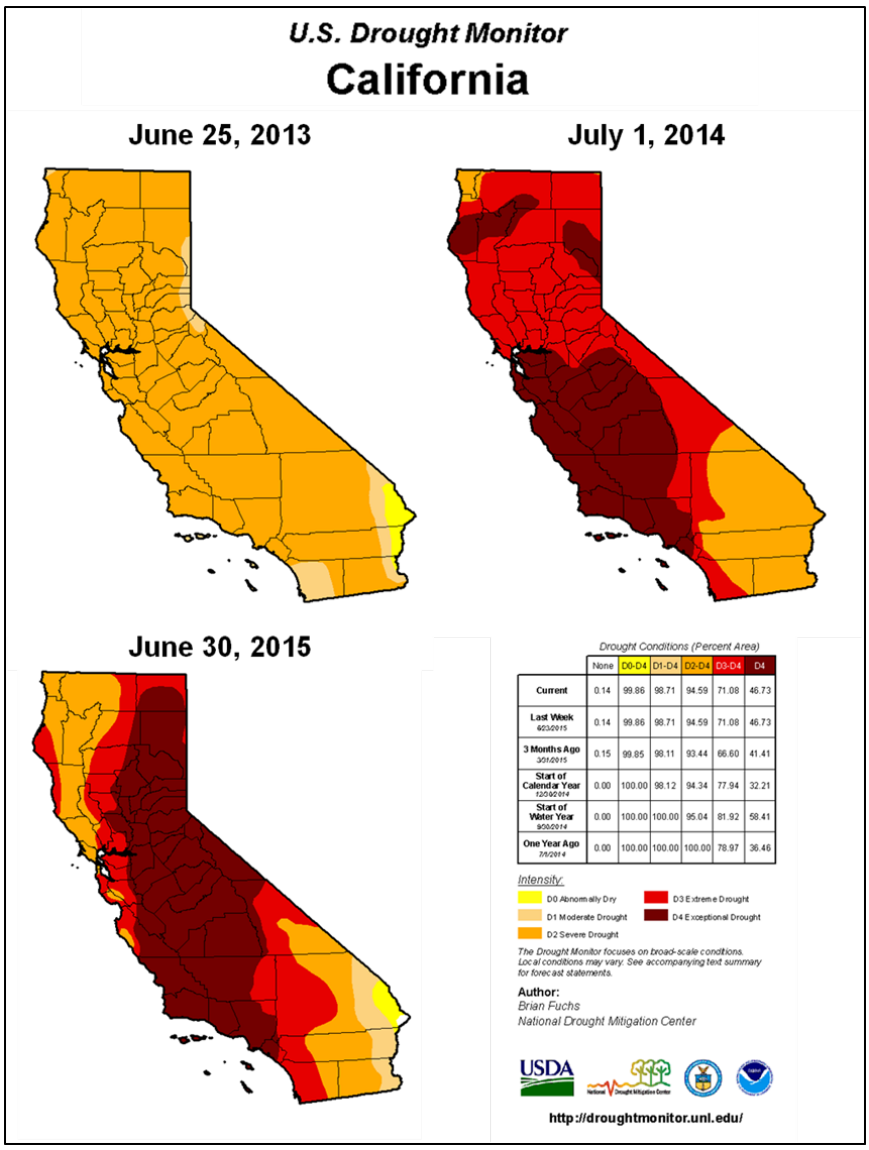

Figure 4-1. California Drought Conditions

Extent: The National Drought Mitigation Center produces drought monitor maps for the United States. It classifies droughts into five categories: D0 is the least severe, with abnormally dry conditions; and D4 is the most severe, with exceptional drought conditions. As of June 30, 2015, Ventura County and roughly half of the State of California remained classified in the highest ranking of D4, exceptional drought conditions.

Probability of Future Events: The ability to reliably predict drought conditions at seasonal or annual timescales is very limited. According to the California Department of Water Resources, the status of El niño-Southern oscillation (EnSo) conditions is currently the only factor that can offer some predictability to the onset of drought. Strong la niña (warm) conditions of EnSo tend to favor a drier outlook for California. Therefore, based on previous la niña conditions, drought conditions may exist in Ventura County every 3 to 10 years.

4.3.5 Earthquake

Nature: An earthquake is a sudden motion or trembling caused by a release of strain accumulated within or along the edge of the earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. Earthquakes usually occur without warning and can cause massive damage and extensive casualties in a few seconds. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure. Ground motion is the vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter. Soft soils can amplify ground motions.

In addition to ground motion, several secondary natural hazards can occur from earthquakes, such as the following:

- **Surface Faulting** is the differential movement of two sides of a fault at the earth's surface. Displacement along faults—both in terms of length and width—varies but can be significant (e.g., up to 20 feet), as can the length of the surface rupture (e.g., up to 200 miles). Surface faulting can cause severe damage to linear structures, including railways, highways, pipelines, tunnels, and dams.
- **Liquefaction** occurs when seismic waves pass through saturated granular soil, distorting its granular structure, and causing some of the empty spaces between granules to collapse. Pore water pressure may also increase sufficiently to cause the soil to behave like a fluid for a brief period and cause deformations. Liquefaction causes lateral spreads (horizontal movements of commonly 10 to 15 feet, but up to 100 feet), flow failures (massive flows of soil, typically hundreds of feet, but up to 12 miles), and loss of bearing strength (soil deformations causing structures to settle or tip). Liquefaction can cause severe damage to property. The California Geological Survey (CGS) Seismic Hazard Zone Maps illustrate areas prone to liquefaction; as shown in **Figure F-5**, 211.39 square miles of liquefaction areas of the saturated sandy soils of the Oxnard Plain and along the Santa Clara River Valley are prone to liquefaction.
- **Landslides/Debris Flows** occur as a result of horizontal seismic inertia forces induced in the slopes by the ground shaking. The most common earthquake-induced landslides include shallow, disrupted landslides such as rock falls, rockslides, and soil slides. Debris flows are created when surface soil on steep slopes becomes totally saturated with water. Once the soil liquefies, it loses the ability to hold together and can flow downhill at very high speeds, taking vegetation and/or structures with it. Slide risks increase after an earthquake during a wet winter.

The severity of an earthquake can be expressed in terms of intensity and magnitude. Intensity measures the strength of shaking produced by the earthquake at a certain location. Intensity is determined from effects on people, structures and facilities (roads, bridges, pipelines, etc.), and the natural environment. Magnitude is the measure of the earthquake "strength," the energy released at the source of the earthquake.

The two most common measures of earthquake intensity used in the United States are the Modified Mercalli Intensity Scale, which measures felt intensity, and peak ground acceleration (PGA), which measures instrumental intensity by quantifying how hard the earth shakes in a

given location. Magnitude is measured by the amplitude of the earthquake waves recorded on a seismograph using a logarithmic scale. The following table presents intensities that are typically observed at locations near the epicenter of earthquakes of different magnitudes, with interpretations of perceived shaking and potential damage to the built environment (**Table 4-4**).

Table 4-4. Magnitude/Intensity/Ground-Shaking Comparisons

Magnitude	Instrumental Intensity	PGA (% g)	Perceived Shaking	Potential Damage
0 – 4.3	I	<0.17	Not Felt	None
	II-III	0.17 – 1.4	Weak	
4.3 – 4.8	IV	1.4 – 3.9	Light	
	V	3.9 – 9.2	Moderate	Very light
4.8 – 6.2	VI	9.2 – 18	Strong	Light
	VII	18 – 34	Very Strong	Moderate
6.2 – 7.3	VIII	34 – 65	Violent	Moderate to Heavy
	IX	65 – 124	Very Violent	Heavy
	X	124 +	Extreme	Very Heavy
7.3 – 8.9	XI			
	XII			

Source: Wikipedia – Peak Ground Acceleration: http://en.wikipedia.org/wiki/Peak_ground_acceleration.

History: Although no large (M 5.0>) earthquakes have occurred recently within Ventura County's boundaries, a number of relatively large earthquakes in other areas have caused damage within the county. These earthquakes occurred in 1925 (Santa Barbara), 1927 (Point Arguello), 1933 (Long Beach), 1941 (Santa Barbara), 1952 (Tehachapi), 1971 (San Fernando), and 1994 (Northridge). Additionally, damaging earthquakes occurred in the County in 1950 (north of Ojai), 1957 (Hueneme), 1963 (Camarillo), and 1973 (Point Mugu). The three most recent events (San Fernando, Point Mugu, and Northridge) are discussed below. **Figure F-6** illustrates historic earthquakes in the Ventura County region.

- **San Fernando, M 6.5, February 9, 1971:** This event was caused by oblique-slip reverse faulting in the San Fernando fault zone. The earthquake caused the destruction of freeway interchanges, houses, and buildings and severe damage to three hospitals in the San Fernando Valley. The earthquake claimed 65 lives. Although the epicenter was within 25 miles of Ventura County, damage sustained within the County was minor.
- **Point Mugu, M 5.3, February 21, 1973:** The Point Mugu earthquake was responsible for at least five injuries and more than $1 million damage in the Point Mugu–Oxnard area, though damage was confined mainly to the vicinity of the epicenter. Large boulders fell down onto State Route 1 at Point Mugu, partially blocking the road. More than 7,000 customers lost electricity for several hours. Most reported damage was to windows, ceilings, plaster, chimneys, and shelved goods, though structural damage and broken pipes were also reported. Although much less powerful than the San Fernando earthquake of 1971, the Point Mugu earthquake was similar in focal mechanism.

- **Northridge, M 6.7, January 17, 1994:** This blind thrust earthquake occurred along the Northridge thrust fault. It was the strongest earthquake instrumentally recorded in an urban setting in North America and caused parking structures, apartments, office buildings, and sections of freeways to collapse. Approximately 25,000 dwellings were rendered uninhabitable. Total damage exceeded $44 billion. The incident resulted in 51 deaths.

Location: As in most of southern and coastal California, the potential for earthquake damage exists throughout Ventura County because of the number of active faults within and near the county. These faults are shown on the CGS Fault Activity Map of California. Descriptions of the active faults are provided below. The locations of the active and potentially active faults are shown on **Figure F-7** and **Figure F-8**. Some of the more significant faults are described below:

- **Malibu Coast fault system:** The Malibu Coast fault system includes the Malibu Coast, Santa Monica, and Hollywood faults. The system begins in the Hollywood area, extends along the southern base of the Santa Monica Mountains, and passes offshore a few miles west of Point Dume. The 1973 Point Mugu earthquake, described in the previous section, is believed to have originated on this fault system.
- **Oak Ridge fault system:** The Oak Ridge fault system is a steep (65 degrees) southerly dipping reverse fault that extends from the Santa Susana Mountains westward along the southerly side of the Santa Clara River Valley and into the Oxnard Plain. The system is more than 50 miles long on the mainland and may extend an equal or greater distance offshore. Several recorded earthquake epicenters on land and offshore may have been associated with the Oak Ridge fault system. Portions of the system are zoned by the state as active.
- **Pine Mountain thrust fault and Big Pine fault:** These two large faults occur in the mountainous portion of Ventura County north of the Santa Ynez fault; the faults are located 9 and 16 miles north of the City of Ojai, respectively. The Pine Mountain thrust fault is reported to have ruptured the ground surface for a distance of 30 miles along its length during the northern Ventura County earthquakes of November 1852.
- **San Andreas fault:** San Andreas is the longest and most significant fault in California. Because of clearly established historical earthquake activity, this fault has been designated as active by the State of California. The last major earthquake on this fault near Ventura County was the Fort Tejon earthquake of 1857, which was estimated at M 8.0 and would have caused considerable damage if there had been structures in the southern part of the county. There is a 59 percent chance that an M 6.7 quake or larger will occur on this fault within the next 30 years.
- **San Cayetano–Red Mountain–Santa Susana fault system:** This fault system consists of a major series of north-dipping reverse faults that extend over 150 miles from Santa Barbara County into Los Angeles County. Within this system, the San Cayetano fault is the greatest hazard to Ventura County; it is a major, north-dipping reverse fault that extends for 25 miles along the northern portion of the Ventura Basin. The San Fernando earthquake of 1971, described in the previous section, was caused by activity along this fault.

- **Simi–Santa Rosa fault system:** This fault system extends from the Santa Susana Mountains westward along the northern margin of the Simi and Tierra Rejada valleys and along the southern slope and crest of the Las Posas Hills to their westerly termination.
- **Ventura-Pitas Point fault:** The western half of this fault is known as the Pitas Point fault, and the eastern half is known as the Ventura fault. The Pitas Point fault extends offshore into the Pacific Ocean and is roughly 14 miles long. The Ventura fault extends into the communities of Ventura and Sea Cliff and runs roughly parallel to portions of U.S. 101 and State Route 126. The fault is roughly 12 miles long. The Ventura-Pitas Point fault is a left-reverse fault.

Extent: The strength of an earthquake's ground movement can be measured by PGA. PGA measures the rate in change of motion relative to the established rate of acceleration due to gravity (g = 980 centimeters per second, per second). PGA is used to project the risk of damage from future earthquakes by showing earthquake ground motions that have a specified probability (e.g., 10 percent, 5 percent, or 2 percent) of being exceeded in 50 years. The ground motion values are used for reference in construction design for earthquake resistance and can also be used to assess relative hazard between sites when making economic and safety decisions.

In 2008, CGS developed an updated map of earthquake shaking potential for California. The map shows the relative intensity of ground shaking and damage in California from anticipated future earthquakes. Regions near major, active faults are shown in red and pink and experience stronger earthquake shaking more frequently. Regions that are distant from known, active faults are shown in orange and yellow and experience lower levels of shaking less frequently. **Figure F-7** and **Figure F-8** indicate the level of low-frequency shaking potential in Ventura County (in which local soil conditions have greater effect on low frequency), which includes 15.16 square miles of severe low frequency ground shaking potential; 659.67 square miles of extreme low frequency shaking potential; and 1,157.57 square miles of a violent low frequency shaking potential.

Probability of Future Events: Ongoing field and laboratory studies suggest the likely maximum magnitudes and recurrence intervals for the major local faults shown in **Table 4-5**.

Table 4-5. Likely Maximum Magnitudes and Recurrence Intervals

Fault	Likely Maximum Magnitudes and Recurrent Intervals
Malibu Coast fault system	M 6.7, recurrence interval 2,908 years
Oak Ridge fault system	M 6.9, recurrence interval 299 years
Red Mountain fault system	M 6.8, recurrence interval 507 years
San Andreas fault	M 8.0, recurrence interval of 300 years
San Cayetano fault system	M 6.8, recurrence interval 150 years
Santa Susana fault system	M 6.6, recurrence interval 138 years
Simi–Santa Rosa fault system	M 6.7, recurrence interval 933 years
Ventura-Pitas Point fault system	M 6.9, recurrence interval not available

4.3.6 Flood

Nature: A flood occurs when the existing channel of a stream, river, canyon, or other watercourse cannot contain excess runoff from rainfall or snowmelt, resulting in overflow onto adjacent lands. In coastal areas, flooding may occur when high winds or tides result in a surge of seawater into areas that are above the normal high tide line.

A floodplain is the area adjacent to a watercourse or other body of water that is subject to recurring floods. Floodplains may change over time as a result of natural processes, changes in the characteristics of a watershed, or human activity such as construction of bridges or channels. In areas where flow contains a high sediment load, such as along the Santa Clara River in Ventura County, the course of a river or stream may shift dramatically during a single flood event. Coastal floodplains may also change over time as waves and currents alter the coastline.

Secondary hazards from floods can include:

- Erosion or scouring of stream banks, roadway embankments, foundations, footings for bridge piers, and other features.
- Impact damage to structures, roads, bridges, culverts, and other features from high-velocity flow and from debris carried by floodwaters. Such debris may also accumulate on bridge piers and in culverts, increasing loads on these features or causing overtopping or backwater effects.
- Destruction of crops, erosion of topsoil, and deposition of debris and sediment on croplands.
- Release of sewage and hazardous or toxic materials when wastewater treatment plants are inundated, storage tanks are damaged, and pipelines are severed.

In areas such as Ventura County that do not have extended periods of below-freezing temperatures or significant snowfall, floods usually occur during the season of highest precipitation or during heavy rainfalls after prolonged dry periods. Ventura County is dry during the late spring, summer, and early fall and receives most of its rain during the winter months. The rainfall season extends from November through April, with approximately 95 percent of the annual rainfall occurring during this period. The average annual rainfall in Ventura County ranges from less than 8 inches in the Cuyama Valley in northwestern Ventura County to 38 inches in the Ventura River watershed west of the City of Ojai. Along the coast near Oxnard, San Buenaventura, Simi Valley, and Thousand Oaks, the average rainfall is approximately 14 inches.

The prevailing weather patterns during the winter and the orientation of the mountain ranges in the northern half of the county combine to produce extremely high-intensity rainfall. The peak historic rainfall intensity recorded by a Ventura County rain gage occurred on February 12, 1992. A rainfall intensity of approximately 4 inches per hour was measured during a 15-minute period at the Wheeler Gorge gage, approximately 3 miles northeast of Matilija Dam. Such intensities can produce severe flooding conditions, particularly in small watersheds where flash floods are likely.

Flash floods are particularly dangerous. NWS defines a flash flood as one in which the peak flow travels the length of a watershed within a 6-hour period. These floods arise when storms produce a high volume of rainfall in a short period over a watershed where runoff collects quickly. They

are likely to occur in areas with steep slopes and sparse vegetation. They often strike with little warning and are accompanied by high-velocity flow.

History: Damaging floods in Ventura County were reported as early as 1862. A 1945 report by the Ventura County Flood Control District reported that floods of sufficient magnitude to cause extensive damage occurred in 1862, 1867, 1884, 1911, 1914, 1938, 1941, 1943, and 1944.

The largest and most damaging natural floods recorded in the Santa Clara and Ventura watersheds occurred in January and February of 1969. The January flood was a result of the highest monthly precipitation total ever recorded in Ventura County at that time. The February flood was a result of intense rainfall similar in magnitude to the rainfall that caused the record-breaking flood in January. The combined effects of the 1969 floods were disastrous: 13 people lost their lives, and property damage was estimated at $60 million (1969 dollars). Homes in Casitas Springs, Live Oak Acres, and Fillmore were flooded, and 3,000 residents in Santa Paula and several families in Fillmore were evacuated twice. A break in the Santa Clara River levee threatened the City of Oxnard. Agricultural land, primarily citrus groves, was seriously damaged or destroyed. All over the county, transportation facilities, including roads, bridges, and railroad tracks, were damaged. The Fillmore, Oak View, and Ventura sewage treatment plants were severely damaged and dumped raw sewage into the Santa Clara and Ventura rivers. The untreated sewage polluted the rivers and the beaches at their outlets into the ocean. In addition, sewer trunk lines were broken along the Ventura River and its tributary, San Antonio Creek. Suspended sediment concentrations and discharge in many streams greatly exceeded any previously measured levels in the flood-affected areas. Suspended sediment concentrations reached a maximum of about 160,000 milligrams per liter in the Santa Clara River at Saticoy, and the maximum daily sediment discharge was 20 million tons during the storm peak (FEMA 2010a).

In 1980, Calleguas Creek breached its levee in the Oxnard Plain and caused approximately $9 million (in 1980 dollars) in damage to the Point Mugu Naval Base from flooding and sediment deposition. In addition, approximately 1,500 acres of farmland were covered by floodwaters. The peak discharge was 9,310 cubic feet per second at the Madera Road Bridge in Simi Valley.

In 1983, a federal disaster was declared because of storm damage. Repairs to flood-control facilities have been estimated to cost $15 million (in 1983 dollars). Improved channels in Moorpark and Simi Valley suffered severe damage from erosion during this event, and Calleguas Creek experienced record flooding. Damage to other public and private facilities has been estimated at approximately $39 million, with little more than half of that total due to damage to agricultural lands.

Table 4-6 details the major flood events to affect Ventura County over the past 20 years.

Table 4-6. Major Disaster Declarations for Floods, 1995-2015

Date	Description
January 1995	On January 9 and 10, the region was subjected to an intense winter storm that produced more than 6 inches of rain in some areas. A major Disaster Declaration was declared for all but one county throughout California on January 10, 1995.
January through March 1995	A second powerful winter storm brought heavy rain, heavy snow, and strong winds throughout much of California from mid-January to mid-March. On January 13, a Major Disaster Declaration was declared for nearly half the counties in California.
December 1996 through January 1997	A series of subtropical storms hit California from late December through early January, resulting in one of the wettest Decembers on record. On January 4, 1997, a Major Disaster Declaration was declared for half of the counties in California, including Ventura County.
February 1998	El niño conditions led to extensive flooding throughout California. A Major Disaster Declaration was declared for more than 30 counties, including Ventura County. Countywide damages exceeded $50 million.
December 2004 through January 2005	A powerful Pacific storm brought heavy rain, snow, flash flooding, high winds, and landslides to Central and Southern California. During the multi-day event, rainfall totals ranged from 3 to 10 inches over coastal areas, with up to 32 inches in the mountains. A Major Disaster Declaration was declared on February 4, 2005, for multiple counties, including Ventura County.

Location: Figure F-9 shows the locations of areas likely to flood and types of flooding in Ventura County, including:

- **Upland flooding:** The mountainous terrain of northern Ventura County and the hills in the central and eastern parts of the county give rise to numerous annual streams, many draining into steep canyons. These streams are subject to floods of relatively short duration, often following high-intensity rainfall. Such floods may occur with little warning and carry large quantities of sediment and debris. Communities adjacent to the upland areas, such as Fillmore, Ojai, Piru, and Santa Paula, are subject to this hazard. Many of the watersheds in question contain dams or basins designed to attenuate flow and trap debris, reducing the effects on downstream communities.
- **Broad floodplains:** The watersheds of the Santa Clara River (watershed area of 1,650 square miles), Ventura River (watershed area of 226 square miles), and Calleguas Creek (watershed area of 325 square miles) drain to the broad coastal plain in the southern part of Ventura County. This plain is subject to inundation during longer intervals of rain, typically as the result of a series of winter storms. These floods typically have longer duration and may be forecast with more warning time. The Santa Clara River Valley, which crosses central Ventura County, is also subject to flooding. Numerous levees have been built to protect the agricultural lands along the river; because of its sediment load, the river has historically migrated across the valley floor during flooding intervals. The levees are typically not sufficient to withstand severe flood events.
- **Coastal flooding:** The County's 43 mile coastline is subject to tidal flooding, storm surge, and wave action, all of which usually occur during winter storms. Areas that are susceptible to severe wave action are generally confined to a narrow area immediately adjacent to the tidal zone, including Sea Cliff Colony, Oxnard Shores, Silver Strand

Beach, and several sections of U.S. 101 from Rincon Point to Emma Wood State Park. However, the effects of coastal flooding can be severe—in addition to wave action, beach and bluff erosion can cause significant damage to coast-side homes and infrastructure. Coastal flooding may also occur as the result of tsunamis, which are extreme tidal surges caused by distant earthquakes or massive undersea landslides. In addition to flooding, winter coastal storms can cause minor coastal erosion along the shores of Ventura County. Coastal erosion is a natural process that occurs particularly in the winter, when coastal storms wear away land by wave action, tidal currents, or wave currents. Material deposited on beaches during the mild summer and fall months gets redistributed by the waves. According to City of Ventura engineers, the majority of the sand is pulled just off coast and then comes back to shore over time. Although most receding sand stays fairly close to shore, some sand is driven south by currents until it reaches Hueneme Canyon, a large deep-water depression near the Port of Hueneme.

Unmapped flood hazard areas include numerous small channels. Agricultural drainage ditches and urban drains cover much of the flatter parts and urban areas of Ventura County. Flooding in these areas is due to high-intensity rainfall occurring over a very short period. The flooding is usually shallow and mainly affects roadways and other low-lying areas. In particular, the Hollywood Beach and Silver Strand residential coastal communities have historically experienced localized flooding conditions primarily due to inadequate storm drainage infrastructure and topography (hence, the "Zone B"/"Zone X-Shaded" FEMA designations on the Flood Insurance Rate Maps [FIRMs] / Digital Flood Insurance Rate Map [DFIRMs]). These residential coastal communities (largely built out) are not currently mapped by FEMA in the "Zone VE" coastal high hazard Special Flood Hazard Area (SFHA). These communities have historically been mapped by FEMA as a Zone B and most recently under the DFRIRMs as a Zone X-Shaded (500-year floodplain).

Repetitive flood hazard areas are discussed in **Section 5.5**.

Natural and Beneficial Floodplain Functions: The county's floodplains drain into five wetlands, described below. A wetland is an area of land whose soil is saturated with moisture either permanently or seasonally. Such areas may also be covered partially or completely by shallow pools of water. Wetlands include swamps, marshes, and bogs; the water found in wetlands can be saltwater, freshwater, or a mixture of both.

- **McGrath Lake Wetlands:** Located on the western city limits of Oxnard, the McGrath Lake wetlands extend south from the Santa Clara River. A small lake within the wetlands helps to attract more than two hundred species of birds, including black-shouldered kites, northern harriers, owls, and herons; and special-status birds, including ospreys, white wagtails, black skimmers, and peregrine falcons. The Santa Clara Estuary Natural Preserve on the northern boundary of McGrath Lake Park offers a refuge for birds, and habitat for various burrowing animals. In April 2010, the Nature Conservancy, the State of California, and the U.S. Fish and Wildlife Service purchased 141 acres of prime riparian habitat, agriculture fields, and floodplains within the McGrath Lake Wetlands to become part of the Santa Clara River Parkway. The parkway was established to protect and restore the river's floodplain and functions, and to provide recreational opportunities such as hiking and bird watching.

- **Mugu Lagoon:** The Mugu Lagoon is located within Point Mugu Naval Base, 8 miles southeast of the City of Oxnard. The lagoon consists of 1,474 acres of wetlands. Calleguas Creek flows into the lagoon. In addition, there is a tidal connection through an inlet in the barrier beach. There are high concentrations of banned pesticides found in lagoon's sediment. Consequently, the Navy has undertaken several wetland restoration projects since the mid-1990s, resulting in the restoration of several acres of tidal mudflats, sandflats, channels, ponds, salt marsh, and sand islands. There are a number of special-status species that inhabit the lagoon, including Pacific loon, ashy and black storm petrels, American white and California brown pelicans, double-crested cormorant, least bittern, white-faced ibis, fulvous whistling duck, harlequin duck, Barrow's goldeneye, osprey, bald eagle, Swainson's hawk, peregrine falcon, sandhill crane, long-billed curlew, laughing gull, California gull, elegant tern, black tern, black skimmer, rhinoceros auklet, long-billed savannah sparrow, and tricolored blackbird.
- **Ormond Beach Wetlands:** The Ormond Beach wetlands, located in the City of Oxnard between the Port of Hueneme and the Point Mugu Naval Base, support many rare plants and hundreds of species of migratory birds, including the endangered California least tern and Western snowy plover. However, a secondary metal smelter, operating at Ormond Beach over the past 40 years, created such a large amount toxic pollution that the site is now a U.S. Environmental Protection Agency Superfund Site. The California State Coastal Conservancy is spearheading efforts to permanently protect habitat and expand and restore the wetlands and, as of June 2010, had acquired 265 acres of the wetlands.
- **Santa Clara River Estuary:** The 49-acre Santa Clara River Estuary is located at the mouth of the Santa Clara River and the Pacific Ocean near the City of Ventura. The river drains a watershed of approximately 1,600 square miles. The City of Ventura's sewage treatment plant currently discharges up to 9 million gallons per day of tertiary treated wastewater into the Santa Clara River Estuary. This is one of the last remaining estuary discharges in California. The discharge is in conflict with the State Water Resources Control Board's Water Quality Control Policy for the Enclosed Bays and Estuaries of California (Resolution No. 74-43, 1974), which mandates that the discharge of municipal and industrial wastewaters to enclosed bays and estuaries be phased out. Exceptions to this policy are limited to circumstances in which the regional water quality control board finds that the treated wastewater enhances the quality of receiving waters above that which would occur in the absence of the discharge. The City of Ventura has been granted an exception since 1977 on the basis that the treatment plant's discharge enhanced fish and wildlife habitat and non-contact water recreation. However, more recent information regarding the relationship of the discharge to the ecological function of the estuary is considered to be lacking, and the issues associated with the treatment plant's discharge include impacts of nutrient-rich water in the estuary and the artificial hydrology created by this volume of water. In addition, with this discharge, the lagoon fills up and breaches on a more frequent basis than it would under natural conditions. In 2008, the Los Angeles Regional Water Quality Control Board required the City of Ventura, as a condition to continue the current discharge practice, to perform three special studies to evaluate a variety of environmental solutions and estimate the needed financial investment for each solution. The studies have been completed and submitted to the Board for review.

- **Ventura River Estuary:** The 110-acre Ventura River Estuary lies directly west of the City of Ventura. It drains a watershed of approximately 226 square miles. The estuary is home to several special-status species, including California brown pelican, western snowy plover, California least tern, Belding's Savannah sparrow, yellow warbler, yellow-breasted chat, tidewater goby, arroyo chub, steelhead trout, and pallid bat. In 1996, the Ventura River Estuary Enhancement Plan was implemented to restore and enhance the estuary. Measures within the plan included riparian restoration along the river, its floodplain, and the surrounding dunes; recreation of habitat types; habitat protective fencing; and trail soil stabilization.

Extent: The magnitude of flooding that is used as the standard for floodplain management in the United States is a flood with a probability of occurrence of 1 percent in any given year. This flood is also known as the 100-year flood or the base flood. The most readily available source of information regarding the 100-year flood, as well as the 500-year flood, is on the FIRMs prepared by FEMA. These maps are used to support the NFIP.

FEMA has prepared a countywide DFIRM for the unincorporated areas of Ventura County and for each incorporated city in the county, effective January 20, 2010. **Figure F-9** shows the SFHAs identified in the Ventura County DFIRM. The Ventura County DFIRM identifies the following SFHAs: 7.79 miles in the 100-year "coastal high hazard" flood zone; 78.37 square miles in the 100-year flood zone; and 51.65 square miles in the 500-year flood zone.

Probability of Future Events: On average, floods causing major damage within Ventura County occur every 5 years.

4.3.7 Landslide

Nature: Landslide is a general term for the dislodging and fall of a mass of soil or rocks along a sloped surface, or for the dislodged mass itself. The term is used for varying phenomena, including mudflows, mudslides, debris flows, rock falls, rock slides, debris avalanches, debris slides, and slump-earth flows. Landslides may result from a wide range of combinations of natural rock, soil, or artificial fill. The susceptibility of hillside and mountainous areas to landslides depends on variations in geology, topography, vegetation, and weather. Landslides may also occur because of indiscriminate development of sloping ground or the creation of cut-and-fill slopes in areas of unstable or inadequately stable geologic conditions.

Additionally, landslides often occur together with other natural hazards, thereby exacerbating conditions, as described below:

- Shaking due to earthquakes can trigger events ranging from rock falls and topples to massive slides.
- Intense or prolonged precipitation that causes flooding can also saturate slopes and cause failures leading to landslides.
- Wildfires can remove vegetation from hillsides, significantly increasing runoff and landslide potential.
- Landslides into a reservoir can indirectly compromise dam safety; a landslide can even affect the dam itself.

Another type of landslide occurs in areas cut by perennial streams. As floodwaters erode channel banks, rivers have undercut clay-rich sedimentary rocks along their south bank, thereby destabilizing the ground and causing the ground above it to slide.

History: Landslides have occurred in areas along the Rincon Fault, hillsides south of the Santa Clara River, and the east side of the Ventura River. In recent years, the most damaging landslides in Ventura County have occurred in the coastal community of La Conchita, just southeast of the Santa Barbara county line. La Conchita has been the site of multiple non-earthquake-induced landslides.

La Conchita was built on ground that had been graded by the Southern Pacific Railroad after a 1909 landslide slid into the railroad tracks. The land was intended to be a buffer zone between the retreating and eroding cliff and the Pacific Ocean. However, it was subdivided into smaller residential lots in 1924. Along the bluff face above La Conchita, the upper portion of the bluff is underlain by two rock formations separated by the Red Mountain fault.

The bluff above La Conchita has been associated with a variety of landslide activity, with historical accounts dating back to 1865. More recently, two small slides occurred in 1988 and 1991, followed by large movements of the same landslide mass in 1995 and 2005. The 1995 landslide, which occurred one month after the heaviest rainfall of an extraordinarily wet year, was considered to be a deep, slow-moving landslide. This landslide destroyed nine houses. The January 2005 event was a shallow and highly fluid remobilization of the same material that carried a thick layer of dry, viscous material. This landslide, which occurred at the peak of an extremely wet 2-week period, killed 10 people and destroyed 13 homes. Approximately 400,000 tons of debris cascaded down the slope behind the La Conchita housing development.

Location: In 2011, CGS created the Susceptibility to Deep-Seated Landslides grip map, covering the entire state of California. The map shows the relative likelihood of deep landsliding based on a methodology developed by Wilson and Keefer (1985), and uses detailed information on:

- Landslide inventory, including all previously mapped deep-seated landslides in California (approximately 57,000) that were assigned the lowest value of rock strength.
- Geology from a general geologic statewide map and a detailed geologic map over the most populated areas.
- Rock strength to measure the resistance to landsliding, developed from geologic and landslide inventory maps. Geologic units were classified into three rock strength units: (1) highest rock strength unit, which includes crystalline rocks and well-cemented sandstones; (2) intermediate rock strength unit, including weakly cemented sandstones; and (3) weakest rock strength unit, including shale, claystone, pre-existing landslides, and unconsolidated surficial units.
- Slope, including eight slope classes ranging from nearly flat (less than 3 degrees) to very steep (greater than 40 degrees).
- Average annual rainfall in inches.
- Earthquake shaking potential.

As shown on **Figure F-10**, the factors listed above were combined to create classes of landslide susceptibility. These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with slope and in weaker rocks. Very high landslide susceptibility—classes VIII, IX, and X—includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks. In Ventura County, areas most susceptible to landslide are generally located on the edge of cities, outside of the cities, and in the northern portion of the county. Each city in the county, with the exception of Port Hueneme, has some land mass in the class VII, IX, and X landslide susceptibility zones.

Extent: According to the 2011 Susceptibility to Deep-Seated Landslides grip map, there are 1,111.52 square miles of Ventura County located in the Very High Landslide Susceptibility area, including 174.51 square miles in class VIII, 668.71 square miles in class IX, and 268.30 square miles in class X.

Probability of Future Events: Based on the history of landslide occurrences and the potential for landslides as a result of the conditions in the county, future events are likely to occur about once every 10 years. The extent of future events is unknown, but could be similar to historic events: up to 400,000 tons or more of debris could be involved in one event.

4.3.8 Levee Failure Inundation

Nature: Levees are typically earthen embankments designed to contain, control, or divert the flow of water to provide some level of protection from flooding. Some levee systems are built for agricultural purposes and provide flood protection and flood loss reduction for farm fields and other land used for agricultural purposes. Urban levee systems are built to provide flood protection and flood loss reduction for population centers and the industrial, commercial, and residential facilities within them.

Levees are designed to provide a specific level of flood protection. Agricultural levee systems provide a level of protection that is appropriate based on the value of the assets being protected. Because urban levee systems are designated to protect urban areas, they are generally built to higher standards. Urban levee systems that are shown to provide protection from a 1% annual chance flood occurrence event on a FEMA FIRM must document ongoing compliance with the Federal Levee Certification requirements found in Section 65.10 of the NFIP regulations (i.e., 44 CFR 65.10).

No levee system provides full protection from all flooding events to the people and structures located behind it. Some level of flood risk exists in the levee-affected areas.

Levee failure is the overtopping, breach, or collapse of a levee wall. Levees can fail because of an earthquake, internal erosion, poor engineering/construction or maintenance, or landslides, but levees most commonly fail as a result of significant flows. During heavy precipitation periods or sudden melting of accumulated snow, excessively large flows may overtop levee sections and cause failure. The overflow of water washes away the top portion of the levee, creating deep grooves. Eventually, the levee weakens, resulting in a breach or collapse of the levee wall and the release of uncontrollable amounts of water.

History: The floods of January and February 1969 were the most damaging floods along the Santa Clara River in Ventura County. The estimated peak discharge of the 1969 flood was 165,000 cubic feet per second (cfs), before the gage data adjustment referenced in the Ventura County hydrology report titled *Santa Clara River 2006 Hydrology Update: Phase I, From Ocean to County Line* (VCWPD 2006) was performed.

The following excerpts taken from the United States Army Corps of Engineers (USACE) report entitled *Floods in Southern California during January and February, 1969* (USACE 1969) document the significant damage that occurred to the SCR-1 Levee protecting Oxnard, specifically within the reach from Highway 118 to Highway 101.

> "*The only significant damage that occurred during this reach during the January (1969) flood was damage to the revetment of an existing levee constructed by the Corps of Engineers. February flood flows washed out about 500 feet of State Route 118 Bridge, damaged agricultural properties constructed by the Corps of Engineers. … The flood eroded the south bank (of the Santa Clara River) near the existing Corps levee, damaging some groins; then deflected, ricocheted from the State Route 118 bridge, and returned to the south bank – where the flood flows cut in close to the Corps levee, bounced off the north bank, and carved a long arch.… The flood flows then deflected to south bank where they undercut the toe protection on the Corps levee, causing the failure of about 2,000 feet of levee and eroding the ground behind the levee for a distance of about 100 feet*."

After the 1969 flood damage, USACE repaired 7 of the original 40 groins (station 330+00 to station 344+50), restored 2,100 linear feet of levee embankment with deeper rock revetment (station 311+00 to station 332+00), and added 35 additional groins (station 246+00 to station 330+00 and station 421+80 to station 436+80), which were completed in 1971. A total of 75 groins are now in place along the reach of the SCR-1 Levee from station 246+00 to station 470+00. In December 1985, the VCWPD restored five groins (between as-built station 316+45 and station 356+45) in the vicinity of the 1969 levee failure location. The damages may have been due to the 1983 flood, with a peak discharge of 100,000 cfs. The damage to the groins was likely due to the low-flow channel encroaching and washing out the top portion of the groin tips. After the 1983 floods, the riverward tips of five groins extending between 40 to 100 feet along the groins were damaged. VCWPD repaired these five groins, which included one of the original 1961 groins constructed by the USACE, and four of those added by VCWPD in 1971 (station 321+00 to station 333+07). The repair included removal of approximately 2 feet of existing rock and placement of 2 tons of rock riprap back to the original design dimensions and backfilling the uncompacted fill. This is the only known non-Corps stone that has been added to the SCR-1 Levee.

Location: In November 2009, the VCWPD completed federally mandated engineering evaluations of nine provisionally accredited levees (PALs) within the Calleguas Creek, Santa Clara River, and Ventura River watersheds. At that time, VCWPD submitted Levee Certification Report (LCR) compliance documentation packages to FEMA for three of the nine PAL-designated levees. As shown on **Figure F-11**, these levees include the ASR-2 Levee Floodwall along Arroyo Santa Rosa in the unincorporated community of Santa Rosa Valley, the AS-6 Levee along Arroyo Simi in Simi Valley, and the SC-1 Levee along Sespe Creek in Fillmore.

At that same time, PAL-Response Reports (PRRs) were also submitted to FEMA for the remaining six PAL-designated levees also shown on **Figure F-11**. These are AS-7 along Arroyo Simi in Simi Valley, CC-2 and CC-3 along Calleguas Creek in Camarillo, SCR-1 along the Santa Clara River in Oxnard, VR-1 along the Ventura River in Ventura, and VR-3 in the unincorporated areas of the Ventura River Valley. The PRRs indicated that in their current condition, those six levees could not be certified by the VCWPD before FEMA's November 30, 2009, compliance submittal deadline date.

Subsequently, two additional levee systems, SC-2 (the south half of the Sespe Creek levee in Fillmore) and SCR-3 (along the Santa Clara River in Oxnard) were added to the above list of six VCWPD levees requiring rehabilitation work to be fully compliant with Federal levee certification regulations (i.e., 44 CFR 65.10). Also, the VR-2 levee system, along the west bank of the Ventura River, which was originally constructed by the Natural Resources Conservation Service (NRCS) in 1979 to provide flood protection for the unincorporated community of Casitas Springs, was added to the list of VCWPD levees requiring rehabilitation and/or improvement work.

Extent: There are 5.17 square miles in Ventura County protected by VCWPD PALs from the 100-year flood.

Probability of Future Events: The probability of future levee failures in Ventura County is unknown, but may result from a large winter storm or seismic event.

4.3.9 Post-Fire Debris Flow

Nature: Wildfires are a common occurrence in the hills and mountainous regions of Ventura County. By reducing or destroying vegetative cover and altering soil characteristics, fires often result in conditions that can significantly increase runoff and erosion when winter rains begin to fall. These conditions may result in a debris flow (also referred to as mud flow), which is a slurry of water, sediment, and rock that converges in a stream channel.

The threats of erosion, flooding, and debris flows are significantly increased by the following processes:

- **Reduced infiltration and increased runoff:** A fire's consumption of vegetative cover increases exposure of the soil surface to raindrop impact. Soil heating destroys organic matter that binds the soil together. Extreme heating may also cause the development of water-repellant, or "hydrophobic," soil conditions that further reduce infiltration.
- **Changes in hill slope conditions:** Fires remove obstructions to overland flow, such as trees, downed timber, and plants, increasing flow velocity and therefore erosive power. Increased sediment movement also fills depressions, reducing storage capacity and further contributing to increased velocity and volume of flow. These factors combine to allow more of the watershed to contribute flow to the flood at the same time, increasing the volume of the flood.
- **Changes in channel conditions:** Increased overland flow and sediment transport result in increased velocity and volume of flow in defined channels. Channel erosion increases, as do peak discharges.

The occurrence of erosion, floods, and debris flows in burned areas is also dependent on precipitation intensity—storms with high intensity are more likely to initiate the processes described above and result in flood events. Additionally, easily eroded soils facilitate changes in hill slope conditions and increase the volume of runoff. Both of these conditions are likely to occur in Ventura County.

In extreme situations, the conditions described above combine to form a debris flow. These flows are often the most destructive events resulting from heavy rainfall in fire-affected areas. They occur with little warning, carry vast quantities of rock and other material, and strike objects with extreme force. Because of their viscosity and density, debris flows can move or carry away objects as large as vehicles and bridges, and they may travel great distances down canyons and stream valleys. Debris flow fronts may also travel at high speeds, exceeding 50 miles per hour.

History: Evidence of debris-flow movement was widespread following the 1969 storms throughout the mountain ranges in Ventura County. Debris flows occurred in numerous watersheds, including Cozy Dell Canyon, Stewart Canyon, Senior Canyon, Orcutt Canyon, Jepson Wash, and others. Mudflows also occurred in 1969 and 1971 in watersheds that were underlain by fine-grained sedimentary rocks and had been more recently burned by wildfires near Ojai. Witnesses to the mudflows described surges of what appeared to be mud covered with water behind a moving boulder.

In 2014, two post-fire debris flows occurred in the Camarillo Springs. Around midnight on November 1, 2014, a heavy rain totaling 0.5 inch—the first in Ventura County in many months—unlodged debris and created thick mud from the hills recently burned by the Springs

Fire in May 2013. Twenty homes were evacuated, including two homes that were severely damaged. According to the Ventura County Fire Department, a storm drain system that should have prevented the mud and debris from flooding the area apparently filled to capacity, in part because of additional amounts of debris left on the hillside due to Springs Fire.

On December 12, 2014, a second debris flow affected Camarillo Springs when a storm dumped 1.8 inches of rainfall over the region. According to the Ventura County Fire Department, 16 homes were damaged, including 10 homes that were red-tagged. Hours before the storm was expected, mandatory evacuations were ordered for 124 homes. County crews had also worked to clear drainage areas before the storm hit and had put up K-rails to direct water and mud away from homes in the projected debris flow area.

Location: Areas of Ventura County that have been subject to recent wildfires are susceptible to potentially hazardous debris flows. Areas susceptible to debris flow include localities that are adjacent to and downslope of these burn areas, especially in locations that are in ravines and canyons, and at the mouths of canyons. **Figure F-12** shows wildfire perimeters of concern; this includes wildfires within the last 3 years (Grand and Springs fires), and burnt areas that are recovering slowly (Day fire).

Extent and Probability of Future Events: Ventura County has a long history of flooding and wildfires, which are two major factors in the occurrence of post-fire debris flow. However, because a number of complex factors lead to debris flow (basin morphometry, burn severity, soil properties, and rainfall characteristics), the probability and estimate of the volume of post-fire debris flow in Ventura County is unknown. The USGS has developed model predictions that can be calculated at specific basin outlets, and along the draining network within and immediately downstream of a burn area. These models can be applied post- fires to predict the probabilities of debris flows and estimate debris-flow volumes throughout a burn area in response to a specific rainstorm event.

4.3.10 Tsunami

Nature: A tsunami is a series of traveling ocean waves of extremely long length, generated by disturbances associated primarily with earthquakes occurring below or near the ocean floor. Subduction zone earthquakes at plate boundaries often cause tsunamis. However, tsunamis can also be generated by submarine landslides, submarine volcanic eruptions, the collapse of volcanic edifices, and—in very rare instances—large meteorite impacts in the ocean.

In the deep ocean, a tsunami may have a length from wave crest to wave crest of 100 miles or more but a wave height of only a few feet or less. Thus, the wave period can be up to several hours, and wavelengths can exceed several hundred miles. Therefore, tsunamis are unlike typical wind-generated swells on the ocean, which might have a period of about 10 seconds and a wavelength of up to 300 feet. Tsunamis cannot be felt aboard ships and they cannot be seen from the air in the open ocean. In deep water, the waves may reach speeds exceeding 700 miles per hour.

Tsunamis can originate hundreds or even thousands of miles away from coastal areas. Local geography may intensify the effect of a tsunami. Areas at greatest risk are less than 50 feet above sea level and within 1 mile of the shoreline. Tsunamis arrive as a series of successive crests (high water levels) and troughs (low water levels). These successive crests and troughs can occur anywhere from 5 to 90 minutes apart. They usually occur 10 to 45 minutes apart.

Tsunamis not only affect beaches that are open to the ocean, but also bay mouths, tidal flats, and the shores of large coastal rivers. Tsunami waves can also diffract around land masses. Because tsunamis are not symmetrical, the waves may be much stronger in one direction than another, depending on the nature of the source and the surrounding geography. However, tsunamis do propagate outward from their source, so coasts in the shadow of affected land masses are usually fairly safe.

History: According to the California Tsunami Evacuation Playbook, City of Ventura – Ventura County (No. 2014-Vent-01), and as shown in **Table 4-7**, there have been eight notable tsunami events run-ups recorded in Ventura County.

Table 4-7. Historical Tsunami Run-Ups in Ventura County

Year	Source/Source Location	Tsunami Location	Remarks
12/21/1812	Earthquake and Landslide	City of Ventura	6.5-foot run-up
4/01/1946	Earthquake – Aleutian Islands, Alaska	Port Hueneme	3-foot run-up
		Ormond Beach	5-foot run-up
11/4/1952	Earthquake – Kamchatka Peninsula	Port Hueneme	2-foot run-up
3/09/1957	Earthquake – Aleutian Islands, Alaska	Port Hueneme	2-foot run-up
3/28/1964	Earthquake and Landslide – Alaska	City of Ventura	Tide dropped 8.0 feet
		Oxnard	Large swells
9/29/2009	Earthquake – Samoa	Ventura	Buoys moved near mouth of harbor
2/27/2010	Earthquake – Chile	Ventura, Oxnard, Port Hueneme	3-foot run-up

Table 4-7. Historical Tsunami Run-Ups in Ventura County

Year	Source/Source Location	Tsunami Location	Remarks
3/11/2011	Earthquake – Japan	Ventura, Oxnard	4-foot run-up
		Port Hueneme	5-foot run-up

Source: CGS 2014.

Run-up = the large amount of water that a tsunami pushes onto the shore above the regular sea level, that is the maximum vertical height onshore above sea level reached by a tsunami

Location: Figure F-13 shows tsunami evacuation areas based on two scenarios—Phase 3 and Maximum Phase—as described in the California Tsunami Evacuation Playbook, City of Ventura – Ventura County. This map illustrates coastal land areas, including areas in the cities of Oxnard, Port Hueneme, and Ventura, that can become submerged due to tsunami run-up. The area of land subject to inundation is a factor of:

- Distance of shoreline from the tsunami-generating event
- Magnitude of the earthquake causing the event; duration and period of waves
- Run-up elevations
- Tidal level at time of occurrence
- Location along shore and direction of shore in respect to propagated waves
- Topography of the seabed

Extent: Figure F-13 shows the Phase 3 Evacuation and Maximum Evacuation Phase, based on models of maximum local and distance tsunamis and for tsunamis coming from the Cascadia Subduction Zone. The Phase 3 Evacuation estimates a tsunami flood level of 1.7 to 5.0 feet above the high tide line, and a tsunami flood level of 7.7 to 11.0 feet above low tide conditions. The Maximum Evacuation Phase estimates a tsunami flood level of more than 5.0 feet above the high tide line, and a tsunami flood level of more than 11.0 feet above low tide conditions.

Probability of Future Events: Based on the history of tsunami run-ups in the region and the history of earthquakes in the Pacific Rim, another tsunami event is likely to occur, although the extent and probability is unknown.

4.3.11 Wildfire

Nature: A wildfire is an uncontrolled fire that spreads through vegetative fuels, exploding and possibly consuming structures. Wildfires often begin unnoticed, spread quickly, and are usually signaled by dense smoke that may be visible from miles around. Wildfires can be human-caused by arson or campfires, or can be caused by natural events such as lightning. Wildfires can be categorized into four types:

- **Wildland fires** occur mainly in areas under federal control, such as national forests and parks, and are fueled primarily by natural vegetation.
- **Interface or intermix fires** occur in areas where both vegetation and structures provide fuel. These are also referred to as urban-wildland interface fires.
- **Firestorms** occur during extreme weather (typically high temperatures, low humidity, and high winds) with such intensity that fire suppression is virtually impossible. These events typically burn until the conditions change or the fuel is exhausted.
- **Prescribed fires and prescribed natural fires** are intentionally set or natural fires that are allowed to burn for beneficial purposes.

The following three factors contribute significantly to wildfire behavior; as described more fully below, these factors can be used to identify wildfire hazard areas:

- **Topography:** As slope increases, the rate of wildfire spread increases. South-facing slopes are also subject to greater solar radiation, making them drier and thereby intensifying wildfire behavior. However, ridgetops may mark the end of wildfire spread because fire spreads more slowly or may even be unable to spread downhill.
- **Fuel:** The type and condition of vegetation plays a significant role in the occurrence and spread of wildfires. Certain types of plants are more susceptible to burning or burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available to fuel the fire (referred to as the “fuel load”); the ratio of living to dead plant matter is also important. The risk of fire is increased significantly during periods of prolonged drought as the moisture content of both living and dead plant matter decreases. The fuel’s continuity is also an important factor, both horizontally and vertically.
- **Weather:** The most variable factor affecting wildfire behavior is weather. Variables such as temperature, humidity, wind, and lightning can affect chances for ignition and spread of fire. Extreme weather, such as high temperatures and low humidity, can lead to extreme wildfire activity. By contrast, cooling and higher humidity often signals reduced wildfire occurrence and easier containment. Years of precipitation followed by warmer years tend to encourage more widespread fires and longer burn periods. Also, since the mid-1980s, earlier snowmelt and associated warming due to global climate change has been associated with longer and more severe wildfire seasons in the western United States.

If not promptly controlled, wildfire may grow into an emergency or disaster. Even small fires can threaten lives and resources and destroy improved properties. It is also important to note that in addition to affecting people, wildfire may severely affect livestock and pets. Such events may require the emergency watering/feeding, shelter, evacuation, and even burying of animals.

Wildfires can have serious effects on the local environment. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capacity to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thereby enhancing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards, as described above. Wildfires can also greatly affect the air quality of the surrounding area.

History: Wildfires are a common occurrence in Ventura County. In the last 50 years (1965 through 2015), 23 wildfires, with an extent greater than 10,000 acres, have occurred. **Table 4-8** illustrates the 10 largest fires over the last 50 years. Most recently, in May 2013, the Springs fire burned 24,251 acres; 10 structures were destroyed and 12 were damaged, and 10 injuries were recorded.

Table 4-8. Ten Largest Ventura County Fires in the Last 50 years, 1965 through 2015

Name	Date	Acres Affected*
Day	September 2006	162,702
Simi Valley	October 2003	108,204
Piru	October 2003	63,991
Ranch**	October 2007	58,401
Ferndale	October 1985	47,064
Green Meadow	October 1993	38,477
Creek Road	September 1979	32,000
Steckel	October 1993	27,088
Parker Ranch	October 1967	25,000
Hopper	August 1997	24,793

Source: Cal FIRE 2015

*Acres affected = total acreage.

** Fire occurred in both Ventura and Los Angeles counties.

Location: Public Resources Code 4201-4204 and Government Code 51175-89 directed the California Department of Forestry and Fire Protection (Cal FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZs), are represented as very high, high, or moderate. Specifically, the maps were created using data and models describing development patterns, potential fuels over a 30- to 50-year time horizon, expected fire behavior, and expected burn probabilities. The maps are divided into local responsibility areas and state responsibility areas. Local responsibility areas generally include cities, cultivated agriculture lands, and portions of the desert. Local responsibility area fire protection is typically provided by city fire departments, fire protection districts, counties, and by Cal FIRE under contract to the local government. State responsibility area is a legal term defining the area where the state has financial responsibility for wildfire protection. Incorporated cities and federal ownership are not included. The prevention

and suppression of fires in all areas that are not state responsibility areas are primarily the responsibility of federal or local agencies.

Figure F-14 displays the areas of Ventura County most susceptible to wildfires. Within the County, very high FHSZs are located in mountainous or hillside areas (west of Lake Casitas, northeast of Ojai, north of Fillmore, and surrounding Thousand Oaks and Simi Valley), where the greatest fuel density exists; as well as throughout much of the county's large agricultural and cattle-grazing areas. Although these areas are not heavily populated, they are near populated communities.

Extent As shown on **Figure F-15**, in Ventura County there are 81.87 square miles in the high FHSZ and 504.42 square miles in the very high FHSZ.

Probability of Future Events: The climate in Ventura County is characterized as Mediterranean dry-summer featuring cool, wet winters and warm, dry summers. High moisture levels during the winter rainy season significantly increase the growth of plants. However, the vegetation is dried during the long, hot summers, decreasing plant moisture content and increasing the ratio of dead fuel to living fuel. As a result, fire susceptibility increases dramatically, particularly in late summer and early autumn. In addition, the presence of chaparral, a drought-resistant variety of vegetation that is dependent on occasional wildfires, is expected in Mediterranean dry-summer climates. Also, the history of plant succession in Ventura County is important in predicting fire susceptibility. For several years after a fire has occurred, easily flammable herbaceous species predominate and increase the likelihood of new fires. When woody species become re-established, they contribute to a lower overall level of fire susceptibility for approximately 10 years. However, after this period, the slow aging plant community becomes ever more likely to burn because of increased levels of dead plant material and lowered plant moisture levels.

In addition, the local meteorological phenomenon known as the Santa Ana winds contributes to the high incidence of wildfires in Ventura County. These winds originate during the autumn months in the hot, dry interior deserts to the north and east of Ventura County. They often sweep west into the county, bringing extremely dry air and high wind speeds that further desiccate plant communities during the period of the year when the constituent species have very low moisture content. The effect of these winds on existing fires is particularly dangerous; the winds can greatly increase the rate at which fires spread.

Based on the conditions described above and the history of occurrence in the past, future events are very likely to occur. In the past, fires burning more than 1,000 acres have occurred about every 1 to 3 years. The extent of future events will depend on specific conditions at the time of the fire.

4.3.12 Winter Storm

Nature: The climate on California's southern coast is hot Mediterranean, in which summers are hot and dry and winters are cool and damp. A dominating factor in the weather of California is the semi-permanent high pressure area of the North Pacific Ocean, sometimes called the Pacific High. This pressure center moves northward in summer, holding storm tracks well to the north; as a result, California receives little or no precipitation during that period. The Pacific High decreases in intensity in winter and moves farther south, permitting storms to move into and across the state and producing high winds, widespread rain at low elevations, and snow at high elevations. Occasionally the state's circulation pattern permits a series of storm centers to move into California from the southwest. This type of storm pattern is responsible for occasional heavy rains that can cause serious winter flooding. The rainy season is from mid-autumn to mid-spring. During these months, winter storms may occur.

In addition to high winds and flooding, winter storms may bring hail, lightning, and extended periods of freezing temperatures to all areas of the county.

History: Ventura County was included in the Presidential Disaster Declarations for freezing/ severe winter storms that occurred in December 1998 and January 2007. The 1998 freeze was particularly damaging to citrus crops.

According to NOAA's National Climatic Data Center (NCDC) database, 105 storms causing high winds occurred in Ventura County over the last 10 years. These storms included wind speeds of up to 76 miles per hour; in one case, the storm caused a death. Storms with high winds also knocked down trees and power lines.

Also according to the NCDC database, 31 winter storms causing snow and ice have occurred in Ventura County over the last 10 years. Some of the storms also caused hail; in addition, two hailstorms have been recorded in Ventura County since 2005, with reported hail of up to 1.5 inches in diameter.

Location: Many events described above affected all of Ventura County. The entire county is susceptible to winter storms and damage from wind. However, only the higher elevation areas (typically at or above 4,000 to 5,000 feet) experience snowfall, while lower elevation areas experience heavy rains. Hail has occurred throughout the county.

Extent: A winter storm can cause high rains, flooding, up to 18 inches of snow at the highest elevations in the county (e.g., Mount Pinos), and wind speeds of up to 70 miles per hour. Hail of up to 1.5 inches in diameter has been recorded.

Probability of Future Events: Based on recent history, a winter storm can occur every year, but those causing injury or damage occur about once every 10 years.

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5.1 OVERVIEW

A vulnerability analysis predicts the extent of exposure that may result from a hazard event of a given intensity in a given area. The analysis provides quantitative data that may be used to identify and prioritize potential mitigation measures by allowing communities to focus attention on areas with the greatest risk of damage.

This vulnerability analysis consists of the following steps:

- Asset inventory
- Methodology
- Exposure analysis and summary of impacts
- RL properties

5.2 ASSET INVENTORY

Land, population, and residential buildings are listed in **Table 5-1** for all of Ventura County, including its 10 cities. The critical facilities and infrastructure of local participants (Unincorporated Ventura County, eight cities and nine special districts) are listed in **Table 5-1**, including the total number of each category of facility or infrastructure. In addition, local participant-specific assets are listed in each local participant-specific appendix.

Table 5-1. Summary of Total Assets

Category		Number
Land (square miles)		1,832.43
Population		823,262
Residential Buildings		232,414
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	1
	Community facilities, including libraries, community centers, and parks	332
	Educational facilities, including school buildings and district offices	359
	Emergency response facilities, including fire and police stations	89
	Government facilities	50
	Medical and residential care facilities	77
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	515
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	158
	TOTAL	1,581

5.3 METHODOLOGY

A conservative exposure-level analysis was conducted to assess the risks associated with the identified hazards. This analysis is a simplified assessment of the potential effects of the hazards on values at risk, without consideration of the probability or level of damage. Due to a combination of a lack of adequate information, the lack of a standard methodology for a quantitative exposure analysis, and limited GIS capabilities, a quantitative exposure analysis has been prepared for the hazards listed in **Table 5-2**.

Table 5-2. Hazards Included in Exposure Analysis

Hazards	
Climate Change (Sea-Level Rise and Combined Storm Flood Hazard Zones)	Landslide
Dam Failure Inundation	Levee Failure Inundation
Earthquake (Ground Shaking and Liquefaction)	Tsunami
Flood	Wildfire

Population was derived from 2010 Census information, then a combination of spatial overlay and proportional analysis was used to determine the number of people in areas where hazards are likely to occur.

Using block-level residential building information from the 2010 Census, a combination of spatial overlay and proportional analysis was used to determine the number of residential buildings located where hazards are likely to occur.

Point locations for each critical facility and infrastructure were compared to locations where hazards are likely to occur. For each critical facility/infrastructure in a hazard area, exposure was calculated by assuming the worst-case scenario (that is, the asset would be completely destroyed and would have to be replaced). A similar analysis was used to evaluate the proportion of the population at risk. However, the analysis simply represents the number of people at risk; no estimate of the number of potential injuries or deaths was prepared.

Additionally, replacement values and/or insured values are not included for residential buildings due to incomplete data, and are only included for critical facilities/facilities if available.

5.4 EXPOSURE ANALYSIS AND SUMMARY OF IMPACTS

The local hazard mitigation planning and floodplain management requirements for an MHMP's exposure analysis and corresponding summary of impacts are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element B: Hazard Identification and Risk Assessment
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 5: Assess the Problem.
A. Summary of each hazard identified in the hazard assessment and their community impact.
B. Description of the impacts of hazards on:
(1) Life, safety, health, procedures for warning and evacuations
(3) Critical facilities and infrastructure
(5) The number and type of affected buildings

Tables 5-3 through **5-19** include the total exposure analysis by hazard. The exposure analysis details the number and percent of land, population, residential buildings, and critical facilities and infrastructure at risk to a hazard. This information is summarized in the summary of impact statement, which follows each exposure analysis table. In addition, local participant-specific exposure analyses are listed in each local participant-specific appendix. Finally, flood insurance information is provided for Unincorporated Ventura County buildings located in the 1% annual chance (100-year) flood. The impacts of flood hazards on life/safety procedures for warnings and evacuations are also discussed for flood and tsunami.

5.4.1 Summary of Impacts to Climate Change (Rising Tides Inundation Areas – 2030)

While the entire County, including all cities, is vulnerable to climate change, only the areas on the coast are susceptible to effects of rising tides due to climate change. The cities of Oxnard and Ventura as well as Unincorporated Ventura County - are all vulnerable to inundation due to rising tides. As predicted for the year 2030, the following percentages of the population live in a rising tides inundation area: Oxnard, 0.2 percent; Ventura, 0.09 percent; and Unincorporated Ventura County, 0.22 percent.

Table 5-3 below illustrates the summary of impacts from rising tides due to climate change on the entire County. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-3. Total: Climate Change Exposure Analysis (Rising Tides Inundation Areas – 2030)

Category		Number	% of Total
Land (square miles)		6.49	0.35%
Population		724	0.09%
Residential Buildings		449	0.19%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	7	2.11%
	Educational facilities, including school buildings and district offices	0	0.00%
	Emergency response facilities, including fire and police stations	0	0.00%
	Government facilities	0	0.00%
	Medical and residential care facilities	0	0.00%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	0	0.00%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	10	6.33%
	TOTAL	17	1.08%

5.4.2 Summary of Impacts to Climate Change (Combined Storm Flood Hazard Zones – 2030)

While the entire County, including all cities, is vulnerable to climate change, only the areas on the coast are susceptible to effects of storm flood hazard zones due to climate change. Combined storm flood zones take into account future coastal erosion, fluvial 100-year storm floodplains, coastal storm wave impact areas, and future sea-level rise. The cities of Oxnard, Port Hueneme, Ventura and Unincorporated Ventura County are all vulnerable to combined storm flooding. As predicted for the year 2030, the following percentages of the population will be located in combined storm flood zone: Oxnard, 5.03 percent; Port Hueneme, 0.16 percent; Ventura, 2.54 percent; and Unincorporated Ventura County, 2.37 percent.

Table 5-4 below illustrates the summary of impacts from a combined storm flood event on the entire County. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-4. Total: Climate Change Exposure Analysis (Combined Storm Flood Hazard Zones – 2030)

Category		Number	% of Total
Land (square miles)		28.43	1.55%
Population		14,927	181%
Residential Buildings		5,633	2.42%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	22	6.63%
	Educational facilities, including school buildings and district offices	5	1.39%
	Emergency response facilities, including fire and police stations	0	0.00%
	Government facilities	0	0.00%
	Medical and residential care facilities	0	0.00%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	26	5.05%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	15	9.49%
	TOTAL	68	4.30%

5.4.3 Summary of Impacts to Dam Failure Inundation

There are 16 state regulated dams within Ventura County as well as 5 state regulated dams outside of the County that can lead to inundation of Ventura County. The entire County is vulnerable to inundation from dam failure(s), but the area's most susceptible to dam failure inundation include those locations along the Santa Clara River, including Fillmore and Santa Paula, and the cities of Oxnard, and Port Hueneme. Accordingly, the following percentages of the population are located within dam failure inundation zones: Camarillo, 37.02 percent; Fillmore, 85.65 percent; Moorpark, 39.94 percent; Ojai, 2.86 percent; Oxnard, 100 percent; Port Hueneme, 100 percent; Santa Paula, 85.88 percent; Simi Valley, 30.77 percent; Thousand Oaks; 3.81 percent; Ventura, 27.77 percent; and Unincorporated Ventura County, 27.35 percent.

Table 5-5 below illustrates the summary of impacts from dam failure inundation on the entire County. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure. It is important to note that this summary reflects the impacts due to failure of all dams with inundations areas in Ventura County, which is not ever anticipated to occur.

Table 5-5. Total: Dam Failure Inundation Exposure Analysis

Category		Number	% of Total
Land (square miles)		189.17	10.32%
Population		394,416	47.91%
Residential Buildings		94,511	40.66%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	1	100.00%
	Community facilities, including libraries, community centers, and parks	147	44.28%
	Educational facilities, including school buildings and district offices	174	48.47%
	Emergency response facilities, including fire and police stations	53	59.55%
	Government facilities	33	66.00%
	Medical and residential care facilities	31	40.26%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	166	32.23%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	98	62.03%
	TOTAL	703	44.47%

5.4.4 Summary of Impacts to Earthquakes (Severe Ground Shaking)

All of Ventura County is vulnerable to ground shaking from an earthquake and the entire County is in the severe, violent or extreme ground shaking potential categories. Areas of severe ground shaking are found in the south eastern corner of the County and the northern portion of the County, which is sparsely populated. Severe ground33 shaking is anticipated for 0.02 percent of Simi Valley's population, 0.66 percent of Thousand Oak's population and 2.88 percent of Unincorporated Ventura County's population.

Table 5-6 below illustrates the summary of impacts from earthquake shaking on the entire County, when looking at areas of severe ground shaking. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-6. Total: Earthquake Exposure Analysis (Severe Ground Shaking)

Category		Number	% of Total
Land (square miles)		15.16	0.83%
Population		3,563	0.43%
Residential Buildings		1,099	0.47%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	3	0.90%
	Educational facilities, including school buildings and district offices	0	0.00%
	Emergency response facilities, including fire and police stations	0	0.00%
	Government facilities	0	0.00%
	Medical and residential care facilities	0	0.00%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	0	0.00%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	0	0.00%
	TOTAL	3	0.19%

5.4.5 Summary of Impacts to Earthquakes (Violent Ground Shaking)

All of Ventura County is vulnerable to ground shaking from an earthquake and the entire County is in the severe, violent or extreme ground shaking potential categories. Areas of violent ground shaking are found throughout the County, but the cities of Camarillo, Moorpark, Ojai and Thousand Oaks are almost entirely or entirely in the violent ground shaking zone. Violent ground shaking is anticipated for 97.40 percent of Camarillo's population; 89.18 percent of Moorpark's population; 100 percent of Ojai's population; 20.40 percent of Oxnard's population; 0.12 percent of Santa Paula's population; 49.64 percent of Simi Valley's population; 99.34 percent of Thousand Oak's population; 25.34 percent of Ventura's population; and 70.92 percent of Unincorporated Ventura County's population.

Table 5-7 below illustrates the summary of impacts from earthquake shaking on the entire County, when looking at areas of violent ground shaking. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure

Table 5-7. Total: Earthquake Exposure Analysis (Violent Ground Shaking)

Category		Number	% of Total
Land (square miles)		1,157.57	63.17%
Population		437,604	53.15%
Residential Buildings		133,671	57.51%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	210	63.25%
	Educational facilities, including school buildings and district offices	191	53.20%
	Emergency response facilities, including fire and police stations	46	51.69%
	Government facilities	21	42.00%
	Medical and residential care facilities	41	53.25%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	338	65.63%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	87	55.06%
	TOTAL	934	59.08%

5.4.6 Summary of Impacts to Earthquakes (Extreme Ground Shaking)

All of Ventura County is vulnerable to ground shaking from an earthquake and the entire County is in the severe, violent or extreme ground shaking potential categories. Areas of extreme ground shaking are found throughout the County, but the cities of Fillmore, Oxnard, Santa Paula, and Ventura are almost entirely or entirely in the extreme ground shaking zone. Extreme ground shaking is anticipated for 2.60 percent of Camarillo's population; 100 percent of Fillmore's population; 10.82 percent of Moorpark's population; 79.60 percent of Oxnard's population; 65.87 percent of Port Hueneme's population; 99.88 percent of Santa Paula's population; 50.34 percent of Simi Valley's population; 74.35 percent of Ventura's population; and 26.01 percent of Unincorporated Ventura County's population.

Table 5-8 below illustrates the summary of impacts from earthquake shaking on the entire County, when looking at areas of extreme ground shaking. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-8. Total: Earthquake Exposure Analysis (Extreme Ground Shaking)

Category		Number	% of Total
Land (square miles)		659.67	36.00%
Population		381,564	46.35%
Residential Buildings		97,306	41.87%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	1	100.00%
	Community facilities, including libraries, community centers, and parks	115	34.64%
	Educational facilities, including school buildings and district offices	168	46.80%
	Emergency response facilities, including fire and police stations	43	48.31%
	Government facilities	29	58.00%
	Medical and residential care facilities	42	54.55%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	167	32.43%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	71	44.94%
	TOTAL	636	40.23%

5.4.7 Summary of Impacts to Earthquakes (Liquefaction)

The entire County of Ventura, including all cities, is susceptible to liquefaction, but those most vulnerable are those locations along the Santa Clara river and those in the valley area which extends from Camarillo to Port Hueneme. All or almost all residents of Fillmore, Oxnard and Port Hueneme are in the liquefaction susceptibility areas. The following percentages of the population live in liquefaction susceptible areas: Camarillo, 23.10 percent; Fillmore, 97.81 percent; Moorpark, 48.64 percent; Ojai, 11.48 percent; Oxnard, 99.99 percent; Port Hueneme, 100 percent; Santa Paula, 34.74 percent; Simi Valley, 42.10 percent; Thousand Oaks; 2.79 percent; Ventura, 40.26 percent; and Unincorporated Ventura County, 32.23 percent.

Table 5-9 below illustrates the summary of impacts from liquefaction on the entire County. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-9. Total: Earthquake Exposure Analysis (Liquefaction)

Category		Number	% of Total
Land (square miles)		211.39	11.54%
Population		406,454	49.37%
Residential Buildings		99,538	42.83%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	145	43.67%
	Educational facilities, including school buildings and district offices	170	47.35%
	Emergency response facilities, including fire and police stations	49	55.06%
	Government facilities	37	74.00%
	Medical and residential care facilities	46	59.74%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	187	36.31%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	118	74.68%
	TOTAL	752	47.56%

5.4.8 Summary of Impacts to Flood (100-Year Flood Zone)

Flooding affects areas all throughout Ventura County. Areas of likely flooding are defined by a 100-year and a 500-year flood zone. While the entire County has population in the 100-year flood zone, the cities of Camarillo, Santa Paula and Simi Valley are most vulnerable. The following percentages of the population live in the 100-year flood zone: Camarillo, 8.33 percent; Fillmore, 2.73 percent; Moorpark, 5.95 percent; Ojai, 3.24 percent; Oxnard, 0.31 percent; Port Hueneme, 0.45 percent; Santa Paula, 37.53 percent; Simi Valley, 11.79 percent; Thousand Oaks, 1.45 percent; Ventura, 0.5 percent; and Unincorporated Ventura County, 6.76 percent.

Table 5-10 below illustrates the summary of impacts of flooding on the entire County, when looking at the 100-year flood zones. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-10. Total: Flood Exposure Analysis (100-Year Flood Zone)

Category		Number	% of Total
Land (square miles)		78.37	4.28%
Population		43,311	5.26%
Residential Buildings		12,801	5.51%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	30	9.04%
	Educational facilities, including school buildings and district offices	19	5.29%
	Emergency response facilities, including fire and police stations	3	3.37%
	Government facilities	1	2.00%
	Medical and residential care facilities	3	3.90%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	82	15.92%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	107	67.72%
	TOTAL	245	15.50%

Additional Flood Insurance Information: Not including public utilities (basins, wells, gages and dams) and bridges, there are four facilities owned by Unincorporated Ventura County that are located within the 100-year floodplain, including: Todd Road Jail; Piru Family Medical Center, Santa Paula Medical Center and the Ventura County Airport. In addition, there are two Ventura County Fire District facilities (stations #22 and #25) located in this hazard area. All of the facilities mentioned above have flood insurance. Not including bridges, there is only one

facility (La Jenelle Park) owned by Oxnard that is located within the 100-year floodplain. Since the park is not an actual facility, it does not have flood insurance.

Additional Life/Safety Information: As described in CRS Activity 610, the VCWPD operates and maintains a Flood Threat Recognition System also known as the Flood Warning System (**Annex A**). The Flood Warning System is made of self-reporting rain and stream gages placed in strategic locations to provide real-time data for monitoring storms and flooding conditions. The gages provide warnings for each water course and basin across Ventura County, including each city. Each stream gage has an Advance Hydrologic Prediction System display to show the current stream level, predicted level(s), and warning levels. Alarm criteria are set by specific thresholds for each gage on rainfall intensity and stream/river flows. Once an alarm is triggered, the alarm message is sent via e-mail, pager text, SMS cell text, and Twitter message to emergency personnel in the Ventura County Storm Operation Centers and the Emergency Operation Center. The staff at the operation centers can provide hydrologic knowledge on how the channels are responding to the storm and can clarify any discrepancies between observed peaks and forecasted peaks for the Ventura County Sheriff's (OES) and other local agencies that execute warnings and evacuations. The Twitter message is sent to a public account and can be monitored by the public, emergency personnel, and NWS.

5.4.9 Summary of Impacts to Flood (500-Year Flood Zone)

While the entire County has people that reside in the 500-year flood zone, the people living in the cities of Camarillo, Moorpark, Ojai, Oxnard, Port Hueneme, and Santa Paula are most vulnerable. The following percentages of the population live in the 500-year flood zone: Camarillo, 28.62 percent; Fillmore, 0.02 percent; Moorpark, 24.39 percent; Ojai, 27.05 percent; Oxnard, 34.96 percent; Port Hueneme, 94.24 percent; Santa Paula, 24.52 percent; Simi Valley, 4.1 percent; Thousand Oaks, 0.77 percent; Ventura, 3.19 percent; and Unincorporated Ventura County, 12.11 percent.

Table 5-11 below illustrates the summary of impacts of flooding on the entire County, when looking at the 500-year flood zones. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-11. Total: Flood Exposure Analysis (500-Year Flood Zone)

Category		Number	% of Total
Land (square miles)		51.65	2.82%
Population		146,882	17.84%
Residential Buildings		34,996	15.06%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	51	15.36%
	Educational facilities, including school buildings and district offices	64	17.83%
	Emergency response facilities, including fire and police stations	27	30.34%
	Government facilities	11	22.00%
	Medical and residential care facilities	17	22.08%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	49	9.51%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	23	14.56%
	TOTAL	242	15.31%

5.4.10 Summary of Impacts to Landslides (Susceptibility Class VIII)

The entire County is susceptible to landslide, but most of the areas susceptible to landslide are not highly populated. High landslide susceptibility is broken up into three classes, VIII, IX and X. The following percentages of the population live in landslide susceptibility Class VIII areas: Camarillo, 0.5 percent; Fillmore, 0.23 percent; Moorpark, 4.55 percent; Ojai, 0.74 percent; Simi Valley, 3.29 percent; Thousand Oaks; 4.07 percent; Ventura, 0.04 percent; and Unincorporated Ventura County, 2.71 percent.

Table 5-12 below illustrates the summary of impacts from landslides on the entire County, when looking at susceptibility Class VIII areas. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-12. Total: Landslide Exposure Analysis (Susceptibility Class VIII)

Category		Number	% of Total
Land (square miles)		174.51	9.52%
Population		13,803	1.68%
Residential Buildings		4,534	1.95%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	6	1.81%
	Educational facilities, including school buildings and district offices	2	0.56%
	Emergency response facilities, including fire and police stations	1	1.12%
	Government facilities	1	2.00%
	Medical and residential care facilities	0	0.00%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	27	5.24%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	0	0.00%
	TOTAL	37	2.34%

5.4.11 Summary of Impacts to Landslides (Susceptibility Class IX)

As noted in the section above, most of the areas in the County that are susceptible to landslide are not highly populated. High landslide susceptibility is broken up into three classes, VIII, IX and X. The following percentages of the population live in landslide susceptibility Class IX areas: Camarillo, 2.5 percent; Fillmore, 1.07 percent; Moorpark, 6.65 percent; Ojai, 1.34 percent; Oxnard, 0.01 percent; Santa Paula, 1.61 percent; Simi Valley, 3.79 percent; Thousand Oaks; 7.26 percent, Ventura, 2.47 percent; and Unincorporated Ventura County, 6.63 percent.

Table 5-13 below illustrates the summary of impacts from landslides on the entire County, when looking at susceptibility Class IX areas. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-13. Total: Landslide Exposure Analysis (Susceptibility Class IX)

Category		Number	% of Total
Land (square miles)		668.71	36.49%
Population		27,445	3.33%
Residential Buildings		9,428	4.06%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	19	5.72%
	Educational facilities, including school buildings and district offices	1	0.28%
	Emergency response facilities, including fire and police stations	1	1.12%
	Government facilities	0	0.00%
	Medical and residential care facilities	0	0.00%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	52	10.10%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	4	2.53%
	TOTAL	77	4.87%

5.4.12 Summary of Impacts to Landslides (Susceptibility Class X)

The following percentages of the population live in landslide susceptibility Class X areas: Camarillo, 1.67 percent; Fillmore, 1.04 percent; Moorpark, 1.51 percent; Ojai, 0.13 percent; Santa Paula, 0.97 percent; Simi Valley, 0.55 percent; Thousand Oaks; 1.93 percent; Ventura, 3.13 percent; and Unincorporated Ventura County, 2.88 percent.

Table 5-14 below illustrates the summary of impacts from landslides on the entire County, when looking at susceptibility Class X areas. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-14. Total: Landslide Exposure Analysis (Susceptibility Class X)

Category		Number	% of Total
Land (square miles)		268.30	14.64%
Population		11,248	1.37%
Residential Buildings		3,951	1.70%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	8	2.41%
	Educational facilities, including school buildings and district offices	3	0.84%
	Emergency response facilities, including fire and police stations	0	0.00%
	Government facilities	3	6.00%
	Medical and residential care facilities	1	1.30%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	41	7.96%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	4	2.53%
	TOTAL	60	3.80%

5.4.13 Summary of Impacts to Levee Failure Inundation (Reduced Flood Risks Due to Levees)

The hazard of levee failure inundation is discussed in **Section 4.3.8**. There are 5.31 square miles in Ventura County protected by VCWPD provisionally-accredited levees from the 100-year flood. Levees are located throughout the County, but the City of Fillmore receives the most benefit from levees. The following percentages of the population have a reduced flood risk due to levees: Fillmore, 47.39 percent; Oxnard, 3.61 percent; Simi Valley, 1.76 percent; Ventura, 4.25 percent; and Unincorporated Ventura County, 0.55 percent.

Table 5-15 below illustrates the summary of impacts of a reduced flood risk due to VCWPD provisionally-accredited levees. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-15. Total: Levee Failure Inundation Exposure Analysis (Reduced Flood Risks Due to Levees)

Category		Number	% of Total
Land (square miles)		5.17	0.29%
Population		21,514	2.61%
Residential Buildings		5,217	2.24%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	8	2.41%
	Educational facilities, including school buildings and district offices	8	2.23%
	Emergency response facilities, including fire and police stations	5	5.62%
	Government facilities	0	0.00%
	Medical and residential care facilities	5	6.49%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	7	1.36%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	0	0.00%
	TOTAL	33	2.09%

5.4.14 Summary of Impacts to Tsunami Inundation (Phase 3)

In general the entire coastal area of Ventura County is vulnerable to run-up from a tsunami. In particular, the areas along the coast of the cities of Ventura, Oxnard, and Port Hueneme and select areas of Unincorporated Ventura County are of most concern. The County has established two tsunami evacuation zones, one for a Phase 3 Evacuation and one for a Maximum Evacuation Phase. The following percentages of the population live in the evacuation zone for a Phase 3 Evacuation: Oxnard, 1.21 percent; Port Hueneme, 4.46 percent; Ventura, 1.88 percent; and Unincorporated Ventura County, 3.0 percent.

Table 5-16 below illustrates the summary of impacts of a tsunami on the entire County, when looking at a Phase 3 Evacuation. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-16. Total: Tsunami Inundation Exposure Analysis (Phase 3)

Category		Number	% of Total
Land (square miles)		9.85	0.54%
Population		8,199	0.99%
Residential Buildings		3,852	1.66%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	12	3.61%
	Educational facilities, including school buildings and district offices	0	0.00%
	Emergency response facilities, including fire and police stations	1	1.12%
	Government facilities	0	0.00%
	Medical and residential care facilities	0	0.00%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	18	3.50%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	9	5.70%
	TOTAL	40	2.53%

Additional Life/Safety Information: As outlined in the Draft 2014 California Tsunami Evacuation Playbook, City of Ventura – Ventura County, a tsunami warning will be issued for a Phase 3 Evacuation (5.0 feet to 8.2 feet). For a Phase 3 Evacuation, evacuations will generally include beaches, piers, and harbor docks and boats. Warning messages will be transmitted by Warning Centers over the NOAA Weather Wire system directly to other Warning Centers, and to the Coastal NWS Forecast Offices and their Area of Responsibility's State Warning Centers. The local NWS Office is in Oxnard and serves Ventura County. Cal OES operates California's

State Warning Center in Sacramento. Some messages will be transmitted automatically based on seismic event magnitude and location, and followed shortly by more detailed information (after review by scientists at the Tsunami Warning Centers). Generally, a message will be generated within 5 minutes of the seismic event. Messages will be recorded for transmission of the Emergency Alert System and local National Weather Radio sites. There is no fixed, audible warning system that covers the entire 42 miles of the county's coastline. Emergency vehicle (and helicopter) public address systems and sirens may be used to alert residents of the need to evacuate. Warnings may not be possible in the event of a tsunami generated by a local seismic event, and will not be available if a tsunami is generated by a local nonseismic event (subaerial or subsea landslide).

5.4.15 Summary of Impacts to Tsunami Inundation (Maximum Phase)

In general the entire coastal area of Ventura County is vulnerable to run-up from a tsunami. In particular, the areas along the coast of the cities of Ventura, Oxnard, and Port Hueneme and select areas of Unincorporated Ventura County are of most concern. The County has established two tsunami evacuation zones, one for a Phase 3 event and one for a Maximum Evacuation Phase. The following percentages of the population live in the evacuation zone for a Maximum Evacuation Phase: Oxnard, 3.66 percent; Port Hueneme, 6.99 percent; Ventura, 4.59 percent; and Unincorporated Ventura County, 3.83 percent.

Table 5-17 below illustrates the summary of impacts of a tsunami on the entire County, when looking at a Maximum Evacuation Phase. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-17. Total: Tsunami Inundation Exposure Analysis (Maximum Phase)

Category		Number	% of Total
Land (square miles)		13.84	0.76%
Population		17,266	2.10%
Residential Buildings		8,225	3.54%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	25	7.53%
	Educational facilities, including school buildings and district offices	2	0.56%
	Emergency response facilities, including fire and police stations	1	1.12%
	Government facilities	0	0.00%
	Medical and residential care facilities	0	0.00%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	27	5.24%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	11	6.96%
	TOTAL	66	4.17%

Similar to a Phase 3 Event, a tsunami warning will be issued for a Maximum Evacuation Phase (8.2 ft. or greater). For a Maximum Evacuation Phase, evacuations will also generally include beaches, piers, and harbor docks and boats. Warning messages will follow the same protocol outlined in **Section 5.4.14**. Limitations of the system, including impacts of local-sourced tsunamis, are also described in **Section 5.4.14**.

5.4.16 Summary of Impacts to Wildfires (High Fire Severity Zone)

The entire County is vulnerable to wildfire, however the area of most concern are along the wildland-urban interface (the zone of transition between unoccupied land and human development). Cal FIRE has developed three FHSZ, including moderate, high and very high. Very little of the County's population falls within the high FHSZ. Accordingly, 0.04 percent of Ojai's population; 0.03 percent of Santa Paula's population; and 3.89 percent of Unincorporated Ventura County's population reside in the high fire severity zone.

Table 5-18 below illustrates the summary of impacts that wildfire has on the entire County, within the high FHSZ. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-18. Total: Wildfire Exposure Analysis (High FHSZ)

Category		Number	% of Total
Land (square miles)		81.87	4.47%
Population		3,682	0.45%
Residential Buildings		1,410	0.61%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	3	0.90%
	Educational facilities, including school buildings and district offices	4	1.11%
	Emergency response facilities, including fire and police stations	0	0.00%
	Government facilities	0	0.00%
	Medical and residential care facilities	0	0.00%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	16	3.11%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	7	4.43%
	TOTAL	30	1.90%

5.4.17 Summary of Impacts to Wildfires (Very High Fire Severity Zone)

The populations that live in the very high FHSZ are mainly located in the cities of Moorpark, Simi Valley, Thousand Oaks, as well as Unincorporated Ventura County. The following percentages of the population live in the very high FHSZ: Camarillo, 4.99 percent; Fillmore, 9.74 percent; Moorpark, 44.0 percent; Ojai, 11.26 percent; Santa Paula, 4.49 percent; Simi Valley, 27.67 percent; Thousand Oaks, 43.06 percent; Ventura, 11.38 percent; and Unincorporated Ventura County, 37.08 percent.

Table 5-19 below illustrates the summary of impacts that wildfire has on the entire County within the very high FHSZ. This includes the level of impact to the County's landmass, population, residential structures, and the critical facilities and infrastructure.

Table 5-19. Total: Wildfire Exposure Analysis (Very High FHSZ *)

Category		Number	% of Total
Land (square miles)		504.42	27.53%
Population		157,918	19.18%
Residential Buildings		51,867	22.32%
Critical Facilities and Infrastructure	Commercial fuel distribution facilities	0	0.00%
	Community facilities, including libraries, community centers, and parks	81	24.40%
	Educational facilities, including school buildings and district offices	42	11.70%
	Emergency response facilities, including fire and police stations	16	17.98%
	Government facilities	8	16.00%
	Medical and residential care facilities	7	9.09%
	Public utilities, including pump stations, electric substations, potable water facilities, wastewater facilities, wells, dams, reservoirs, debris basins hydrostations, meter stations, and stream and river gages	211	40.97%
	Transportation infrastructure, including bridges maintained by the County of Ventura, airports, and transit stations	23	14.56%
	TOTAL	388	24.54%

* Very high FHSZ include both Local Responsibility Areas and State Responsibility Areas.

5.5 REPETITIVE LOSS PROPERTIES

The local hazard mitigation planning requirements for RL properties are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element B: Hazard Identification and Risk Assessment
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))

A RL property is a NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978. A Severe RL (SRL) property consists of any NFIP-insured property that has met at least one of the following paid flood loss criteria since 1978, regardless of ownership: (1) four or more separate claim payments of more than $5,000 each (including building and contents payments); or (2) two or more separate claim payments (building payments only) where the total of the payments exceeds the current market value of the property. In either case, two of the claim payments must have occurred within 10 years of each other. **Table 5-20** shows the number of RL and SRL properties by jurisdiction and **Figure F-19** shows the approximate location of RL and SRL properties as of June 20, 2015.

The VCWPD has identified 12 repetitive flood areas throughout the Unincorporated Ventura County. These areas correspond with the RL and SRL properties identified in **Figure F-19**. The repetitive flood areas are as follows: areas 1-4 are along the Ventura River; areas 5-6 are located along the coast (Rincon Beach/Solimar Beach) near Santa Barbara County; area 7 is located along the Santa Clara River/City of Santa Paula; area 8 is located outside of the City of Oxnard in the Nyeland Acres community; area 9 is located along the coast bordering Los Angeles County; area 10 by Lake Sherwood; area 11 is located outside of Simi Valley next to Los Angeles County; and area 12 is located outside of the City of Camarillo along the Arroyo Las Posas.

Table 5-20. Repetitive Loss Properties

Community Name	RL Properties	National Count/Severe RL Properties	Total
Ventura County	59	4	63
City of Camarillo	0	0	0
City of Fillmore	0	0	0
City of Moorpark	0	0	0
City of Ojai	0	1	1
City of Oxnard	0	0	0
City of Port Hueneme	0	0	0
City of Santa Paula	3	0	3
City of Simi Valley	N/A	N/A	N/A
City of Thousand Oaks	5	0	5

Table 5-20. Repetitive Loss Properties

Community Name	RL Properties	National Count/Severe RL Properties	Total
City of Ventura	7	1	8
TOTAL	74	6	80

Source: FEMA Region IX: May 2015.

N/A = Not Available

6.1 OVERVIEW

A capability assessment identifies and evaluates the human and technical, financial, and legal and regulatory resources available for hazard mitigation; and describes the current, ongoing, and recently completed mitigation projects.

6.2 CAPABILITY ASSESSMENT

The local hazard mitigation planning and floodplain management requirements for a capability assessment are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element C: Mitigation Strategy
C1. Does the Plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement § 201.6(c)(3))
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement § 201.6(c)(3)(i))

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 5: Assess the Problem
C. Review of all damaged buildings/flood insurance claims

Capability assessment tables for each local participant, including human and technical, financial, and legal and regulatory resources, are provided in the participant-specific appendix of this plan (**Appendices G–W**). Additional information about the expansion and improvement of an existing policy or program is also included in the legal and regulatory resource tables. Finally, each appendix lists current and recently completed mitigation projects and programs.

As noted in Section 1, Unincorporated Ventura County and its cities participate in the NFIP. The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in communities that adopt and enforce floodplain management ordinances to reduce future flood damage. As participants of the NFIP, Unincorporated Ventura County and each of its cities enforce a floodplain management ordinance and participate in FEMA's Community Assisted Visits, which occur on a 3-to 5-year cycle. Specifics regarding the floodplain manager and floodplain management ordinance for Unincorporated Ventura County and each city are contained in the capability assessment tables provided in each participant-specific appendix of this plan.

Table 6-1 lists the date of the initially mapped FIRM, the emergency/regular program entrance date into the NFIP, and the number of policies in force as of March 31, 2015. A review of all flood insurance claims for Unincorporated Ventura County and the City of Oxnard is listed below as well.

Table 6-1. Date of Initially Mapped FIRM and Emergency/Regular Program Entrance Date into NFIP for Unincorporated Ventura County and Cities

Community Name	Date of Initially Mapped FIRM	Emergency/Regular Program Entrance Date into NFIP	# of Policies in Force
Unincorporated Ventura County	October 31, 1985	October 31, 1985	1,405
City of Camarillo	September 29, 1986	September 29, 1986	1,192
City of Fillmore	October 17, 1978	October 17, 1986	104
City of Moorpark	September 29, 1986	September 29, 1986	220
City of Ojai	October 17, 1978	October 17, 1978	63
City of Oxnard	March /1, 1979	March 1, 1979	432
City of Port Hueneme	September 24, 1984	September 24, 1984	46
City of Santa Paula	April 15, 1980	April 15, 1980	1070
City of Simi Valley	September 27, 1991	September 27, 1991	1,756
City of Thousand Oaks	September 29, 1978	September 29, 1978	295
City of Ventura	September 29, 1986	September 29, 1986	294

Source: FEMA n.d. (Frank Mansell)

There are 1,405 policies and $374,637,100 of insurance in force in Unincorporated Ventura County as of March 31, 2015. The 1,405 insurance policies are broken out as follows: 1,234 single-family units; 33 2- to 4-family units; 25 all other residential units, and 113 nonresidential units. Since Unincorporated Ventura County joined the NFIP in 1985, 476 paid losses have been made for a total of $9,345,209. The 476 losses are broken out as follows: 404 single-family units; 22 2- to 4-family units; 3 all other residential units; and 47 nonresidential units.

In the City of Oxnard, there are 432 policies and $139,506,600 of insurance in force as of March 31, 2014. The 432 insurance policies are broken out as follows: 386 single-family units; 14 2- to 4-family units; 18 all other residential units, and 14 nonresidential units. Since the City of Oxnard joined the NFIP in 1979, 44 paid losses have been made for a total of $235,777. The 44 losses are broken out as follows: 35 single-family units; 2 2- to 4-family units; 0 all other residential units; and 7 nonresidential units.

7.1 OVERVIEW

A mitigation strategy includes the identification of mitigation goals and actions that will reduce the risks of each hazard and vulnerability to the local population and built environment for each local participant.

In accordance with local mitigation planning requirements, this mitigation strategy consists of the following steps:

- Update of local hazard mitigation goals
- Review of the 2010 MHMP's local participants' mitigation action plans
- Identification of new and updated mitigation actions
- Prioritization of the 2015 MHMP's local participants' mitigation actions
- Implementation of the 2015 MHMP's local participants' mitigation action plans

In addition, this section addresses the following floodplain management planning activities for the VCWPD:

- Set Goals
- Review possible activities
- Draft an action plan

7.2 UPDATE OF LOCAL HAZARD MITIGATION GOALS

The local hazard mitigation planning requirements and floodplain management planning activities for updating local hazard mitigation goals are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element C: Mitigation Strategy
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement § 201.6(c)(3)(i))

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 6: Set Goals
Goals Should address all the major hazards that face the community as well as all flood-related problems identified in Step 5 (Assess the Problem).

Mitigation goals are defined as general guidelines that explain what a community wants to achieve in terms of hazard and loss prevention. Goal statements are typically long-range, policy-oriented statements representing community-wide vision. **Table 7-1** shows the updated mitigation goals that were developed to reduce or avoid long-term vulnerability to hazards.

Table 7-1. Mitigation Goals

Goal Number	Goal Description
1	Minimize loss of life, injury, and damage to property, the economy, and the environment from the hazards identified in the 2015 MHMP through emergency preparedness, response, and recovery actions.
2	Build and enhance local mitigation capabilities to reduce the hazards identified in the 2015 MHMP. This will help ensure individual safety, reduce damage to public buildings, increase awareness/participation in the NFIP, and guarantee continuity of emergency services.

7.3 REVIEW OF THE 2010 MHMP MITIGATION ACTION PLAN

The local hazard mitigation planning requirements for reviewing the 2010 MHMP's mitigation action plans are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element D: Plan Review, Evaluation, and Implementation
D2. Was the Plan revised to reflect progress in local mitigation efforts? (Requirement § 201.6(d)(3))

During the 2015 MHMP update process, each local participant reviewed its 2010 mitigation action plan to determine which mitigation actions had been completed, deleted, deferred, or are ongoing. Mitigation actions are activities, measures, and/or projects that help achieve the goals of a mitigation plan. The results of this review, shown in each participant-specific capability assessment, illustrate the progress of participants in their local mitigation efforts over the 5 years. For the VCWPD, an annual review of its mitigation action plan and that of Unincorporated Ventura County since the 2010 MHMP was adopted by the Ventura County Board of Supervisors; the review is provided in **Appendix X**.

7.4 IDENTIFICATION OF NEW AND UPDATED POTENTIAL MITIGATION ACTIONS

The local hazard mitigation planning requirements and floodplain management planning activities for identifying and updating the 2010 MHMP's potential mitigation actions are as follows:

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element C: Mitigation Strategy
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement § 201.6(c)(3)(ii))

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 7: Review Possible Activities
A. Preventative activities.
B. Floodplain management regulatory/current and future conditions.
C. Property protection activities.
D. Natural resource protection activities.
E. Emergency services activities.
F. Structural projects.
G. Public information activities.

Similar to the 2005 and 2010 MHMP planning process, the MHMP Planning Committee developed overarching potential mitigation actions for all local participants. These potential mitigation actions are listed in **Table 7-2**. In addition, each local participant identified other participant-specific potential mitigation actions through the review of existing resources; identification of past success stories and best management practices; and solicitation of input from pertinent departments, including planning, public works, building and safety, code enforcement, watershed protection, and emergency management staff. Additional local participant-specific potential mitigation actions are provided in each local participant-specific appendix.

As shown in **Table 7-2**, for each potential mitigation action, the following information is listed: mitigation action description; mitigation action category (which includes local plans and regulations, structure and infrastructure projects, natural systems protection, and education and awareness programs); hazard(s) addressed; and type of development affected by mitigation action. For the VCWPD (on behalf of Unincorporated Ventura County) and the City of Oxnard, the following information is listed for each potential mitigation action: mitigation action description; floodplain management activity (which includes preventive, property protection, natural resource protection, emergency services, structural projects, and public information); hazards(s) addressed; and a review of each mitigation action (which includes: pros/cons, capability to fund and implement, and implementation status).

Table 7-2. Potential Overarching Mitigation Actions

No.	Description	Hazard	Mitigation Category	New or Existing Construction
OA 1	Integrate the hazard analysis and mitigation strategy into the General Plan's Safety Element.	All	Local Plans and Regulations	Not Applicable
OA 2	Ensure that existing monitoring capabilities at the state and County level are integrated to provide an early warning of increased or new infestations.*	Agricultural (Insect Pests/Invasive Species)	Natural Systems Protection	Not Applicable
OA 3	Implement an infestation public awareness and educational campaign.	Agricultural (Insect Pests/Invasive Species)	Education and Awareness	Not Applicable
OA 4*	Relocate or reinforce bike trails, parking lots and other beach access amenities away from the shoreline to restore the beach/shoreline in sea-level rise/coastal erosion areas.	Climate Change	Natural Systems Protection	Existing
OA 5*	Restore habitat and improve flood protection for low-lying areas by employing innovative techniques such as constructing levees coupled with gently sloping tidal marshes to help protect from storm wave action and tidal surge.	Climate Change	Natural Systems Protection	New/Existing
OA 6	Develop a public outreach program that informs property owners located in the dam and levee failure inundation areas about voluntary flood insurance.	Dam and Levee Failure Inundation	Education and Awareness	Existing
OA 7	Develop a water conservation public outreach program to increase awareness about the drought, fines and penalties for overuse and solutions for conserving water.	Drought	Education and Awareness	New/Existing
OA 8	Adopt emergency water conservation measures and/or water conservation ordinance to limit irrigation.	Drought	Local Plans and Regulations	New/Existing
OA 9	Identify potentially vulnerable public and private utility systems including electric, gas, oil, water, sewer and communication. Upgrade vulnerable systems to ensure the operation and timely restoration of essential systems to reasonable levels of service.	Earthquake	Structure and Infrastructure Projects	New/Existing
OA 10	Seismically retrofit or upgrade seismically deficient government facilities and pre-identified shelter facilities.	Earthquake	Structure and Infrastructure Projects	Existing

Table 7-2. Potential Overarching Mitigation Actions

No.	Description	Hazard	Mitigation Category	New or Existing Construction
OA 11	Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements.	Earthquake	Local Plans and Regulations & Awareness and Education	Existing
OA 12	Increase participation in the NFIP by entering the Community Rating System program which through enhanced floodplain management activities would allow property owners to receive a discount on their flood insurance.	Flood	All	New/Existing (Residential structures and critical facilities which are located within the 100-year floodplain)
OA 13*	Reinforce roads/bridges from flooding through protection activities, including elevating the roads/bridges and installing/widening culverts beneath the roads/bridges or upgrading storm drains.	Flood	Structure and Infrastructure Projects	Existing
OA 14*	Acquire, relocate, or elevate residential structures, in particular those that have been identified as RL properties, within the 100-year floodplain.	Flood	Structure and Infrastructure Projects	Existing
OA 15	Work with FEMA Region 9 to address any floodplain management issues that may have arisen/arise from the countywide DFIRM, Community Assessment Visits, and/or DWR.	Flood	Local Plans and Regulations	Not Applicable
OA 16*	Implement landslide stabilization and/or protection measures. Stabilization measures include grading the unstable portion of the slope to a lower gradient, construction of rock buttresses and retaining walls, and drainage improvements. Protection measures include containment and/or diversion of the moving debris, such as walls, berms, ditches and catchment basins.	Landslide	Structure and Infrastructure Projects, Natural Systems Protection	New/Existing
OA 17	Implement post-fire debris flow hillslope and channel treatments, such as seeding, mulching, check dams, and debris racks, as needed.	Post-Fire Debris Flow	Natural Systems Protection	New/Existing

Table 7-2. Potential Overarching Mitigation Actions

No.	Description	Hazard	Mitigation Category	New or Existing Construction
OA 18*	Continue to participate in the NWS TsunamiReady Program through continued implementation of Guideline 4: Community Preparedness measures, including public outreach material and curriculum.	Tsunami	Awareness and Education	Not Applicable
OA 19	Create a new vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation from around their homes.	Wildfire	Awareness and Education, Natural Systems Protection	Existing (Residential buildings in high wildfire severity zones)
OA 20	Implement a fuel modification program for new construction by requiring builders and developers to submit their plans, complete with proposed fuel modification zones, to the local fire department for review and approval prior to beginning construction.	Wildfire	Local Plans and Regulations	New (Residential and non-residential buildings located within high wildfire severity zones)
OA 21*	Develop a hazards fuel treatment program for areas that have been identified with overgrown/dead brush/trees to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program.	Wildfire	Natural Systems Protection	New/Existing
OA 22	Develop a vegetation management program in areas within and adjacent to rights-of-way and in close proximity to critical facilities to reduce the risk of tree failure and property damage and avoid creation of wind acceleration corridors within vegetated areas.	Winter Storm	Awareness and Education, Natural Systems Protection	New/Existing

* Recent/current FEMA, NWS and California Coastal Conservancy grant projects (nationwide)

OA = Overarching

7.5 PRIORITIZATION OF THE 2015 MHMP MITIGATION ACTIONS

The requirements for the prioritization of mitigation actions, as stipulated in DMA 2000 and its implementing regulations, are described below.

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element D: Plan Review, Evaluation, and Implementation
D3. Was the plan revised to reflect changes in priorities? (Requirement § 201.6(d)(3))

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element C: Mitigation Strategy
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement § 201.6(c)(3)(iv)); (Requirement § 201.6(c)(3)(iii))

After the list of potential mitigation actions had been developed, the local participants determined which potential mitigation actions should be included in their local plan participant-specific mitigation action plans. For this process, each local participant selected projects that met the majority of the Hazard Mitigation Assistance (HMA) Program requirements (**Table 7-3**), as these projects have the greatest chance of leading to enhanced project scoping and the lowest probability of experiencing HMA funding delays. Therefore, these selected projects are considered high-priority projects. Projects not selected as high-priority projects may be considered at a later date for implementation if the priority projects have been completed or deferred or additional funding sources have become available.

Table 7-3. Priority Project Criteria (HMA Program Requirements)

Requirement	Description
Mitigation Planning	Links the existing mitigation plan, particularly the vulnerability analysis and capability assessment, to project scoping.
Technical Feasibility and Effectiveness	Conforms with accepted engineering practices, established codes, standards, modeling techniques, or best practices. Effective mitigation measures funded under HMA should provide a long-term or permanent solution.
Floodplain Management and Protection of Wetlands	Conforms to 44 CFR Part 9, which incorporates the requirements of Executive Order (EO) 11988 (Floodplain Management) and EO 11990 (Protection of Wetlands).
Environmental Planning and Historic Review and Compliance	Complies with all environmental and historic preservation laws and with 44 CFR Part 10.
Cost-Effectiveness	Is cost-effective or would be in the interest of the NFIP.
Cost Review	Is reasonable in costs compared to the probable benefits.

Table 7-3. Priority Project Criteria (HMA Program Requirements)

Requirement	Description
General Program Requirements	Is an eligible activity, including property acquisition and structure demolition, property demolition and structure relocation, structure elevation, mitigation reconstruction, dry floodproofing of historic residential structures, dry floodproofing of nonresidential structures, minor localized flood reduction projects, structural retrofitting of existing buildings, non-structural retrofitting of existing buildings and facilities, infrastructure retrofit, soil stabilization, wildfire mitigation, and post-disaster code enforcement.

7.5.1 2015 MHMP Local Participant-Specific Mitigation Action Plans

Each local participant selected priority projects to include in its mitigation action plan (provided in each local-participant-specific appendix, **Appendix G–W**). As noted above, priority projects are projects that meet the HMA guidance program requirements identified in **Table 7-3**. Emphasis in this process was placed on cost-effectiveness and technical feasibility and effectiveness.

The following information has been included for local-participant-specific mitigation action plans: mitigation action number and description, facility to be mitigated (if known and/or applicable), department/agency to oversee the implementation of the mitigation action, potential funding source, and implementation timeframe. Also, for the VCWPD and City of Oxnard, the mitigation action plan identifies the mitigation goal associated with each priority project.

8.1 OVERVIEW

This section describes a formal plan maintenance process to ensure that the 2015 MHMP remains an active and applicable document. It includes an explanation of how the Ventura County Project Management Team intend to organize its efforts to ensure that improvements and revisions to the 2015 MHMP occur in a well-managed, efficient, and coordinated manner.

The following three process steps are addressed in detail below:

- Monitoring, evaluating, and updating the MHMP
- Implementation through existing planning mechanisms
- Continued public involvement

In addition, revisions made from the 2010 MHMP plan maintenance section to the 2015 MHMP plan maintenance section are discussed below.

8.2 MONITORING, EVALUATING, AND UPDATING THE PLAN

The local hazard mitigation planning and floodplain management planning requirements for monitoring, evaluating, and updating the MHMP are as follows.

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element A: Planning Process
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating, and updating the mitigation plan within a 5-year cycle? (Requirement § 201.6(c)(4)(1))

Regulation Checklist – CRS 510 Floodplain Management Planning
CRS Step 10: Implement, Evaluate and Revise.
A. Procedures to monitor and recommend revisions.
B. Same planning committee or successor committee that qualifies under Section 511.a.2 (a) does the evaluation.

The Ventura County Project Management Team will take the lead on monitoring, evaluating, and updating the 2015 MHMP through the following activities. (The Ventura County Sheriff's OES will lead these efforts for the MHMP Committee, and VCWPD will lead these efforts for the FMP Committee.)

- **Monitoring:** Every 12 months from plan adoption, the Ventura County Project Management Team will email each member of both planning committees an Annual Review Questionnaire to complete. As shown in **Appendix X**, the Annual Review Questionnaire evaluation of the following: planning process, hazard analysis, vulnerability analysis, capability assessment, and mitigation strategy.
- Additionally, mitigation actions will be monitored and updated through the use of the Mitigation Project Progress Report. During each annual review, each department or agency currently administering a mitigation project will submit a progress report to the

Ventura County Project Management Team to review and evaluate. For projects that are being funded by a FEMA mitigation grant, FEMA quarterly reports may be used as the preferred reporting tool. As shown in **Appendix X**, the progress report will discuss the current status of the mitigation project, including any changes made to the project, identify implementation problems, and describe appropriate strategies to overcome them.

- **Evaluating:** The Ventura County Project Management Team will collect all completed questionnaires and determine if the 2015 MHMP needs to be updated to address new or more threatening hazards, new technical reports or findings, and new or better-defined mitigation projects. The Ventura County Project Management Team will summarize these findings and email them out to both planning committees. As done with the 2010 MHMP, the Project Management Team will submit this annual report to the Ventura County Board of Supervisors as part of the CRS recertification process (See **Appendix X**, for the 2011, 2012, 2013 and 2014 annual reports). In addition, for the annual review of the 2015 MHMP, the report will be posted to the MHMP website for public review. If the Ventura County Project Management Team believes that the 2015 MHMP needs to be updated based on the findings, then a request will be made to the planning committees to attend a formal MHMP update meeting. A media release will be issued that the update process has begun.
- **Updating:** To ensure that this update occurs, on the fourth year following plan adoption, the Ventura County Project Management Team will apply for funding or secure local funding to assist in the next MHMP update. Six months prior to the five year adoption date, the Ventura County Project Management Team will organize both planning committees to kick-off the next MHMP update. The process for the update will follow the process identified in Section 3.

8.3 IMPLEMENTATION THROUGH EXISTING PLANNING MECHANISMS

The local hazard mitigation planning requirements for integrating the MHMP into other planning mechanisms are as follow.

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element C: Mitigation Strategy
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement § 201.6(c)(4)(iii))

After the adoption of the 2015 MHMP, the Ventura County Project Management Team and planning committees will work to incorporate applicable elements of the 2015 MHMP into other existing planning mechanisms. The processes for incorporating the 2015 MHMP into various planning documents will occur as (1) other plans and policies are updated and (2) new plans and policies are developed.

Therefore, Unincorporated Ventura County and the other local participants will undertake and/or continue to undertake the following activities:

- Incorporate information from the hazard analysis and mitigation strategy sections in the 2015 MHMP into the update of the safety element in their respective general plans. As noted in **Section 3**, the 2015 MHMP is concurrently being updated with the Ventura County General Plan: Hazards Appendix.
- Use information from the hazard analysis and vulnerability analysis sections in 2015 MHMP for the update of their respective emergency operation or emergency response plans.
- Use information from the vulnerability analysis section in 2015 MHMP to develop and/or continue to develop emergency preparedness public information and related outreach efforts.
- Use information from the vulnerability analysis (specifically the RL properties analysis) in the 2015 MHMP to develop CRS-eligible activities and reduce the number of RL properties throughout the county.
- Refer to their respective mitigation action plans when updating their respective capital improvement plans/programs.

8.4 CONTINUED PUBLIC INVOLVEMENT

The requirements for continued public involvement, as stipulated in the DMA 2000 and its implementing regulations, are described below.

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element A: Planning Process
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement § 201.6(c)(4))

The Ventura County Project Management Team and the planning committees are dedicated to involving the public directly in the continual reshaping and updating of the 2015 MHMP. A downloadable copy of the 2015 MHMP and any proposed changes or updates will be posted on the 2015 MHMP website (http://www.venturacountymhmp.com). The 2015 MHMP website will also contain an e-mail address and phone number to which people can direct their comments or concerns. Additionally, the County's CRS website (CRS Activity 330 – www.vcfloodinfo.com) is linked to the 2015 MHMP website.

As noted above, the Ventura County Project Management Team will continue to oversee implementation, examine the annual review questionnaires and project progress reports, modify the implementation strategy and process as needed, and update the MHMP as required. The Ventura County Project Management Team will also identify opportunities to raise community awareness about the 2015 MHMP and the hazards that affect the county. This effort could include attendance and provision of materials at county and city-sponsored events, programs and public mailings. Any public comments received regarding the 2015 MHMP will be collected by the Ventura County Project Management Team included in the annual report, and considered during future MHMP updates.

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